

Important Instructions :

- The Answer Sheet is inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars on ORIGINAL Copy carefully with **blue/black** ball point pen only.
- The test is of **3 hours 20 minutes** duration and the Test Booklet contains **200** multiple-choice questions (four options with a single correct answer) from **Physics, Chemistry and Biology (Botany and Zoology)**. **50** questions in each subject are divided into **two Sections (A and B)** as per details given below :
 - Section A** shall consist of **35 (Thirty-five)** Questions in each subject (Question Nos - 1 to 35, 51 to 85, 101 to 135 and 151 to 185). All questions are compulsory.
 - Section B** shall consist of **15 (Fifteen)** questions in each subject (Question Nos - 36 to 50, 86 to 100, 136 to 150 and 186 to 200). In Section B, a candidate needs to **attempt any 10 (Ten)** questions out of **15 (Fifteen)** in each subject. **Candidates are advised to read all 15 questions in each subject of Section B** before they start attempting the question paper. In the event of a candidate attempting more than ten questions, **the first ten questions answered by the candidate shall be evaluated.**
- Each question carries **4** marks. For each correct response, the candidate will get **4** marks. For each incorrect response, **one mark** will be deducted from the total scores. **The maximum marks are 720.**
- Use **Blue/Black Ball Point Pen only** for writing particulars on this page/marking responses on Answer Sheet.

में, अंग्रेजी संस्करण को अंतिम माना जाएगा।

question, English version shall be treated as final.

निरीक्षक के हस्ताक्षर :

Invigilator's Signature

od Rank in Pre-Medical 2024

SECTION-A (CHEMISTRY)

- Heat of neutralisation of an acid by a base is maximum when :-
 - Both the acid and base are weak
 - Both the acid and base are strong
 - The acid is strong and base is weak
 - The acid is weak and base is strong
- Which type of sol is more stable ?
 - Lyophilic sol
 - Lyophobic sol
 - Both have equal stability
 - None of these
- The titration of KMnO_4 against oxalic acid or FeSO_4 is example of :-
 - Iodometric titration
 - Precipitation titration
 - Potentiometric titration
 - Redox titration
- Which of the following pair of solutions are an example of ideal solutions ?
 - n-hexane and n-heptane
 - benzene and toluene
 - bromoethane and chloroethane
 - All of the above
- Which of the following equations related to colligative properties is incorrect ?
 - $\Delta T_b = iK_b m$
 - $\frac{P_1^o - P_1}{P_1^o} = i \frac{n_1}{n_2}$
 - $\Delta T_f = iK_f m$
 - $\pi = iCRT$

6. What will be the molarity of the resulting solution if 20 mL of 0.2 M HCl solution is diluted to 800 mL ?
 (1) 0.05 M (2) 0.005 M
 (3) 0.025 M (4) 0.5 M
7. 0.2 molal acid HX is 20% ionized in solution. If $K_f = 1.86 \text{ K kg mol}^{-1}$ then the freezing point of the solution will be :-
 (1) -0.45°C (2) -0.31°C
 (3) -0.53°C (4) -0.90°C
8. If 0.3 mL of acetic acid (CH_3COOH) having density of 1.06 g mL^{-1} is dissolved in 2 litre of water. The depression in freezing point observed for this strength of this acid was 0.006°C . Then calculate the Van't Hoff factor ? (Given : K_f for water = $1.86 \text{ K kg mol}^{-1}$)
 (1) 1.2 (2) 1.8 (3) 2 (4) 1.5
9. The direction of osmosis can be reversed if a pressure _____ than the osmotic pressure is applied to the solution side having higher concentration.
 (1) Smaller (2) Equal
 (3) Larger (4) Larger or equal
10. Which of the following options is correct for both ideal and non ideal solution ?
 (1) $\Delta H_{\text{mix}} = 0$ (2) $\Delta S_{\text{mix}} > 0$
 (3) $\Delta G_{\text{mix}} > 0$ (4) $\Delta V_{\text{mix}} > 0$
11. How many statements among the following are correct ?
 (A) Mass by volume percentage means the mass of solute dissolved in 100 mL of the solution
 (B) Mass %, ppm, mole fraction and molality are dependent on temperature.
 (C) Pressure does not have any significant effect on solubility of solids in liquids.
 (D) To increase the solubility of CO_2 in soft drinks and soda water, the bottle is sealed under low pressure.
 (1) 3 (2) 4 (3) 1 (4) 2
12. **Assertion :** The solubility of gases in liquid decreases with the rise in temperature.
Reason : According to Le-Chatelier's principle the dissolution is an endothermic process.
 (1) Both assertion and reason are true and the reason is a correct explanation of the assertion.
 (2) Both assertion and reason are true but reason is not a correct explanation of the assertion.
 (3) Assertion is true but the reason is false.
 (4) Both assertion and reason are false.
13. Given below are two statements :-
Statement-I : The solutions which obey Raoult's law over the entire range of concentration are known as ideal solutions.
Statement-II : The enthalpy of mixing and volume of mixing for ideal solution is zero.
 (1) Both statement-I and statement-II are incorrect.
 (2) Both statement-I and statement-II are correct.
 (3) Statement-I is incorrect but statement-II is correct.
 (4) Statement-I is correct but statement-II is incorrect.
14. Match column-I with column-II
- | | Column-I | | Column-II |
|-----|--------------|-----|------------------------------|
| (A) | Henry's law | (P) | $p_i = y_i p_{\text{total}}$ |
| (B) | Raoult's law | (Q) | $p_i = x_i p_i^0$ |
| (C) | Dalton's law | (R) | $p = K_{\text{HX}}$ |

x = mole fraction of any component in liquid phase

y = mole fraction of any component in vapour phase

- (1) A \rightarrow R, B \rightarrow Q, C \rightarrow P
 (2) A \rightarrow Q, B \rightarrow P, C \rightarrow R
 (3) A \rightarrow P, B \rightarrow R, C \rightarrow Q
 (4) A \rightarrow Q, B \rightarrow R, C \rightarrow P

15. If 0.5 g of non-electrolyte solute is dissolved in 39 g of benzene lowered the freezing point of benzene by 0.2 K. The freezing point depression constant of benzene is $5.12 \text{ K kg mol}^{-1}$. Find the molar mass of the solute.

- (1) 380 g mol^{-1}
- (2) 328 g mol^{-1}
- (3) 426 g mol^{-1}
- (4) 508 g mol^{-1}

16. Arrange the following electrolytes in the increasing order of Van't Hoff factor ($\bar{\alpha}$) ?
(Assuming value of $\bar{\alpha} = 100\%$)

- | | |
|--|----------------------------------|
| (a) Na_2SO_4 | (b) MgSO_4 |
| (c) $\text{K}_3[\text{Fe}(\text{CN})_6]$ | (d) $\text{Al}_2(\text{SO}_4)_3$ |
- (1) $c < d < b < a$
 - (2) $a < d < b < c$
 - (3) $b < a < c < d$
 - (4) $b < c < a < d$

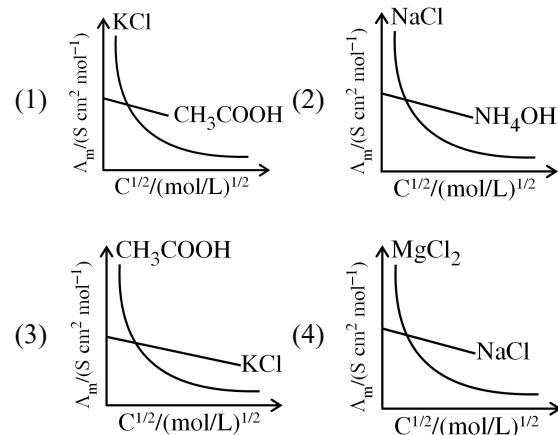
17. Vapour pressure of pure volatile liquids A and B are 280 torr and 320 torr respectively. If 0.2 mole of A and 0.3 mole of B are mixed, then the mole fraction of A in vapour phase is :-

- (1) 0.25
- (2) 0.86
- (3) 0.63
- (4) 0.37

18. Which pair of statements among the following are false?

- (A) The osmotic pressure is proportional to the molarity (C) of the solution at a given temperature T.
 - (B) Reverse osmosis is not used for the desalination of sea water.
 - (C) Two solutions having same osmotic pressure at a given temperature are called as isotonic solutions.
 - (D) A mixture of chloroform and acetone shows positive deviation from Raoult's law.
- (1) A and D
 - (2) B and C
 - (3) B and D
 - (4) A and C

19. Which of the following represent the variation of molar conductance (Λ_m) with (concentration) $^{1/2}$ for the given electrolyte ? [C = concentration]



20. In electrolysis of dilute H_2SO_4 using platinum electrode :-

- (1) $\text{H}_{2(g)}$ is evolved at anode
- (2) $\text{O}_{2(g)}$ is evolved at anode
- (3) $\text{SO}_{2(g)}$ is evolved at cathode
- (4) $\text{O}_{2(g)}$ is evolved at cathode

21. Which of the following statements is correct for galvanic cell ?

- (1) Oxidation occurs at cathode
- (2) Reduction occurs at anode
- (3) Electrons flow from anode to cathode
- (4) All the statements are correct

22. Relation between equivalent conductivity (Λ_{eq}) and molar conductivity (Λ_m) for $\text{Fe}_2(\text{SO}_4)_3$ is :-

- (1) $\Lambda_{eq} = 6 \Lambda_m$
- (2) $\Lambda_{eq} = \frac{\Lambda_m}{3}$
- (3) $\Lambda_{eq} = 3 \Lambda_m$
- (4) $\Lambda_{eq} = \frac{\Lambda_m}{6}$

23. The reaction occurring at the cathode of hydrogen-oxygen fuel cell is :-

- (1) $2\text{H}_2(\text{g}) + 4\text{OH}^-(\text{aq}) \rightarrow 4\text{H}_2\text{O}(\ell) + 4\text{e}^-$
- (2) $2\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{H}_2\text{O}(\ell)$
- (3) $\text{O}_2(\text{g}) + 2\text{H}_2\text{O}(\ell) + 4\text{e}^- \rightarrow 4\text{OH}^-(\text{aq})$
- (4) $\text{H}_2\text{O}(\ell) + \text{e}^- \rightarrow \frac{1}{2}\text{H}_2(\text{g}) + \text{OH}^-(\text{aq})$

24. What is the standard EMF of a galvanic cell if $E^\circ_{\text{cathode}} = 0.80\text{ V}$ and $E^\circ_{\text{anode}} = -0.76\text{ V}$?

- (1) 1.56 V
- (2) 0.04 V
- (3) -1.56 V
- (4) -0.04 V

25. The molar conductance of a solution _____ with dilution while its specific conductance _____ with dilution.

- (1) Decreases, increases
- (2) Increases, decreases
- (3) Decreases, decreases
- (4) Increases, increases

26. If the limiting molar conductance value of Ba^{+2} and Cl^- are $127\text{ S cm}^2\text{ mol}^{-1}$ and $76\text{ S cm}^2\text{ mol}^{-1}$ respectively, then molar conductance at infinite dilution for BaCl_2 will be :-

- (1) $203\text{ S cm}^2\text{ mol}^{-1}$
- (2) $279\text{ S cm}^2\text{ mol}^{-1}$
- (3) $298\text{ S cm}^2\text{ mol}^{-1}$
- (4) $376\text{ S cm}^2\text{ mol}^{-1}$

27. $\text{Cu}^+ + \text{e}^- \rightarrow \text{Cu}, E^\circ = x_1\text{ V}$
 $\text{Cu}^{+2} + 2\text{e}^- \rightarrow \text{Cu}, E^\circ = x_2\text{ V}$
 $\text{Cu}^{+2} + \text{e}^- \rightarrow \text{Cu}^+, E^\circ = ?\text{ V}$

- (1) $x_1 - 2x_2$
- (2) $x_1 + 2x_2$
- (3) $x_1 - x_2$
- (4) $2x_2 - x_1$

28. Match the column :-

	Column-I		Column-II
(A)	$\text{Cr}_{(s)} \text{Cr}_{(\text{aq})}^{+3} \text{Fe}_{(\text{aq})}^{+2} \text{Fe}_{(s)}$ $E^\circ_{\text{Cr}^{+3}/\text{Cr}} = -0.75\text{ V}$ $E^\circ_{\text{Fe}^{+2}/\text{Fe}} = -0.45\text{ V}$	(P)	$E^\circ_{\text{cell}} = +0.40\text{ V}$
(B)	$\text{Zn}_{(s)} \text{Zn}_{(\text{aq})}^{+2} \text{Ag}_{(\text{aq})}^+ \text{Ag}_{(s)}$ $E^\circ_{\text{Zn/Zn}^{+2}} = 0.76\text{ V}$ $E^\circ_{\text{Ag}/\text{Ag}^+} = -0.80\text{ V}$	(Q)	$E^\circ_{\text{cell}} = +0.30\text{ V}$
(C)	$\text{Cd}_{(s)} \text{Cd}_{(\text{aq})}^{+2} \text{H}_{(\text{aq})}^+ \text{H}_2(\text{g})$ $E^\circ_{\text{Cd}^{+2}/\text{Cd}} = -0.40\text{ V}$	(R)	$E^\circ_{\text{cell}} = +1.75\text{ V}$
(D)	$\text{Ni}_{(s)} \text{Ni}_{(\text{aq})}^{+2} \text{Au}_{(\text{aq})}^{+3} \text{Au}_{(s)}$ $E^\circ_{\text{Ni}^{+2}/\text{Ni}} = -0.25\text{ V}$ $E^\circ_{\text{Au}^{+3}/\text{Au}} = 1.50\text{ V}$	(S)	$E^\circ_{\text{cell}} = +1.56\text{ V}$

(1) (A)-(S), (B)-(Q), (C)-(P), (D)-(R)

(2) (A)-(Q), (B)-(S), (C)-(P), (D)-(R)

(3) (A)-(Q), (B)-(S), (C)-(R), (D)-(P)

(4) (A)-(S), (B)-(Q), (C)-(R), (D)-(P)

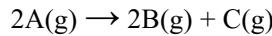
29. What will be order of reaction if rate constant of a reaction is $3.5 \times 10^{-3}\text{ mol}^{-1/2}\text{ L}^{1/2}\text{ s}^{-1}$.

- (1) $\frac{1}{2}$
- (2) $\frac{3}{2}$
- (3) $\frac{-1}{2}$
- (4) 2

30. Which of the following statement is incorrect for zero order reaction :

- (1) Concentration of reactant decreases linearly with time.
- (2) Rate of reaction is independent of the concentration of reactants.
- (3) Half life period is inversely proportional to the rate constant.
- (4) These are always elementary reactions.

31. The following data were obtained during the first order gaseous reaction at constant volume :



S.No.	Time (s)	Total pressure (atm)
1.	0	4
2	100	5

The rate constant for above reaction will be :

- (1) $6.93 \times 10^{-2}\text{ s}^{-1}$
- (2) $6.93 \times 10^{-3}\text{ s}^{-1}$
- (3) $7.4 \times 10^{-2}\text{ s}^{-1}$
- (4) $8 \times 10^{-2}\text{ s}^{-1}$

32. For a chemical reaction $A + B \rightarrow$ product, the order is one with respect to A and order is zero with respect to B. Value of x and y respectively from the given data is :-

$[A] / \text{mol L}^{-1}$	$[B] / \text{mol L}^{-1}$	Initial rate / $\text{mol L}^{-1} \text{min}^{-1}$
0.1	0.1	2.0×10^{-2}
x	0.2	4.0×10^{-2}
0.4	0.4	y

- (1) $0.4, 32 \times 10^{-2}$
- (2) $0.1, 16 \times 10^{-2}$
- (3) $0.2, 8.0 \times 10^{-2}$
- (4) $0.05, 8.0 \times 10^{-2}$

33. 90% of a first order reaction completes in 100 min. The half life of the reaction is :-

- (1) 30.1 min (2) 55.5 min
- (3) 35 min (4) 60 min

34. The value of activation energy for a reaction is 8.314 kJ/mol. then the slope of Arrhenius plot $\left(\ln k v/s \frac{1}{T} \right)$ for the reaction is :-

- (1) -1 K (2) $+1000 \text{ K}$
- (3) -1000 K (4) $-\frac{1000}{2.303} \text{ K}$

35. **Assertion :** When concentration of reactant is doubled then rate of reaction becomes double if it is a first order reaction.

Reason : Rate constant of first order reaction is directly proportional to concentration of reactant.

- (1) Both Assertion and Reason are correct and Reason is correct explanation of Assertion.
- (2) Both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.
- (3) Assertion is correct but Reason is incorrect.
- (4) Assertion is incorrect but Reason is correct.

SECTION-B (CHEMISTRY)

36. $\text{CuSO}_4(s) + 5 \text{H}_2\text{O}(l) \rightarrow \text{CuSO}_4 \cdot 5\text{H}_2\text{O}(s)$ $\Delta H = -x \text{ kJ}$
the value of ΔH represents :-

- (1) Enthalpy of solution of copper (II) sulphate
- (2) Enthalpy of hydration of copper (II) sulphate
- (3) Enthalpy of hydrolysis of copper (II) sulphate
- (4) Lattice energy of copper (II) sulphate

37. Phenolphthalein does not act as an indicator for the titration between :-

- (1) KOH and H_2SO_4
- (2) NaOH and CH_3COOH
- (3) Oxalic acid and KMnO_4
- (4) Ba(OH)_2 and HCl

38. Consider the following statements for Daniell cell when $E_{ext} < 1.1 \text{ V}$

Statement-I : Electrons flow from Copper to Zinc and current flows from Zinc to Copper.

Statement-II : Zinc is deposited at the Zinc electrode and Copper dissolves at Copper electrode.

- (1) Both **Statement I** and **Statement II** are incorrect.
- (2) **Statement I** is correct but **Statement II** is incorrect.
- (3) **Statement I** is incorrect but **Statement II** is correct.
- (4) Both **Statement I** and **Statement II** are correct.

39. Consider the following statements :-

- a. A battery is an arrangement of electrolytic cells.
 - b. A paste of HgO and carbon is used as an cathode in mercury cell.
 - c. Lead storage cell has longer life than Nickel-Cadmium cell.
 - d. In dry cell the space between the electrodes is filled by a moist paste of ammonium chloride and zinc chloride.
- Correct statements are

- (1) a and b only (2) b and d only
- (3) a and c only (4) c and d only

- 40.** **Assertion :** In Debye Huckel Onsager equation $\Lambda_m = \Lambda_m^\infty - Ac^{1/2}$, the value of A is same for CaCl_2 and MgSO_4 .
- Reason :** In Debye Huckel Onsager equation all electrolyte have the same value of A.
- Both **Assertion** and **Reason** are true but **Reason** is NOT the correct explanation of **Assertion**.
 - Assertion** is true but **Reason** is false.
 - Both **Assertion** and **Reason** are false.
 - Both **Assertion** and **Reason** are true and **Reason** is the correct explanation of **Assertion**.
- 41.** The oxidation potential of a hydrogen electrode at $\text{pOH} = 4$ and $P_{\text{H}_2} = 1 \text{ atm}$ is :-
- -0.59 V
 - -0.059 V
 - $+0.59 \text{ V}$
 - 0.059 V
- 42.** The standard reduction potential of three metals P, Q and R are $+0.7 \text{ V}$, -2.5 V and -1.3 V respectively. The order of reducing power of these metals is :-
- $Q > R > P$
 - $P > Q > R$
 - $R > Q > P$
 - $P > R > Q$
- 43.** For a chemical reaction $2\text{N}_2\text{O}_{5(\text{g})} \rightarrow 4\text{NO}_{2(\text{g})} + \text{O}_{2(\text{g})}$, rate of formation of NO_2 is $2 \times 10^{-2} \text{ mol L}^{-1} \text{ s}^{-1}$. The rate of reaction and amount of N_2O_5 consumed in interval of 20 seconds, respectively will be :
- $5 \times 10^{-3} \text{ mol L}^{-1} \text{ s}^{-1}$ and $20 \times 10^{-2} \text{ mol L}^{-1}$
 - $0.5 \times 10^{-3} \text{ mol L}^{-1} \text{ s}^{-1}$ and $20 \times 10^{-3} \text{ mol L}^{-1}$
 - $2 \times 10^{-2} \text{ mol L}^{-1} \text{ s}^{-1}$ and $1 \times 10^{-2} \text{ mol L}^{-1}$
 - $5 \times 10^{-3} \text{ mol L}^{-1} \text{ s}^{-1}$ and $20 \times 10^{-3} \text{ mol L}^{-1}$
- 44.** Which of the following statements are correct :
- Time required for 99.9% completion is 5 times of time required for 75% completion for a first order reaction.
 - Time required for 99% completion is twice the time required for 90% completion for a first order reaction.
 - Time required for 87.5% completion is 3 times of half life for zero order reaction.
 - Time required for 80% completion is 4 times of time required for 20% completion for zero order reaction.
- (a) & (b) only
 - (b) & (c) only
 - (a), (b) & (c)
 - (a), (b) & (d)
- 45.** Match the column-I with column-II :
- | | Column-I | Column-II |
|-----|--|------------------|
| (a) | $[\text{A}]_t$ vs time for zero order reaction | (p) |
| (b) | $\log \left(\frac{[\text{A}]_0}{[\text{A}]_t} \right)$ vs time for first order reaction | (q) |
| (c) | Half life vs $[\text{A}]_0$ for first order reaction | (r) |

Given, $[\text{A}]_0$ = initial concentration of reactant

$[\text{A}]_t$ = Concentration of reactant at time t

Correct match is :-

- (a) \rightarrow (p), (b) \rightarrow (r), (c) \rightarrow (q)
- (a) \rightarrow (p), (b) \rightarrow (q), (c) \rightarrow (r)
- (a) \rightarrow (q), (b) \rightarrow (p), (c) \rightarrow (r)
- (a) \rightarrow (r), (b) \rightarrow (q), (c) \rightarrow (p)

- 46.** The reaction $\text{A} \xrightarrow{k}$ product, is zero order while the reaction $\text{B} \xrightarrow{k}$ product, is first order. If initial concentration of A is $\ell \text{ n } 8 \text{ M}$ then :

- $(t_{1/2})_A = (t_{1/2})_B$
- $(t_{1/2})_A = 2(t_{1/2})_B$
- $(t_{1/2})_A = \frac{3}{2}(t_{1/2})_B$
- $(t_{1/2})_A = \frac{2}{3}(t_{1/2})_B$

47. **Assertion :** In Maxwell Boltzmann distribution curve, the fraction of molecules with most probable kinetic energy increases at higher temperature.

Reason : Most probable kinetic energy of molecules increase with increase in temperature.

Choose the correct option :

- (1) Both Assertion and Reason are correct and Reason is correct explanation of Assertion.
- (2) Both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.
- (3) Assertion is correct but Reason is incorrect.
- (4) Assertion is incorrect but Reason is correct.

48. What is the activation energy of a reaction if its rate becomes 4 times when the temperature is raised from 27°C to 47°C ?

[Given : $R = 8.314 \text{ J/mol K}$]

- (1) 24.2 kJ mol^{-1}
- (2) 55.3 kJ mol^{-1}
- (3) 96.5 kJ mol^{-1}
- (4) 147 kJ mol^{-1}

49. For a reaction $\text{A} \rightarrow \text{B}$ has rate constant k_1 and for another reaction $\text{C} \rightarrow \text{D}$ has rate constant k_2 . Both reactions are of first order and carried out at same temperature and have same pre-exponential factor. If half life of first reaction is half of half life of second reaction then $E_{\text{a}_2} - E_{\text{a}_1}$ will be :

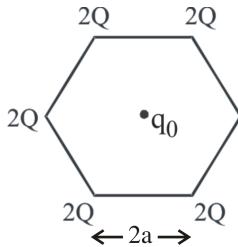
- (1) $-RT \ln 2$
- (2) $RT \ln 2$
- (3) $\frac{RT}{\ln 2}$
- (4) $\frac{1}{RT \ln 2}$

50. Which of the following statement is correct :

- (1) Rate of exothermic reaction decreases with increase in temperature.
- (2) On increasing temperature, activation energy for a reaction decreases.
- (3) An increase in the concentration of reactants of a reaction leads to change in collision frequency.
- (4) In Arrhenius equation, the factor $e^{-E_a/RT}$ corresponds to the fraction of molecules with energies equal to or less than activation energy.

SECTION-A (PHYSICS)

51. A charge obeys the principle of
 - (1) Conservation of charge
 - (2) Conservation of linear momentum
 - (3) Conservation of Angular momentum
 - (4) All of these
52. Two charged spheres of radii 20 cm and 25 cm respectively and having an equal charge Q are connected by a copper wire and then they are separated :-
 - (1) Both the spheres will have the same charge
 - (2) Charge on the 20 cm sphere will be greater than that on the 25 cm sphere
 - (3) Charge on the 25 cm sphere will be greater than that on the 20 cm sphere
 - (4) Charge on each of the spheres will be $2Q$
53. Two bodies are rubbed and one of them is negatively charged. For this body, if m_i = initial mass, m_f = mass after charging, then
 - (1) $m_i = m_f$
 - (2) $m_i < m_f$
 - (3) $m_i > m_f$
 - (4) $m_i + m_f = 2m_f$
54. Find magnitude of the force on a point charge q_0 placed at the centre of regular Hexagon of side $2a$:



$$\text{Diagram: A regular hexagon with side length } 2a. \text{ A central point charge } q_0 \text{ is shown. Each vertex of the hexagon is labeled with a charge } 2Q.$$

 - (1) $\frac{2KQq_0}{a^2}$
 - (2) $\frac{KQq_0}{a^2}$
 - (3) $\frac{KQq_0}{2a^2}$
 - (4) $\frac{KQq_0}{4a^2}$

55. Where should be the 3rd charge + Q placed so that it remain in equilibrium :-



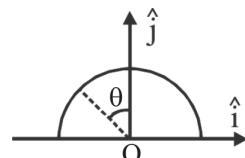
- (1) x = 14 m (2) x = 40 m
 (3) x = 62 m (4) x = 82 m
56. A point charge placed at origin. \vec{E}_1 and \vec{E}_2 are electric field at point (2, 0)m and (0, 2)m respectively. Which is correct :-

- (1) $|\vec{E}_1| > |\vec{E}_2|$ (2) $|\vec{E}_1| < |\vec{E}_2|$
 (3) $\vec{E}_1 \cdot \vec{E}_2 = 0$ (4) $\vec{E}_1 \times \vec{E}_2 = \vec{0}$

57. If potential at centre of charged ring is V_0 then electric field at its centre will be (assume radius=R)

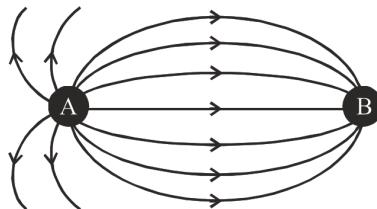
- (1) $\frac{V_0}{R}$ (2) $\frac{3V_0}{2R}$ (3) $\frac{V_0}{2R}$ (4) Zero

58. A thin semi-circular ring of radius r has a positive charge q distributed uniformly over it. The net field \vec{E} at the centre O is :-



- (1) $\frac{q}{4\pi^2\epsilon_0 r^2} \hat{j}$ (2) $-\frac{q}{4\pi^2\epsilon_0 r^2} \hat{j}$
 (3) $-\frac{q}{2\pi^2\epsilon_0 r^2} \hat{j}$ (4) $\frac{q}{2\pi^2\epsilon_0 r^2} \hat{j}$

59. The spatial distribution of the electric field due to charges (A, B) is shown in figure. Which one of the following statements is correct :-



- (1) A is + ve and B is - ve and $|A| > |B|$
 (2) A is - ve and B is + ve ; $|A| = |B|$
 (3) Both are + ve but $A > B$
 (4) Both are - ve but $A > B$

60. In a certain region of space, there exists a uniform electric field $2 \times 10^3 \hat{k}$ (V/m). The electric flux passing through the rectangular coil of dimensions 10 cm × 20 cm placed in x-y plane is :-

- (1) Zero (2) 30 Vm
 (3) 40 Vm (4) 50 Vm

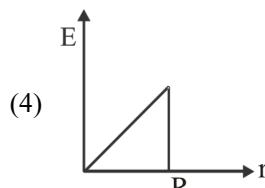
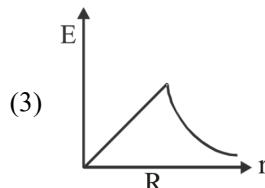
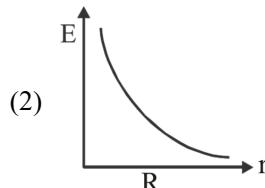
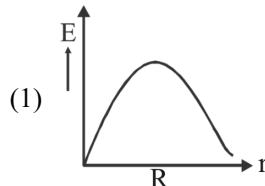
61. The mathematical form of Gauss' law is :

$$\epsilon_0 \oint \vec{E} \cdot d\vec{S} = q$$

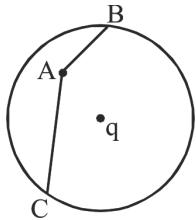
In this reference which of the following is correct ?

- (1) E depends on the charge q which is enclosed within the Gaussian surface only
 (2) E depends on the charge which is inside and outside of the Gaussian surface.
 (3) E does not depend on the magnitude of charge q
 (4) All of the above

62. In a uniformly charged sphere of total charge Q and radius R, the electric field E is plotted as function of distance from the centre, will be :



63. In the electric field of a point charge q placed at the centre of the circle shown, an another charge is carried from A to B and A to C. then :-



- (1) the work done in case I is greater than work done in case II
- (2) the work done in case II is greater than work done in case I
- (3) the work done in both the cases is same but not zero
- (4) the work done in both the cases is same and zero

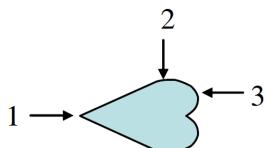
64. The electric potential at a point (x, y, z) is given by

$$V = -x^2 y - xz^3 + 4$$

The electric field \vec{E} at that point is

- (1) $\vec{E} = \hat{i} (2xy + z^3) + \hat{j} x^2 + \hat{k} 3xz^2$
- (2) $\vec{E} = \hat{i} 2xy + \hat{j} (x^2 + y^2) + \hat{k} (3xz - y^2)$
- (3) $\vec{E} = \hat{i} z^3 + \hat{j} xyz + \hat{k} z^2$
- (4) $\vec{E} = \hat{i} (2xy - z^3) + \hat{j} xy^2 + \hat{k} 3z^2x$

65. A heart shaped conductor shown below carries net charge Q. Which of the statement, about the electric field E and the surface charge density σ , below is correct?



- (1) E strongest and σ smallest at position-1
- (2) E strongest and σ highest at position-1
- (3) E weakest and σ highest at position-2
- (4) E strongest and σ highest at position-3

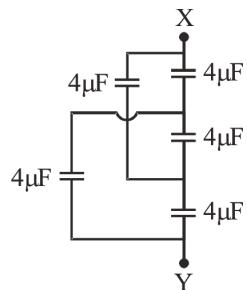
66. The potential to which a conductor is raised, depends on :-

- (1) the amount of charge
- (2) the geometry and size of the conductor
- (3) both (1) and (2)
- (4) None of these

67. Charge of $2Q$ and $-Q$ are placed on two plates of a parallel plate capacitor if capacitance of capacitor is C find potential difference between the plates :-

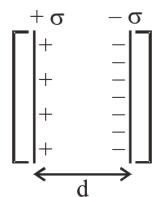
- (1) $V = \frac{Q}{C}$
- (2) $V = \frac{3Q}{2C}$
- (3) $V = \frac{2Q}{3C}$
- (4) None of these

68. Equivalent capacitance between X and Y points in the given figure is :-



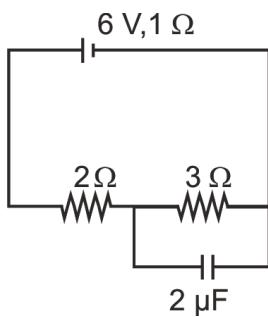
- (1) $2 \mu F$
- (2) $4 \mu F$
- (3) $3 \mu F$
- (4) $1 \mu F$

69. A capacitor of capacity 'C' have two square plates with separation d. Its inner faces have surface charge density $+σ$ and $-σ$ respectively. Electrostatic energy stored in the capacitor is :-



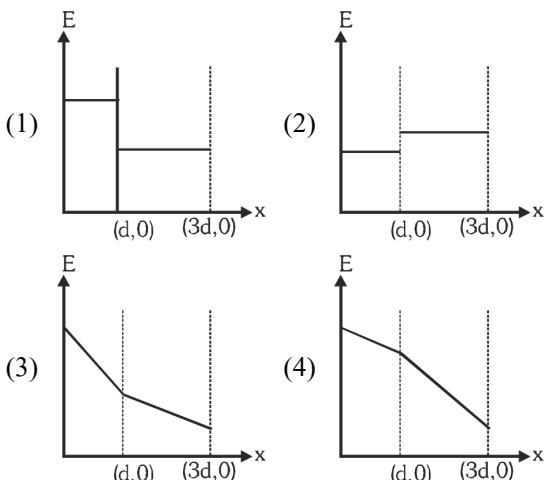
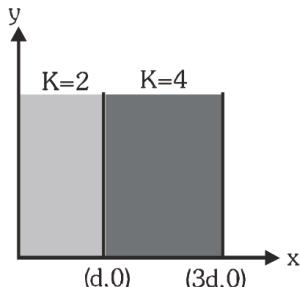
- (1) $\frac{1}{2} \frac{\sigma^2}{\epsilon_0^2} Cd^2$
- (2) $\frac{1}{2} \epsilon_0 E^2$
- (3) $\frac{\sigma^2}{2\epsilon_0} Cd$
- (4) zero

70. Energy stored in the capacitor at steady state in the circuit shown is:



- (1) 3 μJ (2) 6 μJ
 (3) 4.5 μJ (4) 9 μJ

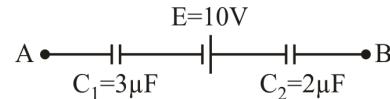
71. A parallel plate capacitor has two layers of dielectric as shown in figure. This capacitor is connected across a battery. The graph which shows the variation of electric field (E) & distance (x) from left plate.



72. 27 small drops each having charge 'q' and radius 'r' coalesce to form a big drop. How many times charge and capacitance will become :

- (1) 3, 27 (2) 27, 3
 (3) 27, 27 (4) 3, 3

73. A section of a circuit is shown in figure potential difference between the point A and B (i.e., $V_A - V_B$) equals to 5V. The voltage across $2\mu F$ capacitor is :-



- (1) 5V (2) 7V (3) 11V (4) 9V

74. A meter bridge is used with a standard 12Ω resistor to determine the resistance of a coil of wire. The balance point is obtained at 60 cm along the wire. If the area of cross-section of wire is $0.1 \times 10^{-6} m^2$, the resistivity of wire of coil (in $\Omega - m$) (length of wire of coil is 0.5 m) :-

- (1) 1.6×10^{-6} (2) 4×10^{-6}
 (3) 8×10^{-5} (4) 12×10^{-6}

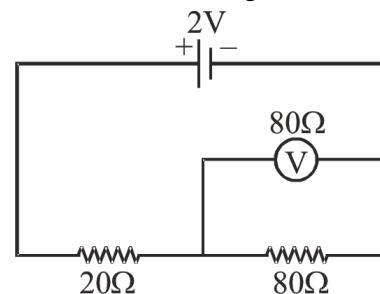
75. There are 0.8×10^{23} free electrons / cm^3 in copper. If 0.2 A current is flowing in copper wire, then the drift velocity of electrons will be, if the cross sectional area of wire is $0.01 cm^2$:-

- (1) $1.56 \times 10^{-5} m/s$ (2) $1.56 \times 10^{-4} m/s$
 (3) $10^{-5} m/s$ (4) $10^{-4} m/s$

76. Two wires A and B of equal masses and of the same metal are taken. The diameter of the wire A is half the diameter of the wire B. If the resistance of the wire A be 24 ohm, the resistance of the wire B is :-

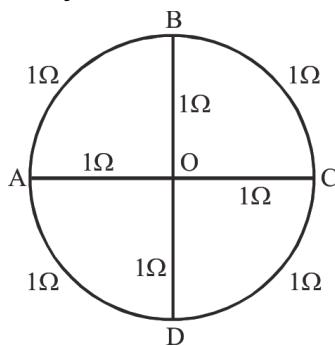
- (1) 3Ω (2) 1.5Ω (3) 4.5Ω (4) 6Ω

77. In the adjoining figure the emf of the cell is 2 V and internal resistance is negligible. The resistance of the voltmeter is 80 ohm. The reading of voltmeter will be :-



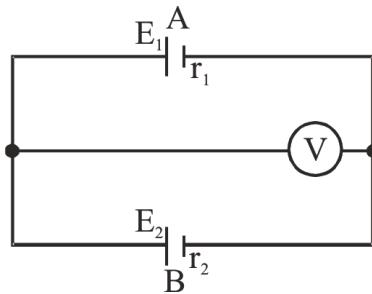
- (1) 2.00 volt (2) 1.33 volt
 (3) 1.66 volt (4) 0.80 volt

- 1 78. The equivalent resistance between the points A and D in the adjoined circuit will be -



- (1) $\frac{8}{7}\Omega$ (2) $\frac{8}{3}\Omega$ (3) $\frac{2}{3}\Omega$ (4) $\frac{8}{15}\Omega$

79. Two cells A and B of emf 1.3 V and 1.5 V respectively are arranged as shown in figure. Find relation between r_1 and r_2 for which the voltmeter reads 1.45 V. The voltmeter is assumed to be ideal.

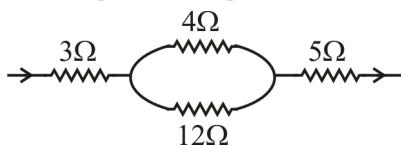


- (1) $r_1 = 2r_2$ (2) $r_1 = 3r_2$
 (3) $r_2 = 2r_1$ (4) $r_2 = 3r_1$

80. To get maximum current through a resistance of 2.5Ω , one can use m rows of cells, each row having n cells. The internal resistance of each cell is 0.5Ω . What are the values of n and m if the total number of cells is 45 ?

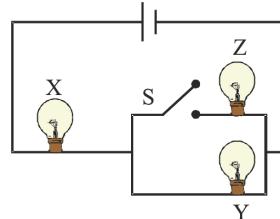
- (1) $m=3, n=15$ (2) $m=5, n=9$
 (3) $m=9, n=5$ (4) $m=15, n=3$

81. If the power dissipated in the 12Ω resistance is 12 W, then the power dissipated in 3Ω will be:-



- (1) 12 W (2) 3 W (3) 8 W (4) 48 W

- 2 82. If X, Y and Z in figure are identical lamps, which of the following changes to the brightness of the lamps occur when switch S is closed ?



- (1) X stays the same, Y decreases
 (2) X increases, Y decreases
 (3) X increases, Y stays the same
 (4) X decreases, Y increases

83. Two metal wires of identical dimensions are connected in series. If σ_1 and σ_2 are the conductivities of the metal wires respectively, the effective conductivity of the combination is :-

- (1) $\frac{\sigma_1 \sigma_2}{\sigma_1 + \sigma_2}$ (2) $\frac{2\sigma_1 \sigma_2}{\sigma_1 + \sigma_2}$
 (3) $\frac{\sigma_1 + \sigma_2}{2\sigma_1 \sigma_2}$ (4) $\frac{\sigma_1 + \sigma_2}{\sigma_1 \sigma_2}$

84. The relation between voltage sensitivity (σ_v) and current sensitivity (σ_i) of a moving coil galvanometer is (Resistance of Galvanometer = G)

- (1) $\frac{\sigma_i}{G} = \sigma_v$ (2) $\frac{\sigma_v}{G} = \sigma_i$
 (3) $\frac{G}{\sigma_v} = \sigma_i$ (4) $\frac{G}{\sigma_i} = \sigma_v$

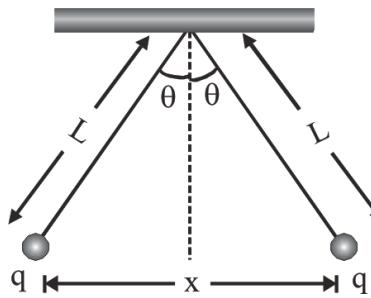
85. **Assertion (A) :** According to kirchoff's voltage law potential drop across closed loop is zero.

Reason (R) : kirchoff's voltage law is based on conservation of energy.

- (1) Both Assertion & Reason are True & the Reason is correct explanation of the Assertion.
 (2) Both Assertion & Reason are True but Reason is not correct explanation of the Assertion.
 (3) Assertion is True but the Reason is False.
 (4) Both Assertion & Reason are False.

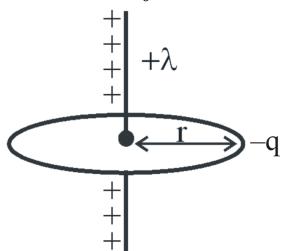
SECTION-B (PHYSICS)

86. In the given figure two tiny conducting balls of identical mass m and identical charge q hang from non-conducting threads of equal length L . Assume that θ is so small that $\tan \theta \approx \sin \theta$, then for equilibrium x is equal to :-



- (1) $\left(\frac{q^2 L}{2\pi \epsilon_0 m g} \right)^{\frac{1}{3}}$
- (2) $\left(\frac{q L^2}{2\pi \epsilon_0 m g} \right)^{\frac{1}{3}}$
- (3) $\left(\frac{q^2 L^2}{4\pi \epsilon_0 m g} \right)^{\frac{1}{3}}$
- (4) $\left(\frac{q^2 L}{4\pi \epsilon_0 m g} \right)^{\frac{1}{3}}$

87. A particle of charge $-q$ and mass m moves in a circle of radius r around an infinitely long line charge of linear charge density $+\lambda$. Then time period will be. ($k = \frac{1}{4\pi \epsilon_0}$).



- (1) $T = 2\pi r \sqrt{\frac{m}{2k\lambda q}}$
- (2) $T^2 = \frac{4\pi^2 m}{2k\lambda q} r^3$
- (3) $T = \frac{1}{2\pi r} \sqrt{\frac{2k\lambda q}{m}}$
- (4) $T = \frac{1}{2\pi r} \sqrt{\frac{m}{2k\lambda q}}$

88. **Assertion** :- An electric dipole experiences maximum force in a uniform electric field when it is placed with its axis at right angles to the field direction.

Reason :- When the axis of a dipole is perpendicular to a uniform external electric field, then torque acting on it will be zero.

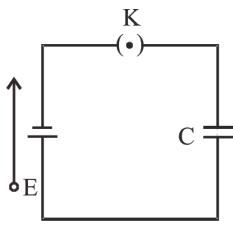
- (1) Both Assertion & Reason are True & the Reason is a correct explanation of the Assertion.
- (2) Both Assertion & Reason are True but Reason is not a correct explanation of the Assertion.
- (3) Assertion is True but the Reason is False.
- (4) Both Assertion & Reason are False.

89. Match the column

	Column-I		Column-II
(a)	Electric field outside a conducting charged sphere	(e)	Constant
(b)	Electric potential outside a conducting charged sphere	(f)	directly proportional to distance from centre
(c)	Electric field inside a non-conducting charged sphere	(g)	inversely proportional to distance from center
(d)	Electric potential inside a charged conducting sphere	(h)	inversely proportional to the square of distance from center

- (1) a - h, b - g, c - e, d - f
- (2) a - e, b - f, c - h, d - g
- (3) a - h, b - g, c - f, d - e
- (4) a - g, b - h, c - f, d - e

90. A parallel plate capacitor is connected to a battery as shown in figure. Consider two situations:



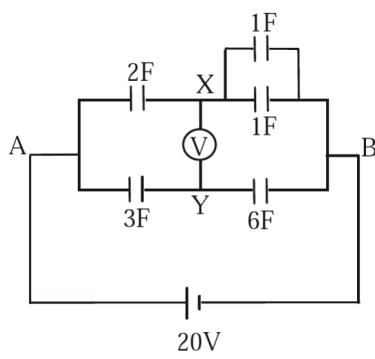
A: Key K is kept closed and plates of capacitors are moved apart using insulating handle.

B: Key K is opened and plates of capacitors are moved apart using insulating handle.

Choose the **CORRECT** option :-

- (1) In A : Q remains same but C changes.
- (2) In B : V remains same but C changes.
- (3) In A : V remains same and hence Q changes.
- (4) In B : Q remains same and hence V remains constant.

91. Calculate the reading of voltmeter between X and Y then $(V_X - V_Y)$ is equal to -



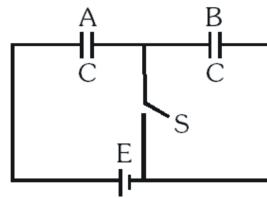
- (1) 10 V
- (2) 13.33 V
- (3) 3.33 V
- (4) 10.33 V

92. **Assertion** : When battery remains connected, electric potential energy will increase if dielectric material is inserted between plates of capacitor.

Reason : When battery remains connected, charge on plates of capacitor remains same.

- (1) Both assertion & reason are true & the reason is a correct explanation of the assertion.
- (2) Both assertion & reason are true but reason is not a correct explanation of the assertion.
- (3) Assertion is true but the reason is false.
- (4) Both assertion & reason are false.

93. Consider the situation shown. The switch S is open for a long time and then closed. Then :



	List-I		List-II
(P)	Charge flown through battery after S is closed	(1)	$\frac{CE^2}{2}$
(Q)	Work done by battery	(2)	$\frac{CE}{2}$
(R)	Charge on capacitor A long after switch S is closed	(3)	$\frac{CE^2}{4}$
(S)	Heat developed in the system	(4)	CE

- (1) P→2; Q→2; R→4; S→3
- (2) P→2; Q→2; R→4; S→1
- (3) P→1; Q→2; R→4; S→3
- (4) P→2; Q→1; R→4; S→3

94. It is required to measure equivalent resistance of circuit with ideal battery, ideal voltmeter and ideal ammeter. Which circuit diagram shows voltmeter V and ammeter A correctly positioned to measure the total resistance of circuit.

- (1)
- (2)
- (3)
- (4)

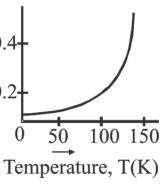
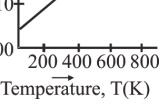
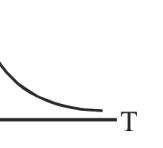
- 95.** To find the resistance of galvanometer by half deflection method, experimental data obtained is given in table below :

S. No.	Resistance $R(\Omega)$	Deflection in galvanometer (θ)	Shunt resistance $S(\Omega)$	Half deflection ($\theta/2$)	Galvanometer resistance (G)
1	3300	30	80	15	G_1
2	5000	20	80	10	G_2

From the above data, the galvanometer resistance R will be near to :

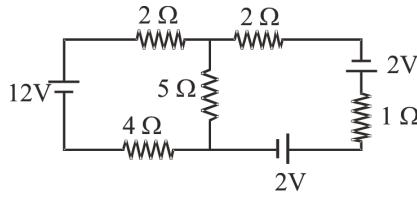
- (1) 20Ω (2) 40Ω
 (3) 50Ω (4) 80Ω

- 96.** Match the following column I with column II and choose correct option from the codes given below:-

	Column-I		Column-II
A.		1.	Temperature dependence of resistivity for a typical semiconductor
B.		2.	Resistivity ρ_T of copper as a function of temperature T
C.		3.	Resistivity ρ_T of nichrome as a function of absolute temperature T.

	A	B	C
(1)	1	2	3
(2)	2	3	1
(3)	3	1	2
(4)	1	3	2

- 97.** Find current in 5Ω resistance



- (1) zero (2) $\frac{4}{7}A$ (3) $\frac{3}{7}A$ (4) $\frac{5}{7}A$

- 98.** When a shunt of 4Ω is attached to a galvanometer, the deflection reduces to $1/5^{\text{th}}$. If an additional shunt of 2Ω is attached what will be the deflection :-

- (1) $\frac{1}{10}^{\text{th}}$ (2) $\frac{1}{13}^{\text{th}}$
 (3) $\frac{1}{18}^{\text{th}}$ (4) None of these

- 99.** The charge flowing in a conductor varies with time as $Q = at - bt^2$. Then which of the following is not correct :—

- (1) The current decreases linearly with time.
 (2) Current reaches a maximum and then decreases.
 (3) Current falls to zero after time $t = \frac{a}{2b}$
 (4) Current changes at a rate $-2b$.

- 100.** This question has Statement I and Statement II. Of the four choice given after the Statements, choose the one that best describes the two Statements.

Statement-I : Higher the range, greater is the resistance of ammeter.

Statement-II : To increase the range of ammeter, additional shunt needs to be used across it.

- (1) Statement-I is true, Statement-II is true, Statement-II is the **correct** explanation of Statement-I
 (2) Statement-I is true, Statement-II is true, Statement-II is **not** the correct explanation of Statement-I.
 (3) Statement-I is **true**, Statement-II is false.
 (4) Statement-I is **false**, Statement-II is true.

SECTION-A (BOTANY)

101. In which of the following set of plants, mature seeds are non-endospermic ?

- (1) Bean & Gram (2) Coconut & Maize
- (3) Castor & Pea (4) Castor & Gram

102. Match the column-I with column-II and select the correct option from options given below :

	Column—I		Column—II
(A)	Micropyle	(I)	Region of ovule fuses with funicle
(B)	Hilum	(II)	One or two protective layer of ovule
(C)	Integument	(III)	Entry of Pollen tube

- (1) A—I, B—II, C—III (2) A—II, B—I, C—III
- (3) A—III, B—I, C—II (4) A—III, B—II, C—I

103. The hard outer layer of pollen grain is called the _____ and is made up of sporopollenin :

- (1) Intine (2) Exine
- (3) Germ pore (4) Epidermis

104. It is possible to store pollen grains of a large number of species for years in liquid Nitrogen at:

- (1) 25°C (2) 0°C
- (3) -4°C (4) -196°C

105. The pollen tube releases the two male gametes in:

- (1) Central cell (2) Synergid
- (3) Antipodal cells (4) Egg cell

106. Pollen–Pistil interaction is a dynamic process involving pollen recognition followed by _____ of the pollen :

- (1) Promotion
- (2) Inhibition
- (3) Suspension
- (4) Promotion or inhibition

107. In grass embryo, epicotyl has a shoot apex and a few leaf primodia which are covered by hollow foliar structure, which is called :–

- (1) Scutellum (2) Aleurone layer
- (3) Coleorrhiza (4) Coleoptile

108. In some cereals such as rice and wheat, pollen grains lose viability within _____ of their release and in some members of Rosaceae, Leguminoseae and Solanaceae, they maintain viability for _____ respectively.

- (1) Months, years
- (2) 30 minutes, months
- (3) Months, 30 minutes
- (4) Seconds, 30 minutes

109. _____ pollinated flowers often have a single ovule in each ovary and numerous flowers are packed into an inflorescence.

- (1) Wind (2) Water (3) Insect (4) Birds

110. Heterogenous (complex) tissues are :-

- (1) Vascular cambium and cork cambium
- (2) Xylem and phloem
- (3) Dermal tissue and ground tissue
- (4) Parenchyma and sclerenchyma

111. The meristems which occur at the tip of roots and shoots and produce primary tissues are called:-

- (1) Apical meristems
- (2) Intercalary meristems
- (3) Lateral meristems
- (4) Radial meristems

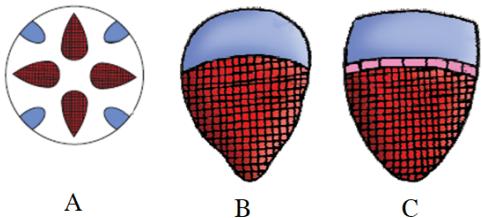
112. Cells of parenchyma and sclerenchyma are :-

- (1) Living and dead respectively
- (2) Dead and living, respectively
- (3) Dead only
- (4) Living only

113. During the formation of leaves and elongation of stem, some cells left behind from shoot apical meristem constitutes the :-

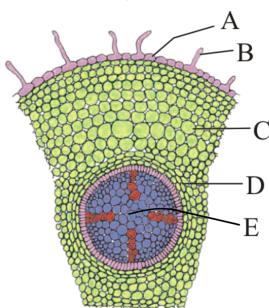
- (1) Cambium (2) Bark
- (3) Axillary bud (4) Lateral meristem

114. Given diagrams A, B & C represents which type of vascular bundles, respectively ?



- (1) Radial, conjoint collateral close, conjoint collateral open
- (2) Conjoint collateral close, conjoint collateral open, radial
- (3) Conjoint collateral close, conjoint collateral open, concentric
- (4) Bicollateral, concentric, radial

115. Diagram of T.S. of dicot root is given below select the correct option in which labelled parts A to E are correctly identified :-



- (1) A = Epiblema, B = Root hair, C = Cortex, D = Endodermis, E = Pith
- (2) A = Cortex, B = Pith, C = Epiblema, D = Endodermis, E = Root hair
- (3) A = Epiblema, B = Endodermis, C = Cortex, D = Root hair, E = Pith
- (4) A = Cortex, B = Epiblema, C = Pith, D = Endodermis, E = Root hair

116. In dicotyledonous root, conjunctive parenchymatous cells are present :-

- (1) Between xylem and phloem patches
- (2) Just below each xylem strand only
- (3) Between endodermis and pericycle
- (4) Between endodermis and periderm

117. Leaves originate from _____ and are arranged in an acropetal order.

- (1) Root Apical meristem
- (2) Shoot Apical meristem
- (3) Region of elongation
- (4) Tap root system

118. Edible part of strawberry is :

- (1) Aril
- (2) Fleshy thalamus
- (3) Glandular hair
- (4) Endosperm

119. Which of the following fruit develops from monocarpellary gynoecium with superior ovary ?

- (1) Drupe (2) Pepo
- (3) Pome (4) All of these

120. _____ which develop from axillary buds, are slender and spirally coiled and help plants to climb such as in gourds and grapevines.

- (1) Stem tendrils (2) Stem thorns
- (3) Leaf tendrils (4) Leaf spines

121. The arrangement of flowers on floral axis is termed as –

- (1) Pollination
- (2) Placentation
- (3) Inflorescence
- (4) Aestivation

- 122.** Which of the following is correct ?

 - In about 60% of angiosperm, pollination occurs at 3-celled stage.
 - In about 40% of angiosperm pollination occurs at 2-celled stage.
 - Generative cell divides meiotically to form two male gametes.
 - In over 60% of angiosperm, pollination occurs when a pollen grain at least form a vegetative cell and a generative cell.

123. Which of the following statement is **incorrect** ?

 - The egg apparatus consists of two synergids and one egg cell.
 - Filiform apparatus, play an important role in guiding the pollen tube entry into embryosac
 - Three cells which are present at the chalazal end are called antipodal cells.
 - Polar nuclei are situated above the egg apparatus in central cell

124. Read the following statements (A to D) :

 - Pneumatophores are found in *Rhizophora*.
 - A few millimetres above the root cap is the region of elongation.
 - Alternate phyllotaxy is found in *Calotropis* and guava.
 - The stem bear buds, which may be terminal or axillary.

Which of the above statement are correct ?

 - A and B
 - B and C
 - A and D
 - B, C and D

125. Select incorrect statement :

 - In monocotyledonous seed, the plumule is enclosed in sheath which is called coleoptile.
 - In coconut fruit, mesocarp is fibrous.
 - The ovules after fertilization, develop into seeds.
 - Orchid seeds are endospermic.

126. Which of the following statement is not correct?

 - Collenchymatous cells assimilate food when they contain chloroplasts.
 - Intercellular spaces are present between collenchymatous cells.
 - Collenchyma is found either as a homogenous layer or in patches below the epidermis in stems of dicot plants.
 - Collenchymatous cells are found in hypodermis of dicot stem.

127. Match the Column-I and Column-II and choose the correct combination from the given options :

	Column-I		Column-II
(a)	Parenchyma	(i)	Provides mechanical support to young stem & petiole
(b)	Collenchyma	(ii)	Photosynthesis & storage of food
(c)	Sclerenchyma	(iii)	Provides mechanical support to monocot stem
(d)	Phloem	(iv)	Transport food materials

 - (a-i), (b-ii), (c-iii), (d-iv)
 - (a-ii), (b-i), (c-iii), (d-iv)
 - (a-i), (b-ii), (c-iv), (d-iii)
 - (a-ii), (b-i), (c-iv), (d-iii)

128. Match the Column-I with Column-II & select correct option-

	Column-I		Column-II
(A)	Sieve tube element	(i)	Stores food & other substance like resins, mucilage & latex
(B)	Phloem fibres	(ii)	Bigger sieve tube
(C)	Meta phloem	(iii)	Without nucleus at maturity
(D)	Phloem parenchyma	(iv)	Bast fibres & sclerenchymatous

 - (A-iii), (B-iv), (C-i), (D-ii)
 - (A-ii), (B-iii), (C-iv), (D-i)
 - (A-iii), (B-iv), (C-ii), (D-i)
 - (A-i), (A-iv), (C-iii), (D-ii)

	Column-I		Column-II
(a)	Parenchyma	(i)	Provides mechanical support to young stem & petiole
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(c)	Sclerenchyma	(iii)	Provides mechanical support to monocot stem
(d)	Phloem	(iv)	Transport food materials

- (1) (a-i), (b-ii), (c-iii), (d-iv)
 - (2) (a-ii), (b-i), (c-iii), (d-iv)
 - (3) (a-i), (b-ii), (c-iv), (d-iii)
 - (4) (a-ii), (b-i), (c-iv), (d-iii)

- 128.** Match the Column-I with Column-II & select correct option-

	Column-I		Column-II
(A)	Sieve tube element	(i)	Stores food & other substance like resins, mucilage & latex
(B)	Phloem fibres	(ii)	Bigger sieve tube
(C)	Meta phloem	(iii)	Without nucleus at maturity
(D)	Phloem parenchyma	(iv)	Bast fibres & sclerenchymatous

- (1) (A–iii), (B–iv), (C–i), (D–ii)
 - (2) (A–ii), (B–iii), (C–iv), (D–i)
 - (3) (A–iii), (B–iv), (C–ii), (D–i)
 - (4) (A–i), (A–iv), (C–iii), (D–ii)

- 129.** Match the Column-I and Column-II and choose the correct combination from the given options-

	Column-I		Column-II
(a)	Fibrous root system	(i)	Wheat
(b)	Adventitious roots	(ii)	Sweat potato
(c)	Stem tendrils	(iii)	<i>Alstonia</i>
(d)	Whorled phyllotaxy	(iv)	Gourds

- (1) (a-i), (b-ii), (c-iii), (d-iv)
- (2) (a-ii), (b-i), (c-iii), (d-iv)
- (3) (a-i), (b-ii), (c-iv), (d-iii)
- (4) (a-ii), (b-i), (c-iv), (d-iii)

- 130.** **Assertion (A) :** In member of fabaceae family stamens are diadelphous.

Reason (R) : The stamens are united into two bundles.

- (1) Both assertion & reason are correct but reason are not correct explanation of assertion.
- (2) Assertion is true but reason is false
- (3) Assertion is false but reason is true
- (4) Both assertion & reason are correct & reason is the correct explanation of assertion.

- 131.** **Statement-I :** The plumule and radicle are enclosed in sheaths which are called coleoptile and coleorhiza, respectively.

Statement-II : Coleoptile and coleorhiza are found in both dicot and monocot seeds.

- (1) Both statement I and II are correct.
- (2) Both statement I and II are incorrect.
- (3) Statement I is correct but statement II is incorrect.
- (4) Statement I is incorrect but statement II is correct.

- 132.** **Assertion :** Both apical meristems and intercalary meristems are primary meristems.

Reason : Apical meristem and intercalary meristems appear early in life of plant and contribute to the formation of the primary plant body

- (1) Both Assertion and Reason are true but Reason is NOT the correct explanation of Assertion.
- (2) Assertion is true but Reason is false.
- (3) Assertion is false but Reason is true.
- (4) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

- 133.** Match the Column-I with Column-II

	Column-I		Column-II
(A)	Opposite phyllotaxy	(i)	Cacti
(B)	Leaf spine	(ii)	<i>Calotropis</i>
(C)	Leaf Tendrils	(iii)	Peas
(D)	Fleshy leaves	(iv)	Onion

- (1) A-(i), B-(ii), C-(iii), D-(iv)
- (2) A-(ii), B-(i), C-(iii), D-(iv)
- (3) A-(iii), B-(i), C-(ii), D-(iv)
- (4) A-(iv), B-(i), C-(ii), D-(iii)

- 134.** Marginal placentation found in how many species-

Pea, Bean, Ground nut, Tomato, Brinjal, Onion, Garlic

- (1) 3 (2) 5 (3) 4 (4) 7

- 135.** How many statement/s is/are correct about flower?

- (i) Flower is a modified shoot.
- (ii) Flowers are morphological and embryological marvels.
- (iii) Flower is the site of sexual reproduction in angiosperm.
- (iv) Flowers are site of sexual reproduction in all plants.

- (1) Two (2) Three
- (3) Four (4) One

SECTION-B (BOTANY)

- 136.** **Statement-I :** The companion cells are specialised collenchymatous cells, which are closely associated with sieve tube elements.

Statement-II : Gymnosperms have albuminous cells and sieve tube.

- (1) Both Statement I and II are correct.
- (2) Statement I are true but statement II are false.
- (3) Statement I are false but statement II are true.
- (4) Both Statement I & II are incorrect.

137. **Assertion (A) :** Apomixis is form of asexual reproduction that mimics sexual reproduction.

Reason (R) : In apomixis seeds are produced without fertilization.

Choose the correct option.

- (1) Both **A** and **R** are true but **R** is not the correct explanation of **A**.
- (2) **A** is true but **R** is false.
- (3) **A** is false but **R** is true.
- (4) Both **A** and **R** are true and **R** is the correct explanation of **A**.

138. **Statement-I :** The number and length of stamens are variable in flowers of different species.

Statement-II : The method of embryo sac formation from a single megasporangium is termed monosporic development.

- (1) Both **Statement I** and **Statement II** are incorrect.
- (2) **Statement I** is correct but **Statement II** is incorrect.
- (3) **Statement I** is incorrect but **Statement II** is correct
- (4) Both **Statement I** and **Statement II** are correct.

139. Match the column-I with column-II and choose the correct option :

Column-I		Column-II	
(i)	Monoecious plant	(a)	Papaya
(ii)	Dioecious plant	(b)	<i>Hydrilla</i>
(iii)	Cleistogamous flower	(c)	Castor
(iv)	Water pollination	(d)	<i>Commelina</i>

- (1) (i) b, (ii) a, (iii) d, (iv) c
- (2) (i) c, (ii) a, (iii) d, (iv) b
- (3) (i) c, (ii) d, (iii) a, (iv) b
- (4) (i) c, (ii) a, (iii) b, (iv) d

140. Transfer of pollen grains from anther to the stigma of a different plant is known as :

- (1) Autogamy
- (2) Geitonogamy
- (3) Xenogamy
- (4) Chasmogamy

141. Pollen grain exine has prominent apertures called ?

- (1) Stomata
- (2) Germ pores
- (3) Micropyle
- (4) Filiform apparatus

142. What would be the ploidy of the cells of pollen grain tetrad & cells of the nucellus, respectively?

- (1) 2n & n
- (2) n & n
- (3) n & 2n
- (4) 2n & 2n

143. Which one is not present in dicot seed.

- (1) Hilum
- (2) Radicle
- (3) Scutellum
- (4) Plumule

144. In seeds of cereals the outer covering of endosperm separates the embryo by which layer-

- (1) Epicarp
- (2) Fibrous layer
- (3) Aleurone layer
- (4) Testa

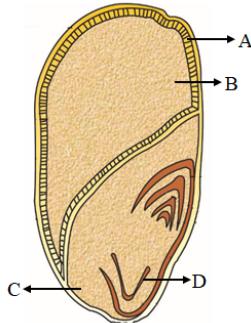
145. Which of the following flower shows actinomorphic symmetry?

- (1) Pea
- (2) Bean
- (3) Cassia
- (4) *Datura*

146. When xylem and phloem within a vascular bundle are arranged in a alternate manner on different radii, the arrangement is called ?

- (1) Conjoint open
- (2) Conjoint closed
- (3) Radial
- (4) Bicollateral open

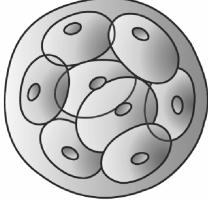
147. Which tissue system consists of parenchyma, collenchyma and sclerenchyma?
- Vascular tissue system
 - Epidermal tissue system
 - Ground tissue system
 - All of the above
148. In dicot stem which layer is also referred to as starch sheath?
- Hypodermis
 - Pericycle
 - Epidermis
 - Endodermis
149. Read the following statements carefully:
- (A) Hypodermis is the innermost layer of cortex.
 (B) Trichomes are usually multicellular.
 (C) Intercalary meristem is a primary meristem.
 (D) Stomatal pore, guard cells and subsidiary cells are together called stomatal aperture.
- How many of the above statements are correct?
- One
 - Two
 - Three
 - Four
150. Identify the parts labelled A,B,C and D in the given figure and select the correct option-



	(A)	(B)	(C)	(D)
1.	Scutellum	Coleorhiza	Hypoblast	Coleoptile
2.	Scutellum	Coleoptile	Epiblast	Coleorhiza
3.	Aleurone Layer	Endosperm	Scutellum	Radicle
4.	Seed coat	Aleurone layer	Epiblast	Coleoptile

SECTION-A (ZOOLOGY)

151. Which of the following correctly paired with its function?
- Epididymis → Maturation and storage of sperms
 - Prostate gland → Secretes ABP and Inhibin
 - Fallopian tube → Catches ova and conducts them towards uterus
 - Seminal vesicle → Produces a sugar containing fluid to nourish sperms in semen
- a only
 - a, b, c
 - a, c, d
 - a, b, c, d
152. Which of the following structure is mismatched according to the function?
- Testis – Secret Androgens
 - Cowper's gland – Provides alkaline pH in penile urethra
 - Seminal vesicle – Secret fructose
 - Prostate – Lubrication of penis
153. Which statement is wrong about human embryology?
- Zona pellucida disappears from blastocyst.
 - Implantation occurs in gastrula stage.
 - Implantation leads to pregnancy
 - Chorio-allantoic placenta.
154. Scientifically it is correct to say that the sex of the human baby is determined by the:
- Father & not by the mother
 - Mother & not by the father
 - Both mother & father
 - By autosomes of father

- 155.** Which of the following shows the correct sequence of events leading to the formation of mature sperm ?
- Spermatogonia → Secondary spermatocyte → Primary spermatocyte → Spermatids → Sperms
 - Spermatogonia → Spermatids → Secondary spermatocyte → Primary spermatocyte → Sperms
 - Spermatids → Primary spermatocyte → Secondary spermatocyte → Spermatogonia → Sperms
 - Spermatogonia → Primary spermatocyte → Secondary spermatocyte → Spermatids → Sperms
- 156.** The given figure represent a stage of embryonic development. Identify the stage with its feature.
- 
- Blastocysts, ready to fertilize with sperm.
 - Secondary oocyte, implants on endometrial layer of uterus
 - Morula, formed by mitotic division of zygote.
 - Ovary, produce female gamete and secretes hormones like estrogen etc.
- 157.** Which of the following structures collect ovum after ovulation ?
- Vagina
 - Fimbriae
 - Ampulla
 - Isthmus
- 158.** The glandular tissue of each breasts is divided into :-
- 15-20 mammary lobes
 - 15-20 alveoli
 - 15-20 tubules
 - All of the above
- 159.** Which egg membrane is secreted by secondary oocyte ?
- Corona radiata
 - Zona pellucida
 - Zona radiata
 - Corona pellucida
- 160.** Release of sperms from sertoli cell of seminiferous tubules is called as :-
- Ejaculation
 - Insemination
 - Spermiation
 - Semination
- 161.** Which of the following can not be considered as secondary sexual character in female ?
- Development of breasts
 - Narrow shoulder and broad pelvis
 - Low pitch voice
 - Appearance of pubic and axillary hair
- 162.** On which day of menstrual cycle approximately, wall of uterus will be maximum thick ?
- 23rd day
 - 28th day
 - 5th day
 - 14th day
- 163.** In males, excretory and reproductive systems share the ?
- Testes
 - Vas deferens
 - Seminal vesicle
 - Urethra
- 164.** In mammals, maturation of sperm take place at a temperature ?
- Equal to that of body
 - Higher than that of body
 - Lower than that of body
 - At any temperature
- 165.** Out of the following which is a primary sexual organ.
- Ovary
 - Oviduct
 - Epididymis
 - Vas deferens

166. Identify the correct match from the columns I, II and III :-

Column-I		Column-II		Column-III	
A	Leydig cells	a	Ovary	i	Inhibin
B	Sertoli cells	b	Seminiferous tubule	ii	Progesterone
C	Theca interna	c	Testis	iii	Androgens
D	Corpus luteum	d	Follicle	iv	Estrogen

- (1) A → d → i; B → c → iv;
C → b → iii; D → a → ii
- (2) A → c → iii; B → b → iv;
C → d → ii; D → a → i
- (3) A → b → i; B → c → iii;
C → a → iv; D → d → ii
- (4) A → c → iii; B → b → i;
C → d → iv; D → a → ii

167. Match the column I with column II and select the correct match :

	Column I		Column II
(a)	Secondary spermatocyte	(i)	Chromosome number is 23 (22 + X) and amount of DNA is half of gamete mother cell.
(b)	Second polar body	(ii)	Chromosome number is 23 (22 + Y) and amount of DNA is equal to mature gamete.
(c)	Spermatids	(iii)	Haploid cells (22 + X or 22 + Y) and amount of DNA is double of mature gamete
(d)	First polar body	(iv)	Chromosome number is 23 (22 + X) and amount of DNA is half of secondary oocytes

- (1) a → iv, b → iii, c → ii, d → i
- (2) a → iii, b → iv, c → ii, d → i
- (3) a → iv, b → iii, c → i, d → ii
- (4) a → iii, b → iv, c → i, d → ii

168. Identify the correct match from the column I, II & III

Column-I		Column-II		Column-III	
A	Corpus luteum	a	Fallopian tube	i	Estrogen
B	Granulosa cells	b	Sperm	ii	Collection of ovum
C	Proximal centriole	c	Ovary	iii	Promote the cleavage
D	Fimbriae	d	Developing follicle	iv	Progesterone

- (1) A → d → i, B → c → iv,
C → b → iii, D → a → ii
- (2) A → c → i, B → d → iii,
C → d → ii, D → b → iv
- (3) A → c → iv, B → d → i,
C → b → iii, D → a → ii
- (4) A → b → iv, B → c → iii,
C → a → ii, D → d → i

169. Time interval of normal reproductive phase /life extends :-

- (1) Between birth to first menstrual cycle
- (2) Between childhood to menarche
- (3) Between foetal life to puberty
- (4) Between menarche to menopause

170. In lactating female, milk is sucked out by baby from :-

- (1) Mammary duct (2) Mammary lobe
- (3) Lactiferous duct (4) Areola

171. Which of the following structures are not include in external genitalia of female ?

- (a) Mons pubis (b) Labia majora (c) Hymen
- (d) Vestibule (e) Cervix
- (f) Fallopian tube

- (1) c, e, f (2) Only e, f
- (3) Only d, f (4) a, d, e, f

172. Read the following statements :-

- (a) It is a paired structure
 - (b) It contains glandular tissue
 - (c) It has variable amount of fat
- In the above sentences, 'it' refers to
- (1) Uterus (2) Oviduct
 - (3) Breast (4) Testis

173. Assertion (A):- Saheli, which is non-steroidal oral contraceptive pills.

Reason (R):- It is a once a week pill with very few side effects and high contraceptive value.

- (1) Both Assertion & Reason are True & the Reason is a correct explanation of the Assertion.
- (2) Both Assertion & Reason are True but Reason is not a correct explanation of the Assertion.
- (3) Assertion is True but the Reason is False.
- (4) Both Assertion & Reason are False.

174. Assertion (A):- Condom provide protection against STDs

Reason (R):- Side-effect of condoms are very less.

- (1) Both Assertion & Reason are True & the Reason is a correct explanation of the Assertion.
- (2) Both Assertion & Reason are True but Reason is not a correct explanation of the Assertion.
- (3) Assertion is True but the Reason is False.
- (4) Both Assertion & Reason are False.

175. Which of the following IUD is same as LNG-20 ?

- | | |
|---------|-------------------|
| (1) CuT | (2) Multiload 375 |
| (3) Cu7 | (4) Progestasert |

176. Which of the following is the least effective method of birth control ?

- | | |
|---------------|-------------------------|
| (1) Vesectomy | (2) Rhythmic abstinence |
| (3) The pill | (4) IUD |

177. Artificial insemination means -

- (1) Transfer of sperms of a healthy donor to a test tube containing ova
- (2) Transfer of sperm of husband to a test tube containing ova
- (3) Artificial introduction of sperm of a healthy donor into the vagina.
- (4) Introduction of sperm of healthy donor directly into the ovary.

178. The assisted reproductive technique in which the egg is first fertilized outside the body and then inserted into the fallopian tubes is -

- (1) MESA
- (2) IUI
- (3) ZIFT
- (4) GIFT

179. Tubectomy is a method of sterilization in which :-

- (1) Small part of the fallopian tube is removed or tied up.
- (2) Ovaries are removed surgically.
- (3) Small part of vas deferens is removed or tied up.
- (4) Uterus is removed surgically.

180. Consider the following statements with two blanks A and B. Select the option which correctly fills up these blanks.

Goverment of India legalised MTP in A with some strict conditions to avoid its misuse. Such restrictions are all the more important to check indiscriminate and illegal B foeticides which are reported to be high in India.

	A	B
(1)	1951	Female
(2)	1971	Male
(3)	1971	Female
(4)	1951	Male

181. Given below are two statements :-

Statement-I : IUD, IUI and IUT are the abbreviations related with infertility.

Statement-II : 'Saheli' is a 'once a month' pill with very few side effects and high contraceptive values. In the light of above statement, choose the most appropriate answer.

- (1) Both statement-I and statement-II are correct.
- (2) Both statement-I and statement-II are incorrect.
- (3) Statement-I is incorrect and statement-II is correct.
- (4) Statement-I is correct and statement-II is incorrect.

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182. Read the given statements and choose the correct answer :

 - (A) An ideal contraceptive should be user friendly, effective and interfere with sexual drive
 - (B) Periodic abstinence is one such method in which the couples avoid or abstain from coitus from day 10 to 17 of the menstrual cycle of approx 28 days.
 - (C) In Multiload 375 IUDS, Copper ions released to suppress sperm motility and the fertilisation capacity of sperms.
 - (D) Diaphragms and cervical caps are not barrier methods.

	<u>True Statement</u>	<u>False Statement</u>
(1)	A, B	C, D
(2)	B, C	A, D
(3)	A, D	B, C
(4)	C, D	A, B

183. What is the disadvantage (s) of intrauterine contraceptive devices ?

 - (1) Risk of infection
 - (2) Tubal pregnancy
 - (3) Can cause excessive bleeding during menstruation
 - (4) All the above

184. Condoms are useful because of:-

 - (1) Its contraceptive value
 - (2) Protection against STDs
 - (3) Increases the immunity
 - (4) Both (1) and (2)

185. Saheli is :-

 - (1) Once a week pill with steroid preparation
 - (2) A daily pill with non-steroidal preparation
 - (3) Once a week pill with centchroman
(Selective estrogen receptor modulator)
which inhibit implantation
 - (4) Developed by National Dairy Research Institute (NDRI)

SECTION-B (ZOOLOGY)

- 186.** Match the following and choose the correct answer :-

(A)	Implantation	(i)	Vagina
(B)	Capacitation	(ii)	Ovary
(C)	Folliculogenesis	(iii)	Uterus
(D)	Fertilisation	(iv)	Fallopian tube

- (1) A-(iv), B-(i), C-(iii), D-(ii)
 - (2) A-(iii), B-(ii), C-(iv), D-(i)
 - (3) A-(iii), B-(i), C-(ii), D-(iv)
 - (4) A-(iii), B-(iv), C-(ii), D-(i)

187. Second polar body is released during oogenesis :-

 - (1) After completion of meiosis-II
 - (2) After completion of I meiotic division
 - (3) Just before ovulation
 - (4) Just before the entry of sperm

- 188.** Which layer of uterus undergoes the cyclic changes during menstrual cycle ?

(1) Myometrium (2) Perimetrium
(3) Hymen (4) Endometrium

- 189.** Implantation refers to :-

 - (1) Embedment of blastocyst in endometrium
 - (2) Embedment of blastocyst in myometrium
 - (3) Embedment of blastocyst in perimetrium
 - (4) Embedment of morula in cervical canal

- 190.** Match the following and choose the correct answer :

A	Testes	i	Steroid hormones
B	Ovary	ii	Produce sperm
C	Alveoli	iii	Outside abdominal cavity
D	Spermatogenesis	iv	Secrete milk

- (1) A-(ii), B-(iii), C-(i), D-(iv)
 - (2) A-(ii), B-(i), C-(iv), D-(iii)
 - (3) A-(iii), B-(ii), C-(iv), D-(i)
 - (4) A-(iii), B-(i), C-(iv), D-(ii)

191. What is not true about meiosis-II during oogenesis ?
- It is essentially started in fallopian tube.
 - It result in formation of second polar body.
 - Its completion is induced by entry of sperm.
 - Ovulation occurs after starting of meiosis-II.
192. Which hormone act on the uterine muscles during parturition ?
- FSH
 - LH
 - Oxytocin
 - Prolactin
193. If the duration of menstrual cycle of female is 38 days, what is the duration of luteal phase and what is the day of ovulation respectively ?
- 14, 24
 - 24, 14
 - 19, 19
 - 11, 17
194. **Assertion :** Bartholin gland of female correspond to bulbourethral gland of male.
Reason : It secretes lubricants in female body.
- Both Assertion & Reason are True & the Reason is a correct explanation of the Assertion.
 - Both Assertion & Reason are True but Reason is not a correct explanation of the Assertion.
 - Assertion is True but the Reason is False.
 - Both Assertion & Reason are False.
195. What is not true about zona pellucida ?
- It is formed around secondary oocyte by follicular cells.
 - It protect zygote from mother's immune system.
 - It disappear during formation of blastocyst in uterus.
 - It is formed after completion of meiosis-I.
196. **Statement-I :** Family planning programmes were initiated in 1951.
Statement-II : Natural methods work on the principle of avoiding chances of ovum and sperm meeting.
- Statement I and II both are correct
 - Statement I and II both are incorrect
 - Only Statement I is correct
 - Only Statement II is correct
197. Which of the following method of contraception is effective only upto a maximum period of six months following parturition ?
- LNG-20
 - Coitus interrupts
 - Lactational amenorrhoea
 - CuT
198. Select the incorrect statement:
- Vault are very popular method of contraception in India.
 - Multiload 375 is a Cu releasing IUD
 - Saheli is "once a week pill"
 - MTP is a type of induced abortion
199. The statutory marriageable age in India for female and male respectively are ?
- 18, 21
 - 21, 18
 - 18, 18
 - 21, 21
200. If a couple failed to fertilization and AI technique is already done then which advance technique will be preferred next :-
- Z.I.F.T
 - I.U.T
 - I.C.S.I
 - G.I.F.T.

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5. Rough work is to be done in the Test Booklet only for the purpose in the Test Booklet.
6. On completion of the test, the candidate **must hand over the Answer Sheet (ORIGINAL and OFFICE Copy) to the Invigilator** before leaving the Room/Hall. The candidates are allowed to take away this Test Booklet with them.
7. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your Form No. anywhere else except in the specified space in the Test Booklet/Answer Sheet.
8. Use of white fluid for correction is **NOT** permissible on the Answer Sheet.
9. Each candidate must show on-demand his/her Allen ID Card to the Invigilator.
10. No candidate, without special permission of the Invigilator, would leave his/her seat.
11. The candidates should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and sign (with time) the Attendance Sheet **twice. Cases, where a candidate has not signed the Attendance Sheet second time, will be deemed not to have handed over the Answer Sheet and dealt with as an Unfair Means case.**
12. Use of Electronic/Manual Calculator is prohibited.
13. The candidates are governed by all Rules and Regulations of the examination with regard to their conduct in the Examination Room/Hall. All cases of unfair means will be dealt with as per the Rules and Regulations of this examination.
14. **No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.**
15. The candidates will write the Correct Test Booklet Code as given in the Test Booklet/Answer Sheet in the Attendance Sheet.
16. Compensatory time of one hour five minutes will be provided for the examination of three hours and 20 minutes duration, whether such candidate (having a physical limitation to write) uses the facility of scribe or not.