UPCATET Complete Sample Paper
– 3

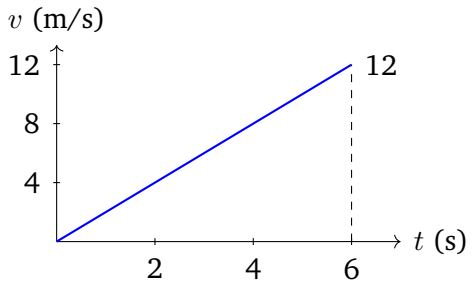
Duration: 180 Minutes **Maximum Marks: 800**

Instructions

- This paper contains **200 Multiple Choice Questions** covering Part A: Physics (Q1–50), Part B: Chemistry (Q51–100), Part C: Biology (Q101–180), and Part D: General Studies (Q181–200), modelled on the **UPCATET** entrance examination (conducted by SVPUAT, Meerut).
- Each correct answer carries **+4 marks**. Each wrong answer carries **−1 mark**. Unattempted questions carry **0 marks**.
- Only **one** option is correct per question. Choose carefully.
- Syllabus level: Class 11–12 (UP Board / NCERT) — Physics, Chemistry, Biology, and General Studies as per the official UPCATET syllabus.
- This is an **OMR-based** pen-and-paper examination. Use only **HB pencil** to darken the appropriate bubble.
- Use of mobile phones, calculators, or any electronic gadgets is **strictly prohibited**.

Part A: Physics (Q1–Q50)

Q1. A velocity–time graph is a straight line from $(0,\ 0)$ to $(6,\ 12)$ (velocity in m/s, time in s). The displacement in 0 to 6 s is:



(A) $36\,\text{m}$

(B) $72\,\text{m}$

(C) $18\,\text{m}$

(D) $48\,\text{m}$

Q2. The position–time graph of a particle shows a straight line with slope $5\,\text{m/s}$. A second particle's graph has slope $-3\,\text{m/s}$. The relative velocity of the first with respect to the second is:

(A) $2\,\text{m/s}$

(B) $8\,\text{m/s}$

(C) $-8\,\text{m/s}$

(D) $15\,\text{m/s}$

Q3. A particle moves along a straight line. Its velocity–time graph forms a triangle: velocity rises linearly from 0 to $+6\,\text{m/s}$ in $3\,\text{s}$, then drops linearly to $-6\,\text{m/s}$ in the next $3\,\text{s}$. The ratio of distance to magnitude of displacement at $t = 6\,\text{s}$ is:

(A) 1

(B) 3

(C) $3:1$

(D) $2:1$

Q4. The velocity–time graph of a body is a curve (not a straight line). Which of the following is correct?

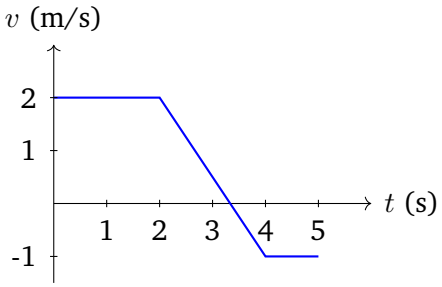
(A) The body has uniform velocity

(B) The body has uniform acceleration

(C) The body has zero acceleration

(D) The body has non-uniform (variable) acceleration

Q5. A velocity–time graph is shown below. What is the displacement of the particle from $t = 0$ to $t = 5\,\text{s}$?



(A) $5\,\text{m}$

(B) $7\,\text{m}$

(C) $3\,\text{m}$

(D) $9\,\text{m}$

Q6. The v–t graph of a car starts at $v = 20\,\text{m/s}$ at $t = 0$ and decreases uniformly to $v = 0$ at $t = 10\,\text{s}$, then continues to $v = -10\,\text{m/s}$ at $t = 15\,\text{s}$. The total distance travelled (not displacement) in 0 to $15\,\text{s}$ is:

(A) $75\,\text{m}$

(B) $125\,\text{m}$

(C) $50\,\text{m}$

(D) $100\,\text{m}$

Q7. A solid of density $5000\,\text{kg/m}^3$ is fully submerged in water (density $1000\,\text{kg/m}^3$). The ratio of the buoyant force to its weight is:

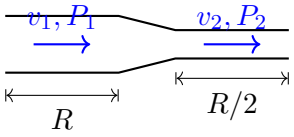
(A) $\dfrac{1}{4}$

(B) $\dfrac{1}{3}$

(C) $\dfrac{1}{5}$

(D) $\dfrac{2}{5}$

Q8. Water flows through a horizontal pipe that narrows from radius R to $R/2$. If the pressure in the wider section is P_1 and velocity is v_1, according to Bernoulli's equation the pressure P_2 in the narrower section satisfies:



(A) $P_2 = P_1 + \frac{15}{2}\rho v_1^2$

(B) $P_2 = P_1 - \frac{15}{2}\rho v_1^2$

(C) $P_2 = P_1 + 8\rho v_1^2$

(D) $P_2 = P_1 - 8\rho v_1^2$

Q9. A large tank contains water and has a small hole at a depth $h = 0.8\,\text{m}$ below the free surface. The speed with which water emerges from the hole (Torricelli's theorem, $g = 10\,\text{m/s}^2$) is:

(A) $4\,\text{m/s}$

(B) $8\,\text{m/s}$

(C) $6\,\text{m/s}$

(D) $2\,\text{m/s}$

Q10. A small sphere of radius $r = 1\,\text{mm}$ and density $8000\,\text{kg/m}^3$ falls through oil of viscosity $\eta = 1\,\text{Pa·s}$ with terminal velocity. The Stokes' drag force is $F = 6\pi\eta r v_t$. Which of the following correctly gives terminal velocity?

(A) $v_t = \dfrac{9\eta}{2r^2(\rho - \rho_f)g}$

(B) $v_t = \dfrac{2r^2(\rho - \rho_f)g}{9\eta}$

(C) $v_t = \dfrac{6\pi\eta r}{(\rho - \rho_f)g}$

(D) $v_t = \dfrac{r^2(\rho - \rho_f)g}{3\eta}$

Q11. A wooden block of mass $500\,\text{g}$ and volume $800\,\text{cm}^3$ floats in water. What fraction of its volume is submerged?

(A) 0.5

(B) 0.75

(C) 0.625

(D) 0.8

Q12. Water flows through a pipe of cross-section area $4\,\text{cm}^2$ at speed $2\,\text{m/s}$. The pipe narrows to area $1\,\text{cm}^2$. By the equation of continuity, the speed in the narrow section is:

(A) $2\,\text{m/s}$

(B) $4\,\text{m/s}$

(C) $6\,\text{m/s}$

(D) $8\,\text{m/s}$

Q13. A wire of length $2\,\text{m}$ and cross-sectional area $1\,\text{mm}^2$ is stretched by a force of $200\,\text{N}$ and extends by $1\,\text{mm}$. The Young's modulus of the material is:

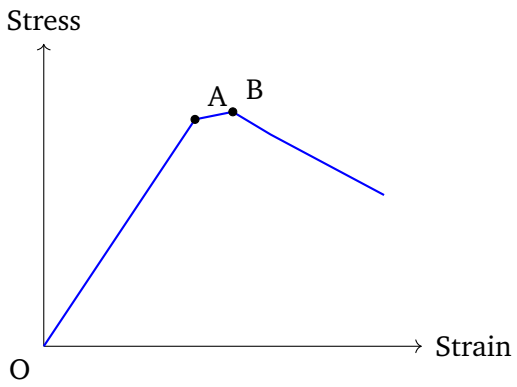
(A) $4 \times 10^{11}\,\text{Pa}$

(B) $2 \times 10^{11}\,\text{Pa}$

(C) $2 \times 10^{10}\,\text{Pa}$

(D) $4 \times 10^{10}\,\text{Pa}$

Q14. The stress–strain graph for a metal wire is shown below. The region OA represents:



(A) Plastic region

(B) Elastic region (Hooke's law)

(C) Yield point

(D) Fracture point

Q15. The elastic potential energy stored per unit volume in a stretched wire with Young's modulus Y, stress σ, and strain ε is:

(A) $Y\varepsilon^2$

(B) $\sigma\varepsilon$

(C) $\dfrac{1}{2}\sigma\varepsilon$

(D) $\dfrac{\sigma^2}{Y}$

Q16. When a wire is stretched longitudinally, its diameter decreases. If the longitudinal strain is 0.002 and lateral strain is -0.0006, the Poisson's ratio of the material is:

(A) 0.4

(B) 0.25

(C) 0.2

(D) 0.3

Q17. The bulk modulus of a gas is defined as $K = -V\dfrac{dP}{dV}$. For an ideal gas undergoing isothermal compression, the bulk modulus equals:

(A) P (the pressure of the gas)

(B) γP

(C) $\dfrac{P}{\gamma}$

(D) ρRT

Q18. A figure-skater pulls her arms inward, reducing her moment of inertia from $I_1 = 4\,\text{kg·m}^2$ to $I_2 = 1\,\text{kg·m}^2$. If her initial angular speed is $\omega_1 = 2\,\text{rad/s}$, what is her final angular speed ω_2?

(A) $2\,\text{rad/s}$

(B) $8\,\text{rad/s}$

(C) $4\,\text{rad/s}$

(D) $16\,\text{rad/s}$

Q19. A solid sphere and a hollow sphere of the same mass and radius roll without slipping up an incline with the same initial kinetic energy. Which one travels farther up the incline?

(A) Both travel the same distance

(B) The solid sphere travels farther

(C) The hollow sphere travels farther

(D) Cannot be determined without more data

Q20. The moment of inertia of a hollow sphere (thin shell) of mass M and radius R about a diameter is $\frac{2}{3}MR^2$. For a solid sphere of same M and R, it is $\frac{2}{5}MR^2$. For a ring of mass M and radius R about its axis, the moment of inertia is:

(A) $\frac{1}{2}MR^2$

(B) $\frac{2}{3}MR^2$

(C) $\frac{2}{5}MR^2$

(D) MR^2

Q21. A torque of $10\,\text{N·m}$ acts on a body for $5\,\text{s}$. If the body started from rest, the angular impulse (change in angular momentum) is:

(A) $50\,\text{kg·m}^2/\text{s}$

(B) $2\,\text{kg·m}^2/\text{s}$

(C) $10\,\text{kg·m}^2/\text{s}$

(D) $0.5\,\text{kg·m}^2/\text{s}$

Q22. A solid cylinder (moment of inertia $I = \frac{1}{2}MR^2$) rolls without slipping. What fraction of its total kinetic energy is rotational?

(A) $\frac{1}{4}$

(B) $\frac{1}{3}$

(C) $\frac{2}{5}$

(D) $\frac{1}{2}$

Q23. A body at 80C cools in surroundings at 20C. According to Newton's law of cooling, the rate of cooling is proportional to the temperature difference. If the temperature difference halves, the rate of cooling:

(A) Doubles

(B) Remains the same

(C) Halves

(D) Reduces to one-quarter

Q24. A black body radiates energy at a rate P at temperature T K. If the temperature is raised to $2T$, the rate of energy radiation becomes:

(A) $2P$

(B) $4P$

(C) $8P$

(D) $16P$

Q25. The sun has a surface temperature of about 6000 K. Using Wien's displacement law ($\lambda_m T = 2.9 \times 10^{-3}$ m·K), the peak wavelength of solar radiation is approximately:

(A) 483 nm

(B) 580 nm

(C) 700 nm

(D) $290\,\text{nm}$

Q26. Two bodies at the same temperature: one is a perfect black body (emissivity $e = 1$), and the other is a polished metal (emissivity $e = 0.1$). The ratio of radiated power (black body to polished metal) is:

(A) 0.1

(B) 10

(C) 100

(D) 1

Q27. Two rods of the same material and length but different cross-sectional areas ($A_1 = 2A_2$) are connected in parallel between two heat reservoirs. The ratio of heat conducted per second through rod 1 to rod 2 is:

(A) 1

(B) $1 : 2$

(C) $2 : 1$

(D) $4 : 1$

Q28. An AC voltage is given by $v = 311 \sin(100\pi t)\,\text{V}$. The RMS voltage is approximately:

(A) $311\,\text{V}$

(B) $155.5\,\text{V}$

(C) $622\,\text{V}$

(D) $220\,\text{V}$

Q29. An inductor of $L = \frac{1}{\pi}\,\text{H}$ is connected to AC of frequency $50\,\text{Hz}$. The inductive reactance X_L is:

(A) $100\,\Omega$

(B) $50\,\Omega$

(C) $\pi\,\Omega$

(D) $200\,\Omega$

Q30. A capacitor of capacitance $C = \frac{1}{2\pi}\,\text{mF}$ is connected to AC of frequency $50\,\text{Hz}$. The capacitive reactance $X_C = \dfrac{1}{\omega C}$ is:

(A) $5\,\Omega$

(B) $10\,\Omega$

(C) $20\,\Omega$

(D) $\pi\,\Omega$

Q31. A series RLC circuit has $R = 6\,\Omega$, $X_L = 10\,\Omega$, and $X_C = 2\,\Omega$. The impedance of the circuit is:

(A) $6\,\Omega$

(B) $14\,\Omega$

(C) $10\,\Omega$

(D) $18\,\Omega$

Q32. In a series RLC circuit, $R = 8\,\Omega$ and impedance $Z = 10\,\Omega$. The power factor ($\cos\phi = R/Z$) is:

(A) 0.6

(B) 0.5

(C) 1.0

(D) 0.8

Q33. A circular coil of 100 turns, area $0.01\,\text{m}^2$, is placed in a magnetic field that increases uniformly from 0 to $2\,\text{T}$ in $0.5\,\text{s}$. The induced EMF is:

(A) $4\,\text{V}$

(B) $2\,\text{V}$

(C) $0.04\,\text{V}$

(D) $8\,\text{V}$

Q34. A conducting rod of length $L = 0.5\,\text{m}$ moves with velocity $v = 4\,\text{m/s}$ perpendicular to a magnetic field $B = 0.3\,\text{T}$. The motional EMF ($\varepsilon = Blv$) is:

(A) $0.3\,\text{V}$

(B) $0.6\,\text{V}$

(C) $1.2\,\text{V}$

(D) $0.15\,\text{V}$

Q35. A bar magnet's north pole is moved towards a conducting loop. According to Lenz's law, the induced current in the loop will:

(A) Flow in the same direction as the bar magnet's rotation

(B) Have no definite direction

(C) Create a magnetic field opposing the approach (repelling the magnet)

(D) Create a field attracting the magnet

Q36. A coil has self-inductance $L = 0.5\,\text{H}$. If the current through it changes at a rate $\dfrac{dI}{dt} = 4\,\text{A/s}$, the magnitude of the back-EMF is:

(A) $0.5\,\text{V}$

(B) $4\,\text{V}$

(C) $0.125\,\text{V}$

(D) $2\,\text{V}$

Q37. An inductor of $L = 200\,\text{mH}$ carries a current of $5\,\text{A}$. The energy stored in the magnetic field of the inductor ($U = \frac{1}{2}LI^2$) is:

(A) $2.5\,\text{J}$

(B) $5\,\text{J}$

(C) $1.25\,\text{J}$

(D) $0.5\,\text{J}$

Q38. In Young's double slit experiment, the slit separation $d = 0.5\,\text{mm}$, screen distance $D = 1\,\text{m}$, and wavelength $\lambda = 600\,\text{nm}$. The fringe width $\beta = \dfrac{\lambda D}{d}$ is:

(A) $0.6\,\text{mm}$

(B) $1.2\,\text{mm}$

(C) $0.3\,\text{mm}$

(D) $2.4\,\text{mm}$

Q39. In Young's double slit experiment, a dark fringe (destructive interference) is observed when the path difference Δx satisfies:

(A) $\Delta x = n\lambda$ $(n = 0, 1, 2, \ldots)$

(B) $\Delta x = 2n\lambda$

(C) $\Delta x = (2n - 1)\dfrac{\lambda}{2}$

(D) $\Delta x = \dfrac{n\lambda}{2}$

Q40. A soap film of refractive index $n = 1.5$ and thickness $t = 200\,\text{nm}$ is illuminated with white light at normal incidence. For constructive interference in reflected light (accounting for one phase reversal), the condition is $2nt = (2m - 1)\lambda/2$, giving the brightest wavelength at $m = 1$:

(A) $800\,\text{nm}$

(B) $400\,\text{nm}$

(C) $600\,\text{nm}$

(D) $1200\,\text{nm}$

Q41. In Young's double slit experiment, the 3rd bright fringe from the centre is at $y_3 = 3\dfrac{\lambda D}{d}$. If λ is doubled and d is halved, the new position of the 3rd bright fringe is:

(A) $12\dfrac{\lambda D}{d}$ (original units)

(B) $6\dfrac{\lambda D}{d}$

(C) $3\dfrac{\lambda D}{d}$

(D) $24\dfrac{\lambda D}{d}$

Q42. Which of the following produces sustained and stable interference fringes?

(A) Two independent sodium lamps

(B) Two slits illuminated by the same monochromatic source (coherent sources)

(C) Two different colour LEDs

(D) Two separate lasers of different frequencies

Q43. The fundamental frequency of a closed organ pipe of length $L = 0.85\,\text{m}$ (speed of sound $v = 340\,\text{m/s}$) is $f_1 = \dfrac{v}{4L}$:

(A) $400\,\text{Hz}$

(B) $200\,\text{Hz}$

(C) $100\,\text{Hz}$

(D) $50\,\text{Hz}$

Q44. An open pipe of length L produces a fundamental frequency f_0. The frequency of the second overtone (third harmonic) of the open pipe is:

(A) f_0

(B) $2f_0$

(C) $f_0/2$

(D) $3f_0$

Q45. A stretched string of length $L = 1\,\text{m}$, linear mass density $\mu = 0.01\,\text{kg/m}$, and tension $T = 100\,\text{N}$ vibrates. The fundamental frequency $f = \dfrac{1}{2L}\sqrt{\dfrac{T}{\mu}}$ is:

(A) $50\,\text{Hz}$

(B) $100\,\text{Hz}$

(C) $25\,\text{Hz}$

(D) $200\,\text{Hz}$

Q46. A closed pipe supports only odd harmonics. If the fundamental frequency is f_1, the first overtone of a closed pipe has frequency:

(A) $2f_1$

(B) $3f_1$

(C) $4f_1$

(D) $5f_1$

Q47. The end correction for an open pipe of radius r is approximately:

(A) r

(B) $r/2$

(C) $0.6r$

(D) $2r$

Q48. When a trivalent impurity like boron (B) is added to pure silicon, the resulting semiconductor is:

(A) n-type; electrons are minority carriers

(B) n-type; holes are minority carriers

(C) Intrinsic; carrier concentration unchanged

(D) p-type; holes are majority carriers

Q49. At a p-n junction, the depletion region forms because:

(A) Electrons from n-side diffuse into p-side and recombine with holes, leaving behind fixed ions

(B) The battery pushes carriers away from the junction

(C) Only holes diffuse; electrons remain stationary

(D) External electric field removes carriers

Q50. A p-n junction diode is forward biased when:

(A) The n-side is connected to the positive terminal of a battery

(B) The p-side is connected to the positive terminal of a battery

(C) No battery is connected

(D) The p-side is connected to the negative terminal

Part B: Chemistry (Q51–Q100)

Q51. Which of the following correctly describes the trend in first ionization energy across a period from left to right in the modern periodic table?

(A) Decreases regularly

(B) Remains constant

(C) Generally increases, with some exceptions

(D) First increases then decreases

Q52. The most electronegative element in the periodic table is:

(A) Oxygen

(B) Chlorine

(C) Nitrogen

(D) Fluorine

Q53. Which of the following has the smallest ionic radius?

(A) Al^{3+}

(B) Mg^{2+}

(C) Na^{+}

(D) F^{-}

Q54. Among the halogens, which element has the highest electron affinity (releases maximum energy when gaining one electron)?

(A) Fluorine

(B) Chlorine

(C) Bromine

(D) Iodine

Q55. The first ionization energy of oxygen is less than that of nitrogen. The reason is:

(A) Oxygen has a larger atomic radius than nitrogen

(B) Nitrogen is a non-metal while oxygen is a semi-metal

(C) Nitrogen has a stable half-filled 2p sub-shell, making it harder to remove an electron

(D) Oxygen has higher nuclear charge

Q56. According to molecular orbital theory (MOT), the bond order of O_2 is:

(A) 1

(B) 3

(C) 1.5

(D) 2

Q57. Molecular orbital theory predicts that O_2 is:

(A) Paramagnetic (has 2 unpaired electrons in π^*_{2p} orbitals)

(B) Diamagnetic (all electrons paired)

(C) Ferromagnetic

(D) Antiferromagnetic

Q58. The bond order of N_2 in molecular orbital theory is:

(A) 2

(B) 3

(C) 2.5

(D) 1

Q59. Using molecular orbital theory, the bond order of the nitric oxide (NO) molecule is:

(A) 2

(B) 3

(C) 2.5

(D) 1.5

Q60. In molecular orbital theory, which species among the following is most stable (highest bond order)?

(A) O_2^-

(B) O_2^{2-}

(C) O_2^+

(D) O_2

Q61. The van der Waals equation for one mole of a real gas is $\left(P + \frac{a}{V^2}\right)(V - b) = RT$. The correction term $\frac{a}{V^2}$ accounts for:

(A) Intermolecular attractive forces (cohesive pressure)

(B) The finite volume of gas molecules

(C) Quantum mechanical effects

(D) Dipole–dipole repulsions at high pressure

Q62. At very high pressures, a real gas deviates from ideal behavior because:

(A) Intermolecular attractions become dominant

(B) The volume of gas molecules becomes significant compared to the container volume

(C) Temperature drops to zero

(D) Molecules slow down appreciably

Q63. Above the critical temperature of a gas:

(A) The gas can be liquefied by increasing pressure alone

(B) The gas solidifies directly

(C) The gas cannot be liquefied regardless of pressure

(D) The gas becomes an ideal gas

Q64. Boyle's law states that at constant temperature, for a fixed amount of gas, $PV =$ constant. Which graph correctly represents this relationship?

(A) P vs V: a straight line through the origin

(B) P vs V: a straight line with positive intercept

(C) P vs T: a hyperbola

(D) P vs $\dfrac{1}{V}$: a straight line through the origin

Q65. Charles's law ($V \propto T$ at constant pressure) predicts that volume becomes zero at:

(A) -273.15C (absolute zero)

(B) 0C

(C) 100C

(D) -100C

Q66. A reaction has $\Delta H = -200\,\text{kJ/mol}$ and $\Delta S = -0.5\,\text{kJ/(mol·K)}$. At $T = 300\,\text{K}$, the value of $\Delta G = \Delta H - T\Delta S$ is:

(A) $-350\,\text{kJ/mol}$

(B) $-50\,\text{kJ/mol}$

(C) $50\,\text{kJ/mol}$

(D) $350\,\text{kJ/mol}$

Q67. A reaction is always spontaneous irrespective of temperature when:

(A) $\Delta H > 0$ and $\Delta S < 0$

(B) $\Delta H > 0$ and $\Delta S > 0$

(C) $\Delta H < 0$ and $\Delta S > 0$

(D) $\Delta H < 0$ and $\Delta S < 0$

Q68. The relationship between standard Gibbs free energy change ΔG and equilibrium constant K is:

(A) $\Delta G = RT \ln K$

(B) $\Delta G = \dfrac{RT}{K}$

(C) $K = e^{\Delta G/RT}$

(D) $\Delta G = -RT \ln K$

Q69. Ellingham diagrams are used to determine:

(A) The feasibility of reducing a metal oxide with a reducing agent at a given temperature

(B) The rate of a chemical reaction

(C) Equilibrium concentrations of reactants and products

(D) The enthalpy of combustion of metals

Q70. The entropy of a system increases when:

(A) A gas is compressed at constant temperature

(B) A solid melts to form a liquid

(C) A vapour condenses to liquid

(D) A solute crystallizes out of solution

Q71. The diagonal relationship exists between:

(A) Na and Mg

(B) K and Ca

(C) Li and Mg

(D) Be and Na

Q72. Unlike other Group 1 metals, lithium forms Li_2O (normal oxide) rather than peroxide or superoxide because:

(A) Lithium has the highest reactivity in Group 1

(B) Lithium's large ionic radius cannot stabilize the larger peroxide ion

(C) Lithium is a liquid at room temperature

(D) Lithium has a lower ionization energy

Q73. Among Group 2 carbonates, which one has the lowest thermal stability (decomposes at the lowest temperature)?

(A) $BeCO_3$

(B) $MgCO_3$

(C) $CaCO_3$

(D) $BaCO_3$

Q74. The characteristic brick-red flame in a flame test indicates the presence of:

(A) Sodium (Na)

(B) Calcium (Ca)

(C) Potassium (K)

(D) Lithium (Li)

Q75. Beryllium (Be) shows anomalous behaviour in Group 2 and resembles aluminium (Al) diagonally. Which property is NOT shared by Be and Al?

(A) Both form amphoteric oxides

(B) Both form covalent chlorides that hydrolyse in water

(C) Both are alkali metals

(D) Both have a tendency to form complex ions

Q76. The complex $[Pt(NH_3)_2Cl_2]$ (square planar) shows geometric (cis-trans) isomerism. Which statement is correct about the *cis* isomer?

(A) The two Cl atoms are on opposite sides of the central metal

(B) The complex has a tetrahedral geometry

(C) The two Cl atoms are trans to each other

(D) The two Cl atoms are on the same side of the central metal

Q77. Which of the following coordination complexes exhibits optical isomerism (exists as Λ and Δ enantiomers)?

(A) $[Co(en)_3]^{3+}$ where en = ethylenediamine

(B) $[NiCl_4]^{2-}$

(C) $[Pt(NH_3)_4]^{2+}$

(D) $[Cu(NH_3)_4]^{2+}$

Q78. Ionization isomers give different ions in solution. Which pair represents ionization isomers?

(A) $[Co(NH_3)_5Cl]SO_4$ and $[Co(NH_3)_5Cl]SO_4$

(B) $[Co(NH_3)_5SO_4]Cl$ and $[Co(NH_3)_5Cl]SO_4$

(C) $[Co(NH_3)_4Cl_2]Br$ and $[Co(NH_3)_4Cl_2]Br$

(D) $[Cr(H_2O)_6]Cl_3$ and $[Cr(H_2O)_6]Br_3$

Q79. Linkage isomerism arises in coordination compounds when the ligand is ambidentate. Which ligand can cause linkage isomerism?

(A) Ethylenediamine (en)

(B) Ammonia (NH_3)

(C) Nitrite ion (NO_2^-)

(D) Chloride ion (Cl^-)

Q80. Which of the following is a strong-field ligand that causes maximum crystal field splitting (Δ)?

(A) Cl^-

(B) F^-

(C) H_2O

(D) CN^-

Q81. In the nitration of benzene, the electrophile that attacks the benzene ring is:

(A) Nitronium ion NO_2^+

(B) Nitrate ion NO_3^-

(C) HNO_3 molecule

(D) N_2O_5

Q82. Which of the following substituents on a benzene ring is an ortho/para director and an activating group?

(A) –NO_2

(B) –OH

(C) –COOH

(D) –CN

Q83. Which of the following groups directs an incoming electrophile to the meta position in EAS reactions?

(A) –NH_2

(B) –OCH_3

(C) –COOH

(D) –CH_3

Q84. In the bromination of benzene (EAS), a Lewis acid catalyst like $FeBr_3$ is required because:

(A) It neutralizes the HBr produced

(B) It donates electrons to the benzene ring

(C) It increases the temperature of the reaction

(D) It generates the electrophile Br^+ by polarizing Br_2

Q85. In the sulfonation of benzene, the electrophile is:

(A) SO_3 (sulphur trioxide)

(B) H_2SO_4

(C) HSO_3^-

(D) SO_4^{2-}

Q86. Among the following, which correctly ranks the acidic strength in decreasing order?

(A) Phenol $>$ Carboxylic acid $>$ H_2CO_3

(B) Carboxylic acid $>$ H_2CO_3 $>$ Phenol

(C) H_2CO_3 $>$ Phenol $>$ Carboxylic acid

(D) Phenol $>$ H_2CO_3 $>$ Carboxylic acid

Q87. When ethanoic acid reacts with ethanol in the presence of concentrated H_2SO_4, the product is:

(A) Ethyl ethanoate and water via an addition reaction

(B) Diethyl ether and CO_2

(C) Ethyl ethanoate and water via Fischer esterification (condensation)

(D) Acetaldehyde and ethanol

Q88. Saponification is:

(A) Acid-catalysed hydrolysis of an ester

(B) Dehydration of a carboxylic acid to form an anhydride

(C) Reduction of a carboxylic acid with $LiAlH_4$

(D) Base-catalysed (alkaline) hydrolysis of an ester to give soap (carboxylate salt) and alcohol

Q89. The peptide bond in proteins is an amide linkage formed between:

(A) The carboxyl group (–COOH) of one amino acid and the amino group ($–NH_2$) of another, with loss of water

(B) Two carboxyl groups of adjacent amino acids

(C) Two amino groups of adjacent amino acids

(D) A carboxyl group and a hydroxyl group

Q90. Among chloroacetic acid ($ClCH_2COOH$), acetic acid (CH_3COOH), and dichloroacetic acid ($Cl_2CHCOOH$), which is the strongest acid?

(A) Acetic acid

(B) Dichloroacetic acid

(C) Chloroacetic acid

(D) All are equally acidic

Q91. An amine in which the nitrogen atom is bonded to two alkyl groups and one hydrogen is classified as:

(A) Primary amine

(B) Tertiary amine

(C) Secondary amine

(D) Quaternary ammonium salt

Q92. In aqueous solution, the order of basic strength of aliphatic amines is:

(A) Primary $>$ Secondary $>$ Tertiary

(B) Tertiary $>$ Secondary $>$ Primary

(C) Primary = Secondary = Tertiary

(D) Secondary > Primary > Tertiary

Q93. When a primary aromatic amine ($ArNH_2$) is treated with $NaNO_2$/HCl at 0–5C, the product formed is:

(A) An aryl diazonium salt ($ArN_2^+Cl^-$)

(B) An N-nitrosoamine

(C) A nitrile (ArCN)

(D) A secondary amine

Q94. In the Sandmeyer reaction, the diazonium group ($-N_2^+$) is replaced by CN when treated with:

(A) CuCl

(B) CuCN

(C) CuBr

(D) CuI

Q95. In azo coupling, a diazonium salt reacts with an electron-rich aromatic compound like phenol or aniline. The product formed is:

(A) A substituted benzene (direct substitution)

(B) An aldehyde

(C) An azo dye (–N=N– linkage)

(D) A carboxylic acid

Q96. In paper chromatography, the Rf (retardation factor) value of a compound is defined as:

(A) $\dfrac{\text{Distance moved by solvent}}{\text{Distance moved by solute}}$

(B) $\dfrac{\text{Distance moved by solvent}}{\text{Total length of paper}}$

(C) $\dfrac{\text{Total paper length}}{\text{Distance moved by solute}}$

(D) $\dfrac{\text{Distance moved by solute}}{\text{Distance moved by solvent front}}$

Q97. Beer-Lambert law states that the absorbance A of a solution is related to its concentration c and path length l by $A = \varepsilon c l$. If c doubles and l is kept constant, absorbance:

(A) Doubles

(B) Halves

(C) Remains the same

(D) Increases fourfold

Q98. In flame photometry, the characteristic yellow flame emission of sodium (Na) occurs at a wavelength of:

(A) $670\,\text{nm}$

(B) $589\,\text{nm}$

(C) $766\,\text{nm}$

(D) $423\,\text{nm}$

Q99. In systematic qualitative analysis, the cations of Group II (like Pb^{2+}, Cu^{2+}, Bi^{3+}) are precipitated by:

(A) HCl gas in acidic solution

(B) NaOH in alkaline solution

(C) H_2S in dilute HCl (acidic medium)

(D) NH_4OH after adding NH_4Cl

Q100. In a titration, $25\,\text{mL}$ of $0.1\,\text{M}$ NaOH is needed to neutralize $50\,\text{mL}$ of an HCl solution. The molarity of the HCl solution is:

(A) $0.1\,\text{M}$

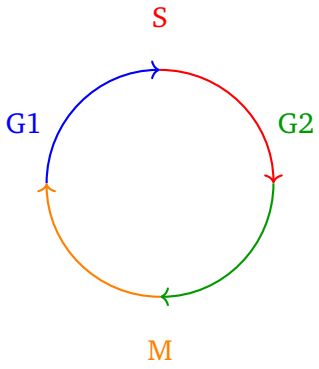
(B) $0.025\,\text{M}$

(C) $0.2\,\text{M}$

(D) $0.05\,\text{M}$

Part C: Biology (Q101–Q180)

Q101. The correct sequence of phases in the cell cycle is:



(A) G1 $\rightarrow$ S $\rightarrow$ G2 $\rightarrow$ M

(B) S $\rightarrow$ G1 $\rightarrow$ M $\rightarrow$ G2

(C) M $\rightarrow$ G2 $\rightarrow$ G1 $\rightarrow$ S

(D) G2 $\rightarrow$ G1 $\rightarrow$ S $\rightarrow$ M

Q102. Which event characterises the S (synthesis) phase of the cell cycle?

(A) Cytokinesis and cell division

(B) DNA replication (chromosomes are duplicated)

(C) Organelle growth and protein synthesis only

(D) Spindle formation

Q103. The tumour suppressor protein p53 primarily acts at which checkpoint?

(A) G2/M checkpoint only

(B) M phase spindle checkpoint

(C) G1/S checkpoint (blocks cells with damaged DNA from entering S phase)

(D) After mitosis in G1

Q104. Cyclin-CDK complexes regulate the cell cycle by:

(A) Synthesizing new DNA strands directly

(B) Degrading damaged organelles

(C) Acting as molecular chaperones during protein folding

(D) Phosphorylating target proteins that drive cell cycle transitions

Q105. Proto-oncogenes are:

(A) Normal genes that promote cell growth; when mutated, they can become oncogenes and cause cancer

(B) Genes that always inhibit cell division

(C) Genes found only in bacteria

(D) Genes that code for antibodies

Q106. Heterochromatin differs from euchromatin in that heterochromatin is:

(A) Loosely packed and transcriptionally active

(B) Tightly packed and largely transcriptionally inactive

(C) Found only in prokaryotes

(D) The region where DNA replication begins

Q107. A nucleosome consists of DNA wound around a histone octamer. How many base pairs of DNA are wound around each nucleosome core?

(A) 200 bp

(B) 80 bp

(C) 146 bp

(D) 300 bp

Q108. A metacentric chromosome has:

(A) The centromere at one end (terminal)

(B) The centromere near one end (sub-terminal)

(C) No centromere

(D) The centromere at the middle, producing two equal arms

Q109. Polytene chromosomes, found in the salivary glands of Drosophila larvae, are characterised by:

(A) Multiple rounds of DNA replication without separation (endomitosis), producing giant banded chromosomes

(B) Chromosomes with reduced DNA content

(C) Chromosomes that lack histones

(D) Chromosomes visible only during interphase

Q110. A human female has a karyotype with 46 chromosomes arranged as:

(A) 44 autosomes + XY

(B) 44 autosomes + XX

(C) 46 autosomes + XX

(D) 44 autosomes + YY

Q111. Morgan used Drosophila melanogaster to study linkage. He found that genes for body colour and wing type were:

(A) Located on different chromosomes and hence always assorted independently

(B) Controlled by mitochondrial genes

(C) Located on the same chromosome (linked) and did not assort independently

(D) Controlled by multiple alleles on separate chromosomes

Q112. If two linked genes show a recombination frequency of 15%, the map distance between them is:

(A) 1.5 cM

(B) 1 cM

(C) 150 cM

(D) 15 cM (centiMorgans)

Q113. Crossing over (recombination) during meiosis I occurs at the stage called:

(A) Pachytene of prophase I (at the synaptonemal complex / chiasmata formation)

(B) Metaphase II

(C) Anaphase I

(D) Zygotene of prophase I (synapsis but no crossing over yet)

Q114. In a three-point test cross, the class of offspring produced with the lowest frequency represents:

(A) Parental types

(B) Double crossover (recombinants)

(C) Single crossover for the left interval

(D) Single crossover for the right interval

Q115. In chromosome mapping, genes A, B, and C are located such that A–B distance is 8 cM and B–C distance is 5 cM. If A and C are 11 cM apart (indicating interference), what is the coefficient of coincidence?

(A) 1.0 (no interference)

(B) 0.25

(C) 0.5

(D) 0.75

Q116. The lac operon of E. coli is induced by:

(A) Glucose (the preferred carbon source)

(B) The repressor protein directly

(C) Tryptophan

(D) Allolactose (or IPTG), which inactivates the repressor

Q117. The trp operon is a repressible operon. It is switched OFF when:

(A) Tryptophan (the co-repressor) binds to the repressor protein, and the complex blocks the operator

(B) Tryptophan levels are very low

(C) RNA polymerase is absent

(D) Glucose is absent

Q118. Transcription factors in eukaryotes are:

(A) Enzymes that directly replicate DNA

(B) Proteins that bind to specific DNA sequences and regulate gene expression

(C) The structural proteins of ribosomes

(D) mRNA molecules that act as gene regulators

Q119. Methylation of CpG islands in the promoter region of a gene generally leads to:

(A) Increased gene expression

(B) mRNA splicing

(C) Gene silencing (epigenetic repression)

(D) DNA replication

Q120. The structural genes of the lac operon in E. coli are:

(A) trpA, trpB, trpC

(B) recA, mutS, mutL

(C) araB, araA, araD

(D) lacZ, lacY, lacA

Q121. Penicillin, the antibiotic, is derived from the fungus:

(A) Penicillium notatum (an Ascomycete)

(B) Agaricus bisporus

(C) Rhizopus stolonifer

(D) Ustilago maydis

Q122. Rusts and smuts are economically important plant pathogens. They belong to the class:

(A) Ascomycetes

(B) Basidiomycetes

(C) Zygomycetes

(D) Oomycetes

Q123. Rhizopus stolonifer (bread mould) belongs to which class of fungi?

(A) Ascomycetes

(B) Basidiomycetes

(C) Zygomycetes

(D) Deuteromycetes

Q124. Saccharomyces cerevisiae (baker's/brewer's yeast) is used in fermentation to produce:

(A) Acetic acid and oxygen

(B) Lactic acid and CO_2

(C) Methanol and H_2O

(D) Ethanol and CO_2 (from glucose)

Q125. The sexual spores of Ascomycetes are called:

(A) Ascospores (formed in a sac called ascus)

(B) Basidiospores

(C) Zygospores

(D) Conidia

Q126. In the life cycle of Funaria (moss), which generation is dominant?

(A) Sporophyte (diploid)

(B) Gametophyte (haploid)

(C) Both are equally dominant

(D) Neither; mosses reproduce only asexually

Q127. In the life cycle of ferns, the sporophyte is:

(A) The small heart-shaped prothallus

(B) The haploid phase

(C) The dominant diploid phase (the familiar leafy fern plant)

(D) Absent; ferns reproduce only sexually

Q128. In Pinus (pine), the female cone (megastrobilus) contains:

(A) Pollen grains

(B) Antheridia

(C) Spores that give rise to male gametophytes

(D) Ovules (megasporangia) which develop into seeds after fertilization

Q129. Double fertilization, unique to angiosperms, results in:

(A) Diploid zygote (2n) from one sperm + egg, and triploid endosperm (3n) from second sperm + two polar nuclei

(B) Two zygotes, each developing into a separate embryo

(C) Haploid embryo and diploid endosperm

(D) Diploid embryo and diploid endosperm

Q130. In angiosperms, after fertilization, which structure develops into the fruit?

(A) The ovule

(B) The ovary wall (pericarp)

(C) The style

(D) The stigma

Q131. The water potential (ψ) of a solution is expressed as $\psi = \psi_s + \psi_p$. In a flaccid cell (no turgor pressure), the water potential equals:

(A) Zero

(B) ψ_p only

(C) ψ_s (the solute/osmotic potential, which is negative)

(D) $+1$ MPa

Q132. Plasmolysis in a plant cell occurs when:

(A) The cell is placed in a hypotonic solution

(B) The cell is placed in distilled water

(C) The turgor pressure exceeds the wall pressure

(D) The cell is placed in a hypertonic solution, causing the protoplast to shrink away from the cell wall

Q133. The cohesion-tension theory of water transport in the xylem proposes that:

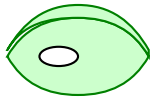
(A) Transpiration pull creates negative pressure; cohesion between water molecules maintains a continuous column up to the leaves

(B) Root pressure alone pushes water to the top of tall trees

(C) Osmosis directly moves water from root to leaf

(D) Phloem sap carries water upward

Q134. Guard cells open the stomata when:



Stoma (open)

(A) K^+ ions are pumped out of guard cells, reducing turgor pressure

(B) K^+ ions accumulate in guard cells, increasing turgor pressure and causing cells to bow outward

(C) CO_2 concentration increases in guard cells

(D) Guard cells lose water by exosmosis

Q135. If a red blood cell (solute concentration 0.9% NaCl) is placed in 0.5% NaCl solution, water moves by osmosis:

(A) Out of the cell (the cell shrinks)

(B) No net movement occurs

(C) Into the cell (the cell swells — endosmosis)

(D) Water splits into H^+ and OH^- and enters separately

Q136. Which of the following is a macronutrient required by plants?

(A) Zinc (Zn)

(B) Boron (B)

(C) Manganese (Mn)

(D) Nitrogen (N)

Q137. Biological nitrogen fixation by Rhizobium in root nodules of legumes converts:

(A) Atmospheric N_2 into NH_3 using the enzyme nitrogenase

(B) NH_3 into N_2 (denitrification)

(C) NO_3^- into N_2O

(D) Atmospheric O_2 into oxides of nitrogen

Q138. Iron (Fe) deficiency in plants leads to:

(A) Purple coloration of leaves (anthocyanin accumulation)

(B) Interveinal chlorosis (yellowing between veins of young leaves)

(C) Necrosis of leaf tips and margins

(D) Stunted root growth only

Q139. Nod factors secreted by Rhizobium bacteria during root nodule formation are:

(A) Proteins that degrade cellulose in root cell walls

(B) Nitrogen compounds used directly as fertilizer

(C) Lipo-chitooligosaccharides that signal root hair curling and initiate nodule development

(D) Antibiotics that kill competing soil bacteria

Q140. Molybdenum (Mo) is a micronutrient required by plants primarily as a component of:

(A) Chlorophyll

(B) Cytochrome oxidase

(C) Carbonic anhydrase

(D) Nitrate reductase (enzyme that reduces NO_3^- to NH_4^+)

Q141. Animals that maintain a constant internal body temperature irrespective of the external environment are called:

(A) Endotherms (warm-blooded; e.g., birds and mammals)

(B) Ectotherms (cold-blooded; e.g., reptiles and fish)

(C) Poikilotherms

(D) Conformers

Q142. Marine bony fish (teleosts) living in saltwater lose water by osmosis through their gills. They compensate by:

(A) Drinking very little water and producing large volumes of dilute urine

(B) Drinking large amounts of seawater and excreting excess salt through gills and producing very little, concentrated urine

(C) Not drinking water at all; all water comes from food

(D) Reducing body surface area to limit osmosis

Q143. After a carbohydrate-rich meal, blood glucose rises. The hormone primarily responsible for lowering blood glucose back to normal is:

(A) Glucagon

(B) Adrenaline

(C) Insulin (secreted by β-cells of pancreatic islets of Langerhans)

(D) Cortisol

Q144. Which of the following is the best example of negative feedback in homeostasis?

(A) Childbirth contractions intensifying as oxytocin release increases

(B) A fever rising continuously with infection

(C) Blood clotting cascades amplifying signal

(D) Body temperature dropping triggering shivering to generate heat and restore normal temperature

Q145. A euryhaline fish species can:

(A) Tolerate a wide range of salinities (e.g., salmon that migrates between fresh and salt water)

(B) Only survive in freshwater

(C) Only survive in marine water

(D) Not regulate its internal osmolarity at all

Q146. Follicle Stimulating Hormone (FSH) in females primarily:

(A) Triggers ovulation (release of the egg)

(B) Stimulates growth of ovarian follicles and production of estrogen by granulosa cells

(C) Maintains the corpus luteum

(D) Causes uterine contractions

Q147. The LH (Luteinizing Hormone) surge triggers:

(A) Menstruation

(B) Implantation of the blastocyst

(C) Ovulation (release of the mature egg from the follicle)

(D) Formation of the placenta

Q148. After ovulation, the ruptured follicle transforms into the:

(A) Graafian follicle

(B) Primordial follicle

(C) Zona pellucida

(D) Corpus luteum (which secretes progesterone and estrogen)

Q149. Human Chorionic Gonadotropin (HCG) is secreted in early pregnancy by:

(A) The trophoblast/early placenta, and it maintains the corpus luteum

(B) The anterior pituitary gland

(C) The ovarian follicle

(D) The endometrium

Q150. During the luteal phase of the menstrual cycle, the dominant hormone is:

(A) FSH

(B) Progesterone (produced by the corpus luteum, prepares endometrium for implantation)

(C) LH

(D) Estrogen only

Q151. Human red blood cells (erythrocytes) are unique because they:

(A) Have a nucleus and mitochondria

(B) Are the largest blood cells

(C) Lack a nucleus and most organelles; have a biconcave disc shape for maximum surface area

(D) Produce antibodies

Q152. A person with blood group O has:

(A) Antigens A and B on RBCs and no antibodies in plasma

(B) Only antigen A on RBCs and anti-B antibodies in plasma

(C) Only antigen B on RBCs and anti-A antibodies in plasma

(D) No antigens (A or B) on RBCs, but both anti-A and anti-B antibodies in plasma

Q153. Neutrophils, the most abundant white blood cells, are best known for:

(A) Phagocytosis of bacteria and cellular debris (first line of innate immune defence)

(B) Producing antibodies

(C) Releasing histamine in allergic reactions

(D) Transporting oxygen

Q154. Rh incompatibility most commonly causes problems when:

(A) An Rh-negative father and Rh-negative mother have a child

(B) An Rh-negative mother carries an Rh-positive fetus in a second or subsequent pregnancy (maternal anti-Rh antibodies attack fetal RBCs)

(C) An Rh-positive mother carries an Rh-negative fetus

(D) Blood type O is transfused into a type A patient

Q155. Platelets (thrombocytes) in the blood primarily function to:

(A) Transport oxygen from lungs to tissues

(B) Produce antibodies against pathogens

(C) Initiate blood clotting (haemostasis) at the site of vessel damage

(D) Engulf and destroy bacteria

Q156. Aquatic organisms such as bony fish and tadpoles excrete nitrogenous waste primarily as ammonia. These organisms are called:

(A) Ureotelic

(B) Uricotelic

(C) Ammonotelic and ureotelic

(D) Ammonotelic

Q157. Adult frogs, mammals (including humans), and cartilaginous fish excrete nitrogenous waste mainly as:

(A) Urea (ureotelic)

(B) Ammonia

(C) Uric acid

(D) Creatinine only

Q158. Birds, reptiles, and insects are uricotelic because they excrete nitrogenous waste as uric acid. The advantage is:

(A) Uric acid is highly toxic and quickly diffuses away

(B) Uric acid is insoluble, non-toxic, and requires very little water to excrete — important for water conservation

(C) Uric acid has a high energy content

(D) It allows them to survive in aquatic habitats

Q159. Haemodialysis (kidney dialysis) works on the principle of:

(A) Active transport of urea across a membrane

(B) Filtration under high pressure (ultrafiltration)

(C) Diffusion of waste products (urea, creatinine) across a semi-permeable membrane from blood into dialysate fluid

(D) Osmosis of water from blood to dialysate

Q160. The most common type of kidney stone is composed of:

(A) Uric acid crystals

(B) Magnesium ammonium phosphate

(C) Cystine

(D) Calcium oxalate

Q161. In the carbon cycle, which process returns CO_2 from the atmosphere into organic compounds?

(A) Photosynthesis (plants fix CO_2 into glucose using light energy)

(B) Respiration

(C) Decomposition

(D) Combustion

Q162. In the nitrogen cycle, denitrification is carried out by bacteria and involves:

(A) Converting N_2 into NH_3 (nitrogen fixation)

(B) Converting nitrates (NO_3^-) back into N_2 gas (released to atmosphere)

(C) Converting NH_3 into NO_2^- (nitrification)

(D) Converting organic nitrogen into NH_3 (ammonification)

Q163. Nitrification in the nitrogen cycle is carried out by:

(A) Pseudomonas (denitrifying bacteria)

(B) Rhizobium (nitrogen-fixing bacteria)

(C) Nitrosomonas and Nitrobacter (chemoautotrophic bacteria) converting NH_3 to NO_2^- to NO_3^-

(D) Decomposers breaking down proteins to amino acids

Q164. Evapotranspiration, a key component of the water cycle, refers to:

(A) The condensation of water vapour to form clouds

(B) Precipitation of rain from clouds

(C) The movement of groundwater to the ocean

(D) The combined loss of water by evaporation from land surfaces and transpiration from plants

Q165. Decomposition of organic matter in the carbon cycle:

(A) Returns CO_2 to the atmosphere and releases mineral nutrients back to the soil

(B) Converts CO_2 into organic compounds

(C) Fixes atmospheric nitrogen

(D) Produces O_2 as a by-product

Q166. Biosphere reserves in India are examples of in-situ conservation because:

(A) Species are maintained in zoos and botanical gardens

(B) Species are protected in their natural habitat, allowing them to evolve in their native ecosystem

(C) Seeds are stored in gene banks

(D) Tissues are preserved in liquid nitrogen

Q167. The Svalbard Global Seed Vault (Norway) is an example of:

(A) In-situ conservation

(B) National park conservation

(C) Ex-situ conservation (preserving seeds outside their natural habitat)

(D) Biosphere reserve management

Q168. Which of the following correctly distinguishes a National Park from a Wildlife Sanctuary in India?

(A) National parks allow human habitation; sanctuaries do not

(B) Wildlife sanctuaries have stricter protection than national parks

(C) Both have identical levels of protection

(D) National parks have the highest level of protection (no human activities permitted); sanctuaries allow limited human activities

Q169. The Nilgiri Biosphere Reserve in India is notable for:

(A) Being the first biosphere reserve established in India (1986) and home to Nilgiri Tahr and Lion-tailed macaque

(B) Being the largest national park in India

(C) Being a marine biosphere reserve

(D) Being entirely located in the state of Tamil Nadu

Q170. Cryopreservation of gametes and embryos of endangered animals is an ex-situ conservation technique. The key advantage is:

(A) Animals can be studied in their natural environment

(B) Genetic material can be stored for very long periods at very low temperatures (-196C in liquid nitrogen)

(C) It does not require specialized equipment

(D) It allows natural selection to operate

Q171. Auxin (IAA) causes phototropism in plants by:

(A) Moving equally to all sides of the stem under light

(B) Inhibiting cell elongation on the illuminated side

(C) Migrating to the shaded side, causing greater cell elongation there — the stem bends towards light

(D) Directly stimulating stomatal opening

Q172. Gibberellins cause bolting in certain plants. Bolting refers to:

(A) Rapid root elongation

(B) Premature leaf senescence

(C) Stomatal opening in response to light

(D) Rapid elongation of the internodes and premature flowering in rosette plants

Q173. Cytokinins promote cell division and delay senescence. The primary site of cytokinin synthesis in the plant is:

(A) The root apical meristem (root tips), from where they are transported upward via xylem

(B) The shoot apex

(C) Mature leaves

(D) Seeds only

Q174. Abscisic acid (ABA) is called the "stress hormone" because it:

(A) Promotes seed germination and cell elongation

(B) Induces dormancy, closes stomata under water stress, and promotes leaf abscission

(C) Stimulates fruit ripening

(D) Causes cell division in the meristem

Q175. Ethylene is a gaseous plant hormone that:

(A) Promotes apical dominance

(B) Delays fruit ripening

(C) Promotes fruit ripening and the abscission of leaves and fruits

(D) Stimulates root nodule formation

Q176. Bt cotton produces Cry proteins that are toxic to certain insects. The Cry gene is derived from:

(A) A plant virus

(B) The cotton plant itself (natural defence gene)

(C) Rhizobium bacteria

(D) Bacillus thuringiensis (a soil bacterium)

Q177. Golden rice was developed to address vitamin A deficiency. It produces β-carotene in the endosperm because it has been engineered with:

(A) Genes from daffodil (Narcissus) and a bacterium (Erwinia) encoding the β-carotene biosynthesis pathway

(B) The gene from carrot encoding carotenoid synthesis

(C) A modified chlorophyll gene

(D) A gene from maize encoding yellow pigment

Q178. Recombinant human insulin is produced by:

(A) Extracting it from the human pancreas

(B) Inserting the human insulin gene into E. coli or yeast, which then produce the insulin protein

(C) Chemical synthesis of insulin from amino acids in a laboratory

(D) Isolating it from pig pancreas and purifying

Q179. The CRISPR-Cas9 gene editing system uses:

(A) Restriction enzymes and ligase for random integration

(B) RNAi to silence gene expression without cutting DNA

(C) A guide RNA (gRNA) to direct the Cas9 nuclease to a specific DNA sequence, creating a targeted double-strand break

(D) Viral vectors that insert genes at random locations

Q180. The first successful gene therapy (1990) treated a child with:

(A) Sickle cell anaemia

(B) Haemophilia B

(C) Cystic fibrosis

(D) Adenosine deaminase (ADA) deficiency (a form of severe combined immunodeficiency)

Part D: General Studies (Q181–Q200)

Q181. The Indian Agricultural Research Institute (IARI), also known as Pusa Institute, is located in:

(A) New Delhi

(B) Karnal, Haryana

(C) Lucknow, Uttar Pradesh

(D) Hyderabad, Telangana

Q182. The National Dairy Research Institute (NDRI) is located in:

(A) Izatnagar, Uttar Pradesh

(B) Karnal, Haryana

(C) Bhubaneswar, Odisha

(D) Pune, Maharashtra

Q183. UPCATET (UP Combined Agriculture and Technology Entrance Test) is conducted by which university?

(A) Chandra Shekhar Azad University of Agriculture & Technology, Kanpur

(B) Banaras Hindu University, Varanasi

(C) Sardar Vallabhbhai Patel University of Agriculture & Technology (SVPUAT), Meerut

(D) Narendra Deva University of Agriculture & Technology, Ayodhya

Q184. The Indian Veterinary Research Institute (IVRI) is located at:

(A) New Delhi

(B) Karnal

(C) Meerut

(D) Izatnagar, Bareilly (Uttar Pradesh)

Q185. The Central Island Agricultural Research Institute (CIARI) is located at:

(A) Port Blair, Andaman & Nicobar Islands

(B) Lakshadweep Islands

(C) Goa

(D) Puducherry

Q186. The 1857 revolt is also called the First War of Indian Independence. The immediate cause of the revolt was:

(A) The partition of Bengal (1905)

(B) The introduction of the Enfield rifle cartridge greased with animal fat (offending Hindu and Muslim soldiers)

(C) The Jallianwala Bagh massacre

(D) The Non-Cooperation Movement launched by Gandhi

Q187. The Indian National Congress was founded in:

(A) 1857

(B) 1882

(C) 1885

(D) 1905

Q188. The Quit India Movement was launched by Mahatma Gandhi in:

(A) 1930

(B) 1920

(C) 1935

(D) 1942

Q189. The SI unit of electric current is:

(A) Ampere (A)

(B) Coulomb (C)

(C) Volt (V)

(D) Ohm (Ω)

Q190. A passenger in a car wearing a seatbelt is protected during a sudden stop because:

(A) The seatbelt provides a forward force to accelerate the passenger

(B) The seatbelt applies a backward force, counteracting the passenger's tendency to continue moving forward due to inertia (Newton's first law)

(C) The seatbelt reduces friction between the passenger and the seat

(D) The car gains momentum which is transferred to the passenger

Q191. The energy content of dietary fat per gram is:

(A) 4 kcal/g

(B) 7 kcal/g

(C) 9 kcal/g

(D) 2 kcal/g

Q192. The median of the data set $\{3, 7, 5, 11, 9\}$ is:

(A) 5

(B) 3

(C) 9

(D) 7

Q193. In a normal distribution (bell curve), approximately what percentage of values lie within ± 1 standard deviation of the mean?

(A) 68%

(B) 95%

(C) 99.7%

(D) 50%

Q194. The mode of the data set $\{4, 2, 4, 6, 8, 4, 2\}$ is:

(A) 2

(B) 4

(C) 6

(D) 8

Q195. A die is rolled once. The probability of getting a prime number (2, 3, or 5) is:

(A) $\frac{1}{6}$

(B) $\frac{1}{3}$

(C) $\frac{1}{2}$

(D) $\frac{2}{3}$

Q196. Kwashiorkor is a form of malnutrition caused by:

(A) Deficiency of both calories and protein (severe overall starvation)

(B) Deficiency of vitamin C (causing scurvy)

(C) Deficiency of vitamin D (causing rickets)

(D) Adequate calorie intake but severe protein deficiency — characterised by oedema (swelling), bloated belly

Q197. India's Public Distribution System (PDS) primarily aims to:

(A) Provide subsidised food grains (wheat, rice) to vulnerable sections of the population through Fair Price Shops

(B) Export surplus food grains to other countries

(C) Set the Minimum Support Price (MSP) for farmers

(D) Regulate food imports

Q198. The National Food Security Act (NFSA) 2013 entitles eligible households to:

(A) Free LPG cylinders

(B) Subsidised foodgrains at Rs 3/kg for rice, Rs 2/kg for wheat, and Rs 1/kg for coarse grains

(C) Free housing under a central scheme

(D) Monthly cash transfers

Q199. Iodization of salt is an example of food fortification aimed at preventing:

(A) Anaemia

(B) Vitamin A deficiency

(C) Iodine Deficiency Disorders (IDD), including goitre and cretinism

(D) Rickets

Q200. According to nutritional guidelines, a balanced diet should provide macronutrients in the approximate proportion:

(A) Fat 50%, Carbohydrates 30%, Protein 20%

(B) Protein 50%, Carbohydrates 30%, Fat 20%

(C) Equal proportions of all three

(D) Carbohydrates 50–60%, Protein 10–15%, Fat 25–30%

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans