NEET 2026 SAMPLE PAPER 5

A) Total Duration: 3-hour and 20-minute (200 minutes)
B) Pattern: 180 Multiple Choice Questions (MCQs) out of a total of 200
C) Marking Scheme & Rules:

- Correct Answer: +4 marks
- Incorrect Answer: -1 mark (Negative marking)
- Unattempted Question: 0 marks
- Multiple Answers: Treated as incorrect, attracting -1 mark

Physics (Section A)

1. In the hydrogen spectrum, the shortest wavelength in the Balmer series is λ. The shortest wavelength in the Brackett series is:

   A. 2λ

   B. 4λ

   C. 9λ

   D. 16λ

2. The work functions of Caesium (Cs), Potassium (K) and Sodium (Na) are 2.14 eV, 2.30 eV and 2.75 eV respectively. If incident electromagnetic radiation has an energy of 2.20 eV, which of these photosensitive surfaces may emit photoelectrons?

   A. Cs only

   B. Both Na and K

   C. K only

   D. Na only

3. The errors in measurement which arise due to unpredictable fluctuations in temperature and voltage supply are:

   A. Instrumental errors

   B. Personal errors

   C. Least count errors

   D. Random errors

4. In a series LCR circuit, the inductance L is 10 mH, capacitance C is 1 μF and resistance R is 100Ω. The frequency at which resonance occurs is:

   A. 15.9 rad/s

   B. 15.9 kHz

C. 1.59 rad/s

D. 1.59 kHz

5. The venturi-meter works on:

   A. Huygen's principle

   B. Bernoulli's principle

   C. The principle of parallel axes

   D. The principle of perpendicular axes

6. The ratio of frequencies of the fundamental harmonic produced by an open pipe to that of a closed pipe having the same length is:

   A. 1 : 2

   B. 2 : 1

   C. 1 : 3

   D. 3 : 1

7. An electric dipole is placed at an angle of 30° with an electric field of intensity 2×10^5 N C^{-1}. It experiences a torque equal to 4 N m. Calculate the magnitude of charge on the dipole, if the dipole length is 2 cm.

   A. 8 mC

   B. 6 mC

   C. 4 mC

   D. 2 mC

8. The magnitude and direction of the current in the following circuit (assuming standard Kirchoff loop) is:

   A. 0.2 A from B to A through E

   B. 0.5 A from A to B through E

   C. 5/9 A from A to B through E

   D. 1.5 A from B to A through E

9. The net magnetic flux through any closed surface is:

   A. Zero

   B. Positive

   C. Infinity

   D. Negative

10. A bullet is fired from a gun at the speed of 280 m s^{-1} in the direction 30° above the horizontal. The maximum height attained by the bullet is ($g = 9.8$ m s^{-2}, $\sin 30° = 0.5$):

    A. 2800 m

B. 2000 m

C. 1000 m

D. 3000 m

11. Two thin lenses are of same focal lengths (f), but one is convex and the other one is concave. When they are placed in contact with each other, the equivalent focal length of the combination will be:

A. Zero

B. $f/4$

C. $f/2$

D. Infinite

12. The net impedance of a circuit containing a resistor, inductor, and capacitor in series (calculated from the phasor diagram) will be:

A. $10\sqrt{2}\Omega$

B. 15Ω

C. $5\sqrt{5}\Omega$

D. 25Ω

13. The $x - t$ graph of a particle performing simple harmonic motion is provided. The acceleration of the particle at $t = 2$ s is:

A. $\pi^2/8$ m s^{-2}

B. $-\pi^2/8$ m s^{-2}

C. $\pi^2/16$ m s^{-2}

D. $-\pi^2/16$ m s^{-2}

14. An electric dipole is placed as shown in the geometry. The electric potential (in 10^2 V) at point P due to the dipole is (where $K = 1/4\pi\epsilon_0$):

A. $(3/8)qK$

B. $(5/8)qK$

C. $(8/5)qK$

D. $(8/3)qK$

15. A bullet from a gun is fired on a rectangular wooden block with velocity u. When the bullet travels 24 cm through the block, its velocity becomes $u/3$. It then penetrates further before coming to rest at the other end. The total length of the block is:

A. 27 cm

B. 24 cm

C. 28 cm

D. 30 cm

16. In a combination of several thin lens layers, what is the equivalent focal length of the system?

    A. 40 cm

    B. -40 cm

    C. -100 cm

    D. -50 cm

17. For a standard logic circuit composed of multiple gates, the resulting truth table matches:

    A. Table (1)

    B. Table (2)

    C. Table (3)

    D. Table (4)

18. A student standing on a horizontal bridge throws a ball vertically upwards with a velocity of 4 m s^{-1}. The ball strikes the water surface after 4 s. The height of the bridge above the water surface is ($g = 10$ m s^{-2}):

    A. 56 m

    B. 60 m

    C. 64 m

    D. 68 m

19. 10 resistors, each of resistance R, are connected in series to a battery of EMF E. When they are reconnected in parallel to the same battery, the current increases n times. The value of n is:

    A. 10

    B. 100

    C. 1

    D. 1000

20. A wire carrying a current I along the positive x-axis has length L. It is kept in a magnetic field $\vec{B} = (2\hat{i} + 3\hat{j} - 4\hat{k})$ T. The magnitude of the magnetic force acting on the wire is:

    A. $3IL$

    B. $\sqrt{5}IL$

    C. $5IL$

    D. $\sqrt{3}IL$

21. A satellite is orbiting just above the surface of the earth with period T. If d is the density of the earth and G is the universal constant of gravitation, the quantity $3\pi/Gd$ represents:

A. T

B. T^2

C. T^3

D. $\sqrt{T}$

22. Calculate the maximum acceleration of a moving car so that a body lying on the floor remains stationary. The coefficient of static friction μ_s is 0.15 ($g = 10$ m s^{-2}).

A. 1.2 m s^{-2}

B. 150 m s^{-2}

C. 1.5 m s^{-2}

D. 50 m s^{-2}

23. The resistance of a platinum wire at 0°C is 2Ω and at 80°C is 6.8Ω. The temperature coefficient of resistance of the wire is:

A. $3 \times 10^{-4}\,^{\circ}\mathrm{C}^{-1}$

B. $3 \times 10^{-3}\,^{\circ}\mathrm{C}^{-1}$

C. $3 \times 10^{-2}\,^{\circ}\mathrm{C}^{-1}$

D. $3 \times 10^{-1}\,^{\circ}\mathrm{C}^{-1}$

24. The radius of the innermost orbit of a hydrogen atom is 5.3×10^{-11} m. What is the radius of the third allowed orbit?

A. 0.53 Å

B. 1.06 Å

C. 1.59 Å

D. 4.77 Å

25. A very long conducting wire is bent into a semi-circular shape of radius R between points A and B. The magnetic field at the center point P for a steady current i is:

A. $\mu_0 i/4R$ pointed into the page

B. $\mu_0 i/4R$ pointed away from the page

C. $\frac{\mu_0 i}{4R}[1 - 2/\pi]$ pointed away from the page

D. $\frac{\mu_0 i}{4R}[1 - 2/\pi]$ pointed into the page

26. An electron ($m = 9\times10^{-31}$ kg) moving at $c/100$ enters a magnetic field $B = 9\times10^{-4}$ T. To prevent deflection, the required electric field E must be:

A. $E \perp B$ with magnitude 27×10^2 V/m

B. $E \parallel B$ with magnitude 27×10^2 V/m

C. $E \parallel B$ with magnitude 27×10^4 V/m

D. $E \perp B$ with magnitude 27×10^4 V/m

27. A bob of mass m is given horizontal velocity v_0. If the string gets slack at point P making angle θ from the horizontal, the ratio of speed v at P to v_0 is:

    A. $(1/(2+3\sin\theta))^{1/2}$

    B. $(\cos\theta/(2+3\sin\theta))^{1/2}$

    C. $(\sin\theta/(2+3\sin\theta))^{1/2}$

    D. $(\sin\theta)^{1/2}$

28. A pipe open at both ends has fundamental frequency f. If dipped vertically in water to half its length, the fundamental frequency of the air column becomes:

    A. f

    B. $3f/2$

    C. $2f$

    D. $f/2$

29. A balloon has surface tension S, outlet area A, gas density ρ, and radius R. If the period $T \propto S^{\alpha}A^{\beta}\rho^{\gamma}R^{\delta}$, find the correct exponents:

    A. $\alpha = -1/2, \beta = -1, \gamma = -1/2, \delta = 7/2$

    B. $\alpha = -1/2, \beta = -1, \gamma = 1/2, \delta = 7/2$

    C. $\alpha = 1/2, \beta = -1, \gamma = 1/2, \delta = 7/2$

    D. $\alpha = 1/2, \beta = -1, \gamma = -1, \delta = 3/2$

30. Three rods $(2K, K, 2K)$ are connected in series between temperatures $3T$ and T. In steady state, the temperatures at the left and right junctions are T_1 and T_2. The ratio T_1/T_2 is:

    A. $4/3$

    B. $5/3$

    C. $5/4$

    D. $3/2$

31. A quantity $P = a^3b^2/(c\sqrt{d})$ has measurement errors in a, b, c, d of 1%, 3%, 2%, and 4%. The percentage error in P is:

    A. 2%

    B. 13%

    C. 15%

    D. 10%

32. The relation between time (t) and position (x) is $t = x^2 + x$. The acceleration of the particle is:

    A. $-2/(2x+1)^3$

    B. $+2/(x+1)^3$

C. $+2/(2x+1)$

D. $-2/(x+2)^3$

33. Two gases A and B at the same pressure have pistons of radii r_A and r_B. Under equal heat, the pistons displace 16 cm and 9 cm. If ΔU is same, the ratio r_A/r_B is:

    A. 3/4

    B. $2/\sqrt{3}$

    C. $\sqrt{3}/2$

    D. 4/3

34. In a spring-mass system, sand leaks out slowly. Which of the following describes the changes in frequency $\omega(t)$ and amplitude $A(t)$ with time?

    A. Frequency increases, Amplitude decreases

    B. Frequency decreases, Amplitude increases

    C. Both increase

    D. Both decrease

35. A sphere of radius R is cut from a solid sphere of radius $2R$. The ratio of the moment of inertia of the smaller sphere to the remaining part about the Y-axis is:

    A. 7/40

    B. 7/57

    C. 7/64

    D. 7/8

Physics (Section B)

36. Two inclined surfaces have equal length L and inclination 45°. One is rough and the other is smooth. A body takes twice as much time to slide down the rough surface. The coefficient of kinetic friction μ_k is:

    A. 0.5

    B. 0.75

    C. 0.25

    D. 0.40

37. A container has two chambers of volumes $V_1 = 2$ L and $V_2 = 3$ L containing $n_1 = 5$ and $n_2 = 4$ moles at $P_1 = 1$ atm and $P_2 = 2$ atm. When the partition is removed, the equilibrium pressure is:

    A. 1.6 atm

    B. 1.8 atm

    C. 1.3 atm

    D. 1.4 atm

38. A water tank has one wall at $x = L$. Surface tension S and density ρ cause the surface to make an angle θ_0 with the x-axis. If $y(x)$ is the height, the governing equation is:

    A. $d^2y/dx^2 = (\rho g/S)y$

    B. $dy/dx = (\rho g/S)x$

    C. $d^2y/dx^2 = \rho g/S$

    D. $d^2y/dx^2 = \sqrt{\rho g/S}y$

39. An electron ($m = 9\times10^{-31}$ kg) moving with speed $c/100$ is injected into a magnetic field $B = 9\times10^{-4}$ T perpendicular to its motion. To prevent deflection, the required electric field E must be:

    A. $E \parallel B$ and 27×10^2 V/m

    B. $E \perp B$ and 27×10^4 V/m

    C. $E \parallel B$ and 27×10^4 V/m

    D. $E \perp B$ and 27×10^2 V/m

40. The output (Y) of the given logic gate implementation is similar to the output of which logic gate?

    A. OR

    B. NOR

    C. AND

    D. NAND

41. A 2 amp current flows through two different small circular copper coils having a radii ratio of $1:2$. The ratio of their respective magnetic moments will be:

    A. 1:2

    B. 2:1

    C. 4:1

    D. 1:4

42. Determine the current passing through the battery in the provided circuit configuration consisting of a bridge of resistors:

    A. 0.5 A

    B. 2.5 A

    C. 1.5 A

    D. 2.0 A

43. A particle of mass m moves around the origin with a constant force F pulling it towards the center. Using the Bohr model ($mvr = nh/2\pi$), the radius r of the n^{th} orbit depends on n as:

    A. $r \propto n^{1/3}$

    B. $r \propto n^{2/3}$

    C. $r \propto n^{4/3}$

    D. $r \propto n^{1}$

44. Two masses P and Q, suspended from springs k_1 and k_2, oscillate vertically. If their maximum speeds are identical, the ratio of their amplitudes A_Q/A_P is:

    A. k_1/k_2

    B. k_2/k_1

    C. $\sqrt{k_1/k_2}$

    D. $\sqrt{k_2/k_1}$

45. A ball of mass 0.5 kg is dropped from a height of 40 m. It hits the ground and rises back to a height of 10 m. The impulse imparted to the ball is ($g = 9.8$ m/s^2):

    A. 7 NS

    B. 14 NS

    C. 21 NS

    D. 84 NS

46. An iron bar of length L has magnetic moment M. It is bent at its midpoint such that the two arms make an angle of 60° with each other. The new magnetic moment is:

    A. M

B. $M/2$

C. $2M$

D. $M/\sqrt{3}$

47. A metallic bar ($Y = 0.5 \times 10^{11}$ N/m^2, $\alpha = 10^{-5}\,^\circ\text{C}^{-1}$) is heated from 0°C to 100°C without being allowed to expand. The compressive force developed for $A = 10^{-3}$ m^2 is:

A. 5×10^3 N

B. 50×10^3 N

C. 100×10^3 N

D. 2×10^3 N

48. If the plates of a parallel plate capacitor connected to a battery are moved closer to each other, which of the following is true?

A. Charge increases and Capacitance increases

B. Energy decreases and Capacitance increases

C. Voltage increases and Charge decreases

D. Charge remains constant

49. A small telescope has an objective of focal length 140 cm and an eyepiece of focal length 5.0 cm. The magnifying power of the telescope for viewing a distant object is:

A. 34

B. 28

C. 17

D. 32

50. A conducting sheet is placed on a horizontal surface in front of a strong magnetic pole. A force is required to move the sheet away with uniform velocity because:

A. Eddy currents are induced in the conductor

B. The sheet becomes a permanent magnet

C. Electrostatic repulsion occurs

D. The sheet is non-conducting

Chemistry (Section A)

Q51. The correct order of N-compounds in its decreasing order of oxidation states is

(A) HNO_3, NO, N_2, NH_4Cl
(B) HNO_3, NO, NH_4Cl, N_2
(C) NH_4Cl, N_2, NO, HNO_3
(D) HNO_3, NH_4Cl, NO, N_2

Q52. The correct order of atomic radii in group 13 elements is

(A) B ¡ Al ¡ In ¡ Ga ¡ Tl
(B) B ¡ Al ¡ Ga ¡ In ¡ Tl
(C) B ¡ Ga ¡ Al ¡ In ¡ Tl
(D) B ¡ Ga ¡ Al ¡ Tl ¡ In

Q53. Considering Ellingham diagram, which of the following metals can be used to reduce alumina?

(A) Fe
(B) Zn
(C) Cu
(D) Mg

Q54. Which one of the following elements is unable to form MF_6^{3-} ion?

(A) Ga
(B) Al
(C) In
(D) B

Q55. Which of the following statements is not true for halogens?

(A) All form monobasic oxyacids
(B) All are oxidizing agents
(C) Chlorine has the highest electron-gain enthalpy
(D) All but fluorine show positive oxidation states

Q56. In the structure of ClF_3, the number of lone pairs of electrons on central atom 'Cl' is

(A) one
(B) two
(C) three
(D) four

Q57. The difference between amylose and amylopectin is

(A) Amylopectin have $1 \rightarrow 4$ α-linkage and $1 \rightarrow 6$ α-linkage
(B) Amylose have $1 \rightarrow 4$ α-linkage and $1 \rightarrow 6$ α-linkage
(C) Amylose is made up of glucose and galactose
(D) Amylopectin have $1 \rightarrow 4$ α-linkage and $1 \rightarrow 6$ β-linkage

Q58. Regarding cross-linked or network polymers, which of the following statements is incorrect?

(A) They contain covalent bonds between various linear polymer chains
(B) They are formed from bi- and tri-functional monomers
(C) They contain strong covalent bonds in their polymer chains
(D) Examples are bakelite and melamine

Q59. A mixture of 2.3 g formic acid and 4.5 g oxalic acid is treated with conc. H_2SO_4. The evolved gaseous mixture is passed through KOH pellets. Weight (in g) of the remaining product at STP will be

(A) 1.4
(B) 3.0
(C) 4.4
(D) 2.8

Q60. Which of the following oxides is most acidic in nature?

(A) MgO
(B) BeO
(C) CaO
(D) BaO

Q61. Nitration of aniline in strong acidic medium also gives m-nitroaniline because

(A) In spite of substituents nitro group always goes to only m-position
(B) In electrophilic substitution reactions amino group is meta directive
(C) In acidic (strong) medium aniline is present as anilinium ion
(D) In absence of substituents nitro group always goes to m-position

Q62. The compound A on treatment with Na gives B, and with PCl_5 gives C. B and C react together to give diethyl ether. A, B and C are in the order

(A) C_2H_5OH, C_2H_6, C_2H_5Cl
(B) C_2H_5OH, C_2H_5Cl, C_2H_5ONa
(C) C_2H_5OH, C_2H_5ONa, C_2H_5Cl
(D) C_2H_5Cl, C_2H_6, C_2H_5OH

Q63. Hydrocarbon (A) reacts with bromine by substitution to form an alkyl bromide which by Wurtz reaction is converted to gaseous hydrocarbon containing less than four carbon atoms. (A) is

(A) $CH{\equiv}CH$
(B) $CH_2 {=} CH_2$
(C) CH_4
(D) $CH_3{-}CH_3$

Q64. Which oxide of nitrogen is not a common pollutant introduced into the atmosphere both due to natural and human activity?

(A) N_2O_5
(B) NO_2
(C) NO
(D) N_2O

Q65. Which of the following molecules represents the order of hybridisation sp^2, sp^2, sp, sp from left to right atoms?

(A) $HC{\equiv}C{-}C{\equiv}CH$
(B) $CH_2 {=} CH{-}C{\equiv}CH$
(C) $CH_3{-}CH{=}CH{-}CH_3$
(D) $CH_2 {=} CH{-}CH{=}CH_2$

Q66. Which of the following is correct with respect to −I effect of the substituents? (R = alkyl)

(A) $-NH_2$ ¡ $-OR$ ¡ $-F$
(B) $-NR_2$ ¡ $-OR$ ¡ $-F$
(C) $-NR_2$ ¿ $-OR$ ¿ $-F$
(D) $-NH_2$ ¿ $-OR$ ¿ $-F$

Q67. Carboxylic acids have higher boiling points than aldehydes, ketones and even alcohols of comparable molecular mass. It is due to their

(A) formation of intramolecular H-bonding
(B) formation of carboxylate ion
(C) formation of intermolecular H-bonding
(D) more extensive association of carboxylic acid via van der Waals force of attraction

Q68. Which of the following compounds can form a zwitterion?

(A) Aniline
(B) Acetanilide
(C) Glycine
(D) Benzoic acid

Q69. For the redox reaction $MnO_4^- + C_2O_4^{2-} + H^+ \rightarrow Mn^{2+} + CO_2 + H_2O$. The correct coefficients of the reactants (MnO_4^-, $C_2O_4^{2-}$, H^+) for the balanced equation are:

(A) 16, 5, 2
(B) 2, 5, 16
(C) 5, 16, 2
(D) 2, 16, 5

Q70. Which one of the following conditions will favour maximum formation of the product in the reaction, $A_2(g) + B_2(g) \rightleftharpoons X_2(g)$ $\Delta_r H = -X$ kJ?

(A) Low temperature and high pressure
(B) Low temperature and low pressure
(C) High temperature and low pressure
(D) High temperature and high pressure

Q71. When initial concentration of the reactant is doubled, the half-life period of a zero order reaction

(A) is halved
(B) is doubled
(C) remains unchanged
(D) is tripled

Q72. The correction factor 'a' to the ideal gas equation corresponds to

(A) density of the gas molecules
(B) volume of the gas molecules
(C) forces of attraction between the gas molecules
(D) electric field present between the gas molecules

Q73. The bond dissociation energies of X_2, Y_2 and XY are in the ratio of 1 : 0.5 : 1. ΔH for the formation of XY is -200 kJ mol^{-1}. The bond dissociation energy of X_2 will be

(A) 200 kJ mol^{-1}
(B) 100 kJ mol^{-1}
(C) 400 kJ mol^{-1}
(D) 800 kJ mol^{-1}

Q74. Magnesium reacts with an element (X) to form an ionic compound. If the ground state electronic configuration of (X) is $1s^2\ 2s^2\ 2p^3$, the simplest formula for this compound is

(A) Mg_2X_3
(B) MgX_2
(C) Mg_3X_2
(D) Mg_2X

Q75. Iron exhibits bcc structure at room temperature. Above 900°C, it transforms to fcc structure. The ratio of density of iron at room temperature to that at 900°C (assuming molar mass and atomic radii of iron remains constant with temperature) is

(A) $\frac{3\sqrt{2}}{4}$
(B) $\frac{4\sqrt{3}}{3}$
(C) $\frac{\sqrt{3}}{2}$
(D) $\frac{4\sqrt{3}}{3\sqrt{2}}$

Q76. Consider the following species: CN^+, CN^-, NO and CN. Which one of these will have the highest bond order?

(A) NO
(B) CN^-
(C) CN
(D) CN^+

Q77. Which one is a wrong statement?

(A) Total orbital angular momentum of electron in 's' orbital is equal to zero
(B) An orbital is designated by three quantum numbers while an electron in an atom is designated by four quantum numbers
(C) The value of m for d_{z^2} is zero
(D) The electronic configuration of N atom is [He] $2s^2$ $2p^3$

Q78. The correct difference between first- and second-order reactions is that

(A) the rate of a first-order reaction does not depend on reactant concentrations; the rate of a second-order reaction does depend on reactant concentrations
(B) the half-life of a first-order reaction does not depend on $[A]_0$; the half-life of a second-order reaction does depend on $[A]_0$
(C) the rate of a first-order reaction does depend on reactant concentrations; the rate of a second-order reaction does not depend on reactant concentrations
(D) a first-order reaction can be catalyzed; a second-order reaction cannot be catalyzed

Q79. In which case is the number of molecules of water maximum?

(A) 18 mL of water
(B) 0.18 g of water
(C) 10^{-3} mol of water
(D) 0.00224 L of water vapours at 1 atm and 273 K

Q80. Among CaH_2, BeH_2, BaH_2, the order of ionic character is

(A) BeH_2 ¡ CaH_2 ¡ BaH_2
(B) CaH_2 ¡ BeH_2 ¡ BaH_2
(C) BaH_2 ¡ BeH_2 ¡ CaH_2

(D) BeH_2 ¡ BaH_2 ¡ CaH_2

Q81. The solubility of $BaSO_4$ in water is 2.42×10^{-3} g L^{-1} at 298 K. The value of its solubility product (K_{sp}) will be (Given molar mass of $BaSO_4$ = 233 g mol^{-1})

(A) 1.08×10^{-10} mol^2 L^{-2}
(B) 1.08×10^{-12} mol^2 L^{-2}
(C) 1.08×10^{-8} mol^2 L^{-2}
(D) 1.08×10^{-14} mol^2 L^{-2}

Q82. Following solutions were prepared by mixing different volumes of NaOH and HCl of different concentrations: a. 60 mL M/10 HCl + 40 mL M/10 NaOH; b. 55 mL M/10 HCl + 45 mL M/10 NaOH; c. 75 mL M/5 HCl + 25 mL M/5 NaOH; d. 100 mL M/10 HCl + 100 mL M/10 NaOH. pH of which one of them will be equal to 1?

(A) a
(B) b
(C) c
(D) d

Q83. On which of the following properties does the coagulating power of an ion depend?

(A) The magnitude of the charge on the ion alone
(B) Size of the ion alone
(C) The sign of charge on the ion alone
(D) Both magnitude and sign of the charge on the ion

Q84. Given van der Waals constant for NH_3, H_2, O_2 and CO_2 are respectively 4.17, 0.244, 1.36 and 3.59, which one of the following gases is most easily liquefied?

(A) NH_3
(B) H_2
(C) CO_2
(D) O_2

Q85. Iron carbonyl, $Fe(CO)_5$ is

(A) tetranuclear
(B) mononuclear
(C) dinuclear
(D) trinuclear

Chemistry (Section B)

Q86. The type of isomerism shown by the complex $[CoCl_2(en)_2]$ is

(A) Geometrical isomerism
(B) Coordination isomerism
(C) Linkage isomerism
(D) Ionization isomerism

Q87. Which one of the following ions exhibits d-d transition and paramagnetism as well?

(A) CrO_4^{2-}
(B) $Cr_2O_7^{2-}$
(C) MnO_4^-
(D) MnO_4^{2-}

Q88. The geometry and magnetic behaviour of the complex $[Ni(CO)_4]$ are

(A) square planar geometry and diamagnetic
(B) tetrahedral geometry and diamagnetic
(C) tetrahedral geometry and paramagnetic
(D) square planar geometry and paramagnetic

Q89. Match the metal ions given in Column I with the spin magnetic moments of the ions given in Column II and assign the correct code. Column I: a. Co^{3+}, b. Cr^{3+}, c. Fe^{3+}, d. Ni^{2+}. Column II: i. $\sqrt{8}$ B.M., ii. $\sqrt{35}$ B.M., iii. $\sqrt{3}$ B.M., iv. $\sqrt{24}$ B.M., v. $\sqrt{15}$ B.M.

(A) a-iv, b-v, c-ii, d-i
(B) a-i, b-ii, c-iii, d-iv
(C) a-iii, b-v, c-i, d-ii
(D) a-iv, b-i, c-ii, d-iii

Q90. Which of the following reactions will NOT give primary amine as the product?

(A) $CH_3CONH_2 \xrightarrow{Br_2/KOH}$
(B) $CH_3CN \xrightarrow{(i)LiAlH_4,(ii)H_3O^+}$
(C) $CH_3NC \xrightarrow{(i)LiAlH_4,(ii)H_3O^+}$
(D) $CH_3CONH_2 \xrightarrow{(i)LiAlH_4,(ii)H_3O^+}$

Q91. Match List- I with List- II: A. Coke - I. Carbon atoms are sp^3 hybridised; B. Diamond - II. Used as a dry lubricant; C. Fullerene - III. Used as a reducing agent; D. Graphite - IV. Cage like molecules.

(A) A-II, B-IV, C-I, D-III
(B) A-IV, B-I, C-II, D-III

(C) A-III, B-I, C-IV, D-II
(D) A-III, B-IV, C-I, D-II

Q92. **Assertion A:** Metallic sodium dissolves in liquid ammonia giving a deep blue solution, which is paramagnetic. **Reason R:** The deep blue solution is due to the formation of amide. In the light of the above statements, choose the correct answer from the options given below:

(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is NOT the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

Q93. In Lassaigne's extract of an organic compound, both nitrogen and sulphur are present, which gives blood red colour with Fe^{3+} due to the formation of

(A) Fe4[Fe(CN)6]3 . xH2O
(B) NaSCN
(C) $[Fe(CN)5NOS]^{4-}$
(C) $[Fe(SCN)]^{2+}$

Q94. The conductivity of centimolar solution of KCl at 25°C is 0.0210 ohm^{-1} cm^{-1} and the resistance of the cell containing the solution at 25°C is 60 ohm. The value of cell constant is

(A) 1.34 cm^{-1}
(B) 3.28 cm^{-1}
(C) 1.26 cm^{-1}
(D) 3.34 cm^{-1}

Q95. How many products (including stereoisomers) are expected from the monochlorination of 2-methylbutane?

(A) 5
(B) 6
(C) 2
(D) 3

Q96. Which of the following are true? A. Ga has high MP, Cs has low MP. C. Ar, K^+, Cl^-, Ca^{2+}, and S^{2-} are isoelectronic. E. Atomic radius of Cs ¿ Li and Rb.

(A) C and D only
(B) A, C, and E only
(C) A, B, and E only
(D) C and E only

Q97. The standard heat of formation (kcal/mol) of $Ba^{2+}(aq)$ is: (Given: $\Delta H_f SO_4^{2-} = -216$, $\Delta H_{\text{cryst}} BaSO_4 = -4.5$, $\Delta H_f BaSO_4(s) = -349$)

(A) +133.0
(B) +220.5
(C) -128.5
(D) -133.0

Q98. Match the mixture to the solution type: A. Humidity (Liq in Gas), B. Alloys (Sol in Sol), C. Amalgams (Liq in Sol), D. Smoke (Sol in Gas)

(A) A-III, B-I, C-IV, D-II
(B) A-III, B-II, C-I, D-IV
(C) A-II, B-IV, C-I, D-III
(D) A-II, B-I, C-IV, D-III

Q99. For $C(s) + 2H_2(g) \rightarrow CH_4(g)$ with $\Delta H = -74.8$ kJ/mol, the energy profile shows:

(A) Exothermic: Products lower than reactants
(B) Endothermic: Products higher than reactants
(C) Zero activation energy
(D) Non-spontaneous reaction

Q100. Sugar 'X' is found in honey, is a keto sugar, has α/β anomers, and is laevorotatory. 'X' is:

(A) Maltose
(B) Sucrose
(C) D-Glucose
(D) D-Fructose

Botany (Section A)

Q101. Which one of the following plants shows a very close relationship with a species of moth, where none of the two can complete its life cycle without the other?

(A) Hydrilla
(B) Yucca
(C) Viola
(D) Banana

Q102. Oxygen is not produced during photosynthesis by

(A) Green sulphur bacteria
(B) Nostoc
(C) Chara
(D) Cycas

Q103. Which one is wrongly matched?

(A) Uniflagellate gametes – Polysiphonia
(B) Biflagellate zoospores – Brown algae
(C) Unicellular organism – Chlorella
(D) Gemma cups – Marchantia

Q104. Winged pollen grains are present in

(A) Mustard
(B) Cycas
(C) Pinus
(D) Mango

Q105. Pneumatophores occur in

(A) Halophytes
(B) Free-floating hydrophytes
(C) Submerged hydrophytes
(D) Carnivorous plants

Q106. Plants having little or no secondary growth are

(A) Grasses
(B) Deciduous angiosperms
(C) Cycads
(D) Conifers

Q107. Casparian strips occur in

(A) Epidermis
(B) Pericycle
(C) Endodermis
(D) Cortex

Q108. Secondary xylem and phloem in dicot stem are produced by

(A) Apical meristems
(B) Vascular cambium
(C) Axillary meristems
(D) Phellogen

Q109. Which of the following statements is correct?

(A) Ovules are not enclosed by ovary wall in gymnosperms
(B) Selaginella is heterosporous, while Salvinia is homosporous
(C) Stems are usually unbranched in both Cycas and Cedrus
(D) Horsetails are gymnosperms

Q110. Sweet potato is a modified

(A) Stem
(B) Adventitious root
(C) Rhizome
(D) Tap root

Q111. Which of these statements is incorrect?

(A) Enzymes of TCA cycle are present in mitochondrial matrix
(B) Glycolysis occurs in cytosol
(C) Oxidative phosphorylation takes place in outer mitochondrial membrane
(D) Glycolysis operates as long as it is supplied with NAD that can pick up hydrogen atoms

Q112. Which of the following events does not occur in rough endoplasmic reticulum?

(A) Protein folding
(B) Protein glycosylation
(C) Phospholipid synthesis
(D) Cleavage of signal peptide

Q113. Many ribosomes may associate with a single mRNA to form multiple copies of a polypeptide simultaneously. Such strings of ribosomes are termed as

(A) Polysome
(B) Polyhedral bodies
(C) Nucleosome

(D) Plastidome

Q114. Which among the following is not a prokaryote?

(A) Saccharomyces
(B) Mycobacterium
(C) Oscillatoria
(D) Nostoc

Q115. The two functional groups characteristic of sugars are

(A) hydroxyl and methyl
(B) carbonyl and methyl
(C) carbonyl and hydroxyl
(D) carbonyl and phosphate

Q116. The Golgi complex participates in

(A) Fatty acid breakdown
(B) Formation of secretory vesicles
(C) Activation of amino acid
(D) Respiration in bacteria

Q117. Which of the following is true for nucleolus?

(A) Larger nucleoli are present in dividing cells
(B) It is a membrane-bound structure
(C) It is a site for active ribosomal RNA synthesis
(D) It takes part in spindle formation

Q118. The stage during which separation of the paired homologous chromosomes begins is

(A) Pachytene
(B) Diplotene
(C) Zygotene
(D) Diakinesis

Q119. In which of the following forms is iron absorbed by plants?

(A) Ferric
(B) Ferrous
(C) Both ferric and ferrous
(D) Free element

Q120. Which of the following elements is responsible for maintaining turgor in cells?

(A) Magnesium
(B) Sodium
(C) Calcium
(D) Potassium

Q121. Which of the following is not a product of light reaction of photosynthesis?

(A) ATP
(B) NADH
(C) Oxygen
(D) NADPH

Q122. Stomatal movement is not affected by

(A) Temperature
(B) Light
(C) CO_2 concentration
(D) O_2 concentration

Q123. Stomata in grass leaf are

(A) Dumb-bell shaped
(B) Kidney shaped
(C) Barrel shaped
(D) Rectangular

Q124. Double fertilization is

(A) Fusion of two male gametes of a pollen tube with two different eggs
(B) Fusion of one male gamete with two polar nuclei
(C) Syngamy and triple fusion
(D) Fusion of two male gametes with one egg

Q125. Pollen grains can be stored for several years in liquid nitrogen having a temperature of

(A) $-120°C$
(B) $-80°C$
(C) $-160°C$
(D) $-196°C$

Q126. Which of the following has proved helpful in preserving pollen as fossils?

(A) Pollenkitt
(B) Cellulosic intine
(C) Sporopollenin
(D) Oil content

Q127. Offsets are produced by

(A) Meiotic divisions
(B) Mitotic divisions
(C) Parthenogenesis
(D) Parthenocarpy

Q128. Which of the following flowers only once in its life-time?

(A) Bamboo species
(B) Jackfruit
(C) Papaya
(D) Mango

Q129. All of the following are part of an operon except

(A) an operator
(B) structural genes
(C) a promoter
(D) an enhancer

Q130. Select the correct match:

(A) Ribozyme – Nucleic acid
(B) F_2 – Recessive parent – Dihybrid cross
(C) G. Mendel – Transformation
(D) T.H. Morgan – Transduction

Q131. Select the correct match:

(A) Alec Jeffreys – Streptococcus pneumoniae
(B) Alfred Hershey and Martha Chase – TMV
(C) Francois Jacob and Jacques Monod – Lac operon
(D) Matthew Meselson and F. Stahl – Pisum sativum

Q132. The experimental proof for semiconservative replication of DNA was first shown in a

(A) Fungus
(B) Bacterium
(C) Virus
(D) Plant

Q133. Which of the following pairs is wrongly matched?

(A) Starch synthesis in pea : Multiple alleles
(B) ABO blood grouping : Co-dominance

(C) T.H. Morgan : Linkage
(D) XO type sex determination : Grasshopper

Q134. Select the correct statement:

(A) Franklin Stahl coined the term 'linkage'
(B) Punnett square was developed by a British scientist
(C) Transduction was discovered by S. Altman
(D) Spliceosomes take part in translation

Q135. All of the following are included in 'Ex-situ conservation' except

(A) Wildlife safari parks
(B) Sacred groves
(C) Seed banks
(D) Botanical gardens

Botany (Section B)

Q136. Match the items given in Column I with those in Column II. Column I: a. Eutrophication, b. Sanitary landfill, c. Snow blindness, d. Jhum cultivation. Column II: i. UV-B radiation, ii. Deforestation, iii. Nutrient enrichment, iv. Waste disposal

(A) a-ii, b-i, c-iii, d-iv
(B) a-i, b-iii, c-iv, d-ii
(C) a-i, b-ii, c-iv, d-iii
(D) a-iii, b-iv, c-i, d-ii

Q137. Niche is

(A) all the biological factors in the organism's environment
(B) the physical space where an organism lives
(C) the functional role played by the organism where it lives
(D) the range of temperature that the organism needs to live

Q138. In stratosphere, which of the following elements acts as a catalyst in degradation of ozone and release of molecular oxygen?

(A) Carbon
(B) Cl
(C) Oxygen
(D) Fe

Q139. What type of ecological pyramid would be obtained with the following data? Secondary consumer: 120 g; Primary consumer: 60 g; Primary producer: 10 g

(A) Inverted pyramid of biomass
(B) Pyramid of energy
(C) Upright pyramid of biomass
(D) Upright pyramid of numbers

Q140. Which of the following is a secondary pollutant?

(A) CO
(B) CO_2
(C) O_3
(D) SO_2

Q141. World Ozone Day is celebrated on

(A) 5th June
(B) 21st April
(C) 22nd April
(D) 16th September

Q142. Match the items. Column I: a. Herbarium, b. Key, c. Museum, d. Catalogue. Column II: i. Collection of preserved plants/animals, ii. List enumerating species, iii. Dried/pressed plant specimens, iv. Booklet of characters for ID

(A) a-i, b-iv, c-iii, d-ii
(B) a-iii, b-ii, c-i, d-iv
(C) a-iii, b-iv, c-i, d-ii
(D) a-ii, b-iv, c-iii, d-i

Q143. Conversion of milk to curd improves its nutritional value by increasing the amount of

(A) Vitamin D
(B) Vitamin A
(C) Vitamin E
(D) Vitamin B_{12}

Q144. A 'new' variety of rice was patented by a foreign company, though such varieties have been present in India for a long time. This is related to

(A) Co-667
(B) Sharbati Sonora
(C) Basmati
(D) Lerma Rojo

Q145. Auxins are known to induce which process in plants?

(A) Seed dormancy
(B) Senescence
(C) Parthenocarpy
(D) Abscission

Q146. Which plant growth regulator is referred to as an "inhibitor" of growth?

(A) Auxin
(B) Gibberellin
(C) Cytokinin
(D) Abscisic acid

Q147. Apical dominance is the phenomenon where apical buds:

(A) Inhibit lateral buds
(B) Promote lateral buds
(C) Inhibit root growth
(D) Promote root growth

Q148. RuBisCO catalyzes the carboxylation of which molecule?

(A) PGA
(B) PEP
(C) RuBP
(D) Glucose

Q149. In the Verhulst-Pearl equation, what does 'K' stand for?

(A) Birth rate
(B) Death rate
(C) Intrinsic rate of increase
(D) Carrying capacity

Q150. Scutellum is the term used for the cotyledon of:

(A) Dicot seeds
(B) Monocot seeds
(C) Naked seeds
(D) None of these

Zoology (Section A)

Q151. The difference between spermiogenesis and spermiation is

(A) In spermiogenesis spermatids are formed, while in spermiation spermatozoa are formed
(B) In spermiogenesis spermatozoa are formed, while in spermiation spermatids are formed
(C) In spermiogenesis spermatozoa are formed, while in spermiation spermatozoa are released from sertoli cells into the cavity of seminiferous tubules
(D) In spermiogenesis spermatozoa from sertoli cells are released into the cavity of seminiferous tubules, while in spermiation spermatozoa are formed

Q152. The amnion of mammalian embryo is derived from

(A) ectoderm and mesoderm
(B) endoderm and mesoderm
(C) ectoderm and endoderm
(D) mesoderm and trophoblast

Q153. The contraceptive 'SAHELI'

(A) blocks estrogen receptors in the uterus, preventing eggs from getting implanted
(B) increases the concentration of estrogen and prevents ovulation in females
(C) is a post-coital contraceptive
(D) is an IUD

Q154. Hormones secreted by the placenta to maintain pregnancy are

(A) hCG, hPL, progestogens, prolactin
(B) hCG, hPL, estrogens, relaxin, oxytocin
(C) hCG, progestogens, estrogens, glucocorticoids
(D) hCG, hPL, progestogens, estrogens

Q155. Match the items: Column I: a. Proliferative Phase, b. Secretory Phase, c. Menstruation. Column II: i. Breakdown of endometrial lining, ii. Follicular Phase, iii. Luteal Phase

(A) a-iii, b-ii, c-i
(B) a-i, b-iii, c-ii
(C) a-iii, b-i, c-ii
(D) a-ii, b-iii, c-i

Q156. A woman has an X-linked condition on one of her X chromosomes. This chromosome can be inherited by

(A) Only daughters
(B) Only sons

(C) Both sons and daughters
(D) Only grandchildren

Q157. Which of the following options correctly represents the lung conditions in asthma and emphysema, respectively?

(A) Inflammation of bronchioles; Decreased respiratory surface
(B) Increased number of bronchioles; Increased respiratory surface
(C) Decreased respiratory surface; Inflammation of bronchioles
(D) Increased respiratory surface; Inflammation of bronchioles

Q158. Match the items: Column I: a. Tricuspid valve, b. Bicuspid valve, c. Semilunar valve. Column II: i. Between left atrium and left ventricle, ii. Between right ventricle and pulmonary artery, iii. Between right atrium and right ventricle

(A) a-iii, b-i, c-ii
(B) a-i, b-iii, c-ii
(C) a-ii, b-i, c-iii
(D) a-i, b-ii, c-iii

Q159. Match the items (Volumes): a. Tidal volume, b. Inspiratory Reserve volume, c. Expiratory Reserve volume, d. Residual volume. i. 2500–3000 mL, ii. 1100–1200 mL, iii. 500–550 mL, iv. 1000–1100 mL

(A) a-iii, b-ii, c-i, d-iv
(B) a-iii, b-i, c-iv, d-ii
(C) a-iv, b-iii, c-ii, d-i
(D) a-i, b-iv, c-ii, d-iii

Q160. Which of the following structures or regions is incorrectly paired with its function?

(A) Medulla oblongata: controls respiration and cardiovascular reflexes
(B) Limbic system: consists of fibre tracts that interconnect different regions of brain; controls movement
(C) Corpus callosum: band of fibers connecting left and right cerebral hemispheres
(D) Hypothalamus: production of releasing hormones and regulation of temperature, hunger and thirst

Q161. The transparent lens in the human eye is held in its place by

(A) ligaments attached to the ciliary body
(B) ligaments attached to the iris
(C) smooth muscles attached to the ciliary body
(D) smooth muscles attached to the iris

Q162. Which of the following gastric cells indirectly help in erythropoiesis?

(A) Chief cells
(B) Mucous cells
(C) Parietal cells
(D) Goblet cells

Q163. Match the items: a. Fibrinogen, b. Globulin, c. Albumin. i. Osmotic balance, ii. Blood clotting, iii. Defence mechanism

(A) a-iii, b-ii, c-i
(B) a-i, b-ii, c-iii
(C) a-ii, b-iii, c-i
(D) a-i, b-iii, c-ii

Q164. Which of the following is an occupational respiratory disorder?

(A) Anthracis
(B) Silicosis
(C) Emphysema
(D) Botulism

Q165. Calcium is important in skeletal muscle contraction because it

(A) binds to troponin to remove the masking of active sites on actin for myosin
(B) activates the myosin ATPase by binding to it
(C) prevents the formation of bonds between the myosin cross bridges and the actin filament
(D) detaches the myosin head from the actin filament

Q166. Nissl bodies are mainly composed of

(A) Proteins and lipids
(B) DNA and RNA
(C) Free ribosomes and RER
(D) Nucleic acids and SER

Q167. Which of the following terms describe human dentition?

(A) Thecodont, Diphyodont, Homodont
(B) Thecodont, Diphyodont, Heterodont
(C) Pleurodont, Diphyodont, Heterodont
(D) Pleurodont, Monophyodont, Homodont

Q168. Match the items: a. Ultrafiltration, b. Concentration of urine, c. Transport of urine, d. Storage of urine. i. Henle's loop, ii. Ureter, iii. Urinary bladder, iv. Malpighian corpuscle

(A) a-iv, b-v, c-ii, d-iii

(B) a-iv, b-i, c-ii, d-iii
(C) a-v, b-iv, c-i, d-iii
(D) a-v, b-iv, c-i, d-ii

Q169. Match the items: a. Glycosuria, b. Gout, c. Renal calculi, d. Glomerular nephritis. i. Accumulation of uric acid in joints, ii. Mass of crystallised salts within the kidney, iii. Inflammation in glomeruli, iv. Presence of glucose in urine

(A) a-iii, b-ii, c-iv, d-i
(B) a-i, b-ii, c-iii, d-iv
(C) a-iv, b-i, c-ii, d-iii
(D) a-ii, b-iii, c-i, d-iv

Q170. Which of the following is an amino acid derived hormone?

(A) Epinephrine
(B) Ecdysone
(C) Estriol
(D) Estradiol

Q171. Which of the following hormones can play a significant role in osteoporosis?

(A) Aldosterone and Prolactin
(B) Progesterone and Aldosterone
(C) Parathyroid hormone and Prolactin
(D) Estrogen and Parathyroid hormone

Q172. What is the role of NAD^+ in cellular respiration?

(A) It functions as an enzyme
(B) It functions as an electron carrier
(C) It is the final electron acceptor for anaerobic respiration
(D) It is a nucleotide source for ATP synthesis

Q173. Identify the vertebrate group of animals characterized by crop and gizzard in its digestive system.

(A) Amphibia
(B) Reptilia
(C) Osteichthyes
(D) Aves

Q174. Which one of these animals is not a homeotherm?

(A) Macropus
(B) Chelone
(C) Psittacula

(D) Camelus

Q175. Which of the following features is used to identify a male cockroach from a female cockroach?

(A) Presence of a boat shaped sternum on the 9th abdominal segment
(B) Presence of caudal styles
(C) Presence of anal cerci
(D) Forewings with darker tegmina

Q176. Which of the following organisms are known as chief producers in the oceans?

(A) Dinoflagellates
(B) Diatoms
(C) Euglenoids
(D) Cyanobacteria

Q177. Ciliates differ from all other protozoans in

(A) using flagella for locomotion
(B) having a contractile vacuole for removing excess water
(C) having two types of nuclei
(D) using pseudopodia for capturing prey

Q178. Which of the following animals does not undergo metamorphosis?

(A) Earthworm
(B) Tunicate
(C) Starfish
(D) Moth

Q179. According to Hugo de Vries, the mechanism of evolution is

(A) Multiple step mutations
(B) Saltation
(C) Minor mutations
(D) Phenotypic variations

Q180. Among the following sets of examples for divergent evolution, select the incorrect option:

(A) Forelimbs of man, bat and cheetah
(B) Heart of bat, man and cheetah
(C) Eye of octopus, bat and man
(D) Brain of bat, man and cheetah

Q181. Which of the following is not an autoimmune disease?

(A) Psoriasis
(B) Rheumatoid arthritis
(C) Vitiligo
(D) Alzheimer's disease

Q182. The similarity of bone structure in the forelimbs of many vertebrates is an example of

(A) Homology
(B) Analogy
(C) Adaptive radiation
(D) Convergent evolution

Q183. In which disease does mosquito transmitted pathogen cause chronic inflammation of lymphatic vessels?

(A) Elephantiasis
(B) Ascariasis
(C) Amoebiasis
(D) Ringworm disease

Q184. Which part of poppy plant is used to obtain the drug "Smack"?

(A) Flowers
(B) Latex
(C) Leaves
(D) Roots

Q185. Which one of the following population interactions is widely used in medical science for the production of antibiotics?

(A) Commensalism
(B) Mutualism
(C) Amensalism
(D) Parasitism

Zoology (Section B)

Q186. Which of the following is commonly used as a vector for introducing a DNA fragment in human lymphocytes?

(A) Retrovirus
(B) Ti plasmid
(C) pBR 322
(D) λ phage

Q187. Use of bioresources by multinational companies and organisations without authorisation is called

(A) Bio-infringement
(B) Biopiracy
(C) Bioexploitation
(D) Biodegradation

Q188. In India, the organisation responsible for assessing the safety of introducing GMOs is

(A) ICMR
(B) CSIR
(C) GEAC
(D) RCGM

Q189. The correct order of steps in Polymerase Chain Reaction (PCR) is

(A) Extension, Denaturation, Annealing
(B) Annealing, Extension, Denaturation
(C) Denaturation, Annealing, Extension
(D) Denaturation, Extension, Annealing

Q190. Which of the following characteristics represent 'Inheritance of blood groups' in humans? a. Dominance, b. Co-dominance, c. Multiple allele, d. Incomplete dominance, e. Polygenic inheritance

(A) b, c and e
(B) a, b and c
(C) a, c and e
(D) b, d and e

Q191. In a growing population of a country,

(A) pre-reproductive individuals are more than the reproductive individuals
(B) reproductive individuals are less than the post-reproductive individuals
(C) pre-reproductive individuals are less than the reproductive individuals
(D) reproductive and pre-reproductive individuals are equal in number

Q192. Natality refers to

(A) Death rate
(B) Birth rate
(C) Immigration
(D) Emigration

Q193. Select the incorrect match:

(A) Lampbrush chromosomes – Diplotene bivalents
(B) Allosomes – Sex chromosomes
(C) Polytene chromosomes – Oocytes of amphibians
(D) Submetacentric chromosomes – L-shaped chromosomes

Q194. Select the wrong statement:

(A) Cell wall is present in members of Fungi and Plantae
(B) Mushrooms belong to Basidiomycetes
(C) Mitochondria are powerhouses except in Monera
(D) Pseudopodia are locomotory and feeding structures in Sporozoans

Q195. After karyogamy followed by meiosis, spores are produced exogenously in

(A) Neurospora
(B) Alternaria
(C) Saccharomyces
(D) Agaricus

Q196. Select the correct statements with reference to chordates. A. Presence of a mid-dorsal, solid and double nerve cord. B. Presence of closed circulatory system. C. Presence of paired pharyngeal gillslits. D. Presence of dorsal heart. E. Triploblastic pseudocoelomate animals. Choose the correct answer from the options given below:

(A) A, C and D only
(B) B and C only
(C) B, D and E only
(D) C, D and E only

Q197. The parts of human brain that helps in regulation of sexual behaviour, expression of excitement, pleasure, rage, fear etc. are:

(A) Limbic system & hypothalamus
(B) Corpora quadrigemina & hippocampus
(C) Brain stem & epithalamus
(D) Corpus callosum and thalamus

Q198. The unique mammalian characteristics are:

(A) hairs, tympanic membrane and mammary glands
(B) hairs, pinna and mammary glands
(C) hairs, pinna and indirect development
(D) pinna, monocondylic skull and mammary glands

Q199. Which of the following are NOT under the control of thyroid hormone? A. Maintenance of water and electrolyte balance B. Regulation of basal metabolic rate C. Normal rhythm of sleep-wake cycle D. Development of immune system E. Support the process of R.B.Cs formation. Choose the correct answer from the options given below:

(A) A and D only
(B) B and C only
(C) C and D only
(D) D and E only

Q200. Which of the following correctly represents the sequence of phases in the cell cycle?

(A) $G_1 \rightarrow S \rightarrow G_2 \rightarrow M$
(B) $S \rightarrow G_1 \rightarrow G_2 \rightarrow M$
(C) $G_1 \rightarrow G_2 \rightarrow S \rightarrow M$
(D) $M \rightarrow G_1 \rightarrow G_2 \rightarrow S$

Solutions & Explanations

Physics (Section A)

Q1. (B) Shortest wavelength of Balmer is $1/\lambda = R(1/2^2)$. For Brackett, $1/\lambda' = R(1/4^2) = 1/4(1/\lambda)$, hence $\lambda' = 4\lambda$.
Q2. (A) Photoelectric emission occurs when $h\nu > \Phi$. Here $E = 2.20$ eV, which is only greater than the work function of Cs (2.14 eV).
Q3. (D) Random errors arise due to unpredictable and erratic fluctuations in experimental conditions like temperature and voltage supply.
Q4. (D) Resonant frequency $f = 1/(2\pi\sqrt{LC})$. Using $L = 10$ mH and $C = 1\mu$F, $f = 1000/(2\pi) \approx 1.59$ kHz.
Q5. (B) The venturi-meter is a horizontal pipe used to measure the flow speed of a fluid in a pipe based on Bernoulli's principle.
Q6. (B) Fundamental frequency of open pipe $f_1 = v/2L$ and closed pipe $f_2 = v/4L$. The ratio f_1/f_2 is $2:1$.
Q7. (D) Torque $\tau = pE\sin\theta = (q \cdot 2l)E\sin\theta$. Substituting values: $4 = q(0.02)(2 \times 10^5)(0.5)$, we get $q = 2$ mC.
Q8. (A) Net EMF is $10 - 4 = 6$V. Applying Kirchhoff's loop rule to the circuit provides a current of 0.2 A from B to A.
Q9. (A) According to Gauss's Law for magnetism, the net magnetic flux through any closed surface is zero as monopoles don't exist.
Q10. (C) Max height $H = u^2\sin^2\theta/2g$. Substituting $u = 280$, $\theta = 30°$, and $g = 9.8$, we get $H = 1000$ m.
Q11. (D) Equivalent power $P_{eq} = P_1 + P_2 = 1/f + (-1/f) = 0$. Since $F = 1/P$, the focal length becomes infinite.
Q12. (C) Impedance $Z = \sqrt{R^2 + (X_L - X_C)^2}$. Using standard series-parallel circuit reductions, the value is $5\sqrt{5}\Omega$.
Q13. (B) Acceleration in SHM is $a = -\omega^2 x$. At $t = 2$s, x is maximum positive, so acceleration is maximum negative $(-\pi^2/8)$.
Q14. (A) Potential $V = kp\cos\theta/r^2$. Calculating for the point P relative to the dipole axis gives $(3/8)qK$.
Q15. (A) Using $v^2 - u^2 = 2as$, the bullet travels 24 cm to reach $u/3$. It needs 3 more cm to stop, making the total length 27 cm.
Q16. (C) For a combination of thin lens layers, $1/F = \sum(1/f_i)$. Summing the powers leads to an equivalent focal length of -100 cm.
Q17. (A) Analyzing the logic gate configuration (NAND/NOR logic), the truth table matches Table 1 where output is 1 for $A = 0, B = 0$.
Q18. (C) Using $h = ut + 0.5gt^2$ with upward as positive: $-H = 4(4) - 0.5(10)(4)^2 = 16 - 80$, so $H = 64$ m.
Q19. (B) Series resistance $R_s = 10R$, Parallel $R_p = R/10$. Since $I = V/R$, the ratio $I_p/I_s = R_s/R_p = 100$.
Q20. (C) Magnetic force $F = I(\vec{L} \times \vec{B})$. Since $\vec{L} = L\hat{i}$, $F = IL(\hat{i} \times (2\hat{i} + 3\hat{j} - 4\hat{k}))$, giving a magnitude of $5IL$.
Q21. (B) Time period $T = 2\pi\sqrt{R/g}$. Substituting $g = 4/3\pi GR\rho$, we get $T^2 \propto 1/Gd$, so $T^2 = 3\pi/Gd$.
Q22. (C) Frictional force $f = \mu mg$ provides the acceleration. Thus $a = \mu g = 0.15 \times 10 =$

1.5 m s^{-2}.
Q23. (C) Coefficient $\alpha = (R_2 - R_1)/(R_1 \cdot \Delta T) = (6.8 - 2)/(2 \times 80) = 4.8/160 = 0.03 = 3 \times 10^{-2}$ °C^{-1}.
Q24. (D) Orbit radius $r_n = n^2 \cdot r_1$. For $n = 3$, $r_3 = 9 \times 0.53 \times 10^{-11} = 4.77 \times 10^{-10}$ m = 4.77 Å.
Q25. (D) For a semi-circle and straight wires, use Biot-Savart Law. Summing vectors at center P gives field into the page.
Q26. (A) For zero deflection, electric force equals magnetic force ($qE = qvB$). $E = (c/100) \times 9 \times 10^{-4} = 27 \times 10^2$ V/m, $\vec{E} \perp \vec{B}$.
Q27. (C) At slack point P, $mg \sin\theta = mv^2/r$. Using energy conservation from v_0 to v, the ratio is derived as $(\sin\theta/(2 + 3\sin\theta))^{1/2}$.
Q28. (A) Open pipe $f = v/2L$. Dipping half in water creates a closed pipe of length $L/2$. New $f' = v/4(L/2) = v/2L = f$.
Q29. (A) Dimensional analysis of $T \propto S^\alpha A^\beta \rho^\gamma R^\delta$ where S is surface tension and ρ is density gives option A.
Q30. (D) In steady state, heat current is constant. $2K(3T - T_1) = K(T_1 - T_2) = 2K(T_2 - T)$. Solving these equations gives $T_1/T_2 = 3/2$.
Q31. (B) % error in $P = 3(\%a)+2(\%b)+1(\%c)+0.5(\%d) = 3(1)+2(3)+2+0.5(4) = 13\%$.
Q32. (A) $t = x^2 + x \implies dt/dx = 2x + 1$, so $v = 1/(2x + 1)$. Acceleration $a = v(dv/dx) = [1/(2x + 1)][-2/(2x + 1)^3]$.
Q33. (D) Equal heat and ΔU imply work W is identical. Pressure balance leads to the ratio $r_A/r_B = 4/3$.
Q34. (A) Frequency $\omega = \sqrt{k/m}$; as mass m decreases, ω increases. Amplitude A decreases as momentum is lost with sand.
Q35. (B) $I_{solid} = 2/5MR^2$. Removing a sphere of R from $2R$ requires calculating I_{rem} by subtraction; the ratio is 7/57.

Physics (Section B)

Q36. (B) $s = 0.5at^2$. Smooth: $a_s = g \sin\theta$. Rough: $a_r = g(\sin\theta - \mu\cos\theta)$. $t_r = 2t_s \implies a_s = 4a_r$. $\mu = 0.75 \tan 45° = 0.75$.
Q37. (A) Equilibrium pressure $P = (P_1V_1 + P_2V_2)/(V_1 + V_2) = (1 \cdot 2 + 2 \cdot 3)/(2 + 3) = 8/5 = 1.6$ atm.
Q38. (A) The height of the liquid rise/dip $y(x)$ due to surface tension is governed by the pressure balance $\rho g y = S(d^2y/dx^2)$.
Q39. (D) Velocity selector principle: $E = vB$. $E = (3 \times 10^6)(9 \times 10^{-4}) = 2700$ V/m. Force must be $\vec{E} \perp \vec{B}$.
Q40. (D) The gate implementation shown (bubbled AND/OR gates) logically simplifies to the NAND gate truth table.
Q41. (D) Magnetic moment $M = IA$. Since $A \propto r^2$ and I is constant, $M_1/M_2 = (r_1/r_2)^2 = (1/2)^2 = 1/4$.
Q42. (D) Calculating the equivalent resistance of the bridge/resistor network provided in the diagram, the battery current is 2.0 A.
Q43. (B) Centripetal force $F = mv^2/r$. Bohr's condition $mvr = nh/2\pi$. Solving for r and v gives $r \propto n^{2/3}$ and $v \propto n^{1/3}$.
Q44. (C) Max speed $V = A\omega = A\sqrt{k/m}$. Since V and m are same, $A_1\sqrt{k_1} =$

$A_2\sqrt{k_2} \implies A_Q/A_P = \sqrt{k_1/k_2}$.
Q45. (C) Velocity before hit $= \sqrt{2g \times 40} = 28$. After hit $= \sqrt{2g \times 10} = 14$. Impulse $J = m\Delta v = 0.5(28 + 14) = 21$ Ns.
Q46. (B) New distance between poles is the chord $L/2$ (since two $L/2$ arms are at 60°). $M_{new} = m \cdot (L/2) = M/2$.
Q47. (B) Thermal force $F = YA\alpha\Delta T = (0.5 \times 10^{11})(10^{-3})(10^{-5})(100) = 50,000$ N $= 50 \times 10^3$ N.
Q48. (A) Capacitance $C = \epsilon_0 A/d$; d decreases $\implies$ C increases. $Q = CV$; since V is fixed, Q increases.
Q49. (B) Magnifying power $M = f_o/f_e$. Given $f_o = 140$ cm and $f_e = 5$ cm, $M = 140/5 = 28$.
Q50. (A) A conducting sheet moving in a magnetic field experiences eddy currents which resist motion (Lenz's Law).

Chemistry (Section A)

Q51. (A) Oxidation states: HNO3 (+5), NO (+2), N2 (0), NH4Cl (-3). This is the correct decreasing order.
Q52. (C) Atomic radius increases down the group, but Ga is smaller than Al due to poor shielding of 3d electrons (d-block contraction).
Q53. (D) In the Ellingham diagram, the Mg line is below the Al line for temperatures below 1350°C, so Mg can reduce Alumina.
Q54. (D) Boron is in the 2nd period and lacks d-orbitals; therefore, it cannot expand its covalency to form BF_6^{3-}.
Q55. (A) Fluorine does not form any oxyacids except HOF (which is unstable and has O in 0 state); others form multiple oxyacids.
Q56. (B) ClF3 has 3 bond pairs and 2 lone pairs on Cl (total 5 electron pairs, sp^3d hybridization) to form a T-shaped molecule.
Q57. (A) Amylose is a linear polymer with α-1,4 linkages. Amylopectin is branched with α-1,4 and α-1,6 linkages.
Q58. (C) The strength of network polymers is due to cross-links between chains, but they are generally brittle, not flexible/strong like fibers.
Q59. (D) HCOOH gives CO and H2C2O4 gives CO + CO2. KOH absorbs CO2. Remaining CO mass $= 0.1 \times 28 = 2.8$ g.
Q60. (B) Oxides of elements with higher electronegativity are more acidic. BeO is amphoteric/acidic compared to the basic group 2 oxides.
Q61. (C) In strong acid, aniline is protonated to the anilinium ion (-NH3+), which is a deactivating and meta-directing group.
Q62. (C) Ethanol (A) reacts with Na to give C2H5ONa (B) and with PCl5 to give C2H5Cl (C). B+C gives ether via Williamson synthesis.
Q63. (C) Methane (CH4) substitutes to CH3Br. Wurtz reaction of CH3Br gives Ethane (C2H6), which has < 4 carbons.
Q64. (A) Nitrogen pentoxide (N2O5) is not a major pollutant. NO, NO2, and N2O are common pollutants from fuels/soil.
Q65. (B) In CH2=CH-C $\equiv CH, the carbons aresp^2, sp^2, sp, sp$ respectively from left to right.

Q66. (A) Electronegativity order is F ¿ O ¿ N, so the -I effect follows the order -NH2 ¡ -OR ¡ -F.
Q67. (C) Carboxylic acids have higher boiling points because they form stable intermolecular hydrogen-bonded dimers.
Q68. (C) Glycine is an amino acid (H2N-CH2-COOH) which can exist as a zwitterion (H3N+-CH2-COO-).
Q69. (B) The balanced equation is 2MnO4- + 5C2O4^{2-} +16$H+ - > 2Mn^{2+}$ +10$CO2+$ 8$H2O$.
Q70. (A) $Exothermicreactions(\Delta H < 0)$ are favored by low temperature. High pressure favors the side with fewer moles of gas.
Q71. (B) For zero-order, $t_{1/2} = [A]_0/2k$. Doubling $[A]_0$ directly doubles the half-life period.
Q72. (C) The 'a' term in the van der Waals equation accounts for the attractive intermolecular forces between gas molecules.
Q73. (D) Using $\Delta H = \sum BE_{react} - \sum BE_{prod}$, $-200 = 0.5x + 0.25x - x$. Solving gives $x = 800$ kJ/mol.
Q74. (C) Mg has valency 2. X (2p^3)$hasvalency3.Thecompoundformedis Mg3X2(likemagnesiumnitri$
Q75. (D) $Ratioofdensities \rho_{bcc}/\rho_{fcc} = (Z_1/a_1^3)/(Z_2/a_2^3)$. Substituting a in terms of r gives $4\sqrt{3}/3\sqrt{2}$.
Q76. (B) CN- is isoelectronic with N2 (14 electrons), giving it a bond order of 3, the highest among the choices.
Q77. (D) The ground state electronic configuration of N is $[He]2s^2 2p^3$. All other statements are fundamentally correct.
Q78. (B) First order $t_{1/2}$ is $0.693/k$ (independent of concentration). Second order $t_{1/2}$ is $1/(k[A]_0)$ (depends on concentration).
Q79. (A) 18 mL water = 18 g = 1 mole = 6.02×10^{23} molecules. Other options represent much smaller amounts (0.01 mol, 10^{-3} mol, etc).
Q80. (A) Ionic character increases with the size of the cation. Order: BeH2 (least) ¡ CaH2 ¡ BaH2 (most).
Q81. (A) Solubility $s = 2.42 \times 10^{-3}/233 = 1.03 \times 10^{-5}$ M. $K_{sp} = s^2 = 1.08 \times 10^{-10}$ mol^2 L^{-2}.
Q82. (C) In (c), excess [H+] = $(75 \times 0.2 - 25 \times 0.2)/100 = 10/100 = 0.1$ M. pH $= -\log(0.1) = 1$.
Q83. (D) Coagulating power depends on both the sign of the charge (Hardy-Schulze rule) and the magnitude of the charge on the ion.
Q84. (A) The gas with the highest van der Waals constant 'a' has the strongest attractive forces and liquefies most easily (NH3, $a = 4.17$).
Q85. (B) Fe(CO)5 is a mononuclear carbonyl because it contains only one central metal atom per molecule.

Chemistry (Section B)

Q86. (A) [CoCl2(en)2] shows cis-trans geometrical isomerism. The cis-isomer is also optically active.
Q87. (D) The manganate ion MnO4$^{2-} hasMn(+6), whichis$d^1. It is paramagnetic and shows color due to d-d transition.

Q88. (B) Ni in Ni(CO)4 is in 0 oxidation state, d^{10} configuration. It is sp^3 hybridized, tetrahedral, and diamagnetic.
Q89. (A) $Co^3+(d^6, n=4)\ \sqrt{24}$; $Cr^3+(d^3, n=3)\ \sqrt{15}$; $Fe^3+(d^5, n=5)\ \sqrt{35}$; $Ni^2+(d^8, n=2)\ \sqrt{8}$.
Q90. (C) Alkyl isocyanides (CH3NC) on reduction with LiAlH4 give secondary amines (CH3NHCH3), not primary amines.
Q91. (C) Coke (Reducing agent), Diamond (sp^3), Fullerene (Cage), Graphite (Lubricant). Match: A-III, B-I, C-IV, D-II.
Q92. (C) Metallic sodium in ammonia gives ammoniated electrons (blue/paramagnetic). Blue is not due to amide formation.
Q93. (D) When both N and S are present, SCN- is formed, which reacts with $Fe^{3+} togive the blood-red complex [Fe(SCN)]^{2+}$.
Q94. (C) Conductivity $\kappa = (1/R) \times$ Cell Constant. Cell Constant $= 0.0210 \times 60 = 1.26$ cm^{-1}.
Q95. (A) Monochlorination of 2-methylbutane gives 4 structural isomers, one of which has a chiral center, resulting in 5 total products.
Q96. (C) Ga has an unusually low MP (30°C). Ar, K+, and Cl- are all isoelectronic (18 electrons). Radius increases down the group.
Q97. (C) $\Delta H_f[Ba^{2+}(aq)] = \Delta H_f[BaSO4(s)] - \Delta H_f[SO4^{2-}(aq)] - \Delta H_{sol}$. Calculating gives -128.5 kcal/mol.
Q98. (D) Humidity (Liq in Gas), Alloys (Sol in Sol), Amalgams (Liq in Sol), Smoke (Sol in Gas). Match: A-I, B-II, C-III, D-IV.
Q99. (A) Since ΔH is negative, the reaction is exothermic. Products are at a lower energy state than the reactants.
Q100. (D) Fructose (keto sugar) is found in honey, exhibits mutarotation, and is highly laevorotatory.

Botany (Section A)

Q101. (B) *Yucca* flowers and the moth *Tegeticula* have an obligate mutualistic relationship where neither can survive without the other.
Q102. (A) Green sulphur bacteria are anoxygenic; they use H2S as a hydrogen donor instead of water, so no oxygen is evolved.
Q103. (A) *Polysiphonia* is a red alga (Rhodophyceae). Red algae never produce flagellated motile stages in their life cycle.
Q104. (C) In *Pinus*, the pollen grains have two wing-like structures (sacci) that help in dispersal by wind.
Q105. (A) Pneumatophores are respiratory roots found in halophytes like *Rhizophora* that grow in oxygen-poor swampy soils.
Q106. (A) Grasses are monocots; monocots generally lack vascular cambium and therefore do not show secondary growth.
Q107. (C) Casparian strips are waterproof suberin bands found in the radial and tangential walls of the endodermis in roots.
Q108. (B) The vascular cambium is a lateral meristem that produces secondary xylem towards the inside and secondary phloem towards the outside.
Q109. (A) In gymnosperms, the ovules are exposed on the surface of megasporophylls

and are not enclosed within an ovary wall.
Q110. (B) Sweet potato is a modified adventitious root used for food storage, unlike a regular potato which is a modified stem.
Q111. (C) Oxidative phosphorylation occurs on the inner mitochondrial membrane (cristae), not the outer membrane.
Q112. (C) Phospholipid synthesis is the primary function of the Smooth Endoplasmic Reticulum (SER), not the Rough Endoplasmic Reticulum.
Q113. (A) A polysome (or polyribosome) is a string of several ribosomes attached to a single mRNA to translate it into proteins.
Q114. (A) *Saccharomyces* (Yeast) is a unicellular fungus and a eukaryote. The others are prokaryotic Monerans.
Q115. (C) Sugars are polyhydroxy aldehydes or ketones; thus, the characteristic functional groups are carbonyl and hydroxyl.
Q116. (B) The Golgi complex is the primary site for the packaging of proteins and the formation of secretory vesicles and glycoproteins.
Q117. (C) The nucleolus is a non-membrane bound region in the nucleus where active synthesis of ribosomal RNA (rRNA) takes place.
Q118. (B) Diplotene is the stage of Prophase I where the synaptonemal complex dissolves and homologous chromosomes begin to separate.
Q119. (A) Iron is absorbed primarily as ferric ions (Fe^{3+}), $although it is used in various metabolic process$
Q120. (D) $Potassium ions (K+) are essential for maintaining the osmotic balance and turgor of guard cel$
Q121. (B) $NADH is produced during respiration. The light reaction of photosynthesis produces ATP, N$
Q122. (D) $Stomatal movement depends on light, temperature, and CO2 levels. Oxygen concentration has$
Q123. (A) $In grasses (monocots), the guard cells are dumb-bell shaped, whereas in dicots they are typical l$
shaped.
Q124. (C) $Double fertilization involves syngamy (fusion of egg and sperm) and triple fusion (fusion of t$
Q125. (D) $Cryopreservation of pollen is done in liquid nitrogen at$ -196 °C to keep them viable for many years.
Q126. (C) Sporopollenin is an extremely resistant organic material in the pollen exine that allows it to survive as a fossil.
Q127. (B) Offsets are vegetative propagules in plants like *Eichhornia* produced through rapid mitotic cell divisions.
Q128. (A) Bamboo species are monocarpic; they grow vegetatively for 50-100 years and flower only once before dying.
Q129. (D) An operon consists of a promoter, operator, and structural genes. Enhancers are regulatory elements found in eukaryotes.
Q130. (A) Ribozymes are catalytic RNA molecules; thus, they are nucleic acids that function as enzymes.
Q131. (C) Jacob and Monod proposed the lac operon model to explain the regulation of gene expression in *E. coli*.
Q132. (B) Meselson and Stahl provided the experimental proof for semiconservative DNA replication using the bacterium *E. coli*.
Q133. (A) Starch synthesis in pea is an example of incomplete dominance or pleiotropy, not multiple alleles.
Q134. (B) Reginald C. Punnett, a British scientist, developed the Punnett square to visualize genetic crosses.
Q135. (B) Sacred groves are forest patches protected by communities (in-situ). Wildlife parks and seed banks are ex-situ.

Botany (Section B)

Q136. (D) Eutrophication (Nutrients), Landfill (Waste), Snow blindness (UV-B), Jhum (Deforestation). Match: a-iii, b-iv, c-i, d-ii.
Q137. (C) A niche refers to the functional role, resource use, and specific status of an organism within its habitat.
Q138. (B) Chlorine atoms from CFCs act as catalysts in the stratosphere, continuously breaking down ozone into molecular oxygen.
Q139. (A) In aquatic systems, if the biomass of consumers exceeds that of producers, an inverted pyramid of biomass is formed.
Q140. (C) Secondary pollutants like Ozone (O3) are formed in the atmosphere through reactions involving primary pollutants.
Q141. (D) World Ozone Day is celebrated on September 16th to mark the signing of the Montreal Protocol.
Q142. (C) Herbarium (Pressed plants), Key (Identification), Museum (Preserved collections), Catalogue (Species list).
Q143. (D) Lactic acid bacteria increase the nutritional quality of curd by significantly increasing the amount of Vitamin B12.
Q144. (C) Basmati rice was the subject of a patent controversy when a US company tried to claim rights over Indian traditional varieties.
Q145. (C) Auxins are used to induce parthenocarpy (seedless fruit production) in various plants like tomatoes.
Q146. (D) Abscisic acid (ABA) is the primary growth inhibitor and stress hormone, inducing bud and seed dormancy.
Q147. (A) Apical dominance is the phenomenon where the growth of the apical bud inhibits the development of lateral buds.
Q148. (C) RuBisCO is the enzyme that catalyzes the primary carboxylation of Ribulose-1,5-bisphosphate (RuBP) in the Calvin cycle.
Q149. (D) In the Verhulst-Pearl logistic growth equation, 'K' stands for the Carrying Capacity of the environment.
Q150. (B) Scutellum is the large, shield-shaped cotyledon specifically found in the embryos of monocot seeds (grass family).

Zoology (Section A)

Q151. (C) Spermiogenesis is the transformation of spermatids to sperm. Spermiation is the release of sperm from Sertoli cells.
Q152. (A) The amnion is an extra-embryonic membrane formed by the combination of ectoderm and mesoderm.
Q153. (A) Saheli is a non-steroidal oral contraceptive that prevents implantation by blocking estrogen receptors in the uterus.
Q154. (D) The placenta secretes hCG, hPL, progesterone, and estrogens to support fetal growth and maintain the pregnancy.
Q155. (D) Proliferative (Follicular), Secretory (Luteal), Menstruation (Breakdown).

Match: a-ii, b-iii, c-i.
Q156. (C) Mothers pass one of their two X-chromosomes to both sons and daughters, so both can inherit an X-linked condition.
Q157. (A) Asthma is characterized by inflammation of the bronchi. Emphysema involves damage to alveolar walls, reducing surface area.
Q158. (A) Tricuspid (Right A-V), Bicuspid (Left A-V), Semilunar (Arterial exit). Match: a-iii, b-i, c-ii.
Q159. (B) Tidal (500), IRV (2500-3000), ERV (1000-1100), Residual (1100-1200). Match: a-iii, b-i, c-iv, d-ii.
Q160. (B) The limbic system regulates emotions and memory; movement is primarily controlled by the cerebellum and motor cortex.
Q161. (A) The lens is held in place by suspensory ligaments (zonules) that are attached to the ciliary body.
Q162. (C) Parietal cells secrete Castle's Intrinsic Factor, which is essential for Vitamin B12 absorption, a requirement for erythropoiesis.
Q163. (C) Fibrinogen (Clotting), Globulin (Defense), Albumin (Osmotic balance). Match: a-ii, b-iii, c-i.
Q164. (B) Silicosis is an occupational disease caused by long-term inhalation of silica dust in stone-breaking or mining industries.
Q165. (A) Calcium binds to troponin, causing a conformational change that uncovers the active sites on actin for myosin heads.
Q166. (C) Nissl bodies are granular structures in neurons composed of rough endoplasmic reticulum and free ribosomes for protein synthesis.
Q167. (B) Humans have teeth in sockets (thecodont), two sets of teeth (diphyodont), and different types of teeth (heterodont).
Q168. (B) Ultrafiltration (Malpighian corpuscle), Concentration (Henle), Transport (Ureter), Storage (Bladder).
Q169. (C) Glycosuria (Glucose in urine), Gout (Uric acid), Calculi (Mass of salts), Nephritis (Glomeruli inflammation).
Q170. (A) Epinephrine (Adrenaline) is an amine hormone derived from the amino acid Tyrosine.
Q171. (D) Estrogen deficiency after menopause and high levels of Parathyroid hormone (PTH) promote bone resorption leading to osteoporosis.
Q172. (B) NAD+ acts as a coenzyme and a hydrogen/electron carrier in both glycolysis and the Krebs cycle.
Q173. (D) Birds (Aves) have a digestive system with a crop for storage and a gizzard for mechanical grinding of food.
Q174. (B) *Chelone* (Turtle) is a reptile and is poikilothermic (cold-blooded), unlike mammals and birds which are homeotherms.
Q175. (B) Male cockroaches are distinguished by the presence of a pair of thread-like anal styles, which are absent in females.
Q176. (B) Diatoms are the chief producers in the oceans, contributing significantly to global carbon fixation via photosynthesis.
Q177. (C) Ciliates like *Paramecium* are unique for having nuclear dimorphism: a macronucleus and a micronucleus.
Q178. (A) Earthworms show direct development; they hatch from cocoons as tiny versions of adults without any larval stage.
Q179. (B) Hugo de Vries proposed that evolution occurs in large, single-step mutations

called saltations.
Q180. (C) Octopus eyes and mammal eyes are analogous (convergent evolution), whereas the others are homologous (divergent evolution).
Q181. (D) Alzheimer's is a neurodegenerative disease, whereas Psoriasis, RA, and Vitiligo are autoimmune disorders.
Q182. (A) The similarity in forelimb bone structure (Humerus, Radius, Ulna) is due to common ancestry, defining homology.
Q183. (A) Elephantiasis (Filariasis) is caused by *Wuchereria* worms, which cause chronic inflammation of the lymphatic vessels.
Q184. (B) "Smack" (Heroin) is chemically diacetylmorphine, obtained from the latex of the poppy plant *Papaver somniferum*.
Q185. (C) Amensalism (where one organism inhibits another, e.g., *Penicillium* vs bacteria) is exploited to produce antibiotics.

Zoology (Section B)

Q186. (D) Medullary pyramids project into minor calyces, which then lead into the renal pelvis and finally the ureter.
Q187. (A) Stabilizing selection favors the intermediate or mean character value and eliminates the individuals at the extremes.
Q188. (C) Insulin is a water-soluble peptide hormone that binds to membrane receptors; steroid hormones bind to intracellular receptors.
Q189. (A) Bacteria are prokaryotes without a nuclear membrane, so DNA replication occurs directly in the cytoplasm within the nucleoid.
Q190. (C) Taenia has flame cells, Paramoecium has vacuoles, and Periplaneta has urecose glands. Nephridia are specific to Pheretima.
Q191. (B) Serum and urine analysis only detect pathogens once they are at high levels; PCR and ELISA are used for early diagnosis.
Q192. (B) Evolution of life proceeded from organic monomers to polymers, which then formed protobionts and DNA-based systems.
Q193. (D) In the lac operon, the repressor binds to the operator to block transcription only when the inducer (lactose) is absent.
Q194. (C) Taylor used radioactive tritiated thymidine to label DNA in Vicia faba root cells to prove semi-conservative replication.
Q195. (A) In gymnosperms, the endosperm is haploid (n) as it forms from the megaspore. The egg cell is also haploid (n).
Q196. (D) A 1:1:1:1 dihybrid test-cross ratio indicates that the genes are located on different chromosomes and assort independently.
Q197. (D) The lagging strand is synthesized discontinuously as Okazaki fragments in the direction away from the replication fork.
Q198. (A) Asthma involves inflammation of the respiratory airways. Emphysema involves permanent damage to the alveolar walls.
Q199. (A) P-wave (Atrial depol), QRS (Ventricular depol), T-wave (Ventricular repol), Q-wave (Onset of ventricular systole).
Q200. (D) Amniocentesis is a diagnostic procedure; its legal ban prevents its misuse for female foeticide and maintains the sex ratio.