



READING COMPREHENSION

1. Read the passage given below and answer the questions that follow: (12 marks)

1. I got up at 4 in the morning, melted snow, and brewed tea. After a light breakfast, I left my tent at around 5.30 a.m. John Cooper was standing outside. He was going to climb without oxygen. But because of this, his feet would get very cold. He, thus, wanted to avoid long exposure at heights and a night at the Summit Camp. He had, therefore, to either get to the peak and back to the South Col the same day or abandon the attempt.

2. He asked if I would like to go with him. Going to the top from the South Col and back in a day would be strenuous and tough and there was the risk of John Cooper turning back if his feet got too cold. I, however, had full confidence in him as well as in my stamina and climbing capability.

3. At 6.20, when John Cooper and I stepped out from the South Col, it was a perfect day. There was a gentle breeze but the cold was intense. I was, however, warm in my well-insulated climbing gear. We climbed unroped. The steep frozen slopes were as hard and brittle as sheets of glass. We had to use the ice – axe and I had to kick really hard to get the front teeth of the crampons to bite into the frozen surface. I took every step very deliberately on the dangerous stretches. In less than two hours, we reached the Summit Camp.

4. He told me that the earlier summit party had taken four hours to reach the Summit Camp and added that if we could keep our present pace, we would be on the summit by 1 p.m. After drinking some tea, we moved on. It was terrifying to stand erect on a knife-edge ridge, with a sheer drop on either side. There was some tricky climbing between the South Summit and what is popularly known as Hillary's Step. John Cooper was already over it, but I was still negotiating its vertical face when he gesticulated towards the top. I was thrilled. The goal was near.

5. With renewed vigour, I was on top of the step in seconds. The sun had made the snow soft and climbing was easier here than it had been earlier. We trudged in the heavy powder snow for some time. Then the gradient started easing off noticeably. A few steps later, I saw that after only a couple of meters there was no upward climb. The slope plunged steeply down. My heart stood still. It dawned on me that success was within reach and at 1.07 p.m. I stood on top of Everest.

A. Choose the correct option of the following questions. (1 × 5 = 5 marks)

(a) What was the first obstacle faced by John Cooper?

- i. It was cold and dark ii. There was no one with him
- iii. There was a lack of oxygen iv. The region was unknown

(b) Why did the narrator choose John Cooper?

- i. He was used to the region ii. His energy levels were high
- iii. He could take risks iv. The narrator had confidence in him

(c) From where they started climbing?

- i. South Camp ii. South Summit iii South Col iv Hillary's Step

(d) How much time had the other summit party taken to reach the Summit camp?

- i Two hours ii Three hours iii Four hours iv Less than two hours

(e) What was their destination?

- i. South Col ii. Hillary's Step iii. Everest iv. Summit Camp

B. Based on your understanding of the passage, answer these questions. (1 × 5 = 5 marks)

(a) Why would John Cooper's feet get very cold?

(b) What were the alternatives of climbing without oxygen?

(c) How did the narrator crossed frozen slopes?

(d) How did the Sun affect their climbing?

(e) How did the narrator feel just before reaching the peak?

C. Pick out the words from the passage which mean the same as the following. (1×2 = 2)

(a) difficult (para 2)

(b) signaled (para 4)

2. Read the passage given below:

1. YOU say that our government is inefficient. YOU say that our laws are too old. YOU say that the municipality does not pick up the garbage. YOU say that the phones don't work, the railways are a joke, the airline is the worst in the world and mails never reach their destinations. YOU say, say and say.

2. What do you do about it? Take a person on his way to Finland. Give him a name – YOURS. Give him a face – YOURS. YOU walk out of the airport and you are at your international best. In Finland, you don't throw cigarette butts on the roads. YOU are as proud of their Underground Links as they are. YOU come back to the parking lot to punch your parking ticket, if you have overstayed in a restaurant or a shopping mall, irrespective of your status or identity. In Finland, you don't say anything, DO YOU?

3. YOU wouldn't dare to eat in public during Ramadan in Dubai. YOU would not dare to go out without your head covered in Jeddah. YOU would not dare to speed beyond 55 mph (88 kmph) in Washington and then tell the traffic cop, "Do you know who I am? I am so and so's son YOU wouldn't chuck an empty coconut shell anywhere other than the garbage pail on the beaches in Australia and New Zealand. Why don't YOU spit betel on the streets of Tokyo? We are still talking of the same YOU.

4. YOU, who can respect and follow a foreign system in other countries but cannot in your own. YOU, who will throw papers and cigarettes on the road, the moment you touch Indian ground. If you can be an involved and appreciative citizen in an alien country, why cannot you be the same here in India?

5. Once in an interview, the famous ex-municipal commissioner of Bombay Mr. Tinaikar had a point to make, "Rich people's dogs are walked on the streets to leave their affluent droppings all over the place," he said. "And then the

same people turn around to criticize and blame the authorities for inefficiency and dirty pavements. What do they expect the officers to do? Go down with a broom every time their dog feels the pressure in his bowels? In America, every dog owner has to clean up after his pet has done the job. The same is in Japan. Will Indian citizens do that here?" He's right.

A. On the basis of your understanding of the passage, answer the following questions by choosing the most appropriate option. (1 × 5 = 5 marks)

i. How do we blame our government?

- (a) It does not work (b) It is inefficient (c) It is useless (d) It does not do anything

ii. Finland is proud of

- (a) Its cleanliness (b) Its parking system (c) Its links (d) Its roads

iii. What wouldn't you dare to?

- (a) To eat in public during Ramadan in Dubai (b) To spit betel on road in Tokyo
(c) To throw garbage on road in Australia (d) All of these

iv. Who was Mr. Tinaikar?

- (a) Municipal commissioner of Bombay (b) Ex-municipal commissioner of Bombay
(c) Commissioner of Bombay (d) Ex-municipal commissioner of Maharashtra

v. In which country/countries a dog owner cleans/clean his dog's droppings on the roads?

- (a) England (b) America (c) India (d) Japan

vi. What are the negative remarks we make about our country?

vii. How does an Indian behave in Finland?

viii. List two deeds an Indian would not dare to do while traveling abroad.

ix. Find a word from the passage which means 'throw' (para 3)

x. Find a word from the passage which means 'prosperous or rich' (para 5)

WRITING SKILLS

3. You are Ganesh/ Gauri living at 39, New Colony, Shimla. You decide to hold a dinner party to congratulate your grandparents on their golden wedding anniversary. Draft a formal invitation in not more than 50 words to all family members to attend a grand dinner at home. (word limit: 50 words) 4

4. You are Ruhi/Rahul, head girl/boy of ABC convent school. Your school is going to organize an Inter-school Singing Competition. Write a notice for your school notice board inviting names of all the interested students. (word limit: 50 words) 4

5. You are Dr. Karan Mehta, invited to inaugurate a science exhibition, but you are unavailable on the mentioned date. Write a formal reply declining the invitation. 4

6. Your friend Neha has invited you to her birthday party. Write an informal reply accepting the invitation. 4

7. You are Priya Sharma, a resident of 221B, Civil Lines, Agra. You are concerned about the increasing problem of garbage accumulation in your locality, which is leading to health hazards. Write a letter to the Editor of a national daily highlighting the issue and suggesting measures. 5

8. You are a resident of Shivaji Nagar Pune. You are concerned about the increasing number of road mishaps in your city. Write a letter to the Editor of a local magazine "Jan Chetna" highlighting the problem and suggesting measures to check the problem. (word limit: 120-150 words) 5

LITERATURE

9. Read the given extracts and answer the questions that follow:

6

Months passed. Shukla was sitting on his haunches at the appointed spot in Calcutta when Gandhi arrived; he waited till Gandhi was free. Then the two of them boarded a train for the city of Patna in Bihar. There Shukla led him to the house of a lawyer named Rajendra Prasad who later became President of the Congress party and of India. Rajendra Prasad was out of town, but the servants knew Shukla as a poor yeoman who pestered their master to help the indigo sharecroppers. So, they let him stay on the grounds with his companion, Gandhi, whom they took to be another peasant. But Gandhi was not permitted to draw water from the well lest some drops from his bucket pollute the entire source; how did they know that he was not an untouchable? (Indigo)

(a) What is the most likely reason for Gandhi to agree to come along with Shukla?

(b) Select the correct option from those given in brackets to fill in the blank.

Rajkumar Shukla waited Gandhi till he was free, shows his (resoluteness/ indecisiveness).

(c) Complete the following suitably.

The author's views on the character of Shukla, in the extract, can best be described as statements based on ____

(d) Explain any one inference that can be drawn from the following, "To say that Shukla was a resolute man will not be an extravagant claim."

(e) The line, "But Gandhi was not permitted to draw water from the well lest some drops from his bucket pollute the entire source" can be best classified as:

(i) a social practice (ii) an opinion (iii) a fallacy (iv) a personal bias

(f) Which of the following headlines gives a clear and accurate picture of the sharecroppers' problem mentioned in the extract?

(i) The farmers wanted compensation from the landlords to release them from the 15% arrangement.

(ii) The landlords wanted compensation from the farmers to release them from the 15% arrangement.

(iii) The farmers refused to grow indigo in their holdings.

(iv) The landlords wanted to replace expensive, natural indigo with the cheap, synthetic version.

10. Read the given extracts and answer the questions that follow:

6

"Sometimes I feel myself I can hardly bear

The thought of so much childish longing in vain, The sadness that lurks near the open window there,

That waits all day in almost open prayer

For the squeal of brakes, the sound of a stopping car," (A Roadside Stand)

(a) Identify the phrase from the extract that suggests the following.

The rural folk are innocent people hoping for someone to give them money.

(b) What will the rural folk feel at the sound of stopping cars?

(i) Hopeful and excited (ii) Faithful and shocked (iii) Shocked and devastated (iv) Excited and shocked

(c) Fill the blank with an appropriate word with reference to the extract.

The squeal of brakes and the stopping of the cars indicate

(d) Select the correct option from those given in brackets to fill in the blank.

The word 'squeal' is an example of the figure of speech (oxymoron/onomatopoeia)

(e) Read the Assertion and the Reason below, with reference to the given extract.

Assertion: The rural folk hope that they would receive help from the city people.

Reason: The hope is not fulfilled as the city people are selfish creatures.

Choose the correct option regarding their relationship.

- (i) Both the Assertion and the Reason are true, and the Reason is the correct explanation of the assertion.
- (ii) Both the Assertion and the Reason are true, but the Reason is not the correct explanation of the Assertion.
- (iii) The Assertion is true, but the Reason is false.
- (iv) The Assertion is false, but the Reason is true.
- (f) What is the 'sadness' referred to in the extract about?

1. Read the given extracts and answer the questions that follow:

4

A. I've been in and out of Grand Central hundreds of times, but I'm always bumping into new doorways and stairs and corridors. Once I got into a tunnel about a mile long and came out in the lobby of the Roosevelt Hotel. Another time I came up in an office building on Forty-sixth Street, three blocks away.

Sometimes, I think Grand Central is growing like a tree, pushing out new corridors and staircases like roots. There's probably a long tunnel that nobody knows about feeling its way under the city right now, on its way to Times Square, and maybe another to Central Park. And maybe - because for so many people through the years Grand Central has been an exit, a way of escape - maybe that's how the tunnel I got into...

(The Third Level)

(a) Complete the following suitably.

The literary device used in 'Grand Central Station growing like a tree' is

(b) What does the narrator mean by 'Grand Central has been an exit'?

(c) Why does, only Charley get lost at the third level in the extract?

- (i) Because he is practical. (ii) Because he is an escapist.
- (iii) Because he loves to perform adventures. (iv) Because he loves travelling.
- (d) Explore the genre and writing style of the narrator in the given extract.

2. Answer the following questions in about 40-50 words each.

(2 marks each)

- i. How does the poem "My Mother at Sixty-six" reflect the poet's inner conflict and universal human fears?
- ii. Why does the poet use the simile "as a late winter's moon" for her mother? (My Mother at Sixty-six)
- iii. Why does the poet smile at the end even though she is sad? (My Mother at Sixty-six)
- iv. "The polished traffic passed with a mind ahead, / Or if ever aside a moment, then out of sorts". What do these lines reveal about the attitude of the city dwellers? (A Roadside Stand)
- v. How does Frost use irony to expose the false promises of progress in "A Roadside Stand"?
- vi. Imagine you are a social reformer. Based on the poem, suggest two practical steps that can help the people at the roadside stand.
- vii. Franz reflects, "How sorry I was for not learning my lessons, for seeking birds' eggs, or going sliding on the Saar!" How does this sudden realization about lost time connect to the story's broader themes of colonialism, identity, and education? (The Last Lesson)
- viii. How does the presence of the village elders in the classroom contribute to the emotional gravity of the narrative and reflect a shift in communal consciousness regarding language and national identity? (The Last Lesson)
- ix. Discuss how the author uses the character of M. Hamel to explore the emotional and symbolic dimensions of a teacher's role in times of cultural and political crisis. (The Last Lesson)
- x. Analyse the metaphor "garbage to them is gold" in the context of Seemapuri's rag-pickers. How does this paradox shape the narrative's critique of consumerist urban India? (Lost Spring)
- xi. Jung writes that Saheb's new job at the tea-stall makes him "no longer his own master." Evaluate how this transition from informal rag-picking to bonded wage labour complicates conventional narratives of "upward mobility." (Lost Spring)

- xii. What does the story teach us about the importance of valuing things before they are lost? Can you relate it to any modern-day situation? (Lost Spring)
- xiii. The peddler believes that the world itself is a rattrap, offering bait in the form of material comforts. How does this metaphor reflect both his cynicism and serve as a philosophical commentary on human entrapment? (The Ratttrap)
- xiv. Though still quite young Edla Willmansson had a good psychological insight and keen observation. Comment. (The Ratttrap)
- xv. At the end, the peddler leaves behind a rattrap as a gift and signs off as "Captain von Stahle." How does this symbolic gesture encapsulate the themes of identity, repentance, and transformation? (The Ratttrap)
- xvi. How does Louis Fischer use the indigo plant as a symbol to represent both economic exploitation and cultural persistence in the story?
- xvii. What was the role of the middlemen in the indigo farming system described in the story?
- xviii. What can be inferred from Rajendra Prasad's recorded upshot of the lawyer's consultations, at Motihari? (Indigo)
- xix. Discuss how Kalki uses the character of the Tiger King to explore the theme of power and its effects on morality. How does the king's obsession with hunting affect his sense of justice and responsibility?
- xx. Analyze the role of irony in the story, especially in relation to the king's fate. How does Kalki use irony to convey a moral lesson? (The Tiger King)
- xxi. How does the Tiger King's attitude towards the tigers reflect his personality and approach to ruling his kingdom?
- xxii. How does Jack Finney blur the boundaries between reality and fantasy in *The Third Level*? What impact does this have on the reader?
- xxiii. How is the setting of Grand Central Station symbolic in *The Third Level*?
- xxiv. What role does nostalgia play in *The Third Level*? Is it a strength or a flaw in Charley's character?

3. Answer the following question in about 150 words each.

5 marks each

- i. "What I did was a very ordinary thing," said Gandhi. What made his actions extraordinary in the Champaran episode? (Indigo)
- ii. The cry of not having money to do anything except carry on the business of making bangles, not even enough to eat, rings in every home.'

(The Lost Spring)

'...far from the city we make our roadside stand and ask for some city money to feel in hand'.

(A Roadside Stand)

Create a conversation between a bangle maker and the owner of a roadside stand with reference to the above extracts.

You may begin the conversation like this:

Owner of a roadside stand: Your bangles are pretty. Tell me about your experience in this business.

- iii. How does Charley make his description of the third level very realistic? (The Third Level)
- iv. How did tiger King succeed in killing 'hundred tigers'? (The Tiger King)
- v. Identify an instance of hope or resilience in 'Lost Spring' and analyse how it reflects one of the story's themes.

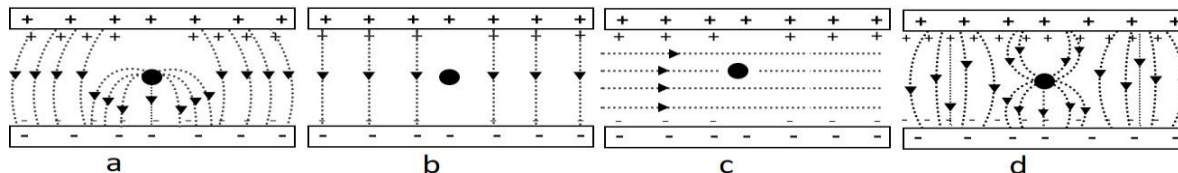


XII, PHYSICS

WORKSHEET -01

CH. 01: ELECTROSTATICS AND CAPACITANCE

1. Which of the following diagrams correctly represents the electric field between two charged plates if a Neutral conductor is placed in between the plates?



2. Two charges q_1 and q_2 are placed at the centres of two spherical conducting shells of radius r_1 and r_2 respectively. The shells are arranged such that their centres are $d(>(r_1+r_2))$ distance apart. The force on q_2 due to q_1 is

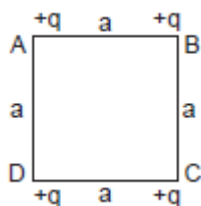
a. $\frac{1}{4\pi\epsilon_0} \frac{q_1 q_2}{d^2}$

b. $\frac{1}{4\pi\epsilon_0} \frac{q_1 q_2}{(d-r_1)^2}$

c. zero

d. $\frac{1}{4\pi\epsilon_0} \frac{q_1 q_2}{[d-(r_1+r_2)]^2}$

3. When a glass rod is rubbed with silk, it
(a) gains electrons from silk. (b) gives electrons to silk. (c) gains protons from silk. (d) gives protons to silk.
4. Four equal charges q are placed at the four corners A, B, C, D of a square of length a . The magnitude of the force on the charge at B will be:



(a) $\frac{3q^2}{4\pi\epsilon_0 a^2}$

(b) $\frac{4q^2}{4\pi\epsilon_0 a^2}$

(c) $\frac{(1+2\sqrt{2})q^2}{2 \times 4\pi\epsilon_0 a^2}$

(d) $\frac{\left(\frac{2+1}{\sqrt{2}}\right)q^2}{4\pi\epsilon_0 a^2}$

5. Two charges of equal magnitudes kept at a distance r exert a force F on each other. If the charges are halved and distance between them is doubled, then the new force acting on each charge is

(a) $\frac{F}{8}$

(b) $\frac{F}{4}$

(c) $4F$

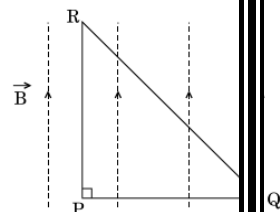
(d) $\frac{F}{16}$

6. The electric field inside a spherical shell of uniform surface charge density is
(a) zero. (b) constant, less than zero.
(c) directly proportional to the distance from the centre. (d) none of the these

7. Electric field at a point varies as r^0 for
 (a) an electric dipole (b) a point charge
 (c) a plane infinite sheet of charge (d) a line charge of infinite length

8. An isosceles right angled current carrying loop PQR is placed in a uniform magnetic field B pointing along PR. If the magnetic force acting on the arm PQ is F , then the magnetic force which acts on the arm QR will be:

- a. F b. $\frac{F}{\sqrt{2}}$ c. $\sqrt{2}F$ d. $-F$



9. An electric charge q is placed at the centre of a cube of side a . The electric flux on one of its faces will be

- (a) $\frac{q}{6\epsilon_0}$ (b) $\frac{q}{\epsilon_0 a^2}$
 (c) $\frac{q}{4\pi\epsilon_0 a^2}$ (d) $\frac{q}{\epsilon_0}$

10. Total electric flux coming out of a unit positive charge kept in air is

- (a) ϵ_0 (b) ϵ_0^{-1}
 (c) $(4\pi\epsilon_0)^{-1}$ (d) $4\pi\epsilon_0$

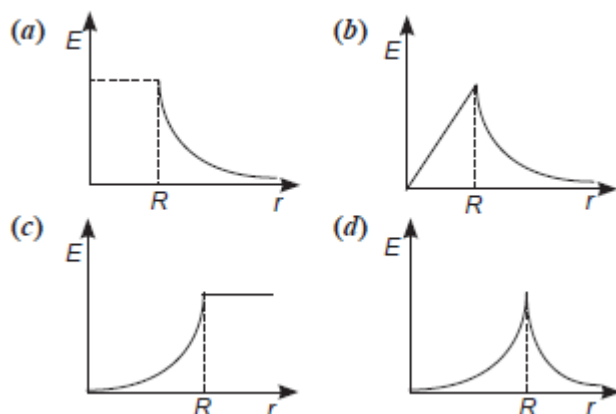
11. The electric field intensity due to an infinite cylinder of radius R and having charge q per unit length at a distance r ($r > R$) from its axis is

- (a) directly proportional to r^2 . (b) directly proportional to r^3 .
 (c) inversely proportional to r . (d) inversely proportional to r^2 .

12. A point charge q is placed at a distance $a/2$ directly above the centre of a square of side a . The electric flux through the square is

- (a) q/ϵ_0 (b) $q/\pi\epsilon_0$ (c) $q/4\epsilon_0$ (d) $q/6\epsilon_0$

13. Which of the following graphs shows the variation of electric field E due to a hollow spherical conductor of radius R as a function of distance from the centre of the sphere?



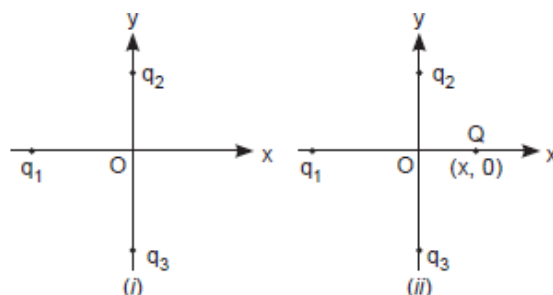
14. Two charges q_1 and q_2 are separated by distance d and placed in a medium of dielectric constant k . what will be the equivalent distance between charges in air for the same electrostatic force?

- a. $d\sqrt{k}$ b. $k\sqrt{d}$ c. $1.5d\sqrt{k}$ d. $2d\sqrt{k}$

15. Two point charges $+16q$ and $-4q$ are located at $x = 0$ and $x = L$. The location of the point on x -axis at which the resultant electric field due to these charges is zero, is:

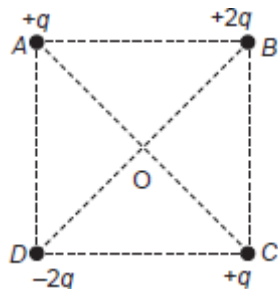
- a. 8 b. $4L$ c. $6L$ d. $2L$

16. The magnitude of electric field intensity E is such that, an electron placed in it would experience an electrical force equal to its weight is given by
 (a) mg/e (b) mg/e (c) e/mg (d) e^2g/m^2
17. In Fig. (i) two positive charges q_2 and q_3 fixed along the y -axis, exert a net electric force in the $+x$ direction on a charge q_1 fixed along the x -axis. If a positive charge Q is added at $(x, 0)$ in figure(ii), the force on q_1 is

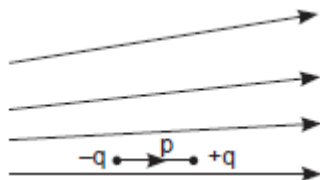


- (a) shall increase along the positive x -axis.
 (b) shall decrease along the positive x -axis.
 (c) shall point along the negative x -axis.
 (d) shall increase but the direction changes because of the intersection of Q with q_2 and q_3 .
18. Which of the following statement is correct? The electric field at a point is
 (a) always continuous.
 (b) continuous if there is a charge at that point.
 (c) discontinuous only if there is a negative charge at that point.
 (d) discontinuous if there is a charge at that point.
19. A point charge $+q$ is placed at a distance d from an isolated conducting plane. The field at a point P on the other side of the plane is
 (a) directed perpendicular to the plane and away from the plane.
 (b) directed perpendicular to the plane but towards the plane.
 (c) directed radially away from the point charge.
 (d) directed radially towards the point charge.
20. Gauss's law will be invalid if
 (a) there is magnetic monopoles.
 (b) the inverse square law is not exactly true.
 (c) the velocity of light is not a universal constant.
 (d) none of these.
21. A charge Q is divided into two parts of q and $Q-q$. If coulomb repulsion between them when they are separated is maximum, the ratio of $Q:q$ should be
 a. 2:1 b. 1:2 c. 4:1 d. 1:4
22. A cylinder of radius ' r ' and length ' l ' is placed in a uniform electric field parallel ' E ' to the axis of the cylinder. The total flux for the surface of the cylinder is given by
 a. Zero b. πr^2 c. $E\pi r^2$ d. $2E\pi r^2$
23. Three charges $+Q$, q and $+Q$ are placed respectively, at distances 0 , $d/2$ and d from the origin, on the x -axis. If the net force experienced by $+Q$, placed at $x = 0$, is zero, then value of q is -
 a. $+Q/2$ b. $-Q/2$ c. $-Q/4$ d. $+Q/4$
24. An electric dipole of moment p is placed in the position of stable equilibrium in uniform electric field of intensity E . It is rotated through an angle θ from the initial position. The potential energy of electric dipole in the final position is
 (a) $pE \cos \theta$ (b) $pE \sin \theta$ (c) $pE(1 - \cos \theta)$ (d) $-pE \cos \theta$
25. An electric dipole is kept in a non-uniform electric field. It experiences
 (a) a force and a torque. (b) a force but not a torque.
 (c) a torque but not a force. (d) neither a force nor a torque.
26. There are two charges $+1 \mu C$ and $+5 \mu C$. The ratio of the forces acting on them will be
 (a) 1 : 5 (b) 1 : 1 (c) 5 : 1 (d) 1 : 25

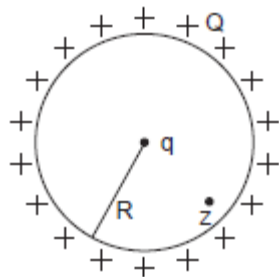
27. Four charges are arranged at the corners of a square ABCD, as shown. The force on the charge kept at the centre O is



- (a) zero
(b) along the diagonal AC
(c) along the diagonal BD
(d) perpendicular to side AB
28. Which of the following statement is correct?
If $\oint \mathbf{E} \cdot d\mathbf{A} = 0$ over a surface, then
(a) the electric field inside the surface and on it is zero.
(b) the electric field inside the surface is necessarily uniform.
(c) the number of flux lines entering the surface must be equal to the number of flux lines leaving it.
(d) all charges must not necessarily be outside the surface.
29. Two identical conducting spheres P and S with charge Q on each, repel each other with a force 16 N. A third identical uncharged conducting sphere R is successively brought in contact with the two spheres. The new force of repulsion between P and S is-
- a. 4 N b. 6 N c. 1 N d. 12 N
30. Two point charges $+16q$ and $-4q$ are located at $x = 0$ and $x = L$. The location of the point on x-axis at which the resultant electric field due to these charges is zero, is:
- a. 8 b. $4L$ c. $6L$ d. $2L$
31. Two identical conducting spheres A and B with charge Q on each, repel each other with a force 1 N. Two identical uncharged conducting spheres C and D are brought in contact with the two spheres A and B respectively. If the distance between A and B is reduced to half, the new force of repulsion between A and B is-
- a. 4 N b. 6 N c. 1 N d. 16 N
32. A hemisphere is uniformly charged positively. The electric field at a point on a diameter away from the centre is directed:
- (a) perpendicular to the diameter (b) parallel to the diameter
(c) at an angle tilted towards the diameter (d) at an angle tilted away from the diameter.
33. Figure shows electric field lines in which an electric dipole p is placed as shown. Which of the following statements is correct?



- (a) The dipole will not experience any force.
(b) The dipole will experience a force towards right.
(c) The dipole will experience a force towards left.
(d) The dipole will experience a force upwards.
34. A positive charge Q is uniformly distributed along a circular ring of radius R. A small test charge q is placed at the centre of the ring.
Which of the following statement is not correct?



- (a) If $q > 0$ and is displaced away from the centre in the plane of the ring, it will be pushed back towards the centre.
 (b) If $q < 0$ and is displaced away from the centre in the plane of the ring, it will never return to the centre and will continue moving till it hits the ring.
 (c) If $q < 0$, it will perform SHM for small displacement along the axis.
 (d) q at the centre of the ring is in an unstable equilibrium within the plane of the ring for $q > 0$.

35. Two charged spheres A and B having their radii in the ratio 1 : 2 are connected together with a conducting wire. The ratio of their surface charge densities $\frac{\sigma_A}{\sigma_B}$ will be:

- (a) $\frac{1}{2}$ (b) 2 (c) $\frac{1}{4}$ (d) 4

36. In general, metallic ropes are suspended on the carriers taking inflammable materials. The reason is-

- (a) to control the speed of the carrier.
 (b) to keep the centre of gravity of the carrier nearer to the earth.
 (c) to keep the body of the carrier in contact with the earth.
 (d) none of these.

37. Two similar spheres having $+Q$ and $-Q$ charges are kept at a certain distance. F force acts between the two. If at the middle of two spheres, another similar sphere having $+Q$ charge is kept, then it experiences a force in magnitude and direction as

- (a) zero having no direction. (b) $8F$ towards $+Q$ charge.
 (c) $8F$ towards $-Q$ charge. (d) $4F$ towards $+Q$ charge.

38. Two identical spheres A and B, sphere 'A' which is charged, when brought in contact with uncharged sphere 'B' and then separated. It is observed that

- (a) mass of A and B are same. (b) mass of A $>$ mass of B.
 (c) mass of A $<$ mass of B. (d) both will not have any mass.

39. Coulomb's law in electrostatics is valid

- (a) in all the situations.
 (b) electric charges are in motion.
 (c) separation between the charges must be smaller than 10^{-15} m.
 (d) electric charges are point charges.

40. Five corners of a regular hexagon of each side has a static charge q . There is no charge located at the 6th corner of the hexagon. The net force on a single charge $-q$ placed at the geometric centre of the hexagon is

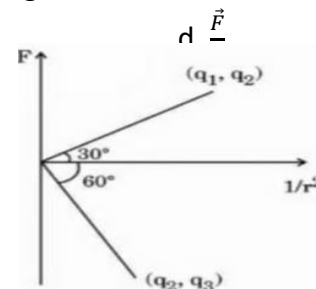
- (a) $\frac{1}{4\pi\epsilon_0} \frac{q^2}{L^2}$ (b) Zero
 (c) $5 \times \frac{1}{4\pi\epsilon_0} \frac{q^2}{L^2}$ (d) $\frac{1}{4\pi\epsilon_0} \frac{q^2}{\left(\frac{L}{2}\right)^2}$

41. A charge Q is placed at the centre of the line joining two charges q and q . The system of the three charges will be in equilibrium if Q is:

- (a) $+\frac{q}{3}$ (b) $-\frac{q}{3}$ (c) $+\frac{q}{4}$ (d) $-\frac{q}{4}$

42. The magnitude of the electric field due to a point charge, object at a distance of 4.0 m is 9 N/C. From the same in charged object the electric field of magnitude, 16 N/C will be at a distance of:

- (a) 1 m (b) 2 m (c) 3 m (d) 6 m
43. Two point charges $+16q$ and $-4q$ are located at $x = 0$ and $x = L$. The location of the point on x-axis at which the resultant electric field due to these charges is zero, is:
 (a) 8 L (b) 6 L (c) 4 L (d) 2 L
44. An electric dipole, consisting of two opposite charges of 2×10^{-6} C each separated by a distance 3 cm is placed in electric field of 2×10^5 N/C. Maximum torque experienced by the dipole is:
 (a) 12×10^{-3} Nm (b) 12×10^{-3} N/m (c) 1.2×10^{-3} Nm (d) 1.2×10^{-3} N/m
45. An infinite long straight wire having a charge density λ is kept along y'y axis in x-y plane. The coulomb force on a point charge q at a point P (x, o) will be :
 a. attractive and $\frac{q\lambda}{2\pi\epsilon_0 x}$ b. repulsive and $\frac{q\lambda}{2\pi\epsilon_0 x}$ c. attractive and $\frac{q\lambda}{\pi\epsilon_0 x}$ d. repulsive and $\frac{q\lambda}{\pi\epsilon_0 x}$
46. A charge q is placed at the centre of one of the surfaces of a cube. The flux linked with the cube is-
 a. $\frac{q}{4\epsilon_0}$ b. $\frac{q}{2\epsilon_0}$ c. $\frac{q}{8\epsilon_0}$ d. zero
47. Two charge q and $3q$ are separated by a distance ' r ' in air. At a distance x from charge q , the resultant electric field is zero. The value of x is:
 a. $\frac{(1+\sqrt{3})}{r}$ b. $\frac{r}{3(1+\sqrt{3})}$ c. $\frac{r}{(1+\sqrt{3})}$ d. $r(1+\sqrt{3})$
48. A point charge situated at a distance ' r ' from a short electric dipole on its axis, experiences a force \vec{F} . If the distance of the charge is ' $2r$ ', the force on the charge will be:
 a. $\frac{\vec{F}}{8}$ b. $\frac{\vec{F}}{16}$ c. $\frac{\vec{F}}{4}$ d. $\frac{\vec{F}}{2}$
49. F versus $(\frac{1}{r^2})$: graphs for two pairs of charges (q_1 and q_2) and (q_2 and q_3) are shown in the figure. The ratio of charges ($\frac{q_1}{q_2}$) is-
 a. $\sqrt{3}$ b. $\frac{1}{\sqrt{3}}$ c. 3 d. $\frac{1}{3}$



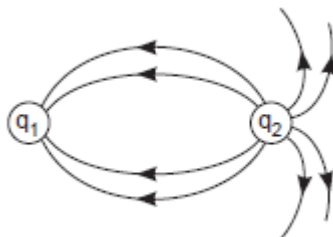
50. A charged particle of mass m and charge q initially at rest is released in an electric field of magnitude E . Its kinetic energy after time t will be:

a. $\frac{2E^2 t^2}{mq}$ b. $\frac{E^2 q^2 t^2}{m}$ c. $\frac{Eq^2 m}{2t^2}$ d. $\frac{Eqm}{2t}$

For questions 51 and 68 two statements are given- one labelled Assertion (A) and the other labelled Reason(R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

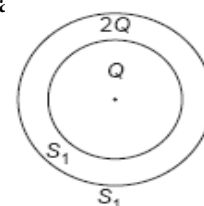
- (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of assertion (A).
 (b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of assertion.
 (c) Assertion (A) is true but Reason (R) is false.
 (d) Assertion (A) is false and Reason (R) is true.
51. Assertion (A): In a non-uniform electric field, a dipole will have translator as well as rotator motion.
 Reason (R): In a non-uniform electric field, a dipole experiences a force as well as a torque.
52. Assertion (A): If the bob of a simple pendulum is kept in a horizontal electric field, its period of oscillation will remain same.
 Reason (R): If bob is charged and kept in a horizontal electric field, then time period will be decreased.

53. **Assertion (A):** Acceleration of charged particle in a non-uniform electric field does not depend on velocity of charged particle.
Reason (R): Charge is an invariant quantity. That is the amount of charge on a particle does not depend on frame of reference.
54. **Assertion (A):** A negative charge in an electric field moves along the direction of the electric field.
Reason (R): On a negative charge a force acts in the direction of the electric field.
55. **Assertion (A):** An electric force acting on a proton and an electron, moving in a uniform electric field is the same, whereas acceleration of electron is 1836 times that of a proton.
Reason (R): The mass of electron is less than the mass of proton.
56. **Assertion (A):** The force between two given charges placed at a given distance apart in water is only $1/81$ of the force between them in air/vacuum.
Reason (R): Electric force increases when a dielectric is inserted between the two charges.
57. **Assertion (A):** A body can be charged by conduction and induction.
Reason (R): In charging by induction, body acquires same of charge.
58. **Assertion (A):** When two charges q_1 and q_2 are kept at some distance apart, force acting between these charges is F . If a third charges q_3 is placed quite close to q_2 , the force will remains F .
Reason (R): The force acting between two charges does not depend upon the presence of any other charge.
59. **Assertion (A):** The total number of electric lines of force passing through a given area in a normal direction is called electric flux.
Reason (R): Electric flux is a vector quantity.
60. **Assertion (A):** Electric field lines can have break in between.
Reason (R): Single isolated charge can exist.
61. **Assertion (A):** In the given figure q_1 is positive and q_2 is negative.
Reason (R): Electric field lines emerge from positive and terminate at negative charge.

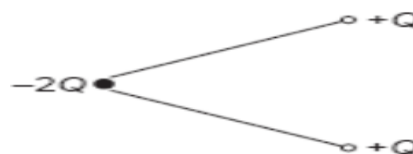


62. **Assertion (A):** An electric dipole is placed in an electric field antiparallel to it. If it is displaced then it will come back to initial position.
Reason (R): Dipole is in stable equilibrium.
63. **Assertion (A):** The net flux through a closed surface is zero due to charge which is lying outside it.
Reason (R): Gauss's law gives total flux passing through a closed surface for net charge inside the closed surface.
64. **Assertion (A):** A charge ' q ' is placed on a height h/s above the centre of a square of side ' a '. The flux will not be affected when the side is increased to $a + b$.
Reason (R): Gauss' Law depends on shape not on size of Gaussian surface.
65. **Assertion (A):** A metallic shield in the form of a hollow shell, can be built to block an electric field.
Reason (R): In a hollow spherical shell, the electric field is not zero at every point inside the shell.
66. **Assertion (A):** Electric field lines form closed loops.
Reason: Direction of electric field is not from positive to negative charge.
67. **Assertion (A):** Electric field due to an electric dipole at a far point on its perpendicular bisector varies as r^{-3} .
Reason ®: Electric field due to an electric dipole at a far point on its perpendicular bisector is directed opposite to its dipole moment
68. **Assertion (A):** Though large numbers of free electrons are present in the metal. Yet there is no current in the absence of electric field.
Reason(R): In the absence of electric field electrons move randomly in all directions.
69. An electric field $\vec{E} = \frac{2\hat{i}+6\hat{j}+8\hat{k}}{\sqrt{6}}$ passes through the surface of 4 m^2 area having unit vector $\hat{n} = \frac{2\hat{i}+6\hat{j}+\hat{k}}{\sqrt{6}}$. Calculate electric flux for that surface.

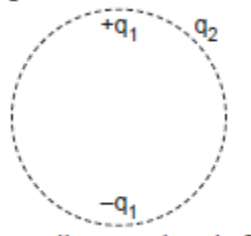
70. A spherical rubber balloon carries a charge that is uniformly distributed over its surface. As the balloon is blown up; how does electric field E vary for points (i) inside the balloon, (ii) on the surface of the balloon?
71. A spherical rubber balloon carries a charge that is uniformly distributed over its surface. As the balloon is blown up; how does electric flux ϕ_E vary for points (i) inside the balloon, (ii) outside the surface of the balloon?
72. Two similar balls each having mass m and charge q are hung from a silk thread of length l . Prove that equilibrium separation when each thread makes a small angle θ with the vertical is $x = \left(\frac{q^2 l}{2\pi\epsilon_0 m g} \right)^{\frac{1}{3}}$
73. An infinite number of charges, each equal to q are placed along X-axis at $x = 1, x = 2, x = 4, x = 8, \dots$ and so on. Find the electric field at the point $x = 0$ due to this set up of charges.
74. Plot a graph showing variation of coulomb force F versus $\frac{1}{r^2}$, where r is the distance between the two charges of each pair of charges ($1\mu C, 2\mu C$) and ($2\mu C, -3\mu C$) interpret the graphs obtained.
75. S_1 and S_2 are two hollow concentric spheres enclosing charge Q and $2Q$ respectively as shown in figure.



- What is the ratio of the electric flux through S_1 and S_2 ?
 - How will the electric flux through the sphere S_1 change, if a medium of dielectric constant 5 is introduced in the space inside S_1 in place of air?
76. Two charges q and $-3q$ are placed fixed on x - axis separated by distance ' d '. Where should a third charge $2q$ be placed such that it will not experience any force?
77. Two isolated metal spheres A and B have radii R and $2R$ respectively, and same charge q . Find which of the two spheres have greater energy density just outside the surface of the spheres.
78. Two charged conducting spheres of radii ' x ' and ' y ' are connected to each other by a wire. Find the ratio of the electric fields at their surfaces.
79. Sketch the electric field lines for the following system of charges.

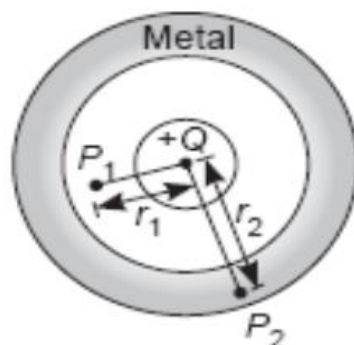


80. Two point electric charges of unknown magnitude and sign are placed at a distance d apart. The electric field intensity is zero at a point, not between the charges but on the line joining them. Write two essential conditions for this to happen.
81. A positive point charge ($+q$) is kept in the vicinity of an uncharged conducting plate. Sketch electric field lines originating from the point on to the surface of the plate. Derive the expression for the electric field at the surface of a charged conductor.
82. A thin straight infinitely long conducting wire having charge density λ is enclosed by a cylindrical surface of radius r and length l , its axis coinciding with the length of the wire. Find the expression for the electric flux through the surface of the cylinder
83. Two small balls with equal positive charges q coulomb are suspended by two insulating strings of equal length l metre from a hook fixed to a stand. The whole set up is taken in a satellite into space where there is no gravity. Find the angle between the strings and tension (T) in each string.
84. An infinitely large thin plane sheet has a uniform surface charge density $+\sigma$. Obtain the expression for the amount of work done in bringing a point charge q from infinity to a point, distant r , in front of the charged plane sheet.
85. An electric dipole is held in a uniform electric field.
- Using suitable diagram, show that it does not undergo any translatory motion, and
 - derive an expression for the torque acting on it and specify its direction.
86. Consider the charge configuration and a spherical Gaussian surface as shown in figure. Which charge(s) out of these three will not be the cause of electric field while calculating the flux of the field over the spherical surface.

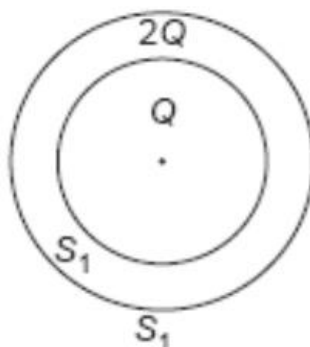


87. A small metal sphere carrying the charge $+Q$ is located at the centre of a spherical cavity in a large uncharged metal sphere as shown in the figure.

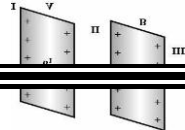
Use the Gauss's theorem to find the electric flux at points P_1 and P_2 .



88. A point charge Q is at the centre of a conducting shell and another charge q is outside the shell. Now, answer the following:
- Does the charge Q experience a force?
 - Does the charge q experience a force? Explain
89. An electric dipole is free to move in a uniform electric field. Explain its motion when it is placed (i) parallel to the field, and (ii) perpendicular to the field.
90. S_1 and S_2 are two hollow concentric spheres enclosing charge Q and $2Q$ respectively as shown in figure.

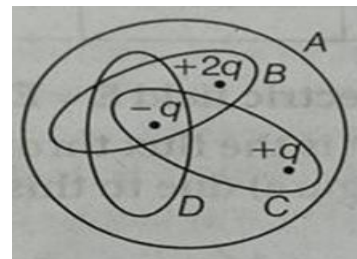


- What is the ratio of the electric flux through S_1 and S_2 ?
 - How will the electric flux through the sphere S_1 change, if a medium of dielectric constant 5 is introduced in the space inside S_1 in place of air
91. Show diagrammatically the orientation of the dipole in the field for which the torque is (i) maximum, (ii) half the maximum value, and (iii) zero.
92. State Coulomb's law in vector form and prove that $\vec{F}_{12} = -\vec{F}_{21}$ where letters have their usual meanings.
93. Sixty four drops of radius 0.02 m and each carrying a charge of $5 \mu\text{C}$ are combined to form a bigger drop. Find how the surface charge density of electrification will change if no charge is lost.
94. Three charges $+q$, $+q$ and $-2q$ are placed at the vertices of an equilateral triangle. Find the dipole moment of the system.

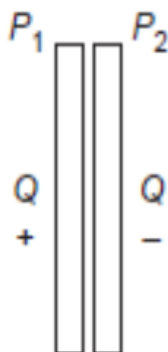


95. Five point charges, each of value $+q$ are placed on the five vertices of a regular hexagon of side L meters. Find the magnitude of force on a charge $-q$ coulomb placed at the centre of the hexagon.
96. (i) Arrange the Gaussian surfaces shown below. In order of decreasing electric flux, starting with most positive.

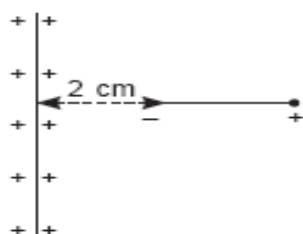
(ii) A point charge $(+Q)$ is kept in the vicinity of uncharged conducting plate. Sketch electric field lines between the charge and the plate.



97. Two infinitely large plane thin parallel sheets having surface charge densities σ_1 and σ_2 ($\sigma_1 > \sigma_2$) are shown in the figure. Write the magnitudes and directions of net fields in the regions marked II and III.
98. An electric dipole of dipole moment \vec{p} is placed in a uniform electric field \vec{E} . Write the expression for the torque experienced by the dipole. Identify two pairs of perpendicular vectors in the expression. Show diagrammatically the orientation of the dipole in the field for which the torque is (i) maximum (ii) half the maximum value.
99. (a) An infinitely long positive charged wire has a linear charge density $\lambda \text{ Cm}^{-1}$. An electron is revolving around the wire as its centre with a constant velocity in a circular plane perpendicular to the wire. Deduce the expression for its kinetic energy. (b) Plot a graph of the kinetic energy as a function of charge density λ .
100. Two charged conducting spheres of radii a and b are connected to each other by a wire. Find the ratio of the electric fields at their surfaces.
101. Figure shows two large metal plates, P_1 and P_2 , tightly held against each other and placed between two equal and unlike point charges perpendicular to the line joining them.
- (i) What will happen to the plates when they are released?
- (ii) Draw the pattern of the electric field lines for the system.

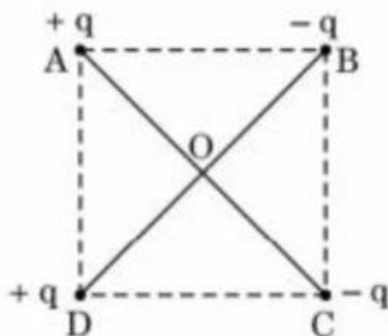


102. An electric dipole consists of charges $\pm 2.0 \times 10^{-8} \text{ C}$ separated by $2.0 \times 10^{-3} \text{ m}$. It is placed near a long line charge of linear charge density $4.0 \times 10^{-4} \text{ C/m}$ as shown in the figure, such that the negative charge is at 2.0 cm from the line charge. Find the force acting on the dipole.

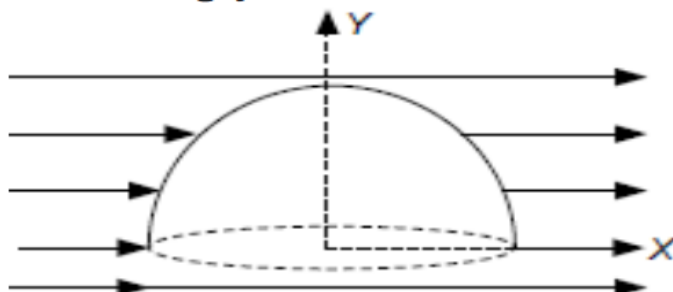


103. (a) The distance of a far-off point on the equatorial plane of an electric dipole is halved. How will the electric field be affected for the dipole?

- (b) Two identical electric dipoles are placed along the diagonals of a square ABCD of side $\sqrt{2}$ m as shown in the figure. Obtain the magnitude and direction of the net electric field at the centre (O) of the square.

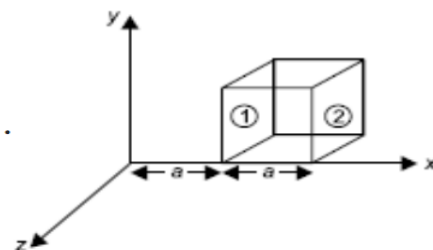


104. A hemispherical surface lies as shown in a uniform electric field region. Find the net electric flux through the curved surface if electric field is
(a) along x -axis, and

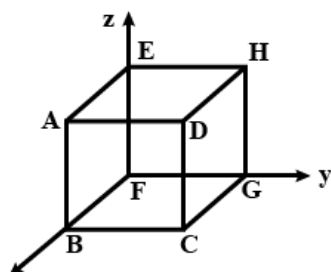


- (b) along y -axis.

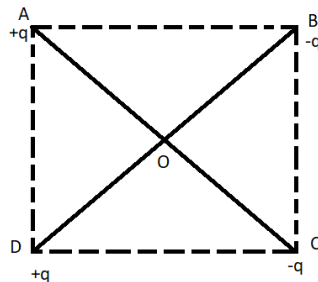
105. State Gauss's law in electrostatics. A cube with each side a is kept in an electric field given by $E = Cx$ along X -Axis, (as is shown in the figure) where C is a positive dimensional constant. Find out
(i) the electric flux through the cube, and
(ii) the net charge inside the cube



106. (i) Define electric flux and write its SI unit. Use Gauss's law to obtain the expression for the electric field due to a uniformly charged infinite sheet.

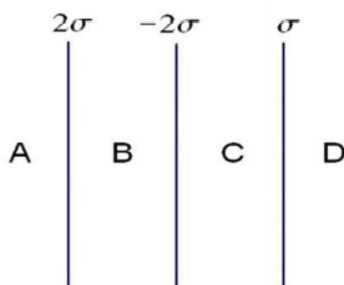


- (ii) A cube of side L is kept in space as shown in the figure. An electric field $\vec{E} = (Ax + B) \hat{i}$ N/C exists in the region. Find the net charge enclosed by the cube.
107. (a). The distance of a far off point on the equatorial plane of an electric dipole is halved, how will the electric field be affected for the dipole?



(b). Two identical electric dipoles are placed along the diagonals of a square ABCD of side $\sqrt{2}$ m as shown in the figure. Obtain the magnitude and direction of the net electric field at the centre of the square.

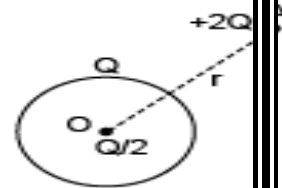
108. i) What do you mean by electric flux? Draw the field lines when the charge density of the sphere is (a) positive (b) negative.
 (ii) Show that the electric field for same charge density is twice in case of a conducting plate or surface than in a non-conducting sheet.
109. i. Show with the help of a suitable figure that outwards flux due to a point charge Q in vacuum with in Gaussian surface is independent of its size and shape.
 ii. In figure given, there are three infinitely long thin sheets having surface charge density $+2\sigma$, -2σ and $+\sigma$ respectively. Give the magnitude and direction of electric field at a point to the left of sheet of charge density $+2\sigma$ and to the right of sheet of charge density $+\sigma$.



110. (a) Eight identical point charges of Q coulomb each are placed at the corners of a cube of each side 0.1 m. Calculate the electric field at the centre G of the cube. Calculate the field at the centre when one of the corner charges is removed.
- (b) Two large parallel thin metallic plates are placed close to each other. The plates have surface charge densities of opposite signs and of magnitude $20 \times 10^{-12} \text{ C/m}^2$. Calculate the electric field intensity (i) in the outer region of the plates, and (ii) in the interior region between the plates.
- (c) Using Gauss's theorem, show mathematically that for any point outside the shell, the field due to a uniformly charged thin spherical shell is the same as if the entire charge of the shell is concentrated at the centre. Why do you expect the electric field inside the shell to be zero according to this theorem?
111. a. A charge q is placed at the centre of the line joining two equal charges Q . Show that the system of three charges will be in equilibrium if $q = -Q/4$.
- b. An electric dipole is free to move in a uniform electric field. Explain its motion when it is placed (i) parallel to the field, and (ii) perpendicular to the field.

- c. The sum of two - point charges is $7\ \mu\text{C}$. They repel each other with a force of $1\ \text{N}$ when kept $30\ \text{cm}$ apart in free space. Calculate the value of each charge.

112. (i) A thin metallic spherical shell of radius 'R' carries a charge Q on its surface. A point charge $Q/2$ is placed at the centre 'O' and another charge $+2Q$ is placed outside the shell at A at a distance 'r' from the centre as shown in the figure.



- (a) Find the electric flux through the shell.
 (b) State the law used, and (c) Find the force on the charges at the centre 'O' of the shell and at the point A.
 (ii) Given a uniform electric field $\vec{E} = 5 \times 10^3 \hat{i}\ \text{N/C}$, find the flux of this field through a square of $10\ \text{cm}$ on a side whose plane is parallel to the y - z plane. What would be the flux through the same square if the plane makes a 30° angle with the x -axis?
113. (i) State Gauss's law of electrostatics and hence define Gaussian surface.
 (ii) Apply Gauss's law of electrostatic to show that for a spherical shell, the electric field outside the shell, is the same as the field is as if all the charges had been concentrated at the centre.
114. (i) (a) An infinitely long positively charged wire has linear charge density $\lambda\ \text{cm}^{-1}$. An electron is revolving around the wire as its centre with a constant velocity in a circular plane perpendicular to the wire. Deduce the expression for its kinetic energy. (b) Plot a graph of the kinetic energy as a function of charge density λ .
 (ii) An infinite line of charge has linear charge density of $10^{-7}\ \text{C/m}$. Calculate magnitude and nature of the force acting on an alpha particle ($q=2e$) at a distance of $4\ \text{cm}$ from the line of charge
115. Apply Gauss's law to calculate the electric field of a thin infinitely long straight line of charge, with uniform linear charge density $\lambda\ \text{C/m}$. Hence, plot a graph showing the variation of electric field E versus distance r for the same.

Case –Study: Read the following paragraph and answer the questions that follow:

The term electric flux implies some kind of flow. Flux is the property of any vector field. Electric flux is the property of electric field. It is equal to the product of the given area and the normal component of electric field through it.

116. What is the SI unit of electric flux?

a. $\frac{N}{C} \times \text{m}^2$ b. $\text{N} \times \text{m}^2$ c. $\frac{N}{\text{m}^2} \times \text{C}$ d. $\frac{N^2}{\text{m}^2} \times \text{C}^2$

117. If $\oint \vec{E} \cdot d\vec{s} = 0$, inside a surface, that means there is:

a. no net charge present inside the surface b. uniform electric field inside the surface
 c. discontinuous field lines inside the surface d. some charge present inside the surface

118. Let N_1 be the number of electric field lines going out of an imaginary cube of side a that encloses an isolated point charge $2q$ and N_2 be the corresponding number for an imaginary sphere of radius a that encloses an isolated point charge $3q$. Then (N_1/N_2) is:

a. $\frac{1}{\pi}$ b. $\frac{2}{3}$ c. $\frac{9}{4}$ d. π

119. An electric field is given by $(6\hat{i} + 5\hat{j} + 3\hat{k})\ \text{NC}^{-1}$. The electric flux through a surface area $30\ \hat{i}\ \text{m}^2$ lying in YZ-plane (in SI units) is:

a. 90 b. 150 c. 180 d. 60

120. Two charges of $5Q$ and $-2Q$ are situated at the points $(3a, 0)$ and $(-5a, 0)$ respectively. The electric flux through a sphere of radius '4a' having centre at origin is:

- a. $\frac{2Q}{\epsilon_0}$ b. $\frac{5Q}{\epsilon_0}$ c. $\frac{7Q}{\epsilon_0}$ d. $\frac{3Q}{\epsilon_0}$

121. A charge q is placed at one corner of a cube. Electric flux through one face of the cube is-

- a. $\frac{q}{4\epsilon_0}$ b. $\frac{q}{24\epsilon_0}$ c. $\frac{q}{6\epsilon_0}$ d. $\frac{q}{8\epsilon_0}$

122. An electric field is given by $(5\hat{i} + 6\hat{j} + 3\hat{k}) \text{ NC}^{-1}$. The electric flux through a surface area $25 \hat{j} \text{ m}^2$ lying in ZX-plane (in SI units) is:

- a. 90 b. 150 c. 180 d. 60

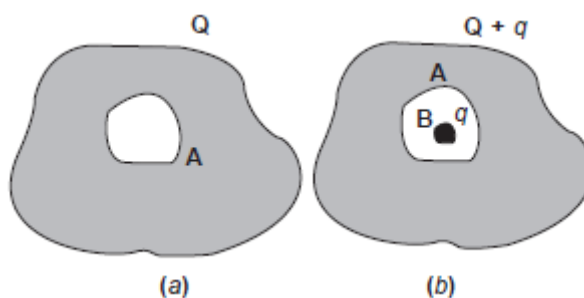
123. Two charges of $5Q$ and $-2Q$ are situated at the points $(3a, 0)$ and $(-5a, 0)$ respectively. The electric flux through a sphere of radius ' $6a$ ' having centre at origin is:

- a. $\frac{2Q}{\epsilon_0}$ b. $\frac{5Q}{\epsilon_0}$ c. $\frac{7Q}{\epsilon_0}$ d. $\frac{3Q}{\epsilon_0}$

124. Let N_1 be the number of electric field lines going out of an imaginary cube of side a that encloses an isolated point charge $2q$ and N_2 be the corresponding number for an imaginary sphere of radius a that encloses an isolated point charge $3q$. Then (N_1/N_2) is:

- a. $\frac{1}{\pi}$ b. $\frac{2}{3}$ c. $\frac{9}{4}$ d. π

Case-Study: A conductor A with a cavity as shown in figure is given a charge Q . Another conductor B with charge q is inserted into the cavity keeping B insulated from A.



125. The entire charge must appear:

- (a) Anywhere on sphere (b) On outer surface of conductor
(c) Inside the conductor (d) None

126. Total charge on outer surface is

- (a) Q (b) q (c) $Q + q$ (d) $Q - q$

127. The sensitive instrument is to be _____ from the strong electrostatic fields in its environment after putting in this cavity.

- (a) broke (b) leaked (c) protected (d) away

128. Electric field inside a cavity is:

- (a) $\frac{Q}{r}$ (b) $\frac{q}{r}$ (c) Zero (d) None

129. Inside the cavity the value of potential is:

- (a) Zero (b) Same as that of surface of conductor.
(c) Same as that of outer surface of conductor (d) None of these

Case-Study: Electric charge is the physical property of matter that causes it to experience a force when placed in an electromagnetic field. There are two types of charges positive and negative charges. Also, like charges repel each other whereas unlike charges attract each other.

130. Charge on a body which carries 200 excess electrons is:

- (a) $-3.2 \times 10^{-18} \text{ C}$ (b) $3.2 \times 10^{18} \text{ C}$ (c) $-3.2 \times 10^{-17} \text{ C}$ (d) $3.2 \times 10^{-17} \text{ C}$

131. Charge on a body which carries 10 excess electrons is:

- (a) $-1.6 \times 10^{-18} \text{ C}$ (b) $1.6 \times 10^{-18} \text{ C}$ (c) $2.6 \times 10^{-18} \text{ C}$ (d) $1.6 \times 10^{-21} \text{ C}$

132. A body is positively charged, it implies that:

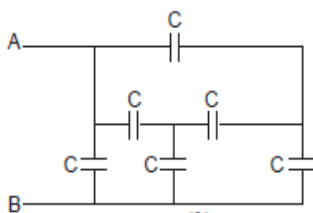
- (a) there is only a positive charge in the body
 (b) there is positive as well as negative charge in the body but the positive charge is more than negative charge
 (c) there is equally positive and negative charge in the body but the positive charge lies in the outer regions
 (d) the negative charge is displaced from its position
133. A body has a charge of $-2 \mu\text{C}$. If it has 2.5×10^{13} protons, then how many electrons the body has:
 (a) 1.25×10^{13} (b) 2.5×10^{13} (c) 3.75×10^{13} (d) 1.28×10^{13}
134. A $10 \mu\text{C}$ charge divided into two parts are placed at 1 cm distance so that the repulsive force between them is maximum. The charges of the two parts are:
 (a) $9 \mu\text{C}, 1 \mu\text{C}$ (b) $5 \mu\text{C}, 5 \mu\text{C}$ (c) $7 \mu\text{C}, 3 \mu\text{C}$ (d) $8 \mu\text{C}, 2 \mu\text{C}$
135. Point charges $+4q$, $-q$ and $+4q$ are kept on the X-axis at points $x = 0$, $x = a$ and $x = 2a$ respectively.
 (a) Only $-q$ is in stable equilibrium
 (b) None of the charges is in equilibrium
 (c) All the charges are in unstable equilibrium
 (d) All the charges are in stable equilibrium.

WORKSHEET-02

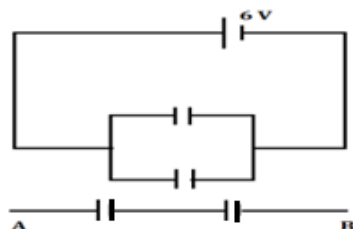
CHAPTER 02: ELECTROSTATIC POTENTIAL AND CAPACITANCE

MCQ WITH ONE CORRECT OPTION

- Electric potential at a point p due to a point charge of 5×10^{-9} is 50 V. the distance of P from point charge is
 a. 3 cm b. 9 cm c. 90 cm d. 0.9 cm
- 64 identical drops each charged upto potential of 10 mV are combined to form a bigger drop. The potential of the bigger drop will be
 a. 16 mV b. 160 mV c. 64 mV d. 128 mV
- The angle between the electric lines of force and equipotential surface is
 a. 0° b. 45° c. 90° d. 180°
- The electrostatic potential due to an electric dipole at a distance r varies as
 a. r b. $\frac{1}{r^2}$ c. $\frac{1}{r^3}$ d. $1/r$
- A fully charged capacitor is connected in parallel to another identical uncharged capacitor. The total energy of resulting system.
 a. remains same b. becomes twice c. reduces to half d. becomes thrice
- Find the equivalent capacitance of the system across the terminals A and B. All the capacitors have equal capacitances.

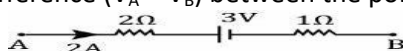


- a. 2 C b. 4 C c. 3 C d. 5 C
- Two particles A and B of the same mass but having charges q and 2q respectively, are accelerated from rest through potential differences V_A and V_B such that they attain same kinetic energies. The value of $(\frac{V_A}{V_B})$ is-
 a. $\frac{1}{4}$ b. 4 c. 2 d. $\frac{1}{2}$
 - Two identical parallel plate capacitors are connected in parallel and joined to a 6 V battery. The battery is then disconnected and the two capacitors are joined in series as shown. The potential difference between the points A and B is

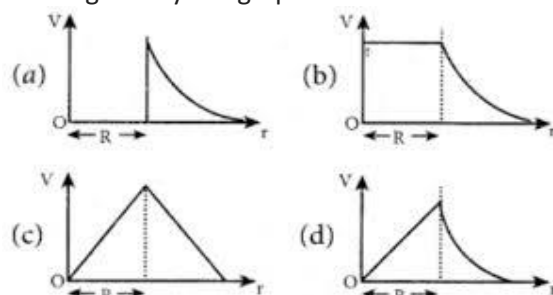


- a. 3 V b. 6 V c. 9 V d. 12 V
9. A Capacitor has capacitance $5 \mu\text{F}$ when its parallel plates are separated by air medium of thickness d . A slab of material of dielectric constant 1.5 having equal to that of plates but thickness $\frac{d}{2}$ is inserted between the plates. Capacitance of the capacitor in the presence of slab will be:
- a. $5 \mu\text{F}$ b. $7 \mu\text{F}$ c. $8 \mu\text{F}$ d. 6 μF

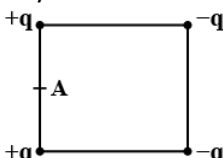
10. The potential difference ($V_A - V_B$) between the points A and B in the given figure is-



- a. 6 V b. +3 V c. -3 V d. +9 V
11. The plates of a parallel plate capacitor are 4 cm apart, the first plate is at 300 V and the second plate is at -100 V. The voltage at 3 cm from the second plate is
- a. 200 V b. 400 V c. 250 V d. 500 V
12. The variation of electrostatic potential with radial distance 'r' from the centre of a positively charged metallic thin shell of radius R is given by the graph

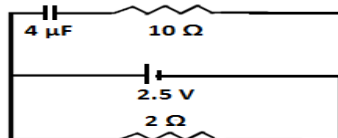


13. An electric dipole consisting of charges $+q$ and $-q$ separated by a distance L is in stable equilibrium in a uniform electric field E . The electrostatic potential energy of the dipole is
- a. qLE b. zero c. $-qLE$ d. $-2qLE$
14. If a positive charge is displaced against the electric field in which it was situated, then
- a. Work will be done by the electric field on the charge
- b. The intensity of the electric field decreases
- c. Energy of the system will decrease
- d. Energy will be provided by external source displacing the charge
15. The capacitors of capacitance C_1 and C_2 are connected in parallel. If a charge Q is given to the combination, the ratio of the charge on the capacitor C_1 to the charge on C_2 will be
- a. $\frac{C_1}{C_2}$ b. $\sqrt{\frac{C_1}{C_2}}$ c. $\sqrt{\frac{C_2}{C_1}}$ d. $\frac{C_2}{C_1}$
16. A charge Q is kept at the centre of a circle of radius r . A test charge q_0 is carried from a point X to the point Y on this circle such that arc XY subtends an angle of 60° at the centre of the circle. The amount of work done in this process will be
- a. $\frac{Qq_0}{4\pi\epsilon_0 2r}$ b. $\frac{\sqrt{3}Qq_0}{4\pi\epsilon_0 2r}$ c. Zero d. $\frac{\sqrt{3}Qq_0}{4\pi\epsilon_0 r}$
17. A charge Q is uniformly distributed over the surface of a spherical shell of radius R . The work done in bringing a test charge Q_0 from its centre to its surface is
- a. $\frac{QQ_0}{4\pi\epsilon_0 R}$ b. $\frac{QQ_0}{4\pi\epsilon_0 2R}$ c. $\frac{QQ_0}{\epsilon_0 R}$ d. zero

18. Two charges $14\ \mu\text{C}$ and $-4\ \mu\text{C}$ are placed at $(-12\ \text{cm}, 0, 0)$ and $(12\ \text{cm}, 0, 0)$ in an external electric field $E = \frac{B}{r^2}$ (where $B = 1.2 \times 10^6\ \text{N/Cm}^2$) and r is in meters. The electrostatic potential energy of the configuration is
- 97.9 J
 - 102.1 J
 - 2.1 J
 - 97.9 J
19. The electric potential on the surface of a charged conducting sphere is 100 V. two statements are made in this regard
- S_1 : At any point inside the sphere, electric intensity is zero
- S_2 : At any point inside the sphere, the electrostatic potential is 100 V
- S_1 is true but S_2 is false
 - Both S_1 and S_2 are false
 - S_1 is true S_2 is also true and S_1 is the cause of S_2
 - S_1 is true S_2 is also true but the statements are independent
20. The capacitors of capacitance C_1 and C_2 are connected in parallel. If a charge Q is given to the combination, the ratio of the charge on the capacitor C_1 to the charge on C_2 will be
- $\frac{C_1}{C_2}$
 - $\sqrt{\frac{C_1}{C_2}}$
 - $\sqrt{\frac{C_2}{C_1}}$
 - $\frac{C_2}{C_1}$
21. A variable capacitor is connected to a 200 V battery. If its capacitance is changed from $2\ \mu\text{F}$ to $X\ \mu\text{F}$, the decrease in the energy of the capacitor is $2 \times 10^{-2}\ \text{J}$. The value of X is
- 1
 - 2
 - 3
 - 4
22. Four charges $-q$, $-q$ and $+q$ are placed at the corners of a square of side $2L$ is shown in figure. The electric potential at point A midway between the two charges $+q$ and $+q$ is
- 
- $\frac{2q}{4\pi\epsilon_0 L} \left(1 - \frac{1}{\sqrt{5}}\right)$
 - $\frac{2q}{4\pi\epsilon_0 L} \left(1 + \frac{1}{\sqrt{5}}\right)$
 - $\frac{2q}{4\pi\epsilon_0 2L} \left(1 - \frac{1}{\sqrt{5}}\right)$
 - zero
23. A point P lies at a distance x from the mid-point of an electric dipole on its axis. The electric potential at point P is proportional to
- $\frac{1}{x^2}$
 - $\frac{1}{x^3}$
 - $\frac{1}{x^4}$
 - $\frac{1}{x^{1/2}}$
24. Three capacitors $2\ \mu\text{F}$, $3\ \mu\text{F}$ and $6\ \mu\text{F}$ are joined in series with each other. The equivalent capacitance is
- $\frac{1}{2}\ \mu\text{F}$
 - $1\ \mu\text{F}$
 - $2\ \mu\text{F}$
 - $11\ \mu\text{F}$
25. A proton is taken from point P1 to P2 both located in an electric field. The potentials at points P1 and P2 are $-5\ \text{V}$ and $+5\ \text{V}$ respectively. Assuming that kinetic energies of the proton at points P1 and P2 are zero, the work done on the proton is
- $-1.6 \times 10^{-18}\ \text{J}$
 - $1.6 \times 10^{-18}\ \text{J}$
 - zero
 - $0.8 \times 10^{-18}\ \text{J}$
26. An electric dipole of dipole moment P is kept in a uniform electric field E . The amount of work done to rotate it from the position of stable equilibrium to that of unstable equilibrium will be
- $2pE$
 - $-2pE$
 - pE
 - zero
27. The net charge on a capacitor is
- $+q$
 - $-q$
 - $2q$
 - zero
28. A $500\ \mu\text{F}$ capacitor is charged at a steady rate of $100\ \mu\text{C}$ per second. A potential difference of $10\ \text{V}$ will be developed between the capacitor plates after
- 5 s
 - 10 s
 - 20 s
 - 50 s
29. Consider a uniform electric field in the Z-direction. The potential is a constant
- In all space
 - For any x for a given Z
 - For any y for a given Z
 - On the x - y plane for a given Z
30. A $2\ \mu\text{F}$ capacitor is charged to 200 volt and then the battery is disconnected. When it is connected in parallel to another uncharged capacitor, the potential difference between the plates of both is 40 volt. The capacitance of the other capacitor is

- a. $2\ \mu\text{F}$ b. $4\ \mu\text{F}$ c. $8\ \mu\text{F}$ d. $16\ \mu\text{F}$

31. A capacitor of $4\ \mu\text{F}$ is connected as shown in the circuit. The internal resistance of the battery is $0.5\ \Omega$. The amount of charge on the capacitor plates will be



- a. 0 b. $4\ \mu\text{C}$ c. $16\ \mu\text{C}$ d. $8\ \mu\text{C}$

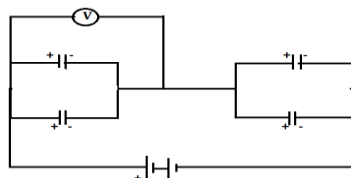
32. A positively charged particle is rereleased from rest in an uniform electric field. The electric potential energy of the charge

- a. Remains a constant because the electric field is uniform
 b. Increases because the charge moves along the electric field
 c. Decreases because the charge moves along the electric field
 d. Decreases because the charge moves opposite to the electric field

33. Equipotentials at a great distance from a collection of charges whose total sum is not zero are approximately

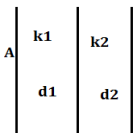
- a. Spheres b. planes c. paraboloids d. ellipsoids

34. Four capacitors, each of $50\ \mu\text{F}$ are connected as shown. The DC voltmeter V reads 100 V. The charge on each plate of each capacitor is



- a. 2 mC b. 5 mC c. 0.2 C d. 0.5 C

35. A parallel plate capacitor is made of two dielectric blocks in series. One of the blocks has thickness d_1 and dielectric constant k_1 and the other has thickness d_2 and dielectric constant k_2 as shown in the figure. This arrangement can be thought as a dielectric slab of thickness $d = (d_1 + d_2)$ and effective dielectric constant k then k is



- a. $\frac{k_1 d_1 + k_2 d_2}{d_1 + d_2}$ b. $\frac{k_1 d_1 + k_2 d_2}{k_1 + k_2}$ c. $\frac{k_1 k_2 (d_1 + d_2)}{k_1 d_2 + k_2 d_1}$ d. $\frac{2k_1 k_2}{k_1 + k_2}$

36. Equipotential surfaces

- a. Are closer in regions of large electric fields compared to regions of lower electric fields.
 b. Will be more crowded near sharp edges of a conductor
 c. Will be more crowded near regions of large charge densities
 d. Will always be equally spaced

37. Two identical metal plates, separated by a distance d form a parallel plate capacitor. A metal sheet of thickness $d/2$ is inserted between the plates. The ratio of the capacitance after the insertion of the sheet to that before insertion is

- a. $\sqrt{2} : 1$ b. $2 : 1$ c. $1 : 1$ d. $1 : 2$

38. n identical capacitors joined in parallel are charged to a common potential V . the battery is disconnected. Now the capacitors are separated and joined in series. For the new combination

- a. energy and potential difference both will remain unchanged
 b. energy will remain same, potential difference will become nV
 c. energy and potential both will become n times
 d. energy will become n times and potential difference will remain V

39. The capacitance of a capacitor becomes $\frac{7}{6}$ times its original value is a dielectric slab of thickness $t = \frac{2}{3}d$ is introduced in between the plates, where d is the separation between the plates. The dielectric constant of the slab is

- a. $\frac{14}{11}$ b. $\frac{11}{14}$ c. $\frac{7}{11}$ d. $\frac{11}{7}$
40. The distance between the two plates of a parallel plate capacitor is doubled and the area of each plate is halved. If C is its initial capacitance, its final capacitance is equal to
a. 2C b. C/2 c. 4C d. C/4
41. The effective capacitances of two capacitors are $3\mu\text{F}$ and $16\mu\text{F}$, when they are connected in series and parallel respectively. The capacitances of two capacitors are
a. $10\mu\text{F}$, $6\mu\text{F}$ b. $8\mu\text{F}$, $8\mu\text{F}$ c. $12\mu\text{F}$, $4\mu\text{F}$ d. $1.2\mu\text{F}$, $1.8\mu\text{F}$
42. A capacitor of capacitance C is charged to a potential V. the flux of the electric field through a closed surface enclosing the positive plate of the capacitor is
a. $\frac{CV}{2\epsilon_0}$ b. $\frac{2CV}{\epsilon_0}$ c. $\frac{CV}{\epsilon_0}$ d. zero
43. A 12 pF capacitor is connected to a 50 V battery. The electrostatic energy stored in the capacitor in nJ is
a. 15 b. 7.5 c. 0.3 d. 150
44. Two capacitors of capacitance $3\mu\text{F}$ and $6\mu\text{F}$ are charged to a potential of 12 V each. They are now connected to each other, with the positive plate of each joined to the negative plate of the other. The potential difference across each will be
a. 3 V b. zero c. 6 V d. 4 V
45. The plates of a parallel plate capacitor are 4 cm apart; the first plate is at 300 V and the second plate at -100 V . The voltage at 3 cm from the second plate is
a. 200 V b. 400 V c. 250 V d. 500 V
46. Two identical capacitors have same capacitance C. one of them is charged to the potential V and other to the potential $2V$. The negative ends of both are connected together. When the positive ends are also joined together, the decrease in energy of the combined system is
a. $\frac{1}{4}CV^2$ b. $2CV^2$ c. $\frac{1}{2}CV^2$ d. $\frac{3}{4}CV^2$
47. A parallel plate capacitor of capacitance 2 F is charged to potential V the energy stored in the capacitor is U_1 . The capacitor is now connected to another charged identical capacitor in parallel combination. The energy stored in the combination is U_2 . The ratio U_2/U_1 is
A. $2 : 1$ b. $1 : 2$ c. $1 : 4$ d. $2 : 3$
48. Three capacitors of capacitances $25\mu\text{F}$, $30\mu\text{F}$ and $45\mu\text{F}$ are connected in parallel to supply of 100 V . energy stored in the above combination is E. when these capacitors are connected in series to the same supply, the stored energy is $9/x\text{ E}$. the value of x is
a. 43 b. 86 c. 45 d. 90
49. Three capacitors, each of $4\mu\text{F}$ are to be connected in such a way that the effective capacitance of the combination is $6\mu\text{F}$. this can be achieved by connecting
a. All three in parallel
b. All three in series
c. Two of them connected in series and the combination in parallel to the third
d. Two of them connected in parallel and the combination in series to the third
50. A parallel plate condenser with oil between the plates (dielectric constant of oil $K = 2$) has a capacitance C. if the oil is removed, then capacitance of the capacitor becomes
a. $\sqrt{2}C$ b. $\frac{C}{\sqrt{2}}$ c. $2C$ d. $C/2$

ASSERTION AND REASON TYPE QUESTIONS

For the following questions two statements are given –one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the options given below:

- a. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.
b. If both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
c. If Assertion is true but Reason is false.
d. If both Assertion and Reason are false.
51. Assertion : If an electric dipole moment $30 \times 10^{-5}\text{ Cm}$ is enclosed by a closed surface, the net flux coming out of the surface will be zero
Reason : Electric dipole consists of two equal and opposite charges.
52. Assertion : In the absence of an externally applied electric field, the displacement per unit volume of

a polar dielectric material is always zero.

Reason : In polar dielectrics, each molecule has a permanent dipole moment but these are randomly oriented in the absence of an externally applied electric field.

53. Assertion (A): The force between the plates of a parallel plate capacitor is proportional to charge on it.

Reason R: Electric field is equal to electric force per unit electric charge.

54. Assertion (A): Work done by electric field on moving a positive charge on an equipotential surface is always zero.

Reason (R): Electric lines of forces are always perpendicular to equipotential surfaces.

55. **Assertion:** The capacitance of a conductor does not depend on the charge given to it.

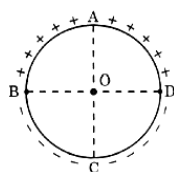
Reason: The capacitance of a conductor depends only on geometry and size of conductor.

56. **Assertion:** The surface of a conductor is always an equipotential surface.

Reason: A conductor contains free electrons which can move freely to equalise the potential.

57. Assertion (A): Equal amount of positive and negative charges are distributed uniformly on two halves of a thin circular ring as shown in figure (a). The resultant electric field at the centre O of the ring is along OC.

Reason (R): It is so because the potential at O is not zero.



58. Assertion: Electric potential of earth is taken zero.

Reason: No electric field exists on earth surface.

59. Assertion: Work done in moving a charge between any two points in a uniform electric field is independent of the path followed by the charge, between these points.

Reason: Electrostatic forces are not conservative.

60. Assertion: A metallic shield in the form of a hollow shell may be built to block an electric field.

Reason: In a hollow spherical shield, the electric field inside it is zero at every point.

61. Assertion: Dielectric polarisation means formation of positive and negative charges inside the dielectric.

Reason: Free electrons are formed in this process.

62. Assertion: When charges are shared between any two bodies, no charge is really lost and some loss of energy does occur.

Reason: Some energy disappears in the form of heat sparking etc.

63. Assertion: A spherical equipotential surface is not possible for a point charge.

Reason: A spherical equipotential surface is not possible inside a spherical capacitor.

64. Assertion: Lines of force are perpendicular to the conductor surface.

Reason: Generally electric field is perpendicular to equipotential surface.

65. Assertion: If a dielectric is placed in external field, then field inside dielectric will be less than applied field.

Reason: Electric field will induce dipole moment opposite to field direction.

66. Assertion: Charge never flows from a condenser of higher capacity to the condenser of lower capacity.

Reason: Flow of charge between two bodies connected by a thin wire is determined by the charges on them.

67. Assertion: The force between the plates of a parallel plate capacitor is proportional to charge on it.

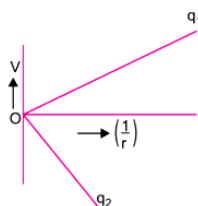
Reason: Electric force is equal to charge per unit area.

2 OR 3 MARKS QUESTIONS

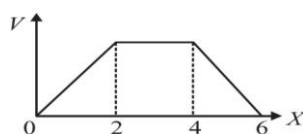
68. Twenty seven drops of same size are charged at 220 V each. They combine to form a bigger drop. Calculate the potential of the bigger drop.

69. Two charged conducting spheres of radii a and b when connected by conducting wire acquire charges q_1 and q_2 respectively. Find the ratio of the electric fields at the surface of the two spheres.

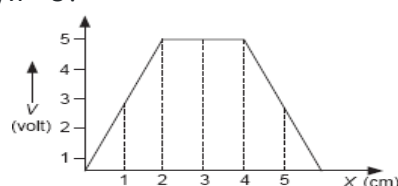
70. Obtain an expression for the electrostatic potential energy of a system of three charges q , $2q$ and $-3q$ placed at the vertices of an equilateral triangle of side a .
71. The two graphs shown here, shows the variation of electrostatic potential with $1/r$ for two point charges q_1 and q_2 . What are the signs of the two charges and which of the two charges has a larger magnitude and why?



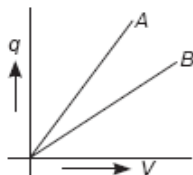
72. An infinite number of charges each equal to q are placed along the x -axis at $x = 1, x = 2, x = 4 \dots$ And so on. Find the potential at point $x = 0$ due to this set of charges. What will be your answer if the consecutive charges have opposite signs?
73. The electric potential V at any point x, y, z in space is given by $V = 4x^2$ volts. Calculate the electric field at that point $(1\text{m}, 0, 2\text{m})$.
74. Capacitance of an isolated conducting sphere of radius R_1 becomes n times when it is enclosed by a concentric conducting sphere of radius R_2 connected to earth. Find the ratio R_2/R_1 of their radii.
75. Assuming an expression for the potential of an isolated conductor, show that the capacitance of such a sphere will be increased by a factor n if it is enclosed with in an earthed concentric sphere, the ratio of the radii of the sphere being $n/(n-1)$.
76. The electric potential V as a function of distance x is shown in fig. Draw a graph of the electric field strength as a function of x .



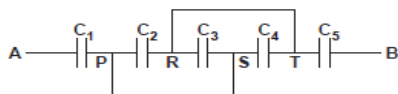
77. The variation of electric potential with distance from a fixed point is shown in the figure. What is the electric field at (i) $x = 3$ and (ii) $x = 5$?



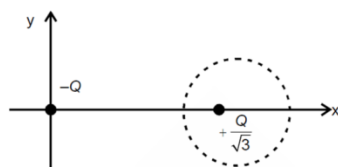
78. A spherical drop of mercury having a potential of 2.5 V is obtained as a result of merging 125 droplets. Calculate the potential of a constituent droplet.
79. Plot a graph showing the variation of velocity v acquired by an electron starting from rest moving through a potential difference V , with suitable explanation.
80. A charged particle $+q$ moves in a uniform electric field E in the direction opposite to E . What will be the effect on its electrostatic potential energy during its motion? (2020)
81. Why is the electrostatic potential inside a charged conducting shell constant throughout the volume of the conductor? (2019)
82. Draw the equipotential surfaces corresponding to a uniform electric field in the z -direction. (2019)
83. Draw an equipotential surface for a system consisting of two charges $Q, -Q$ separated by a distance r in air. Locate the point where the potential due to the dipole is zero. (2019, 2020)
84. Draw the equipotential surfaces due to an isolated point charge. (2019)
85. The work done in moving a charge particle between two points in an uniform electric field does not depend on the path followed by the particle. Why? (2020)
86. The given graph shows that variation of charge q versus potential difference V for two capacitors C_1 and C_2 . The two capacitors have same plate separation but the plate area of C_2 is double than that of C_1 . Which of the lines in the graph correspond to C_1 and C_2 and why?



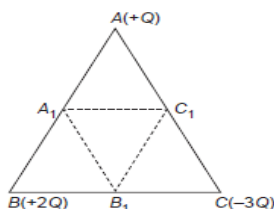
87. Find equivalent capacitance between A and B in the combination given below. Each capacitor is of 2 mF capacitance.



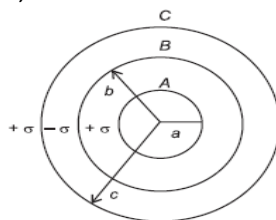
88. If a dc source of 7 V is connected across AB, how much charge is drawn from the source and what is the energy stored in the above network?
89. Obtain an expression for electrostatic potential energy of a system of three charges q , $2q$ and $-3q$ placed at the vertices of an equilateral triangle of side a . (2023)
90. Consider two identical point charges located at points $(0, 0)$ and $(a, 0)$. (i) is there a point on the line joining them at which the electric field is zero? (ii) Is there a point on the line joining them at which the electric potential is zero? Justify your answers for each case. (2023)
91. Two point charges $-Q$ and $+\frac{Q}{\sqrt{3}}$ are placed in the x - y plane at the origin $(0, 0)$ and a point $(2, 0)$, respectively, as shown in the figure. This results in an equipotential circle of radius R and potential $V = 0$ in the xy -plane with its centre at $(b, 0)$. All lengths are measured in meters. Find the values of R and b .



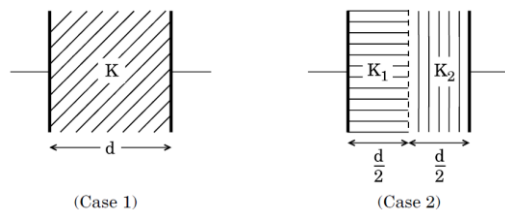
92. Two small conducting balls A and B of radius r_1 and r_2 have charges q_1 and q_2 respectively. They are connected by a wire. Obtain the expression for charges on A and B, in equilibrium. (2023)
93. Three point charges, $+Q$, $+2Q$ and $-3Q$ are placed at the vertices of an equilateral triangle ABC of side l . If these charges are displaced to the mid-points A_1 , B_1 and C_1 respectively, find the amount of the work done in shifting the charges to the new locations.



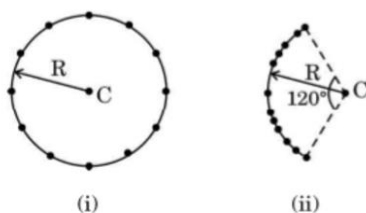
94. Three concentric metallic shells A, B and C of radii a , b and c ($a < b < c$) have surface charge densities $+\sigma$, $-\sigma$ and $+\sigma$ respectively as shown in the figure. If shells A and C are at the same potential, then obtain the relation between the radii a , b , c .



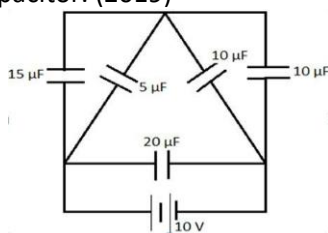
95. The space between the plates of a parallel plate capacitor is completely filled in two ways. In the first case, it is filled with a slab of dielectric constant K . In the second case; it is filled with two slabs of equal thickness and dielectric constant K_1 and K_2 respectively as shown in the figure. The capacitance of the capacitor is same in the two cases. Obtain the relationship between K , K_1 and K_2 . (2020)



96. If N drops of same size each having the same charge, coalesce to form a bigger drop. How will the following vary with respect to single small drop. (i) Total charge on bigger drop, (ii) Potential on the bigger drop and (iii) Capacitance.
 (a) Twelve negative charges of same magnitude are equally spaced and fixed on the circumference of a circle of radius R as shown in figure (i). Relative to potential being zero at infinity, find the electric potential and electric field at the centre ' C ' of the circle.
 (b) If the charges are equally spaced and fixed on an arc of 120° of radius R as shown in figure (ii), find electric potential at the centre C .



97. The figure shows a network of five capacitors connected to a 10 V battery. Calculate the charge acquired by the $5\ \mu\text{F}$ capacitor. (2019)



98. Two identical capacitors of $12\ \mu\text{F}$ each are connected in series across a 50 V battery. Calculate the electrostatic energy stored in the combination. If these were connected in parallel across the same battery, find out the value of the energy stored in this combination. (2019)

5 MARKS QUESTIONS

99. Define electric potential. Draw a graph showing variation of electric potential with the distance. Also derive an expression for the electric potential due to an electric dipole at any point on its axis.
100. Derive an expression for electric potential due to an electric dipole at any point on its equatorial line.
101. Consider an electric dipole of charge q and length $2l$. Derive an expression for electric potential due to this dipole at any point distant r from its centre at an angle θ .
102. Derive an expression for the relation between electric potential and electric field.
103. Define equipotential surface write properties of equipotential surfaces and draw the equipotential surfaces (i) for a point charge (ii) for a system of two like charges (iii) for a system of two unlike charges (iv) for uniform electric field.
104. What is meant by electric potential energy? Derive an expression for the potential energy of (i) a system of two point charges. (ii) a system of n charges (iii) potential energy of a single charge in an external field.
105. State and prove the various electrostatic properties shown by conductors placed in electric field.
106. What do you mean by capacitance define capacitor. Explain principle of a capacitor and derive an expression for the capacitance of a isolated spherical capacitor.
107. Derive an expression for the capacitance of a parallel plate capacitor filled with air
108. Derive an expression for the capacitance of a parallel plate capacitor with dielectric slab and with a conducting slab.
109. Obtain an expression for net capacitance C when three capacitors C_1 , C_2 and C_3 are connected in parallel.

110. Obtain an expression for net capacitance C when three capacitors C_1 , C_2 and C_3 are connected in series
111. Explain how the polarization of a dielectric reduces the electric field inside the dielectric. Hence define dielectric constant.
112. Explain briefly, using a proper diagram, the difference in behaviour of a conductor and a dielectric in the presence of external electric field.
113. Derive an expression for the energy stored in a parallel plate capacitor.
114. A parallel plate capacitor is charged by a battery. When the battery remains connected, a dielectric slab is inserted in the space between the plates. Explain what changes, if any, occur in the values of
 - a. Charge on the plates
 - b. Capacitance
 - c. Potential difference between the plates
 - d. Electric field between the plates
 - e. Energy stored in the capacitor

Case Study Based Question

Read the following paragraph and answer the questions that follow:

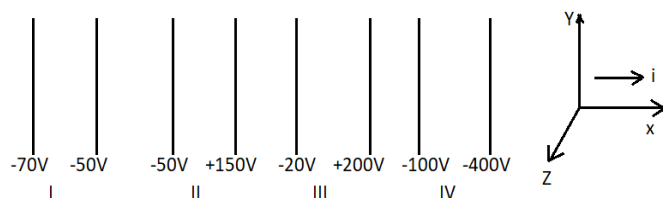
Device known as capacitors are used to store electrical energy as electrical charge builds up on their plates. In this way, capacitors are similar to batteries in that they store energy when they are linked to a power source and can release that energy when the connection is broken. The distinction is that a capacitor merely holds charge whereas a battery uses electrochemical processes to store energy.

115. When a dielectric material is introduced between the plates of a charged condenser, then its capacitance -
 - a. decreases
 - b. remains constant
 - c. increases
 - d. first (c) then (a)
116. The distance between the two plates of a parallel plate capacitor is halved and the area of each plates is also halved. If C is its initial capacitance, its final capacitance is equal to:
 - a. $2C$
 - b. $\frac{C}{2}$
 - c. C
 - d. $\frac{C}{4}$
117. The earth has volume V and surface area A , then capacitance would be:
 - a. $4\pi\epsilon_0 \frac{A}{V}$
 - b. $4\pi\epsilon_0 \frac{V}{A}$
 - c. $12\pi\epsilon_0 \frac{V}{A}$
 - d. $12\pi\epsilon_0 \frac{A}{V}$
118. A 12 PF capacitor is connected to a 50 V battery. The electrostatic energy stored in the capacitor in nJ is:
 - a. 15
 - b. 7.5
 - c. 0.3
 - d. 150

Read the following paragraph and answer the questions that follow:

The figure shows four pairs of parallel identical conducting plates, separated by the same distance 2.0 cm and arranged perpendicular to x-axis. The electric potential of each plate is mentioned. The electric field between a pair of plates is uniform and normal to the plates.

Based on the above information, answer the following questions:



119. For which pair of the plates is the electric field \vec{E} along \hat{i} ?
 - i. I
 - ii. II
 - iii. III
 - iv. IV
120. An electron is released midway between the plates of pair IV. It will
 - i. Move along \hat{i} at constant speed
 - ii. Move along $-\hat{i}$ at constant speed
 - iii. Accelerate along \hat{i}
 - iv. Accelerate along $-\hat{i}$
121. Let V_0 be the potential at the left plate of any set, taken to be at $x = 0$ m. Then potential V at any point ($0 \leq x \leq 2$ cm) between the plates of that set can be expressed as
 - i. $V = V_0 + ax$
 - ii. $V = V_0 + ax^2$
 - iii. $V = V_0 + ax^{1/2}$
 - iv. $V = V_0 + ax^{3/2}$

122. Let E_1 , E_2 , E_3 and E_4 be the magnitudes of the electric field between the pairs of plates I, II, III and IV respectively. Then

- i. $E_1 > E_2 > E_3 > E_4$ ii. $E_3 > E_4 > E_1 > E_2$ iii. $E_4 > E_3 > E_2 > E_1$ iv. $E_2 > E_3 > E_4 > E_1$

Read the following paragraph and answer the questions that follow:

The energy possessed by a system of charges by virtue of their positions. When two like charges lie infinite distance apart, their potential energy is zero because no work has to be done in moving one charge at infinite distance from the other. In carrying a charge q from point, A to point B, work done $W = q(V_A - V_B)$. This work may appear as change in KE/PE of the charge. The potential energy of two charges q_1 and q_2 at a distance r are in air is $\frac{q_1 q_2}{4\pi\epsilon_0 r}$. It is measured in joule. It may be positive, negative or zero depending on the signs of q_1 and q_2 .

123. Calculate work done in separating two electrons from a distance of 1 m to 2 m in air, when e is electric charge and K is electrostatic force constant.

- ii. Ke^2 ii. $e^2/2$ iii. $-Ke^2/2$ iv. zero

124. Two points A and B are located in diametrically opposite directions of a point charge $+2 \mu\text{C}$ at distance 2 m and 1 m respectively from it. The potential difference between A and B is:

- v. $3 \times 10^3 \text{ V}$ ii. $6 \times 10^4 \text{ V}$ iii. $-9 \times 10^3 \text{ V}$ iv. $-3 \times 10^3 \text{ V}$

125. Two point charges $A = +3 \text{ nC}$ and $B = +1 \text{ nC}$ are placed 5 cm apart in air. The work done to move charge B towards A by 1 cm is:

- ii. $2.0 \times 10^{-7} \text{ J}$ ii. $1.35 \times 10^{-7} \text{ J}$ iii. $2.7 \times 10^{-7} \text{ J}$ iv. $12.1 \times 10^{-7} \text{ J}$

126. A charge Q is placed at the origin. The electric potential due to this charge at a given point in space is V . the work done by an external force in bringing another charge q from infinity up to the point is:

- a. V/q ii. Vq iii. $V + q$ iv. V

Read the following paragraph and answer the questions that follow:

Device known as capacitors are used to store electrical energy as electrical charge builds up on their plates. In this way, capacitors are similar to batteries in that they store energy when they are linked to a power source and can release that energy when the connection is broken. The distinction is that a capacitor merely holds charge whereas a battery uses electrochemical processes to store energy.

127. Capacitors are used in electrical circuits where appliances need more-

- a. current b. voltage c. watt d. resistance

128. The distance between the two plates of a parallel plate capacitor is doubled and the area of each plates is halved. If C is its initial capacitance, its final capacitance is equal to:

- a. $2C$ b. $\frac{C}{2}$ c. $4C$ d. $\frac{C}{4}$

129. The earth has volume V and surface area A , then capacitance would be:

- a. $4\pi\epsilon_0 \frac{A}{V}$ b. $4\pi\epsilon_0 \frac{V}{A}$ c. $12\pi\epsilon_0 \frac{V}{A}$ d. $12\pi\epsilon_0 \frac{A}{V}$

130. A capacitor of capacitance C has charge Q and stored energy is W . If the charge is increased to $2Q$, the stored energy will be:

- a. $\frac{W}{4}$ b. $\frac{W}{2}$ c. $2W$ d. $4W$

Read the following source and answer the following questions:

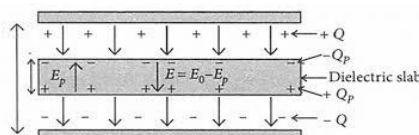
Electrostatic potential energy of a system of point charges is defined as the total amount of work done in bringing the different charges to their respective positions from infinitely charge mutual separations. The work is stored in the system of two-point charges in the form of electrostatic potential energy U of the system. Electric potential difference between any points A and B in an electric field is the amount of work done in moving a unit positive test charge from A to B along any path against the electrostatic force

$$V_A - V_B = \frac{W_{AB}}{q_0} = \int \vec{E} \cdot d\vec{l}$$

131. A test charge is moved from lower potential point to a higher potential point. The potential energy of test charge will
 (a) remain the same (b) increase (c) decrease (d) become zero
132. Which of the following statement is not true
 (a) Electrostatic force is a conservative force
 (b) Potential energy of charge q at a point is the work done per unit charge in bringing a charge from any point to infinity.
 (c) Spring force and gravitational force are conservative force
 (d) Both (a) and (c)
133. Work done in moving a charge from one point to another inside a uniformly charged conducting sphere is
 (a) always zero (b) non zero (c) may be negative (d) may be positive
134. The work done in bringing a unit positive charge from infinite distance to a point at distance x from a positive charge Q is W. Then the potential 'V' at that point is
 a) $\frac{WQ}{x}$ (b) W (c) $\frac{W}{Q}$ (d) WQ
135. If $1\mu\text{C}$ charge is shifted from A to B and it is found that work done by an external force is $40\text{ }\mu\text{J}$. In doing so against electrostatic force, the potential difference $V_A - V_B$ is
 (a) 40 V (b) 20 V (c) -40 V (d) -60 V

Read the following source and answer the following questions:

A dielectric slab is a substance which does not allow the flow of charges through it but permits them to exert electrostatic forces on one another. When a dielectric slab is placed between the plates, the field E_0 polarises the dielectric. The induced charge $-Q_p$ on the upper surface and $+Q_p$ on the lower surface of the dielectric. These induced charges set up a field E_p inside the dielectric in the opposite direction of E_0 as shown



136. In a parallel plate capacitor, the capacitance increases from $4\text{ }\mu\text{F}$ to $80\text{ }\mu\text{F}$, on introducing a dielectric medium between the plates. What is the dielectric constant of the medium?
 (a) 10 (b) 20 (c) 50 (d) 100
137. A parallel plate capacitor with air between the plates has a capacitance of 8 pF . The separation between the plates is now reduced half and the space between them is filled with a medium of dielectric constant 5. Calculate the value of capacitance of the capacitor in second case.
 (a) 8 pF (b) 10 pF (c) 80 pF (d) 100 pF
138. A dielectric introduced between the plates of a parallel condenser:
 (a) decreases the electric field between the plates (b) increases the capacity of the condenser
 (c) increases the charge stored in the condenser (d) decreases the capacity of the condenser
139. A parallel plate capacitor of capacitance 1 pF has separation between the plates 'd'. When the distance of separation becomes $2d$ and wax of dielectric constant X is inserted in it, the capacitance becomes 2 pF . What is the value of X?
 (a) 2 (b) 4 (c) 6 (d) 8
140. A variable capacitor is connected to a 200 V battery. If its capacitance is changed from $2\text{ }\mu\text{F}$ to $X\text{ }\mu\text{F}$, the decrease in energy of the capacitor is $2 \times 10^{-2}\text{ J}$. The value of X is:

a) 1
4

(b) 2

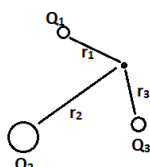
(c) 3

(d)

Read the following source and answer the following questions:

An electric potential is defined as the amount of the work required to move a unit positive charge from a reference point to a specific point in an electric field without producing acceleration. Usually, the reference point is taken as the earth or a point at infinity where the potential is taken as zero. The potential energy for a positive charge increases when it moves against an electric field and decreases when it moves with the electric field. Like we define electric field as the force per unit charge, we can define the electric potential as the potential energy per unit charge. So electric potential can be expressed in units of joule per coulomb or volt. The electric potential near an isolated positive charge is positive because work has to be done by an external agent to push a positive charge in from infinity. The electric potential near an isolated negative charge is negative because the positive test charge is attracted by negative charge. The electric potential due to a charge q at its own location is not defined- it is infinite. Because of arbitrary choice of the reference point, the electric potential at a point is arbitrary to within an additive constant. But it is immaterial because it is the potential difference between two points which is physically significant. $V = \frac{kQ_1}{r_1} +$

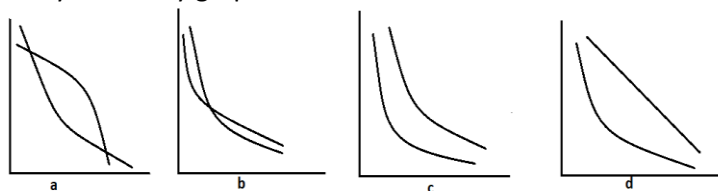
$$\frac{kQ_2}{r_2} + \frac{kQ_3}{r_3}$$



141. Which of the following is not true

- For a point charge, the electrostatic potential varies as $1/r$
- For a dipole, the potential depends on the position vector and dipole moment vector
- The electric dipole potential varies as $1/r$ at large distance
- For a point charge, the electrostatic field varies as $1/r^2$

142. The variation of electrostatic potential V and the electrostatic field E with distance r from a point charge q is correctly shown by graphs



143. What is the electric potential at the centre C of the square?

- Zero
- $\frac{kq}{a\sqrt{2}}$
- $\frac{kq}{a^2}$
- none of these

144. n small metal drops of same size are charged to V volt each. If they coalesce to form a single large drop, then its potential will be

- $\frac{V}{n}$
- Vn
- $Vn^{1/3}$
- $Vn^{2/3}$

145. A hollow conducting sphere is placed in an electric field produced by a point charge placed at P as shown in the figure. Let V_A , V_B , V_C be the potentials at points A, B and C respectively, then

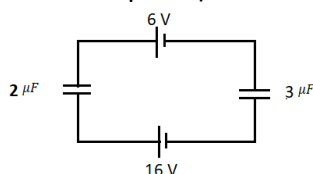
- $V_C > V_B$
- $V_B > V_C$
- $V_A > V_B$
- $V_A = V_C$

Read the following source and answer the following questions:

An arrangement of two conductors separated by an insulating medium can be used to store electric charge and electric energy. Such a system is called a capacitor. The more charge a capacitor can store, the greater is its capacitance. Usually a capacitor consists of two conductors having equal and opposite charge $+Q$ and $-Q$. hence, there is a potential difference V between them. By the capacitance of a capacitor we mean the ratio of the charge Q to the potential

difference V . By the charge on the capacitor we mean only the charge Q on the positive plate. Total charge of the capacitor is zero. The capacitance of the capacitor is a constant and depends on geometric factors, such as the shapes size and the relative positions of the two conductors, and the nature of the medium between them. The unit of capacitance is farad but the more convenient units are μF and pF . A commonly used capacitor consists of two long strips of metal foils separated by two long strips of dielectrics, rolled up into a small cylinder. Common dielectric materials are plastics (such as polyesters and polycarbonates) and aluminium oxide. Capacitors are widely used in television, computers and other electric circuits.

146. A parallel plate capacitor C has a charge Q . the actual charges on the plates are
 i. Q, Q ii $Q/2, Q/2$ iii $Q, -Q$ iv $Q/2, -Q/2$
147. A parallel plate capacitor is charged. If the plates are pulled apart,
 i. The capacitance increases
 ii. The potential difference increases
 iii. The total charge increases
 iv. The charge and potential difference remain the same.
148. If n capacitors, each of capacitance C , are connected in series, then the equivalent capacitance of the combination will be
 i. nC ii. n^2C iii. C/n iv. C/n^2
149. Three capacitors of $2.0, 3.0$, and $6.0 \mu F$ are connected in series to a $10 V$ source. The charge on the $3.0 \mu F$ capacitor is
 i. $5 \mu F$ ii. $10 \mu F$ iii. $12 \mu F$ iv. $15 \mu F$
150. What is the potential difference across $2 \mu F$ capacitor in the circuit shown below?



- i. $12 V$ ii. $4 V$ iii. $6 V$ iv. $18 V$

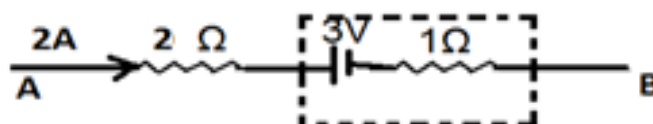
WORKSHEET-03

CH:APTER 03: CURRENT ELECTRICITY

MCQ (WITH ONE CORRECT OPTION)

- Consider a current carrying wire (current I) in the shape of a circle. Note that as the current progresses along the wire, the direction of j (current density) changes in an exact manner, while the current ' I ' remains unaffected. The agent that is essentially responsible for is
 - Source of emf.
 - Electric field produced by charges accumulated on the surface of wire.
 - The charges just behind a given segment of wire which push them just the right way by repulsion
 - The charges ahead.
- The drift velocity of the free electrons in a conducting wire carrying a current I is v . If in a wire of the same metal, but of double the radius, the current be $2i$, then the drift velocity of the electrons will be
 - $v/4$
 - $v/2$
 - v
 - $4v$

3. Assume that each atom of copper contributes one free electron. If the current flowing through a copper wire of 1 mm diameter is 1.1 A, the drift velocity of electrons will be (density of Cu = $9 \times 10^3 \text{ kg/m}^3$. At. Wt. of Cu = 63, Avogadro number = $6.02 \times 10^{26}/\text{kg atom}$)
- a. 0.3 mm/s b. 0.5 mm/s c. 0.1 mm/s d. 0.2 mm/s
4. A resistance R is to be measured using a meter bridge. Student chooses the standard resistance S to be 100Ω . He finds the null point at $l_1 = 2.9 \text{ cm}$. He is told to attempt to improve the accuracy. Which of the following is a useful way?
- a. He should measure l_1 more accurately.
b. He should change S to 1000Ω and repeat the experiment.
c. He should change S to 3Ω and repeat the experiment.
d. He should give up hope of a more accurate measurement with a meter bridge.
5. Figure represents a part of a closed circuit. The potential difference between points A and B ($V_A - V_B$) is

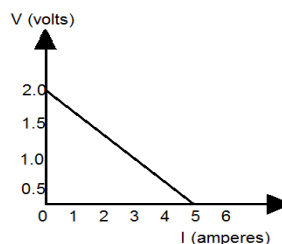


- a. +9V b. -9V c. +3 V d. +6 V
6. A student connected 10 dry cells each of emf E and internal resistance r in series, but by mistake the one cell gets wrongly connected. Then the net emf and net internal resistance of the combination will be
- a. $8E, 8r$ b. $8E, 10r$ c. $10E, 10r$ d. $8E, r/10$
7. Two bulbs each marked 100 W, 220 V are connected in series across 220 V supply. The power consumed by them, when lit, is
- a. 220 W b. 100 W c. 50 W d. zero
8. A wire of resistance 90Ω is melted and drawn into a wire of one-third of its length. The new resistance of the wire will be:
- a. 640Ω b. 10Ω c. 40Ω d. 16Ω
9. A wire of resistance $12 \Omega/\text{m}$ is bent to form a complete circle of radius 10 cm. the resistance between its two diametrically opposite points A and B is
- a. 3Ω b. $6 \pi \Omega$ c. 6Ω d. $0.6 \pi \Omega$
10. Kirchhoff's junction rule is a reflection of
- a. Conservation of current density vector
b. Conservation of charge
c. Conservation of momentum
d. The fact that there is no accumulation of charge at a junction

11. If a copper wire is stretched to make 0.1% longer, the percentage increase in resistance will be

- a. 0.2 b. 2 c. 1 d. 0.1

12. For a cell, the graph between the potential difference V across the terminals of the cell and the current I drawn from the cell is shown in the figure. The emf and the internal resistance of the cell are

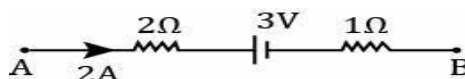


- a. 2 V, 0.5Ω b. 2 V, 0.4Ω c. > 2 V, 0.5Ω d. > 2 V, 0.4Ω

13. In a metallic conductor, under the effect of applied electric field, the free electrons of the conductor

- d. Drift from higher potential to lower potential.
e. Move in the curved paths from lower to higher potential.
f. Move with the uniform velocity throughout from lower potential to higher potential.
g. Move in the straight line paths in the same direction.

14. The potential difference ($V_A - V_B$) between the points A and B in the given figure is-



- a. 6 V b. +3 V c. -3 V d. +9 V

15. A cell of internal resistance ' r ' is connected across an external resistance ' R ' can supply maximum current when

- (a) $R = r$ (b) $R > r$ (c) $R = \frac{r}{2}$ (d) $R < r$

16. A current of 0.8 A flows in a conductor of 40Ω for 1 minute. The heat produced in the conductor will be

- (a) 14.45 J (b) 15.36 J (c) 1569 J (d) 1640 J

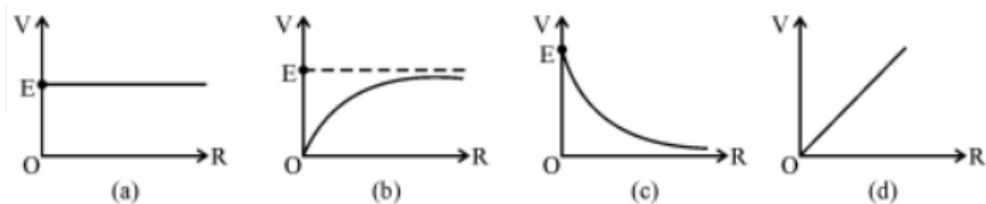
18. A battery is connected to the conductor of non – uniform cross section area. The quantities or quantity which remains constant is

- (a) electric field only (b) drift speed and electric field
(c) electric field and current (d) current only

17. Two source of equal emf are connected in series this combination is in turn connected to an external resistance R . the internal resistance of two sources are r_1 and r_2 ($r_2 > r_1$). If the potential difference across the source of internal resistance r_2 is zero, then R equal to

- a. $\frac{r_1 + r_2}{r_2 - r_1}$ b. $r_2 - r_1$ c. $\frac{r_1 r_2}{r_2 - r_1}$ d. $\frac{r_1 + r_2}{r_1 r_2}$

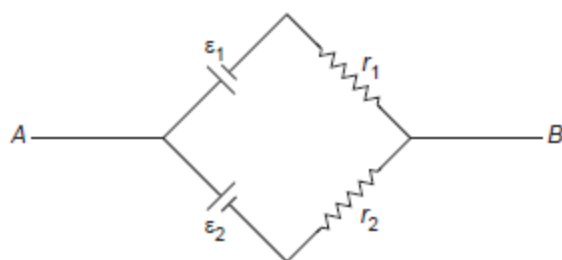
18. A cell of emf E and internal resistance r is connected across a variable external resistor R . The graph of terminal potential difference V as a function of R is



19. A cell of emf E is connected across an external resistance R . When current I is drawn from the cell, the potential difference across the electrodes of the cell drops to V . The internal resistance r of the cell is

- a. $\left(\frac{E-V}{E}\right)R$ b. $\left(\frac{E-V}{R}\right)$ c. $\left(\frac{E-V}{I}\right)R$ d. $\left(\frac{E-V}{V}\right)R$

20. Two batteries of ϵ_1 and ϵ_2 ($\epsilon_2 > \epsilon_1$) and internal resistance r_1 and r_2 respectively are connected in parallel as shown in figure.



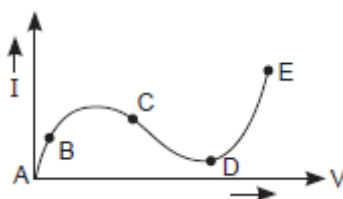
(a) The equivalent emf ϵ_{eq} of the two cells is between ϵ_1 and ϵ_2 , i.e. $\epsilon_1 < \epsilon_{eq} < \epsilon_2$.

(b) The equivalent emf ϵ_{eq} is smaller than ϵ_1 .

(c) The ϵ_{eq} is given by $\epsilon_{eq} = \epsilon_1 + \epsilon_2$ always.

(a) ϵ_{eq} is independent of internal resistances r_1 and r_2 .

21. From the graph between current I and voltage V shown below, identify the portion corresponding to negative resistance



(a) AB

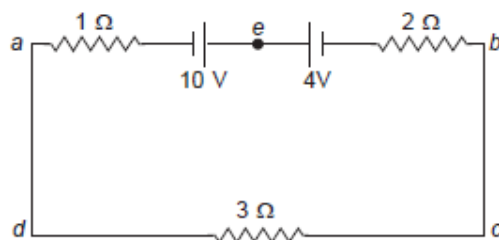
(b) BC

(c) CD

(d) DE

22. Which of the following characteristics of electrons determines the current in a conductor?
- (a) Drift velocity alone. (b) Thermal velocity alone.
 (c) Both drift velocity and thermal velocity. (d) Neither drift nor thermal velocity.

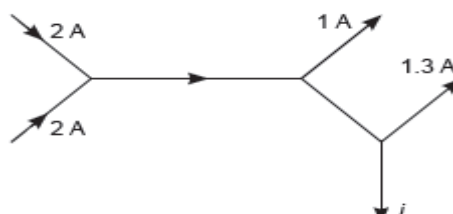
23. The magnitude and direction of the current in the circuit shown will be



- (a) $7/3$ A from a to b through e (b) $7/3$ A from b to a through e
 (c) 1 A from b to a through e (d) 1 A from a to b through e
24. The terminal potential difference of a cell is greater than its e.m.f. when it is
- (a) being discharged. (b) in open circuit.
 (c) being charged. (d) being either charged or discharged.
25. A wire is stretched so as to change its length by 0.1%, the percentage increase in its resistance will be _____.
- (a) 0.2% (b) 0.02% (c) 0.5% (d) 0.05%
26. The resistances of two wires having same length and same area of cross-section are $2\ \Omega$ and $8\ \Omega$ respectively. If the resistivity of $2\ \Omega$ wire is $2.65 \times 10^{-8}\ \Omega\text{-m}$ then the resistivity of $8\ \Omega$ wire is:
- (a) $10.60 \times 10^{-8}\ \Omega\text{-m}$ (b) $8.32 \times 10^{-8}\ \Omega\text{-m}$ (c) $7.61 \times 10^{-8}\ \Omega\text{-m}$ (d) $5.45 \times 10^{-8}\ \Omega\text{-m}$
27. When a potential difference V is applied across a conductor at temperature T , the drift velocity of the electrons is proportional to:
- (a) T (b) \sqrt{T} (c) V (d) \sqrt{V}
28. A Wheatstone bridge is balanced. If the galvanometer is short-circuited, the current in the various resistors will
- (a) increase (b) decrease (c) not change (d) cannot say
29. Kirchhoff's voltage law deals with

- (a) conservation of angular momentum. (b) conservation of charge.
 (c) conservation of linear momentum. (d) conservation of energy.

30. The figure below shows currents in a part of electric circuit. The current i is _____.

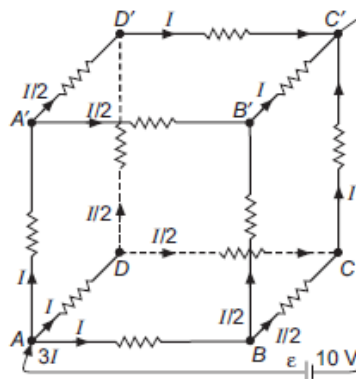


- (a) 1.7 A (b) 2.0 A (c) 3.4 A (d) 0.85 A

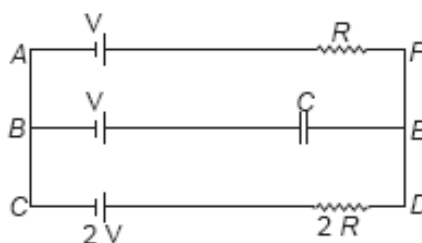
Very Short Answer type questions (Two Marks)

- (a) You are required to select a carbon resistor of resistance $47 \text{ k}\Omega \pm 10\%$ from a large collection. What should be the sequence of colour bands used to code it?
 (b) Write two characteristics of manganin which make it suitable for making standard resistances.
- Define mobility of electron in a conductor. How does electron mobility change when (i) temperature of conductor is decreased and (ii) applied potential difference is doubled at constant temperature?
- Nichrome and copper wires of same length and area of cross section are connected in series, current is passed through them why does the nichrome wire get heated first?
- A cell of emf E and internal resistance r is connected to two external resistances R_1 and R_2 and a perfect ammeter. The current in the circuit is measured in four different situations:
 - without any external resistance in the circuit,
 - with resistance R_1 only,
 - with R_1 and R_2 in series combination, and
 - with R_1 and R_2 in parallel combination.
 The currents measured in the four cases are 4.2 A, 1.05 A, 0.42 A, 1.4 A but not necessarily in that order. Identify the currents corresponding to the four cases mentioned above.
- Five identical cells, each of emf E and internal resistance r , are connected in series to form (a) an open (b) a closed circuit. If an ideal voltmeter is connected across three cells, what will be its reading?
- A cell of emf E and internal resistance r is connected across a variable resistor R . Plot a graph showing variation of terminal voltage V of the cell versus the current I . Using the plot, show how the emf of the cell and its internal resistance can be determined.
- If a wire of resistance R is stretched to n times, without affecting resistivity, and then it is cut into n equal parts. Now, all the parts are connected in parallel, what will be the new resistance?
- Plot a graph showing temperature dependence of resistivity for a typical semiconductor. How is this behaviour explained?

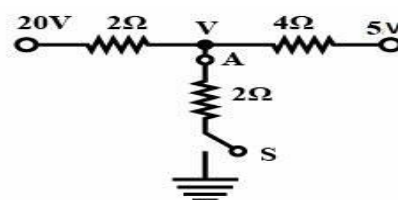
9. A battery of 10V and negligible internal resistance is connected across the diagonally opposite corners of a cubical network consisting of 12 resistors each of resistance $3\ \Omega$ in figure. Determine the equivalent resistance of the network and the current along each edge of the cube.



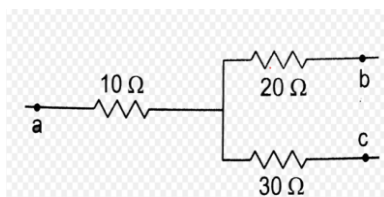
10. A number of identical cells, n , each of emf E , and internal resistance r connected in series are charged by a dc source of emf E' , using a resistor R .
- Draw the circuit arrangement.
 - Deduce the expressions for (a) the charging current, and (b) the potential difference across the combination of the cells.
11. In the given circuit in the steady state, obtain the expressions for
- the potential drop
 - the charge and
 - the energy stored in the capacitor, C .



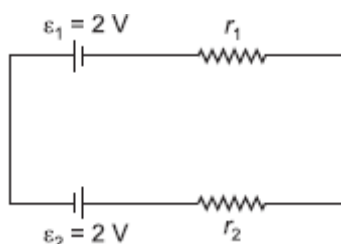
12. A potential difference V is applied across a conductor of length L and diameter D . How are the electric field E and the resistance R of the conductor affected when (i) V is halved (ii) L is halved (iii) D is doubled. Justify your answer.
13. Calculate the value of current $4\ \Omega$ resistance in the circuit shown in figure, when the switch S is closed.



14. Figure shows a part of an electric circuit. The potentials at points a , b and c are 30 V, 12 V and 2 V respectively. Calculate the current through a $20\ \Omega$ resistor.



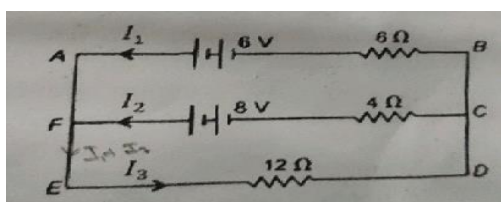
15. A current of 5 A is passing through a non – linear magnesium wire of cross – section 0.04 m^2 . At every point the direction of current density is at an angle of 60° with the unit vector of area of cross – section. Find the magnitude of electric field at any point of the conductor. (Resistivity of magnesium $\rho = 44 \times 10^{-8} \Omega\text{m}$)
16. A wire of length L_0 has a resistance R_0 . It is gradually stretched till its length becomes $1.5 L_0$. Plot a graph showing variation of its resistance R with L during stretching. What will be its resistance when its length becomes $1.5 L_0$.
17. For two nichrome wires connected in series with a battery, how does the ratio of drift velocity of electrons in them depend on their (a) lengths and (b) diameters.
18. A cell of emf E and internal resistance r is connected across a variable resistor R . Plot a graph showing variation of terminal voltage V of the cell versus the current I . Using the plot, show how the emf of the cell and its internal resistance can be determined.
19. If a wire of resistance R is stretched to n times, without affecting resistivity, and then it is cut into n equal parts. Now, all the parts are connected in parallel, what will be the new resistance?
20. Under what condition is the heat produced in an electric current
- (i) directly proportional, and (ii) inversely proportional to the resistance of the circuit?
21. State Kirchhoff 's rules. Use Kirchhoff 's rules to show that no current flows in the given circuit, when any one of the cells relates to reverse polarity



22. The thickness of a conductor continuously decreases from its one end (A) to another end (B). It is connected across the terminals of a battery. What will be the effect on the value of
- (a) electric field, (b) current density, and (c) mobility of the electron at a point on the conductor as one moves from end A to end B?

Short Answer Type Questions (Three Marks)

1. In the network shown here, find the following:

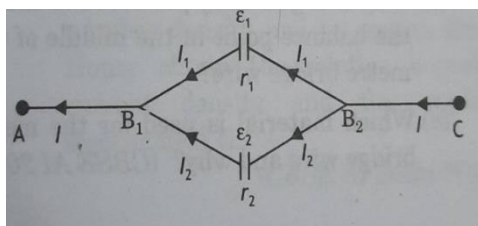


(a) Currents I_1 , I_2 and I_3 .

(b) Terminal potential difference of each battery. Consider $6\ \Omega$ to be the internal resistance of 6 V battery and $4\ \Omega$ to be internal resistance of 8 V battery.

2. (i) Two cells of emfs ε_1 , ε_2 and internal resistances r_1 and r_2 respectively are connected in parallel as shown in the figure. Deduce the expression for

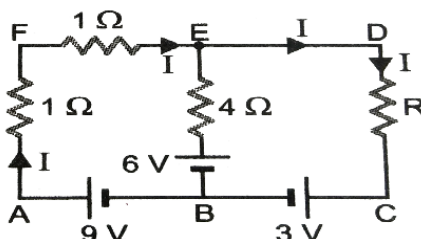
(a) the equivalent emf of the combination, (b) the equivalent resistance of the combination



(ii) Two identical cells each of emf 1.5 V and internal resistance r are connected in parallel across a parallel combination of two resistors each of resistance $20\ \Omega$. A voltmeter connected in the

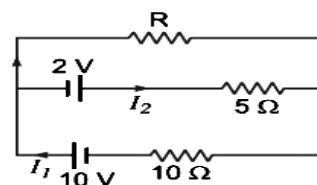
circuit measures 1.2 V . Calculate internal resistance of the cell.

3. Using Kirchhoff's rules determine the value of unknown resistance R in the circuit so that no current flows through $4\ \Omega$ resistance. Also find the potential difference between A and D .



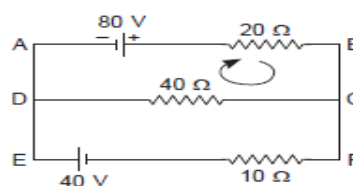
5. (a) Two wires A and B of the same material and having same length, have their cross-sectional areas in the ratio $1:6$. What would be the ratio heat produced in these wires when same voltage is supplied across each?

(b) Two cells of emf 10 V and 2 V and internal resistance $10\ \Omega$ and $5\ \Omega$ respectively, are connected in parallel as shown in figure. Find the effective voltage across R .



6. (a) Three identical resistors, each of resistance R , when connected in series with a d.c. source, dissipate power X . If the resistors are connected in parallel to the same d.c. source, how much power will be dissipated?

(b) Using Kirchhoff's rules, calculate the current through the $40\ \Omega$ and $20\ \Omega$ resistors in the following circuit:



7. Two identical cells each of emf 1.5 V are connected in parallel across a parallel combination of two resistors each of resistance 20Ω . A voltmeter connected in the circuit measures 1.2 V . calculate the internal resistance of each cell.

8. A long wire is bent into a circular coil of one turn and then into a circular coil of smaller radius having n turns. If the same current passes in both the cases, find the ratio of the magnetic fields produced at the centres in the two cases.

9. A potential difference V is applied across a conductor of length L and diameter D . How are the electric field E and the resistance R of the conductor affected when (i) V is halved (ii) L is halved (iii) D is doubled. Justify your answer.

10. a) Why do the free-electrons in a metal wire, flowing by themselves, not cause any current in the wire.

b) Write the relation between current and drift velocity for a conductor and use this expression to show that the

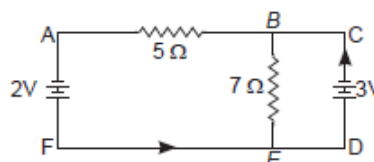
resistivity of the material of a wire is inversely proportional to the relaxation time for the free electrons in the

metal.

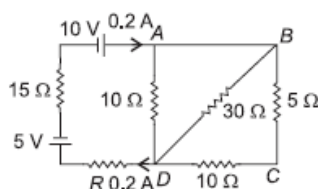
11. A student has two wires of copper and silver having same dimensions. First he connects the two wires in series and passes electric current through this series combination which increases gradually. Then he joins the two wires in parallel and repeats the process of passing the current. Which wire will glow first in each case and why?

12. Two resistances 5Ω and 7Ω are joined as shown to two batteries of emf 2 V and 3 V . If the 3 V battery

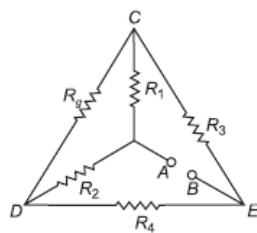
is short circuited. What will be the current through 5Ω ?



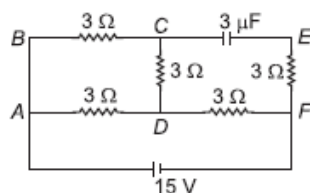
13. Calculate the value of the resistance R in the circuit shown in the figure so that the current in the circuit is 0.2 A . What would be the potential difference between points A and D ?



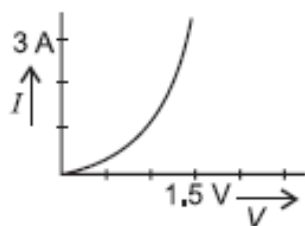
14. (i) Calculate the equivalent resistance of the given electrical network between points A and B .
(ii) Also calculate the current through CD and ACB , if a 10 V dc source is connected between A and B , and the value of R is assumed as 2Ω .



15. In the circuit shown in the figure, find the total resistance of the circuit and the current in the arm CD .



16. A cell of emf 1.5 V and internal resistance $0.5\ \Omega$ is connected to a (non-linear) conductor whose V – I graph is shown in figure. Obtain graphically the current drawn from the cell and its terminal voltage.



Long Answer Type of Questions (5 Marks)

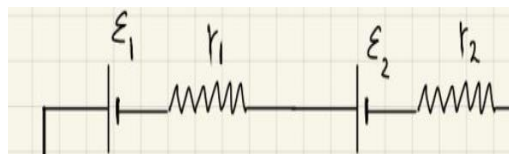
1. (i) Define the terms drift velocity and relaxation time. Deduce a relation between them. Plot a graph showing the variation of drift velocity of electrons with the length of a conductor at a given temperature and potential difference.

(ii) Two wires of equal cross sectional area, one of copper and other of manganin have the same resistance. Which one will be longer? Explain.

2. (i) Deduce an expression for resistivity ρ in terms of number density n of free electrons and relaxation time τ . Hence, plot a graph showing the variation of resistivity ρ for copper with temperature T .

ii) Two wires of equal lengths, one of copper and the other of manganin have the same resistance. Which wire will be thicker? Explain.

3. (i) Two cells of emfs ε_1 , ε_2 and internal resistances r_1 and r_2 respectively are connected in series as shown in the figure. Deduce the expression for (a) the equivalent emf of the combination, (b) the equivalent

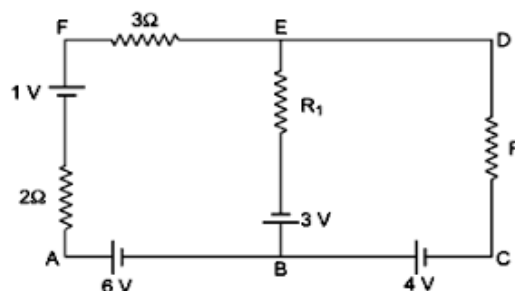


resistance of the combination, and(c) the potential difference between the points A and B .

(ii) Two identical cells each of emf 1.5 V and internal resistance r are connected in parallel across a parallel combination of two resistors each of resistance $20\ \Omega$. A voltmeter connected in the circuit measures 1.2 V . Calculate internal resistance of the cell.

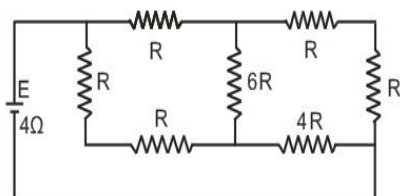
4. (a) Define relaxation time of the free electrons drifting in a conductor. How is it related to the drift velocity of free electrons? Use this relation to deduce the expression for the electrical resistivity of the material.

(b) Use Kirchhoff's rules to determine the potential difference between the points A and D when no current flows in the arm BE of the electric network shown in the figure.



5. (a) Define terminal potential difference of a cell. Derive a relation between the internal resistance, emf and terminal potential difference of a cell.

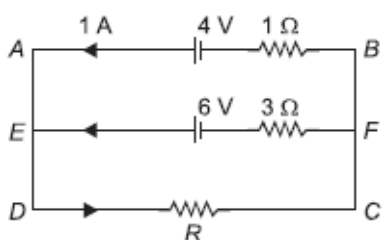
(b) A battery of internal resistance $r = 4\ \Omega$ is connected to the network of resistances, as shown in figure. What must be the value of R , so that maximum power is declined to the network? What is the maximum power?



6. (a) Eight identical cells, each of emf 2 V and internal resistance $3\ \Omega$, are connected in series to form a row. Six such rows are connected in parallel to form a battery. This battery is now connected to an external resistor 'R' of resistance $6\ \Omega$. Calculate (i) emf of the battery (ii) internal resistance of the battery and (iii) current flowing through R.

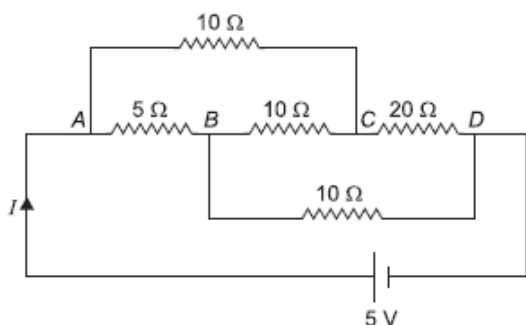
(b) Define emf and terminal potential difference of a cell. Derive a relation between the internal resistance, emf and terminal potential difference of a cell.

7. (a) Using Kirchhoff's rules, determine (i) the voltage drop across the unknown resistor R and (ii) the current flowing in the arm EF in the circuit as shown.

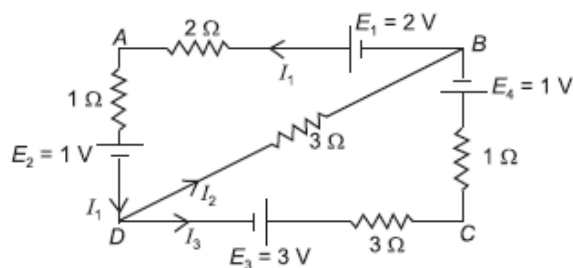


(b) Define the terms drift velocity and relaxation time. Deduce the relation between them

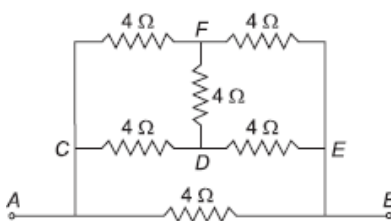
8. (a) Calculate the value of the current drawn from a 5 V battery in the circuit as shown.



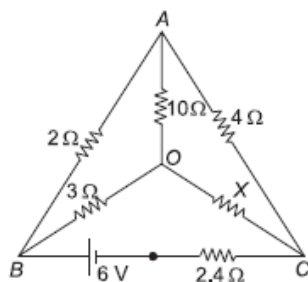
b. In the given network, find the values of the currents, I_1 , I_2 and I_3 .



9. (a) Six resistors, each of value $4\ \Omega$, are joined together in a circuit as shown in the figure. Calculate equivalent resistance across the points A and B. If a cell of emf 2 V is connected across AB, compute the current through the arms AB and DF of the circuit.

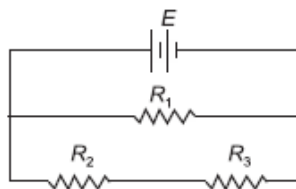


(b) Find the value of the unknown resistance X , in the following circuit, if no current flows through the section AO . Also calculate the current drawn by the circuit from the battery of emf 6 V and negligible internal resistance.

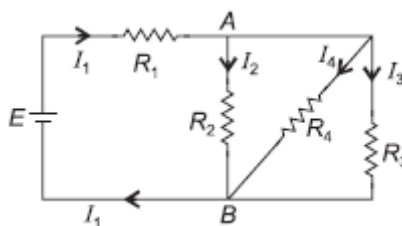


10. Two nichrome wires are connected in series with a battery. The lengths of nichrome wires are in the ratio of 1 : 2 whereas their resistances are in the ratio of 2: 1. Find the (a) ratio of their diameters and (b) ratio of drift velocity of free electrons in them.

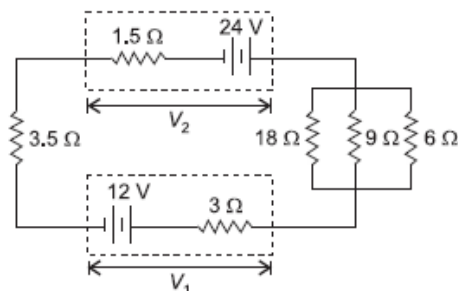
11. (a) Three identical resistors R_1 , R_2 and R_3 are connected to a battery as shown in figure. What will be the ratio of voltages across R_1 and R_3 ?



(b) In the circuit shown, $R_1 = 4 \Omega$, $R_2 = R_3 = 15 \Omega$, $R_4 = 30 \Omega$ and $E = 10 \text{ V}$. Calculate the equivalent resistance of the circuit and the current in each resistor.



12. A 24 V battery of internal resistance $1.5\ \Omega$ is connected to three coils $18\ \Omega$, $9\ \Omega$ and $6\ \Omega$ in parallel, a resistor of $3.5\ \Omega$ and a reversed battery (emf = 12 V and internal resistance = $3\ \Omega$) as shown. Calculate (i) the current in the circuit, (ii) current in resistor of $18\ \Omega$ coil, and (iii) p.d. across each battery.



ASSERTION AND REASONS BASED QUESTIONS

DIRECTIONS: In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Mark the correct choice as:

- If both Assertion and Reason are true and reason is the correct explanation of the assertion.
- If both Assertion and Reason are true and reason is not the correct explanation of the assertion.
- If assertion is true but reason is false
- If both assertion and reason are false.

29.**Assertion:** The dimensional formula for product of resistance and conductance is same as for dielectric constant.

Reason: Both have dimensions of time constant.

30.**Assertion:** Electrons move from a region of higher potential to a region of lower potential.

Reason: An electron has less potential energy at a point where potential is higher and vice-versa.

31.**Assertion:** A wire carrying an electric current has no electric field around it.

Reason: Rate of flow of electrons in one direction is equal to the rate of flow of protons in opposite direction.

32.**Assertion:** Though large number of free electrons are present in the metal. Yet there is no current in the absence of electric field.

Reason: In the absence of electric field electrons move randomly in all directions.

33.**Assertion:** The value of temperature coefficient of resistance is positive for metals.

Reason: The temperature coefficient of resistance for insulators is also positive

34.**Assertion:** A current flows in a conductor only when there is an electric field within the conductor.

Reason: The drift velocity of electrons in presence of electric field decreases.

35. **Assertion:** An electrical bulb starts glowing instantly as it is switched on.

Reason: drift speed of electrons in a metallic wire is very large.

36. **Assertion:** The conductivity of an electrolyte is very low as compared to a metal at room temperature.

Reason: The number density of free ions in electrolyte is much smaller as compared to number density of free electrons in metals. Further, ions drift much more slowly, being heavier.

37. **Assertion:** Current can be represented with an arrow.

Reason: Current is a vector quantity

38. **Assertion:** Bending a wire does not affect electrical resistance.

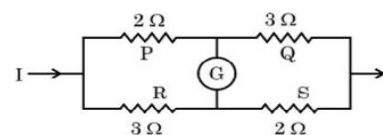
Reason: Resistance of wire is proportional to resistivity of material

39. **Assertion:** The drift velocity of electrons in a metallic wire will decrease, if the temperature of the wire is increased.

Reason: On increasing temperature, conductivity of metallic wire decreases.

40. **Assertion (A):** The given figure does not show a balanced wheat-stone bridge.

Reason: For a balanced bridge, small current should flow through



41. **Assertion:** The electric current flows in a conductor when there is an electric field within the conductor.

Reason: The electrons in a conductor drift only in the presence of electric field.

42. **Assertion:** The current flows in a conductor when there is an electric field within the conductor.

Reason: The electrons in a conductor drift only in the presence of electric field.

CASE STUDY BASED QUESTIONS:

1. Kirchhoff's circuit laws are two equalities that deal with the current and potential difference in the lumped element model of electrical circuits. They were first described in 1845 by German physicist Gustav Kirchhoff.

Kirchhoff's current law

This law states that for any node in an electric circuit, the sum of currents flowing into that node is equal to the sum

of currents flowing out of that node.

Kirchhoff's Voltage law

The directed sum of potential differences (Voltages) around any closed loop is zero.

Read the above passage carefully and answer the following:

a. Kirchhoff's current law is conservation of

- i. Charge ii. Energy iii. Potential iv. momentum

b. Kirchhoff's current law can be written as

- i. $\sum V = 0$ ii. $\sum I = 0$ iii. $\sum R = 0$ iv. $\sum q = 0$

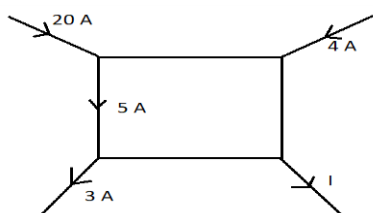
c. Kirchhoff's voltage law is the conservation of

- i. Energy ii. Charge iii. Current iv. Momentum

d. Kirchhoff's voltage law is applied over

- i. Closed circuit loop ii. At a circuit node iii. Across battery iv. None of these

e. The value of I in the figure shown



- i. 19 A ii. 21 A iii. 4 A iv. 8 A

2. All charges whether free or bound, were considered to be at rest. Charges in motion constitute an electric current. Such currents occur naturally in many situations. Lightning is one such phenomenon in which charges flow from the clouds to the earth through the atmosphere, sometimes with disastrous results. The flow of charges in lightning is not steady, but in our everyday life we see many devices where charges flow in a steady manner, like water flowing smoothly in a river. A torch and a cell-driven clock are examples of such devices.

(i) Which of the following is the correct example of the flow of charges?

- (a) Lightning (b) Glass (c) Water (d) Juice

(ii) Which type of charges is either free or bound?

- (a) Positive charge (b) Negative charge (c) Neutral charge (d) All types of charges

(iii) Which of the following statement is correct?

- (a) Only positive charge is considered to be at rest.
(b) Torch and a cell – driven clock are the incorrect example of flow of charges.
(c) All types of charges whether positive or negative charge are considered to be at rest.
(d) Both (a) and (b).

(iv) Which of the following statement is correct about lightning?

- (a) The flow of charges in lightning is steady.

- (b) Lightning is one such phenomenon in which charges flows from the clouds to the earth through the atmosphere.
- (c) Lightning is one such phenomenon in which charges flows from the atmosphere to the earth through the clouds.
- (d) Both (a) and (b).

Or

(iv) Which of the following is the correct example of flow of charge in a steady manner?

- (a) Torch (b) Lightning (c) Cell-driven clock (d) Both (a) and (c)

3. Consider the case when no electric field is present. The electrons will be moving due to thermal motion during which they collide with the fixed ions. An electron colliding with an ion emerges with the same speed as before the collision. However, the direction of its velocity after the collision is completely random. At a given time, there is no preferential direction for the velocities of the electrons. Thus on the average, the number of electrons travelling in any direction will be equal to the number of electrons travelling in the opposite direction. So, there will be no net electric current.

(i) What is the cause of the movement of electrons?

- (a) Thermal motion (b) Kinetic energy (c) Resistance (d) Capacitance

(ii) What is the relation between speed of the electron both before and after the collision?

- (a) Greater speed before the collision than after the collision
 (b) Same speed, before and after the collision
 (c) Greater speed after the collision than before the collision
 (d) None of the above

(iii) What is the direction of the velocity of electron after collision?

- (a) Towards the cell (b) Away from the resistor (c) Random (d) Static

(iv) What is the value of net electric current?

- (a) Infinite (b) 90 A (c) 180 A (d) 0 A

4. If we consider solid conductors, then of course the atoms are tightly bound to each other so that the current is carried by the negatively charged electrons. There are, however, other types of conductors like electrolytic solutions where positive and negative charges both can move. We will focus only on solid conductors so that the current is carried by the negatively charged electrons in the background of fixed positive ions.

- (i) Which type of conductor, have tight bond of atoms to each other?
 (a) Liquid (b) Solid (c) Semi-solid (d) Both (a) and (b)
- (ii) Which of the following type of conductor have positive and negative charge, which can move?
 (a) Electrolytic solutions (b) Insulator (c) Semi-conductor (d) Alloys
- (iii) Which of the following statements is correct?
 (a) Other types of conductors like electrolytic solutions where positive and negative charges both can move.
 (b) We consider solid conductors, and then of course the atoms are tightly bound to each other so that the current is carried by the negatively charged electrons.
 (c) Only in solid conductors, the current is carried by the negatively charged electrons in the background of fixed positive ions.
 (d) All of the above.
- (iv) We can obtain large currents in a conductor because
 (a) drift speed of electron is usually very large.
 (b) the number density of free electrons is very high and this can compensate for the low values of the electron drift speed and the very small magnitude of the electron charge.
 (c) the number density of free electrons as well as the electron drift speeds are very large and these compensate for the very small magnitude of the electron charge.
 (d) none of the above.

Or

- (iv) Which of the following is responsible for the flow of current in a conductor?
 (a) Protons (b) Free electron (c) Positive ions (d) Protons and holes

5. An electric charge will experience a force if an electric field is applied. If it is free to move, it will thus move contributing to a current. In nature, free charged particles do exist like in upper strata of atmosphere called the ionosphere. However, in atoms and molecules, the negatively charged electrons and the positively charged nuclei are bound to each other and are thus not free to move. Bulk matter is made up of many molecules, a gram of water, for example, contains approximately 10^{22} molecules.

- (i) When will an electric charge experiences force?

- (a) If an electric field is applied. (b) If electric current is applied.
 (c) If voltage is applied. (d) Both (a) and (b).

(ii) Which of the following correctly describes ionosphere?

- (a) Free charged particles do exist like in lower strata of atmosphere called the ionosphere.
 (b) Free charged particles do exist like in upper strata of atmosphere called the ionosphere.
 (c) It is only the free molecules in the atmosphere.
 (d) Bulk matter is responsible for the ionosphere.

(iii) Which of the following have free electrons to move within the bulk material?

- (a) Non-Metals (b) Semi-conductors (c) Alloys (d) Metals

(iv) Which type of matter is made up of many molecules?

- (a) Bulk (b) Semi- Bulk (c) Both (a) and (b) (d)
 Conductor

Or

(iv) Which of the following statement is correct?

- (a) An electric charge will experience a force if an electric field is applied.
 (b) Bulk matter is made up of many molecules, a gram of water, for example, contains approximately 10^{22} molecules.
 (c) In nature, free charged particles do exist like in upper strata of atmosphere called the ionosphere.
 (d) All of the above.

WORKSHEET-04

CH. 04: MOVING CHARGES AND MAGNETISM

Section: A (MCQs having one correct answer)

- Biot-Savart law indicates that the moving electrons (velocity v) produce a magnetic field B such that
 (a) $B \perp v$. (b) $B \parallel v$.
 (c) it obeys inverse cube law. (d) it is along the line joining the electron and point of observation.
- When a magnetic compass needle is carried nearby to a straight wire carrying current, then
 (I) the straight wire cause a noticeable deflection in the compass needle.
 (II) the alignment of the needle is tangential to an imaginary circle with straight wire as its centre and has a plane perpendicular to the wire
 (a) (I) is correct (b) (II) is correct

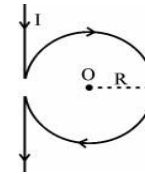
(c) both (I) and (II) are correct

(d) neither (I) nor (II) is correct

3. Two parallel wires of infinite length convey the same amount of current in the same direction. The magnetic field produced by a location in the middle of the two wires is:

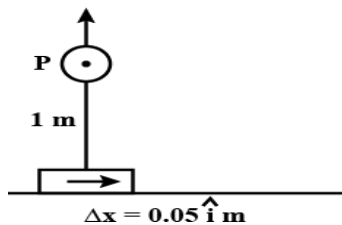
- a) Equal to two times of that of magnetic field produced by each wire
- b) Equal to half of that of magnetic field produced by each wire
- c) Equal to square of that of magnetic field produced by each wire
- d) Zero

4. A current I flows through a long straight conductor which is bent into circular loop of radius R in the middle as shown in the figure:



- a. Zero b. $\frac{\mu_0 I}{2R}(1 + \pi)$ c. $\frac{\mu_0 I}{4\pi R}$ d. $\frac{\mu_0 I}{2R}(1 - \frac{1}{\pi})$

5. An element of 0.05 m is placed at the origin as shown in figure which carries a large current of 10 A . The magnetic field at a distance of 1 m in perpendicular direction is:

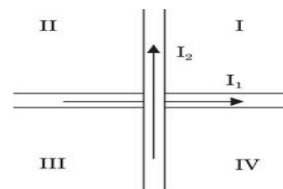


- (a) $4.5 \times 10^{-8} \text{ m}$
- (b) $5.5 \times 10^{-8} \text{ m}$
- (c) $5.0 \times 10^{-8} \text{ m}$
- (d) $7.5 \times 10^{-8} \text{ m}$

6. A current of 10 A is flowing from east to west in a long straight wire kept on a horizontal table. The magnetic field developed at 10 cm due north on the table is:

- (a) $2 \times 10^{-5} \text{ T}$, acting downwards
- (b) $2 \times 10^{-5} \text{ T}$, acting upwards
- (c) $4 \times 10^{-5} \text{ T}$, acting downwards
- (d) $4 \times 10^{-5} \text{ T}$, acting upwards

7. Two wires carrying currents I_1 and I_2 lie, one slightly above the other, in a horizontal plane as shown in figure. The region of vertically upward strongest magnetic field is



- (a) I (b) II (c) III (d) IV

8. The magnetic fields at two points on the axis of a circular coil at 0.05 m and 0.2 m from the centre are in the ratio $8:1$. The radius of coil is

- (a) 0.15 m
- (b) 0.1 m
- (c) 0.2 m
- (d) 1.0 m

9. The magnetic field at the centre of a current carrying circular loop of radius R , is B_1 . The magnetic field at a point on its axis at a distance R from the centre of the loop is B . Then the ratio B_1/B_2 is
- a. $2\sqrt{2}$ b. $1/\sqrt{2}$ c. $\sqrt{2}$ d. 2

Section: B (Assertion and Reason)

In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Mark the correct choice as:

- a. Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
 b. Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
 c. Assertion (A) is true but Reason (R) is false.
 d. Both Assertion (A) and Reason (R) are false.

10. **Assertion (A)** : The magnetic field intensity at the centre of a circular coil carrying current changes, if the current through the coil is doubled.

Reason (R) : The magnetic field intensity is dependent on current in conductor.

11. **Assertion (A)**: The magnetic field at the ends of a very long current carrying solenoid is half of that at the centre.

Reason (R): If the solenoid is sufficiently long, the field within it is uniform.

12. **Assertion (A)**: The magnetic field produced by a current carrying solenoid is independent of its length and cross- sectional area.

Reason (R) : The magnetic field inside the solenoid is uniform.

13. **Assertion (A)**: A current-carrying conductor produces a magnetic field around it.

Reason (R): Moving charges produce a magnetic field.

14. **Assertion (A)**: The magnetic field at the centre of a circular loop carrying current is zero.

Reason (R): The magnetic field lines due to each segment of the loop cancel out at the centre.

15. **Assertion (A)**: The magnitude of the magnetic field at a point due to a long straight current-carrying wire decreases with distance from the wire.

Reason (R): The magnetic field due to a long straight wire is inversely proportional to the distance from the wire.

16. **Assertion (A)**: The Biot-Savart law is used to calculate the magnetic field due to a small element of current. **Reason (R)**: The Biot-Savart law relates the magnetic field to the current element, the distance from the element, and the angle between the element and the line connecting the point of interest.

17. **Assertion (A)**: Magnetic field lines form closed loops.

Reason (R): Magnetic monopoles do not exist.

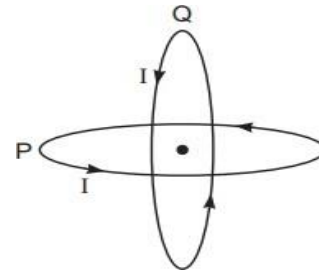
18. Assertion(A): Biot-Savart's law gives us the expression for the magnetic field strength of an infinitesimal current element (Idl) of a current carrying conductor only.

Reason (R): Biot-Savart's law is analogous to Coulomb's inverse square law of charge q , with the former being related to the field produced by a scalar source, Idl while the latter being produced by a vector source, q .

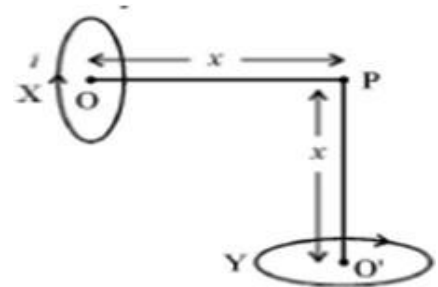
19. Assertion (A): The magnetic flux through a surface is always zero if the surface is closed.

Reason (R): Magnetic field lines do not begin or end at any point, ensuring that the net flux through a closed surface is zero.

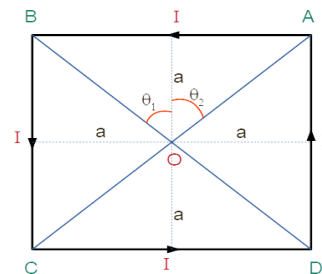
1. Two identical circular wires P and Q each of radius R and carrying current ' I ' are kept in perpendicular planes such that they have a common centre as shown in the figure. Find the magnitude and direction of the net magnetic field at the common centre of the two coils



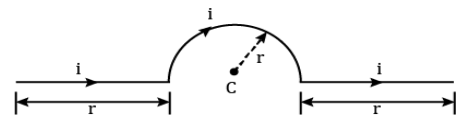
2. (a) Draw the pattern of magnetic field lines for a circular coil carrying current.
(a) Two identical circular loops X and Y of radius R and carrying the same current are kept in perpendicular planes such that they have a common centre at P as shown in the figure. Find the magnitude and direction of the net magnetic field at the point P due to the loops.



3. Use Biot – Savart law to obtain an expression for the magnetic field at the centre of a coil bent in the form of a square of side $2a$ carrying current I .

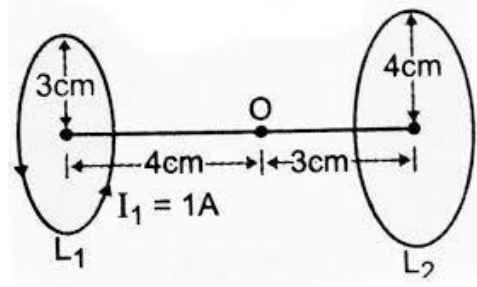


4. A long wire having a semi-circular loop of radius r carries a current I , as shown in fig. Find the magnetic field due to entire wire at the point ' O '.

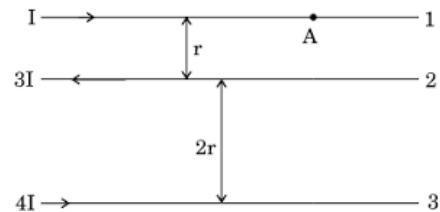


5. Two circular loops A and B, each of radius 3 m , are placed coaxially at 4 m . They carry currents of 3 A

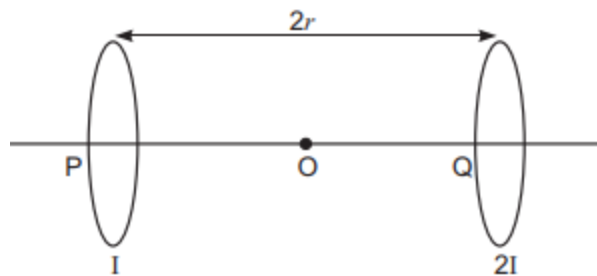
and 2 A in opposite directions respectively. Find the net magnetic field at the centre of loop A



6. The figure shows three infinitely long straight parallel current carrying conductors. Find the magnitude and direction of the net magnetic field at point 'A' lying on the conductor 1.



7. Two identical circular loops, P and Q, each of radius r and carrying currents I and $2I$ respectively are lying in parallel planes such that they have a common axis. The direction of current in both the loops is clockwise as seen from 'O' which is equidistant from the both loops. Find the magnitude of the net magnetic field at point O.



8. Two identical coils P and Q each of radius R are lying in perpendicular planes such that they have a common centre. Find the magnitude and direction of magnetic field at the common centre. Find the magnitude and direction of magnetic field at the common centre of the two coils, if they carry currents equal to I and $\sqrt{3} I$ respectively.



DELHI PUBLIC SCHOOL BULANDSHAHR



HOLIDAY HOMEWORK (SESSION: 2025 – 2026)

XII, CHEMISTRY

ELECTROCHEMISTRY

MCQs

Q1) Dilution affects both conductivity as well as molar conductivity. Effect of dilution on both is as follows:

- (A) both increase with dilution.
- (B) both decrease with dilution.
- (C) conductivity increases whereas molar conductivity decreases on dilution.
- (D) conductivity decreases whereas molar conductivity increases on dilution

Q2) Which of the following statement is not correct about an inert electrode in a cell?

- (a) It does not participate in the cell reaction
- (b) It provides surface either for oxidation or for reduction reaction
- (c) It provides surface for conduction of electrons
- (d) It provides surface for redox reaction

Q3) Which of the statements about solutions of electrolytes is not correct?

- (a) Conductivity of solution depends upon size of ions
- (b) Conductivity depends upon viscosity of solution
- (c) Conductivity does not depend upon solvation of ions present in solution
- (d) Conductivity of solution increases with temperature

Q4) In a lead storage battery, which of the following is the electrolyte?

- (a) Potassium hydroxide (b) Manganese dioxide
- (c) Ammonium chloride (d) Sulphuric acid

Q5) Equilibrium constant K is related to E°_{cell} and not E_{cell} because

- (a) E°_{cell} is easier to measure than E_{cell}
- (b) E_{cell} becomes zero at equilibrium point but E°_{cell} remains constant under all conditions
- (c) at a given temperature, E_{cell} changes hence value of K can't be measured

(d) any of the terms E_{cell} or E°_{cell} can be used

Q6) Which of the following solutions will have the highest conductivity 298K ?

- (a) 0.01M HCl solution (b) 0.1M HCl solution
(c) 0.01M CH_3COOH solution (d) 0.1M CH_3COOH solution

Q7) Which of the following solutions of KCl will have the highest value of molar conductivity?

- (a) 0.01M (b) 1M (c) 0.5 M (d) 0.1 M

Q8) Which of the following cells was used in the Apollo space program?

- (A) Mercury cell (B) $\text{H}_2\text{-O}_2$ fuel cell (C) Dry cell (D) Ni-Cd cell

Q9) The cell constant of a conductivity cell _____.

- (A) Changes with change of electrolyte.
(B) Changes with change of concentration of electrolyte.
(C) Changes with temperature of electrolyte.
(D) Remains constant for a cell.

Q10) In an electrochemical process, a salt bridge is used:

- (A) as a reducing agent (B) as an oxidizing agent
(C) to complete the circuit so that current can flow (D) None of these.

Q11) What will happen during the electrolysis of aqueous solution of CuSO_4 by using platinum electrodes?

- (A) Copper will deposit at cathode.
(B) Copper will deposit at anode.
(C) Oxygen will be released at anode.
(D) Copper will dissolve at anode.

Q12) Which of the following cells is not a galvanic cell?

- (a) Daniel cell (b) Lead storage battery during discharge
(c) Electrolytic cell used for electroplating (d) Dry cell

Q13) Why is platinum used as an electrode in SHE (Standard Hydrogen Electrode)?

- (a) It is reactive and enhances the reaction.
(b) It is a good conductor and chemically inert.
(c) It dissolves hydrogen well.

(d) It is a cost-effective material.

Q14) Which of the following cells is used in transistors?

- (a) Dry cell (b) Mercury cell (c) Ni-Cd cell (d) Fuel cell

Q15) How much charge is required to obtain 1 mole of aluminium from Al_2O_3 ?

- (a) 1F (b) 3F (c) 2F (d) 6F

Q16) The molar ionic conductivities of Al^{3+} and SO_4^{2-} are $189 \text{ S cm}^2 \text{ mol}^{-1}$ and $160 \text{ S cm}^2 \text{ mol}^{-1}$ respectively. The value of limiting molar conductivity of $\text{Al}_2(\text{SO}_4)_3$ will be:

- (a) $198 \text{ S cm}^2 \text{ mol}^{-1}$ (b) $588 \text{ S cm}^2 \text{ mol}^{-1}$
(c) $858 \text{ S cm}^2 \text{ mol}^{-1}$ (d) $891 \text{ S cm}^2 \text{ mmol}^{-1}$

Q17) Which of the following is given to a fuel cell's cathode?

- (a) Hydrogen (b) Nitrogen (c) Oxygen (d) Chlorine

Q18) During electroplating, the metal ion from the electrolyte gets deposited on the cathode. Why does this happen?

- (a) Cathode attracts negative ions.
(b) Metal dissolves into the cathode.
(c) Reduction occurs at the cathode, converting metal ions to metal.
(d) Electrolyte dissolves the cathode.

Q19) In an electrochemical cell, electrons flow from anode to cathode. This happens because:

- (a) The anode attracts electrons.
(b) The anode is at a higher potential energy for electrons.
(c) Electrons are produced at the cathode.
(d) The cathode is always negative.

Q20) Copper does not displace hydrogen from dilute HCl, but zinc does. Why?

- (a) Copper is heavier than zinc.
(b) Zinc has a more negative standard reduction potential than hydrogen.
(c) Zinc forms stronger bonds with chloride.
(d) Copper reacts only with concentrated acids.

Q21) Electrolysis of molten NaCl yields sodium metal and chlorine gas, but electrolysis of aqueous NaCl gives hydrogen and chlorine. Why?

- (a) Sodium reacts with water to form hydrogen.

(b) Water gets reduced more easily than Na^+ due to lower reduction potential.

(c) Chlorine is unstable in molten state.

(d) Na^+ is more reactive in solution.

Q22) The molar ionic conductivities of Ca^{2+} and Cl^- are 119.0 and $76.3 \text{ S cm}^2 \text{ mol}^{-1}$ respectively. The value of limiting molar conductivity of CaCl_2 will be:

(a) $195.3 \text{ S cm}^2 \text{ mol}^{-1}$ (b) $314.3 \text{ S cm}^2 \text{ mol}^{-1}$

(c) $43.3 \text{ S cm}^2 \text{ mol}^{-1}$ (d) $271.6 \text{ S cm}^2 \text{ mol}^{-1}$

Q23) How will the cell be represented?

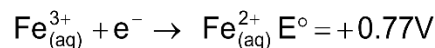
(A) $\text{Zn(s)} | \text{Zn}^{2+}(\text{aq}) || \text{Pb}^{2+}(\text{aq}) | \text{Pb(s)}$

(B) $\text{Zn}^{2+}(\text{s}) | \text{Zn(aq)} || \text{Pb}^{2+}(\text{aq}) | \text{Pb(s)}$

(C) $\text{Pb}^{2+}(\text{aq}) | \text{Pb(s)} || \text{Zn}^{2+}(\text{s}) | \text{Zn(aq)}$

(D) $\text{Pb(s)} | \text{Pb}^{2+}(\text{aq}) || \text{Zn}^{2+}(\text{s}) | \text{Zn(aq)}$

Q24) Consider the following standard electrode potential values:



What is the cell potential for the redox reaction?

(a) -2.28 V (b) -0.74 V (c) $+0.74 \text{ V}$ (d) $+2.28 \text{ V}$

Q25) ΔG and E_{cell}° for a spontaneous reaction will be:

(a) positive, negative (b) negative, negative

(c) negative, positive (d) positive, positive

Q26) Standard solution of KNO_3 is used to make a salt bridge because

(a) Velocity of K^+ is greater than that of NO_3^-

(b) Velocity of NO_3^- is greater than that of K^+ .

(c) Velocity of both K^+ and NO_3^- are nearly same

(d) KNO_3 is highly soluble in water.

Q27) Limiting molar conductivity of NH_4OH [i.e., $\Lambda_{\text{m}}^\circ(\text{NH}_4\text{OH})$] is equal to-

A) $\Lambda_{\text{m}}^\circ(\text{NH}_4\text{Cl}) + \Lambda_{\text{m}}^\circ(\text{NaCl}) - \Lambda_{\text{m}}^\circ(\text{NaOH})$

B) $\Lambda_{\text{m}}^\circ(\text{NaOH}) + \Lambda_{\text{m}}^\circ(\text{NaCl}) - \Lambda_{\text{m}}^\circ(\text{NH}_4\text{Cl})$

C) $\Lambda_{\text{m}}^\circ(\text{NaOH}) + \Lambda_{\text{m}}^\circ(\text{NH}_4\text{Cl}) - \Lambda_{\text{m}}^\circ(\text{HCl})$

D) $\Lambda_{\text{m}}^\circ(\text{NH}_4\text{Cl}) + \Lambda_{\text{m}}^\circ(\text{NaOH}) - \Lambda_{\text{m}}^\circ(\text{NaCl})$

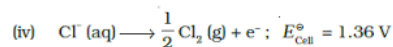
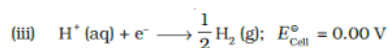
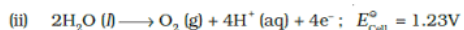
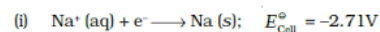
Q28) Using given below find strongest reduction agent.

$$E^\circ_{\text{Cr}_2\text{O}_7^{2-}/\text{Cr}^{3+}} = 1.33 \text{ V}, E^\circ_{\text{Cl}_2/\text{Cl}^-} = 1.36 \text{ V}$$

$$E^\circ_{\text{MnO}_4^-/\text{Mn}^{2+}} = 1.51 \text{ V}, E^\circ_{\text{Cr}^{3+}/\text{Cr}} = -0.74 \text{ V}$$

- (a) Cl^- (b) Cr (c) Cr^{3+} (d) Mn^{2+}

Q29) In the electrolysis of aqueous sodium chloride solution, which of the half-cell reaction will occur at



anode?

Q30) SI unit for conductivity of a solution is:

- (A) S m^{-1} (B) $\text{S m}^2 \text{ mol}^{-1}$
(C) mol cm^{-3} (D) $\text{S cm}^2 \text{ mol}^{-1}$

Q31) Equilibrium constant K is related to E°_{cell} and not E_{cell} because

- (a) E°_{cell} is easier to measure than E_{cell}
(b) E_{cell} becomes zero at equilibrium point but E°_{cell} remains constant under all conditions
(c) at a given temperature, E_{cell} changes hence value of K can't be measured
(d) any of the terms E_{cell} or E°_{cell} can be used

ASSERTION REASON TYPE QUESTIONS

Q32) Assertion (A): Mercury cell does not give steady potential.

Reason (R): In the cell reaction, ions are not involved in solution.

Q33) Assertion (A): For a Daniell cell, $\text{Zn}/\text{Zn}^{2+} (1\text{M}) \parallel \text{Cu}^{2+} (1\text{M})/\text{Cu}$ with $E^\circ_{\text{cell}} = 1.1 \text{ V}$, if the external opposing potential is more than 1.1 V, the electrons flow from Cu to Zn.

Reason (R): Cell acts like a galvanic cell.

Q34) Assertion (A): Conductivity decreases with decrease in concentration of electrolyte.

Reason (R): Number of ions per unit volume that carry the current in a solution decreases on dilution.

Q35) Assertion (A): Electrolytic conduction increases with increase in temperature.

Reason (R): Increase in temperature cause the electronic movement more rapid.

Q36) Assertion (A): E_{cell} should have a positive value for the cell to function.

Reason (R): $E_{\text{cathode}} < E_{\text{anode}}$.

Q37) Assertion (A): Cu is less reactive than hydrogen.

Reason (R): $E^{\circ}\text{Cu}/\text{Cu}^{+2}$ is negative.

Q38) Assertion (A): Copper sulphate can be stored in zinc vessel.

Reason (R): Zinc is more reactive than copper.

Q39) Assertion (A): $E_{\text{Ag}^+/\text{Ag}}$ increases with increase in concentration of Ag^+ ions.

Reason (R): $E_{\text{Ag}^+/\text{Ag}}$ has a positive value.

Q40) Assertion (A): Electrolysis of NaCl solution gives chlorine at anode instead of O_2 . **Reason (R):** Formation of oxygen at anode requires over voltage.

Q41) Assertion (A): Electrolytic cells require an external source of electric energy to drive the reaction.

Reason (R): The redox reactions in electrolytic cells are spontaneous.

Q42) Assertion (A): For measuring resistance of an ionic solution an AC source is used.

Reason (R): Concentration of ionic solution will change if DC source is used.

Q43) Assertion (A): The mass of copper and silver, deposited on the cathode are same.

Reason (R): Copper and silver have different equivalent masses.

Q44) Assertion (A): Current stops flowing when $E_{\text{cell}} = 0$.

Reason (R): Equilibrium of the cell reaction is attained.

Q45) Assertion (A): The negative sign in the expression $E_{\text{Zn}^{2+}/\text{Zn}} = -0.76\text{V}$ means Zn^{2+} cannot be oxidised to Zn.

Reason (R): Zn is more reactive than hydrogen and Zn will be oxidised and H^+ will get reduced.

Q46) Assertion (A): In a galvanic cell, chemical energy is converted into electrical energy. **Reason (R):** Redox reactions provide the chemical energy to the cell.

Q47) Assertion (A): At equilibrium condition $E_{\text{cell}} = 0$ or $\Delta_r G = 0$.

Reason (R): E_{cell} is zero when both electrodes of the cell are of the same metal.

Q48) Assertion (A): \wedge_m for weak electrolytes shows a sharp increase when the electrolytic solution is diluted.

Reason (R): For weak electrolytes degree of dissociation increases with dilution of solution.

Q49) Assertion (A): Molar conductivity of an ionic solution depends on temperature.

Reason (R): Molar conductivity of an ionic solution depends on the concentration of electrolytes in the solution.

Q50) Assertion: Galvanised iron does not rust.

Reason: Zn has more negative electrode potential than Fe.

Q51) Assertion: Salts like KCl, KNO₃ i.e., inert electrolytes are used in salt bridge.

Reason: An inert electrolyte can easily be filled in the U-tube.

Q52) Assertion: Emf and potential difference are the same for cells.

Reason: Both give the difference in electrode potential under any condition.

VERY SHORT ANSWER TYPE QUESTIONS (2 MARKS)

Q53) Define conductivity and molar conductivity for the solution of an electrolyte.

Q54) Discuss the variations of conductivity and molar conductivity with concentration.

Q55) State Faraday laws of electrolysis.

Q56) Can absolute electrode potential of an electrode be measured?

Q57) Discuss the variation of molar conductivity of strong and weak electrolytes with increasing dilution.

Q58) Under what condition is $E_{\text{cell}} = 0$ or $\Delta G^\circ = 0$?

Q59) What does the negative sign in the expression $E^\circ_{\text{Zn}/\text{Zn}^{2+}} = -0.76\text{V}$ mean?

Q60) Aqueous copper sulphate solution and aqueous silver nitrate solution are electrolysed by 1 ampere current for 10 minutes in separate electrolytic cells. Will the mass of copper and silver deposited on the cathode be same or different? Explain your answer.

Q61) What is electrode potential and cell potential?

Q62) Why is alternating current used for measuring resistance of an electrolytic solution?

Q63) How will the pH of brine (aq NaCl solution) be affected when it is electrolysed?

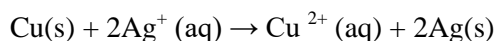
Q64) Unlike dry cell, the mercury cell has a constant cell potential throughout its useful life. Why?

Q65) Solutions of two electrolytes A and B are diluted. The Λ_m of 'B' increases 1.5 times while that of A increases 25 times. Which of the two is a strong electrolyte? Justify your answer.

Q66) When acidulated water (dil. H₂SO₄ solution) is electrolysed, how the pH of the solution is affected?

Q67) In an aqueous solution how does specific conductivity of electrolytes change with addition of water?

Q68) Depict the following cell-



Also write the individual electrode reaction.

Q69) What advantage do the fuel cells have over primary and secondary batteries?

Q70) Why on dilution the Λ_m of CH₃COOH increases drastically, while that of CH₃COONa increases gradually?

Q71) A galvanic cell has electrical potential of 1.1V. If an opposing potential of 1.1V is applied to this cell, what will happen to the cell reaction and current flowing through the cell ?

Q72) What is meant by 'limiting molar conductivity'?

Q73) State Kohlrausch law of independent migration of ions. Suggest a way to determine the λ° value of water.

Q74) The conductivity of 0.20 M solution of KCl at 298 K is 0.0248 S cm^{-1} . Calculate its molar conductivity.

Q75)i) Suggest a list of metals that are extracted electrolytically.

ii) Suggest two materials other than hydrogen that can be used as fuels in fuel cells.

Q76) Consider the reaction: $\text{Cr}_2\text{O}_7^{2-} + 14\text{H}^+ + 6\text{e}^- \rightarrow 2\text{Cr}^{3+} + 7\text{H}_2\text{O}$ What is the quantity of electricity in coulombs needed to reduce 1 mol of $\text{Cr}_2\text{O}_7^{2-}$?

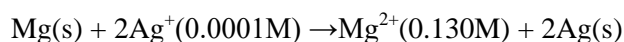
Q77) $\Lambda^\circ \text{m}$ for NaCl, HCl and NaAc are 126.4, 425.9 and $91.0 \text{ S cm}^2 \text{ mol}^{-1}$ respectively. Calculate for HAc.

Q78) Calculate the potential of hydrogen electrode in contact with a solution whose pH is 10.

Q79) The standard electrode potential for Daniell cell is 1.1V. Calculate the standard Gibbs energy for the reaction: $\text{Zn(s)} + \text{Cu}^{2+}(\text{aq}) \rightarrow \text{Zn}^{2+}(\text{aq}) + \text{Cu(s)}$

Q80) Calculate the equilibrium constant of the reaction: $\text{Cu(s)} + 2\text{Ag}^+(\text{aq}) \rightarrow \text{Cu}^{2+}(\text{aq}) + 2\text{Ag(s)}$ Given, $E^\circ_{\text{cell}} = 0.46 \text{ V}$

Q81) Represent the cell in which the following reaction takes place



Also calculate its $E(\text{cell})$ if $E^\circ_{\text{cell}} = 3.17 \text{ V}$

Q82) Calculate the emf of the cell in which the following reaction takes place:



Q83) How much electricity in terms of Faraday is required to produce

- (i) 20.0 g of Ca from molten CaCl_2 ?
- (ii) 40.0 g of Al from molten Al_2O_3 ?

Q84) How much electricity is required in coulomb for the oxidation of

- (i) 1 mol of H_2O to O_2 ?
- (ii) 1mol of FeO to Fe_2O_3 ?

Q85)What is the difference between primary battery and secondary battery? Give one example of each type.

Q86) Given that the standard electrode potentials (E°) of metals are :

$\text{K}^+/\text{K} = -2.93 \text{ V}$, $\text{Ag}^+/\text{Ag} = 0.80 \text{ V}$, $\text{Cu}^{2+}/\text{Cu} = 0.34 \text{ V}$,
 $\text{Mg}^{2+}/\text{Mg} = -2.37 \text{ V}$, $\text{Cr}^{3+}/\text{Cr} = -0.74 \text{ V}$, $\text{Fe}^{2+}/\text{Fe} = -0.44 \text{ V}$.

Arrange these metals in increasing order of their reducing power.

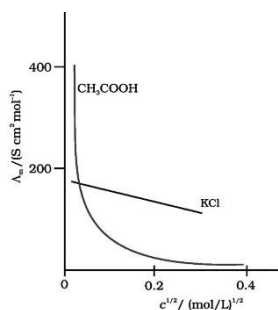
Q87) How standard hydrogen electrode is constructed?

Q88)Differentiate between an electrolytic and an electrochemical cell.

Q89) Copper does not dissolve in HCl but it readily dissolves in HNO₃. Why?

Q90) How would you determine the standard electrode potential of the system Mg²⁺|Mg?

Q91) Can you stir copper nitrate solution with a zinc spoon?



Q92)

(i) Predict the nature of electrolytes A and B.

(ii) What happens on extrapolation of Λ_m to concentration approaching zero for electrolytes A and B?

Q93) Define fuel cell. Write its advantages.

Q94) What type of battery is mercury cell? Why it is more advantageous than dry cell?

Q95) Why Direct current is not used in experimental determination of electrolytic conductance?

Q96) Give Debye Huckel Onsager equation for strong electrolyte. Compare the variation of conductivity and molar conductivity of NaCl solutions on dilution. Give reason.

Q97) What are the directions of current and electrons in Daniell cell when $E_{\text{ext}} < 1.1\text{V}$?

Q98) What happens when $E_{\text{cell}} = 1.1\text{V}$ in Daniell cell?

Q99) What are the directions of current and electrons in Daniell cell when $E_{\text{ext}} > 1.1\text{V}$?

Q100) Define overpotential. Justify your answer with an example.

Q101) Why does a galvanic cell become dead after some time?

Q102) Define electrochemical series.

SHORT ANSWER TYPE QUESTIONS (3 MARKS)

Q103) Out of the following pairs, predict with reason, which pair will allow greater conduction of electricity:

- a) Silver wire at 30°C or silver wire at 60°C
- b) 0.1M CH₃COOH solution or 1M CH₃COOH solution
- c) KCl solution at 20°C or KCl solution at 50 °C

Q104) For the given redox reaction , E°_{cell} is 2.71V

$\text{Mg(s)} + \text{Cu}^{2+}(0.01\text{M}) \rightarrow \text{Mg}^{2+}(0.001\text{M}) + \text{Cu(s)}$ Calculate E_{cell} for the reaction. Write the direction of flow of current when an external opposite potential applied is:

(i) less than 2.71V and (ii) greater than 2.71V

Q105) Resistance & conductivity of a conductivity cell filled with $0.1 \text{ mol L}^{-1} \text{KCl}$ solution is 100 ohm & 1.29 S/m respectively. If the resistance of the same cell when filled with $0.02 \text{ mol L}^{-1} \text{KCl}$ solution is 520 ohm, calculate the conductivity and molar conductivity of $0.02 \text{ mol L}^{-1} \text{KCl}$ solution.

Q106) The cell in which the following reaction occurs:

$2\text{Fe}^{3+}(\text{aq}) + 2\text{I}^{-}(\text{aq}) \rightarrow 2\text{Fe}^{2+}(\text{aq}) + \text{I}_2(\text{s})$ has $E^\circ_{\text{cell}} = 0.236 \text{ V}$ at 298 K. Calculate the standard Gibbs energy and the equilibrium constant of the cell reaction.

Q107) The conductivity of $0.001028 \text{ mol L}^{-1}$ acetic acid is $4.95 \times 10^{-5} \text{ S cm}^{-1}$. Calculate its dissociation constant if κ_m for acetic acid is $390.5 \text{ S cm}^2 \text{ mol}^{-1}$.

Q108) A solution of CuSO_4 is electrolysed for 10 minutes with a current of 1.5 amperes. What is the mass of copper deposited at the cathode?

Q109) If a current of 0.5 ampere flows through a metallic wire for 2 hours, then how many electrons would flow through the wire?

Q110) In the button cells widely used in watches and other devices the following reaction takes place: $\text{Zn(s)} + \text{Ag}_2\text{O(s)} + \text{H}_2\text{O(l)} \rightarrow \text{Zn}^{2+}(\text{aq}) + 2\text{Ag(s)} + 2\text{OH}^{-}(\text{aq})$ Determine ΔG° (**maximum work**) and E° for the reaction.

Q111) How much charge is required for the following reductions:

- (i) 1 mol of Al^{3+} to Al ?
- (ii) 1 mol of Cu^{2+} to Cu ?
- (iii) 1 mol of MnO_4^{-} to Mn^{2+} ?

Q112) Which electrolytes are used in the following cells?

- a) Dry cell/ Leclanche cell
- b) Mercury cell
- c) Lead storage battery

Q113) Which cell is used in hearing aids?

- (ii) Which cell was used in Apollo Space Programme?
- (iii) Which cell is used in automobiles and inverters?

Q114) a) Which cell does not have long life?

b) Which cell is used in clocks?

c) Which cell is used in watches?

Q115) What are the differences between ionic and electronic conductance?

Q116) Discuss the variation of electrolytic and metallic conductance with temperature.

Q117) Can we construct an electrochemical cell with two half cells composed of ZnSO_4 solution and zinc electrodes? Explain your answer.

Q118) The resistance of a conductivity cell containing 0.001M KCl solution at 298 K is 1500 . What is the cell constant if conductivity of 0.001M KCl solution at 298 K is $0.146 \times 10^{-3} \text{ S cm}^{-1}$?

Q119) Show the working of an electrolytic and electrochemical cell with labelled diagrams.

Q120)a) Why does the cell voltage of a mercury cell remain constant during its lifetime?

b) What are the applications of Kohlrausch law?

Q121) What are the functions of a salt bridge in an electrochemical cell? How a salt bridge is made?

Q122) The electrical resistance of a column of 0.05 mol L^{-1} NaOH solution of diameter 1 cm and length 50 cm is $5.55 \times 10^3 \text{ ohm}$. Calculate its resistivity ,conductivity and molar conductivity.

Q123) What is the relationship between Gibbs free energy of the cell reaction in a galvanic cell and the emf or E_{cell} ? When will the maximum work be obtained from a galvanic cell ?

CASE STUDY BASED QUESTIONS

Q124) A galvanic cell is an electrochemical cell that converts the chemical energy of a spontaneous redox reaction into electrical energy. In this device the Gibbs energy of the spontaneous redox reaction is converted into electrical work which may be used for running a motor or other electrical gadgets like heater, fan, geyser, etc. We can construct innumerable number of galvanic cells by taking combinations of different half-cells. Each half cell consists of a metallic electrode dipped into an electrolyte. The two half-cells are connected by a metallic wire through a voltmeter and a switch externally. The electrolytes of the two half-cells are connected internally through a salt bridge. Sometimes, both the electrodes dip in the same electrolyte solution and in such cases we do not require a salt bridge.

A) Represent a Daniell cell.

B) In a galvanic cell, i) Which of the electrode is negatively charged? (ii) What are the carriers of the current in the cell.

C) Write the individual reaction at each electrode. [1+1+2]

Q125) The resistivity for a substance is its resistance when it is one metre long and its area of cross section is one m^2 . Conductivity of a material in S m^{-1} is its conductance when it is 1 m long and its area of cross section is 1 m^2 . Magnitude of conductivity varies a great deal and depends on the nature of the material. It also depends on the temperature and pressure at which the measurements are made. Materials are classified into conductors, insulators and semiconductors depending on the magnitude of their conductivity. Molar conductivity of a solution at a given concentration is the conductance of the volume V of solution containing one mole of electrolyte kept between two electrodes with area of cross section A and distance of unit length.

A) What are superconductors ?

B) Give 2 examples of semiconductors.

C) Express the relation among the cell constant, the resistance of the solution in the cell and the conductivity of the solution. How is the conductivity of a solution related to its molar conductivity? [1+1+2]

LONG ANSWER TYPE QUESTIONS (5 MARKS)

Q126) Using the standard electrode potentials table, predict if the reaction between the following is feasible/spontaneous :

- (i) $\text{Fe}^{3+}(\text{aq})$ and $\text{I}^{-}(\text{aq})$ (ii) $\text{Ag}^{+}(\text{aq})$ and $\text{Cu}(\text{s})$
(iii) $\text{Fe}^{3+}(\text{aq})$ and $\text{Br}^{-}(\text{aq})$ (iv) $\text{Ag}(\text{s})$ and $\text{Fe}^{3+}(\text{aq})$
(v) $\text{Br}_2(\text{aq})$ and $\text{Fe}^{2+}(\text{aq})$.

Q127)a) Define electrolysis.

b) Using E°_{cell} values, predict the products of electrolysis in each of the following:

- (i) An aqueous solution of AgNO_3 with silver electrodes.
(ii) An aqueous solution of AgNO_3 with platinum electrodes.
(iii) A dilute solution of H_2SO_4 with platinum electrodes.
(iv) An aqueous solution of CuCl_2 with platinum electrodes.

Q128) a) Why electrolysis products of aqueous NaCl and molten NaCl using platinum electrodes are different ?

b) Calculate emf of the following cell at 25°C :



Given: $E^{\circ}_{\text{Cd}^{2+}/\text{Cd}} = -0.40\text{ V}$ and $E^{\circ}_{\text{Zn}^{2+}/\text{Zn}} = -0.76\text{ V}$

Q129) a) What is the effect of increasing concentration of reactants and products on emf?

b) Write the Nernst equation and emf of the following cells at 298 K :

- (i) $\text{Mg}(\text{s}) \mid \text{Mg}^{2+}(0.001\text{M}) \parallel \text{Cu}^{2+}(0.0001\text{ M}) \mid \text{Cu}(\text{s})$
(ii) $\text{Fe}(\text{s}) \mid \text{Fe}^{2+}(0.001\text{M}) \parallel \text{H}^{+}(1\text{M}) \mid \text{H}_2(\text{g})(1\text{bar}) \mid \text{Pt}(\text{s})$
(iii) $\text{Sn}(\text{s}) \mid \text{Sn}^{2+}(0.050\text{ M}) \parallel \text{H}^{+}(0.020\text{ M}) \mid \text{H}_2(\text{g})(1\text{ bar}) \mid \text{Pt}(\text{s})$
(iv) $\text{Pt}(\text{s}) \mid \text{Br}^{-}(0.010\text{ M}) \mid \text{Br}_2(\text{l}) \parallel \text{H}^{+}(0.030\text{ M}) \mid \text{H}_2(\text{g})(1\text{ bar}) \mid \text{Pt}(\text{s})$

Q130) Explain how rusting of iron is envisaged as setting up of an electrochemical cell. Write the reactions occurring during the corrosion of iron in the atmosphere. Give any 2 methods of prevention of iron from rusting.

Q131) Write the anode , cathode and overall reactions for the lead storage battery when current is drawn from it. What happens when this battery is recharged ?

Q132) Write the anode, cathode and overall cell reactions for Leclanche cell and mercury cell.

Q133) Three electrolytic cells A,B,C containing solutions of ZnSO_4 , AgNO_3 and CuSO_4 , respectively are connected in series. A steady current of 1.5 amperes was passed through them until 1.45 g of silver deposited at the cathode of cell B. How long did the current flow? What mass of copper and zinc were deposited?

Q134) The molar conductivity of KCl solutions at different concentrations at 298 K are given below:

$c/\text{mol L}^{-1}$	$\Lambda_m/\text{S cm}^2 \text{mol}^{-1}$
0.000198	148.61
0.000309	148.29
0.000521	147.81
0.000989	147.09

Show that a plot between Λ_m and $c^{1/2}$ is a straight line. Determine the values of Λ°_m and A for KCl.

Q135) a) Using E° values, predict which is better for coating the surface of iron to prevent corrosion and why?

$$E^\circ (\text{X}^{2+}/\text{X}) = -2.36\text{V} , E^\circ (\text{Y}^{2+}/\text{Y}) = -0.14\text{V} , E^\circ (\text{Fe}^{2+}/\text{Fe}) = -0.44\text{V}$$

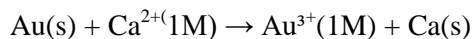
b) For strong electrolytes, $\Lambda_m = \Lambda^\circ_m - A c^{1/2}$

Which of the electrolytes have same value of A ?

MgSO_4 , K_2SO_4 , NaCl , CaCl_2 and KBr

c) How Λ_m varies with dilution for strong and weak electrolytes?

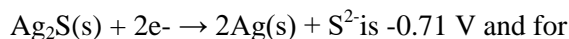
Q136)a) Calculate the standard Gibbs energy ($\Delta^\circ G$) of the following reaction at 25 °C:



$$E^\circ \text{Au}^{3+}/\text{Au} = +1.5 \text{ V}, E^\circ \text{Ca}^{2+}/\text{Ca} = -2.87 \text{ V}$$

Predict whether the reaction will be spontaneous or not at 25 °C. [1 F=96500 C mol⁻¹]

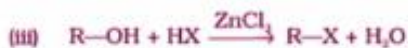
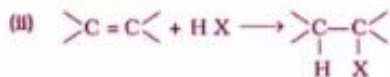
b) Tarnished silver contains Ag_2S . Can this tarnish be removed by placing tarnished silverware in an aluminium pan containing an inert electrolytic solution such as NaCl ? The standard electrode potential for half reaction:



HALOALKANES AND HALOARENES

MCQs

1. Which of the following is a halogen exchange reaction?



2. Arrange the following compounds in increasing order of their boiling points.



- (i) (b) < (a) < (c)
(ii) (a) < (b) < (c)
(iii) (c) < (a) < (b)
(iv) (c) < (b) < (a)

3. Which of the following is most reactive towards $\text{S}_\text{N}1$ reaction?

- a) 1-Chloropropane b) 2-Chloropropane
c) 2-Chloro-2-methylpropane d) Chlorobenzene

4. The major product of the reaction of 2-bromopentane with alcoholic KOH is:

- a) Pentanol b) Pent-1-ene
c) Pent-2-ene d) Pentanoic acid

5. Which of the following is an example of a primary alkyl halide?

- a) $\text{CH}_3\text{CHBrCH}_3$ b) $\text{CH}_3\text{CH}_2\text{Cl}$
c) $(\text{CH}_3)_3\text{CCl}$ d) $\text{C}_6\text{H}_5\text{CH}_2\text{Cl}$

6. Which of the following undergoes nucleophilic substitution most easily?

- a) Chlorobenzene b) Benzyl chloride
c) Vinyl chloride d) Chloroethene

7. A compound $\text{C}_3\text{H}_7\text{Cl}$ on hydrolysis gives $\text{C}_3\text{H}_7\text{OH}$. The compound is:

- a) Isopropyl chloride b) Allyl chloride
c) n-Propyl chloride d) Propylene

8. Which of the following does not show optical isomerism?

- a) 2-Chlorobutane b) 1-Chlorobutane
c) 3-Chloropentane d) 2-Bromobutane

9. Which of the following halides is least reactive towards $\text{S}_\text{N}2$ reaction?

- a) CH_3Cl b) $(\text{CH}_3)_3\text{CCl}$
c) $\text{CH}_3\text{CH}_2\text{Cl}$ d) $\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}$

10. What is the IUPAC name of $\text{CH}_3\text{CHClCH}_3$?

- a) 2-Chloropropane b) 1-Chloropropane
c) 3-Chloropropane d) Isopropyl chloride

11. Which of the following reagents can be used to convert an alcohol into an alkyl chloride?

- a) $\text{HCl} + \text{ZnCl}_2$ b) HNO_3

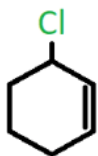
c) H_2SO_4

d) NaOH

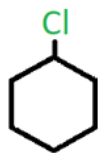
12. Chlorobenzene is less reactive towards nucleophilic substitution because:

- a) Benzene ring is electron-deficient
- b) Halogen is electronegative
- c) Resonance and partial double bond character
- d) Steric hindrance

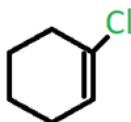
13. Which of the following compounds contains an allylic carbon?



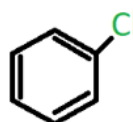
A
(a) A



B
(b) B



C
(c) C



D
(d) D

14. The order of reactivity of halides in $\text{S}_\text{N}2$ reactions is:

- a) $\text{RI} > \text{RBr} > \text{RCl} > \text{RF}$
- b) $\text{RF} > \text{RCl} > \text{RBr} > \text{RI}$
- c) $\text{RCl} > \text{RBr} > \text{RI} > \text{RF}$
- d) $\text{RI} > \text{RCl} > \text{RBr} > \text{RF}$

15. Which of the following is an aryl halide?

- a) $\text{CH}_3\text{CH}_2\text{Cl}$
- b) $\text{C}_6\text{H}_5\text{Cl}$
- c) $\text{C}_2\text{H}_5\text{Br}$
- d) $\text{CH}_3\text{CH}_2\text{I}$

16. Reaction of $\text{C}_2\text{H}_5\text{Cl}$ with aqueous KOH is an example of:

- a) Elimination reaction
- b) Nucleophilic substitution
- c) Addition reaction
- d) Free radical reaction

17. The product formed when chlorobenzene is treated with NaOH at 623K and 300 atm is:

- a) Benzyl alcohol
- b) Phenol
- c) Benzene
- d) Benzoic acid

18. Fittig reaction can be used to prepare

- (a) Toluene
- (b) Acetophenone
- (c) Diphenyl
- (d) Chlorobenzene

19. What is the hybridization of carbon atom in vinyl chloride ($\text{CH}_2=\text{CHCl}$)?

- a) sp
- b) sp^2
- c) sp^3
- d) sp^3d

20. The reaction of $\text{C}_2\text{H}_5\text{Cl}$ with alcoholic KOH gives:

- a) C_2H_6
- b) $\text{C}_2\text{H}_5\text{OH}$
- c) C_2H_4
- d) $\text{C}_2\text{H}_5\text{OK}$

21. Which of the following statements about S_N^2 mechanisms is incorrect?

- a) The transition state is stable.
- b) The complete mechanism takes place in a single step.
- c) The rate of the reaction depends on the concentration of both reactants.
- d) There is an inversion of configuration.

22. Which of the following is the best method for preparation of alkyl halides from alcohols?

- a) Using HI
- b) Using PCl_3
- c) Using SOCl_2
- d) Using HCl only

23. p-dichlorobenzene has higher melting point than its o- and m- isomers because

- (a) p-dichlorobenzene is more polar than o- and m- isomer.
- (b) p-isomer has a symmetrical crystalline structure.
- (c) boiling point of p-isomer is more than o- and m-isomer.
- (d) All of these are correct reasons.

24. The correct increasing order of boiling points of haloalkanes is:

- a) $\text{RI} < \text{RBr} < \text{RCl} < \text{RF}$
- b) $\text{RF} < \text{RCl} < \text{RBr} < \text{RI}$
- c) $\text{RCl} < \text{RF} < \text{RBr} < \text{RI}$
- d) $\text{RF} < \text{RBr} < \text{RI} < \text{RCl}$

25. $\text{S}_\text{N}1$ reaction of alkyl halides lead to

- a) Retention of configuration
- b) Racemisation
- c) Inversion of configuration
- d) None of these

26. Which is the correct product when methyl chloride reacts with KCN ?

- a) Methyl isocyanide
- b) Methyl cyanide
- c) Acetophenone
- d) Ethyl cyanide

27. $\text{S}_\text{N}1$ reactions are favored by:

- a) Polar protic solvents
- b) Polar aprotic solvents

c) Non-polar solvents

d) All of these

28. Which of the following undergoes S_N2 reaction fastest?

a) $\text{CH}_3\text{CH}_2\text{Cl}$

b) $\text{CH}_3\text{CH}_2\text{Br}$

c) $\text{CH}_3\text{CH}_2\text{I}$

d) $\text{CH}_3\text{CH}_2\text{F}$

29. Which product is obtained when $\text{CH}_3\text{CH}_2\text{Br}$ reacts with NaI in acetone?

a) $\text{CH}_3\text{CH}_2\text{F}$

b) $\text{CH}_3\text{CH}_2\text{Cl}$

c) $\text{CH}_3\text{CH}_2\text{I}$

d) $\text{CH}_3\text{CH}_2\text{OH}$

30. In the reaction of methyl chloride with AgCN , the major product is:

a) CH_3NC

b) CH_3CN

c) CH_3NH_2

d) CH_3OH

ASSERTION REASON TYPE QUESTIONS

Each question has an assertion (A) and a reason (R). After reading both, choose the correct option:

Options:

a) Both A and R are true, and R is the correct explanation of A.

b) Both A and R are true, but R is not the correct explanation of A.

c) A is true, but R is false.

d) A is false, but R is true.

1. A: Tertiary alkyl halides undergo S_N1 reactions faster than primary alkyl halides.

R: Tertiary carbocations are more stable than primary carbocations.

2. A: Chlorobenzene does not undergo nucleophilic substitution easily.

R: The C–Cl bond in chlorobenzene has partial double bond character due to resonance.

3. A: Alkyl iodides are more reactive towards nucleophilic substitution than alkyl fluorides.

R: C–I bond is weaker than the C–F bond.

4. A: Vinyl chloride readily undergoes S_N1 reaction.

R: The carbocation formed during the reaction is stabilized by resonance.

5. A: Benzyl chloride is highly reactive in S_N1 reactions.

R: Benzyl carbocation is stabilized by resonance.

6. A: Reaction of ethyl chloride with aqueous KOH gives ethanol.

R: OH^- ion acts as a nucleophile and replaces Cl^- in a nucleophilic substitution reaction.

7. A: In aryl halides, the halogen is ortho-para directing.

R: Halogens show +R effect in aromatic rings.

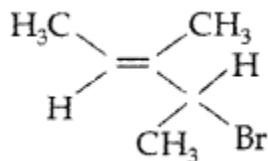
8. A: The reaction of haloalkanes with KCN gives alkyl cyanides.
R: CN^- ion is an ambident nucleophile, but it preferentially attacks through the carbon atom.
9. A: Chloroform undergoes oxidation in air to give phosgene.
R: Chloroform is stable in the presence of oxygen and sunlight.
10. A: Primary alkyl halides follow $\text{S}_\text{N}2$ mechanism.
R: In $\text{S}_\text{N}2$ reactions, steric hindrance should be minimal.
11. A: The boiling point of alkyl halides increases with increase in molecular mass.
R: Van der Waals forces increase with increase in surface area and molecular mass.
12. A: Chlorobenzene is resistant to hydrolysis by aqueous NaOH.
R: Resonance stabilizes the C–Cl bond, making it less reactive.
13. A: Refluxing 2-bromopentane with alcoholic KOH gives pent-2-ene.
R: Alcoholic KOH induces elimination reaction.
14. A: The C–Cl bond in chlorobenzene is shorter than in CH_3Cl .
R: In chlorobenzene, the lone pair on chlorine is in conjugation with the π -electrons of the benzene ring.
15. A: Aryl halides undergo $\text{S}_\text{N}2$ reactions easily.
R: Aryl halides have planar structure and the halogen is directly attached to sp^2 carbon.
16. A: Haloalkanes are more reactive than alkanes.
R: The carbon–halogen bond in haloalkanes is polar.
17. A: Vinyl chloride is less reactive in nucleophilic substitution reactions.
R: The carbon bearing the halogen is sp^2 hybridized and the C–Cl bond has partial double bond character.
18. A: Halogenation of benzene in presence of Lewis acid gives aryl halides.
R: Lewis acid activates the halogen molecule by forming an electrophile.
19. A: Chloroform must be stored in dark bottles filled to the brim.
R: In presence of air and light, chloroform forms poisonous phosgene gas.
20. A: The $\text{S}_\text{N}1$ mechanism involves inversion of configuration.
R: In $\text{S}_\text{N}1$, the nucleophile attacks from the side opposite to leaving group.

VERY SHORT ANSWER TYPE QUESTIONS (2 MARKS)

1. Define ambident nucleophile. Give one example.
2. (a) A hydrocarbon C_5H_{10} gives only one mono-chlorination product in presence of sunlight. Identify the

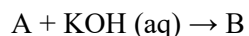
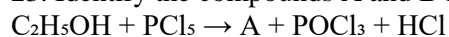
hydrocarbon.

(b) Give the IUPAC name of the following compound :



3. Write one method to convert ethyl alcohol into ethyl iodide.
4. Why is chlorobenzene less reactive than chloromethane towards nucleophilic substitution?
5. Explain why alkyl halides are more reactive towards nucleophilic substitution than aryl halides.
6. What happens when chlorobenzene is treated with NaOH at 623 K and 300 atm? Give the equation.
7. Give reasons: Alkyl halides are polar in nature but insoluble in water.
8. What are Grignard reagents? How are they prepared?
9. Explain with equations: SN1 mechanism of hydrolysis of tert-butyl bromide.
10. What is Wurtz reaction? Write a chemical equation to illustrate it.
11. Convert: (i) Propanol to 1-bromopropane, (ii) Aniline to iodobenzene.
12. Which is more reactive towards SN2 reaction: $\text{CH}_3\text{CH}_2\text{Br}$ or $(\text{CH}_3)_3\text{CBr}$? Give reasons.
13. Write the reaction of chloroform with (i) AgNO_3 , (ii) air and sunlight.
14. What are freons? Why are they banned in many countries?
15. How does the nature of the alkyl group affect the rate of SN1 reaction?
16. Write the structure and IUPAC name of the product formed when bromobenzene reacts with magnesium in dry ether.
17. Explain the following: Vinyl chloride is inert to nucleophilic substitution.
18. Differentiate between SN1 and SN2 mechanisms (any two differences).
19. What is optical activity? Which compound among 2-bromobutane and 1-bromobutane shows optical activity and why?
20. Write the mechanism for the reaction of $\text{CH}_3\text{CH}_2\text{Br}$ with aqueous KOH.
21. Write a chemical reaction to show the conversion of bromoethane to ethyl alcohol.
22. What is the effect of increasing chain length of haloalkanes on boiling point?

23. Identify the compounds A and B in the following:



24. What happens when benzyl chloride is treated with aqueous NaOH? Write the reaction.

25. Write the structure of the product formed when chlorobenzene reacts with methyl chloride in the presence of AlCl_3 .

26. Account for the following:

(i) The C – Cl bond length in chlorobenzene is shorter than that in $\text{CH}_3 - \text{Cl}$.

(ii) Chloroform is stored in closed dark brown bottles.

27. Name the products formed when 1-bromopropane reacts with alcoholic KOH.

28. Account for the following:

(i) The C – Cl bond length in chlorobenzene is shorter than that in $\text{CH}_3 - \text{Cl}$.

(ii) Chloroform is stored in closed dark brown bottles.

29. Why do tertiary haloalkanes undergo $\text{S}_\text{N}1$ reaction more readily than primary haloalkanes?

30. What is the hybridization of carbon in CCl_4 ? What is its shape?

31. Write equations to convert: (i) Ethyl alcohol to ethyl iodide, (ii) Ethyl iodide to ethyl alcohol.

32. What happens when chloroform is treated with silver powder?

33. Which has higher dipole moment – CH_3Cl or CH_3I ? Give reason.

34. Write a chemical reaction to show the preparation of iodoform.

35. Explain: Aryl halides do not undergo $\text{S}_\text{N}1$ or $\text{S}_\text{N}2$ reactions easily.

36. What is the difference between nucleophilic and electrophilic substitution?

37. Why is the bond length of C–Cl in chlorobenzene shorter than in CH_3Cl ?

38. How do alkyl halides react with KCN and AgCN? Give equations.

39. State two uses of DDT. Why is it banned in many countries?

40. How is benzene diazonium salt converted to iodobenzene? Give the reaction.

41. Predict the product: $\text{C}_2\text{H}_5\text{Cl} + \text{AgNO}_2 \rightarrow ?$

42. Explain with reason: Aryl halides are less reactive towards nucleophilic substitution.

43. What happens when chlorobenzene is treated with methyl chloride and anhydrous AlCl_3 ?

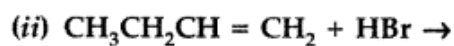
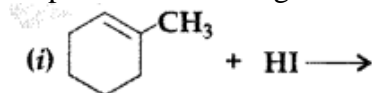
44. What are freons? Give their harmful effect.

45. Give one chemical test to distinguish between chlorobenzene and benzyl chloride.

46. How would you convert ethanol to ethyl fluoride?
47. What happens when phenol reacts with SOCl_2 ?
48. Write the steps involved in the mechanism of SN_2 reaction of bromoethane.
49. How is vinyl chloride different from chloroethane in reactivity? Explain with reasons.
50. What is the product formed when ethyl bromide is treated with zinc and hydrochloric acid?

SHORT ANSWER TYPE QUESTIONS (3 MARKS)

1. (a) Complete the following reaction equations :



- (b) Illustrate Swarts reaction with the help of a suitable example.

2. Write the structure of the major organic product formed in each of the following:

- (a) $\text{C}_2\text{H}_5\text{Br} + \text{KCN} \rightarrow$
- (b) $\text{C}_2\text{H}_5\text{Br} + \text{AgCN} \rightarrow$
- (c) $\text{C}_2\text{H}_5\text{Br} + \text{SOCl}_2 \rightarrow$

3. Account for the following:

- (i) Vinyl chloride does not undergo nucleophilic substitution reaction.
- (ii) Tertiary alkyl halides undergo SN_1 reaction readily.
- (iii) Aryl halides do not undergo nucleophilic substitution easily.

4. How will you bring about the following conversions?

- (i) Propene to 1-bromopropane
- (ii) Ethanol to ethyl fluoride
- (iii) Chlorobenzene to phenol

5. What happens when:

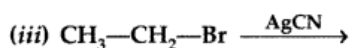
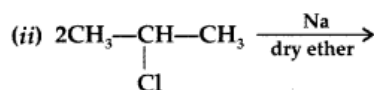
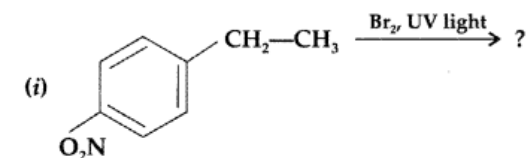
- (i) Methyl chloride is treated with KOH (alc.)
- (ii) Benzyl chloride is treated with aqueous KOH
- (iii) Chloroform is exposed to air and sunlight

6. Write the steps involved in the preparation of chlorobenzene from aniline.

7. Give reasons:

- (i) C-Cl bond in chlorobenzene is shorter than in CH_3Cl .
- (ii) Haloalkanes are more reactive than haloarenes towards nucleophilic substitution.
- (iii) $\text{S}_\text{N}2$ reactions are accompanied by inversion of configuration.

8 Write the major product(s) in the following:



9. Write equations for the following reactions:

- (i) Sandmeyer reaction
- (ii) Finkelstein reaction
- (iii) Wurtz reaction

10. What happens when

- (i) Bromoethane is treated with Zn/acid
- (ii) Chlorobenzene is heated with NaOH at 623 K and 300 atm
- (iii) Methyl chloride is treated with Na in dry ether

11. Describe the $\text{S}_\text{N}1$ mechanism with suitable example. Why does racemisation occur in $\text{S}_\text{N}1$?

12. Write the mechanism of the following reaction:

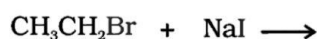
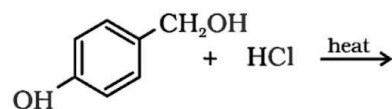
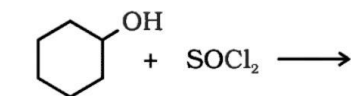


13. Explain the following with chemical reactions:

- (i) Aryl halides undergo electrophilic substitution.
- (ii) Alkyl halides undergo elimination in presence of alcoholic KOH .
- (iii) Chloroform gives phosgene on oxidation.

14. Complete the following reactions

15. Differentiate between:

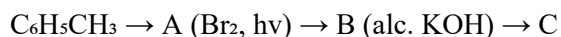


- (i) SN1 and SN2 (any two points)
- (ii) Alkyl halides and Aryl halides (based on reactivity)

16. What happens when chlorobenzene reacts with:

- (i) Chlorine in the presence of FeCl_3
- (ii) Methyl chloride and AlCl_3
- (iii) Concentrated HNO_3 and H_2SO_4

17. Write the structures of A, B, and C in the following reactions:



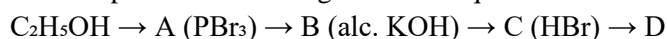
18. How will you prepare the following?

- (i) Methyl bromide from methane
- (ii) 2-bromopropane from propan-2-ol
- (iii) Iodobenzene from benzene

19. Give reasons:

- (i) Aryl halides are less reactive towards nucleophilic substitution.
- (ii) CH_3I is more reactive than CH_3Cl .
- (iii) Haloalkanes undergo elimination with alcoholic KOH.

20. Complete the following reaction sequence:



CASE BASED QUESTIONS

Case:1

Ravi was performing an experiment to study the nucleophilic substitution reactions of haloalkanes. He took three compounds: bromoethane, 2-bromopropane, and tert-butyl bromide, and reacted each with aqueous NaOH. He observed that tert-butyl bromide reacted fastest, followed by 2-bromopropane, while bromoethane was the slowest.

Based on the above case, answer the following:

- (i) Identify the type of nucleophilic substitution mechanism followed by each compound.
- (ii) Why does tert-butyl bromide react faster than bromoethane?
- (iii) Write the chemical reaction of bromoethane with aqueous NaOH.
- (iv) Explain why the rate of SN2 reactions decreases with increasing steric hindrance.
- (v) What is the major product formed when 2-bromopropane reacts with alcoholic KOH?

Case: 2

Priya was studying the reactivity of chlorobenzene in her school lab. She learned that chlorobenzene does not undergo nucleophilic substitution easily due to resonance and partial double bond character in the C–Cl bond. However, under drastic conditions (NaOH at 623 K and 300 atm), phenol is formed. She also explored the electrophilic substitution reactions of chlorobenzene, such as nitration and halogenation.

Based on the above case, answer the following:

- (i) Why is chlorobenzene less reactive towards nucleophilic substitution than alkyl halides?
- (ii) Write the reaction of chlorobenzene with NaOH under high temperature and pressure.
- (iii) Name the directing effect of the $-Cl$ group in electrophilic substitution reactions.
- (iv) What is the major product when chlorobenzene undergoes nitration?
- (v) Give one reason why the $C-Cl$ bond in chlorobenzene is shorter than in CH_3Cl .

LONG ANSWER TYPE QUESTIONS (5 MARKS)

1. (a) Describe the SN_1 and SN_2 mechanisms with suitable examples.
(b) Give two differences between the two mechanisms.

2. Complete the following reactions and identify the major products:

- (i) $CH_3CH_2Br + KCN \rightarrow$
- (ii) $C_6H_5N_2^+Cl^- + CuCl \rightarrow$
- (iii) $C_2H_5OH + PCl_5 \rightarrow$
- (iv) $C_6H_5CH_2Cl + aq. NaOH \rightarrow$
- (v) $CHCl_3 + Cl_2 \text{ (sunlight)} \rightarrow$

3. Write the chemical equations to carry out the following conversions:

- (i) Ethanol to bromoethane
- (ii) Chlorobenzene to phenol
- (iii) Aniline to iodobenzene
- (iv) Benzyl alcohol to benzyl chloride
- (v) 2-propanol to 2-bromopropane

4. Answer the following:

- (a) Explain why:
 - (i) Alkyl halides are more reactive than aryl halides.
 - (ii) CH_3-I is more reactive than CH_3-F .
- (b) Give two reasons why aryl halides do not undergo SN_1 or SN_2 reactions easily.
- (c) Give the hybridisation of carbon in $C-Cl$ bond in CH_3Cl and C_6H_5Cl .

5. (a) What is Wurtz reaction? Give an example.

- (b) How is Grignard reagent prepared? Write any two of its reactions.
- (c) Write a test to distinguish between chlorobenzene and benzyl chloride.

6. An organic compound (A) with molecular formula C_2H_5Br is treated with alcoholic KOH to give compound (B).

(B) is then treated with HBr to give compound (C), which is an isomer of (A).

- (a) Identify A, B, and C.
- (b) Give the chemical equations for each step.
- (c) Name the type of reaction involved in each step.

7. Give reasons for the following:

- (i) Vinyl chloride is less reactive towards nucleophilic substitution.
- (ii) Aryl halides are less reactive than alkyl halides.
- (iii) Chloroform is stored in dark bottles.
- (iv) S_N2 reactions show inversion of configuration.
- (v) Ethyl iodide undergoes substitution faster than ethyl chloride.

8. Write the chemical equations for the following reactions:

- (i) Sandmeyer reaction
- (ii) Reimer–Tiemann reaction
- (iii) Finkelstein reaction
- (iv) Conversion of ethyl alcohol to ethene
- (v) Preparation of iodoform from ethanol

9. How would you convert the following:

- (i) Propanol to 1-bromopropane
- (ii) Aniline to chlorobenzene
- (iii) Chlorobenzene to 2,4,6-trinitrochlorobenzene
- (iv) Ethanol to ethyl fluoride
- (v) Ethyl iodide to ethyl alcohol

10. (a) Explain why:

- (i) S_N1 reactions are accompanied by racemization.
- (ii) The C–Cl bond in chlorobenzene is shorter than in CH_3Cl .
- (b) Write the mechanism for S_N2 reaction of bromoethane with OH^- .
- (c) What is the effect of the nature of the halogen atom on the reactivity of haloalkanes?



CHAPTER-1

SEXUAL REPRODUCTION IN FLOWERING PLANTS

MULTIPLE CHOICE QUESTIONS (MCQS)

1. Spiny/sticky pollen grains and large attractive coloured flowers are associated with
 - a) Hydrophily
 - b) Entomophily
 - c) Ornithophily
 - d) Anemophily
2. Study the correct order of endosperm types



- a) Cellular, Helobial, Free nuclear
 - b) Helobial, Free nuclear, Cellular
 - c) Free nuclear, Cellular, Helobial
 - d) Cellular, Free nuclear, Helobial
3. Abundant occurrence of fossilized pollen grain is due to resistant:
 - a. Pectocellulose
 - b. Pectin Lignin
 - c. Sporopollenin
 - d. Lignocellulose
 4. This plant flowers occur in 12 years. During September 2006, its mass flowering transformed large tracts of hilly areas in Kerala ,Karnataka and Tamilnadu into blue stretches and attract a large number of tourists. This plant is
 - a) *Bambusatulda*
 - b) *Strobilantheskunthiana*
 - c) *Kigelia*
 - d) *Adansonia*
 5. Select the mismatched pair

a) Storage of pollen grains ----

- 196° C

b) Pollen allergy -----

Carrot grass

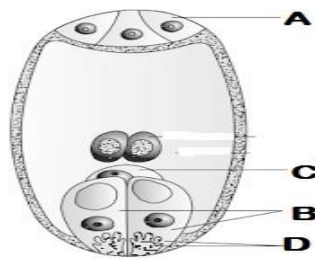
c) Chasmogamous flower ----

Exposed anthers and stigmas

d) Xenogamy -----

Self pollination

6. A bilobed dithecous anther had 50 microspore mother cells per microsporangium. How many male gametes this anther can produce?
- a) 400 b) 800 c) 100 d) 200
7. Flowering plants have developed certain outbreeding devices to discourage self-pollination and encourage cross-pollination. One of these is not an example of such a breeding device.
- a) Dicliny b) Dichogamy c) Herkogamy d) Cleistogamy
8. Which of the following statements about sporopollenin is incorrect?
- a) Exine is made up of sporopollenin.
- b) Sporopollenin is one of the resistant organic materials.
- c) Exine has apertures called germ pores where sporopollenin is present.
- d) Sporopollenin can withstand high temperatures and strong acids.
9. Persistent nucellus is called as and is found in
- a) Perisperm. Black pepper b) Perisperm. Ground nut
- c) Endosperm, Black pepper d) Endosperm, Ground nut
10. Identify the parts labelled in the given figure and select the correct match.



- | | | | |
|--------------|-----|-----------------|--------------------|
| A | B | C | D |
| a) Synergids | Egg | Antipodal cells | Filiform apparatus |

b) Antipodal cells	Synergids	Egg	Filiform apparatus
c) Egg	Synergids	Antipodal cells	Filiform apparatus
d) Egg	Antipodal cells	Synergids	Filiform apparatus

11. The scutellum observed in a grain of wheat or maize is comparable to which part of the seed of the monocotyledons?

- a) Cotyledon
- b) Endosperm
- c) Aleurone layer
- d) Plumule

12. What is the function of the filiform apparatus in an angiospermic embryo sac?

- a) Guides pollen tube from synergid to egg.
- b) Helps in entry of pollen tube into a synergid.
- c) Prevents entry of more than one pollen tube into a synergid.
- d) Brings about the opening of the pollen tube.

13. Both chasmogamous and cleistogamous flowers are present in

- a) Helianthus
- b) Commelina
- c) Rosa
- d) Gossypium

14. From among the sets of terms given below, identify those that are associated with the gynoecium

- (a) Stigma, ovule, embryo sac, placenta
- (b) Thalamus, pistil, style, ovule
- (c) Ovule, ovary, embryo sac, tapetum
- (d) Ovule, stamen, ovary, embryo sac

15. If an endosperm cell of an angiosperm contains 24 chromosomes, the number of chromosomes in each cell of the root will be

- a) 8
- b) 4
- c) 16
- d) 24

16. Which one of the following is not found in a female gametophyte of an angiosperm?

- (a) Germ Pore
- (b) Synergids
- (c) Filiform apparatus
- (d) Central cell

17..... is the transfer of pollen grains from anther of one flower to the stigma of another flower of the same plant.

- (a) Autogamy
- (b) Geitonogamy
- (c) Xenogamy
- (d) Monogamy

18. During microsporogenesis, meiosis occurs in-

- (a) Endothecium (b) Microspore mother cell (c) Microspore tetrads (d) Pollen grains

19. Embryo sac is to ovule as _____ is to an anther-

- (a) Stamen (b) filament (c) Pollen grain (d) Androecium

20. Double fertilization is characteristic of-

- (a) Bryophytes (b) Pteridophytes (c) Gymnosperms (d) Angiosperms

21. The fusion product of polar and male gamete is-

- (a) Secondary nucleus (b) triple fusion (c) Primary endosperm nucleus (d) Zygote

22. A leaf cell of flowering plant has 22 chromosomes then the number of chromosomes would be-

- (a) 11 in gametes (b) 22 in gametes (c) 44 in embryo (d) 44 in cell of stem

23. The best example of Polyembryony is-

- (a) Cocos (b) Citrus (c) Capsicum (d) Cycas

24. The embryo sac of a typical dicot at the time of fertilization is –

- (a) 8-celled (b) 7-celled (c) 6-celled (d) 5-celled

25. When the hilum, chalaza, and micropyle of the ovule lie in the same longitudinal axis, it is known as-

- (a) Anatropous ovule (b) Amphitropous ovule (c) Campylotropous ovule (d) Orthotropous ovule

26. The phenomenon where the ovary develops into a fruit without fertilization is called-

- (a) Parthenocarpy (b) Apomixis (c) Asexual reproduction (d) Sexual reproduction

27. Which of the following flowers only once in its lifetime?

- (a) Bamboo species (b) jackfruit (c) Mango (d) Papaya

28. Which among these are the layers of Microsporangium-

- (a) Endothecium (b) Epidermis (c) Tapetum (d) All of these

29. Banana is a

- (a) Fruit (b) True fruit (c) Parthenocarpic fruit (d) All of these

30. Perisperm is the remains of-

- (a) Archegonium (b) Integuments (c) endosperm (d) nucellus

31. Which of the following statements is correct about the majority of angiosperms?

- a) Egg has five antipodal cells
b) Reduction division occurs in the megaspore mother cells.
c) A small central cell is present in the embryo sac
d) Egg has filiform apparatus

32. Which of the following is not a method to prevent autogamy in plants?

- a) Pollen release and stigma receptivity are not synchronised
b) Anther and stigma are placed at different positions

- c) Self-incompatibility
 - d) Bisexual flowers
33. The type of tissue present in the fertilised ovules of an angiosperm plant to supply food and nourishment to the developing embryo is
- a) Tapetum
 - b) Sporogenous tissue
 - c) Endosperm
 - d) Synergids
34. The microspores are generally formed in a cluster of
- a) 4
 - b) 3
 - c) 2
 - d) 5
35. A bilobed ditheous anther has 500 microspore mother cells per microsporangium. How many male gametophytes can this anther produce?
- a) 10,000 b) 25,000 c) 20,000 d) 8,000
36. Choose the correct order of stages of development of a dicotyledonous embryo.
- a) Zygote → embryo → globular embryo → heart shaped embryo
 - b) Zygote → globular embryo → mature embryo
 - c) Embryo → proembryo → mature embryo → globular embryo
 - d) Zygote → proembryo → globular embryo → mature embryo
37. From the statements given below choose the option that are true for a typical female gametophyte of a flowering plant.
- (i) It is 8-nucleate and 7-celled at maturity
 - (ii) It is free-nuclear during the development
 - (iii) It is situated inside the integument but outside the nucellus.
 - (iv) It has an egg apparatus situated at the chalazal end
- (a) i and iv (b) ii and iii (c) i and ii (d) ii and iv
38. Which of the following is not generally a characteristic feature of wind pollinated flowers
- A. The Flowers do not produce nectar or scent,
 - B. The microsporangia hang out of the flower
 - C. The pollen produced are light weight
 - D. Flowers are brightly coloured
39. In one form of reproduction in flowering plants, the egg is formed with $2n$ chromosomes and develops without ever being fertilized. Or the cells of the ovule ($2n$) develop into an embryo. The phenomena described here is
- i) Polyembryony ii) Apomixis iii) Double fertilization iv)
- Parthenocarpy
- A. i) & ii) B i) & iii) C. ii) & iii) D i) & iv)
40. Which of the following strategy does not promote outbreeding in Plants?

- A. Flowers with long stamens & a short style
- B. Flowers with short stamens & a long style
- C. Self-incompatibility
- D. Bisexual flowers

41. The fruits that are not derived from the ovary, but from another part of the flower are known as

- A. Multiple fruits
- B. False fruits
- C. Parthenocarpic fruits
- D. Aggregate

Fruits

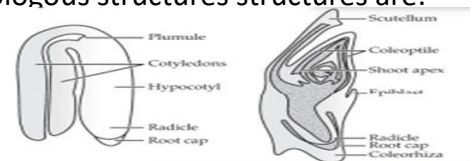
42. Which is the correct sequence of events after double fertilization in dicots

- i) The developing embryo has a heart shape
- ii) The terminal cell divides to form a globular shaped proembryo
- iii) The basal cell gives rise to the suspensor
- iv) iv) The zygote divides to form two cells
- v) As the embryo and cotyledons enlarge, they become crowded inside the developing seed and are forced to bend.

- A. i),ii)iii)iv) v)
- B. v) i) ii) iv) iii)
- C. iv) iii) ii) i) v)
- D. iii) ii) iv) i) v)

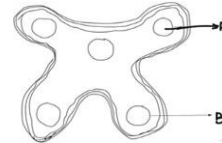
43. In the embryos of a typical dicot and a grass, true homologous structures are:

- (a) Coleorhiza and coleoptile
- (b) Coleoptile and scutellum
- (c) Cotyledons and scutellum
- (d) Hypocotyl and radicle



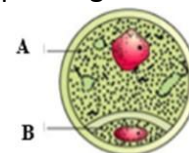
44. Identify 'A' and 'B' in the given diagram of a transverse section of a young anther.

- a) A- Tapetum, B-Sporogenous tissue
- b) A- Sporogenous tissue, B- Tapetum
- c) A-Connective, B- Epidermis
- d) A- Endothecium, B-Tapetum



45. Identify 'A' and 'B' in the following diagram of a mature pollen grain.

- a) A- Generative cell B- Vegetative cell
- b) A- Vegetative cell B- Generative cell
- c) A- Vacuole B- Nucellus
- d) A- Nucleus B- Vacuole



46. Select the odd one w.r.t the embryo sac

- (A) Six of eight nuclei are surrounded by cell walls.
- (B) The large central cell has two polar nuclei
- (C) Egg cells has filiform apparatus
- (D) 3 cells are at chalazal end

47. What is incorrect for generative cell

- (A) Having abundant food reserve

- (B) Spindle shaped
 - (C) Has dense cytoplasm and a nucleus
 - (D) Floats in cytoplasm of vegetative cell
48. Megasporangium is equivalent to
- (A) Ovule
 - (B) Fruit
 - (C) Embryo sac
 - (D) Nucellus
49. In Entomophily, flowers are
- (A) Dull coloured (B) Nectarless (C) With sticky pollen grains (D) Small sized solitary
50. Which of the following is helpful for wind pollination of flowers?
- (A) Sticky pollen
 - (B) Flowers with nectar
 - (C) Well exposed stamens
 - (D) Attractive coloured petals
51. Functional megaspore in an angiosperm develops into
- (A) Ovule
 - (B) Endosperm
 - (C) Embryo sac
 - (D) Embryo
52. Persistent nucellus present in some seeds is called
- (A) Perisperm
 - (B) Pericarp
 - (C) Periderm
 - (D) Phelloderm
53. Pollen banks
- (A) Stores pollen grain in liquid nitrogen
 - (B) Stores pollen of extinct plants only
 - (C) Are source of pollen grains for various artificial plant breeding programme
 - (D) Both (A) and (C)
54. The pollen tube usually enters the embryo sac
- (A) By penetrating into the persistent synergid
 - (B) Through the space between synergid and egg cell
 - (C) Through the degenerated synergid
 - (D) Directly into egg
55. Which one of the following statements is not correct ?
- (A) Offspring produced by the asexual reproduction are called clone
 - (B) Microscopic, motile asexual reproductive structures are called zoospores
 - (C) In potato, banana and ginger, the plantlets arise from the internodes present in modified stem
 - (D) Water hyacinth, growing in the standing water, drains oxygen from water that leads to the death of fishes.

56. Unisexuality of flowers prevents
- (A) Autogamy and geitonogamy
 - (B) Autogamy, but not geitonogamy
 - (C) Both geitonogamy and xenogamy
 - (D) Geitonogamy, but not xenogamy
57. Which one of the following is resistant to enzyme action ?
- (A) Leaf cuticle
 - (B) Cork
 - (C) Wood fibre
 - (D) Pollen exine
58. The scutellum observed in a grain of wheat or maize is comparable to which part of the seed in other dicotyledonous?
- (A) Aleurone layer
 - (B) Plumule
 - (C) Cotyledon
 - (D) Endosperm
59. Apomictic embryos in citrus arise from
- (A) Antipodal cells
 - (B) Diploid egg
 - (C) Synergids
 - (D) Maternal sporophytic tissue
60. Advantage of cleistogamy is
- (A) Vivipary
 - (B) Higher genetic variability
 - (C) More vigorous offspring
 - (D) No dependence on pollinators

1 Mark Questions

1. In a young anther, a group of compactly arranged homogenous cells were observed in the center of each microsporangium. What is the name given to these cells?
2. Give the scientific name of a plant which came to India as a contaminant with imported wheat and causes pollen allergy.
3. Pollen grains of water pollinated species have a special characteristics for protection from water. What is that?
4. Why are pollen grains produced in enormous quantity in Maize?
5. In some species of Asteraceae and grasses, seed are formed without fusion of gametes. Mention the scientific term for such form of reproduction.
6. Arrange the following in correct developmental sequence : Male gamete, Potential pollen mother cell, sporogenous tissue, Pollen grains, Microspore tetrad.
7. If the diploid number of chromosomes in an angiospermic plant is 16. Mention number of chromosomes in the endosperm and antipodal cell.
8. What kind of structures is formed at the end of microsporogenesis and megasporogenesis?
9. What is funiculus?

10. Define parthenocarpy.
11. What is microsporogenesis?
12. Why is emasculation done in the process of hybridization?
13. What do you understand by double fertilization?
14. What is sporopollenin?
15. Name one plant each where pollination occurs with the help of
a)Water b)Bats
16. Why do most zygotes develop after certain amount of embryo is formed?
17. What is polyembryony?
18. Name the type of cross pollination in Vallisneria & Bougainvillea.
19. How many haploid nuclei and haploid cells are present in female gametophyte of angiosperm?
20. Mention the scientific term for the type of pollination which ensures Genetic recombination.
- 21 Which are the nuclei that fuse to form endosperm?
22. Give an example of Bat – Pollinated flower.
23. Why are pollen grains produced in enormous quantity in maize?
24. Name the part of an angiosperm flower in which development of male & female gametophyte takes place.
25. Why apple is called a false fruit. Which part of plant forms the fruit?
26. Name the part of plant producing seed & fruit after fertilization.

2 Marks Questions

1. In angiospermic plant before formation of microspore sporogenous tissue undergo cell division
(a) Name the type of cell division.
(b) What would be the ploidy of the cells of tetrad?
2. Outer envelop of pollen grain made of a highly resistant substance. What is that substance? At which particular point the substance is not present?
3. Fruits generally develops from ovary, but in few species thalamus contributes to fruit formation.
(a)Name the two categories of fruits.
(b)Give one example of each.
4. List any four characteristic features of the insect pollinated flower.
- 5.Differentiate between geitonogamy and xenogamy.

6. In the given figure of a dicot embryo, label the parts (A) and (B) and give their function.

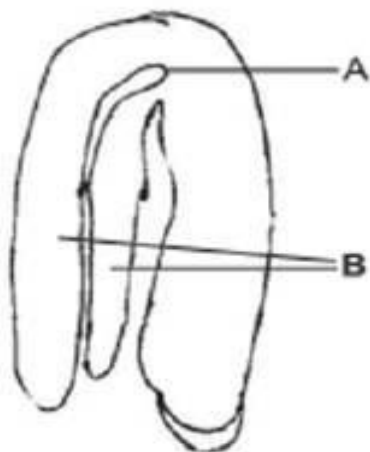


Figure 1

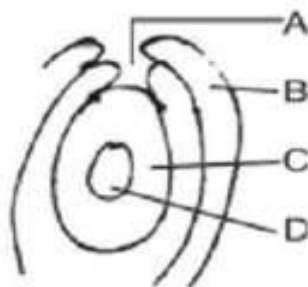
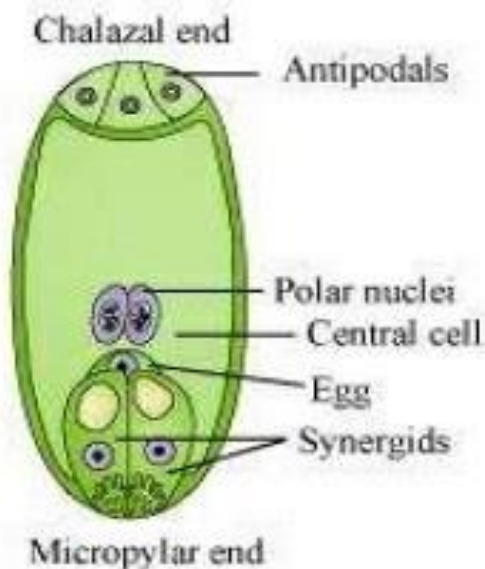


Figure 2

7. Name the parts A, B, C and D of the anatropous ovule (Figure 2) given above.

8. Given below is an incomplete flow chart showing formation of gamete in angiospermic plant. Observe the flow chart carefully and fill in the blank A, B, C and D.



9. Even though each pollen grain has two male gametes. Why are at least 10 pollen grains and not 5 pollen grains required to fertilise 10 ovules present in a particular carpel?

10. Describe the structure of a microsporangium with a neatly labeled diagram.

11. Why pollen grains can remain well preserved as fossils?
12. How are the cells arranged in an embryo sac?
13. Why are cleistogamous flowers invariably autogamous?
14. State any one advantage and disadvantage of pollen grains to humans.
15. State the characteristics of insect pollinated flowers.
16. Differentiate between chasmogamous and cleistogamous flowers
17. Which type of pollination ensures the arrival of genetically different pollen grain.
18. What relationship exists between a species of moth and Yucca plant?
19. Differentiate between Geitonogamy & Allogamy.
20. Draw a diagram of L.S. of an anatropous ovule of an Angiosperm & label the following parts :-
(i) Nucellus (ii) Integument (iii) Antipodal cells (iv) Secondary Nucleus.
21. Why is process of fertilization in flowering plants referred to as double fertilization?
22. What are cleistogamous flowers? Can cross – pollination occurs in cleistogamous flowers. Give reason?
23. Draw a labeled diagram of mature embryo sac & label the following
i) Egg cell ii) Antipodal cells iii) Synergids iv) Polar nuclei
24. Mention two strategies evolved lay flowers to prevent self-pollination
25. What is apomixis? What is its importance?
26. Draw a well labeled diagram of longitudinal section of pistil showing pollen germination?
27. List the advantages of pollination to angiospermic plants?

3 Marks Questions

1. Continued self pollination lead to inbreeding depression. List three devices, which flowering plant have developed to discourage self pollination?
2. What will be the fate of following structures in the angiospermic plant? Ovary wall, Ovule, zygote, outer integument Inner integument and primary endosperm nucleus.
3. Differentiate between microsporogenesis and megasporogenesis. What type of cell division occurs during these events. Name the structure formed at the end of these two events.
4. Differentiate between microsporogenesis and megasporogenesis.
5. Explain the stages involved in the maturation of a microspore into a pollen grain.
6. What is triple fusion? Where does it occur?
7. Explain the structure of an anatropous ovule with a neat labeled diagram?
8. Describe the structure of a pollen grain.
9. Enlist the advantages offered by seeds to angiosperms.
10. Give any three advantages of sexual incompatibility.
11. List any three differences between wind pollinated flower & insect – pollinated flower.
12. Trace the development of microsporocyte into mature pollen grains.
13. i) Explain the structure of a maize grain with the help of a diagram

- ii) Why cannot we use the term maize seeds for maize grains?
14. Trace the development of megasporocyte into mature ovule.
15. "Incompatibility is the natural barrier in fusion of gamete". Justify this statement.
16. How does pollination take place in saliva. List any four adaptations required for such type of pollination.

5 Marks Questions

- Draw the embryo sac of a flowering plant and label :
(i) Central Cell (ii) Chalazal end (iii) Synergids
(a) Name the cell that develops into embryo sac and explain how this cell leads to formation of embryo sac.
(b) Mention the role played by various cells of embryo sac.
(c) Give the role of filiform apparatus.
- Explain the formation of an embryo sac with diagrams.
- Explain the development of embryo in a dicotyledonous plant with neatly labeled diagrams.
- Describe the post-fertilization changes taking place in a flowering plant?
- Trace the events that would take place in flower from the time of Pollen grain of species fall on stigma up to completion of fertilization.
- i) Why is zygote dominant for sometime in fertilized ovule.
ii) What is polyembryony? Give an example.
iii) In fruits, what is formed from following parts :-
a) Ovary wall
b) Outer integument
c) Inner integument
d) Zygote

CHAPTER-2

Human Reproduction

MULTIPLE CHOICE QUESTIONS:

- Identify the wrong statement from the following:
a. High levels of estrogen triggers the ovulatory surge.
b. Oogonial cells start to proliferate and give rise to primary oocytes by mitotic division.
c. Sperms released from seminiferous tubules are poorly motile / non-motile.
d. The female gamete is produced every month by the process of gametogenesis.
- The vas deferens receives duct from the post ovulatory phase of menstrual cycle.
a. Epididymis b. Ejaculatory duct c. Efferent ductile d. Ureter
- Urethral meatus refers to the:
a. Urogenital duct b. Opening of vas deferens into urethra
c. External opening of the urogenital duct d. Muscles surrounding the urogenital duct
- The membranous cover of the ovum at ovulation is:
a. Corona radiata b. Zona radiata c. Zona pellucida d. Chorion
- The correct sequence of spermatogenetic stages leading to the formation of sperms in a mature human testis is:

- a. Spermatogonia → spermatid → spermatocyte → sperms
- b. Spermatocyte → spermatogonia → spermatid → sperms
- c. Spermatogonia → spermatocyte → spermatid → sperms
- d. Spermatid → spermatocyte → spermatogonia → sperms

6. The hemoglobin of a human foetus:

- A. Has a higher affinity for oxygen than that of an adult
- B. Has a lower affinity for oxygen than that of the adult
- C. Its affinity for oxygen is the same as that of an adult
- D. Has only two protein subunits instead of four

7. Column I contains terms and Column II contains definitions. Match them correctly and choose the right:

Column I	Column II
A. Parturition	p. Attachment of zygote to endometrium
B. Gestation	q. Release of egg from Graafian follicle
C. Ovulation	r. Delivery of baby from uterus
D. Implantation	s. Duration between pregnancy and birth
E. Conception	t. Formation of zygote by fusion of the egg and sperm
	u. Stoppage of ovulation and menstruation

Options:

- a) A = q, B = s, C = p, D = t, E = r
- b) A = s, B = r, C = p, D = t, E = q
- c) A = t, B = p, C = q, D = r, E = s
- d) A = r, B = s, C = q, D = p, E = t

8. Match the following parts of sperm and their descriptions:

Parts:	Column II:
• (a) Acrosome	i) Contains mitochondria producing energy for the sperm
• (b) Head	ii) Whip-like movements to propel the sperm
• (c) Midpiece	iii) Contains the chromosomes
• (d) Tail	iv) Contains the enzymes for assisting fertilization

Options:

- A. (a) - (i), (b) - (ii), (c) - (iv), (d) - (iii)
- B. (a) - (iv), (b) - (iii), (c) - (i), (d) - (ii)
- C. (a) - (iii), (b) - (iv), (c) - (ii), (d) - (i)
- D. (a) - (iv), (b) - (iii), (c) - (i), (d) - (ii)

11. Ovulation in the human female normally takes place during the menstrual cycle:

- A. At the end of the proliferative phase
- B. At the beginning of the proliferative phase
- C. Just before the end of the secretory cycle
- D. At the mid-secretory phase

12. The chemical substance released by activated spermatozoa that acts on the ground substances of the follicle cells is known as:

- A. Progesterone
- B. Hyaluronidase
- C. Relaxin
- D. Gonadotropin

13. Which of the following groups of cells in the male gonad represent haploid cells?

- A. Primary spermatocytes
- B. Spermatogonial cells
- C. Germinal epithelial cells
- D. Secondary spermatocytes

14. In the human female, menstruation can be deferred by the administration of:

- A. Combination of estrogen and progesterone
- B. Combination of FSH and LH
- C. LH only
- D. FSH only

16. How many autosomes does a human primary spermatocyte have?

- a. 34 b. 44 c. 54 d. 33

17. Acrosome is filled with _____

- a. Lipids b. Hormones c. Digestive enzymes d. None of the above

18. After ovulation Graafian follicle regresses into:

- a. Corpus atresia b. Corpus callosum c. Corpus luteum d. Corpus albicans

19. Which one of the following events is correctly matched with the time period in a normal menstrual cycle?

- a. Release of egg: 5th day
b. Endometrium regenerates: 5 – 10 days
c. Endometrium secretes nutrients for implantation: 11 – 18 days
d. Rise in progesterone level: 1 – 15 days

20. In oocyte secondary maturation occurs in:

- a. Ovary b. Abdominal cavity c. Fallopian tube d. Uterus

21. Write the missing step in proper sequence—

- a. Signals originate from fully developed fetus and placentas.
b. -----
c. -----
d. Oxytocin causes strong uterine contractions.
e. -----

22. Which membrane delivers the strong uterine contraction during parturition?

- a. Myometrium b. Endometrium c. Perimetrium d. Amnion

23. Given below is a diagrammatic sketch of a portion of human male reproductive system.

Select the correct set of the names of the parts labelled A, B, C, D.

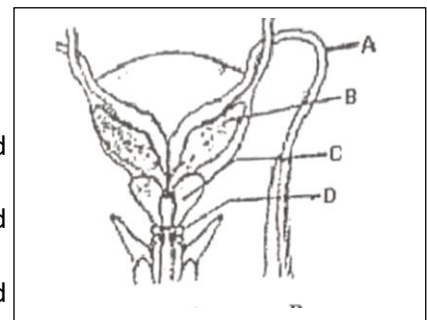
Option A

B

C

D

- | | | | | |
|----|--------------|-----------------|---------------------|---------------------|
| a. | Ureter | Seminal vesicle | Prostate | Bulbourethral gland |
| b. | Ureter | Prostate | Seminal vesicle | Bulbourethral gland |
| c. | Vas deferens | Seminal vesicle | Prostate | Bulbourethral gland |
| d. | Vas deferens | Seminal vesicle | Bulbourethral gland | Prostate |



24. The endocrine structure and the corresponding hormones are listed in the table below.

Match the columns and select the correct option:

Column I:

Column II:

- (a) Hypothalamus
- (b) Anterior Pituitary
- (c) Testis
- (d) Ovary
- (p) Relaxin
- (q) Estrogen
- (r) FSH and LH
- (s) Androgens
- (t) Gonadotropin releasing hormone

Options:

- A. (a) - (t), (b) - (r), (c) - (s), (d) - (q)
- B. (a) - (t), (b) - (q), (c) - (d), (d) - (s)
- C. (a) - (p), (b) - (q), (c) - (s), (d) - (r)
- D. (a) - (r), (b) - (t), (c) - (s), (d) - (q)

1 Mark Questions

1. Failure of testes to descend into scrotal sacs leads to sterility. Why?
2. Both vaccine and colostrum produce immunity. Name type of immunity produced by these.
3. How many sperms will be produced from 10 primary spermatocytes and how many eggs will be produced from 10 primary oocytes?
4. The spermatogonial cell has 46 chromosomes in human male. Give the number of chromosomes in
(a) Primary spermatocyte (b) Spermatid
5. In ovary which structure transforms as corpus luteum and name the hormone secreted by corpus luteum?
6. "Each and every coitus does not results in fertilization and pregnancy". Justify the statement.
7. Why are male testes located outside the abdominal cavity?
8. State the function of leydig cells.
9. Where do we find fimbriae?
10. What is semen?
11. Define parturition.
12. Where does fertilization normally takes place in a human female.
13. Name the substance present in the sperm acrosome & which help in sperms entry into egg.
14. Name the layer of cells that forms the outer wall of blastocyst.
15. At what stage is the mammalian embryo implanted in uterus?
16. Despite the presence of So many sperms in the vicinity of an egg cell, only one sperm enters the ovum. Why?
17. How many polar bodies are given out in production of one egg during cogenesis?

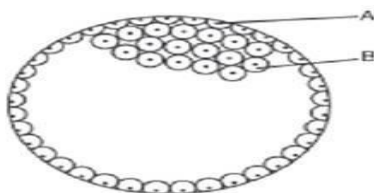
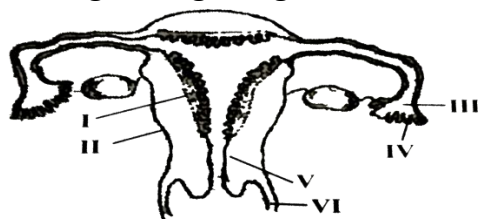
2 Marks Questions

1. Give the function of

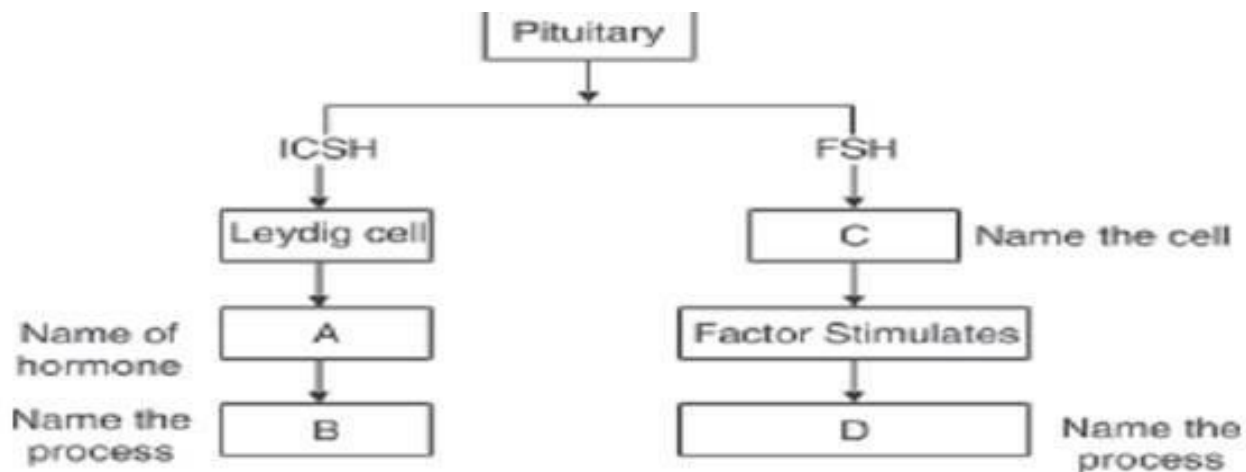
(a) Corpus luteum

(b) Endometrium

2. In the given figure, give the name and functions of parts labeled A and B.



3. Given below is an incomplete flow chart showing influence of hormone on gametogenesis in male, observe the flow chart carefully and fill in the blank A, B, C and D.



4. Give reason for the following :

(a) The first half of the menstrual cycle is called follicular phase as well as proliferative phase.

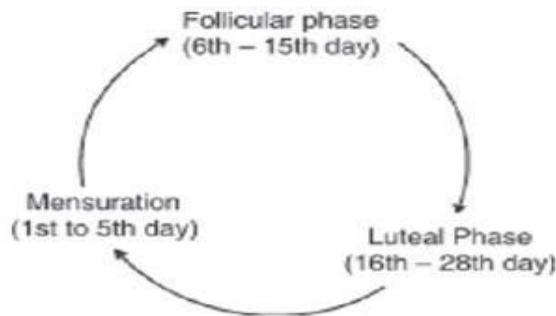
(b) The second half of the menstrual cycle is called luteal phase as well as secretory phase.

5. What is meant by L.H. Surge? Write the role of L.H.

6. Explain significance of the condition in which the testes remain suspended in scrotum outside the abdomen.

7. Describe the structure of a sperm with a diagram.

8. Enlist any two functions of a female placenta.



9. What is the number of chromosomes in the following cells? Primary oocyte, secondary oocyte, ootid and follicle.
10. What is corpus luteum. How does it function as an endocrine gland?
11. Where are Leydig cells located? What do they secrete?
12. Draw a well-labeled diagram of T.S. of ovary?
13. Why are testes of human males considered extra-abdominal? What is the significance of this condition?
14. Draw a diagram of the T.S. of seminiferous tubule of testis of an adult human male & label any four parts in it.
15. What is colostrum? What is its significance to a newborn baby?

3 Marks Questions

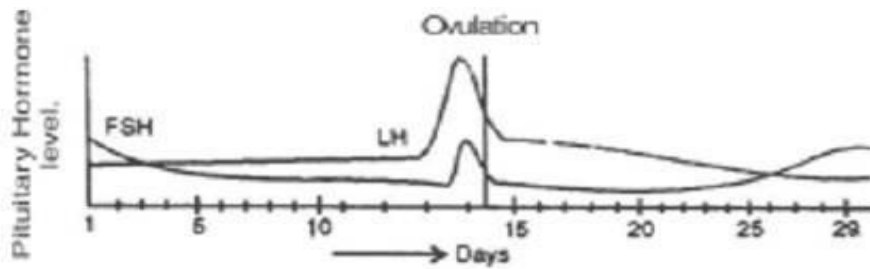
1. Mention the name and role of hormones which are involved in regulation of gamete formation in human male.
2. Three of the steps of neuro-endocrine mechanism in respect of parturition are mentioned below. Write the missing steps in proper sequence.
Signals originate from fully developed foetus and placenta.

- (a) _____.
- (b) _____.
- (c) Oxytocin causes strong uterine contraction.
- (d) Uterine contraction stimulates further secretion of oxytocin.
- (e) _____.

3. The events of the menstrual cycle are represented below. Answer the following questions.

- (i) State the levels of FSH, LH and Progesterone simply by mentioning high or low around 13th and 14th day and 21st to 23rd day.
- (ii) In which of the above mentioned phases does egg travel to fallopian tube?
- (iii) Why is there no menstruation after fertilisation?

4. (a) Read the graph given below. Correlate the ovarian events that take place in the human female according to the level of the pituitary hormone during the following day.



(i) 10th - 14th days (ii) 14th -15th days

(iii) 16th - 23th days (iv) 25th -
29th days (If the ovum is not fertilized)

(b) What are the uterine events that follow beyond 29th day if the ovum is not fertilized?

5. T.S. of mammalian testis revealing seminiferous tubules show different types of cell.

(i) Name the two types of cells of germinal epithelium.

(ii) Name of cells scattered in connective tissue and lying between seminiferous tubules. Differentiate between them on the basis of their functions.

6.What are the various male accessory glands? Give their function.

7.Explain the menstrual cycle with a diagram.

8.Differentiate between spermatogenesis and oogenesis.

9. 'A fertilized egg is the blue print of future development'. Explain

10.Briefly describe the stages of spermatogenesis in human?

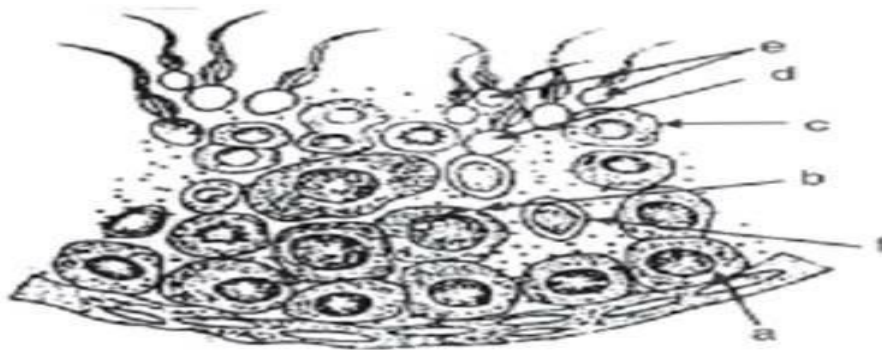
11.Describe the hormonal control of human male reproduction system with the help of a flow chart & highlight the inhibitory & stimulatory directions in it?

12.A sperm has just fertilized a human egg in the fallopian tube. Trace the events that the fertilized eggs will undergoes upto implantation of blastocyst in the uterus.

13.Where oogenesis does takes place. Describe the stages of this process?

5 Marks Questions

1. Identify the labeled parts and explain the process shown here



2.Explain the development of human embryo with diagrams.

3.What is menstruation? What are the specific actions of FSH, LH, estrogen & progesterone in menstrual cycle?

4. A woman has conceived & implantation has occurred within her uterus. Discuss the sequence of changes up to parturition which will take place within her body under the influence of various hormones.

CHAPTER-3

Reproductive Health

Multiple choice questions

1Which of the following cannot be detected in a developing foetus by amniocentesis?

- | | |
|------------------------------|---------------------|
| (a)Jaundice syndrome | (b)Downn's syndrome |
| (c)Cystic fibrosis blindness | (d)Colour blindness |

2Which of the following pairs contributes to an increase in population (a)Natality and immigration

- (b)Mortality and emigration
- (c)Natality and emigration
- (d)Mortality and immigration

3.The common means of transmission of AIDS is

- (a)Sexual intercourse (b)Blood transfusion
- (c)Placental transfer (d)All of these.

4.The test-tube baby programme employs which one of the following techniques ?

- (a)Zygote intra Fallopian transfer (ZIFT)
- (b)Intra uterine insemination (IUI)
- (c)Gamete intra Fallopian transfer
- (d)All of these

5.Multiload device contains

- (a)Manganese (b) Iron (c) Copper (d) Calcium

6.Progesterone pill helps in preventing pregnancy by not allowing

- (a)Ova formation. (b)Fertilisation.
- (c)Implantation. (d)None of these.

7.Which part of the figure is being cut and tied in the below showing in particular ?

- (a)Ovary. (b)Uterine. (c)Ovarian duct. (d)Vas deferens .

8.Which of the following is a full proof method contraception ?

- (a)Implantation (b)Lactational amenorrhea. (c)Condoms (d)Sterilisation

9.The most important component of oral contraceptive pills is

- (a)Progesterone-estrogen (b)Growth hormone
- (c)Thyroxine (d)Luteinising hormone.

10.Which is the correct surgical procedure as a contraceptive method is

- (a)Ovariectomy (b)Hysterectomy
(c)Vasectomy (d)Castration.

11.From the sexually transmitted diseases mentioned below, identify the one which does not specifically affect the sex organs.

- (a)Syphilis (b)AIDS (c)Gonorrhea (d)Genital warts

12.The method of directly injecting a sperm into ovum in assisted reproductive technology is called

- (a)GIFT (b)ZIFT (c)ICSI (d)ZI ET

13.Assisted Reproductive Technology involves transfer of

- (a)Ovum into fallopian tube (b)Zygote into fallopian tube
(c)Embryo into fallopian tube (d)(D) Zygote into uterus

14.Choose the odd one out

- (a)Multiload 375 (b)CuT (c)Tubectomy (d)Cu7

15.In which of the following age groups, the incidences of STDs are reported to be very high?

- (a)10-15 years (b)24-30 years
(c)28-32 years (d)15-24 years

16.Chorionic villus sampling involves taking a sample of

- (a)placental tissue (b)amniotic fluid
(c)mother's blood (d)mother's lymph

17.involves taking a sample of amniotic fluid.

- (a)ICSI (b)ART
(c)Chorionic villus sample (d)Amniocentesis

18. In vitro Fertilization is used to treat women with

- (a) damaged fallopian tube (b) blocked fallopian tube
(c) hormone deficiency (d) both A and B

19. Handling gametes/embryos outside the body to achieve pregnancy is known as

- (a) Assisted Reproductive Technology (b) Surrogacy
(c) Cloning (d) External Gamete Fusion

20. A disease that affects the mucus membrane of urogenital tract in male and yellow discharge in urine with feeling of illness.

- (a) AIDS (b) Wart (c) Gonorrhea
(d) Syphilis

21. Medical Termination of Pregnancy is considered safe up to how many weeks of pregnancy

- (a) 6 (b) 8 (c) 12 (d) 18

22. Induced Abortion is also called

- (a) SID (b) PID (c) MTP (d) IUD

23. Oral pills help in birth control by

- (a) killing the sperm (b) killing the ova
(c) forming barrier between sperm and ova
(d) preventing ovulation

24. AIDS is

- (a) An autoimmune disease (b) Reduction in number of T cells

(c)Reduction in number of Helper T cells (d)all the above

25.The transfer of ovum of a donor female into the oviduct of a recipient female is

- (a)IUT (b)ZIFT (c)IVF (d)GIFT

26Expand RCH

- (a)regional and central healthcare
- (b)reproductive and complete health
- (c)reproductive and child healthcare
- (d)reproductive and cumulative health

27.Locational amenorrhea is effective up to maximum period of

- (a)6 months (b)12 months (c)9 months (d)18 months

28.From the following list , which STDs are not curable completely

- (a)Hepatitis- B and genital herpes
- (b)AIDS and genital herpes
- (c)AIDS and hepatitis- B
- (d)all the above

29.Contraceptive methods are used

- (a)to prevent pregnancy
- (b)to delay or space pregnancy
- (c)for the maintenance of reproductive health
- (d)all of these

30.Cu ions released from copper- releasing IUD's

- (a) suppress sperm motility
- (b) prevent ovulation
- (c) Make uterus unsuitable for implantation.
- (d) act as spermicide

31. Amniocentesis is a technique to

- (a) change the sex of the foetus
- (b) find the abnormalities in the foetus
- (c) Correct genetic disorder of the foetus
- (d) None of the above

32. Lactational Amenorrhea is related to

- (a) Temporary method of contraception
- (b) permanent method of contraception
- (c) Absence of menstruation
- (d) Onset of menstruation

33. Which of the birth control device is not used by women?

- (a) Copper-T (b) Oral pill (c) Diaphragm (d) Nirodh

35. Emergency contraceptives should be used in --- hours to avoid possible pregnancy.

- (a) 72 hrs (b) 64 hrs (c) 32 hrs (d) 16 hrs

36. MTP is essential

- (a) to get rid of unwanted pregnancy
- (b) Pregnancy is fatal to mother
- (c) Pregnancy is fatal to foetus
- (d) All of the above

37.Sruti's aunty got some infection.Doctor told that it is STI,but need not worry, it is absolutely curable. Can you find out Sruti's aunty was infected with which STI?

(a) Genital herpes (b) AIDS (c) Hepatitis B (d) Gonorrhoea

38.Which days are considered as most fertile period in the menstrual cycle?

(a) 5 to 10 days (b) 10 to 17 days (c) 17 to 23 days (d) 23 to 28 days

39.Artifitial insemination technique is applicable when

- (a)Inability of a male to inseminate the female
- (b) Low sperm count in ejaculates
- (c) Both a & b
- (d) None of the above

40.Test tube baby programme include

- (a) In vitro fertilization and embryo transfer
- (b) Invitro fertilization and artifitial insemination
- (c) Gamete intra fallopian transfer
- (d) Invivo fertilization

41.Which among the following is not a copper releasing IUD?

- (a) CuT (b) Cu7 (c) LNG-20 (d) Multiload 375

42.Progesterone in the contraceptive help in preventing

- (a) Implantation of zygote (b) Ovulation
- (c) Fertilisation (d) None of the above

43.Reproductively healthy society is important for

- (a) Controlling population growth
- (b) Reducing crime
- (c) Taking necessary steps at the time of requirement
- (d) All of the above

44. The method in which sperm is directly injected into the ovum to form embryo in laboratory is

- (a) ZIFT (b) IUI (c) ICSI (d) GIFT

45. Population explosion in recent years is due to

- (a) Decline in Maternal mortality rate
- (b) Decline in Infant mortality rate
- (c) Increased number of people in reproductive age
- (d) All of the above

46.Hum Do Hamare Do' slogan is for encouraging-

- (a) family planning (b) immunization
- (c) electronic growth (d) patriotism

47. An ideal contraceptive should be

- (a)user friendly (b)reversible
(c)Both (a) and (b) (d)decreased sexual

drive

48.Periodic abstinence is avoiding intercourse during the of menstrual cycle.

- (a)luteal phase (b)ovulatory phase

(c)menstrual phase

(d)None of these

49.Lactational amenorrhea is the -

(a)absence of menses in adult age

(b)late onset of menses

(c)absence of menses during lactation

(d)no menses during pregnancy.

50.Intrauterine devices are used to prevent

(a)the sperm from reaching the egg

(b)the sperm from leaving the male reproductive system

(c)the sperm from surviving for many days in the female reproductive system

(d)All of the above.

51.What technique involves fertilization outside the body of the female?

a) Intrauterine fertilization

b) In vitro fermentation

c) In vitro fertilization

d) In vivo fertilization

52.What does IVF stand for?

a) In vivo fertilization

b) In vitro fermentation

c) In vitro fertilization

d) In vivo fermentation

53.What follows IVF?

a) Coitus

b) Embryo transfer

c) Embryo sacrifice

d) Embryo delivery

54.Which program is involved in collecting eggs from females and sperms from males to induce fertilization in a test tube?

a) Swachha Bharat program

b) Test tube baby program

- c) Anti-national program
- d) Fertility program

55. In the test tube baby program, what method is used for implantation of embryo from 1–8 cell stage?

- a) Zygote intra fallopian transfer
- b) Intra uterine transfer
- c) Zygote inter fallopian transfer
- d) Inter uterine transfer

56. IUT stands for _____

- a) Intra uterine transfer
- b) Inter uterine transfer
- c) Intra uterine traction
- d) Inter uterine traction

57. What technique is used to inject the sperm directly into the ovum in a laboratory setting?

- a) ZIFT
- b) GIFT
- c) IUT
- d) ICSI

58. Increased IMR and decreased MMR in a population will:

- a. Cause rapid increase in growth rate
- b. Result in decline in growth rate
- c. Not cause significant change in growth rate
- d. Result in an explosive population growth

59. Sterilisation techniques are generally foolproof methods of contraception with least side effects. Yet, this is the last option for the couples because:

- i. It is almost irreversible
- ii. Of the misconception that it will reduce sexual urge/drive
- iii. It is a surgical procedure
- iv. Lack of sufficient facilities in many parts of the country

Choose the correct option:

- a. (i and iii)
- b. (ii and iii)
- c. (i and iv)
- d. (i, ii, iii, and iv)

60. A national level approach to build up a reproductively healthy society was taken up in our country in:

- a. 1950s
- b. 1960s
- c. 1980s
- d. 1990s

61. Emergency contraceptives are effective if used within:

- a. 72 hrs of coitus
- b. 72 hrs of ovulation
- c. 72 hrs of menstruation
- d. 72 hrs of implantation

62. Choose the right one among the statements given below:

- a. IUDs are generally inserted by the user herself
- b. IUDs increase phagocytosis reaction in the uterus
- c. IUDs suppress gametogenesis
- d. IUDs once inserted need not be replaced

63. Following statements are given regarding MTP. Choose the correct options given below:

- i. MTPs are generally advised during first trimester
- ii. MTPs are used as a contraceptive method
- iii. MTPs are always surgical
- iv. MTPs require the assistance of qualified medical personnel

- a. (i and ii) b. (i and iii) c. (i and iv) d. (i and ii)

64. From the sexually transmitted diseases mentioned below, identify the one which does not specifically affect the sex organs:

- a. Syphilis b. AIDS c. Gonorrhea d. Genital warts

65. Condoms are one of the most popular contraceptives because of the following reasons:

- a. These are effective barriers for insemination b. They do not interfere with coital act
c. These help in reducing the risk of STDs d. All of the above

66. Choose the correct statement regarding the ZIFT procedure:

- a. Ova collected from a female donor are transferred to the fallopian tube to facilitate zygote formation
- b. Zygote is collected from a female donor and transferred to the fallopian tube
- c. Zygote is collected from a female donor and transferred to the uterus
- d. Ova collected from a female donor and transferred to the uterus

67. The correct surgical procedure as a contraceptive method is:

- a. Ovariectomy b. Hysterectomy c. Vasectomy d. Castration

68. Diaphragms are contraceptive devices used by the females. Choose the correct option from the statements given below:

- i. They are introduced into the uterus
- ii. They are placed to cover the cervical region
- iii. They act as physical barriers for sperm entry
- iv. They act as spermicidal agents

- a. (i and ii) b. (i and iii) c. (ii and iii) d. (iii and iv)

1 Mark Questions

1. Give the term for prenatal diagnostic technique aimed to know the sex of developing foetus and to detect congenital disorders.
2. After a successful in vitro fertilization, the fertilized egg begins to divide. Where is this egg transferred before it reaches the 8-celled stage and what is this technique called?
3. Give the term for rapid population growth.
4. Name the fluid from which foetal cells are extracted for chromosomal analysis.
5. Give technical name of female used to bring up in vitro fertilized egg to maturity.
6. Name the oral contraceptive developed by CDRI, Lucknow.
7. What is the WHO's interpretation of reproductive health?
8. Why has the Government imposed a statutory ban on amniocentesis?
9. Expand MTP and ICSI.
10. What is lactational amenorrhoea?
11. Write the scientific name of causative agents of :--
(i) Syphilis (ii) Gonorrhoea.
12. Name the technique by which one can disorder any possible chromosomal or metabolic disorders in foetus.
13. Expand the following :--
(i) GIFT (ii) ICSI (iii) IUCD

2 Marks Questions

1. Lactational Amenorrhea is a method of contraception Justify. What is the maximum effectiveness of this method in terms of period/duration?
2. How are non medicated IUDS different from hormone releasing IUDS? Give examples.
3. What are implants? How do they help in preventing fertilisation?
4. Briefly explain two natural barriers for birth control.
5. Enlist any four possible reasons for infertility in human beings.
6. What does GIFT represent?
7. How does Cu- T act as a contraceptive?
8. Mention any four probable reasons for the rapid rise of population in our country?
9. Identify the device used for the following methods of birth control: Barrier, IUD, Surgical technique and Administering hormone.
10. What are STDs? Mention any two of it.
11. "Removal of Gonads cannot be a contraceptive option". Why?

12. What are MTPs ? Under what conditions MTPs are legally permitted?
13. Describe the technique which is used for sex determination in foetus?
14. What are test tube babies? Are they different from normal babies?
15. Mention any four objectives of RCHC.

3 Marks Questions

1. Give another name for sexually transmitted diseases. Name two sexually transmitted diseases which are curable and two diseases which are not curable.
2. Differentiate between Vasectomy and Tubectomy.
3. Name the techniques which are employed in following cases :
 - (a) Transfer of an ovum collected from a donor into the fallopian tube of another female who cannot produce ova but can provide suitable environment for fertilisation and development.
 - (b) Embryo is formed in laboratory in which sperm is directly injected into ovum.
 - (c) Semen collected either from husband or a healthy donor is artificially introduced either into vagina or uterus.
4. Mention the various precautions one has to take in order to protect himself/herself from STDs.
5. What are the disturbing trends observed regarding MTP?
6. Enlist any three causes of infertility in men and women.
7. State the consequences of over population.
8. Differentiate between natality rate and mortality rate.
9. Explain any one natural method of birth control.
10. Give three differences between tubectomy and vasectomy.
11. Describe the three manners in which fertilization of human ovum by sperm can be prevented?
12. Suggest some methods to assist infertile couples to have children?
13. Briefly explain the various reproductive technologies to assist an infertile couple to have children.

CHAPTER-4

PRINCIPLES OF INHERITANCE AND VARIATION

Multiple choice questions

(a) Sutton (b) Boveri (c) Morgan (d) Mendel

(a) Venn diagram (b) Pie diagram (c) A pyramid diagram (d) Punnet square

(a) IA i (Male); IB i (Female) (b) IA i (Male); IB IB (Female)
(c) IA IA (Male); IB IB (Female) (d) IA IA (Male); IB i (Female)

(a) This experiment does not follow the principle of dominance.
 (b) Pink colour in F_1 is due to incomplete dominance.
 (c) Ratio of F_2 is (Red): (Pink): (White)

$$2 \qquad \qquad \qquad 4 \qquad \qquad 2 \qquad \qquad 4$$

(d) Law of Segregation does not apply in this experiment.

(a) A unit of distance between two expressed genes, representing 10% cross over.
(b) A unit of distance between two expressed genes, representing 100% cross over.
(c) A unit of distance between genes on chromosomes, representing 1% cross over.
(d) A unit of distance between genes on chromosomes, representing 50% cross over

(a) Male fruit fly is heterogametic.
(b) In male grasshoppers, 50% of sperms have no sex-chromosome.
(c) In domesticated fowls, sex of progeny depends on the type of sperm rather than egg.
(d) Human males have one, of their sexchromosome much shorter than the other.

(a) Only daughters
(b) Only sons
(c) Both sons and daughters
(d) Only grandchildren

A. Dominance

- B. Co-dominance
- C. Multiple allele
- D. Incomplete dominance
- E. Polygenic inheritance

(a) B, C and E (b) A, B and C (c) A, C and E (d) B, D and E

(9.) The genotypes of a husband and wife are $I^A I^B$ and $I^A i$.

Among the blood types of their children, how many different genotypes and phenotypes are possible?

- (a) 3 genotypes; 4 phenotypes
- (b) 4 genotypes; 3 phenotypes
- (c) 4 genotypes; 4 phenotypes
- (d) 3 genotypes; 3 phenotypes

(10.) Among the following characters, which one was not considered by Mendel in his experiments on pea ?

- (a) Trichomes - Glandular or non-glandular
- (b) Seed-Green or Yellow
- (c) Pod - Inflated or Constricted
- (d) Stem - Tall or Dwarf

(11.) Which one from those given below is the period for Mendel's hybridisation experiments?

- (a) 1840–1850
- (b) 1857–1869
- (c) 1870–1877
- (d) 1856–1863

(12.) A tall true breeding garden pea plant is crossed with a dwarf true breeding garden pea plant. When the F_1 plants were selfed the resulting genotypes were in the ratio of **[2016]**

- (a) 1: 2: 1:: Tall homozygous : Tall heterozygous : Dwarf
- (b) 1: 2: 1:: Tall heterozygous : Tall homozygous : Dwarf
- (c) 3: 1:: Tall : Dwarf
- (d) 3: 1:: Dwarf: Tall

(13.) Match the terms in Column-I with their description in Column-II and choose the correct option.

Column-I Column-II

- (a) Dominance (i) Many genes govern a single character
- (b) Codominance (ii) In a heterozygous organism, only one allele expresses itself
- (c) Pleiotropy (iii) In a heterozygous organism, both alleles express themselves fully
- (d) Polygenic inheritance (iv) A single gene influences many characters

(A) (B) (C) (D)

(a) (ii) (i) (iv) (iii)

(b) (ii) (iii) (iv) (i)

(c) (iv) (i) (ii) (iii)

(d) (iv) (iii) (i) (ii)

(14.)In a test cross involving F_1 dihybrid flies, more parental type offspring were produced than the recombinant type offspring. This indicates

- (a) the two genes are located on two different chromosomes. chromosomes failed to separate during meiosis.
- (b) the two genes are linked and present on the same chromosome.
- (c) both of the characters are controlled by more than one gene.

(15.)How many pairs of contrasting characters in pea plants were studied by Mendel in his experiments ?

- (a) Six (b) Eight (c) Seven (d) Five

(16.)Alleles are

- (a) true breeding homozygotes
- (b) different molecular forms of a gene
- (c) heterozygotes
- (d) different phenotype

(17.)In his classic experiments on Pea plants, Mendel did not use

- (a) Pod length (b) Seed shape (c) Flower position (d) Seed colour

(18.)A man with blood group 'A' marries a woman with blood group 'B'. What are all the possible blood groups of their offsprings ?

- (a) A, B and AB only (b) A, B, AB and O (c) O only (d) A and B only

(19.)Multiple alleles are present :

- (a) At different loci on the same chromosome
- (b) At the same locus of the chromosome
- (c) On non-sister chromatids
- (d) On different chromosomes

(20.)A gene showing codominance has:

- (a) alleles tightly linked on the same chromosome
- (b) alleles that are recessive to each other
- (c) both alleles independently expressed in the heterozygote
- (d) one allele dominant on the other

(21.)The term 'linkage' was coined by :

- (a) T. Boveri (b) G. Mendel (c) W. Sutton (d) T.H. Morgan

(22.) If two persons with 'AB' blood group marry and have sufficiently large number of children these children could be classified as 'A' blood group: 'AB' blood group: 'B' blood group in 1: 2 : 1 ratio. Modern technique of protein electrophoresis reveals presence of both ' A ' and ' B ' type proteins in 'AB' blood group individuals. This is an example of

- (a) incomplete dominance
- (b) Partial dominance
- (b) Complete cominance
- (d) Codominance

(23.) Which Mendelian idea is depicted by a cross in which the F_1 generation resembles both the parents?

- (a) Law of dominance
- (b) Inheritance of one gene
- (b) Co-dominance
- (d) Incomplete dominance

(24.) Which of the following statements is not true of two genes that show 50% recombination frequency?

- (a) The genes are tightly linked
- (b) The genes show independent assortment
- (c) If the genes are present on the same chromosome, they undergo more than one crossovers in every meiosis
- (d) The genes may be on different chromosomes

(25.) Genetic variation in a population arises due to

- (a) Mutations only
- (b) Recombination only
- (b) Mutations as well as recombination
- (d) Reproductive isolation and selection

(26.) A certain road accident patient with unknown blood group needs immediate blood transfusion. His one doctor friend at once offers his blood. What was the blood group of the donor?

- (a) Blood group B
- b) Blood group AB
- (c) Blood group O
- (d) Blood group A

(27.) A test cross is carried out to

- (a) determine the genotype of a plant at F_2 .
- (b) predict whether two traits are linked.
- (c) assess the number of alleles of a gene.
- (d) determine whether two species or varieties will breed successfully.

(28.) F_2 generation in a Mendelian cross showed that both genotypic and phenotypic ratios are same as 1: 2 : 1. It represents a case of:

- (a) Co-dominance
- (b) Dihybrid cross
- (c) Monohybrid cross with complete dominance
- (d) Monohybrid cross with incomplete dominance

(29.) A person with unknown blood group under ABO system, has suffered much blood loss in an accident and needs immediate blood transfusion. His one friend who has a valid certificate of his

own blood type offers blood donation without delay. What would have been the type of blood group of the donor friend?

- (a) Type B (b) Type O (c) Type AB (d) Type A

(30.) Test cross in plants or in *Drosophila* involves crossing

- (a) between two genotypes with recessive trait
(b) between two F_1 hybrids
(c) the F_1 hybrid with a double recessive genotype.
(d) between two genotypes with dominant trait

(31.) Which one of the following conditions of the zygotic cell would lead to the birth of a normal human female child?

- (a) Two X chromosomes
(b) Only one Y chromosome
(c) Only one X chromosome
(d) One X and one Y chromosome

(32.) Which one of the following cannot be explained on the basis of Mendel's Law of Dominance?

- (a) The discrete unit controlling a particular character is called a factor
(b) Out of one pair of factors one is dominant, and the other recessive
(c) Alleles do not show any blending and both the characters recover as such in F_2 generation.
(d) Factors occur in pairs

(33.) The genotype of a plant showing the dominant phenotype can be determined by:

- (a) test cross
(b) dihybrid cross
(c) pedigree analysis
(d) back cross

(34.) Select the correct statement from the ones given below with respect to dihybrid cross.

- (a) Tightly linked genes on the same chromosome show higher recombinations
(b) Genes far apart on the same chromosome show very few recombinations
(c) Genes loosely linked on the same chromosome show similar recombinations as the tightly linked ones
(d) Tightly linked genes on the same chromosome show very few recombinations.

(35.) A common test to find the genotype of a hybrid is by

- (a) crossing of one F_2 progeny with female parent
(b) studying the sexual behaviour of F_1 progenies
(c) crossing of one F_1 progeny with male parent
(d) crossing of one F_2 progeny with male parent.

(36.) Two genes R and Y are located very close on the chromosomal linkage map of maize

plant. When RRY^Y and rry^y genotypes are hybridized, the F₂ show

- (a) segregation in the expected 9:3:3:1 ratio
- (b) segregation in 3:1 ratio
- (c) higher number of the parental types
- (d) higher number of the recombinant types.

(37.) In pea plants, yellow seeds are dominant to green. If a heterozygous yellow seeded plant is crossed with a green seeded plant, what ratio of yellow and green seeded plants would you expect in

- (a) 9:1
- (b) 1:3
- (c) 3:1

(d) 50:50 F₁ generation **(38.)** Inheritance of skin colour in humans is an example of

- (a) point mutation
- (b) polygenic inheritance
- (c) codominance
- (d) chromosomal aberration.

(39.) A human male produces sperms with the genotypes AB, Ab, aB, and ab pertaining to two diallelic characters in equal proportions. What is the corresponding genotype of this person?

- (a) AaBB
- (b) AABb
- (c) AABB
- (d) AaBb

(40.) Which one of the following is an example of polygenic inheritance?

- (a) Production of male honey bee
- (b) Pod shape in garden pea
- (c) Skin colour in humans
- (d) Flower colour in *Mirabilis jalapa*

(41.) In Mendel's experiment with garden pea, round seed shape (RR) was dominant over wrinkled seeds (rr), yellow cotyledon (YY) was dominant over green cotyledon (yy).

What are the expected phenotypes in the F₂ generation of the cross RRY^Y × rry^y?

- (a) only wrinkled seeds with yellow cotyledons
- (b) only wrinkled seeds with green cotyledons
- (c) Round seeds with yellow cotyledons, and wrinkled seeds with yellow cotyledons
- (d) only round seeds with green cotyledons.

1 Mark questions

1. Give any two reasons for the selection of pea plants by Mendel for his experiments.
2. Name any one plant that shows the phenomenon of incomplete dominance during the inheritance of its flower colour.
3. Name the base change and the amino acid change, responsible for sickle cell anaemia.
4. Name the disorder with the following chromosome complement.

(i) 22 pairs of autosomes + X X Y

(ii) 22 pairs of autosomes + 21st chromosome + XY.

5. A haemophilic man marries a normal homozygous woman. What is the probability that their daughter will be haemophilic? 6. A test is performed to know whether the given plant is homozygous dominant or heterozygous. Name the test and phenotypic ratio of this test for a monohybrid cross.

7. Name the phenomena that occur when homologous chromosomes do not separate during meiosis.

8. Name one trait each in humans & in *Drosophila* whose genes are located on sex chromosome.

9. What is meant by aneuploidy?

10. What genetic principle could be derived from a monohybrid cross?

11. Which one change is the cause of sickle – cell anaemia ?

12. What is a test cross?

13. What is mutagen? Give an example?

14. What was the total number of varieties of garden pea which Mendel had taken to start his experiment?

15. Name any one plant & its feature that shows the phenomena of incomplete dominance?

2 Marks Questions

1. Identify the sex of organism as male or female in which the sex chromosome are found as

(i) ZW in bird (ii) XY in *Drosophila* (iii) ZZ in birds. (iv) XO in grasshopper.

2. Mention two differences between Turner's syndrome and Klinefelter's syndrome.

3. The human male never passes on the gene for haemophilia to his son. Why is it so?

4. Mention four reasons why *Drosophila* was chosen by Morgan for his experiments in genetics.

5. Differentiate between point mutation and frameshift mutations.

6. Give any two similarities between behavior of genes (Mendel's factor) during inheritance & chromosomes during cell division.

7. Which law of Mendel is universally accepted? State the law?

8. How will you find out whether a given plant is homozygous or heterozygous?

9. Why do sons of haemophilic father never suffer from this trait?

10. How is the child affected if it has grown from the zygote formed by an XX-egg fertilized by Y-carrying sperm? What do you call this abnormality?

11. The map distance in certain organism between genes A & B is 4 units, between B & C

is units, & between C & D is 8 units which one of these gene paves will show more recombination frequency? Give reason.

12. Give the chromosomal constitution & related sex in each of the following :-

i) Turner syndrome

ii) Klinefilter syndrome

13. What is pedigree Analysis? How is it useful?

14. What are multiple alleles? Give an example?

3 Marks Questions

1. A woman with O blood group marries a man with AB blood group

(i) work out all the possible phenotypes and genotypes of the progeny.

(ii) Discuss the kind of dominance in the parents and the progeny in this case.

2. Explain the cause of Klinefelters syndrome. Give any four symptoms shown by sufferer of this syndrome.

3. In Mendels breeding experiment on garden pea, the offspring of F₂ generation are obtained in the ratio of 25% pure yellow pod, 50% hybrid green pods and 25% green pods State (i) which pod colour is dominant (ii) The Phenotypes of the individuals of F₁ generation. (iii) Workout the cross.

4. In *Antirrhinum majus* a plant with red flowers was crossed with a plant with white flowers. Work out all the possible genotypes & phenotypes of F₁ & F₂ generations comment on the pattern of inheritance in this case?

5. A red eyed male fruitfly is crossed with white eyed female fruitfly. Work out the possible genotype & phenotype of F₁ & F₂ generation. Comment on the pattern of inheritance in this cross?

6. A man with AB blood group marries a woman with O group blood.

(i) Work out all the possible phenotypes & genotypes of the progeny.

(ii) Discuss the kind of domination in parents & progeny in this case?

7. In an cross made between a hybrid tall & red plant (TtRr) with dwarf & white flower (ttrr). What will be the genotype of plants in F₁ generation?

8. How sex is determined in human brings?

9. A smooth seeded & red – flowered pea plant (SsRr) is crossed with smooth seeded & white flowered pea plant (Ssrr). Determine the phenotypic & genotypic ratio in f₁ progeny?

5 Marks Questions

1. A dihybrid heterozygous round, yellow seeded garden pea (*Pisum sativum*) was crossed with a double recessive plant.

(i) What type of cross is this?

(ii) Work out the genotype and phenotype of the progeny.

(iii) What principle of Mendel is illustrated through the result of this cross?

2. In dogs, barking trait is dominant over silent trait & erect ears are dominant over drooping ears. What is the expected phenotypic ratio of offspring when dogs heterozygous for both the traits are crossed?

3. Differentiate between dominance, co-dominance & Incomplete dominance with one

example each.

4. A dihybrid heterozygous tall & yellow pea plant was crossed with double recessive plant.

(i) What type of cross is this?

(ii) Work out the genotype & phenotype of progeny

(iii) What principle of Mendel is illustrated through result of this cross?



DELHI PUBLIC SCHOOL BULANDSHAHR

HOLIDAY HOMEWORK (SESSION: 2025 – 2026)



XII, MATHEMATICS

Chapter : – Matrices

Multiple choice questions

- If a matrix has 6 elements, then number of possible orders of the matrix can be
(a) 2 (b) 4 (c) 3 (d) 6
- If A and B are square matrices of the same order, then $(A + B)(A - B)$ is equal to
(a) $A^2 - B^2$ (b) $A^2 - BA - AB - B^2$ (c) $A^2 - B^2 + BA - AB$ (d) $A^2 - BA + B^2 + AB$
- Total number of possible matrices of order 2×3 with each entry 1 or 0 is
(a) 6 (b) 36 (c) 32 (d) 64
- If A is a square matrix such that $A^2 = A$, then $(I + A)^2 - 3A$ is
(a) I (b) 2A (c) 3I (d) A
- If a matrix A is both symmetric and skew symmetric then matrix A is
(a) a scalar matrix (b) a diagonal matrix (c) a zero matrix of order $n \times n$ (d) none of these.
- Total number of possible matrices of order 3×3 with each entry 2 or 0 is
(a) 9 (b) 27 (c) 81 (d) 512
- If A and B are two matrices of the order $3 \times m$ and $3 \times n$, respectively, and $m = n$, then the order of matrix $(5A - 2B)$ is
(a) $m \times 3$ (b) 3×3 (c) $m \times n$ (d) $3 \times n$
- If A is matrix of order $m \times n$ and B is a matrix such that AB' and $B'A$ are both defined, then order of matrix B is
(a) $m \times m$ (b) $n \times n$ (c) $n \times m$ (d) $m \times n$
- If A and B are matrices of same order, then $(AB' - BA')$ is a
(a) skew symmetric matrix (b) null matrix (c) symmetric matrix (d) unit matrix
- For any two matrices A and B, we have
(a) $AB = BA$ (b) $AB \neq BA$ (c) $AB = O$ (d) None of the above
- A matrix has 18 elements, then possible number of orders of a matrix are
(a) 3 (b) 4 (c) 6 (d) none of these

12. If a matrix A is both symmetric and skew symmetric then matrix A is

- (a) a scalar matrix (b) a diagonal matrix
(c) a zero matrix of order $n \times n$ (d) a rectangular matrix.

13. If A and B are two matrices such that their multiplication is defined, then $(AB)'$

- (a) $A'B'$ (b) AB (c) AB' (d) $B'A'$

14. If matrices A and B are inverse of each other then

- (a) $AB = BA$ (b) $AB = BA = I$ (c) $AB = BA = O$ (d) $AB = O, BA = I$

15. If A and B are matrices of order $3 \times m$ and $3 \times n$ respectively such that $m = n$, then order of

$2A + 7B$ is

- (a) 3×3 (b) $m \times 3$ (c) $n \times 3$ (d) $3 \times m$

16.. If A is a square matrix such that $A^2 = A$, then $(I + A)^2 - 3A$ is

- (a) I (b) $2A$ (c) $3I$ (d) A

17. If A and B are symmetric matrices, then $AB - BA$ is

- (a) symmetric matrix (b) skew symmetric matrix (c) null matrix (d) Identity matrix

18. If a matrix A is both symmetric and skew symmetric then matrix A is

- (a) a scalar matrix (b) a diagonal matrix
(c) a zero matrix of order $n \times n$ (d) a rectangular matrix.

Short answer type question

19. If a matrix has 5 elements, write all possible orders it can have ?

20. If matrix $A = [1 \ 2 \ 3]$ then find AA' , where A' is the transpose of matrix A .

21. If a matrix has 28 elements, what are the possible orders it can have? What if it has 13 elements?

22. Write a 3×3 skew symmetric matrix.

23. If A and B are symmetric matrices, show that AB is symmetric, if $AB = BA$.

24. If A and B are two matrices such that $AB = B$ and $BA = A$ then write $A^2 + B^2$ in terms of A and B

25. Show that all the elements on the main diagonal of a skew symmetric matrix are zero.

26. For the matrix A , show that $A + A^T$ is a symmetric matrix.

27. Show that the matrix $B'AB$ is symmetric or skew symmetric according as A is symmetric or skew symmetric.

28. There are 2 families A and B . There are 4 men, 6 women and 2 children in family A , and 2 men, 2 women and 4 children in family B . The recommended daily amount of calories is 2400 for men, 1900 for women, 1800 for children and 45 grams of proteins for men, 55 grams for women and 33 grams for children. Represent the above information using matrices. Using matrix multiplication, calculate the total requirement of calories and proteins for each of the 2 families.

29. If $\begin{bmatrix} x - y & 2x + z \\ 2x - y & 3z + w \end{bmatrix} = \begin{bmatrix} -1 & 5 \\ 0 & 13 \end{bmatrix}$, find x, y, z, w .
(2002, 2013)

C.B.S.E

30. Construct a 2×2 matrix $A = [a_{ij}]$ whose elements a_{ij} are given by

$$a_{ij} = \frac{(i-2j)^2}{2}$$

C.B.S.E (2002)

31. Construct a 2×2 matrix $A = [a_{ij}]$ whose elements a_{ij} are given by

$$a_{ij} = \frac{(2i+j)^2}{2}$$

C.B.S.E (2002).

32. If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$, show that $A^2 - 5A + 7I = 0$
(2003, 2007)

C.B.S.E (

33. If $A = \begin{bmatrix} 2 & -3 & -5 \\ -1 & 4 & 5 \\ 1 & -3 & -4 \end{bmatrix}$, show that $A^2 = A$

34. Find the matrix A , such that $\begin{bmatrix} 2 & -1 \\ 1 & 0 \\ -3 & 4 \end{bmatrix} A = \begin{bmatrix} -1 & -8 & -10 \\ 1 & -2 & -5 \\ 9 & 22 & 15 \end{bmatrix}$.

35. If $A^T = \begin{bmatrix} 3 & 4 \\ -1 & 2 \\ 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 2 & 1 \\ 1 & 2 & 3 \end{bmatrix}$, find $A^T - B^T$.

C.B.S.E (2012)

36. Express the matrix $\begin{bmatrix} 3 & -2 & -4 \\ 3 & -2 & -5 \\ -1 & 1 & 2 \end{bmatrix}$ as the sum of symmetric and skew-symmetric matrix

and verify the result.

C.B.S.E (2010)

37. Find the value of x from the matrix $\begin{bmatrix} 2x-y & 5 \\ 3 & y \end{bmatrix} = \begin{bmatrix} 6 & 5 \\ 3 & -2 \end{bmatrix}$.

C.B.S.E (2009)

38. If $\begin{bmatrix} 2x+y & 3y \\ 0 & 4 \end{bmatrix} = \begin{bmatrix} 6 & 0 \\ 6 & 4 \end{bmatrix}$, find x .

C.B.S.E (2010)

39. If $2\begin{bmatrix} 3 & 4 \\ 5 & x \end{bmatrix} + \begin{bmatrix} 1 & y \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 7 & 0 \\ 10 & 5 \end{bmatrix}$, find x - y.

C.B.S.E (2014)

40. If $\begin{bmatrix} xy & 4 \\ z+6 & x+y \end{bmatrix} = \begin{bmatrix} 8 & w \\ 0 & 6 \end{bmatrix}$, write the value of x+y+z.

C.B.S.E (2014)

41. For what value of x , the matrix $A = \begin{bmatrix} 0 & 1 & -2 \\ -1 & 0 & 3 \\ x & -3 & 0 \end{bmatrix}$ is a skew- symmetric matrix? C.B.S.E (2013)

2. If $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$, prove that $A^3 - 6A^2 + 7A + 2I = 0$.

43. If $A = \begin{bmatrix} 0 & -\tan \frac{\alpha}{2} \\ \tan \frac{\alpha}{2} & 0 \end{bmatrix}$ and I is the identity matrix of order 2, then show that :

$$I + A = (I - A) \begin{bmatrix} \cos \alpha & -\sin \alpha \\ \sin \alpha & \cos \alpha \end{bmatrix}$$

44. If $F(x) = \begin{bmatrix} \cos x & -\sin x & 0 \\ \sin x & \cos x & 0 \\ 0 & 0 & 1 \end{bmatrix}$, then show that $F(x) \cdot F(y) = F(x+y)$

45. Show that the matrix $B^T A B$ is symmetric or skew- symmetric according as A is

Symmetric or skew- symmetric.

46. If $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$, then prove that $A^n = \begin{bmatrix} 3^{n-1} & 3^{n-1} & 3^{n-1} \\ 3^{n-1} & 3^{n-1} & 3^{n-1} \\ 3^{n-1} & 3^{n-1} & 3^{n-1} \end{bmatrix}$, $n \in N$.

47. If $A = \begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}$ and I is the identity matrix of order 2, then show that $A^2 = 4A - 3I$. Hence find A^{-1}

48. Let $A = \begin{bmatrix} 2 & 3 \\ -1 & 2 \end{bmatrix}$ then show that $A^2 - 4A + 7I = 0$. Using this result calculate A^5 .

49. Prove that every matrix can be uniquely expressed as the sum of a symmetric and skew-symmetric matrix.

50. Given matrix $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, find $f(A)$, if $f(x) = 2x^2 - 3x + 5$.
51. For the following matrices A and B , verify that $(AB)' = B'A'$. $A = \begin{bmatrix} 1 \\ -4 \\ 3 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 2 & 1 \end{bmatrix}$.
52. If $A = \begin{bmatrix} 1 & -1 \\ 2 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} a & 1 \\ b & -1 \end{bmatrix}$ and $(A + B)^2 = A^2 + B^2$, then find the values of a and b .
53. Let $A = \begin{bmatrix} 2 & -1 \\ 3 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 5 & 2 \\ 7 & 4 \end{bmatrix}$ and $C = \begin{bmatrix} 2 & 5 \\ 3 & 8 \end{bmatrix}$. Find a matrix D such that $CD - AB = 0$.
54. For the matrix $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, find k so that $A^2 = 5A + kI$.
55. If $A = \begin{bmatrix} \cos x & -\sin x \\ \sin x & \cos x \end{bmatrix}$, find AA' .
56. If $A = \begin{bmatrix} \alpha & \beta \\ \gamma & -\alpha \end{bmatrix}$ is such that $A^2 = I$, then find the value of $1 - \alpha^2 - \beta\gamma$.
57. Find the matrix A satisfying the matrix equation $\begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix} A \begin{bmatrix} -3 & 2 \\ 5 & -3 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$.
58. If $A = \begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}$ and I is the identity matrix of order 2, then show that $A^2 = 4A - 3I$. Hence find A^{-1} .
59. Let $A = \begin{bmatrix} 2 & 3 \\ 1 & 1 \end{bmatrix}$ then show that $A^2 - 3A - I = 0$. Using this result calculate A^4 .
60. If $f(\alpha) = \begin{bmatrix} \cos \alpha & -\sin \alpha & 0 \\ \sin \alpha & \cos \alpha & 0 \\ 0 & 0 & 1 \end{bmatrix}$, prove that $f(\alpha) \cdot f(-\beta) = f(\alpha - \beta)$.

Chapter : – Determinants

Multiple choice questions

- Value of $\begin{vmatrix} x+1 & x-1 \\ x^2+x+1 & x^2-x+1 \end{vmatrix}$ is equal to
[C.B.S.E 2024]
(a) $2x^3$ (b) 2 (c) 0 (d) $2x^3 - 2$
- Value of $\begin{vmatrix} 8 & 2 & 7 \\ 12 & 3 & 5 \\ 16 & 4 & 3 \end{vmatrix}$ is:
[C.B.S.E 2024]
(a) 0 (b) 2 (c) 7 (d) -2
- If $\begin{vmatrix} 1 & 3 & 1 \\ k & 0 & 1 \\ 0 & 0 & 1 \end{vmatrix} = \pm 6$, then the value of k is
[C.B.S.E 2024]
(a) 2 (b) -2 (c) ± 2 (d) ∓ 2
- If $\begin{vmatrix} 2 & 3 & 2 \\ x & x & x \\ 4 & 9 & 1 \end{vmatrix} + 3 = 0$, then the value of x is:
[C.B.S.E 2020]
(a) 3 (b) 0 (c) -1 (d) 1

5. Let $A = \begin{bmatrix} 200 & 50 \\ 10 & 2 \end{bmatrix}$ & $B = \begin{bmatrix} 50 & 40 \\ 2 & 3 \end{bmatrix}$, then $|AB|$ is equal to
[C.B.S.E 2020]
(a) 460 (b) 2000 (c) 3000 (d) -7000
6. If A is a square matrix of order 2 & $|A| = -2$, then value of $|5A^T|$ is
[C.B.S.E 2024]
(a) -50 (b) -10 (c) 10 (d) 50
7. If A is an invertible matrix, then $\det A^{-1}$ is equal to
(a) $\det(A)$ (b) $\frac{1}{\det(A)}$ (c) 1 (d) None of these
8. If $A = \begin{bmatrix} 7 & x & 2 \\ -5 & x+1 & 3 \\ 4 & x & 7 \end{bmatrix}$ and $B = \begin{bmatrix} x & 2 & 7 \\ x+1 & 3 & -5 \\ x & 7 & 4 \end{bmatrix}$, then the value of x for which $A + B = 0$ is
(a) 2 (b) any real number (c) 0 (d) None of these
9. If A is a skew symmetric matrix of order 3, then the value of $|A|$ is
(a) 3 (b) 0 (c) 9 (d) 27
10. If the area of the triangle with vertices $(-3,0)$, $(0,3)$ & $(0,k)$ is 9 sq units, then value of k is
(a) 9 (b) ± 3 (c) -9 (d) 6
11. Given that $A = [a_{ij}]$ is a square matrix of order 3×3 and $|A| = -7$, then the value of $\sum_{i=1}^3 a_{i2} A_{i2}$
Where A_{ij} , denotes the cofactor of elements a_{ij} is
(a) 7 (b) -7 (c) 0 (d) 49
12. For matrix $A = \begin{bmatrix} 2 & 5 \\ -11 & 7 \end{bmatrix}$, $(adj A)^T$ is equal to
(a) $\begin{bmatrix} -2 & -5 \\ 11 & -7 \end{bmatrix}$ (b) $\begin{bmatrix} 7 & 5 \\ 11 & 2 \end{bmatrix}$ (c) $\begin{bmatrix} 7 & 11 \\ -5 & 2 \end{bmatrix}$ (d) $\begin{bmatrix} 7 & -5 \\ 11 & 2 \end{bmatrix}$
13. Given that A is a square matrix of order 3 and $|A| = -2$, then $|adj(2A)|$ is
(a) -2^6 (b) 4 (c) -2^8 (d) 2^8
14. If $A = \begin{bmatrix} -2 & 0 & 0 \\ 1 & 2 & 3 \\ 5 & 1 & 1 \end{bmatrix}$, then the value of $|A(adj A)|$ is
[C.B.S.E 2024]
(a) $100I$ (b) $10I$ (c) 10 (d) 1000
15. For two matrices A and B , given that $A^{-1} = \frac{1}{4}B$, then inverse of $(4A)$ is:
[C.B.S.E 2024]
(a) $4B$ (b) B (c) $\frac{1}{4}B$ (d) $\frac{1}{16}B$
16. Let $\alpha, \beta \in R$. If system of equations $3x + 5y + az = 3$; $7x + 11y - 9z = 2$; $97x + 155y - 189z = \beta$
Has infinitely many solutions, then $\alpha + 2\beta$ is equal to
(a) 25 (b) 24 (c) 27 (d) 22

17. The value of the determinant $\Delta = \begin{vmatrix} 1! & 2! & 3! \\ 2! & 3! & 4! \\ 3! & 4! & 5! \end{vmatrix}$ is
 (a) $2!$ (b) $3!$ (c) $4!$ (d) $5!$
18. The set of values of k for which the system of equations $\begin{bmatrix} 2 & 3 & 1 \\ 4 & 5 & 0 \\ 1 & k & 3 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 5 \\ 6 \\ 7 \end{bmatrix}$ gives a unique solution
 (a) $\{\frac{5}{4}\}$ (b) $\{-\frac{5}{4}, \frac{5}{4}\}$ (c) $\{\frac{11}{4}\}$ (d) $R - \{11/4\}$
19. If A be a 3×3 square matrix such that $A(\text{adj } A) = \begin{bmatrix} 5 & 0 & 0 \\ 0 & 5 & 0 \\ 0 & 0 & 5 \end{bmatrix}$, then the value of $|\text{adj } A|$ is
 (a) 5 (b) 25 (c) 125 (d) 625
20. If $\begin{vmatrix} 2 & 4 \\ 5 & 1 \end{vmatrix} = \begin{vmatrix} 2x & 4 \\ 6 & x \end{vmatrix}$, then the possible values of x is /are
 (a) 3 (b) $\sqrt{3}$ (c) $-\sqrt{3}$
 (d) $-\sqrt{3}, \sqrt{3}$
21. If A and B are two non-singular matrices of order n then $|kAB|$ is
 (a) $k^{2n}|A||B|$ (b) $k^{n^2}|A||B|$ (c) $k^n|A||B|$ (d) $k|A||B|$
22. If $A(\text{adj } A) = \begin{bmatrix} -3 & 0 & 0 \\ 0 & -3 & 0 \\ 0 & 0 & -3 \end{bmatrix}$, then $|A|$ is equal to
 (a) 9 (b) -3 (c) -6 (d) 3
- 23.

ASSERTION – REASON

24. **Assertion-** If $A = \begin{bmatrix} 2 & 1 & -1 \\ 0 & 3 & 2 \\ 0 & 0 & -4 \end{bmatrix}$, then $|A| = -24$
Reason- Then determinant of upper triangular matrix is equal to product of its diagonals elements.
25. **Assertion-** If $A = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 2 \\ 0 & 0 & 4 \end{bmatrix}$, then $|3A| = 27|A|$
Reason- If A is a square matrix of order n , then $|kA| = k^n|A|$.
26. **Assertion-** If A is a skew-symmetric matrix of odd order, then $|A| = 0$.
Reason- For a square matrix A , $|A| = |A^T|$
27. **Assertion-** $A(\text{adj } A) = |A|I_2$
Reason- $\text{adj}(AB) = (\text{adj } A)(\text{adj } B)$
28. **Assertion -** The determinant of matrix $A = \begin{bmatrix} 0 & 1 & 2 \\ -1 & 0 & 3 \\ -2 & -3 & 0 \end{bmatrix}$ is zero
Reason - The determinant of every skew-symmetric matrix of odd order is zero.

29. **Assertion** – Suppose

A, B & C are square matrices of same order such that AB is invertible

If $AB = AC$, then $B = C$

Reason - A is invertible,

30. **Assertion** - $\text{adj}(\text{adj } A) = |A|^{n-2}A$

Reason - $|\text{adj } A| = |A|^{n-1}$

31. **Assertion** – If A is a diagonal matrix, then $\det A = 0$

Reason - If A is a skew-symmetric matrix of odd order, then $\det(A)=0$.

32. **Assertion** - The value of x satisfying $\begin{vmatrix} x & 2 \\ 18 & x \end{vmatrix} = \begin{vmatrix} 6 & 2 \\ 18 & 6 \end{vmatrix}$ are ± 6 .

Reason - If $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$, then $|A| = ad - bc$

33. **Assertion** – The determinant of matrix $A = \begin{bmatrix} 0 & 1 & 2 \\ -1 & 0 & 3 \\ -2 & -3 & 0 \end{bmatrix}$ is zero

Reason - The determinant of every skew-symmetric matrix of odd order is zero.

Short answer type Questions

34. If $A = \begin{bmatrix} 1 & 2 \\ 4 & 2 \end{bmatrix}$, then show that $|2A| = 4|A|$.

35. Show that the points $A(a, b + c)$, $B(b, c + a)$, and $C(c, a + b)$ are collinear.

36. If $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 2 \\ 0 & 0 & 4 \end{bmatrix}$, then show that $|3A| = 27|A|$.

37. Find the value of x if $\begin{vmatrix} 2 & 4 \\ 5 & 1 \end{vmatrix} = \begin{vmatrix} 2x & 4 \\ 6 & x \end{vmatrix}$.

38. Let $A = \begin{bmatrix} 3 & 7 \\ 2 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 6 & 8 \\ 7 & 9 \end{bmatrix}$, verify that $(AB)^{-1} = B^{-1}A^{-1}$.

39. If $\begin{vmatrix} x & 2 \\ 18 & x \end{vmatrix} = \begin{vmatrix} 6 & 2 \\ 18 & 6 \end{vmatrix}$, then x is equal to _____?

40. Find the inverse of the matrix $\begin{bmatrix} -3 & 2 \\ 5 & -3 \end{bmatrix}$. Hence, find the matrix P satisfying the matrix equation

$$P \begin{bmatrix} -3 & 2 \\ 5 & -3 \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$$

41. If $A = \begin{bmatrix} -1 & a & 2 \\ 1 & 2 & x \\ 3 & 1 & 1 \end{bmatrix}$ & $\begin{bmatrix} 1 & -1 & 1 \\ -8 & 7 & -5 \\ b & y & 3 \end{bmatrix}$, find the value of $(a + x) - (b + y)$

42. Verify that $(AB)^{-1} = B^{-1}A^{-1}$ for matrices $A = \begin{bmatrix} 2 & 3 \\ 1 & -4 \end{bmatrix}$ & $B = \begin{bmatrix} 1 & -2 \\ -1 & 3 \end{bmatrix}$

43. If A & B are invertible matrices of same order such that

$$(AB)^{-1} = \frac{1}{48} \begin{bmatrix} 0 & 0 & 16 \\ 0 & 24 & 0 \\ 3 & 0 & 0 \end{bmatrix} \text{ \& } A = \begin{bmatrix} -2 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 3 \end{bmatrix}$$

Long Answer type question

44. If $A = \begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$ & $B = \begin{bmatrix} 3 & -1 & 1 \\ -15 & 6 & -5 \\ 0 & -2 & 2 \end{bmatrix}$, find $(AB)^{-1}$

45. If $A = \begin{bmatrix} \cos \alpha & \sin \alpha & 0 \\ \sin \alpha & \cos \alpha & 0 \\ 0 & 0 & 1 \end{bmatrix}$, then find $\text{adj } A$ & verify $A(\text{adj } A) = (\text{adj } A)A = |A|I_3$

46. Use product $\begin{bmatrix} 1 & -1 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{bmatrix} \begin{bmatrix} -2 & 0 & 1 \\ 9 & 2 & -3 \\ 6 & 1 & -2 \end{bmatrix}$ to solve the system of equations:

$$x - y + 2z = 1 ; 2y - 3z = 1 ; 3x - 2y + 4z = 2$$

47. Using matrices, solve the following system of equations:

$$4x + 3y + 2z = 60 ; x + 2y + 3z = 45 ; 6x + 2y + 3z = 70.$$

48. Determine the product $\begin{bmatrix} -4 & 4 & 4 \\ -7 & 1 & 3 \\ 5 & -3 & -1 \end{bmatrix} \begin{bmatrix} 1 & -1 & 1 \\ 1 & -2 & -2 \\ 2 & 1 & 3 \end{bmatrix}$ and use it to solve the system of equations

$$x - y + z = 4; \quad x - 2y - 2z = 9 ; 2x + y + 3z = 1.$$

49. If $A = \begin{bmatrix} -3 & -2 & -4 \\ 2 & 1 & 2 \\ 2 & 1 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 & 0 \\ -2 & -1 & -2 \\ 0 & -1 & 1 \end{bmatrix}$, then find AB and use it to solve the following system of

equation :

$$x - 2y = 3 ; 2x - y - z = 2 ; -2y + z = 3.$$

50. Solve the following system of equations using matrix method

$$\frac{2}{x} + \frac{3}{y} + \frac{10}{z} = 4 ; \frac{4}{x} - \frac{6}{y} + \frac{5}{z} = 1 ; \frac{6}{x} + \frac{9}{y} - \frac{20}{z} = 2$$

Case Study based questions

51. A manufacturer produced three stationary products Pencil, Eraser and Sharpners which he sells in two markets A & B. Annual sales are indicated below:

Market	Products (in numbers)		
	Pencil	Eraser	Sharpener
A	10,000	2,000	18,000
B	6,000	20,000	8,000

If the unit price of Pencil, Eraser and Sharpner are Rs 2.50, Rs 1.50 and Rs 1.00 respectively and unit cost of the above three commodities are Rs 2.00, Rs 1.00 and Rs 0.50 respectively, then by using matrix method.

- Find total revenue of market A.
- Find total revenue of market B.
- Find total profit in market A and market B.

52. Amit, Bina & Chirag were given the task of creating a square matrix of order 2. Below are the matrices created by them. $A = \begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix}$, $B = \begin{bmatrix} 4 & 0 \\ 1 & 5 \end{bmatrix}$ & $C = \begin{bmatrix} 2 & 0 \\ 1 & -2 \end{bmatrix}$.

On the basis of the above information, answer the following questions:

- (a) Find the value of $|A + (B + C)|$ (1)

- (b) Evaluate $|(A^T)^T|$ (1)
 (c) Find the matrix $(a + b)|B|$ when $a = 4$ & $b = -2$. (2)

53. Raman wants to donate a rectangle plot of land for a school in her village. When she was asked to give dimensions of the plot, she told that if its length is decreased by 50 m and breath is increased by 50 m, then its area does not alter, but if length is decreased by 10 m and breath is decreased by 20 m, then its area will decreased by 5300 m^2
- (a) If the length & breath of the rectangular plot are x m and y m respectively, then find the system of linear equations in x, y .
- (b) Write the matrix equation representing the system of equations obtained in (i).
- (c) What is the length of the rectangular plot. (solve by matrix method).
54. Shopkeeper. His friends, Daya and Anil purchases 2 pens, 1 pencil, 2 instrument boxes and 2 pens, 2 pencils and 2 mathematical instrument boxes respectively. Daya and Anil pays ₹ 29 and ₹ 44 respectively.

Based on the above information answer the following

- (a) The cost of one pen is
 (i) ₹ 2 (ii) ₹ 5 (iii) ₹ 10 (iv) ₹ 15
- (b) The cost of one pen and one pencil is
 (i) ₹ 5 (ii) ₹ 10 (iii) ₹ 15 (iv) ₹ 17
- (c) The cost of one pen and one mathematical instrument box is
 (i) ₹ 7 (ii) ₹ 10 (iii) ₹ 15 (iv) ₹ 18
- (d) The cost of one pencil and one mathematical instrumental box is
 (i) ₹ 5 (ii) ₹ 10 (iii) ₹ 15 (iv) ₹ 20

56. Three vegetable shopkeepers A, B and C are using polythene bags. Handmade bags which are prepared by old age home workers and newspapers' envelope as carry bags. It is found that A, B and C are using (20, 30, 40), (30, 40, 20) and (40, 20, 30) polythene bags, handmade bags, and newspaper envelopes respectively. The shopkeepers A, B, and C spent ₹ 250, ₹ 270 and ₹ 200 on these bags respectively.

Based on the above information answer the following:

- (a) What is the cost of one handmade bag?
 (b) What is the cost of one polythene bag?
 (c) What is the cost of one newspaper bag?

OR

Which vegetable shopkeeper is better, based on the social condition?

Chapter : – Relation & Function

Multiple choice questions – 1 mark each

55. A relation R defined on a set of human being as $R = \{(x, y) : x \text{ is } 5 \text{ cm shorter than } y\}$ is
- (b) Reflexive only (c) Symmetric and transitive
 (c) Reflexive and transitive (d) None of above

56. Let R be a relation on the set Z of integers given by aRb iff $a = 3^k b$ for some integer k . Then R
- (a) Symmetric but not transitive (c) Not symmetric but transitive
(b) Neither symmetric nor transitive (d) Equivalence relation
57. S is a relation over the set of R of all real numbers and it is given by $(a, b) \in S$ iff $ab \geq 0$. Then S
- (a) Symmetric & transitive (c) Reflexive and Symmetric
(b) Reflexive and transitive (d) Equivalence relation
58. Let set $X = \{1, 2, 3\}$ and a relation R on X defined as $R = \{(1, 3) (2, 2) (3, 2)\}$, then minimum ordered pairs which should be added in relation R to make it reflexive and symmetric are:
- (a) $\{(1, 1) (2, 3) (1, 2)\}$ (c) $\{(3, 3) (3, 1) (1, 2)\}$
(b) $\{(1, 1) (3, 3) (3, 1) (2, 3)\}$ (d) $\{(1, 1) (3, 3) (3, 1) (1, 2)\}$
59. Let $A = \{1, 2, 3\}$, Then, the number of relations containing $(1, 2)$ & $(1, 3)$ which are reflexive and symmetric but not transitive is:
- (b) 1 (b) 2 (c) 3 (d) 4
60. The number of possible reflexive relations on a set of 3 elements is:
- (b) 512 (b) 64 (c) 256 (d) 128
61. Let $f(x) = \log(1 - x) + \sqrt{x^2 - 1}$. Then, the domain of f is
- (a) $(1, \infty)$ (b) $(-\infty, -1]$ (c) $[-1, 1)$ (d) $(0, 1)$
62. If f is a real function defined by $f(x) = \frac{\log(2x+1)}{\sqrt{3-x}}$, then the domain of the function is
- (a) $(-\frac{1}{2}, \infty)$ (b) $(-\infty, 3)$ (c) $(-\frac{1}{2}, 3]$ (d) $(-\frac{1}{2}, 3)$
63. If a function $f : [2, \infty) \rightarrow R$ is defined by $f(x) = x^2 - 4x + 5$, then the range of f is:
- (b) R (b) $[1, \infty)$ (c) $[4, \infty)$ (d) $[5, \infty)$
64. If $g = \{(1, 1) (2, 3) (3, 5) (4, 7)\}$ is described as $g(x) = \alpha x + \beta$, then $(\alpha, \beta) =$
- (b) $(2, 1)$ (b) $(2, -1)$ (c) $(-2, 1)$ (d) $(-2, -1)$
65. If $A = \{a, b, c\}$ and $B = \{-3, -1, 0, 1, 3\}$, then the number of injection that can be defined from A to B
- (b) 125 (b) 243 (c) 60 (d) 120
66. If $A = \{0, 1, 2, 3, 4\}$ and $B = \{a, b\}$, then the number of onto functions from A to B is :
- (b) 20 (b) 31 (c) 30 (d) None of these
67. A function $f: R \rightarrow A$ defined as $f(x) = x^2 + 1$ is onto, if A is
- (b) $(-\infty, \infty)$ (b) $(1, \infty)$ (c) $[1, \infty)$ (d) $[-1, \infty)$
68. Which of the following statements are correct ?
- (b) A greatest integer function is one-one in R . (c) A constant function is onto in R .
(c) A signum function is into in R . (d) A cubic function is not bijective in R .
69. Let Z denote the set of integers, then function $f: Z \rightarrow Z$ defined as $f(x) = x^3 - 1$ is :
- (b) Both one -one and onto (c) One-one but not onto

- (c) Onto but not one-one (d) Neither one –one nor onto
70. If $f(x) = \cos[\pi^2]x + \cos[-\pi^2]x$; $[.]$ denotes a greatest integer function, then which of the following are correct.
- (b) $f(0) = 0$ (b) $f\left(\frac{\pi}{2}\right) = -1$ (c) $f(\pi) = 0$
 (d) $f(-x) = 2$
71. Let $f(x) = \sqrt{\log(2x - x^2)}$. Then, domain of f is :
 (b) (0,2) (b) [1,2] (c) $(-\infty, 1]$ (d) None of these
72. The domain of $f(x) = \frac{\log_{(x+1)}(x-2)}{e^{2\log x} - (2x+3)}$ is:
 (b) $\mathbb{R} - \{3\}$ (b) $(2, \infty) - \{3\}$ (c) $(-1, \infty) - \{3\}$ (d) $\mathbb{R} - \{-1, 3\}$
73. $f(x) = \frac{2^{2x}}{2^{2x} + 2}$, $x \in \mathbb{R}$, then $f\left(\frac{1}{2023}\right) + f\left(\frac{2}{2023}\right) + \dots + f\left(\frac{2022}{2023}\right)$ is equal to:
 (a) 2010 (b) 2011 (c) 1011 (d) 1010
74. The range of the function $f(x) = \frac{1}{3 - \sin 4x}$ is :
 (a) $\left[\frac{1}{4}, \frac{1}{2}\right]$ (b) $\left[\frac{1}{2}, 1\right]$ (c) $\left[\frac{1}{4}, \frac{3}{4}\right]$ (d) $\left[\frac{1}{2}, \frac{3}{4}\right]$

ASSERTION – REASON

75. **Assertion-** The reason $R = \{(x, y) : (x + y) \text{ is a prime number and } x, y \in \mathbb{N}\}$ is not a reflexive relation
Reason- The number ' $2n$ ' is composite for all natural number n .
76. **Assertion-** Let S be a relation on set R of real numbers defined by $S = \{(a, b) : 1 + ab > 0, a, b \in R\}$
Reason- S on R is symmetric relation.
77. **Assertion-** The relation $I = \{(x, y) (y, y) (z, z) (t, t)\}$ is the identity relation on set $A = \{x, y, z, t\}$.
Reason- A relation I on set A is the identity relation if every element of A is related to itself only.
78. **Assertion-** Let A be a set consisting of n elements. The number of reflexive relation on A is $2^{n(n-1)}$
Reason- A relation on a non-empty set A is a subset of $A \times A$.
79. **Assertion -** The domain of the function $f(x) = \log(3x - 2)$ is $\left(\frac{2}{3}, \infty\right)$.
Reason - The domain of the function $g(x) = \frac{1}{\sqrt{3x-2}}$ is $\left(\frac{2}{3}, \infty\right)$.
80. **Assertion –** Let A and B be two sets having m & n elements respectively such that $m < n$. Then,
 number of surjective from A to $B = \sum_{r=1}^n {}^n C_r (-1)^{n-r} r^m$
Reason - If $f: A \rightarrow B$ is a surjection, then every element of B has a pre image in A .

81. **Assertion** - If two set X & Y contain 3 and 5 elements respectively, then $C_3^5 \times 3!$ one- one functions

can be defined from X to Y .

Reason - A one one function from X to Y relates different elements of set X to different elements

Of set X to different elements of set Y .

82. **Assertion** - A function $f: R - \{0\} \rightarrow R - \{0\}$ is defined by $f(x) = \frac{1}{x}$ is *one - one*

Reason - A function $f: R - \{0\} \rightarrow R - \{0\}$ is defined by $f(x) = \frac{1}{x}$ is *not onto*

83. **Assertion** - The function $f: R \rightarrow R$ defined by $f(x) = \frac{x}{x^2+1}$ is not one one.

Reason - $f(4) = \frac{4}{17}$ and $f\left(\frac{1}{4}\right) = \frac{4}{17}$

84. **Assertion** - Let m, n be natural numbers other than 1 . Then, (i) $2^{mn} > n^m$ (ii) $2^{mn} > m^n$

Reason - Every function is a relation but a relation need not be a function.

Very short answer type questions – 2 marks each

85. A relation R in $S = \{1,2,3\}$ is defined as $R = \{(1,1) (1,2) (2,2) (3,3) (3,1)\}$. Which elements of relation R be removed to make R an equivalence relation?

86. Let R be the relation in the set Z of integers given by $R = \{(a, b) : 2 \text{ divides } a - b\}$. Show that the relation R is transitive ? Write the equivalence class $[0]$.

87. Let $A = \{1,2,3,4\}$. Let R be the equivalence relation on $A \times A$ defined by $(a, b)R(c, d)$ iff $a + d = b + c$. Find the equivalence class $[(1,3)]$.

88. How many equivalence relations on the set $\{1,2,3\}$ containing $(1,2)$ and $(2,1)$ are there in all? Justify your answer.

89. An equivalence relation R in A divides it into equivalence classes A_1, A_2, A_3 . What is the value of $A_1 \cup A_2 \cup A_3$ & $A_1 \cap A_2 \cap A_3$.

90. A relation R in the set or real numbers R defined as $R = \{(a, b) : \sqrt{a} = b\}$ is a function or not. Justify.

91. Check whether the function $f: R \rightarrow R$ defined as $f(x) = x^3$ is one-one or not.

92. X & Y are two sets with their number of elements being k & l respectively ($k < l$). Find the number of onto functions that can be defined from set X to Y . Explain your answer.

93. A function $f: A \rightarrow B$ defined as $f(x) = 2x$ is both one-one onto. If $A = \{1,2,3,4\}$, then find the set B .

94. Find the range of the function, $f(x) = P_{x-3}^{7-x}$

95. Find domain and range of the real valued function defined by $f(x) = \frac{1}{x^2-1}$

96. Let the function $f: R \rightarrow R$ be defined by $f(x) = 4x - 1, \forall x \in R$. Then show that f is one-one.

97. Let the function $f: R \rightarrow R$ be defined by $f(x) = 2x + \sin x, \forall x \in R$. Then show that f is onto.

Short answer type Questions – 3 marks each

98. A relation R on the set $A = \{1,2,3,4,5\}$ is defined as $R = \{(x, y) : |x^2 - y^2| < 8\}$. Check whether the relation R is reflexive, symmetric & transitive.
99. Check whether the relation R in the set N of natural number given by $R = \{(a, b) : a \text{ is divisor of } b\}$ is reflexive, symmetric or transitive. Also determine whether R is an equivalence relation.
100. Check whether the relation R defined on the set $A = \{1,2,3,4,5,6\}$ as $R = \{(a, b) : b = a + 1\}$ is reflexive, symmetric or transitive.
101. Let Q be the set of rational numbers and R be a relation on Q defined by $R = \{(x, y) : x, y \in Q, x^2 + y^2 = 5\}$. Check that relation R is reflexive, symmetric or transitive?
102. Show that the relation S in the set $A = \{x \in Z : 0 \leq x \leq 12\}$ given by $S = \{(a, b) : a, b \in A, |a - b| \text{ is divisible by } 3\}$ is an equivalence relation.
103. A relation R in the set $G = \{\text{All the countries in the world}\}$ is defined as $R = \{(x, y) : x \text{ \& } y \text{ shares the common bondry}\}$. Determine whether R is equivalence relation ?
104. A function f is defined from $R \rightarrow R$ as $f(x) = ax + b$, such that $f(1) = 1$ and $f(2) = 3$. Find function $f(x)$. Hence, check whether function $f(x)$ is one-one and onto or not.
105. Show that the modulus function $f: R \rightarrow R$, given by $f(x) = |x|$, is neither one one nor onto.
106. Show that the Greatest integer function $f: R \rightarrow R$, given by $f(x) = [x]$, is neither one one nor onto.
107. Show that the function $f: R - \{-1\} \rightarrow R - \{1\}$ given by $f(x) = \frac{x}{x+1}$ is bijective.
108. Let A & B be sets, Show that $f: A \times B \rightarrow B \times A$ such that $f(a, b) = (b, a)$ is bijective function.
109. If the function $f: R \rightarrow A$ given by $f(x) = \frac{x^2}{x^2+1}$ is a surjection, then find set A .
110. Consider a bijective function $f: R_+ \rightarrow (7, \infty)$ given by $f(x) = 16x^2 + 24x + 7$, where R_+ is the set of all positive real numbers. Find the inverse function of f .

Long answer type questions – 5 marks each

111. Let N be the set of natural numbers and R be the relation on $N \times N$ defined by $(a, b)R(c, d)$ iff $ad = bc$ for all $a, b, c, d \in N$. Show that R is an equivalence relation.
112. A relation R is defined on $N \times N$ as $(a, b)R(c, d)$ iff $a - c = b - d$, where N is set of all natural numbers. show that R is an equivalence relation.
113. Let N denotes the set of all natural numbers and R be the relation on $N \times N$ defined by $(a, b)R(c, d)$

iff $ad(b + c) = bc(a + d)$, Show that R is an equivalence relation.

114. Check whether the relation S in the set of real numbers R defined by $S = \{(a, b) : \text{where } a - b + \sqrt{2} \text{ is an irrational number}\}$ is reflexive, symmetric or transitive.
115. Given a non empty set X, define the relation R in $P(X)$ as follows: For $A, B \in P(X)$, $(A, B) \in R$ iff A is the subset of B. Prove that R is reflexive, transitive and not symmetric.
116. Prove that a function $f: [0, \infty) \rightarrow [-5, \infty)$ defined as $f(x) = 4x^2 + 4x - 5$ is one – one and onto.
117. Show that a function $f: R \rightarrow R$ defined by $f(x) = \frac{2x}{1+x^2}$ is neither one –one nor onto. Further , find set A so that the given function $f: R \rightarrow A$ becomes an onto function.
118. A function $f: [-4,4] \rightarrow [0,4]$ is given by $f(x) = \sqrt{16 - x^2}$. Show that f is an onto function but not a one one function . Further, find all possible values of 'a' for which $f(a) = \sqrt{7}$.
119. If $f(x) = 3 + \left(\frac{e^{3x} + e^{-3x}}{e^{3x} - e^{-3x}}\right)$ and $f^{-1}(x) = \frac{1}{A} g(x)$. find : (i) the value of A (ii) $g(x)$
120. Prove that the function $f: N \rightarrow N$ defined by $f(x) = x^2 + x + 1$ is one one but not onto . Find inverse of $f: N \rightarrow S$, where S is range of f.
121. Let $A = R - \{5\}$ & $B = R - \{1\}$. Consider the function $f: A \rightarrow B$ defined by $f(x) = \frac{x-3}{x-5}$. Show that f is one one and onto.
122. Check whether a function $f: R \rightarrow \left[-\frac{1}{2}, \frac{1}{2}\right]$ defined as $f(x) = \frac{x}{1+x^2}$ is one one and onto or not.
123. Let $f: R - \left\{-\frac{4}{3}\right\} \rightarrow R$ be a function defined as $f(x) = \frac{4x}{3x+4}$. Show that f is a one one function. Also ckeck whether f is an onto function or not?
124. A function $f: R - \{-1,1\} \rightarrow R$ defined by $f(x) = \frac{x}{x^2-1}$
- (i) Check if f is one- one
- (ii) Check if f is onto
125. Prove that the function f is surjective, where $f: N \rightarrow N$ such that $f(n) = \begin{cases} \frac{n+1}{2} & \text{if } n \text{ is odd} \\ \frac{n}{2} & \text{if } n \text{ is even} \end{cases}$
- Is the function injective ? Justify your answer.
126. Show that a function $f: (-\infty, 0) \rightarrow (-1,0)$ defined as $f(x) = \frac{x}{1+|x|}$, $x \in (-\infty, 0)$ is one- one & onto
127. Show that the function $f: R \rightarrow R$ defined by $f(x) = x^2 + x + 1$ is neither one one nor onto . Also , find the values of x for which $f(x) = 3$.
128. Let $f: W \rightarrow W$ be defined as $f(n) = \begin{cases} n - 1, & \text{if } n \text{ is odd} \\ n + 1, & \text{if } n \text{ is even} \end{cases}$. Show that f is invertible.
- W is set of whole numbers.
129. Let R be a relation on the set of natural numbers N as follows:

$R = \{(x, y) : x \in N, y \in N, 2x + y = 41\}$. Find the domain & range of the relation R. Also verify whether R is reflexive, symmetric & transitive.

Case Study based Questions – 4 marks each

130. Students of a school are taken to a railways museum to learn about railways heritage and its history.

An exhibition in the museum depicts many rail lines on the track near the railway station. Let L be the set of all rail lines on the railway station. Let L be the set of all rail lines on the railway track and R be the relation on L defined by : $R = \{(l_1, l_2) : l_1 \text{ is parallel to } l_2\}$

Based on the above information, answer the following questions:

- (i) Find whether the relation R is symmetric or not?
- (ii) Find whether the relation R is transitive or not?
- (iii) If one of the rail lines on the railway track is represented by the equation $y = 3x + 2$, then find the set of rail lines in R related to it.

OR

Let S be the relation defined by $S = \{(l_1, l_2) : l_1 \text{ is perpendicular to } l_2\}$ check whether the relation S is symmetric & transitive.

131. An organization conducted bike race under two different categories— Boys and Girls. There were 28 participants in all. Among all of them, finally three from category 1 and two from category 2 were selected for the final race. Ravi forms two sets B & G with these participants for his college project.

Let $B = \{b_1, b_2, b_3\}$ & $G = \{g_1, g_2\}$, where B represents the set of Boys selected and G represents the set of Girls selected for the final race.

Based on the above information, answer the following questions:

- (i) How many relations are possible from B to G?
- (ii) Among all the possible relations from B to G, how many functions can be formed from B to G.
- (iii) Let $R: B \rightarrow B$ be defined by $R = \{(x, y) : x \text{ & } y \text{ are students of the same gender}\}$. Check R is equivalence or not?

OR

A function $f: B \rightarrow G$ be defined by $f = \{(b_1, g_1), (b_2, g_2), (b_3, g_1)\}$. Check if f is bijective. Justify your answer.

132. Raji visited the amusement park with her family. The amusement park featured a huge swing that attracted many children. Raji noticed that the swing traced the path of a parabola given by $y = x^2$.

Based on the above information, answer the following questions:

- (i) If $f: R \rightarrow R$ is defined by $f(x) = x^2$, then show that f is neither injective nor surjective.
- (ii) If $f: N \rightarrow N$ is defined by $f(x) = x^2$, then show that f is injective but not surjective.

- (iii) If $f: \{1,2,3,4 \dots\} \rightarrow \{1,4,9,16, \dots\}$ is defined by $f(x) = x^2$, then show that f is bijective.

OR

Show that the function $f: \mathbb{Z} \rightarrow \mathbb{Z}$ defined by $f(x) = x^2$ is neither injective nor surjective.

133. In a school, the students of class XII were discussing Relations and Functions. Two students wrote the first four natural numbers and the vowels of the English alphabets in the form of sets as follows:

$$A = \{1,2,3,4\}; B = \{a, e, i, o, u\}$$

Based on the above information , answer the following questions:

- Find the number of relations from set A to set B.
- Find the number of functions from set A to set B.
- If the function $f: A \rightarrow B$ is defined by $f = \{(1, a) (2, e) (3, i) (4, u)\}$, is f One -one into?

OR

Find the numbers of one one function from set A to set B.

134. A factory manufactures a triangular shaped sachet for sauce. These all triangular shaped sachet are same in shape and size. Let T be the set of all triangles in a plane with R a relation in T given by

$$R = \{(T_1, T_2) \in R \Rightarrow T_1 \text{ is congruent to } T_2\}$$

Based on the above information , answer the following questions:

- State whether the relation R on the set T is reflexive or not. Give reason.
- State whether the relations R on the set T is symmetric or not. Give reason.
- State whether the relation R on the set T is an equivalence relation?

OR

State whether the relation R on the set T is transitive or not. Give reason.

135. A general election of Lok sabha is a gigantic exercise. About 911 million people were eligible to vote and voter turnout was about 67%, the highest ever. Let I be the set of all citizens of India who were eligible to exercise their voting right in general election held in 2019. A relation 'R' is defined on I as follows:

$$R = \{(V_1, V_2) : V_1, V_2 \in I \text{ \& both use their voting right in general election – 2019}\}$$

- Two neighbours X & $Y \in I$. X exercised his voting right while Y did not cast her vote in general election –2019. Check whether X is related to Y or not.
- Mr. X and his wife W both exercised their voting right in general election-2019. Show that
 $(X, W) \in R$ & $(W, X) \in R$.
- Show that the relation R defined on set I is an equivalence relation.



DELHI PUBLIC SCHOOL BULANDSHAHR

HOLIDAY HOMEWORK (SESSION: 2025 – 2026)



XII, COMPUTER SCIENCE

Question 1:

Write queries for (i) to (iv) and find outputs for SQL queries (v) to (viii), which are based on the tables.

Table : VEHICLE

VCODE	VEHICLETYPE	PERKM
V01	VOLVO BUS	150
V02	AC DELUXE BUS	125
V03	ORDINARY BUS	80
V05	SUV	30
V04	CAR	18

Table : TRAVEL

CNO	CNAME	TRAVELDATE	KM	VCODE	NOP
101	K. Niwal	2015-12-13	200	V01	32
103	Fredrick Sym	2016-03-21	120	V03	45
105	Hitesh Jain	2016-04-23	450	V02	42
102	Ravi Anish	2016-01-13	80	V02	40
107	John Malina	2015-02-10	65	V04	2
104	Sahanubhuti	2016-01-28	90	V05	4
106	Ramesh Jaya	2016-04-06	100	V01	25

Note:

PERKS is Freight Charges per kilometer.

Km is kilometers Travelled

NOP is number of passangers travelled in vechicle.

- I. To display CNO, CNAME, TRAVELDATE from the table TRAVEL in descending order of CNO.
- II. To display the CNAME of all customers from the table TRAVEL who are travelling by vechicle with code Vo1 or Vo2
- III. To display the CNO and CNAME of those customers from the table TRAVEL who travelled between '2015-12-31' and '2015-05-01'.
- IV. To display all the details from table TRAVEL for the customers, who have travel distacne more than 120 KM in ascending order of NOE
- V. SELECT COUNT (*), VCODE FROM TRAVEL GROUP BY VCODE HAVING COUNT (*) > 1;
- VI. SELECT DISTINCT VCODE FROM TRAVEL :
- VII. SELECT A.VCODE, CNAME, VEHICLETYPE FROM TRAVEL A, VEHICLE B WHERE A. VCODE = B. VCODE and KM < 90;

VIII. SELECT CNAME, KM*PERKM FROM TRAVEL A, VEHICLE B WHERE A.VCODE = B.VCODE AND A. VCODE 'V05';

Question 2:

Write SQL queries for (i) to (iv) and find outputs for SQL queries (v) to (viii), which are based on the tables TRANSPORT and TRIP

TABLE: TRANSPORT

TCODE	TTYPE	PERKM
103	ORDINARY BUS	90
105	SUV	40
104	CAR	20
103	ORDINARY BUS	90
101	VOLVO BUS	160
102	AC DELUXE BUS	140

Note:

PERKS is Freight Charages per kilometer

TTYPE is Transport Vehicle Type

TABLE: TRIP

NO	NAME	TDATE	KM	TCODE	NOP
11	Tanish Khan	2015-12-13	200	101	32
13	Danish Sahai	2016-06-21	100	103	45
15	Ram Kumar	2016-02-23	350	102	42
12	Fen Shen	2016-01-13	90	102	40
17	Aan Kumar	2015-02-10	75	104	2
14	Veena	2016-06-28	80	105	4
16	Rajpal Kirti	2016-06-06	200	101	25

Note:

NO is Driver Number

KM is Kilometer travelled

NOP is number of travellers travelled in vehicle

TDATE is Trip Date

- I. To display NO, NAME, TDATE from the table TRIP in descending order of NO.
- II. To display the NAME of the drivers from the table TRIP who are traveling by transport vehicle with code 101 or 103.
- III. To display the NO and NAME of those drivers from the table TRIP who travelled between '2015-02-10' and '2015-04-01'.
- IV. To display all the details from table TRIP in which the distance travelled is more than 100 KM in ascending order of NOP
- V. SELECT COUNT (*), TCODE From TRIP GROUP BY TCODE HAVING COUNT (*) > 1;
- VI. SELECT DISTINCT TCODE from TRIP;
- VII. SELECT A.TCODE, NAME, TTYPE FROM TRIP A, TRANSPORT B WHERE A. TCODE = B. TCODE AND KM < 90;
- VIII. SELECT NAME, KM *PERKM FROM TRIP A, TRANSPORT B WHERE A. TCODE = B. TCODE AND A. TCODE = 105';

Question 3: Write SQL queries given below on the basis of following table –

Table : SchoolBus

Rtno	Area_covered	Capacity	Noofstudents	Distance	Transporter	Charges
1	Vasant kunj	100	120	10	Shivamtravels	100000
2	Hauz Khas	80	80	10	Anand travels	85000
3	Pitampura	60	55	30	Anand travels	60000
4	Rohini	100	90	35	Anand travels	100000
5	Yamuna Vihar	50	60	20	Bhalla Co.	55000
6	Krishna Nagar	70	80	30	Yadav Co.	80000
7	Vasundhara	100	110	20	Yadav Co.	100000
8	Paschim Vihar	40	40	20	Speed travels	55000
9	Saket	120	120	10	Speed travels	100000
10	Jank Puri	100	100	20	Kisan Tours	95000

- (b) To show all information of students where capacity is more than the no of student in order of rtno.
- (c) To show area_covered for buses covering more than 20 km., but charges less than 80000.
- (d) To show transporter wise total no. of students traveling.
- (e) To show rtno, area_covered and average cost per student for all routes where average cost per student is - charges/noofstudents.

- (f) Add a new record with following data:
(11, " Moti bagh",35,32,10," kisan tours ", 35000)
- (g) Give the output considering the original relation as given:
- (i) select sum(distance) from schoolbus where transporter= "Yadav Co.";
 - (ii) select min(noofstudents) from schoolbus;
 - (i) select avg(charges) from schoolbus where transporter= "Anand travels";
 - (ii) select distinct transporter from schoolbus;

Question 4: Write SQL queries given below on the basis of following table –

TABLE : GRADUATE

S.NO	NAME	STIPEND	SUBJECT	AVERAGE	DIV.
1	KARAN	400	PHYSICS	68	I
2	DIWAKAR	450	COMP. Sc.	68	I
3	DIVYA	300	CHEMISTRY	62	I
4	REKHA	350	PHYSICS	63	I
5	ARJUN	500	MATHS	70	I
6	SABINA	400	CEHMISTRY	55	II
7	JOHN	250	PHYSICS	64	I
8	ROBERT	450	MATHS	68	I
9	RUBINA	500	COMP. Sc.	62	I
10	VIKAS	400	MATHS	57	II

- a) List the names of those students who have obtained DIV 1 sorted by NAME.
- b) Display a report, listing NAME, STIPEND, SUBJECT and amount of stipend received in a year assuming that the STIPEND is paid every month.
- c) To count the number of students who are either PHYSICS or COMPUTER SC graduates.
- d) To insert a new row in the GRADUATE table: 11,"KAJOL", 300, "computer sc", 75, 1
- e) Give the output of following sql statement based on table GRADUATE:
 - (i) Select MIN(AVERAGE) from GRADUATE where SUBJECT="PHYSICS";
 - (ii) Select SUM(STIPEND) from GRADUATE WHERE div=II;
 - (iii) Select AVG(STIPEND) from GRADUATE where AVERAGE>=65;
 - (iv) Select COUNT(distinct SUBJECT) from GRADUATE;
- f) Assume that there is one more table GUIDE in the database as shown below:

Table: GUIDE

MAINAREA	ADVISOR
PHYSICS	VINOD
COMPUTER SC	ALOK

CHEMISTRY	RAJAN
MATHEMATICS	MAHESH

g) What will be the output of the following query:

SELECT NAME, ADVISOR FROM GRADUATE, GUIDE WHERE SUBJECT= MAINAREA;

Question 5: Write SQL queries given below on the basis of following table –

Table: Employees

Empid	Firstname	Lastname	Address	City
010	Ravi	Kumar	Raj nagar	GZB
105	Harry	Waltor	Gandhi nagar	GZB
152	Sam	Tones	33 Elm St.	Paris
215	Sarah	Ackerman	440 U.S. 110	Upton
244	Manila	Sengupta	24 Friends street	New Delhi
300	Robert	Samuel	9 Fifth Cross	Washington
335	Ritu	Tondon	Shastri Nagar	GZB
400	Rachel	Lee	121 Harrison St.	New York
441	Peter	Thompson	11 Red Road	Paris

Table: EmpSalary

Empid	Salary	Benefits	Designation
010	75000	15000	Manager
105	65000	15000	Manager
152	80000	25000	Director
215	75000	12500	Manager

244	50000	12000	Clerk
300	45000	10000	Clerk
335	40000	10000	Clerk
400	32000	7500	Salesman
441	28000	7500	salesman

Write the **SQL commands** for the following :

- (i) To show firstname,lastname,address and city of all employees living in paris
 - (ii) To display the content of Employees table in descending order of Firstname.
 - (iii) To display the firstname,lastname and total salary of all managers from the tables Employee and empsalary , where total salary is calculated as salary+benefits.
 - (iv) To display the maximum salary among managers and clerks from the table Empsalary.
- Give the **Output** of following SQL commands:

- (i) Select firstname,salary from employees ,empsalary where designation = 'Salesman' and Employees.empid=Empsalary.empid;
- (ii) Select count(distinct designation) from empsalary;
- (iii) Select designation, sum(salary) from empsalary group by designation having count(*) >2;
- (iv) Select sum(benefits) from empsalary where designation ='Clerk';

Question 6: Write SQL queries given below on the basis of following table –

TABLE : FURNITURE					
No	ITEMNAME	TYPE	DATEOFSTOCK	PRICE	DISC
1	White Lotus	Double Bed	23/02/02	30000	25
2	Pink feather	Baby cot	20/01/02	7000	20
3	Dolphin	Baby cot	19/02/02	9500	20
4	Decent	Office table	01/01/02	25000	30
5	Comfort zone	Double bed	12/01/02	25000	25
6	Donald	Baby cot	24/02/02	6500	15
7	Royal finish	Office table	20/02/02	18000	30
8	Royal tiger	Sofa	22/02/02	31000	30
9	Econo	Sofa	13/12/01	9500	25
10	Eating paradise	Dining table	19/02/02	11500	25
TABLE : ARRIVALS					
No	ITEMNAME	TYPE	DATEOFSTOCK	PRICE	DISC
11	Wood comfort	Double bed	23/03/03	25000	25
12	Old fox	Sofa	20/02/03	17000	20
13	Milky	Baby cot	21/02/03	7500	15

- a) To show all information about the baby cots from the FURNITURE table.

- b) To list the ITEMNAME which are priced at more then 15000 from the FURNITURE table.
- c) To list ITEMNAME and the type of those items, in which DATEOFSTOCK is before 22/01/02 from the FURNITURE table in descending order of ITEMNAME.
- d) To display ITEMNAME and DATEOFSTOCK of those items, in which the DISC percentage is more then 25 from FURNITURE table.
- e) To count the number of items, whose type is SOFA from FURNITURE table?
- f) To insert a new row in ARRIVAL table.
- g) Give the output of the following SQL command.
 - a. SELECT COUNT (DISTINCT TYPE) FROM FURNITURE
 - b. SELECT MAX (DISCOUNT) FROM FURNITURE WHERE TYPE="Baby cot"
 - c. SELECT AVG (DISCOUNT) FROM ARRIVALS WHERE TYPE='D. bed'
 - d. SELECT SUM (PRICES) FROM FURNITURE WHERE DATEOFSTOCK<{12/02/02}

Question 7: Write SQL queries given below on the basis of following table –

NO.	TITLE	TYPE	RATING	STARS	QTY	PRICE
1	Gone with the world	Drama	G	Gable	4	39.95
2	Friday the 13 th	Horror	R	Jason	2	69.95
3	Top Gun	Drama	PG	Cruise	7	49.95
4	Splash	Comedy	PG13	Hanks	3	29.95
5	Independence day	Drama	R	Turner	3	19.95
6	Risky Business	Comedy	R	Cruise	2	44.95
7	Cocoon	Scifi	PG	Ameche	2	31.95
8	Crocodile Dundee	Comedy	PG13	Harris	2	69.95
9	101 Dalmatians	Comedy	G	Cruise	3	59.95
10	Tootsie	Comedy	PG	Hoffman	1	29.95

- a) Find the total value of the movie cassettes available in the library.
- b) Display a list of all movies with Price over 20 and sorted by price
- c) Display all movies sorted by QTY in descending order.
- d) Display a report listing movie number, current value and replacement value for each movie in the above table. Calculate the replacement value for all movies as QTY*PRICE*1.15.
- e) Count the number of movies where Rating is not "G".
- f) Insert a new movie in the MOV table. Fill all the columns with values.
- g) Give the output of following SQL commands on the basis of table MOV.
 - i. Select AVG(Price) FROM MOV where Price<30;

- ii. Select MAX(Price) FROM MOV where Price>30;
- iii. Select SUM(Price*QTY) FROM MOV where QTY<4;
- iv. Select COUNT(distinct TYPE) FROM MOV

Question 8: Write SQL queries given below on the basis of following table –

TABLE : CONSIGNOR

CnorID	CnorName	CnorAddress	City
ND01	R singhal	24,ABC Enclave	New Delhi
ND02	AmitKumar	123,Palm Avenue	New Delhi
MU15	R Kohil	5/A,South,Street	Mumbai
MU50	S Kaur	7-K,Westend	Mumbai

TABLE : CONSIGNEE

CneeID	CnorID	CneeName	CneeAddress	CneeCity
MU05	ND01	RahulKishore	5,Park Avenue	Mumbai
ND08	ND02	P Dhingr a	16/j,Moore Enclave	New Delhi
KO19	MU15	A P Roy	2A,Central/ avenue	Kolkata
MU32	ND0 2	S mittal	P 245, AB Colony	Mumbai
ND48	MU5 0	B P jain	13,Block d,a,viha	New Delhi

- (i) To display the names of all consignors from Mumbai.
- (ii) To display the cneeID, cnorName, cnorAddress, CneeName, CneeAddress for every Consignee.
- (iii) To display the consignee details in ascending order of CneeName.
- (iv) To display number of consignors from each city.
- (v) SELECT DISTINCT City FROM CONSIGNEE;

(vi) SELECT A.CnorName A, B.CneeName B FROM Consignor A, Consignee B WHERE A.CnorID=B.CnorID

AND B.CneeCity='Mumbai';

(vii) SELECT CneeName,CneeAddress FROM Consignee WHERE CneeCity Not IN ('Mumbai', 'Kolkata');

(viii) SELECT CneeID, CneeName FROM Consignee WHERE CnorID = 'MU15' OR CnorID = 'ND01';

Python SQL Connectivity

Q9. Write a program in python to show the python – mysql connectivity by displaying records from existing table based on some Criteria.

Existing Table : Book

BOOKCODE	BOOKNAME	AUTHOR	PRICE
B001	COMPUTER SCIENCE	PREETI ARORA	500
B002	INFORMATICS PRACTICES	PREETI ARORA	500
B003	COMPUTER SCIENCE WITH C++	SUMITA ARORA	400
B004	OPERATING SYSTEM	GALVIN	600
B005	SQL	EVAN BAYROSS	650

Criteria/Condition : Display Bookcode and their name of those whose Price lies between 300 and 600(300 and 600 are also included)

Q10. Write a program in python to show the python – mysql connectivity by displaying records from existing table based on some Criteria.

Existing Table : Employee

EMPCODE	EMPNAME	EMPDESIG	EMPSAL
1	CHETAN	ACCOUNTANT	20000
2	ROHIT	MANAGER	50000
3	REENA	SUPERVISOR	20000
4	RAHUL	SECRETARY	25000
5	RAJ	IT HEAD	35000

Criteria/Condition : Display only those records whose salary lies between 20000 and 30000(20000 and 30000 are also included)

Q11. Write a program in python to show the python – mysql connectivity by displaying records from existing table based on some Criteria. Existing Table : Student

ROLLNO	NAME	CLASS	MARKS
1	ANJALI	XII SC	100
2	AMAN	XII COM	200
3	ANITA	XII SC	300
4	ANJALI	XII SC	450
5	ATUL	XIICOM	345

Criteria/Condition : Display only those records whose marks lies between 200 and 400(200 and 400 are also included)

Q12. Write a MySQL-Python connectivity to retrieve data, one record at a time, from city table for employees with id less than 10

SECTION B THEORY QUESTIONS

1. What is connection? What is its role?
2. Which package must be imported in Python to create a database connectivity application?
3. Which function is used to get multiple records retrieved as the result of SQL query executed?
4. Which method is used to close the open database connection?
5. To make the changes made by any SQL Queries permanently in database, which function is used after execution of the query ?
6. Which function is used to execute an SQL query from within a Python program?
7. Identify the name of connector to establish bridge between Python and MySQL
 - a) mysql.connection
 - b) connector
 - c) mysql.connect
 - d) mysql.connector
8. Which of the following component act as a container to hold all the data returned from the query and from there we can fetch data one at a time
9. Which attribute of cursor is used to get number of records stored in cursor (Assuming cursor name is mycursor)?
 - a) mycursor.count
 - b) mycursor.row_count
 - c) mycursor.records
 - d) mycursor.rowcount

2 MARKS QUESTIONS

10. Write the code to create the connection in which database's name is Python, name of host, user and password can taken by user. Also, print that connection?
11. Explain the following results retrieval methods with examples- fetchone () rowcount ()
12. Write a small python program to insert a record in the table books with attributes (title ,isbn).
13. Differentiate between fetchone() and fetchall() methods.

Question 9: Write SQL queries given below on the basis of following table –

TABLE : SENDER

SenderID	SenderName	Sender Address	Sender City
ND01	R jain	2,ABC Appts	New Delhi
MU02	H sinha	12, Newton	Mumbai
MU1 5	S haj	27/ A,Park Street	New Delhi
ND5 0	T Prasad	122-K,SDA	Mumbai

TABLE :RECIPIENT

RecID	SenderID	ReCName	RecAddress	ReCCity
KO05	ND01	RBajpayee	5,Central Avenue	Kolkata
ND08	MU0 2	S Mahajan	116, A Vihar	NewDelhi
MU19	ND01	H sing	2A,Andheri East	Mumbai
MU32	MU1 5	PK Swamy	B5, CS erminus	Mumbai
ND48	ND50	S Tripathi	13, B1 D,Mayur Vihar	NewDelhi

- (i) To display the names of all senders from Mumbai.
- (ii) To display the recID, senderName, senderAddress, RecName, RecAddress for every receipt.
- (iii) To display the sender details in ascending order of SenderName.
- (iv) To display number of Recipients from each city.
- (v) SELECT DISTINCT SenderCity FROM Sender;
- (vi) SELECT A.SenderName A, B.RecName FROM Sender A, Recipient B WHERE A.SenderID=B. SenderID
AND B.RecCity='Mumbai';

(vii) SELECT RecName,RecAddress FROM Recipient WHERE RecCity Not IN ('Mumbai','Kolkata');

(viii) SELECT RecID, RecName FROM Recipient WHERE SenderID = 'MU02' OR SenderID = 'ND50';

Question 10: Write SQL queries given below on the basis of following table –

TABLE: FLIGHTS

FL_NO	STARTING	ENDING	NO_FLGHTS	NO_STOPS
IC301	MUMBAI	DELHI	8	0
IC799	BANGALORE	DELHI	2	1
MC101	INDORE	MUMBAI	3	0
IC302	DELHI	MUMBAI	8	0
AM812	KANPUR	BANGLORE	3	1
IC899	MUMBAI	KOCHI	1	4
AM501	DELHI	TRIVENDRUM	1	5
MU499	MUMBAI	MADRAS	3	3
IC701	DELHI	AHMEDABAD	4	0

TABLE:FLIGHTS

FL_NO	AIRLINES	FARE	TAX%
IC701	INDIAN AIRLINES	6500	10
MU499	SAHARA	9400	5
AM501	JET AIRWAYS	13450	8
IC899	INDIAN AIRLINES	8300	4
IC302	INDIAN AIRLINES	4300	10

IC799	INDIAN AIRLINES	1050	10
MC101	DECCAN AIRLINES	3500	4

- (i) Display FL_NO and NO_FLIGHTS from “KANPUR” TO “BANGALORE” from the table FLIGHTS.
- (ii) Arrange the contents of the table FLIGHTS in the ascending order of FL_NO.
- (iii) Display the FL_NO and fare to be paid for the flights from DELHI to MUMBAI using the tables FLIGHTS and FARES, where the fare to paid = FARE+FARE+TAX%/100 AND Ending=“MUMBAI”
- (iv) Display the minimum fare “Indian Airlines” is offering from the tables FARES.
- (v) Select FL_NO,NO_FLIGHTS,AIRLINES from FLIGHTS, FARES Where STARTING = “DELHI” AND FLIGHTS.FL_NO = FARES.FL_NO
- (vi) SELECT count (distinct ENDING) from FLIGHTS.

Question 11: Write SQL queries given below on the basis of following table –

TABLE: DOCTOR

ID	NAME	DEPT	SEX	EXPERIENCE
101	Johan	ENT	M	12
104	Smith	ORTHOPEDIC	M	5
107	George	CARDIOLOGY	M	10
114	Lara	SKIN	F	3
109	K George	MEDICINE	F	9
105	Johnson	ORTHOPEDIC	M	10
117	Lucy	ENT	F	3
111	Bill	MEDICINE	F	12
130	Murphy	ORTHOPEDIC	M	15

TABLE: SALARY

ID	BASIC	ALLOWANCE	CONSULTAION
101	12000	1000	300
104	23000	2300	500
107	32000	4000	500
114	12000	5200	100
109	42000	1700	200
105	18900	1690	300
130	21700	2600	300

- (i) Display NAME of all doctors who are in "MEDICINE" having more than 10 years experience from the Table DOCTOR.
- (ii) Display the average salary of all doctors working in "ENT" department using the tables. DOCTORS and SALARY Salary =BASIC+ALLOWANCE.
- (iii) Display the minimum ALLOWANCE of female doctors.
- (iv) Display the highest consultation fee among all male doctors.
- (v) SELECT count (*) from DOCTOR where SEX = "F"
- (vi) SELECT NAME, DEPT , BASIC from DOCTOR, SALRY Where DEPT = "ENT" AND DOCTOR.ID = SALARY.ID

Question 12: Write SQL queries given below on the basis of following table –

EMPLOYEES

EMPID	FIRSTNAME	LASTNAME	ADDRESS	CITY
010	GEORGE	Smith	83 First Street	Howard
105	MARY	Jones	842VineAve	Losantiville
152	SAM	Tones	33 Elm st	Paris
215	SARAH	Ackerman	440 U.S.110	Upton

244	MANILA	Sengupta	24 FriendsStreet	New Delhi
300	ROBERT	Samuel	9 Fifth Cross	Washington
335	HENRY	Williams	12 Moore Street	Boston
400	RACHEL	Lee	121 Harrison	New York
441	PETER	Thompson	11 Red road	Paris

EMPSALRAY

EMPID	SALARY	BENEFITS	DESIGNATION
010	75000	15000	Manager
105	65000	15000	Manager
152	80000	25000	Director
215	75000	12500	Manager
244	50000	12000	Clerk
300	45000	10000	Clerk
335	40000	10000	Clerk
400	32000	7500	Salesman
441	28000	7500	Salesman

(i) To display Firstname, Lastname, Address and City of all employees living in Paris from the table

EMPLOYEES.

(ii) To display the content of EMPLOYEES table in descending order of FIRSTNAME.

(iii) To display the Firstname, Lastname, and Total Salary of all managers from the tables, where Total Salary is

calculated as Salary+Benifts.

(iv) To display the Maximum salary among Managers and Clerks from the table EMPSALARY.

(v) SELECT FIRSTNAME,SALARY FROM EMPLOYEES,EMPSALARY WHERE DESTINATION

= 'Salesman' AND EMPLOYEE.EMPID=EMPSALARY.EMPID ;

(vi) SELECT COUNT (DISTINCT DESIGNATION) FROM EMPSALARY

(vii) SELECT DESIGNATION , SUM(SALARY) FROM EMPSALARY GROUP BY DESIGNATION

HAVING COUNT(*)>2;

(viii) SELECT SUM (BENEFITS) FROM EMPSALARY WHERE DESIGNATION='Clerk';

Question 13: Write SQL queries given below on the basis of following table –

WORKERS

W_ID	FIRSTNAME	LASTNAME	ADDRESS	CITY
102	Sam	Tones	33 Elm St.	Paris
105	Sarah	Ackerman	44 U.S.110	NewYork
144	Manila	Sengupta	24 Friends Street	New Delhi
210	George	Smith	83 First Street	Howard
255	Mary	Jones	842 Vine Ave.	Losantiville
300	Robert	Samuel	9 Fifth Cross	Washington
335	Henry	Williams	12 Moore Street	Boston
403	Ronny	Lee	121 Harrison St.	New York
451	Pat	Thompson	11 Red Road	Paris

DESIG

W_ID	SALARY	BENEFITS	DESIGNATION
102	75000	15000	Manager
105	85000	25000	Director
144	70000	15000	Manager

210	75000	12500	Manager
255	50000	12000	Clerk
300	45000	10000	Clerk
335	40000	10000	Clerk
400	32000	7500	Salesman
451	28000	7500	Salesman

(i) To display W_ID Firstname, address and City of all employees living in New York from the Table WORKERS.

(ii) To display the content of workers table in ascending order of LASTNAME.

(iii) To display the FIRSTNAME, LASTNAME and Total Salary of all Clerks from the tables WORKERS And DESIG, where Total salary is calculated as Salary + benefits.

(iv) To display the minimum salary among managers and Clerks from the tables DESIG.

(v) SELECT FIRSTNAME, SALARY FROM WORKERS, DESIG WHERE DESIGNATION = "MANAGER" AND WORKERS.W_ID = DESIGN.W_ID

(vi) SELECT COUNT(DISTINCT DESIGNATION) FROM DESIGN ;

(vii) SELECT DESIGNATION, SUM(SALARY) FROM DESIG GROUP BY DESIGNATION
HAVING COUNT (*) < 3;

(viii) SELECT SUM(BENIFTS) FROM DESIG WHERE DESIGNATION ="salesman";

Question 14: Write SQL queries given below on the basis of following table –

TABLE : BOOKS

BOOK_ID	BOOK_NAME	AUTHORNAME	PUBLISHER	PRICE	TYPE	QUANTITY
F0001	The Tears	William Hopkins	First Publ	750	Fiction	10
F0002	Thund erbolts	Anna Roberts	First Publ.	700	Fiction	5
T0001	My first C+ +	Brains &	EPB	250	Text	10

		Brooke				
T0002	C++ Brain works	A.W.Ros saine	TDH	325	Text	5
C001	Fast Cook	Lata Kapoore	EPB	350	Cookery	8

TABLE:ISSUED

BOOK_ID	QUANTITY_ISSUED
F0001	3
T0001	1
C0001	5

- (A) To show Book name, Author name and Price of books of EPB publisher.
- (B) To list the names of the books of FICTIONS type.
- (C) To display the names and prices of the books in descending order of their price.
- (D) To increase the price of all books of First Pub.by 50.
- (E) To Display the Book_ID, Book_Name and Quantity Issued for all books Which have been issued.
- (F) To insert a new row in the table Issued having the following data: "F0002",4
- (G) Give the output of the following queries on the above tables:
- (i) Select Count(Distinct Publishers) From Books
 - (ii) Select Sum(Price) From Books Where Quantity>5 Ans: 1350.
 - (iii) Select Book_Name,Author_Name From Books Where Price<500.
 - (iv) Select Count(*) From Books.

Question 15: Write SQL queries given below on the basis of following table –

TABLE: INTERIORS

NO	ITEM NAME	TYPE	DATEOFSTOCK	PRICE	DISCOUNT
1	Red rose	DoubleBed	23/02/02	32000	15

2	Soft touch	Baby cot	20/01/02	9000	10
3	Jerry'shome	Baby cot	19/02/02	8500	10
4	Rough wood	Office Table	01/01/02	20000	20
5	Comfort zone	Double Bed	12/01/02	15000	20
6	Jerry look	Baby cot	24/02/02	7000	19
7	Lion king	Office Table	20/02/02	16000	20
8	Royal tiger	Sofa	22/02/02	30000	25
9	Park sitting	Sofa	13/12/01	9000	15
10	Dine paradise	DinningTable	19/02/02	11000	15

TABLE:NEWONES

NO	ITEMNAME	TYPE	DATEOFSTOCK	PRICE	DISCOUNT
11	White wood	Doublebed	23/03/03	20000	20
12	James007	Sofa	20/02/03	15000	15
13	Tom look	Baby cot	21/02/03	7000	10

- (A) To show all information about the sofas from the INTERIORS table.
- (B) To list ITEMNAME and TYPE of those items, in which DATEOFSTOCK is before 22/01/02 from the INTERIORS table in descending order of ITEMNAME.
- (C) To display ITEMNAME and DATEOFSTOCK of those items in which the Discount percentage is more than 15 from INTERIORS.
- (D) To count the number of items whose type is "Double bed";
- (E) To insert new row in the NEWONES table with the following data:14, "True Indian ", "Office Table ", {28/03/03},15000,20.
- (F) Give the outputs for the following SQL statements.

(i) Select COUNT (distinct TYPE) from INTERIORS;

(ii) Select AVG(DISCOUNT)from INTERIORS where TYPE ="Baby cot";

(iii) Select SUM(price)from INTERIORS where DATEOFSTOCK<{12/02/02};

Question 16: Write SQL queries given below on the basis of following table –

Teacher

No	Name	Department	DateofJoining	Salary	Sex
1	Raja	Computer	21/5/98	8000	M
2	Sangita	History	21/5/97	9000	F
3	Ritu	Sociology	29/8/98	8000	F
4	Kumar	Linguistics	13/6/96	10000	M
5	Venka traman	History	31/10/99	8000	M
6	Sindhu	Computer	21/5/86	14000	M
7	Aishwarya	Sociology	11/1/1998	12000	F

(A) To select all the information of teacher in computer department.

(B) To list the name of female teachers in History Department.

(C) To list all names of teachers with date of admission in ascending order.

(D) To display Teacher's Name, Department, and Salary of female teachers

(E)To count the number of items whose salary is less than 10000

(F) To insert a new record in the Teacher table with the following data: 8,"Mersha","Computer",

(1/1/2000),12000,"M".Ans: Insert into Teacher values ,"Mersha", "Computer",{1/1/2000},12000,"M");

Question 17: Write SQL queries given below on the basis of following table –

TABLE: SPORTS

Studno	Class	Name	Game1	Grade1	Game2	Grade2
--------	-------	------	-------	--------	-------	--------

10	7	Smeer	Cricket	B	Swimming	A
11	8	Sujit	Tennis	A	Skating	C
12	7	Kamala	Swimming	B	Football	B
13	7	Veena	Tennis	C	Tennis	A
14	9	Archana	Basketball	A	Cricket	A
15	10	Arpit	Cricket	A	Athletics	C

- (i) Display the names of the students who have grade 'C' in either Game1 or Game2 or both.
- (ii) Display the number of students getting grade 'A' in Cricket.
- (iii) Display the names of the students who have same game for both game1 and game2
- (iv) Display the games taken up by the students, whose name starts with 'A'.
- (v) Add a new column named 'marks'.
- (vi) Assign a value 200 for marks for all those who are getting grade 'B' or 'A' in both Game1 and Game2.
- (vii) Arrange the whole table in the alphabetical order of name.

Question 18: Write SQL queries given below on the basis of following table –

TABLE: CLUB

COACH ID	COACH NAME	AGE	SPORTS	DATE OF APP	PAY	SEX
1	KUKREJA	35	KARATE	27/03/96	1000	M
2	RAVINA	34	KARATE	20/01/98	1200	F
3	KARAN	34	SQUASH	19/01/98	2000	M
4	TARUN	33	BASKET BAL	01/01/98	1500	M
5	ZUBIN	36	SWIMMING	12/01/98	750	M
6	KETAKI	36	SWIMMING	24/02/98	800	F
7	ANKITA	39	SQUASH	20/02/98	2200	F

8	ZAREEN	37	KARATE	22/02/98	1100	F
9	KUSH	41	SWIMMING	13/01/98	900	M
10	SHAILYA	37	BASKETBALL	19/02/98	1700	M

- (A) To show all information about the swimming coaches in the club.
- (B) To list names of all coaches with their date of appointment (DATOFAPP) in descending order.
- (C) To display a report, showing coachname, pay, age and bonus(15% of pay) for all coaches.
- (D) To insert a new row in the CLUB table with following data:

11,"PRAKASH",37,"SQUASH", {25/02/98},2500,"M"

- (E) Give the output of the following SQL statements:

- (i) select COUNT (distinct SPORTS)from CLUB;
- (ii) select MIN(AGE) from CLUB where SEX ="F";
- (iii) select AVG(PAY) fromCLUB where SPORTS = "KARATE";
- (iv) select SUM(PAY) from CLUB where DATAOFAPP>{31/01/98};

Question 19: Write SQL queries given below on the basis of following table –

Hospital

NO	NAME	AGE	DEPARTMENT	DATEOFADM	CHARGES	SEX
1	Arpit	62	Surgery	21/1/98	300	M
2	Zareena	22	Ent	12/12/97	250	F
3	Kareem	32	Arthopedic	19/2/98	200	M
4	Arun	12	Surgery	11/1/98	300	M
5	Zubin	30	Ent	12/1/98	250	M
6	Karin	16	Ent	24/2/98	250	F
7	Ankita	29	cardiology	22/2/98	800	F
8	Zareen	45	Gynecology	22/2/98	300	F

9	Kush	19	Cardiology	13/1/98	800	M
10	Shilpa	23	Nuclear medicine	21/2/98	400	F

- (A) To select all the information of patients of all cardiology department.
- (B) To list the names of female patients who are in ent department.
- (C) To list names of all patients with their date of admission in ascending order.
- (D) To display patients name, charges, age, for only female patients.
- (E) To count the number of patients with age <30.
- (F) To insert the new row in the hospital table with the following data: 11, "aftab", 24, "surgery", {25/2/98}, 300, "M".
- (G) Give the output of the following SQL statements:
- (i) Select count (distinct charges)from hospital;
 - (ii) Select min(age) from hospital where sex = "f";
 - (iii) Select sum(charges) from hospital where department = "ent";
- (H) Select avg(charges) from hospital where date of admission is <{12/02/98}

Question 20: Write SQL queries given below on the basis of following table –

COMPANY

CID	NAME	CITY	PRODUCTNAME
111	SONY	DELHI	TV
222	NOKIA	MUMBAI	MOBILE
333	ONIDA	DELHI	TV
444	SONY	MUMBAI	MOBILE
555	BLACKBERRY	MADRAS	MOBILE
666	DELL	DELHI	LAPTOP

CUSTOMER

CUSTID	NAME	PRICE	QTY	CID
101	ROHAN SHARMA	70,000	20	222
102	DEEPAK KUMAR	50,000	10	666
103	MOHAN KUMAR	30,000	5	111
104	SAHIL BANSAL	35,000	3	333
105	NEHA SONI	25,000	7	444
106	SONAL AGGARWAL	20,000	5	333
107	ARUN SINGH	50,000	15	666

- I. To display those company name which are having prize less than 30000.
- II. To display the name of the companies in reverse alphabetical order.
- III. To increase the prize by 1000 for those customer whose name starts with „S“?
- IV. To add one more column totalprice with decimal] 10,2) to the table customer
- V. SELECT COUNT(*) , CITY FROM COMPANY GROUP BY CITY;
- VI. SELECT MIN(PRICE), MAX(PRICE) FROM CUSTOMER WHERE QTY>10;
- VII. SELECT AVG(QTY) FROM CUSTOMER WHERE NAME LIKE “%r%”;
- VIII. SELECT PRODUCTNAME,CITY, PRICE FROM COMPANY, CUSTOMER WHERE COMPANY.CID=CUSTOMER.CID AND PRODUCTNAME=“MOBILE”;

SECTION B -THEORY QUESTIONS

Q1 State two advantages of using Databases.

Q2 Name some popular relational database management systems.

Q3 Define – Relation, Tuple, Degree, Cardinality

Q4 What is Data Dictionary?

Q5 Name some data types in MySQL

Q6. Differentiate between Char and Varchar.

Q7 What is a Primary Key?

Q8 What is a Foreign Key? What is its use?

Q9. Write Python script to implement database connectivity with a MySQL database. The script should be menu-driven with User defined functions to perform the following operations:

- a. Create database TESTDB

b. Open database TESTDB

c. Create table emp in TESTDB

Q10. Write code for database connectivity.

Q11. Differentiate between fetchone() and fetchall(), rowcount() methods with suitable examples for each. Q4. Write the steps to perform an Insert query in database connectivity application.

Table 'student' values are rollno, name, age (1,'AMIT',22)

Q12. What are the various Integrity Constraints?

Q13. Define the following terms with example:

(i) DDL

(ii) DML

(iii) Primary Key

(iv) Candidate Key

(v) Alternate Key

(vi) Foreign Key

(vii) Cardinality of relation

(viii) Degree of relation

(ix) Relation

(x) Attribute

(xi) Tuple

(xii) Selection

(xiii) Projection

Python SQL Connectivity Assignments

Q1. Write code for database connectivity.

Q2. Differentiate between fetchone() and fetchall(), rowcount() methods with suitable examples for each.

Q3. Write the steps to perform an Insert query in database connectivity application.

Table 'student' values are rollno, name, age (1,'AMIT',22)

Q4. A resultset is extracted from the database using the cursor object (that has been already created) by giving the following statement.

```
Mydata=cursor.fetchone()
```

(a) How many records will be returned by fetchone() method?

(b) What will be the datatype of Mydata object after the given command is executed?

Q5.

Consider the SQL table Product given below, predict the output of the following code in Python:

Table: Product

pno	pname	price	supid
101	pen	10	222
102	pencil	10	333
103	eraser	5	222

```
import mysql.connector as m
con=m.connect(host='localhost',user='root',passwd='kvcbe',database='12a')
cur=con.cursor()
cur.execute('select *from product')
d=cur.fetchmany(2)
print(d)
print(type(d))
```

Q6.

Rohan Wants to delete a table "STUDENT" physically from the database "SCHOOL", based on the given code fill the statement 1 and statement 2:

```
import mysql.connector
mydb=mysql.connector.connect(host="localhost",user="root",passwd="12345",database="SCHOOL")
mycursor=_____ #statement 1
mycursor.execute(_____) #statement 2
```

Q7. A result-set is extracted from the database using the cursor object (that has been already created) by giving the following statement (Assume table contains 10 tuples).

```
mydata=cursor.fetchall()
```

- (a) How many records will be returned by fetchall() method?
- (b) What will be the datatype of Mydata object after the given command is executed?

Q8. What is the datatype of the result set extracted from the database using the cursor object when we use the following:

- (a) fetchone() method (b) fetchall() method

Q9.

Q4. Write a program in python to show the python – mysql connectivity by displaying records from existing table based on some Criteria.

Existing Table : Book

BOOKCODE	BOOKNAME	AUTHOR	PRICE
B001	COMPUTER SCIENCE	PREETI ARORA	500
B002	INFORMATICS PRACTICES	PREETI ARORA	500
B003	COMPUTER SCIENCE WITH C++	SUMITA ARORA	400
B004	OPERATING SYSTEM	GALVIN	600
B005	SQL	EVAN BAYROSS	650

Criteria/Condition : Display Bookcode and their name of those whose Price lies between 300 and 600(300 and 600 are also included)

Q5. Write a program in python to show the python – mysql connectivity by displaying records from existing table based on some Criteria.

Existing Table : Employee

EMPCODE	EMPNAME	EMPDESIG	EMPSAL
1	CHETAN	ACCOUNTANT	20000

2	ROHIT	MANAGER	50000
3	REENA	SUPERVISOR	20000
4	RAHUL	SECRETARY	25000
5	RAJ	IT HEAD	35000

Criteria/Condition : Display only those records whose salary lies between 20000 and 30000(20000 and 30000 are also included)

Q6. Write a program in python to show the python – mysql connectivity by displaying records from existing table based on some Criteria. Existing Table : Student

ROLLNO	NAME	CLASS	MARKS
1	ANJALI	XII SC	100
2	AMAN	XII COM	200
3	ANITA	XII SC	300
4	ANJALI	XII SC	450
5	ATUL	XIICOM	345

Criteria/Condition : Display only those records whose marks lies between 200 and 400(200 and 400 are also included)

Q7. Write a MySQL-Python connectivity to retrieve data, one record at a time, from city table for employees with id less than 10.



Delhi Public School Bulandshahr

Subject: Informatics Practices (065)

Class: XII (2025-26)



Chapter: Data Handling using Pandas

Worksheet – 1

- _____ is a popular data-science library of Python.
- A _____ is a Pandas data structure that represents a 1 D array like object.

1. Write code to create a Series object using the Python sequence [4, 6, 8, 10]. Assume that Pandas is imported as alias name pd.

2. Write code to create a Series object using the Python sequence (11, 21, 31, 41). Assume that Pandas is imported as alias name pd.

3. Consider the given DataFrame 'Employees':

Name	Employee_ID	Department
------	-------------	------------

Alice	EMP001	HR
Bob	EMP002	Sales
Carol	EMP003	IT
David	EMP004	Marketing

Write suitable Python statements for the following operations:

i) Add a column called 'Salary' with the following data:

[55000, 60000, 65000, 58000].

ii) Include a new employee named 'Eve' with Employee_ID 'EMP005', working in the 'Finance' department, and a salary of 62000.

iii) Change the name of the 'Employee_ID' column to 'ID'.

4. Ms. Ritika conducted an online assessment and stored the details in a DataFrame result as given below:

	Name	Score	Attempts	Qualify
a	Atulya	12.5	1	yes
b	Disha	9.0	3	no
c	Kavita	16.5	2	yes
d	John	15.0	1	no

Answer the following questions:

(i) Predict the output of the following Python statement:

```
print(result.loc[:, 'Attempts'] > 1)
```

(ii) Write the Python statement to display the last three records.

(iii) Write Python statement to display records of 'a' and 'd' row labels.

(iv) Write suitable Python statement to retrieve the data stored in theFile, 'registration.csv' into a DataFrame, 'regis'.

5. (a) Write a program in Python Pandas to create the following DataFrame

	country	population	percent
IT	Italy	61	0.83
ES	Spain	46	0.63
GR	Greece	11	0.15
FR	France	65	0.88
PO	Portugal	10	0.14

(b) Perform the following operations on the DataFrame:

(i) Display the columns country and population.

(ii) Display all the rows where population is more than 40.

(iii) Delete the last 2 rows.

Chapter: Data Visualization using Matplotlib

Worksheet – 1

1. Name the plot in which bars need not to be of the same width.
2. Name the plot in which bars cannot touch each other.
3. Name the function which is used to plot the line plot.
4. Which graphs are used to show results of continuous data, such as: weight, height, how much time etc?
5. Name the method which is used to plot the horizontal bar plot.
6. Name the plot which needs only one set of values for plotting.
7. Name the plot which Indicates distribution of discrete variables.
8. Name the method which is used to set the label for y axis.
9. Write command to install matplotlib.
10. Write command to add/import matplotlib.pyplot library into your program.
11. What is the minimum number of arguments required for plot() function in matplotlib? a. 1 b. 2 c. 3 d. 4
12. _____ is the function to save the graph.
a. Savefig() b. Savefigure() c. Savegraph() d. Savechart()
13. The command used to give a heading to a graph is _____
a. plt.show() b. plt.plot() c. plt.xlabel() d. plt.title()
14. Using Python Matplotlib _____ can be used to count how many values fall into each interval.
a. line plot b. bar graph c. histogram d. None of these
15. Using Python Matplotlib _____ can be used to display information as a series of data points.
(A) line chart (B) bar graph (C) histogram
16. Which graph should be used where each column represents a range of values, and the height of a column corresponds to how many values are in that range?
a. plot b. line c. bar d. histogram

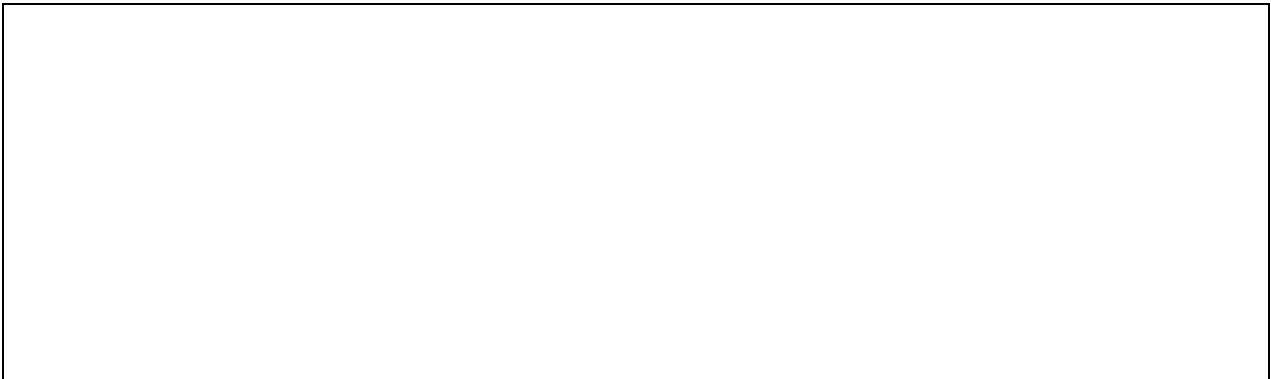
Chapter: Data Visualization using Matplotlib

Worksheet – 2

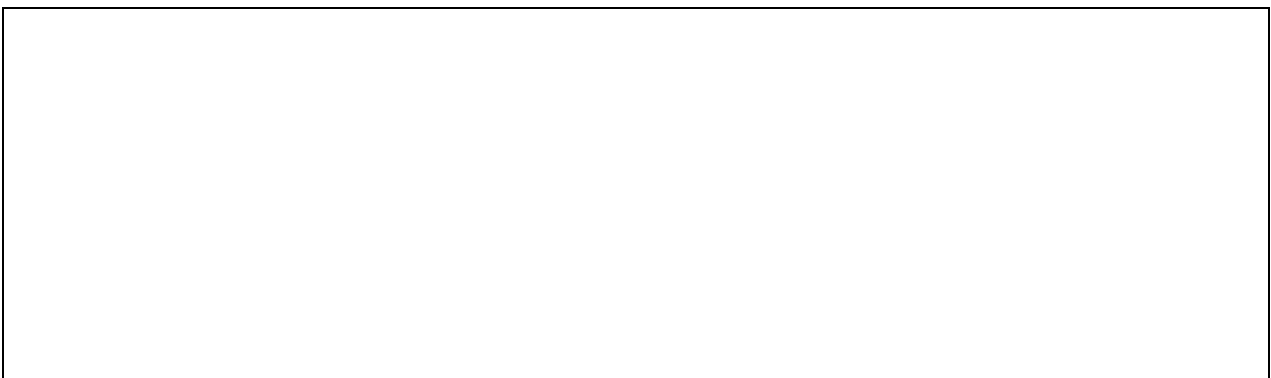
1. Write a Python code to draw a histogram of the marks obtained by 20 students out of 100. (Take bins=5)



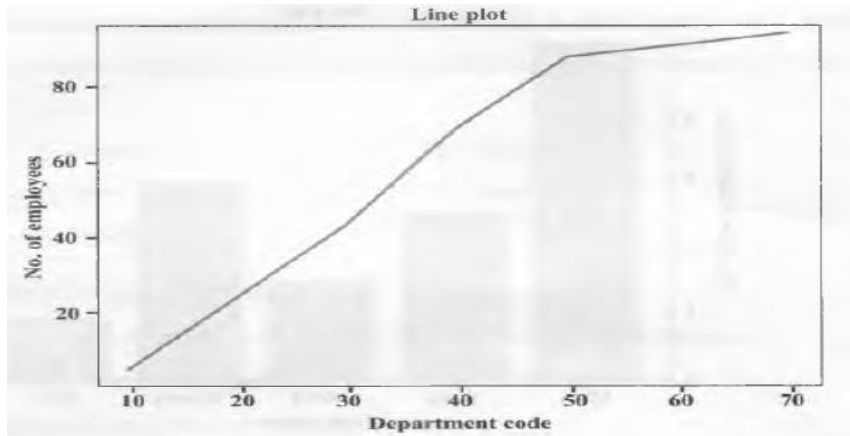
2. Write a Python code to draw a line plot for the number of students in each class from class 1 to 5. Add appropriate title and x and y labels.



3. Write a Python code to draw a bar plot for the number of fruits in 6 shops from shop1 to shop6. Add appropriate title and x and y labels.



4. Consider the following graph. Write the code to plot it.



5. Consider the following code:

```
import matplotlib.pyplot as m
x=[ 1.0, 2.0, 3.0, 4.0, 5.0 ]
y=[250,330,180,450,80]
m.plot(x,y)
m.xlabel("Days of week")
m.ylabel("Number of people")
m.title(" Line Plot")
m.show()
```

Draw a line graph which will be produced when the above code is executed.



XII, PHYSICAL EDUCATION

Chapter 1– Management of Sporting Events

Section A: Multiple Choice Questions (1 mark each)

1. Which of the following is not a type of sports tournament?
 - a) Knock-out
 - b) League
 - c) Intramural
 - d) Combination
2. The term "fixture" in sports refers to:
 - a) Lighting arrangements
 - b) Scheduling of matches
 - c) Rules of the game
 - d) Audience arrangements
3. A league tournament is also known as:
 - a) Knock-out tournament
 - b) Round-robin tournament
 - c) Challenge tournament
 - d) Elimination tournament
4. The formula for number of matches in a single league is:
 - a) $N(N+1)/2$
 - b) $N(N-1)/2$
 - c) $N/2$
 - d) $N+1$
5. The term "Bye" in sports fixture refers to:
 - a) Losing a match
 - b) Getting injured
 - c) Not playing a round
 - d) Referee's decision
6. Which committee is responsible for keeping record of results?
 - a) Finance committee
 - b) Publicity committee
 - c) Recorders & Results committee
 - d) Transport committee
7. Which of the following is a pre-tournament responsibility?
 - a) Awarding prizes
 - b) Preparing budget
 - c) Publishing results
 - d) Holding closing ceremony
8. The combination tournament is useful when:
 - a) Few teams are participating
 - b) Many teams are participating
 - c) Only 2 teams are playing
 - d) Game is played indoor only

9. An intra-mural competition involves:

- a) Teams from outside schools institution
- b) Players from within the same institution
- c) National teams
- d) Professional clubs

10. Which of the following is not a committee in event management?

- a) Reception committee
- b) Equipment committee
- c) Disciplinary committee
- d) Trophy designing committee

11. The formula for total number of byes in a knock-out tournament is:

- a) $N+1$
- b) Next power of 2 – N
- c) $N(N-1)/2$
- d) $2N-1$

12. The main aim of organizing a sports event is:

- a) Collecting money
- b) Providing entertainment
- c) Promoting physical activity
- d) Increasing followers

13. In which type of tournament does a team continue playing until they lose?

- a) League
- b) Knock-out
- c) Round robin
- d) Challenge

14. Which committee is responsible for food and refreshments?

- a) Catering committee
- b) Reception committee
- c) Lodging committee
- d) Record committee

15. Which of the following is not a duty of the organizing committee?

- a) Managing audience
- b) Deciding venue
- c) Conducting matches
- d) Playing the matches

16. The advantage of a league tournament is:

- a) Less time-consuming
- b) Suitable for fewer teams
- c) Each team gets equal opportunity
- d) Cheaper to organize

17. Which committee is responsible for contacting the press and media?

- a) Technical committee
- b) Publicity committee
- c) Result committee
- d) Medical committee

18. Number of matches in a knock-out tournament with 8 teams:

- a) 7
- b) 6

- c) 8
19. In league system, if 6 teams are participating, total number of matches are:
a) 15
c) 6
d) 15
b) 12
d) 18
20. Which of these is not a purpose of a fixture?
a) Avoid confusion
b) Ensure fair play
c) Save time
d) Train athletes

Section B: Short Answer Questions (2 Marks each)

(Answer any 10 questions)

1. Define "tournament" and its importance in sports.
2. What is a "fixture"?
3. Name two types of league tournaments.
4. State any two objectives of intramurals.
5. Mention any two responsibilities of a technical committee.
6. What is a knock-out tournament?
7. Define "bye" and explain its relevance.
8. What is the importance of record keeping in sports events?
9. Give two functions of the equipment committee.
10. List two differences between knock-out and league tournaments.
11. What are extramurals?
12. Give any two pre-tournament responsibilities of the organizing committee.

Section C: Short Answer Questions (3 Marks each)

(Answer any 10 questions)

1. Explain any three types of tournaments.
2. What are the steps in planning a sporting event?
3. Write three functions of the publicity committee.
4. How are fixtures prepared for a league tournament?
5. Explain any three duties of the finance committee.

6. Mention three advantages of knock-out tournaments.
7. Describe three responsibilities of the reception committee.
8. Write a short note on combination tournaments with example.
9. What are the post-tournament responsibilities of an organizing committee?
10. How is a league tournament different from a knock-out tournament?

Section D: Case Study-Based Questions (4 Marks each)

(Attempt both)

Case Study 1:

During your school's Annual Sports Day, 16 teams participated in a knock-out football tournament. You were a part of the organizing committee and were tasked with preparing the fixture and assigning byes.

Questions:

- a) How many matches will be played in total?
- b) How many byes will be given?
- c) Mention one advantage and one disadvantage of a knock-out tournament.
- d) Suggest one committee that would manage the refreshments.

Case Study 2:

A school is planning to host an inter-school athletic meet. The Principal has asked the Physical Education teacher to form different committees.

Questions:

- a) List any four committees to be formed.
- b) Mention one duty of each committee.
- c) Why is planning important in sports events?
- d) Name the type of tournament best suited for athletics events.

Section E: Long Answer Questions (5 Marks each)

(Answer any 5 questions)

1. Explain the role of various committees in organizing a sports event.
2. Describe the procedure for organizing a knock-out tournament with 13 teams.
3. Differentiate between intramural and extramural competitions with examples.
4. What are the merits and demerits of league tournaments?

5. Explain the responsibilities before, during, and after a sports event.
6. Draw a fixture for 6 teams using the league method.
7. How does proper event management contribute to the success of sports events?
8. Prepare a budget plan for organizing a two-day school sports meet.

Chapter 2 – Children and Women in Sports

Section A: Multiple Choice Questions (1 mark each)

1. What is the primary reason for considering physical activity important for children?
 - a) Entertainment
 - b) Physical development
 - c) Academic performance
 - d) Fashion
2. Which condition is characterized by a curvature of the spine?
 - a) Lordosis
 - b) Flat foot
 - c) Scoliosis
 - d) Kyphosis
3. Flat foot is caused due to:
 - a) Weak abdominal muscles
 - b) High-arched foot
 - c) Lack of arch in the foot
 - d) Tight hamstrings
4. Which one is not a spinal deformity?
 - a) Scoliosis
 - b) Flat foot
 - c) Kyphosis
 - d) Lordosis
5. Which is an advantage of physical activity for women?
 - a) Reduced metabolism
 - b) Increased stress
 - c) Hormonal imbalance
 - d) Improved bone density
6. Knock knees are a condition where:
 - a) Knees bend outward
 - b) Feet turn inward
 - c) Knees touch and ankles are apart
 - d) Spine curves to one side
7. Which exercise is best for correcting bow legs?
 - a) Cycling
 - b) Horse riding
 - c) Walking on straight lines
 - d) Side stretching
8. One reason for low participation of women in sports is:

- a) High interest in sports
 - b) Equal opportunities
 - c) Lack of encouragement
 - d) Strong community support
9. Menarche is:
- a) End of puberty
 - b) Beginning of puberty in boys
 - c) First menstruation
 - d) Muscle fatigue
10. A child with a hunched back may be suffering from:
- a) Lordosis
 - b) Scoliosis
 - c) Kyphosis
 - d) Bow legs
11. Which factor affects motor development in children?
- a) Type of school
 - b) Physical activity
 - c) Siblings
 - d) Gender only
12. Which of the following is not a cause of scoliosis?
- a) Bad posture
 - b) Heredity
 - c) Proper nutrition
 - d) Injury
13. Women athletes are more prone to:
- a) Flat foot
 - b) ACL injuries
 - c) Scoliosis
 - d) Menstrual cramps
14. The term Menstrual Dysfunction includes:
- a) Menopause
 - b) Amenorrhea
 - c) Lordosis
 - d) Myopia
15. The best way to correct flat foot is:
- a) Jumping
 - b) Skipping
 - c) Walking on toes
 - d) Walking on heels
16. One reason for motor development being better in physically active children:
- a) Good sleeping habits
 - b) Physical activity improves coordination
 - c) Interest in studies
 - d) Watching sports
17. Lordosis affects which body part?
- a) Neck
 - b) Lower back

c) Arms

d) Legs

18. Post-menstrual syndrome in athletes can result in:

a) Increased flexibility

b) Improved endurance

c) Mood swings and cramps

d) Better sleep

19. Children should avoid which activity if suffering from scoliosis?

a) Swimming

b) Heavy weight lifting

c) Running

d) Cycling

20. Which training method is best to improve motor fitness in children?

a) Yoga

b) Meditation

c) Circuit training

d) Aerobics only

Section B: Short Answer Questions (2 marks each)

(Attempt any ten questions.)

1. Define motor development.

2. What is Lordosis?

3. Mention any two causes of Flat Foot.

4. Define Menarche.

5. Write any two causes of scoliosis.

6. What do you understand by Amenorrhea?

7. List two exercises that can help correct knock knees.

8. Write two benefits of exercise for women.

9. Define motor fitness.

10. Name two spinal deformities found in children.

11. What is the impact of exercise on pre-natal women?

12. Mention two psychological benefits of physical activity in children.

Section C: Short Answer Questions (3 marks each)

(Attempt any Eight questions.)

1. Explain the effects of exercise on menstruation.
2. Differentiate between Bow Legs and Knock Knees.
3. List three causes of low participation of women in sports.
4. What are the corrective measures for Lordosis?
5. Write three advantages of physical activity for children.
6. How does physical activity impact motor development in children?
7. Describe three problems faced by women athletes.
8. Suggest three exercises to prevent scoliosis.
9. Explain the term Post-Menstrual Syndrome.
10. What steps can be taken to increase women's participation in sports?

Section D: Case Study-Based Questions (4 marks each)

Case Study 1:

Rekha, a 14-year-old girl, has shown signs of low self-confidence and poor posture. Her PE teacher noticed a sideways curvature in her spine and suspected scoliosis.

Q1. Based on the case, answer the following:

- a) What is scoliosis?
- b) Suggest two causes of scoliosis.
- c) Mention two exercises to help correct this condition.
- d) How can physical activity help in boosting Rekha's confidence?

Case Study 2:

A physical education teacher noticed that many girls in her class avoid games during certain days of the month. She wants to create awareness and promote sports participation without affecting health.

Q2. Based on the case, answer the following:

- a) What phase is being referred to?
- b) Name one menstrual disorder and define it.
- c) How can teachers support girls during menstruation?
- d) Suggest any one way to create awareness regarding menstrual health in schools.

Section E: Long Answer Questions (5 marks each)

(Attempt any four questions.)

1. Explain in detail the role of physical activity in correcting postural deformities.
2. Discuss the causes and preventive measures for Flat Foot and Knock Knees.

3. Describe the impact of physical activity on women with respect to hormonal balance and bone health.
4. Elaborate on the reasons behind low participation of women in sports and suggest solutions.
5. What is motor development? Explain the factors affecting motor development in children.

UNIT-3

YOGA AS PREVENTIVE MEASURE FOR LIFESTYLE DISEASE

Section A: Multiple Choice Questions (1 mark each)

1. *Yoga sutra* was compiled by

(a) Patanjali	(b) Gheranda
(c) Shivananda	(d) Svartmarma
2. According to Patanjali, the definition of *Asana* is

(a) control of sense organs	(b) sitting in a cross-legged position
(c) sitting in a comfortable position	(d) control of diet and water intake.
3. How many types of *Asanas* are there in Yoga?

(a) 3	(b) 4
(c) 5	(d) 12
4. Which *Asana* is good for the performance of the Excretory System?

(a) <i>Sukhasana</i>	(b) <i>Tadasana</i>
(c) <i>Pawanmuktasana</i>	(d) <i>Virabhadrasana</i>
5. According to WHO the criteria for overweight as per BMI is

(a) 18.5 –24.9	(b) 25 -29.9
(c) 30 –34.9	(d) 35-39.9
6. Which *asana* improves efficiency of liver?

(a) <i>Vajrasana</i>	(b) <i>Makrasana</i>
(c) <i>Ardhamatsyendrasana</i>	(d) <i>Tadasana</i>
7. Which *asana* is suggested to relax muscles after performing *Vajarasana*?

(a) <i>Sukhasana</i>	(b) <i>Savasana</i>
(c) <i>Sarvangasana</i>	(d) <i>Virabhadrasana</i>
8. Which gland is associated with Diabetes

(a) Endocrine glands	(b) Pituitary
(c) Pancreas	(d) Hypothalamus
9. *Bhujangasana* is also known as

(a) Dog posture	(b) Child posture
(c) Cobra posture	(d) Reverse Boat posture

10. What causes an Asthma Attack?

(a) Allergy

(b) Smoke

(c) Exercise

(d) All of the

Section B: Short Answer Questions (2 marks each)

Q.1 Draw a stick diagram of any two asanas to prevent obesity.

Q.2. State the procedure of Ardhashakrasana.

Q3. Mention any four benefits of Yoga.

Q4. Design a free hand drawing of any two asanas to prevent back pain.

Q.5. Write the procedure of Katichakrasana.

Section C: Short Answer Questions (3 marks each)

1. How is yoga helpful in improving lifestyle?

2. How do *Asanas* help bones and joint to grow stronger?

3. Write the procedure of practicing *Vajrasana*?

4. Explain how *Trikonasana* is helpful in management of obesity?

5. What modification can be done to learn *Ardhamatsyendrasana*

Section D: Case Study-Based Questions (4 marks each)



1.The above pose can be identified as

(a) vajrasana (b) trikonasana (c) Chakrasana (d) padmasana

2.This asana is used to cure

(a) Obesity (b) diabetes (c) Knee pain (d) Asthma

3.Normal Blood pressure is an adult is _____

(a) 120/80mm (b) 140/90mm (c) 80/100mm (d) 100/80mm

4.This asana is contraindicated when a person is suffering with _____

(a) Knee pains (b) gastric problem (c) Sciatica (d) hernia

Section E: Long Answer Questions (5 marks each)

1. Discuss *Asanas* as a preventive measure for disease.

2. Discuss the Yogic methods to manage obesity in detail.

3. Write down benefits and contraindications of *Tadasana*.

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DELHI PUBLIC SCHOOL BULANDSHAHR

HOLIDAY HOMEWORK (SESSION: 2025 – 2026)



XII, PAINTING

Rajasthani miniature painting

1. Choose select a suitable answer of the statement given below.
 - (i) Which statement is not correct about the miniature painting 'Raja Aniruddha Singh Hara'?
 - (a) It was painted by Utkal Ram.
 - (b) This painting is not related to Bundi sub-school.
 - (c) Medium of this painting is water colour on paper.
 - (d) Period of this painting is early 18th century.
 - (ii) Sahibdin was a courtier painter of Mewar. Name the painting of your course painted by him.
 - (a) Maru-Ragini
 - (b) Chaugan Players
 - (c) Radha (Bani-Thani)
 - (d) Krishna on Swing
 - (iii) Painting "Bharat Meets Rama at Chitrakuta" was painted by
 - (a) Dana
 - (b) Nuruddin
 - (c) Nihal Chand
 - (d) Arrogance
 - (iv) Which painting of your syllabus is related to Bikaner sub-school of Rajasthani school?
 - (a) Chaugan Players
 - (b) Maru-Ragini
 - (c) Radha (Bani-Thani)
2. Describe the following briefly:
 - (a) Sub-school of Bikaner painting
 - (b) Kishangarh Sub-school of painting
 - (c) Sub-school of Mewar painting
 - (d) Sub-school of Bundi painting
2. Clarify the specialties of miniature paintings of Jodhpur sub-school of Rajasthani painting.

SHORT TYPE QUESTIONS

3. On the basis of your study, describe the compositional arrangement of the following:
 - (a) Maru-Ragini
 - (b) Raja Aniruddha Singh Hara
 - (c) Radha of Kishangarh (Bani-Thani)
 - (d) Krishna on Swing
4. On which themes/topics have the artists laid emphasis to make miniature paintings in Rajasthani school?

Pahari miniature painting

Multiple Choice Questions

1. The Pahari School of Miniature Painting originated in which region?
 - A. Bengal
 - B. Punjab Hills
 - C. Rajasthan
 - D. Gujarat
2. Which ruler is associated with the promotion of the Pahari style in Guler?
 - A. Raja Ranjit Singh

- B. Raja Balwant Singh
 - C. Raja Man Singh
 - D. Raja Sansar Chand
3. The famous artist Nainsukh was associated with which Pahari centre?
- A. Basohli
 - B. Chamba
 - C. Guler
 - D. Kangra
4. Which theme is most commonly seen in Pahari miniatures?
- A. Mughal court scenes
 - B. Battlefields
 - C. Krishna-Radha love stories
 - D. Hunt

ing
scenes

Short
Questio
ns

1. What are the distinguishing features of the Pahari School of painting?
2. Name any two sub-schools under the Pahari School.
3. Mention one famous painting from the Kangra style and its theme.
4. Describe the contribution of Raja Sansar Chand to Pahari art.
5. How does the Pahari style differ from the

Mughal style? Long Questions

1. Describe the main features of the Kangra style of the Pahari School.
Include details such as composition, color scheme, themes, and emotions portrayed.
2. Write a detailed note on the life and works of artist Nainsukh.
Mention his artistic style, patrons, and notable contributions to Pahari painting.

Mughal miniature painting

Multiple Choice Questions

1. The Mughal School of painting developed during the reign of which Mughal emperor?
 - A. Babur
 - B. Akbar
 - C. Shah Jahan
 - D. Aurangzeb
2. Who were the two Persian painters invited by Akbar to develop Mughal painting?
 - A. Nainsukh and Manaku
 - B. Bichitr and Daswanth
 - C. Abd-us-Samad and Mir Sayyid Ali
 - D. Basawan and Mansoor
3. Which Mughal emperor's period is known for the refinement and elegance in miniature paintings?
 - A. Akbar
 - B. Humayun
 - C. Shah Jahan

D. Jahangir

4. Which theme is least likely to be found in Mughal miniature painting?

A. Portraits

B. Court scenes

C. Religious Hindu themes

D. Hunting scenes

Short Questions

1. Name any two important painters of the Mughal School.

2. Mention two characteristics of Mughal miniature painting.

3. What is the importance of the 'Jahangirnama' in Mughal art?

4. How did Mughal painting influence Rajput painting?

5. What role did Emperor Akbar play in the development of Mughal painting?

Long Questions

1. Discuss the features and significance of the painting "Birth of Salim".

Mention its artist, medium, subject matter, and stylistic features.

2. Explain the development of Mughal miniature painting under different emperors.

Include the contribution of Akbar, Jahangir, and Shah Jahan with relevant examples.

Multiple Choice Questions

Deccan miniature painting

1. The Deccan School of miniature painting originated in which region?

A. Punjab

B. Rajasthan

C. South India

D. Central India

2. Which of the following is not a centre of Deccan painting?

A. Bijapur

B. Golconda

C. Hyderabad

D. Jaipur

3. Which of these is a famous painting from the Bijapur School?

A. Hazrat Nizamuddin Auliya and Amir Khusrau

B. Chand Bibi Playing Polo

C. Krishna Lifting Govardhan

D. Jahangir Holding a Picture of the Madonna

4. The Deccan miniature paintings are known for their:

A. Dark tones and religious themes

B. Bold lines and flat colors

C. Rich colors, Persian influence, and luxurious themes

D. Simple lines

and naturalism

Short Questions

1. Name any two major centres of the Deccan School of painting.

2. What are two unique features of Deccan miniature painting?

3. Write a short note on the painting "Chand Bibi Playing Polo".

4. How is the Deccan School different from the Mughal School?

5. Mention the influence of Persian art on the Deccan School. Long Questions

1. Describe the characteristics of Deccan miniature painting.

Discuss color usage, themes, human figures, background details, and Persian influence.

2. Write a detailed note on any one centre of the Deccan School (e.g., Bijapur, Golconda, or Hyderabad), highlighting its style and famous works.



DELHI PUBLIC SCHOOL BULANDSHAHR

HOLIDAY HOMEWORK (SESSION: 2025 – 2026)

XII, MUSIC



1. राग भैरव का वादी स्वर क्या है?
(क) रे (ख) प (ग) ध (घ) म
2. सुबह के समय गाए-बजाए जाने वाले राग?
(क) खमाज (ख) भैरव (ग) बागेश्री (घ) बिहाग
3. संधिप्रकाश राग किस समय गाए-बजाये जाते है?
(क) 10 से 4 (ख) 7 से 10 (ग) 4 से 7 (घ) मध्य रात्री
4. रे-ध शुद्ध वाले राग कब गाए जाते है?
(क) 4 से 7 (ख) 7 से 10 (ग) 10 से 1 (घ) 1 से 4
5. अध्वदर्शक स्वर किसे कहा गया है?
(क) षडज (ख) धैवत (ग) मध्यम (घ) ऋषभ
6. मौसमी राग कौन से हैं?
(क) भैरव-भैरवी (ख) तोड़ी-पूर्वी (ग) मालकौस-बागेश्री (घ) बसंत-बहार
7. राग भैरव में कितने कोमल स्वरो का प्रयोग होता है?
(क) दो (ख) तीन (ग) चार (घ) एक
8. झपताल में खाली किस मात्रा पर है?
(क) 7 (ख) 6 (ग) 8 (घ) 9
9. ताल झपताल की कितनी मात्रा होती है?
(क) आठ (ख) बारह (ग) दस (घ) चौदह
10. रूपक ताल की कितनी मात्रा होती हैं?
(क) पाच (ख) सात (ग) नौ (घ) ग्यारह
11. रूपक ताल की खाली किस मात्रा पर है?
(क) तीसरी (ख) पाँचवी (ग) पहली (घ) सातवी
12. ताल रूपक के विभाग किस तरह है?
(क) 1 2 | 3 4 | 5 6 7 (ख) 1 2 3 | 4 5 6 | 7
(ग) 1 2 3 | 4 5 | 6 7 (घ) 1 2 | 3 4 | 5 6 7

13. झपताल की विभाग व्यवस्था किस तरह है?
 (क) 1 2 3 | 4 5 | 6 7 8 | 9 10 (ख) 1 2 | 3 4 | 5 6 | 7 8 | 9 10
 (ग) 1 2 | 3 4 5 | 6 7 | 8 9 10 (घ) 1 2 3 | 4 5 6 | 7 8 | 9 10
14. इनमें से किसका शाब्दिक अर्थ आभूषण है?
 (क) तान (ख) खटका (ग) गमक (घ) अलंकार
15. विलंबित लय में स्वरो को गाने की प्रक्रिया क्या कहलाती है?
 (क) तान (ख) आलाप (ग) मुरकी (घ) खटका
16. मीड़ लिखने के लिए उलटा आधेचंद्र कहाँ लगाते है?
 (ख) दाईं ओर (ख) बाईं ओर (ग) ऊपर (घ) नीचे
17. संगीत पारिजात के लेखक कौन है?
 (क) तानसेन जी (ख) अहोबल जी (ग) मतंग जी (घ) भातखण्ड जी
18. संगीत पारिजात कब लिखा गया?
 (ख) 1650 (ख) 1720 (ग) 1750 (घ) 1525
19. संगीत पारिजात के कितने अध्याय है?
 (ख) सात (ख) चार (ग) आठ (घ) पाँच
20. नीचे दो कथन बताए गए हैं सही कथन चुने :-
 कथन (क)- उस्ताद फ़ैयाज़ खान का जन्म 1886 को हुआ।
 कथन (ख)- वह अपनी रचनाओं में अपना नाम प्रेम प्रिय लिखते थे।
 इन कथनों के आलोक में निम्नलिखित विकल्पों में से सही उत्तर चुने-
 (क) कथन (क) और कथन (ख) दोनों सही है।
 (ख) कथन (क) सही है, परंतु कथन (ख) गलत है।
 (ग) कथन (क) गलत है, परंतु कथन (ख) सही है।
 (घ) कथन (क) और कथन (ख) दोनों गलत है।
21. नीचे दो कथन बताए गए हैं सही कथन चुने:-
 कथन (क)- संगीत पारिजात में सात अध्याय होते है।
 कथन (ख)- संगीत पारिजात में 120 रागो का वर्णन है।
 इन कथनों के आलोक में निम्नलिखित विकल्पों में से सही उत्तर चुने-
 (क) कथन (क) और कथन (ख) दोनों सही है।
 (ख) कथन (क) सही है, परंतु कथन (ख) गलत है।
 (ग) कथन (क) गलत है, परंतु कथन (ख) सही है।
 (घ) कथन (क) और कथन (ख) दोनों गलत है।
22. नीचे दो कथन बताए गए हैं:-
 कथन (क)- स्वरो का विशिष्ट क्रम अलंकार कहलाता है।
 कथन (ख)- अलंकार को हम पलटा भी कहते है।
 इन कथनों के आलोक में निम्नलिखित विकल्पों में से सही उत्तर चुने-
 (क) कथन (क) और कथन (ख) दोनों सही है।

- (ख) कथन (क) सही है, परंतु कथन (ख) गलत है।
 (ग) कथन (क) गलत है, परंतु कथन (ख) सही है।
 (घ) कथन (क) और कथन (ख) दोनों गलत है।
23. नीचे दो कथन बदए गए हैं:-
 कथन (क)- राग भैरव की जाबत सम्पूर्ण सम्पूर्ण है।
 कथन (ख)- राग भैरव में रे और ध स्वर वर्जित हैं।
 इन कथनों के आलोक में निम्नलिखित विकल्पों में से सही उत्तर चुनें-
 (क) कथन (क) और कथन (ख) दोनों सही है।
 (ख) कथन (क) सही है, परंतु कथन (ख) गलत है।
 (ग) कथन (क) गलत है, परंतु कथन (ख) सही है।
 (घ) कथन (क) और कथन (ख) दोनों गलत है।
24. नीचे दो कथन बदए गए हैं:-
 कथन (क)- ताल झपताल में दो ताली हैं।
 कथन (ख)- ताल झपताल दस मात्रा की ताल है।
 इन कथनों के आलोक में निम्नलिखित विकल्पों में से सही उत्तर चुनें-
 (क) कथन (क) और कथन (ख) दोनों सही है।
 (ख) कथन (क) सही है, परंतु कथन (ख) गलत है।
 (ग) कथन (क) गलत है, परंतु कथन (ख) सही है।
 (घ) कथन (क) और कथन (ख) दोनों गलत है।
25. ऋतुकालीन राग कौन से होते हैं?
26. राग भैरव का संप्रकृत राग क्या है?
27. अध्वदर्शक स्वर क्या होते हैं?
28. पूवाङ्गवादी और उतराङ्गवादी से आप क्या समझते हैं?
29. ताल झपताल में कौन से गीत गाए जाते हैं?
30. आलाप से आप क्या समझते हैं?
31. ताल झपताल को दुगुण में लिखिए।
32. रागो के समय सिद्धांत का संबिप्त वर्णन करें।
33. राग भैरव का परिचय लिखिए।
34. उस्ताद फ़ैयाज़ खाँ की मृत्यु कब हुई थी?
35. संगीत पारिजात में कितने श्लोक होते हैं?
36. मीड़ को परिभाषित करें।
37. उस्ताद फ़ैयाज़ खाँ का जीवन परिचय बलखें।
38. संगीत पारिजात का संक्षिप्त वर्णन करें।



DELHI PUBLIC SCHOOL BULANDSHAHR

HOLIDAY HOMEWORK (SESSION: 2025 – 2026)

XII, KATHAK DANCE



SECTION –A

(1x20=20)

1. How many Taali in Jhap Taal-
a) 2 b) 3 c) 5
2. How many khali in Jhap Taal-
a) 2 b) 1 c) 3
3. How many Chaand in Jhap Taal-
a) 2/2 b) 2/3 c) 3/2
4. Write the 5th bol of Jhap Taal-
a) Na b) Dhi c) Ti
5. Write the 2nd bol of Jhap Taal -
a) Dha b) Na c) Dhi
6. How many beats in Teen Taal?
a) 15 b) 12 c) 16
7. How many Taali in Teen Taal-
a) 2 b) 1 c) 3
8. How many khali in Teen Taal-
a) 1 b) 2 c) 3
9. How many Chaand in Teen Taal-
a) 3/2 b) 4/4 c) 4/6
10. Write the 9th bol of Teen Taal-
a) Dha b) Na c) Tin
11. How many non -composite Mudras are in Dance?
a) 28 b) 26 c) 23
12. How many composite Mudras are in Dance?
a) 25 b) 23 c) 24
13. Which mudra denote a crocodile(Makara)?
a) Swastika b) Utsanga c) Pushpaputa

14. Which hand mudra used to denote holding of objects or attack?

- a) Mayur b) Mushti c) Aral



15. Name this hasta mudra.

- a) Mushti b) Shikhar c) Aral



16. Name this hasta mudra.

- a) Suchimukh b) Shukatund c) Tripataka

17. Which mudra used to show the beginning of the dance?

- a) Pushpaput b) Shivalinga c) Dolahast

18. Which mudra used to show a pig?

- a) Khatwa b) Varaha c) Bherund

19. Which mudra is used to express Goddess Saraswati?

- A) Mukul b) Kapith c) Padmakosh

20. Which mudra shows anxiety or bow?

- a) Shikhara b) Mushti c) Ardachandra

SECTION- B

(02x05=10)

21. Who was the founder of Jaipur gharana?

22. Name the brothers of Janki Prasad, write their names.

23. Who was the father of Lalluji?

24. Who was Chiranjilal?

25. Name the sons of Narayan Prasad.

SECTION-C

(02x05=10)

26. Who was Bindadin Maharaj?

27. Who was Lacchu Maharaj?
28. Who was Birju Maharaj?
29. Who was appointed as Guru to whom?
30. Who was Gopi Krishna?

SECTION –D

(02x04=08)

31. What is Thumri?
32. What is Tatkar?
33. What is Sam and Aamad?
34. Explain Teen Taal and Jhaap taal with 1 to 4 guna.

SECTION-E

(06x02=12)

35. Explain three Gharanas of Kathak dance.
36. Write a brief note about the Kathak Dance.