NEET (2024)

PRACTICE TEST-01

DURATION : 200 Minutes | **M. MARKS : 720**

Topics Covered

Physics :	Electric charges and field (Full Syllabus), Electrostatic potential and Capacitance: (Electric potential, potential energy, Problems on electric potential, potential energy, equatorial and general points, Dipole in external electric field.
Chemistry :	Complete Electrochemistry
Biology :	**(Botany):** Sexual Reproduction in Flowering Plants: Full syllabus, Principles of Inheritance and Variation, Introduction to Genetics, Mendel's Law of Inheritance, Inheritance of One Gene **(Zoology):** (Human Reproduction) Introduction, male reproductive system- Male reproductive system-Testis Male accessory glands,external genitalia Spermatogenesis Hormonal control of spermatogenesis Female reproductive system Oogenesis Oogenesis Mammary gland and lactation Menstrual cycle Menstrual cycle Fertilisation Cleavage and implantation.

General Instructions:

1. Immediately fill in the particulars on this page of the test booklet.
2. The test is of **3 hours 20 min**. duration.
3. The test booklet consists of **200** questions. The maximum marks are **720**.
4. There are four Section in the Question Paper, Section I, II, III & IV consisting of Section-I **(Physics)**, Section-II **(Chemistry)**, Section-III **(Botany)** & Section IV **(Zoology)** and having **50 Questions** in each Subject and each subject is divided in two Section, **Section A** consisting 35 questions (all questions all compulsory) and **Section B** consisting 15 Questions (Any 10 questions are compulsory).
5. There is only one correct response for each question.
6. Each correct answer will give 4 marks while 1 Mark will be deducted for a wrong MCQ response.
7. No student is allowed to carry any textual material, printed or written, bits of papers, pager, mobile phone, any electronic device, etc. inside the examination room/hall.
8. On completion of the test, the candidate must hand over the Answer Sheet to the Invigilator on duty in the Room/Hall. However, the candidates are allowed to take away this Test Booklet with them.

OMR Instructions:

1. Use blue/black dark ballpoint pens.
2. Darken the bubbles completely. Don't put a tick mark or a cross mark where it is specified that you fill the bubbles completely. Half-filled or over-filled bubbles will not be read by the software.
3. Never use pencils to mark your answers.
4. Never use whiteners to rectify filling errors as they may disrupt the scanning and evaluation process.
5. Writing on the OMR Sheet is permitted on the specified area only and even small marks other than the specified area may create problems during the evaluation.
6. Multiple markings will be treated as invalid responses.
7. **Do not fold or make any stray mark on the Answer Sheet (OMR).**

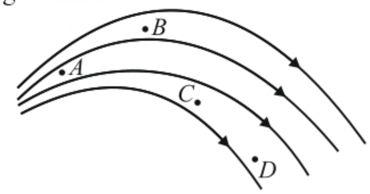
SECTION-I (PHYSICS)

SECTION – A

1. In the region of space the electric field is given by $\vec{E} = 8\hat{i} + 4\hat{j} + 3\hat{k}$. The electric flux through a surface of area 100 units in the xz plane is

(1) 800 units (2) 300 units
(3) 400 units (4) 1500 units

2. A positive test charge is released in the following field. At which point the acceleration of the test charge is minimum?



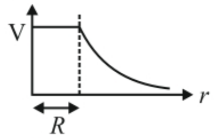
(1) A (2) B
(3) C (4) D

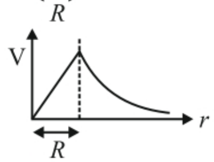
3. Work done in carrying an electric charge Q_1 once round a circle of radius R with a charge Q_2 at the center of the circle is

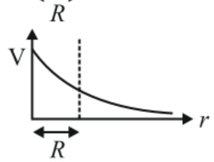
(1) $\frac{Q_1Q_2}{4\pi\varepsilon_0 R}$ (2) ∞

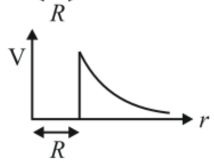
(3) $\frac{Q_1Q_2}{5\pi\varepsilon_0 R}$ (4) Zero

4. 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.

(1) 

(2) 

(3) 

(4) 

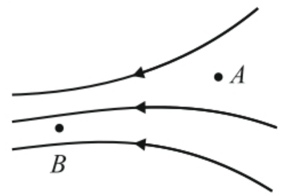
5. When a test charge is brought in from infinity along the perpendicular bisector of an electric dipole, the work done is

(1) Positive
(2) Zero
(3) Negative
(4) None of these

6. The electric potential V at a point $P(x, y, z)$ in space is given by $V = 4x^2$ volt. Electric field at a point (1m, 0, 2m) in V/m is

(1) 8 along –ve x-axis
(2) 8 along +ve x-axis
(3) 16 along –ve x-axis
(4) 16 along +ve x-axis

7. In figure two points A and B are located in a region of electric field. The potential difference $V_B - V_A$ is



(1) Positive (2) Negative
(3) Zero (4) None of these

8. A proton is accelerated from rest through a potential 500 volts. Its final kinetic energy is

(1) 50 eV (2) 500 eV
(3) 1000 eV (4) 2000 eV

9. A particle A has charge $+q$ and particle B has charge $+4q$ with each of them having the same mass m. When allowed to fall from rest through the same electric potential difference, the ratio of their speeds V_A/V_B will become

(1) 1 : 2 (2) 2 : 1
(3) 1 : 4 (4) 4 : 1

10. If an α-particle and a proton are accelerated from rest by a potential difference of 1 megavolt then the ratio of their kinetic energy will be

(1) 1/2 (2) 1
(3) 2 (4) 4

11. An infinite conducting sheet has surface charge density σ. The distance between two equipotential surfaces is r. The potential difference between these two surfaces is

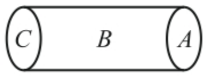
(1) $\frac{\sigma r}{2\varepsilon_0}$ (2) $\frac{\sigma r}{\varepsilon_0}$

(3) $\frac{\sigma}{\varepsilon_0 r}$ (4) $\frac{\sigma}{2\varepsilon_0 r}$

12. Two point charges of +1.0 μC are kept stationary 2 m apart. How much work is needed to be done to bring them 1 m apart?

(1) 4.5 mJ (2) 9 mJ
(3) 45 mJ (4) 90 mJ

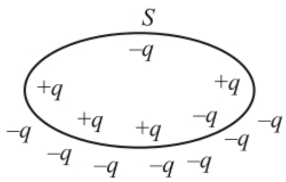
13. A hollow cylinder has a charge q within it. If ϕ is the electric flux in unit of volt meter associated with the curved surface B, the flux linked with the plane surface A in unit of volt meter will be



(1) $\frac{1}{2}\left(\frac{q}{\varepsilon_0}-\phi\right)$ (2) $\frac{q}{2\varepsilon_0}$

(3) $\frac{\phi}{3}$ (4) $\frac{q}{\varepsilon_0}-\phi$

14. The flux of electric field due to these charges through the surface S is



(1) $\frac{2q}{\varepsilon_0}$ (2) $\frac{3q}{\varepsilon_0}$

(3) $\frac{-5q}{\varepsilon_0}$ (4) $q\varepsilon_0$

15. Equipotential surface for a spherical charge distribution is

(1) Sphere (2) Plane

(3) Cylinder (4) Ring

16. Potential and potential gradient is a:

(1) Scalar and vector (2) Both are vector

(3) Both are scalar (4) Vector and scalar

17. If we move opposite direction of electric field then electric potential

(1) Increases

(2) Decreases

(3) Can't say

(4) May increase or decrease

18. Electric dipole is placed perpendicular to uniform electric field then force and torque on dipole are

(1) $F = 0; \tau = 0$ (2) $F \neq 0; \tau \neq 0$

(3) $F = 0; \tau \neq 0$ (4) $F \neq 0; \tau = 0$

19. Point charge $5q$ is placed inside a cube at centre, then electrostatic flux passing through one face of cube is

(1) $\frac{q}{\varepsilon_0}$ (2) $\frac{q}{6\varepsilon_0}$

(3) $\frac{5q}{6\varepsilon_0}$ (4) $\frac{6q}{5\varepsilon_0}$

20. Nature of graph of electric field due to infinite charge sheet with distance from sheet is

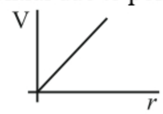
(1) Straight line parallel to distance axis

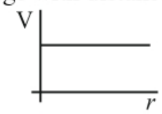
(2) Parabola

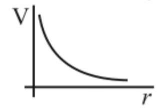
(3) Circle

(4) Hyperbola

21. Which of the following graph is correct for electric potential due to point charge with distance

(1) 

(2) 

(3) 

(4) None of these

22. Charge Q is uniformly distributed on conducting solid sphere of radius R then electric field at distance $R/2$ from centre

(1) $\frac{kQ}{R^2}$ (2) zero

(3) $\frac{kQ}{2R^2}$ (4) $\frac{kQ}{4R^2}$

23. Electric field line at the surface of equipotential surface is

(1) Along surface

(2) Perpendicular to the surface

(3) At some angle from surface

(4) Can't say

24. If electric field at any point is non-zero then potential at that point will be

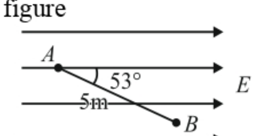
(1) Non-zero

(2) Zero

(3) May be zero or non-zero

(4) Constant

25. Find potential difference between A and B as shown in figure



(1) $4E$ (2) $3E$

(3) zero (4) $E/4$

26. Electron and proton is moving away from each other then potential energy of system

(1) Remains same (2) Increasing

(3) Decreasing (4) None of these

27. Electric potential at the centre of a charged hollow metal sphere is

(1) Zero

(2) Twice as that on surface

(3) Half of that on the surface

(4) Same as that on the surface

28. The electric field due to a point charge at a distance 6 m from it is 630 N/C. The magnitude of the charge is

(1) 2.52 μC (2) 1.24 μC
(3) 4.96 μC (4) 0.62 μC

29. A charge Q is placed at the corner of a cube of edge length L. The electric flux linked to one of the faces not touching the charge Q is

(1) $\frac{Q}{24\varepsilon_0}$ (2) $\frac{Q}{6\varepsilon_0}$
(3) $\frac{Q}{8\varepsilon_0}$ (4) Zero

30. Two positive ions, each carrying a charge q, are separated by a distance d. If F is the force of repulsion between the ions, the number of electrons missing from each ion will be (e being the charge on an electron)

(1) $\frac{4\pi\varepsilon_0 Fd^2}{e^2}$ (2) $\sqrt{\frac{4\pi\varepsilon_0 Fe^2}{d^2}}$
(3) $\sqrt{\frac{4\pi\varepsilon_0 Fd^2}{e^2}}$ (4) $\frac{4\pi\varepsilon_0 Fd^2}{q^2}$

31. If 50 joule of work must be done to move an electric charge of 2 C from a point, where potential is –10 volt to another point, where potential is V volt, the value of V is

(1) 5 V (2) –15 V
(3) +15 V (4) + 10 V

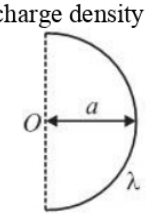
32. A particle of mass m and charge q is placed at rest in a uniform electric field E and then released. The kinetic energy attained by the particle after moving a distance y is

(1) qEy (2) qE^2y
(3) qEy^2 (4) q^2Ey

33. A charge q is placed at the centre of the line joining two exactly equal positive charges Q. The system of three charges will be in equilibrium, if q is equal to

(1) $-Q$ (2) $Q/2$
(3) $-Q/4$ (4) $+Q$

34. Electric field at centre O of semicircle of radius a having linear charge density λ is given as



(1) $\frac{2\lambda}{\varepsilon_0 a}$ (2) $\frac{\lambda\pi}{\varepsilon_0 a}$
(3) $\frac{\lambda}{2\pi\varepsilon_0 a}$ (4) $\frac{\lambda}{\pi\varepsilon_0 a}$

35. In a region, the intensity of an electric field is given by $E = 8\hat{i} + 8\hat{j} + \hat{k}$ in NC^{-1}. The electric flux through a surface $S = 10\hat{i}\ m^2$ in the region is

(1) 10 Nm^{2}C^{-1}
(2) 80 Nm^{2}C^{-1}
(3) 8 Nm^{2}C^{-1}
(4) None

SECTION – B

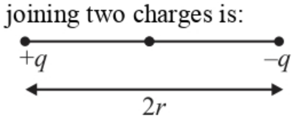
36. A proton of mass 'm' charge 'e' is released from rest in a uniform electric field of strength 'E'. The time taken by it to travel a distance 'd' in the field is

(1) $\sqrt{\frac{2de}{mE}}$ (2) $\sqrt{\frac{2dm}{Ee}}$
(3) $\sqrt{\frac{2dE}{me}}$ (4) $\sqrt{\frac{2Ee}{dm}}$

37. Charges on two spheres are +10 μC and –5 μC respectively. They experience a force F. If each of them is given an additional charge +2 μC then new force between them keeping the same distance is

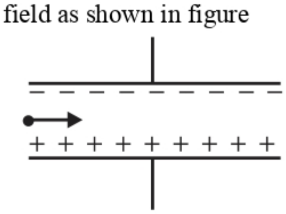
(1) $18F$ (2) $F/25$
(3) $18F/25$ (4) $(25/18)\ F$

38. Two charge $+q$ and $-q$ are placed at a distance of $2r$ as shown in figure. Electric field at the centre of the line joining two charges is:



(1) $\frac{Kq}{r^2}$ (2) $\frac{4Kq}{r^2}$
(3) $\frac{2Kq}{r^2}$ (4) $\frac{Kq}{2r^2}$

39. A proton and an α particle having equal kinetic energy are projected in a uniform transverse electric field as shown in figure



(1) Proton trajectory is more curved
(2) α particle trajectory is more curved
(3) Both trajectories are equally curved but in opposite direction
(4) Both trajectories are equally curved and in same direction

40. If $\dot{E}_1$ and $\dot{E}_2$ are electric field at axial point and equatorial point of an electric dipole, then

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

41. The electric potential at a point in free space due to charge Q coulomb is $Q \times 10^{11}$ volts. The electric field at that point is

(1) $4\pi\varepsilon_0 Q \times 10^{20}$ volt/m
(2) $12\pi\varepsilon_0 Q \times 10^{22}$ volt/m
(3) $4\pi\varepsilon_0 Q \times 10^{22}$ volt/m
(4) $12\pi\varepsilon_0 Q \times 10^{20}$ volt/m

42. How much kinetic energy will be gained by an α-particle in going from a point at 70 V to another point at 50V?

(1) 40 eV (2) 40 keV
(3) 40 MeV (4) 0

43. In a circuit, 5C of charge is passed through a battery in a given time. The plates of the battery are maintained at a potential difference of 12V. The work done by the battery is:

(1) 120 J (2) 60 J
(3) 30J (4) 15 J

44. Four point charges $-Q$, $-q$, $2q$ and $2Q$ are placed, one at each corner of the square. The relation between Q and q for which the potential at the centre of the square is zero, is

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

45. An electric dipole of moment $\vec{p}$ is lying along a uniform electric field $\vec{E}$. The work done in rotating the dipole by 90° is:

(1) $\sqrt{2}pE$ (2) $\frac{2E}{p}$
(3) $2pE$ (4) pE

46. **Assertion :** Two equipotential surfaces can cut each other.
Reason: Two equipotential surfaces are always parallel to each other.

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

47. **Assertion:** The potential difference between any two points in an electric field depends only on initial and final position.
Reason: Electric field is a conservative field so the work done per unit positive charge does not depend on path followed.

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

48. **Assertion :** Work done in moving a charge between any two points in an electric field is independent of the path followed by the charge, between these points.
Reason: Electrostatic force is a non conservative force.

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

49. **Assertion :** Two adjacent conductors of unequal dimensions, carrying the same positive charge have a potential difference between them.
Reason : The potential of a conductor depends upon the charge given to it.

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

50. **Assertion :** Electric potential and electric potential energy are different quantities.
Reason : For a system of positive test charge and point charge electric potential energy = electric potential.

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

SECTION-II (CHEMISTRY)

SECTION – A

51. A dilute solution of sodium sulphate in water is electrolysed using Pt electrodes. The products at cathode and anode respectively are
(1) H_2 and O_2 (2) O_2 and H_2
(3) O_2 and Na (4) O_2 and SO_2

52. The standard reduction potential for $Fe^{2+}|Fe$ and $Sn^{2+}|Sn$ electrodes are –0.44 V and –0.14 V respectively. For the cell reaction, $Fe^{2+} + Sn \rightarrow Fe + Sn^{2+}$, the standard e.m.f. is
(1) +0.30 V (2) 0.58 V
(3) +0.58 V (4) –0.30 V

53. Prevention of corrosion of iron by Zn coating is called
(1) Galvanization (2) Cathodic protection
(3) Electrolysis (4) None of these

54. Corrosion of Fe is favoured by presence of
(1) H^+ (2) Moisture
(3) Impurities (4) All of these

55. E° for $Fe^{2+} + 2e^- \rightarrow Fe$ is -0.44 V and E° for $Zn^{2+} + 2e^- \rightarrow Zn$ is –0.76 V thus
(1) Zn is more electropositive than Fe
(2) Zn is more electronegative than Fe
(3) Fe is more electropositive than Zn
(4) None of the above

56. When Fe is rusted, the final product formed has Fe in
(1) +2 state (2) +3 state
(3) Elemental state (4) None of these

57. Iron can be prevented from rusting by
(1) Connecting iron to more electropositive metal, cathodic protection
(2) Connecting iron to more electropositive metal, anodic protection
(3) Connecting iron to less electropositive metal, cathodic protection
(4) None of these

58. In electrolysis, oxidation takes place at
(1) Anode
(2) Cathode
(3) The anode as well as cathode
(4) The surface of electrolyte solution

59.

Electrolyte	KCl	KNO_3	HCl	NaOAC	NaCl
Λ^∞ (S cm^2 mol^{-1})	149.9	145.0	426.2	91.0	126.5

Calculate Λ^∞_{HOAc} using appropriate molar conductances of the electrolytes listed above at infinite dilution in H_2O at 25°C.
(1) 217.5 (2) 390.7
(3) 552.7 (4) 517.2

60. A correct electrochemical series can be obtained from K, Ca, Na, Al, Mg, Zn. Fe, Pb, H, Cu, Hg, Ag, Au by interchanging :
(1) Al and Mg (2) Zn and Fe
(3) Zn and Pb (4) Pb and H

61. When Zn piece is kept in $CuSO_4$ solution, copper gets precipitated because:
(1) Standard reduction potential of zinc is more than copper
(2) Standard reduction potential of zinc is less than copper
(3) Atomic number of zinc is larger than copper.
(4) Atomic number of zinc is lower than copper

62. Which of the following is the cell reaction that occurs when the following half – cells are combined?
$I_2 + 2e^- \rightarrow 2I^-$ (1 M); E° = + 0.54 V
$Br_2 + 2e^- \rightarrow 2Br^-$ (1 M); E° = +1.09 V
(1) $2Br^- + I_2 \rightarrow Br_2 + 2I^-$
(2) $I_2 + Br_2 \rightarrow 2I^- + 2Br^-$
(3) $2I^- + Br_2 \rightarrow I_2 + 2Br^-$
(4) $2I^- + 2Br^- \rightarrow I_2 + Br_2$

63. If the current is passed into the solution of an electrolyte:
(1) Anions move towards anode, cations towards cathode
(2) Anions and cations both move towards anode
(3) Anions move towards cathode, cations towards anode
(4) No movement of ions takes place

64. Standard reduction potential for, $Li^+|Li$, $Zn^{2+}|Zn$, $H^+|H_2$ and $Ag^+|Ag$ is $-3.05, -0.762, 0.00$ and $+0.80$ V. Which has highest reducing capacity?
(1) Ag (2) H_2
(3) Zn (4) Li

65. A solution of $CuSO_4$ is electrolysed for 10 min with a current of 1.5 A. What is the mass of copper deposited at the cathode?
(1) 2.096 g (2) 0.296 g
(3) 3.029 g (4) 2.906 g

66. Which metal is most readily corroded in moist air?
(1) Copper (2) Iron
(3) Silver (4) Nickel

67. The oxidation potential of Mg and Al are + 2.37 and + 1.66 volt respectively. The Mg in chemical reactions :
(1) Will be replaced by Al
(2) Will replace Al
(3) Will not be able to replace Al
(4) None of the above

68. The weight of silver (eq. wt. = 108) displaced by that quantity of current which displaced 5600 mL of hydrogen at STP is :
(1) 54 g (2) 108 g
(3) 5.4 g (4) None of these

69. The standard oxidation potentials of the electrodes
$Ag|Ag^+$, $Sn|Sn^{2+}$, $Ca|Ca^{2+}$, $Pb|Pb^{2+}$ are – 0.8, 0.136, 2.866 and 0.126 V respectively. The most powerful oxidising agent among these metal ions is :
(1) Pb^{2+} (2) Ca^{2+}
(3) Sn^{2+} (4) Ag^+

70. The desired amount of charge for obtaining one mole of Al from Al^{3+} is
(1) 96500 C (2) 2×96500 C
(3) 3×96500 C (4) $\frac{96500}{2}$ C

71. Electrolytes when dissolved in water dissociates into ions because
(1) They are unstable
(2) The water dissolves it
(3) The force of repulsion increases
(4) The force of electrostatic attraction are broken down by water

72. Limiting molar ionic conductivities of a univalent electrolyte are 57 and 73. The limiting molar conductivity of the solution will be :
(1) $130\ Scm^2mol^{-1}$
(2) $65\ Scm^2mol^{-1}$
(3) $260\ Scm^2mol^{-1}$
(4) $187\ Scm^2mol^{-1}$

73. Molten NaCl conducts electricity due to the presence of :
(1) Free electrons
(2) Free molecules
(3) Free ions
(4) Atoms of Na and Cl

74. The emf of the cell, $\left(E^o_{Zn^{2+}/Zn}=-0.76\,V\right)$
$Zn/\ Zn^{2+}(1\ M)\ ||\ Cu^{2+}(1\ M)|\ Cu$
$\left(E^o_{Cu^{2+}/Cu}=+0.34\,V\right)$ will be
(1) +1.10 V (2) –1.10 V
(3) +0.42 V (4) –0.42 V

75. Which represents a concentration cell?
(1) $Pt, H_2\,|\,\underset{C_1}{HCl}\,||\,\underset{C_2}{HCl}\,|\,H_2, Pt$
(2) $Pt, H_2\,|\,HCl\,||\,\underset{C_1}{Cl}\,|\,H_2, Pt$
(3) $Zn\,|\,Zn^{2+}\,||\,Cu^{2+}\,|\,Cu$
(4) $Fe\,|\,Fe^{2+}\,||\,Cu^{2+}\,|\,Cu$

76. In electrolysis of aqueous copper sulphate, the gas at anode and cathode are
(1) O_2 and H_2
(2) H_2 and O_2
(3) SO_2 and H_2
(4) SO_3 and O_2

77. The emf of the cell
$Mg\,|\ Mg^{2+}(0.01\ M)\,||\ Sn^{2+}(0.1\ M)|Sn$
at 298 K is
(Given, $E^\circ_{Mg^{2+},\,Mg}=-2.34\,V, E^\circ_{Sn^{2+},\,Sn}=-0.14\,V$)
(1) 2.23 V (2) 1.86 V
(3) 1.56 V (4) 3.26 V

78. The specific conductivity of 0.1 N KCl solution is 0.0129 $\Omega^{-1}cm^{-1}$. The resistance of the solution in the cell is 100Ω. The cell constant of the cell will be
(1) 1.10
(2) 1.29
(3) 0.56
(4) 2.80

79. The passage of electricity in the Daniell cell when Zn and Cu electrodes are connected:
(1) From Cu to Zn inside the cell
(2) From Cu to Zn outside the cell
(3) From Zn to Cu outside the cell
(4) None of the above

80. The resistance of a decinormal solution of a salt occupying a volume between two platinum electrodes 1.80 cm apart and $5.4\,cm^2$ in area was formed to be 32 ohm. The specific and equivalent conductivity respectively in their proper units are :
(1) 104.1 and 0.0104
(2) 208.2 and 0.0208
(3) 0.0104 and 104.0
(4) None of these

81. The molar conductance of NaCl, HCl and CH_3COONa at infinite dilution are 126.45,426.16 and 91.0 S cm^2 mol^{-1} respectively. The molar conductance of CH_3COOH at infinite dilution is. Choose the right option for your answer.

(1) $390.71\ Scm^2mol^{-1}$

(2) $698.28\ Scm^2mol^{-1}$

(3) $540.48\ Scm^2mol^{-1}$

(4) $201.28\ Scm^2mol^{-1}$

82. In a typical fuel cell, the reactants (R) and product (P) are

(1) $R = H_{2(g)}, O_{2(g)}; P = H_2O_{(\ell)}$

(2) $R = H_{2(g)}, O_{2(g)}, Cl_{2(g)}; P = HClO_{4(aq)}$

(3) $R = H_{2(g)}, N_{2(g)}; P = NH_{3(aq)}$

(4) $R = H_{2(g)}, O_{2(g)}; P = H_2O_{2(\ell)}$

83. In dry cell cathode is

(1) Zn (2) Carbon rod

(3) $Zn + NH_4Cl$ (4) $C + MnO_2$

84. During the electrolysis of molten sodium chloride, the time required to produce 0.10 mol of chlorine gas using a current of 3 amperes is:

(1) 220 minutes (2) 330 minutes

(3) 55 minutes (4) 110 minutes

85. The number of electrons delivered at the cathode during electrolysis by a current of 1 ampere in 60 seconds is:

(charge on electron $= 1.60 \times 10^{-19}$ C)

(1) 3.75×10^{20} (2) 7.48×10^{23}

(3) 6×10^{23} (4) 6×10^{20}

SECTION – B

86. Which of the following does not evolve oxygen at anode when electrolysis is carried out

(1) dil. H_2SO_4 with Pt electrode

(2) Fused NaOH with Pt electrode

(3) Acidic water with Pt electrode

(4) dil. H_2SO_4 with Cu electrode

87. E^0_{cell} for the reaction, $2H_2O \rightarrow H_3O^+ + OH^-$ at 25°C is –0.8277 V. The equilibrium constant for the reaction is:

(1) 10^{-14} (2) 10^{-23}

(3) 10^{-7} (4) 10^{-21}

88. Electrolysis of dil. H_2SO_4 liberates gases at cathode and anode respectively as

(1) O_2 and SO_2

(2) SO_2 and O_2

(3) O_2 and H_2

(4) H_2 and O_2

89. The e. m. f. of the cell $Zn \mid Zn^{2+}$ (1 M) $\|$ $Cu^{2+} \mid Cu$ (1 M) is 1.1 volt. If the standard reduction potential of $Zn^{2+} \mid Zn$ is –0.78 volt, what is the oxidation potential of $Cu \mid Cu^{2+}$?

(1) + 1.86 V (2) 0.32 V

(3) –0.32 V (4) –1.86 V

90. What will be the electrode potential of that hydrogen electrode is filled with HCl solution of pH value 1.0?

(1) –59.15 V (2) +59.15

(3) +59.15 mV (4) –59.15 mV

91. The emf of the cell

$$Zn \left| Zn^{2+}(0.01\ M) \right\| Fe^{2+}(0.001\ M) \left| Fe \right.$$

at 298 K is 0.2905. The value of equilibrium constant for the cell reaction is

(1) $10^{\frac{0.32}{0.0298}}$

(2) $e^{\frac{0.32}{0.0295}}$

(3) $10^{\frac{0.32}{0.0591}}$

(4) $10^{\frac{0.26}{0.0295}}$

92. EMF of hydrogen electrode in term of pH is (at 1 atm pressure)

(1) $E_{H_2} = \frac{RT}{F} \times pH$

(2) $E_{H_2} = \frac{RT}{F} . \frac{1}{pH}$

(3) $E_{H_2} = \frac{2.303RT}{F} .pH$

(4) $E_{H_2} = -0.0591\ pH$

93. What is the quantity of electricity (in Coulombs) required to deposit all the silver from 250mL of 1 M $AgNO_3$ solution?

(1) 2412.5 (2) 24125

(3) 4825.0 (4) 48250

94. If the E°_{cell} for a given reaction has a negative value, then which of the following gives the correct relationships for the value of ΔG° and K_{eq}?

(1) $\Delta G^\circ > 0; K_{eq} < 1$

(2) $\Delta G^\circ > 0;\ K_{eq} > 1$

(3) $\Delta G^\circ < 0;\ K_{eq} > 1$

(4) $\Delta G^\circ < 0;\ K_{eq} < 1$

95. Standard reduction potentials of the half reactions are given below :

$F_2(g)+2e^- \rightarrow 2F^-(aq);$ $E^\circ = +2.85$ V

$Cl_2(g)+2e^- \rightarrow 2Cl^-(aq);$ $E^\circ = +1.36$ V

$Br_2(l)+2e^- \rightarrow 2Br^-(aq);$ $E^\circ = +1.06$ V

$I_2(s)+2e^- \rightarrow 2I^-(aq);$ $E^\circ = +0.53$ V

The strongest oxidising and reducing agents respectively are :

(1) F_2 and I^- (2) Br_2 and Cl^-
(3) Cl_2 and Br^- (4) Cl_2 and I_2

96. In acidic medium MnO_4^- is converted to Mn^{2+}. The quantity of electricity in faraday required to reduce 0.5 mole of MnO_4^- to Mn^{2+} would be

(1) 2.5 (2) 5
(3) 1 (4) 0.5

97. The rusting of iron takes place as follows

$2H^+ + 2e^- + \frac{1}{2} O_2 \rightarrow H_2O(l);$ $E^\circ = +1.23$ V

$Fe^{2+} + 2e^- \rightarrow Fe(s);$ $E^\circ = -0.44$ V

Calculate ΔG° for the net process.

(1) -322 kJ mol^{-1}
(2) -161 kJ mol^{-1}
(3) -152 kJ mol^{-1}
(4) -76 kJ mol^{-1}

98. For the cell reaction

$2Fe^{3+}(aq)+2I^-(aq) \rightarrow 2Fe^{2+}(aq)+I_2(aq)$

$E^\ominus_{cell} = 0.24$ V at 298 K. The standard Gibbs energy $(\Delta_r G^\ominus)$ of the cell reaction is:

[Given that Faraday constant $F = 96500$ C mol^{-1}]

(1) -46.32 kJ mol^{-1}
(2) -23.16 kJ mol^{-1}
(3) 46.32 kJ mol^{-1}
(4) 23.16 kJ mol^{-1}

99. In the electrochemical cell

$Zn|ZnSO_4(0.01M)||CuSO_4(1.0M)|Cu$, the emf of this Daniel cell is E_1. When the concentration of $ZnSO_4$ is changed to 1.0M and that of $CuSO_4$ changed to 0.01M, the emf changes to E_2. From the following, which one is the relationship between E_1 and E_2?

(Given, $\frac{RT}{F} = 0.059$)

(1) $E_2 = 0 \neq E$ (3) $E_1 < E_2$
(2) $E_1 = E_2$ (4) $E_1 > E_2$

100. The pressure of H_2 required to make the potential of H_2 electrode zero in pure water at 298 K is:

(1) 10^{-4} atm (2) 10^{-14} atm
(3) 10^{-12} atm (4) 10^{-10} atm

SECTION-III (BOTANY)

SECTION - A

101. Pollen grain of angiosperms represents

(1) Male gamete
(2) Microsporangium
(3) Male gametophyte
(4) Megaspore

102. Pollen grains are well preserved as fossils due to the presence of

(1) Sporopollenin in the intine of pollen
(2) Pectocellulose in the intine of pollen
(3) Sporopollenin in the exine of pollen
(4) Pectin in the exine of pollen

103. Which of the following has been used in the form of tablets as a food supplement?

(1) Pollens (2) Sepals
(3) Pistils (4) Petals

104. Viability of pollen grains of wheat is about

(1) 7 days
(2) One month
(3) 30 minutes
(4) One day

105. The layer in pollen grain which has germ pores is

(1) Epidermis (2) Epicarp
(3) Exine (4) Outer integument

106. Which of the following condition is helpful for wind pollination of flowers?

(1) Sticky pollens
(2) Flowers with nectar
(3) Well exposed stamens
(4) Attractive colored petals

107. Which of the following structure guides the entry of pollen tube into the embryo sac?

(1) Nucellus
(2) Antipodal cells
(3) Filiform apparatus of synergid cells
(4) Egg cell

108. Cleistogamy refers to the condition in which

(1) Pollinators are not required
(2) Flowers are absent
(3) Flowers always remain open
(4) Flowers are gamopetalous

109. Majority of insect pollinated flowers are
(1) Small, colorless, fragrant and producing dry pollens
(2) Large, colourful, fragrant and rich in nectar
(3) Small and producing large number of dry pollens
(4) Large, colourful, without nectar and producing dry pollens

110. Which of the following pairs is not correctly matched?
(1) Ovule – Megasporangium
(2) Filiform apparatus – Synergids
(3) Apocarpus, multicarpellary gynoecium – *Papaver*
(4) Largest cell of the embryo sac – Central cell

111. Read the given features of a plant 'A'.
a. Non-sticky pollen grains.
b. Well exposed stamens.
c. Nectar absent.
d. Flowers are packed into inflorescence.
On the basis of above features, identify the type of pollinating agent preferred by the plant '*A*' for pollination.
(1) Water (2) Insect
(3) Wind (4) Bat

112. Choose the odd statement for pollen grains
(1) Pollen grains of some species cause severe allergies
(2) Can be used as food supplement
(3) Can be stored at – 196°C in liquid N_2
(4) Have fascinating array of patterns and designs of pectocellulose on outer wall.

113. Persistent nucellus present in some seeds is called
(1) Perisperm (2) Pericarp
(3) Periderm (4) Phelloderm

114. Most common type of embryo sac present in angiosperms is
(1) Bisporic, 8 nucleated and 7 celled
(2) Monosporic, 8 nucleated and 8 celled
(3) Bisporic, 8 nucleated and 8 celled
(4) Monosporic, 8 nucleated and 7 celled

115. The innermost layer of anther wall is
(1) Endothecium and it provides nutrition to pollens
(2) Tapetum and it nourishes the developing pollen grains
(3) Nucellus and it forms microspores
(4) Endothecium and it helps in dehiscence of anther

116. Persistent nucellus in the seeds of black pepper is called
(1) Tegmen (2) Endosperm
(3) Perisperm (4) Cotyledon

117. Parthenocarpic fruits
(1) Develop from fertilised ovary
(2) Are seedless
(3) Are apple and cashew nut
(4) Develop from other parts of fertilised ovary except its wall

118. An aquatic plant which is pollinated by water is
(1) Water hyacinth (2) Water lily
(3) *Zostera* (4) *Salvia*

119. If there is only one PMC in a pollen sac then the total number of male gametes produced by it is
(1) 4 (2) 2
(3) 8 (4) 6

120. The event which is unique to angiosperms is
(1) Fusion of male and female gametes
(2) Fusion of male gamete with secondary nucleus
(3) Formation of zygote
(4) Presence of female gametophyte

121. The portion of embryonal axis above the level of attachment of scutellum is called
(1) Coleoptile (2) Epicotyl
(3) Hypocotyl (4) Epiblast

122. The cells of anther wall layer which nourish the developing pollen grains is related to all of the following features, except
(1) Dense cytoplasm
(2) Polyploid
(3) Multinucleate
(4) Low DNA content

123. Choose the odd one w.r.t. reward for insect in entomophily.
(1) Nectar
(2) Safe place for egg laying
(3) Pollen grains
(4) Fragrance

124. If artificial hybridization is performed in maize, then which of the given steps will not be required?
(1) Selection of parents
(2) Emasculation
(3) Bagging
(4) Rebagging

125. Endospermic dicotyledonous seeds are present in
(1) Pea (2) Castor
(3) Beans (4) Groundnut

126. Mendel proposed something was being stable passed down from parents to offspring called
(1) Genes (2) Genotype
(3) Factors (4) Alleles

127. Segregation of Mendelian factors occurs during
(1) Anaphase I
(2) Anaphase II
(3) Diplotene
(4) Metaphase I

128. Tt is crossed with ……... to give both tall and dwarf
progeny in equal number
(1) Tt (2) TT
(3) tt (4) Tr

129. What should be the phenotype of the F_1 progeny produced by a cross between tall and dwarf true-breeding garden pea plants?
(1) Tall plants
(2) Dwarf plants
(3) Intermediate plants
(4) Mixed population of tall and dwarf plants

130. Mendel's principle of segregation is based on separation of alleles during
(1) Gamete formation
(2) Seed formation
(3) Pollinations
(4) Embryonic development

131. Which one from those given below is the period for Mendel's hybridisation experiments?
(1) 1856 – 1863 (2) 1840 – 1850
(3) 1857 – 1869 (4) 1870 – 1877

132. In monohybrid test cross, ratio obtained is
(1) 1:1 (2) 1:1:1
(3) 3:1 (4) 1 : 2 : 1

133. Which one of the following is not true for the experiments of Mendel on pea?
(1) His observations were based on natural, statical analysis & mathematical logics.
(2) He had chosen characters of two contrasting states.
(3) He used true-breeding lines.
(4) His experiments had small sampling size

134. I = Inflated, i = constricted. Given that the phenotype of F_1 progeny is inflated pods and that the parents are true-breeding, which of the following is not a possible genotype of parents?
(1) Parent 1 : II; Parent 2 : ii
(2) Parent 1 : II; Parent 2 : II
(3) Parent 1 : ii; Parent 2 : ii
(4) Parent 1 : ii; Parent 2 : II

135. According to Mendel's principle of segregation, gametes always receive
(1) One pair factor
(2) One quarter of the genes
(3) Both one factor of father and one factor of mother
(4) Only one factor

SECTION - B

136. What is the generation of plants produced by the crossing of true-breeding plants called?
(1) F_1
(2) F_0
(3) F_2
(4) F_3

137. Law of dominance and law of segregation was based on _____ .
(1) Dihybrid cross
(2) Monohybrid cross
(3) Test cross
(4) Back cross

138. Mendel's Law of dominance explains.
(1) Expression of only one of the parental characters in monohybrid cross in the F_1
(2) Expression of both parental character in F_2
(3) Proportion of 3:1 obtained at the F_2 generation
(4) All of the above

139. What does F in "F_1 progeny" stand for?
(1) Filial
(2) Fillial
(3) Filum
(4) Filler

140. Which of the following traits expresses itself only in homozygous condition?
(1) Yellow seed colour
(2) Violet flower colour
(3) Green pod colour
(4) Terminal flower position

141. Consider violet flower is dominant over white flower colour. To determine the genotype of violet flowered pea plant of F_1 generation, it should be crossed with

(1) White flowered pea plant
(2) Homozygous dominant parent
(3) Homozygous recessive parent
(4) Both (1) & (3)

142. A plant that exhibits two alleles for only one trait is called _______

(1) Monohybrid (2) Dihybrid
(3) Monogamous (4) Digamous

143. The factor which expresses in homozygous and heterozygous states is called ________

(1) Dominant (2) Recessive
(3) Gene (4) Allele

144. The presence of two different alleles at a particular locus results in _____

(1) Homozygosity
(2) Heterozygosity
(3) Hemizygosity
(4) Nullizygosity

145. With green pods as a dominant trait over yellow, which of the following crosses will result in all progeny having yellow pods?

(1) Homozygous green and homozygous yellow
(2) Heterozygous green and heterozygous green
(3) Homozygous yellow and homozygous yellow
(4) Homozygous green and homozygous green

146. If VV produces violet flowers and vv produces white flowers, what will be the phenotype and genotype of the F_1 progeny?

(1) All violet
(2) All white
(3) 50% violet and 50% white
(4) 75% violet and 25% white

147. Two tall pea plants are crossed together. In its F_1 generation, the probability of tallness will be

(1) 100% tall or 75% tall
(2) Always 100% tall
(3) 100% tall or 50% tall
(4) Always 50% tall

148. The term used for the units of inheritance by Mendel was

(1) Traits (2) Genes
(3) Alleles (4) Factors

149. During meiosis, what happens to the parental alleles?

(1) They segregate
(2) They undergo repair
(3) They undergo breakage
(4) They replicate

150. What should be the phenotype of a cross between violet and white-flowered true-breeding garden pea plants?

(1) Violet (2) White
(3) Pink (4) Red

SECTION-IV (ZOOLOGY)

SECTION-A

151. Select the correct sequence for transport of sperm cells in male reproductive system.

(1) Testis $\rightarrow$ Epididymis $\rightarrow$ Vasa efferentia $\rightarrow$ Vas deferens $\rightarrow$ Ejaculatory duct $\rightarrow$ Inguinal canal $\rightarrow$ Urethra $\rightarrow$ Urethral meatus
(2) Testis $\rightarrow$ Epididymis $\rightarrow$ Vasa efferentia $\rightarrow$ Rete testis $\rightarrow$ Inguinal canal $\rightarrow$ Urethra
(3) Seminiferous tubules $\rightarrow$ Rete testis $\rightarrow$ Vasa efferentia $\rightarrow$ Epididymis $\rightarrow$ Vas deferens $\rightarrow$ Ejaculatory duct $\rightarrow$ Urethra $\rightarrow$ Urethral meatus
(4) Seminiferous tubules $\rightarrow$ Vasa efferentia $\rightarrow$ Epididymis $\rightarrow$ Inguinal canal $\rightarrow$ Urethra

152. In the 28 day human ovarian cycle, the ovulation takes place typically on

(1) Day 14 of the cycle
(2) Day 28 of the cycle
(3) Day 1 of the cycle
(4) Day 5 of the cycle.

153. Match the following columns and select the correct option.

	Column-I		Column-II
(A)	Placenta	(i)	Androgens
(B)	Zona pellucida	(ii)	Human Chorionic Gonadotropin (hCG)
(C)	Bulbourethral glands	(iii)	Layer of the ovum
(D)	Leydig cells	(iv)	Lubrication of the penis

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

154. In human female, the blastocyst

(1) Forms placenta even before implantation
(2) Gets implanted into uterus 3 days after ovulation
(3) Gets nutrition from uterine endometrial secretion only after implantation
(4) Gets implanted in endometrium by the trophoblast cells.

155. Menstrual flow occurs due to lack of
(1) Oxytocin (2) Vasopressin
(3) Progesterone (4) FSH.

156. In humans, at the end of the first meiotic division, the male germ cells differentiate into the
(1) Spermatids
(2) Spermatogonia
(3) Primary spermatocytes
(4) Secondary spermatocytes.

157. Read the statement carefully & choose the correct option.
Statement I: The blastocyst continues to divide and transform into morula
Statement II: The embryo with 4-8 blastomeres is called morula.
(1) Both statement are correct.
(2) Both statement are incorrect.
(3) Only statement I is correct
(4) Only statement II is correct

158. Which one of the following is the correct matching of the events occurring during menstrual cycle?
(1) Proliferative phase : Rapid regeneration of myometrium and maturation of Graafian follicle
(2) Secretory phase : Development of corpus luteum and increased secretion of progesterone
(3) Menstruation : Breakdown of myometrium and ovum not fertilised
(4) Ovulation : LH and FSH attain peak level and sharp fall in the secretion of progesterone

159. Seminal plasma in humans is rich in
(1) Fructose and calcium but has no enzymes
(2) Glucose and certain enzymes but has no calcium
(3) Fructose and certain enzymes but poor in calcium
(4) Fructose, calcium and certain enzymes.

160. Morula is a developmental stage
(1) between the zygote and blastocyst
(2) between the blastocyst and gastrula
(3) after the implantation
(4) between implantation and parturition

161. Match the following and choose the correct options.

	Column I		**Column II**
A.	Trophoblast	I.	Embedding of blastocyst in the endometrium
B.	Cleavage	II.	Group of cells that would differentiate as embryo
C.	Inner cells mass	III.	Outer layer of blastocyst attached to the endometrium
D.	Implantation	IV.	Mitotic division of zygote

Codes

	A	B	C	D
(1)	II	I	III	IV
(2)	III	IV	II	I
(3)	III	I	II	IV
(4)	II	IV	III	I

162. Match column I with column II and choose the correct option

	Column I		**Column II**
A.	Relaxin	I.	Help in spermiogenesis
B.	Progesterone	II.	Ovary
C.	hCG	III.	Corpus luteum
D.	FSH	IV.	Placenta

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

163. The mitotic division starts as the zygote moves through the ___A__ of the ___B___ called cleavage.
Identify A & B_
(1) A-Ampulla, B-Ovary
(2) A-Isthmus, B-Oviduct
(3) A-Infundibulum, B-Fallopian tube
(4) A-Infundibulum, B- Ovary

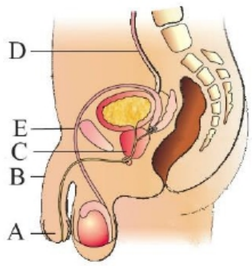
164. The menstrual phase is followed by _______.
(1) Follicular phase
(2) Luteal phase
(3) Menstruation
(4) Fertilisation

165. Match the column I with column II and choose the correct option

	Column I		Column II
A.	Gestation	I.	Formation of gametes
B.	Implantation	II.	Fusion of male and females gametes
C.	Fertilisation	III.	Blastocyst attachment to uterine wall
D.	Gametogenesis	IV.	Embryonic development

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

166. Identify A, B, C, D and E from the following diagram.



(1) A-Penis, B-Prostate, C-Rectum, D-Ureter, E-Vas deferens
(2) A-Prostate, B-Penis, C-Rectum, D-Vas deferens, E-Ureter
(3) A-Glans Penis, B-Penis, C-Prostate, D-Ureter, E-Vas deferens
(4) A-Penis, B-Glans penis C-Ureter, D-Prostate, E-Vas deferens.

167. The regions outside the seminiferous tubules contains.
(1) Leydig cells
(2) Interstitial cells
(3) Blood vessels
(4) All of the above

168. Assertion: Ovaries produce the female gamete.
Reason: Ovaries produce steroid hormones.
(1) Both assertion and reason are correct and reason is the correct explanation for assertion.
(2) Both assertion and reason are correct but reason is not the correct explanation for assertion.
(3) Both assertion and reason are incorrect.
(4) Only assertion is correct and reason is incorrect.

169. Identify correct statement regarding Prostate.
I. Male external genitalia
II. Male accessory gland
III. Their secretion help in lubrication of penis.
(1) I, II, III (2) Only I
(3) Only II (4) Only III

170. How many of the following comes under female external genitalia?
Labia majora, cervix, hymen, clitoris, ampulla, mons pubis
(1) 5 (2) 4
(3) 6 (4) 2

171. Choose the incorrect statement.
(1) Mammary ampulla connected to mammary lobes.
(2) In the wall of uterus the external thin membrane is perimetrium.
(3) Clitoris lies at the upper junction of 2 labia minora.
(4) Secondary spermatocytes have only 23 chromosomes.

172. ___A____ forms a new membrane called zona pellucida. (Identify A).
(1) Primary Oocyte (2) Secondary Oocyte
(3) Tertiary Oocyte (4) Graafian follicle.

173. The first menstruation begins at ___A__ and is called ___B___
Identify A & B
(1) A-Puberty, B-Menopause
(2) A-30 years, B-Menarche
(3) A-30 years, B-Menopause
(4) A-Puberty, B-Menarche

174. The seminal plasma along with _______ constitute the semen.
(1) Sperms (2) Fructose
(3) Calcium (4) Some enzymes

175. Read the statements carefully and choose the correct option.
Statement I: Primary oocyte within the tertiary follicle complete its first meiotic division.
Statement II: First meiotic division in primary oocyte is equal division produces a secondary oocyte and a polar body.
(1) Both statement are correct.
(2) Both statement are incorrect.
(3) Only statement I is correct
(4) Only statement II is correct

176. Choose the incorrect statement(s)

I. In the presence of fertilisation corpus luteum degenerates.

II. During fertilisation sperm comes in contact with the zona pellucida.

III. Menstrual cycle starts with the proliferative phase.

(1) Only I (2) I & II

(3) I & III (4) II & III

177. The blastomeres in the blastocyst are arranged into an outer layer ___A___ and inner ___B___ Identify A & B

(1) A-Inner cell mass, B-Trophoblast

(2) A-Blastocyst, B-Trophoblast

(3) A-Inner & cell mass, B-Blastocyst

(4) A-Trophoblast, B-Inner cell mass

178. Which of the following hormones level are increased during pregnancy?

Estrogens, FSH, LH, Cortisol, thyroxine

(1) 1

(2) 2

(3) 4

(4) 3

179. In adults, length of each testis is about

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

(3) 1-2 cm (4) 8-10 cm

180. Choose the correct statement/(s).

I. Vasa efferentia is a male sex accessory duct.

II. Vasa efferentia open into epididymis.

III. Ejaculatory duct store and transports the sperms.

(1) I & II (2) II & III

(3) I & III (4) I, II & III

181. Which of the following is female accessory ducts?

(1) Oviducts

(2) Fallopian tubes.

(3) Vagina

(4) All of the above

182. How many sperms are formed from 6 primary spermatocytes?

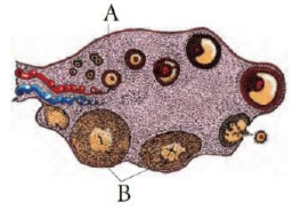
(1) 12

(2) 4

(3) 32

(4) 24

183. The figure shows a section of human ovary. Select the option which gives the correct identification of either A or B with function/characteristic.



(1) B – Corpus luteum – Secretes progesterone

(2) A – Tertiary follicle – Forms Graafian follicle

(3) B-Corpus luteum – Secretes estrogen

(4) A-Primary oocyte – It is in the prophase I of the miotic division

184. The human male ejaculates about ________ sperms.

(1) 150 millions

(2) 450 millions

(3) 250 millions

(4) 100 millions

185. Transfer of sperms in female genital tract is called _________.

(1) Implantation (2) Fertilisation

(3) Insemination (4) Gestation

SECTION-B

186. Read the statement carefully and choose the correct option.

Statement I: fertilisation can only occur if the ovum and sperm are transported simultaneously to the infundibulum region.

Statement II: Secretion of prostate gland help the sperm enter into the cytoplasm.

(1) Both statement are correct.

(2) Both statement are incorrect.

(3) Only statement I is correct

(4) Only statement II is correct

187. The trophoblast layer gets attached to __A__ and inner cell mass differentiated as the ___B___. Identify A & B

(1) A-Perimetrium B-Zygote

(2) A-Myometrium B-embryo

(3) A-Endometrium B-embryo

(4) A-Endometrium B- Blastocyst

188. Which of the following statements is correct regarding male gamete?
(1) 80% of sperm carry Y-chromosome, 20% of sperm carry X-chromosome.
(2) Sex of zygote depends on whether sperm carry X-chromosome/Y-chromosome
(3) Sex of zygote depends on whether ova carry X-chromosome/Y-chromosome
(4) Sperm head eontain an elongated diploid nucleus.

189. The opening of the vagina is often partially covered by _________
(1) Hymen (2) Clitoris
(3) Labia minora (4) Labia majora

190. Assertion: Not all copulations lead to fertilisation and pregnancy.
Reason: Fertilisation can only occur if the ovum and sperm are transported simultaneously to the ampullary region.
(1) Both assertion and reason are correct and reason is the correct explanation for assertion.
(2) Both assertion and reason are correct but reason is not the correct explanation for assertion.
(3) Both assertion and reason are incorrect.
(4) only assertion is correct and reason is incorrect.

191. Milk production starts _______.
(1) Towards the end of pregnancy
(2) During the 1^{st} month of pregnancy.
(3) During 6^{th} month of pregnancy.
(4) After fertilisation.

192. A female external genitalia which is a cushion of fatty tissue covered by skin & pubic hair is called
(1) Clitoris
(2) Labia majora
(3) Mons pubis
(4) Labia minora

193. Changes in GnRH pulse frequency in females is controlled by circulating levels of
(1) Progesterone only
(2) Progesterone and inhibin
(3) Estrogen and progesterone
(4) Estrogen and inhibin.

194. Which of the following hormones is not secreted by human placenta?
(1) hCG
(2) Estrogens
(3) Progesterone
(4) LH

195. Urethral meatus refers to the
(1) urinogenital duct
(2) opening of vas deferens into urethra
(3) external opening of the urinogenital duct
(4) muscles surrounding the urinogenital duct

196. Which among the following has 23 chromosomes?
(1) Spermatogonia
(2) Zygote
(3) Secondary oocyte
(4) Oogonia

197. The vas deferens receives duct from the seminal vesicle and opens into urethra as
(1) Epididymis
(2) Ejaculatory duct
(3) Efferent ductule
(4) Ureter

198. Sperms are finally released from the seminiferous tubules by the process _________.
(1) Spermiogenesis
(2) Spermatogenesis
(3) Gametogenesis
(4) Spermiation

199. The glandular tissue of each breast is divided into __________.
(1) 15-20 mammary lobes.
(2) 15-20 mammary ducts.
(3) 15-20 lactiferous ducts
(4) 20-40 mammary ducts.

200. Milk is secreted by _______.
(1) Mammary lobes
(2) Cells of alveoli
(3) Mammary ducts
(4) Lactiferous duct

NEET (2024)

PRACTICE TEST-01 SOLUTION

DURATION : 200 Minutes

M. MARKS : 720

ANSWER KEY

PHYSICS		CHEMISTRY		BOTANY		ZOOLOGY	
1.	(3)	51.	(1)	101.	(3)	151.	(3)
2.	(4)	52.	(4)	102.	(3)	152.	(1)
3.	(4)	53.	(1)	103.	(1)	153.	(4)
4.	(1)	54.	(4)	104.	(3)	154.	(4)
5.	(2)	55.	(1)	105.	(3)	155.	(3)
6.	(1)	56.	(2)	106.	(3)	156.	(4)
7.	(2)	57.	(1)	107.	(3)	157.	(2)
8.	(2)	58.	(1)	108.	(1)	158.	(2)
9.	(1)	59.	(2)	109.	(2)	159.	(4)
10.	(3)	60.	(1)	110.	(3)	160.	(1)
11.	(2)	61.	(2)	111.	(3)	161.	(2)
12.	(1)	62.	(3)	112.	(4)	162.	(3)
13.	(1)	63.	(1)	113.	(1)	163.	(2)
14.	(1)	64.	(4)	114.	(4)	164.	(1)
15.	(1)	65.	(2)	115.	(2)	165.	(1)
16.	(1)	66.	(2)	116.	(3)	166.	(3)
17.	(1)	67.	(2)	117.	(2)	167.	(4)
18.	(3)	68.	(1)	118.	(3)	168.	(2)
19.	(3)	69.	(4)	119.	(3)	169.	(3)
20.	(1)	70.	(3)	120.	(2)	170.	(2)
21.	(3)	71.	(4)	121.	(2)	171.	(1)
22.	(2)	72.	(1)	122.	(4)	172.	(2)
23.	(2)	73.	(3)	123.	(4)	173.	(4)
24.	(3)	74.	(1)	124.	(2)	174.	(1)
25.	(2)	75.	(1)	125.	(2)	175.	(3)
26.	(2)	76.	(1)	126.	(3)	176.	(3)
27.	(4)	77.	(1)	127.	(1)	177.	(4)
28.	(1)	78.	(2)	128.	(3)	178.	(4)
29.	(1)	79.	(2)	129.	(1)	179.	(2)
30.	(3)	80.	(3)	130.	(1)	180.	(4)
31.	(3)	81.	(1)	131.	(1)	181.	(4)
32.	(1)	82.	(1)	132.	(1)	182.	(4)
33.	(3)	83.	(2)	133.	(4)	183.	(1)
34.	(3)	84.	(4)	134.	(3)	184.	(3)
35.	(2)	85.	(1)	135.	(4)	185.	(3)
36.	(2)	86.	(4)	136.	(1)	186.	(2)
37.	(3)	87.	(1)	137.	(2)	187.	(3)
38.	(3)	88.	(4)	138.	(4)	188.	(2)
39.	(2)	89.	(3)	139.	(1)	189.	(1)
40.	(3)	90.	(4)	140.	(4)	190.	(1)
41.	(3)	91.	(1)	141.	(4)	191.	(1)
42.	(1)	92.	(4)	142.	(1)	192.	(3)
43.	(2)	93.	(2)	143.	(1)	193.	(3)
44.	(1)	94.	(1)	144.	(2)	194.	(4)
45.	(4)	95.	(1)	145.	(3)	195.	(3)
46.	(4)	96.	(1)	146.	(1)	196.	(3)
47.	(1)	97.	(1)	147.	(1)	197.	(2)
48.	(3)	98.	(1)	148.	(4)	198.	(4)
49.	(2)	99.	(4)	149.	(1)	199.	(1)
50.	(3)	100.	(2)	150.	(1)	200.	(2)

SECTION – I (PHYSICS)

1. **(3)**

$\phi = \vec{E}.\vec{A}$

$= (8\hat{i}+4\hat{j}+3\hat{k}).100\,\hat{j}$

$= 400$ units

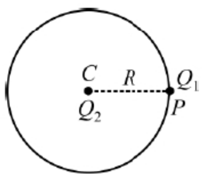
2. **(4)**

$a = \dfrac{qE}{m}$

$\because\ E_A > E_B > E_C > E_D$

Then at point D acceleration of the test charge will be minimum.

3. **(4)**



$W = Q_1 \Delta V$

$\because \Delta V = 0$

Then $W = 0$

or $W = U_f - U_i$

$\because\ U_f = U_i$

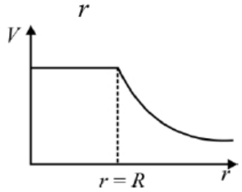
Then $W = 0$

4. **(1)**

$V = k\dfrac{Q}{r}$, for $r > R$

$V = k\dfrac{Q}{R}$, for $r = R$

$V = k\dfrac{Q}{r}$ = Constant, for $r < R$



5. **(2)**

6. **(1)**

$E = -\dfrac{\partial V}{\partial x}$

$\because V = 4x^2$

$E = -\dfrac{\partial}{\partial x}4x^2$

$\boxed{E = -8x}$

At point (1m, 0, 2m)

$E = -8\times 1 = -8$

$\boxed{E = -8\ V/m}$

7. **(2)**

In the direction of electric field value of electric potential decreases, then

$V_B - V_A < 0$

$\boxed{V_B < V_A}$

8. **(2)**

$W = q\Delta V$

and $W = K_f - K_i$

$K_f - K_i = q\Delta V$

$\because K_i = 0$

Then $K_f = q\Delta V$

$=$ e 500

$= 500$ eV

9. **(1)**

$\dfrac{1}{2}mv^2 = qV$

$v = \sqrt{\dfrac{2qV}{\text{m}}}$

$\boxed{v \propto \sqrt{q}}$

$\dfrac{V_A}{V_B} = \sqrt{\dfrac{q}{4q}} = \dfrac{1}{2}$

10. **(3)**

$KE = q\Delta V$

$KE \propto q$

$\dfrac{K_\alpha}{K_P} = \dfrac{2e}{e} = \dfrac{2}{1}$

11. **(2)**

$V = E.\,r$

$= \dfrac{\sigma}{\epsilon_0}.r$

12. **(1)**

$W = U_f - U_i$

$= K\dfrac{10^{-6}\times 10^{-6}}{1} - k\dfrac{10^{-6}\times 10^{-6}}{2}$

$= 9\times 10^9 \times 10^{-12}\left(1-\dfrac{1}{2}\right)$

$= \dfrac{9\times 10^{-3}}{2} = 4.5\times 10^{-3}\ \text{J} = 4.5\ \text{mJ}$

13. **(1)**

$$\phi = \phi_A + \phi_B + \phi_C = \frac{q}{\varepsilon_0}$$

$\because \phi_A = \phi_C$

$$\phi_A + \phi + \phi_A = \frac{q}{\varepsilon_0}$$

$$2\phi_A = \frac{q}{\varepsilon_0} - \phi$$

$$\phi_A = \frac{1}{2}\left(\frac{q}{\varepsilon_0} - \phi\right)$$

14. **(1)**

$$\phi = \frac{\Sigma Q}{\varepsilon_0}$$

$$\phi = \frac{q - q + q + q - q + q}{\varepsilon_0} = \frac{2q}{\varepsilon_0}$$

15. **(1)**

16. **(1)**

17. **(1)**

$dV = -\vec{E}.\vec{dr}$

Negative sign in the above expression signifies that as one moves in the direction of electric field potential decreases.

18. **(3)**

$F_{net} = F - F = 0$

and $\tau = pE \sin 90°$

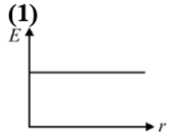
then $F = 0,\ \tau \neq 0$

19. **(3)**

$$\phi = \frac{\Sigma Q}{\varepsilon_0} = \frac{5q}{\varepsilon_0}$$

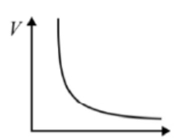
$$\phi' = \frac{5q}{6\varepsilon_0}$$

20. **(1)**



$$E = \frac{\sigma}{2\varepsilon_0}$$

21. **(3)**



$$V = k\frac{Q}{r}$$

$$V \propto \frac{1}{r}$$

22. **(2)**

$E = 0$

23. **(2)**

Direction of electric field line at the equipotential surface is perpendicular to the surface.

24. **(3)**

25. **(2)**

$$\int_{V_A}^{V_B} dV = -\int E.dr$$

$V_B - V_A = -E\,5\cos 53°$

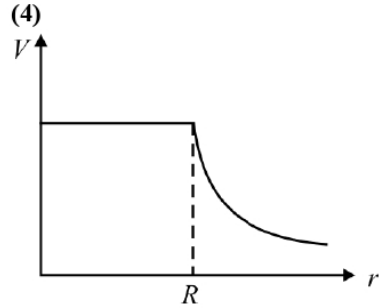
$= -3E$

$\boxed{V_A - V_B = 3E}$

26. **(2)**

$$\boxed{U = -k\frac{e^2}{r}}$$

27. **(4)**



28. **(1)**

$$\boxed{E = k\frac{Q}{r^2}}$$

$$630 = 9 \times 10^9 \times \frac{Q}{(6)^2}$$

$$Q = \frac{630 \times 36}{9 \times 10^9}$$

$$\boxed{Q = 63 \times 4 \times 10^{-8}}$$

$Q = 252 \times 10^{-8} = 2.52 \times 10^{-6}\ C = 2.52\ \mu C$

29. **(1)**

Enclosed charge = $Q/8$

No. flux through the touching surfaces

So, through each surface $\phi = \frac{Q/8}{3\varepsilon_0} = \frac{Q}{24\varepsilon_0}$

30. **(3)**

$$F = k\frac{Q^2}{d^2}$$

$$\because\ Q = ne$$

$$F = k\frac{n^2e^2}{d^2}$$

$$n^2 = \frac{Fd^2}{ke^2}$$

$$n = \sqrt{\frac{Fd^2}{ke^2}}$$

$$n = \sqrt{\frac{4\pi\varepsilon_0 Fd^2}{e^2}}$$

31. **(3)**

$W = q\Delta V$

$50 = 2\ (V + 10)$

$V = 15$ volt

32. **(1)**

$$\text{KE} = \frac{1}{2}mv^2$$

$$\because\ v^2 = u^2 + 2as$$

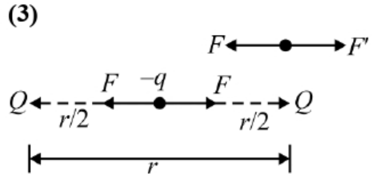
$$v^2 = 0 + 2\frac{qE}{m}y$$

$$v^2 = \frac{2qE}{m}y$$

$$\text{KE} = \frac{1}{2}m.\frac{2qE}{m}y$$

$$\boxed{KE = qEy}$$

33. **(3)**



At equilibrium, net force on $Q = 0$

$$\frac{kq.Q}{\left(\frac{r}{2}\right)^2} + k\frac{Q^2}{r^2} = 0$$

$$\frac{4kqQ}{r^2} + k\frac{Q^2}{r^2} = 0$$

$$4q + Q = 0$$

$$\boxed{q = -\frac{Q}{4}}$$

34. **(3)**

$$E = \frac{2k\lambda}{r}$$

$$= \frac{2\lambda}{4\pi\varepsilon_0 r}$$

$$= \frac{\lambda}{2\pi\varepsilon_0 r}$$

$$\because\quad r = a$$

$$\boxed{E = \frac{\lambda}{2\pi\varepsilon_0 a}}$$

35. **(2)**

$$\phi = \vec{E}.\vec{A}$$

$$= (8\hat{i} + 8j + k).10\hat{i}$$

$$= 80\ \text{Nm}^2/C$$

36. **(2)**

$$s = \frac{1}{2}\frac{qE}{m}t^2$$

$$t^2 = \frac{2sm}{qE}$$

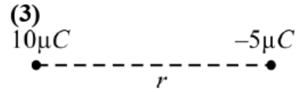
$$\because\quad q = e$$

$$\boxed{t = \sqrt{\frac{2sm}{eE}}}$$

$$\because\quad s = d$$

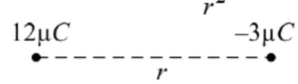
$$t = \sqrt{\frac{2dm}{eE}}$$

37. **(3)**



$$F = k\frac{10\times10^{-6}\times5\times10^{-6}}{r^2} \qquad \ldots \text{(i)}$$

and $$F' = k\frac{12\times3\times10^{-12}}{r^2} \qquad \ldots \text{(ii)}$$



$$F' = \frac{k12\times3\times10^{-12}}{\frac{k\times10\times5\times10^{-12}}{F}}$$

$$= F\frac{36}{50} = \frac{18F}{25}$$

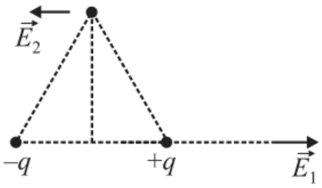
38. **(3)**

$$E = \frac{kq}{r^2}\times2$$

39. **(2)**

$\boxed{\tan\theta \propto q}$ (when projected with same KE)

40. **(3)**



Angle between E_1 and E_2 is 180°

So, $\vec{E}_1 \cdot \vec{E}_2$ will be negative

41. **(3)**

$V = \frac{1}{4\pi\varepsilon_0} \cdot \frac{Q}{r} = Q.10^{11}$ volts

$\therefore \quad \frac{1}{r} = 4\pi\varepsilon_0 \times 10^{11}$

$E = \frac{\text{Potential}}{r} = Q.10^{11} \times 4\pi\varepsilon_0 .10^{11}$

$\Rightarrow \quad E = 4\pi\varepsilon_0.\ Q.10^{22}$ volt/m

42. **(1)**

$KE = q\Delta V$

$= 2e(70 - 50)$

$= 40\ eV$

43. **(2)**

$W = q\Delta V$

$= 5 \times 12$

$= 60$ J

44. **(1)**

$Vc = 0$

$\Rightarrow q + Q - 2q - 2Q = 0$

$\therefore Q = -q$

45. **(4)**

$W = \Delta U$

$= -pE(\cos\theta_f - \cos\theta_i)$

$= -pE(\cos 90 - \cos 0)$

$= +pE$

46. **(4)**

47. **(1)**

48. **(3)**

49. **(2)**

$V_1 = \frac{kq}{r_1} \neq V_2 = \frac{kq}{r_2}$

50. **(3)**

$V = \frac{kq}{r}$ and $U = \frac{kq_1q_2}{r}$.

SECTION – II (CHEMISTRY)

51. **(1)**

The reduction potential of H_2O is more than Na^+,

$\therefore H^+$ from H_2O is reduced at cathode.

The oxidation potential of H_2O is more than SO_4^{2-},

$\therefore$ Oxygen from H_2O is oxidised at anode

Cathode: $2H_2O + 2e^- \longrightarrow 2OH^- + H_2(g)$

Anode: $2H_2O \longrightarrow O_2 + 4H^+ + 4e^-$ (g)

52. **(4)**

$E^\circ_{cell} = E^\circ_{OP_{Sn}} + E^\circ_{RP_{Fe}}$

$= 0.14 + (-0.44)$

$= -0.30$ V

53. **(1)**

Galvanization is the process of applying a protective zinc coating to steel or iron to prevent corrosion.

54. **(4)**

Theoretical

55. **(1)**

High value for E°_{red}. Shows more electronegativity i. e., Zn is more electropositive than Fe. ($E^\circ_{Zn^{2+}/Zn} < E^\circ_{Fe^{2+}/Fe}$)

56. **(2)**

During corrosion of iron, Fe changes to +3 Oxidation state

$4Fe + 3O_2 + 6H_2O \rightarrow \underbrace{4Fe(OH)_3}_{\text{rust}}$

57. **(1)**

In cathodic protection, iron is attached to more electropositive metal such as zinc or magnesium, which give up electron to oxygen more readily than iron. So, Iron is protected from rusting.

58. **(1)**

Anode is electrode at which oxidation occurs.

59. **(2)**

$\Lambda^\infty_{AcOH} = \Lambda^\infty_{AcONa} + \Lambda^\infty_{HCl} - \Lambda^\infty_{NaCl}$

$= 91.0 + 426.2 - 126.5$

$= 390.7$

60. **(1)**

E°_{OP} of Mg > E°_{OP} of Al.

61. **(2)**

$E^{\circ}_{OP_{Zn}} > E^{\circ}_{OP_{Cu}}$ or $E^{\circ}_{RP_{Zn}} < E^{\circ}_{RP_{Cu}}$

62. **(3)**

Higher the reduction potential, stronger is the oxidising agent

$$2I^- \rightarrow I_2 + 2e^- \quad \text{[oxidation]}$$

$$Br_2 + 2e^- \rightarrow 2Br^- \text{[Reduction]}$$

$$2I^- + Br_2 \rightarrow I_2 + 2Br^- \text{[Net reaction]}$$

63. **(1)**

Ions move towards opposite electrodes due to coulombic forces of attraction.

64. **(4)**

E°_{OP} for Li / Li^+ is maximum in these.

65. **(2)**

Current $(i) = 1.5\,A$

Time (t) $10\text{ min} = 10 \times 60 = 600\text{ s}$

Quantity of electricity passed

$Q = i \times t$

$= (1.5\,A) \times (600\,s) = 900\,C$

Copper is deposited as

$Cu^{2+} + 2e^- \rightarrow Cu(s)$

2 moles of electrons or $2 \times 96500\,C$ of current deposit copper = 63.56 g

900 C of current will deposit copper

$= \frac{63.56}{2 \times 96500} \times 900 = 0.296$ g

66. **(2)**

Rusting of iron is catalyzed by moist air.

67. **(2)**

Metal having higher E°_{OP} replaces the other from its solution.

68. **(1)**

Eq. of Ag = Eq. of H_2;

$\frac{W}{108} = \frac{5600 \times 2}{22400 \times 1}$

$\therefore \quad W_{Ag} = 54$ g

69. **(4)**

More +ve is E°_{Op} for an electrode more is its reducing power and vice – versa.

70. **(3)**

$Al \rightarrow Al^{3+} + 3e^-$

The charge required $= 3 \times 96500\,C$

71. **(4)**

72. **(1)**

$\Lambda^0_M = \Lambda^0_a + \Lambda^0_c$

73. **(3)**

Molten NaCl possesses Na^+ and Cl^- ions.

74. **(1)**

Given, that

$Zn / Zn^{2+} \,||\, Cu^{2+} / Cu$

∴ Zn is anode and Cu is cathode.

Given,

$Zn^{2+} / Zn = -0.76$ V

$Cu^{2+} / Cu = +0.34$ V

$E^o_{cell} = E^o_{cathode} - E^o_{anode}$

= 0.34 – (– 0.76)

= 0.34 + 0.76

= 1.10 V

75. **(1)**

Net redox change is zero.

76. **(1)**

Cathode $2H_2O + 2e^- \rightarrow H_2(g) + 2OH^-$

Anode : $H_2O \rightarrow 2H^+ + \frac{1}{2}O_2(g) + 2e^-$

77. **(1)**

Cell reaction is $Mg + Sn^{2+} \rightarrow Mg^{2+} + Sn$

$$E_{cell} = E^{\circ}_{cell} - \frac{0.0591}{2}\log\frac{[Mg^{2+}]}{[Sn^{2+}]}$$

$$= (2.34 - 0.14) - \frac{0.0591}{2}\log\frac{10^{-2}}{10^{-1}} = 2.23 \text{ V}$$

78. **(2)**

Specific conductivity (κ)

$= \frac{1}{R} \times$ cell constant

Cell constant $= \kappa \times R$

= 0.0129 × 100 = 1.29

79. **(2)**

Electrons flow from Zn to Cu in outside circuit and current from Cu to Zn.

80. **(3)**

$k = \frac{1}{R} \times \frac{1}{a} = \frac{1}{32} \times \frac{1.8}{5.4} = 0.0104$

And $\lambda = k \times 1000 / N = 0.0104 \times 10{,}000 = 104$

81. **(1)**

$\Lambda_{NaCl} = \Lambda_{Na^+} + \Lambda_{Cl}$

$\Lambda_{HCl} = \Lambda_{H^+} + \Lambda_{Cl^-}$

$\Lambda_{CH_3COONa} = \Lambda_{Na^+} + \Lambda_{CH_3COO^-}$

Let, $\Lambda_{Na^+} = x, \Lambda_{Cl^-} = y, \Lambda_{H^+} = z, \Lambda_{CH_3COO^-} = w$

Given,

$x + y = 126.45$ …. (1)

$y + z = 426.16$ …. (2)

$x + w = 91$ …. (3)

From the above 3 equations, value of z + w = 390.71 d

82. **(1)**

Cell reaction involved in hydrogen-oxygen fuel cell is

$2H_2(g) + O_2(g) \rightarrow 2H_2O(1)$

Thus $R = H_2(g), O_2(g); P = H_2O(1)$

83. **(2)**

Carbon rod

84. **(4)**

According to Faraday's first law:

$w = z.i.t$

$z = \frac{E}{96500}$ (molar mass)

$0.1 \times 71 = \frac{35.5}{96500} \times 3 \times t$ as $\times$ factor2

$t = 110$ min

85. **(1)**

According to Faraday's law

$Q = ne$

$Q = it$

$ne = it$

$n = \frac{1 \times 60}{1.6 \times 10^{-19}} = 3.75 \times 10^{20}$ electrons

86. **(4)**

Copper is an active electrode. It will be oxidised as well as reduced.

Anode: $Cu \longrightarrow Cu^{2+} + 2e^-$

Cathode: $Cu^{2+} + 2e^- \longrightarrow Cu$

87. **(1)**

$2H_2O \rightarrow H_3O^+ + OH^-$

$E^0_{cell} = \frac{0.0591}{n} \log K$

$\log K = \frac{E^0_{cell} \times n}{0.0591} = \frac{-0.8277 \times 1}{0.0591} = -14$

$K = 10^{-14}$

88. **(4)**

Cathode: $2H^+ + 2e^- \rightarrow H_2$

Anode: $H_2O \rightarrow \frac{1}{2}O_2 + 2H^+ + 2e^-$

89. **(3)**

$E_{cell} = E^\circ_{OP_{Zn}} + E^\circ_{RP_{Cu}} + \frac{0.059}{2} \log \frac{[Cu^{2+}]}{[Zn^{2+}]}$

$\therefore \quad 1.1 = 0.78 + E^\circ_{RP_{Cu}} + \frac{0.059}{2} 1$

$\therefore \quad E^o_{RP_{Cu^{2+}/Cu}} = 0.32$

$\therefore \quad E^o_{OP_{Cu/Cu^{++}}} = -0.32$ V

90. **(4)**

$E_{cell} = E^\circ_{cell} - \frac{0.05915}{n} \log Q$

For standard hydrogen electrode,

$E^\circ_{cell} = 0.00V$

$\therefore \ E_{cell} = -\frac{0.05915}{n} \log Q$

Given, pH = 1.0

$\therefore \quad \left[H^+\right] = 1 \times 10^{-1}$

$E_{cell} = -\frac{0.05915}{n} \log \frac{1}{\left[H^+\right]}$

[$\because$ The reaction occurring is $2H^+ + 2e^- \rightarrow H_2$]

$= + \frac{0.05915}{1} \log\left(H^+\right)$

$= 0.05915 \log\left(10^{-1}\right)$

= - 0.05915 V

= - 59.15 mV

91. **(1)**

For the given cell, reaction is

$Zn + Fe^{2+} \rightarrow Zn^{2+} + Fe$

$E = E^\circ - \frac{0.0591}{n} \log \frac{Zn^{2+}}{Fe^{2+}}$

or, $E^\circ = E + \frac{0.0591}{n} \log \frac{Zn^{2+}}{Fe^{2+}}$

$= 0.2905 + \frac{0.0591}{2} \log \frac{10^{-2}}{10^{-3}} = 0.32$ V

$E^\circ = \frac{0.0591}{2} \log K_c$

$\therefore \log K_c = \frac{0.32 \times 2}{0.0591} = \frac{0.32}{0.0295}$

$K_c = 10^{\frac{0.32}{0.0295}}$

92. (4)

$2H^+ + 2e^- \rightarrow H_2$

According to Nernst equation,

$$E = E^\circ + \frac{0.0591}{n}\log\frac{1}{[H^+]^2}$$

$$E = 0 - \frac{0.0591}{2}\log[H^+]^2$$

= - 0.0591 pH

93. (2)

250mL of 1 M $AgNO_3$ contain $= \frac{250}{1000}$

= 0.25 mole $AgNO_3$

∵ Electricity required to liberate 1 g equivalent of metal

= 96500 C

∴ Electricity required to liberate 0.25 g equivalent of metal

$= \frac{96500 \times 0.25}{1}$

= 24125 C

94. (1)

$E° = \frac{0.059}{n}\log K_{eq}$ and $\Delta G° = -nE°F$

∴ $\Delta G° = +ve, E°$ will be $-$ ve and $K_{eq} < 1$.

95. (1)

Elements with low S.R.P. value are strong reducing agents and elements with higher S.R.P. value are strong oxidising agent.

96. (1)

In MnO_4^- the oxidation number of Mn is + 7.

∴ $\overset{+7}{Mn} + 5e^- \rightarrow \overset{+2}{Mn}$

In the reaction, 5 electrons are involved hence 5 Faraday will be needed for the reduction of 1 mole of MnO_4^-.

Therefore, for 0.5 mole of MnO_4^-, number of Faradays required = 2.5 F

97. (1)

Reactions

(i) $Fe(s) \rightarrow Fe^{2+} + 2e^-$, $E^\circ = +0.44\,V$

and $\Delta G_1^\circ = -nE^\circ F$

$= -2 \times 0.44 \times F$

(ii) $2H^+ + 2e^- + \frac{1}{2}O_2 \rightarrow H_2O(l)$;

$E^\circ = +1.23\,V$

and $\Delta G_2^\circ = -2 \times (+1.23) \times F$

Net reaction,

$$Fe(s) + 2H^+ + \frac{1}{2}O_2 \rightarrow Fe^{2+} + H_2O(l)$$

$\Delta G_3^\circ = \Delta G_1^\circ + \Delta G_2^\circ$

$= -2 \times (+0.44)\,F + (-2 \times 1.23 \times F)$

$= -0.88\,F \times -2.46\,F = -3.34\,F$

$= -3.34 \times 96500\,J$

$= -322.31\,kJ = -322\,kJ$

98. (1)

$\Delta G^\ominus = -nFE^\ominus_{cell}$

$= -2 \times 96500 \times 0.24$

$= -46320 Jmol^{-1} = \frac{-46320}{1000}$

$= -46.32$ kJ/ mol

99. (4)

$Zn|ZnSO_4(0.01M)||CuSO_4(1.0M)|Cu$

$\therefore\ E_1 = E^o_{cell} - \frac{2.303RT}{2 \times F} \times \log\frac{(0.01)}{1}$

When concentrations are changed

$\therefore\ E_2 = E^0_{cell} - \frac{2.303RT}{2\,F} \times \log\frac{1}{0.01}$

i.e., $E_1 > E_2$

100. (2)

$2H^+ + 2e^- \rightarrow H_2$

$$E = E^\circ - \frac{0.059}{2}\log\frac{P_{H_2}}{(H^+)^2}$$

$$0 = 0 - \frac{0.059}{2}\log\frac{P_{H_2}}{(10^{-7})^2}$$

$\log 1 = 0$

$p_{H_2} = (10^{-7})^2 = 10^{-14}$ atm

SECTION – III (BOTANY)

101. (3)

Pollen grain of angiosperms represents male gametophyte

102. (3)

Pollen grains are well preserved as fossils due to the presence of sporopollenin in the exine of pollen.

103. (1)

Pollens are used in the form of tablets as a food supplement

104. (3)

The period for which the pollen grains retain the ability to germinate on landing on the stigma is called as pollen viability pollen viability for wheat is 30 minutes.

105. **(3)**
Exine is the outer layer of pollen have germ pores

106. **(3)**
Well exposed stamens helpful for wind pollination of flowers

107. **(3)**
Filiform apparatus of synergid cells guides the entry of pollen tube into embryo sac

108. **(1)**
Cleistogamy is the condition of closed flower, where pollinators are not required

109. **(2)**
Majority of insect pollinated flowers are large, colourful , fragrant and rich in nectar

110. **(3)**
Apocarpus, multicarpellary gynoecium – *Mirabilis*, syncarpus – *Papaver*

111. **(3)**
Wind pollination is preferred by plant 'A'
Having floral characters includes
- Non-sticky pollen grains
- Well exposed stamens
- Nectar absent

112. **(4)**
Outer wall of pollen is exine which composed of sporopollenin

113. **(1)**
Persistent nucellus present in some seeds is called perisperm

114. **(4)**
Monosporic, 8 nucleated and 7 celled embryo sac is most common in angiosperms.

115. **(2)**
Innermost layer of other wall is lapetum.

116. **(3)**
Persistant nucellus in the seeds of black paper is called perisperm.

117. **(2)**
Parthenocarpic fruits are seedless.

118. **(3)**
An aquatic plant which is pollinated by water is zostera

119. **(3)**
1 Pollen mother cell
↓ meiosis
4 microspores
↓
4 pollen grains (1 pollen grain carries 2 male gametes)
↓
8 male gametes

120. **(2)**
Fusion of male gamete with secondary nucleus give rise to primary endosperm nucleus.

121. **(2)**
The portion of embryonal axis above the level of attachment of scutellum is called epicotyl.

122. **(4)**
High DNA content

123. **(4)**
Foul-odoured flowers if pollinated by flies and beetles

124. **(2)**
Emasculation is the process of removal of anther.

125. **(2)**
Endospermic dicotyledonous seeds are present in castor.

126. **(3)**
Mendel proposed something was being stably passed down unchanged from parents to offspring called factors (now called genes).

127. **(1)**
Class 12^{th} NCERT Pg. No 82

128. **(3)**
Test cross results in equal phenotypic and genotypic ratio. Tt X tt

129. (1)
Tall plants are dominant over dwarf plants. Being true-breeding parents, the offsprings will be heterozygous. Moreover, hence phenotypically, all of them will be tall.

130. (1)
Class 12^{th} NCERT Pg. No 75

131. (1)
Gregor Mendel, conducted hybridisation experiments on garden peas for seven years (1856-1863) and proposed the laws of inheritance in living organisms.

132. (1)
Class 12^{th} NCERT Pg. No.74

133. (4)
His experiments had large sampling size.

134. (3)
Inflated is the dominant phenotype. Hence it can be expressed in two genotypes: II and Ii. The F1 progeny can have it in all the mentioned cases except when both parents are recessive ii.

135. (4)
According to mendel's law of segregation, gametes always receive only one factor

136. (1)
True-breeding plants are taken as parental plants in crosses. Hence offsprings produced by the crossing of these true-breeding plants are F1 progeny.

137. (2)
Based on his observations on monohybrid crosses Mendel proposed two general rules to consolidate his understanding of inheritance in monohybrid crosses. Today these rules are called the Principles or Laws of Inheritance: The First Law or Law of Dominance and the Second Law or Law of Segregation.

138. (4)
The law of dominance is used to explain the expression of only one of the parental characters in a monohybrid cross in the F_1 and the expression of both in the F_2. It also explains the proportion of 3:1 obtained at the F_2.

139. (1)
F1 progeny refers to the first generation of offsprings. This is also termed as the first Filial generation, thereby stating their filial relationship with the true-breeding plants.

140. (4)
Terminal flower position is the recessive trait which express itself only in homozygous condition.

141. (4)
Test cross should be done to determine the genotype of violet flowered pea plant of F_1 generation.

142. (1)
Monohybrid refers to a hybrid that differs at only one gene. Thus, a plant that exhibits two alleles for one trait is a monohybrid.

143. (1)
A dominant factor masks the expression of its recessive counterpart. Thus, it can express in both homozygous and heterozygous states.

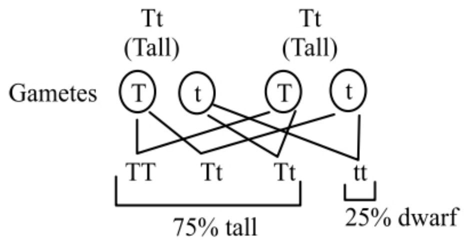
144. (2)
Heterozygosity refers to different alleles present at a given locus. This is the condition that is of interest to the study of genetics. It can be used to test the nature of an allele.

145. (3)
Yellow being recessive will express only when both alleles are present. That occurs only when both parents can contribute and allele encoding for the yellow pod. For all progeny to have yellow pods, both parent have to be homozygous for yellow pods.

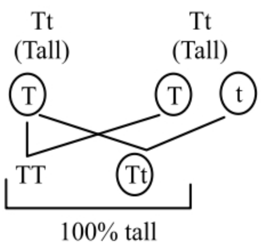
146. (1)
The VV and vv upon crossing will produce all progeny with genotype Vv. This is the heterozygous state. Violet being dominant over white, all the progeny will have violet flowers.

147. **(1)**

Cast I



Cast II



148. **(4)**

Factors is the term used for the units of inheritance by Mendel.

149. **(1)**

Based on his studies on pea plants, he observed that the parental recessive traits were observed again only in the F_2 progeny without any form of blending in F_1 generation. This points out that the factors segregate or separate during the process of meiosis.

150. **(1)**

Violet is the dominant factor over white in pea flowers. Hence violet can express even in the presence of white. The cross of violet true-breeding and white true-breeding pea plants will produce all heterozygous offsprings. Thus, all of them will have violet flowers.

SECTION – IV (ZOOLOGY)

151. **(3)**

Seminiferous tubules $\rightarrow$ Rete testis $\rightarrow$ Vasa efferentia $\rightarrow$ Epididymis $\rightarrow$ Vas deferens $\rightarrow$ Ejaculatory duct $\rightarrow$ Urethra $\rightarrow$ Urethral meatus

152. **(1)**

In the 28 day human ovarian cycle, ovulation takes place day 14 of the cycle.

153. **(4)**

Conceptual question

154. **(4)**

Implantation in endometrial uterine wall takes place at blastocyst stage of embryonic development. Before implantation, the blastomeres of early blastocyst get arranged into an outer layer called trophoblast and an inner group of cells attached to trophoblast called inner cell mass. It is the trophoblast layer through which blastocyst gets attached to the endometrium and the inner cell mass gets differentiated as the embryo.

155. **(3)**

Menstrual flow occurs due to lack of progesterone.

156. **(4)**

In humans at the end of the first meiotic division, the male germ cells differentiate into the secondary spermatocyte.

157. **(2)**

The morula continues to divide & transforms into blastocyst.

The embryo with 8-16 blastomeres is called a morula.

158. **(2)**

Secretory phase is also called as luteal phase. The luteinising hormone or LH is secreted by the anterior lobe of pituitary gland. LH causes ovulation. LH stimulates cells of ovarian follicles to develop corpus luteum. Corpus luteum secretes large amount of progesterone.

159. **(4)**

Seminal plasma in humans is rich in fructose, calcium, and certain enzymes

160. **(1)**

The haploid nucleus of the sperms and that of the ovum fuse together to form a diploid zygote. As the zygote moves through the isthmus of the oviduct towards the uterus, the mitotic division (cleavage) starts and forms 2, 4, 8, 16 daughter cells called blastomeres.

The embryo with 8-16 blastomeres is called a morula. The morula continues to divide and transforms into blastocyst as it moves further to get embedded in the endometrium of the uterus. This is called implantation.

161. (2)

	Column I	Column II
A.	Trophoblast	Outer layer of blastocyst attached to the endometrium
B.	Cleavage	Mitotic division of zygote
C.	Inner cell mass	Group of cell that would differentiate as embryo
D.	Implantation	Embedding of blastocyst in the endometrium

162. (3)
Conceptual question

163. (2)
The mitotic division starts as the zygote moves through the isthmus of the oviduct called cleavage.

164. (1)
The menstrual phase is followed by follicular phase.

165. (1)
Gestation = Embryonic development.
Implantation = Blastocyst attachment to uterine wall
Fertilisation = Fusion of male and female gametes
Gametogenesis = Formation of gametes.

166. (3)
NCERT, Page No. 27, Fig. No. 2.1(a)

167. (4)
The regions outside the seminiferous tubules contain leydig/interstitial cells and small amount of blood vessels.

168. (2)
Ovaries produce the female gamete.
Ovaries produce steroid hormones.

169. (3)
Prostate is a male accessory gland.

170. (2)
Female external genitalia includes-
Mons pubis, labia majora, labia minora, hymen and clitoris.

171. (1)
Mammary ampulla connected to lactiferous duct.

172. (2)
Secondary oocyte forms a new membrane called zona pellucida.

173. (4)
The first menstruation begins at puberty called menarche.

174. (1)
The seminal plasma alongwith sperms constitute the semen.

175. (3)
First meiotic division in primary oocyte is an unequal division produces a large secondary oocyte and a tiny first polar body.

176. (3)
In the absence of fertilisation, the corpus luteum degenerates.
Menstrual cycle starts with menstrual phase.

177. (4)
The blastomeres in the blastocyst are arranged into an outer layer called trophoblast and an inner group of cells attached to trophoblast called the inner cells mass.

178. (4)
Conceptual question.

179. (2)
In adults length of each testis is about
4-5 cm.

180. (4)
Ejaculatory ducts store and transport the sperms from the testis to the outside through urethra.

181. (4)
Female accessory ducts includes ---
Oviducts (fallopian tubes), Vagina, Uterus.

182. (4)
One primary spermatocyte (2n) produces 4 haploid male gametes after completion of both stages of meiosis, then accordingly 6 primary spermatocyte produces 24 male gametes.

183. (1)
NCERT page no. 33, fig. 2.7

184. (3)
The human male ejaculates about 250 millions sperms.

185. (3)
Transfer of sperms in female genital tract is called insemination.

186. (2)
Fertilisation can only occur if the ovum and sperm are transported simultaneously to the ampullary region.
Secretion of the acrosome help the sperm enter into the cytoplasm.

187. (3)
The trophoblast layer gets attached to the endometrium and the inner cell mass get differentiated as the embryo.

188. (2)
50% of sperm carry X-chromosome, 50% of sperm carry Y-chromosome
Sperm head has haploid nucleus.

189. (1)
The opening of the vagina is often partially covered by hymen.

190. (1)
Not all copulations lead to fertilisation and pregnancy because fertilisation can only occur if the ovum and sperm are transported simultaneously to the ampullary region.

191. (1)
Milk production starts towards the end of pregnancy.

192. (3)
Mons pubis is cushion of fatty tissue covered by skin and pubic hair.

193. (3)
GnRH is secreted by the hypothalamus which stimulates the anterior lobe of pituitary gland to secrete luteinising hormone (LH) and follicle stimulating hormone (FSH). FSH stimulates the growth of the ovarian follicles and stimulates the formation of estrogens. LH stimulates the corpus luteum to secrete progesterone. Rising levels of progesterone and estrogen inhibits the release of GnRH, which in turn, inhibits the production of FSH and LH.

194. (4)
LH-Luteising Hormone is produced by anterior pituitary gland. The placenta is an organ that connects the developing embryo (foetus) and maternal body (uterine wall) to allow nutrient uptake, waste elimination and gas exchange via the mother's blood supply.
Placenta also acts as an endocrine tissue and produces several hormones like Human Chorionic Gonadotropin (hCG), Human Placental Lactogen (hPL), estrogens, progesterone, etc.

195. (3)
The urethra originates from the urinary bladder and extends through the penis to its external opening called urethral meatus. Opening of vas deferens along with a duct of seminal vesicle open into urethra as the ejaculatory duct.

196. (3)
Conceptual question

197. (2)
The vas deferens is a continuation of the cauda epididymis (tail part of epididymis). It is about 40 cm long and slightly coiled at first but becomes straight as it enters the abdominal cavity through the inguinal canal.

Here, it passes over the urinary bladder, curves round the ureter and joins a duct from seminal vesicle and opens into urethra as the ejaculatory duct. These ducts store and transport the sperms from the testis to the outside through urethra.

198. (4)
Sperms are finally released from the seminiferous tubules by the process called spermiatioin.

199. (1)
The glandular tissue of each breast is divided into 15-20 mammary lobes.

200. (2)
Milk is secreted by the cells of alveoli.