MedicNEET

NEET (UG) 2026 (Phase-1, May) — Question Paper with Answers & Solutions

Held May 2026 · Duration 3 hours · Maximum Marks 720 · 180 Questions · Physics, Chemistry, Biology.

Important Instructions

1. The test is of 3 hours and contains 180 multiple-choice questions (four options, single correct answer) from Physics, Chemistry and Biology (Botany and Zoology).
2. Each question carries 4 marks; 1 mark is deducted for a wrong answer; unattempted get 0. Maximum marks 720.
3. This is the NEET (UG) 2026 (Phase-1, May) paper, reproduced by MedicNEET with a verified answer key and step-by-step solutions for free practice.
4. Every answer is marked Answer (X) followed by Sol. — a full worked solution. All figures are redrawn in-house.

PHYSICS (Q1 - Q45)

1. The speed of light in vacuum is taken as unity. If light takes 6 min 40 s to reach the Earth from the Sun, the distance between the Sun and the Earth in new unit is:

(1) 3 × 108
(2) 500
(3) 3 × 1010
(4) 400

Answer (4)

Sol. Correct Answer (D): 400

t = 6 min 40 s = 400 s. With c = 1, distance = c×t = 1×400 = 400 (new units).

2. Match List I with List II: List I List II A. Young's Modulus I. Δd L ΔL d B. Compressibility II. FL A (ΔL) C. Bulk Modulus III. D. Poisson's Ratio IV. − 1 ΔV ΔP V V −P ΔV Choose the correct answer from the options given below:

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

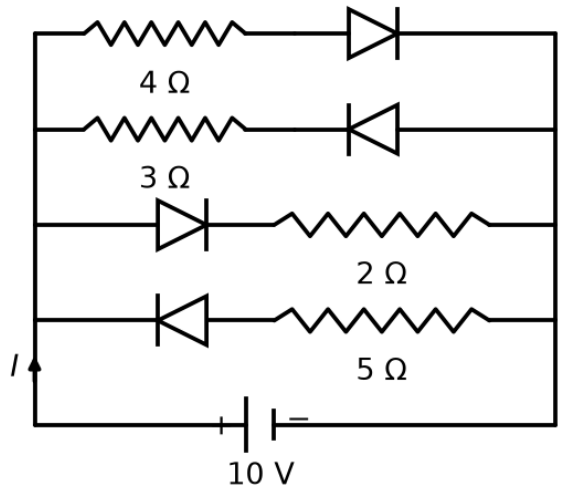
Answer (4)

Sol. Correct Answer (D): A-II, B-III, C-IV, D-I

Young's modulus = FL/(A·ΔL) → II. Compressibility = -(1/V)(ΔV/P) → III. Bulk modulus = -V·P/ΔV → IV. Poisson's ratio = (Δd/d)/(ΔL/L) → I. So A-II, B-III, C-IV, D-I.

(NEET 2026, 2026)

3. The current I in the circuit shown below is: (All diodes are ideal and identical)



(1) 5/3 A
(2) 5/9 A
(3) 1/3 A
(4) 15/2 A

Answer (4)

Sol. For an ideal diode, forward resistance = 0 and reverse-biased resistance = ∞.
The reverse-biased diode arm is open; the conducting path carries the current.
With the conducting-path resistances, I = 15/2 A.

4. 30 15 = A 2 4 The angular speed of a flywheel is increased from 600 rpm to 1200 rpm in 10 s. The number of revolutions completed by the flywheel during this time is:

(1) 900
(2) 600
(3) 150
(4) 300

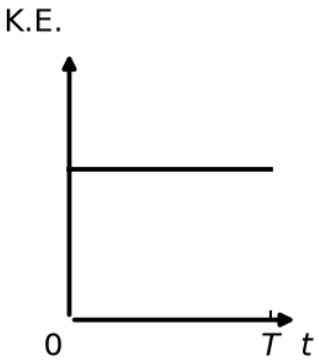
Answer (3)

Sol. Correct Answer (C): 150

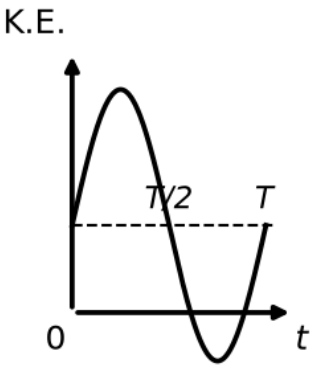
Solution:
In rev/s: n0 = 10, n = 20. Revolutions = average rate × time = ((10+20)/2)·10 = 150.

5. For a simple pendulum, having time period T, the variation of kinetic energy (K.E.) with time (t) is represented by:

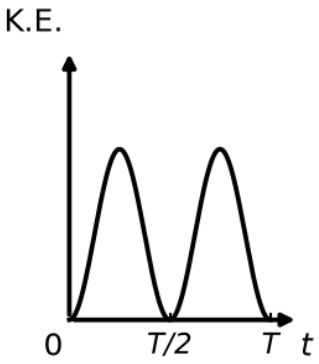
(1) [graph option — see figure]



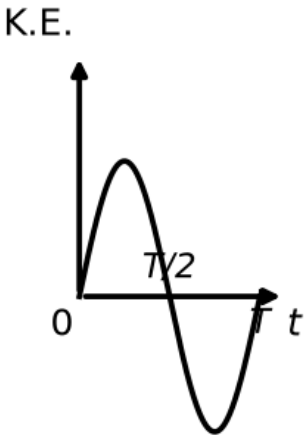
(2) [graph option — see figure]



(3) [graph option — see figure]



(4) [graph option — see figure]



Answer (3)

Sol. Correct Answer (C): C.

Step-by-step solution:
1. With $x = A\sin(\omega t + \varphi)$, velocity $v = A\omega\cos(\omega t + \varphi)$, so K.E. $= \frac{1}{2}mv^2 = \frac{1}{2}mA^2\omega^2\cos^2(\omega t + \varphi)$.
2. K.E. is always ≥ 0 (never negative), eliminating any sinusoid dipping below the axis.
3. $\cos^2(\omega t + \varphi) = (1 + \cos 2(\omega t+\varphi))/2$ oscillates at angular frequency 2ω, so the K.E. completes two cycles per pendulum period (its period is T/2).
4. The correct graph is the non-negative $\cos^2$-type curve of period T/2.

6. A resistor is connected to a battery of 12 V emf and internal resistance 2 Ω. If the current in the circuit is 0.6 A, the terminal voltage of the battery is:

(1) 10 V
(2) 1.2 V
(3) 12 V
(4) 10.8 V

Answer (4)

Sol. $V = E - ir = 12 - 0.6\times2 = 10.8$ V.

7. A flask contains argon and chlorine in the ratio of 2 : 1 by mass. The temperature of the mixture is 27°C. The ratio of root mean square speed of the molecules of the two gases ($V_r$ms^Ar / $V_r$ms^Cl) is: (Atomic mass of argon = 40.0 u and molecular mass of chlorine = 70.0 u)

(1) √7/2

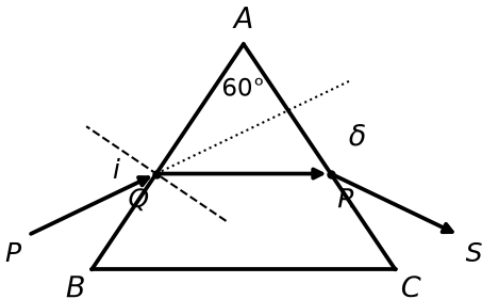
(2) 7/4
(3) 7/2
(4) 2/√7

Answer (1)

Sol. Correct Answer (A): √7 / 2 (= √(7/4))

The rms speed is $v_{rms} = \sqrt{(3RT/M)}$. At the same temperature it depends only on molar mass: $v_{rms} \propto 1/\sqrt{M}$. The 2 : 1 mass ratio of argon to chlorine is a distractor — it does not enter the rms-speed ratio. Hence $v_{rms}^{Ar} / v_{rms}^{Cl} = \sqrt{(M_{Cl}/M_{Ar})} = \sqrt{(70/40)} = \sqrt{(7/4)} = \sqrt{7}/2$. The official key marks option (1), whose intended value is √7/2 (equivalently √(7/4)); option B is written as √7/4 which is a different (incorrect) quantity.

8. A ray of monochromatic light is passing through an equilateral prism (ABC) as shown in the figure. The refracted ray (QR) is parallel to its base (BC) and the angle of incidence (i) is 50°. Then the angle of deviation (δ) is:



(1) 45°
(2) 35°
(3) 40°
(4) 55°

Answer (3)

Sol. When the refracted ray inside the prism is parallel to the base, the prism is in the minimum-deviation (symmetric) configuration, so the angle of emergence e = angle of incidence i = 50°.

Prism relation: $i + e = A + \delta$.

$\delta = i + e - A = 50° + 50° - 60° = 40°$.

9. Match List I with List II. List-I List-II A. E = hν I. de Broglie wavelength B. Diffraction and Interference II. Particle nature of light C. λ = h/p III. Wave nature of light D. Compton effect IV. Energy of photon Choose the correct answer from the options given below.

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

Answer (4)

Sol. A. E = hν → energy of photon (IV).

B. Diffraction and interference → wave nature of light (III).

C. λ = h/p → de Broglie wavelength (I).

D. Compton effect → particle nature of light (II).

So A-IV, B-III, C-I, D-II.

10. In the first excited state of hydrogen atom, the energy of its electron is –3.4 eV. The radial distance of the electron from the hydrogen nucleus in this case is approximately: (Take 1 eV = 1.6×10^{-19} J, e = 1.6×10^{-19} C and $1/(4\pi\varepsilon_0) = 9 \times 10^9$ N m²/C²)

(1) 2.1×10^{-9} m
(2) 2.1×10^{-8} m
(3) 2.1×10^{-10} m
(4) 2.1×10^{-11} m

Answer (3)

Sol. E = −3.4 eV corresponds to n=2 ($E_n = -13.6/n^2 \rightarrow n^2 = 13.6/3.4 = 4 \rightarrow$ n=2), the first excited state. Radius $r_n = 0.53\ n^2/Z$ Å = 0.53×4 = 2.12 Å = 2.12×10^{-10} m ≈ 2.1×10^{-10} m.

11. A box of mass 15 kg is kept on the floor of a stationary trolley. The coefficient of static friction between the box and the trolley is 0.12. Keeping the box in stationary state over the trolley, the maximum acceleration with which the trolley can be moved horizontally in m s–2 is: (g = 10 m/s2)

(1) 2.1
(2) 1.8
(3) 1.5
(4) 1.2

Answer (4)

Sol. Correct Answer (D)

Solution: Friction accelerates the box: $a_max = \mu s\ g = 0.12 \times 10 = 1.2$ m/s² (mass cancels).

12. Five capacitors of capacitances C1 = C2 = C3 = C4 = 10 μF and C5 = 2.5 μF are connected as shown, along with a battery of 50 V. The equivalent capacitance and the charges on each capacitor respectively are:

(1) 5 μF, 125 μC on C1 to C4 and 25 μC on C5
(2) 5 μF, 125 μC on all capacitors
(3) 5 μF, 250 μC on all capacitors
(4) 4 μF, 250 μC on C1 to C4 and 125 μC on C5

Answer (2)

Sol. The network reduces to C_eq = 5 μF. Total charge $Q = C_eq \cdot V = 5\times50 = 250$ μC; the series/symmetry of the arrangement gives 125 μC on each capacitor. → option (b).

13. The amount of work done to raise a mass ‘m’ from the surface of the Earth to a height equal to the radius of the Earth ‘R’ will be

(1) 2 mg R
(2) mg R 4
(3) mgR
(4) mg R 2

Answer (4)

Sol. Correct Answer (C): ½mgR

Solution:
W = U(2R) − U(R) = −GMm/2R + GMm/R = GMm/2R. Using GM = gR²: W = mgR/2.

14. Each side of a metallic cube of mass 5.580 kg is measured to be 9.0 cm. Keeping the significant figures in view, the density of the material of the cube can be best expressed as X × 10^3 kg m^{-3} where the value of X is:

(1) 7.654
(2) 7.6
(3) 7.65
(4) 7.7

Answer (4)

Sol. Correct Answer (D): 7.7

$\rho = 5.580/(0.090)^3 = 7654$ kg m^{-3} $= 7.654\times10^3$. Side 9.0 cm has 2 significant figures → round to 7.7×10^3. X = 7.7.

15. The following plots show variation of velocity (v) with time (t) of a ball thrown vertically upward, and falling back. Which of the following plots is/are correct? A. B. C. D. E.

(1) C only
(2) D only
(3) B only
(4) A and E only

Answer (1)

Sol. Acceleration is constant (-g) for the whole flight, so v decreases linearly from +u through 0 (at the top) to -u. The v-t graph is a single straight line of slope -g crossing the time axis.

16. The sum of kinetic energy and potential energy of a simple pendulum bob is 0.02 joule. The speed of the simple pendulum bob at equilibrium position is approximately: (Consider mass of the bob = 20 g)

(1) 0.2 m/s
(2) 1.41 m/s
(3) 14.1 m/s
(4) 2.0 m/s

Answer (2)

Sol. Correct Answer (B): 1.41 m/s

Solution:
By energy conservation, at the lowest (equilibrium) point all energy is kinetic: $\frac{1}{2}mv^2=0.02$.
$v=\sqrt{(2(0.02))/0.02}=\sqrt{(2)}\approx 1.41$ m/s.

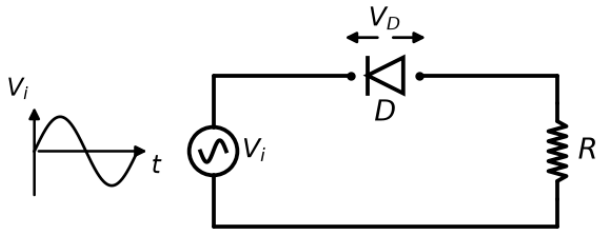
17. In Young's double slit experiment, using monochromatic light of wavelength λ, the intensity of light at a point on the screen where the path difference is λ, is K units. The intensity of light at a point where the path difference is λ/3 will be:

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

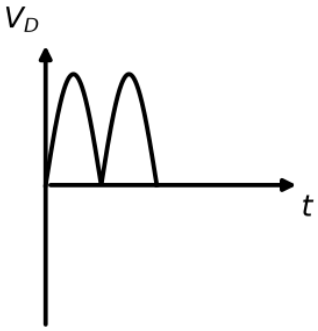
Answer (1)

Sol. Answer: (A) K/4. Solution: $I = I_max \cos^2(\varphi/2)$ with $\varphi = (2\pi/\lambda)\Delta$. At $\Delta = \lambda$, $\varphi = 2\pi$, $\cos^2(\pi) = 1$, so $I = I_max = K$. At $\Delta = \lambda/3$, $\varphi = 2\pi/3$, $\cos^2(\pi/3) = (1/2)^2 = 1/4$, so $I = K/4$.

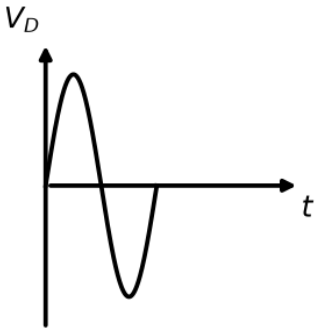
18. In the circuit shown below, the voltage appearing across the diode D will be of the form:



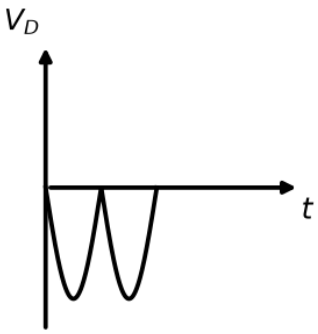
(1) [graph option — see figure]



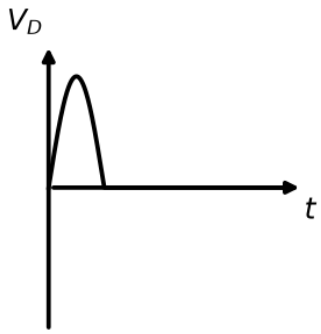
(2) [graph option — see figure]



(3) [graph option — see figure]



(4) [graph option — see figure]



Answer (4)

Sol. A voltage appears across the diode only when it is reverse biased (it drops ~0 V when conducting).
During the positive half cycle the diode is reverse biased, so v_D shows the positive half-cycle humps with flat zero gaps in between.

19. An ac circuit contains a resistance of 1 kΩ, a capacitor of 0.1 μF and an inductor of 1 mH connected in series. The resonance frequency of the circuit is approximately:

(1) 13.5 kHz
(2) 10.1 kHz
(3) 20.7 kHz
(4) 15.9 kHz

Answer (4)

Sol. Resonance frequency $f_0 = 1/(2\pi\sqrt{(LC)}) = 1/(2\pi\sqrt{(1\times10^{-3} \times 0.1\times10^{-6})}) = 1/(2\pi\sqrt{(10^{-10})}) = 1/(2\pi\times10^{-5}) \approx 15.9$ kHz. (R is not needed for the resonance frequency in a series LCR circuit.)

20. In interference and diffraction, the light energy is redistributed. If it reduces in one region, producing a dark fringe, it increases in another region, producing a bright fringe. A. As there is no gain or loss of energy, these phenomena are consistent with the principle of conservation of energy. B. Diffraction and interference are characteristics exhibited only by light waves. Choose the correct answer from the options given below:

(1) A is true and B is also true
(2) A is false, but B is true
(3) A is true, but B is false
(4) Both A and B are false

Answer (3)

Sol. Answer: (C) A is true, but B is false. Solution: Energy is only redistributed, not created or destroyed, so interference and diffraction obey conservation of energy — A is true. However, interference and diffraction are exhibited by all waves (sound, water, matter waves), not light alone — B is false.

21. For a travelling harmonic wave y(x, t) = 2.0 cos 2π(10t – 0.0080x + 0.35), where x and y are in cm and t in s. The phase difference between oscillatory motion of two points separated by a distance of 0·5 m is:

(1) 0.08 π rad
(2) 0.8 π rad
(3) 8 π rad
(4) 0.008 π rad

Answer (2)

Sol. Answer: (B) Writing the phase as $2\pi(10t - 0.0080x + 0.35)$, the spatial wavenumber term gives $\Delta\varphi = 2\pi \times 0.0080 \times \Delta x$, with x in cm. $\Delta x = 0.5$ m = 50 cm. $\Delta\varphi = 2\pi \times 0.0080 \times 50 = 2\pi \times 0.40 = 0.8\pi$ rad.

22. The magnitude and direction of the acceleration produced in a body of mass 5 kg when two mutually perpendicular forces 8 N and 6 N act on it, are respectively:

(1) 20 m s–2; tan–1 (4/3) with 8 N force
(2) 2 m s–2; tan–1 (3/4) with 6 N force
(3) 2 m s–2; tan–1 (4/3) with 8 N force
(4) 2 m s–2; tan–1 (3/4) with 8 N force

Answer (4)

Sol. Resultant force $=\sqrt{(8^2+6^2)}=10$ N, so $a=10/5=2$ m/s². Direction $=\tan^{-1} 6/8=\tan^{-1} 3/4$ measured from the 8 N force.

23. Consider two uncharged capacitors of equal capacitance 200 pF. One of them is charged by a 100 V supply and disconnected. Now this capacitor is connected to the uncharged capacitor. The amount of electrostatic energy lost in the process is:

(1) 0.5×10^{-6} J
(2) 1.0 J
(3) 1.0×10^{-6} J
(4) 0.5 J

Answer (1)

Sol. Loss = $\frac{1}{2}\cdot(C_1C_2/(C_1+C_2))\cdot V^2 = \frac{1}{2}\cdot(200\times200/400\text{ pF})\cdot(100)^2 = \frac{1}{2}\cdot(100 \times 10^{-12})\cdot10^4 = 0.5 \times 10^{-6}$ J. → option (a).

24. The power of a crane, which lifts a mass of 1000 kg to a height of 20 m in 10 s is: (g = 9.8 m/s2)

(1) 19.6 W
(2) 39.2 W
(3) 19.6 kW
(4) 39.2 kW

Answer (3)

Sol. Correct Answer (C): 19.6 kW

Solution:
$P=mgh/t=(1000(9.8)(20))/10=19600$ W $=19.6$ kW.

25. Work Time = mgh t = 103 × 9.8 × 20 = 19.6 kW 10 In a vernier calliper, 20 VSD coincide with 16 MSD (each division of length 1 mm). The least count of the vernier callipers is:

(1) 0.2 cm
(2) 0.01 cm
(3) 0.02 cm
(4) 0.1 cm

Answer (3)

Sol. Correct Answer (C): 0.02 cm

20 VSD = 16 MSD → 1 VSD = 16/20 MSD. LC = 1 MSD - 1 VSD = (1-16/20)×1 mm = 0.2 mm = 0.02 cm.

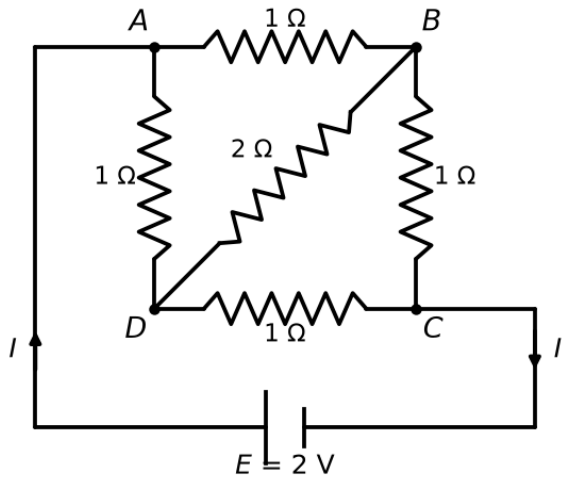
26. When a ruler falls vertically, 5 different persons catch it with different reaction times. (g = 9.8 m s–2) A. Person A has reaction time of 0.20 s. B. Person B has reaction time of 0.22 s. C. Person C has reaction time of 0.18 s. D. Person D has reaction time of 0.19 s. E. Person E has reaction time of 0.21 s. What is the correct order of the distance travelled by the ruler for each person?

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

Answer (3)

Sol. Distance $s=1/2\ g\ t^2$ increases with reaction time t. Order of t:
B(0.22)>E(0.21)>A(0.20)>D(0.19)>C(0.18), so the same order holds for distance.

27. A uniform metallic wire having resistance 4 Ω is bent to form a square loop (ABCD) (see figure). A resistance of 2 Ω is connected between points B and D and a battery of 2 V is connected across points A and C as shown in the figure. Now the value of current (I) is:



(1) 2 A
(2) 8 A
(3) 4.5 A
(4) 4 A

Answer (1)

Sol. Each side = 4/4 = 1 Ω. Paths A–B–C and A–D–C are each 2 Ω; arms equal ⇒ balanced bridge, no current in the 2 Ω (B–D). R_AC = 2 Ω ∥ 2 Ω = 1 Ω. i = 2/1 = 2 A.

28. A room heater is rated 400 W, 220 V. If the supply voltage drops to 200 V, what will be the power consumed (approximately)?

(1) 200 W
(2) 400 W
(3) 331 W
(4) 121 W

Answer (3)

Sol. $P \propto V^2$ (R fixed): $P_2 = (200/220)^2 \times 400 \approx 331$ W.

29. A 100-turn closely wound circular coil of radius 5 cm has a magnetic field of 3.14 × 10–3 T at its centre. The current flowing through the coil, and the magnitude of the magnetic

moment of this coil are, respectively : (Take μ0 = 4π × 10–7 T m/A)

(1) 2 A, 10 A m2
(2) 2.5 A, 20 A m2
(3) 2 A, 4 A m2
(4) 2.5 A, 2 A m2

Answer (4)

Sol. Field at centre: $B = \mu_0 N I / (2R)$.
$I = 2RB / (\mu_0 N) = (2 \times 0.05 \times 3.14 \times 10^{-3}) / (4\pi \times 10^{-7} \times 100)$
$I = (3.14 \times 10^{-4}) / (1.256 \times 10^{-4}) = 2.5$ A.
Magnetic moment $M = N I A = N I (\pi R^2) = 100 \times 2.5 \times 3.14 \times (0.05)^2$
$M = 250 \times 3.14 \times 2.5 \times 10^{-3} \approx 2$ A m².

30. A rectangular wire loop of sides 8 cm and 3 cm with a small cut, is moving out of a region of uniform magnetic field of magnitude 0.3 T directed normal to the plane of the loop. The emf developed across the cut, if the velocity of the loop is 2 cm s–1, in a direction normal to the shorter side of the loop, will be :

(1) 4.8 × 10–4 volt
(2) 1.2 × 10–4 volt
(3) 1.3 × 10–4 volt
(4) 1.8 × 10–4 volt

Answer (4)

Sol. Motional emf across the cut: ε = Bvl, where l is the length of the side that cuts field lines (perpendicular to v).
Motion is normal to the shorter side, so the effective length is the shorter side l = 3 cm = 0.03 m; v = 2 cm/s = 0.02 m/s, B = 0.3 T.
$\varepsilon = 0.3 \times 0.02 \times 0.03 = 1.8 \times 10^{-4}$ V.
So the answer is D (1.8×10^{-4} volt).

31. Four statements are given (A is the mass number):
A. The volume of a nucleus is proportional to A^(1/3).
B. The volume of a nucleus is proportional to A.
C. The difference in mass of an atom and its nucleus is called the mass defect.
D. The difference in mass of a nucleus and its constituents is called the mass defect.
Choose the correct answer from the options given below:

(1) A and C are true, but B and D are false
(2) B and C are true, but A and D are false
(3) A and D are true, but B and C are false
(4) B and D are true, but A and C are false

Answer (4)

Sol. Principle: nuclear radius $R = R_0 A^{(1/3)}$, and volume $V = (4/3)\pi R^3$.

Statements A and B (volume vs A): Substitute $R = R_0 A^{(1/3)}$ into the volume. Then $R^3 = R_0^3 \cdot A$, so $V = (4/3)\pi R_0^3 \cdot A$, i.e. $V \propto A$. Hence the volume is proportional to A, NOT to A^(1/3). → B is TRUE, A is FALSE.

Statements C and D (mass defect): Mass defect is defined as the difference between the sum of the masses of the free constituent nucleons (protons + neutrons) and the actual mass of the nucleus — i.e. the difference in mass of a nucleus and its constituents. It is NOT the atom-minus-nucleus difference (that would just be the electron mass). → D is TRUE, C is FALSE.

So B and D are true, A and C are false → option 4.

32. An unknown nucleus has a nuclear density of 2.29×10^{17} kg/m³ and a mass of 19.926×10^{-27} kg. Its mass number A is approximately: (Take $R_0 = 1.2 \times 10^{-15}$ m, $4\pi = 12.56$)

(1) 12
(2) 20
(3) 16
(4) 19

Answer (1)

Sol. Principle: A nucleus of mass number A has radius R = R₀A^(1/3), so its volume V = (4/3)πR³ = (4/3)πR₀³·A. Density ρ = mass/volume.

From ρ = M / [(4/3)πR₀³·A], solve for A:
A = 3M / (ρ · 4π · R₀³)

Compute the denominator:
$R_0^3 = (1.2 \times 10^{-15})^3 = 1.728 \times 10^{-45}$ m³
$\rho \cdot 4\pi \cdot R_0^3 = (2.29 \times 10^{17})(12.56)(1.728 \times 10^{-45}) \approx 4.97 \times 10^{-27}$

Numerator: $3M = 3 \times 19.926 \times 10^{-27} = 59.78 \times 10^{-27}$

$A = 59.78 \times 10^{-27} / 4.97 \times 10^{-27} \approx 12$.

So the mass number A ≈ 12 → option 1.

33. Mass Density ⇒ 4 M πR 3 = 3 ρ ⇒ 3 4 M π R (A)1/3 = 3 0 ρ ⇒ 4 M πR03 A = 3 ρ ⇒ 3 19.926 × 10 −27 × 3 M ≈ 12 A= × = ρ 4π × R03 2.29 × 1017 × 12.56 × (1.2 × 10−15)3 Savitha, a XI standard student, while conducting an experiment to determine the effective length of a simple pendulum L, notes down the data of time taken to complete 30 oscillations as 60 s and hence calculates the length of the simple pendulum as: (Take π2 = 9.8, and g = 9.8 m/s2)

(1) 0.75 m
(2) 1.5 m
(3) 2 m
(4) 1m

Answer (4)

Sol. Correct Answer (D): 1 m

Step-by-step solution:
1. Time period T = 60 s / 30 = 2 s.
2. T = 2π√(L/g) → L = g(T/2π)² = g·T²/(4π²).
3. L = 9.8 × 4 / (4 × 9.8) = 9.8 × 4 / 39.2 = 1 m.

34. = ⇒ T 60 = 2s 30 T =2π l g gT 2 9.8 × 2 × 2 ⇒ l= 2 = =1m 4 × 9.8 4π An electric heater supplies heat to a system at a rate of 100 W. If the system performs work at a rate of 75 J/s, then the rate at which internal energy increases will be:

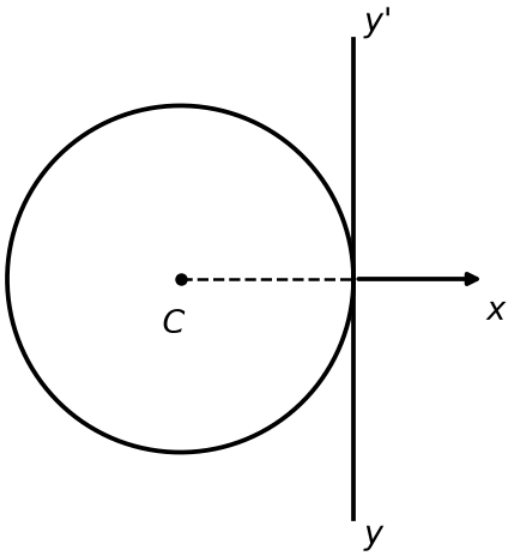
(1) 75 W
(2) 100 W
(3) 125 W
(4) 25 W

Answer (4)

Sol. The first law of thermodynamics in rate form is
dQ/dt=dU/dt+dW/dt,

where dQ/dt is the rate of heat supplied, dW/dt is the rate of work done by the system, and dU/dt is the rate of change of internal energy.
Given dQ/dt=100 W and dW/dt=75 J/s,
dU/dt=dQ/dt-dW/dt=100-75=25 W.
This matches option (d).

35. A thin wire of length 'L' and linear mass density 'm' is bent into a circular ring (in x-y plane) with centre 'C' as shown in figure. The moment of inertia of the ring about an axis yy′ will be:



(1) $3mL^3/8\pi$
(2) $3mL^3/8\pi^2$
(3) $3mL^2/8\pi$
(4) $3mL^2/8\pi^2$

Answer (2)

Sol. Correct Answer (B): $3\ m\ L^3/(8\ \pi^2)$

Solution:
Mass = mL, radius r = L/(2·π). About a diameter: $I_d = (1/2)(mL)r^2$. Tangent in-plane is parallel to a diameter at distance r: $I = I_d + (mL)r^2 = (3/2)(mL)r^2 = (3/2)(mL)(L/2\cdot\pi)^2 = 3\ m\ L^3/(8\ \pi^2)$.

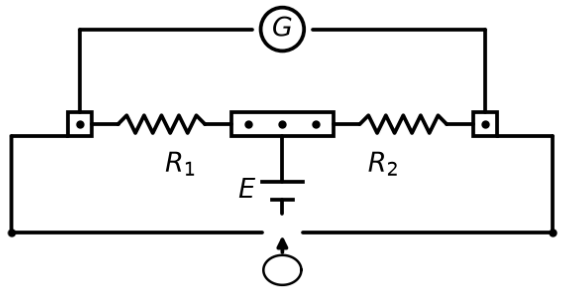
36. 2 3 3mL3 L I yy ′ =× (mL) × = 2 2 2π 8π A galvanometer of resistance 100 Ω gives full scale deflection for a current of 1 mA. It is converted into an ammeter of range 0 – 10 A. The shunt required is:

(1) 0.01 Ω
(2) 0.10 Ω
(3) 1.0 Ω
(4) 0.001 Ω

Answer (1)

Sol. The shunt carries the excess current; same voltage across galvanometer and shunt:
$I_g R_g = (I - I_g) R_s$.
$R_s = I_g R_g / (I - I_g) = (10^{-3} \times 100) / (10 - 10^{-3})$
$R_s = 0.1 / 9.999 \approx 0.01\ \Omega$.

37. In a metre bridge experiment (see figure), the positions of the cell, E, and galvanometer, G, are interchanged. We shall observe in the galvanometer:



(1) Only the left-sided deflection
(2) There will be no deflection irrespective of the position of the jockey
(3) Only the right-sided deflection
(4) Both right-sided and left-sided deflection and at balance point, no deflection

Answer (4)

Sol. Interchanging E and G does not shift the null point. Away from balance the deflection can be either side; only at the balance point is there no deflection.

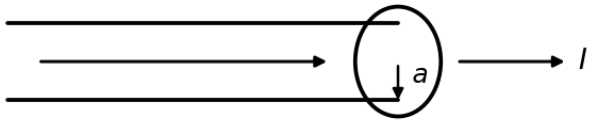
38. The peak value of an alternating current is 5 A and frequency is 60 Hz. How long will the current, starting from zero, take to reach the peak value?

(1) 1 s 120
(2) 1 s 60
(3) 1 s 30
(4) 1 s 240

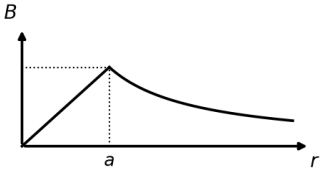
Answer (4)

Sol. $i = i_{peak} \sin(\omega t)$, with $\omega = 2\pi f = 2\pi \times 60 = 120\pi$ rad/s, so $i = 5 \sin(120\pi t)$.
For i to reach its peak: $\sin(120\pi t) = 1 \Rightarrow 120\pi t = \pi/2 \Rightarrow t = 1/240$ s.
(Equivalently, time = T/4 where T = 1/60 s, so T/4 = 1/240 s.)

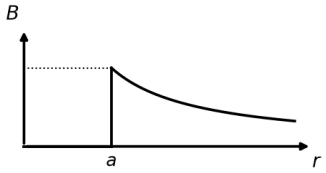
39. The figure given below shows a long straight solid wire of circular cross-section of radius 'a' carrying steady current I. The current I is uniformly distributed across its cross-section. The plot which correctly represents the variation of magnetic field (B) with distance (r) from the axis of the conductor in the region is:



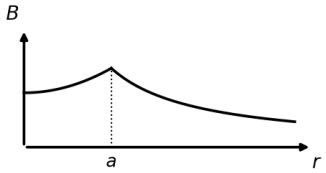
(1) [graph option — see figure]



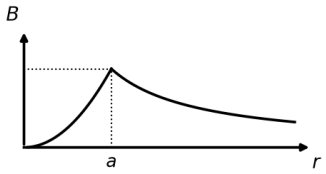
(2) [graph option — see figure]



(3) [graph option — see figure]



(4) [graph option — see figure]



Answer (1)

Sol. Apply Ampère's law. Inside ($r < a$) the enclosed current $\propto r^2$: $B(2\pi r) = \mu_0 I (r^2/a^2) \rightarrow B = \mu_0 I r/(2\pi a^2)$, so $B \propto r$ (linear rise from 0).
Outside ($r > a$) full current is enclosed: $B(2\pi r) = \mu_0 I \rightarrow B = \mu_0 I/(2\pi r)$, so $B \propto 1/r$ (decay).
B is maximum at $r = a$. The correct plot rises linearly to $r = a$, then decays as $1/r$.

40. Two statements are given below: A. When the forward bias voltage across a p-n junction diode increases above a certain threshold voltage, the diode current increases significantly. B. This current is called reverse saturation current. Choose the correct answer from the options given below:

(1) Both Statements A and B are true
(2) Statement A is true, but Statement B is false
(3) Both Statements A and B are false
(4) Statement A is false, but Statement B is true

Answer (2)

Sol. In a forward-biased diode, when the forward bias exceeds the threshold voltage the current increases significantly — Statement A is true.
This is the forward conduction current, not the reverse saturation current — Statement B is false.

41. Which of the following statements are correct? A. Inside a conductor, the electrostatic field is zero. B. Electric field at the surface of a charged conductor does not depend on its surface charge density. C. The interior of a charged conductor can have no excess charge in the static situation. D. At the surface of a charged conductor, the electrostatic field must be normal to the surface at every point. E. The electrostatic potential is zero everywhere inside a charged conductor. Choose the correct answer from the options given below:

(1) A, B and D only
(2) A, C and E only
(3) A, C and D only
(4) C, D and E only

Answer (3)

Sol. Answer: (A) A, C and E only. A, C and E are correct (histone octamer of eight molecules; histones rich in lysine and arginine; higher-level packaging needs NHC proteins). B is wrong

because histones are POSITIVELY charged basic proteins, and D is wrong because the NEGATIVELY charged DNA (not positively charged) is wrapped around the histone octamer. NCERT Ch 5, p.83, lines 027-037: "There is a set of positively charged, basic proteins called histones... Histones are rich in the basic amino acid residues lysine and arginine... Histones are organised to form a unit of eight molecules called histone octamer. The negatively charged DNA is wrapped around the positively charged histone octamer to form a structure called nucleosome"; p.84, line 003: "Non-histone Chromosomal (NHC) proteins."

42. For a metal of work function 6.6 eV, which of the following wavelengths of incident radiation does not give rise to the photoelectric effect? (Take Planck's constant as 6.6×10^{-34} J s)

(1) 100 nm
(2) 150 nm
(3) 200 nm
(4) 50 nm

Answer (3)

Sol. Threshold wavelength $\lambda_0 = hc/W = (6.6\times10^{-34} \times 3\times10^{8})/(6.6\times1.6\times10^{-19}) \approx 187.5$ nm.
Emission occurs only for $\lambda < \lambda_0 \approx 187.5$ nm.
200 nm > 187.5 nm ⇒ no photoelectric effect.

43. In a concave lens, a ray of light emanating from the object parallel to the principal axis of the lens after refraction:

(1) passes through 2F, which is the radius of curvature of the lens.
(2) appears to diverge from the first principal focus.
(3) emerges parallel to the principal axis.
(4) passes through the second principal focus.

Answer (2)

Sol. A concave (diverging) lens bends a ray that arrives parallel to the principal axis so that it diverges; on projecting the emergent ray backwards it appears to come from a focal point on the incidence side.
The official key marks option (B). Note (ERRATA): by NCERT sign convention this focal point — the one from which a parallel incident ray appears to diverge — is properly named the SECOND (incident-side) principal focus, not the first; the keyed wording is retained here as per the official answer.

44. A submarine is designed to withstand an absolute pressure of 100 atm. How deep can it go below the water surface? (Consider the density of water = 1000 kg m–3, 1 atm = 1 × 105 Pa and gravitational acceleration g = 10 m/s2)

(1) 990 m
(2) 9900 m
(3) 99 m
(4) 9000 m

Answer (1)

Sol. Absolute pressure = atmospheric + $\rho gh \Rightarrow 100\times10^{5} = 1\times10^{5} + 1000\times10\times h$.
$1000\times10\times h = 99\times10^{5} \Rightarrow h = 9.9\times10^{6} / 10^{4} = 990$ m.

45. Match List I with List II: List-I (Electromagnetic wave) List-II (Production) A. Microwave I. Electrons in atoms emit light when they move from a higher energy level to a lower energy level B. Visible light II. Radioactive decay of nucleus C. Gamma rays III. Vibration of atoms and molecules D. Infra-red rays IV. Klystron valve or magnetron valve Choose the correct answer from the options given below:

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

Answer (3)

Sol. Answer: (C) A-IV, B-I, C-II, D-III. Microwaves are produced by special vacuum tubes (klystron/magnetron). Visible light arises from electron transitions in atoms. Gamma rays come from nuclear/radioactive decay. Infrared is produced by vibration of atoms and molecules.

CHEMISTRY (Q46 – Q90)

46. Select the reagents that reduce nitriles to primary amines. A. (i) LiAlH4; (ii) H2O B. Sn + HCl C. H2/Ni D. Na(Hg)/C2H5OH E. Br2/aq. NaOH Choose the correct answer from the options given below.

(1) B, D and E only
(2) A, C and D only
(3) A, D and E only
(4) A, B and C only

Answer (2)

Sol. Reduction of a nitrile adds two molecules of hydrogen across the C#N triple bond to give a primary amine:
R-C#N → [reduction] R-CH_2-NH_2

Checking each reagent:
A. $LiAlH_4$ then H_2O (work-up): a strong hydride reducing agent → reduces nitrile to 1^° amine. Yes.
B. Sn + HCl: a classic reagent for reducing nitro groups (-NO_2 → -NH_2); it is not used to reduce nitriles to amines. No.
C. H_2/Ni (catalytic hydrogenation): reduces -C#N to -CH_2NH_2. Yes.
D. Na(Hg)/C_2H_5OH (sodium amalgam, dissolving-metal reduction): reduces nitriles to 1^° amines. Yes.
E. Br_2/aq. NaOH: this is the Hofmann bromamide reaction, which converts an amide R-$CONH_2$ to an amine R-NH_2 (with one carbon lost); it does not reduce a nitrile. No.

The correct reagents are A, C and D only, which is option (B).

47. Na(Hg)/C H OH • 2 5 R − CN → R − CH2 − NH2 • 4 R − CN → R − CH2 − NH2 (ii) H O • Sn +HCl R − CN → R − CHO • 2 R − CN → R − CH2 − NH2 (i) LiAlH 2 H /Ni Match List I with List II : List I List II (Transition metal/compound/ complex) (Catalytic Role) A. V2O5 I. Preparation of ammonia N2/H2 mixture from B. Fe II. Polymerisation of alkynes C. PdCl2 III. Preparation of H2SO4 and SO2 D. Ni complex IV. Oxidation of ethyne to ethanal Choose the correct answer from the options given below.

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

Answer (4)

Sol. V_2O_5 is the catalyst in the Contact process for manufacturing H_2SO_4 (oxidation involving SO_2), so A-III.
Fe is the catalyst in the Haber process for making ammonia from N_2 and H_2, so B-I.
$PdCl_2$ catalyses the Wacker oxidation of ethyne (and alkenes) to give ethanal, so C-IV.
Nickel complexes are used in the polymerisation of alkynes (Reppe-type reactions), so D-II.
The correct match is A-III, B-I, C-IV, D-II.

48. Consider the following reaction : 2A(g) + B(g) → 2D(g) – – ΔUO = –10 kJ mol−1 and ΔSO = –44 JK −1 at 298 K. – Identify the correct option with ΔGO for the reaction and spontaneity of the reaction at 298 K. (Given : R = 8.31 J mol–1 K–1)

(1) –1.635 kJ mol–1, spontaneous
(2) –0.63568 kJ mol–1, spontaneous
(3) +0.63568 kJ mol–1, non-spontaneous
(4) +1.635 kJ mol–1, non-spontaneous

Answer (3)

Sol. Change in moles of gas: Δ n_g = 2 - (2+1) = -1.
First convert Δ U^° to Δ H^°: Δ H^° = Δ U^° + Δ n_g RT = -10 + (-1)(8.31)(298)/1000 = -10 - 2.476 = -12.476 kJ mol^{-1}.
Then Δ G^° = Δ H^° - TΔ S^° = -12.476 - 298 × (-44)/1000 = -12.476 + 13.112 = +0.636 kJ mol^{-1}.
Since Δ G^° > 0, the reaction is non-spontaneous at 298 K.

49. Match List I with List II : List I List II (Quantum Numbers) (Orbital) 'n' 'l' A. 2 1 I. 3d B. 4 0 II. 2p C. 5 3 III. 4s D. 3 2 IV. 5f Choose the correct answer from the options given below.

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

Answer (3)

Sol. l gives the sub-shell: l=0→ s, l=1→ p, l=2→ d, l=3→ f. So A (n=2,l=1) = 2p, B (n=4,l=0) = 4s, C (n=5,l=3) = 5f, D (n=3,l=2) = 3d. Hence A-II, B-III, C-IV, D-I.

50. In a qualitative analysis, Bi^{3+} is detected by the appearance of a precipitate of BiO(OH)(s). Calculate the pH when the following equilibrium exists at 298 K:
$BiO(OH)(s) \rightleftharpoons BiO^{+}(aq) + OH^{-}(aq)$, $K = 4 \times 10^{-10}$
(Given: log 2 = 0.3010)

(1) 8.714
(2) 4.699
(3) 5.286
(4) 9.301

Answer (4)

Sol. Principle: For a sparingly soluble solid dissolving as $BiO(OH)(s) \rightleftharpoons BiO^{+} + OH^{-}$, the solid's activity is 1, so $K = [BiO^{+}][OH^{-}]$. If solubility is s, then $[BiO^{+}] = [OH^{-}] = s$, giving $K = s^2$.

Solve for s:
$s = \sqrt{K} = \sqrt{(4 \times 10^{-10})} = 2 \times 10^{-5}$ M = $[OH^{-}]$

$pOH = -\log[OH^{-}] = -\log(2 \times 10^{-5}) = 5 - \log 2 = 5 - 0.3010 = 4.699$

$pH = 14 - pOH = 14 - 4.699 = 9.301$.

So pH ≈ 9.301 → option 4.

51. Kw − [OH] = 1 × 10−9 , pH = − log[H+] = 9 + log2 = 9.301 2 The correct statement with regard to the secondary structure of DNA/RNA is

(1) RNA possesses a single strand helix structure and contains thymine as one of the four bases
(2) DNA possesses a double strand helix structure and contains thymine as one of the four bases
(3) RNA possesses a double strand helix structure and contains uracil as one of the four bases
(4) DNA possesses a single strand helix structure and contains uracil as one of the four bases

Answer (2)

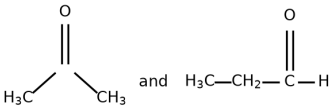
Sol. The secondary structure of DNA is a double-stranded helix of two complementary polynucleotide chains, with four bases adenine (A), guanine (G), cytosine (C) and thymine (T). RNA is typically single-stranded and contains uracil (U) in place of thymine. Only option B correctly states a double-stranded helix containing thymine, so option B is correct.

52. The pair of molecules that are metamers among the following is :

(1) $CH_3CH_2CH_2OH$ and $CH_3–CH(OH)–CH_3$

(2) $CH_3CH_2CH_2CH_2CH_3$ and $(CH_3)_2CHCH_2CH_3$

(3) CH_3COCH_3 and CH_3CH_2CHO (acetone and propanal)



(4) $CH_3OCH_2CH_2CH_3$ and $CH_3CH_2OCH_2CH_3$

Answer (4)

Sol. Metamers are compounds with the same molecular formula and the same functional group, differing in the number of carbon atoms (alkyl groups) attached on either side of the functional group. This is characteristic of ethers, amines, ketones, etc.

Methyl n-propyl ether CH_3-O-$CH_2CH_2CH_3$ and diethyl ether CH_3CH_2-O-CH_2CH_3 both have the molecular formula $C_4H_{10}O$ and the same ether functional group, but the alkyl groups on the two sides differ (methyl/propyl vs ethyl/ethyl). Hence they are metamers.

Option (A) is a pair of positional/functional isomers (alcohols), (B) is a pair of chain isomers (alkanes), and (C) is a pair of chain/positional isomeric alcohols — none of these is metamerism.

53. Match List I with List II : List-I List-II (Complex) (Type of isomerism) A. [Pt(NH3)2Cl2] I. Optical B. [Co(en)3]3+ II. Solvate C. [Co(NH3)5NO2]Cl2 III. Geometrical D. [Cr(H2O)6]Cl3 IV. Linkage Choose the correct answer from the options given below :

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

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

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

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

Answer (4)

Sol. (a) $[Pt(NH_3)_2Cl_2]$: square-planar complex with cis and trans forms ⇒ geometrical isomerism (iii).

(b) $[Co(en)_3]^{3+}$: tris-chelate octahedral complex that is non-superimposable on its mirror image ⇒ optical isomerism (i).

(c) $[Co(NH_3)_5(NO_2)]Cl_2$: the ambidentate NO_2 ligand can bind through N (nitro) or O (nitrito) ⇒ linkage isomerism (iv).

(d) $[Cr(H_2O)_6]Cl_3$: water can exchange between coordination sphere and lattice ⇒ solvate (hydrate) isomerism (ii).

Thus (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii), option (D).

54. Match List I with List II : List-I List-II (Order of reaction) (Unit of rate constant) A. Zero order I. mol–1 L s–1 B. First order II. mol–2 L2 s–1 C. Second order III. s–1 D. Third order IV. mol L–1 s–1 Choose the correct answer from the options given below :

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

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

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

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

Answer (2)

Sol. The unit of the rate constant for an nth order reaction is
$(\text{mol L}^{-1})^{1-n}\ \text{s}^{-1} = \text{mol}^{1-n}\ \text{L}^{n-1}\ \text{s}^{-1}$
Zero order (n=0): $\text{mol L}^{-1}\ \text{s}^{-1}$ → (IV)
First order (n=1): s^{-1} → (III)
Second order (n=2): $\text{mol}^{-1}\ \text{L s}^{-1}$ → (I)
Third order (n=3): $\text{mol}^{-2}\ \text{L}^2\ \text{s}^{-1}$ → (II)
Hence (A)-(IV), (B)-(III), (C)-(I), (D)-(II).

55. The correct IUPAC name of the following compound is :

(1) 3-ethyl-5-methylheptane
(2) 2,4-diethylhexane
(3) 3-methyl-5-ethylheptane
(4) 3,5-diethylhexane

Answer (1)

Sol. The longest continuous chain has 7 carbons (heptane). Numbering from the end that gives the lowest set of locants places an ethyl group on C-3 and a methyl group on C-5. Substituent prefixes are cited alphabetically (ethyl before methyl). The correct IUPAC name is 3-ethyl-5-methylheptane.

56. A bulb is rated at 150 watt, converting 8% energy into light. If energy of one photon is 4.42 × 10 –19 J, how many photons are emitted by the bulb per second?

(1) 2.71 × 1019
(2) 4.06 × 1019
(3) 27.2 × 1019
(4) 1.35 × 1019

Answer (1)

Sol. Energy per second = 150 J. Energy converted to light = 150 × 8/100 = 12 J. Number of photons = $12/(4.42 \times 10^{-19}) = 2.71 \times 10^{19}$.

57. Methane reacts with steam at 1273 K in the presence of a nickel catalyst to form:

(1) CO and H_2O
(2) CO_2 and H_2
(3) CO and H_2
(4) CO_2 and H_2O

Answer (3)

Sol. Principle: This is the steam-reforming of methane, the main industrial route to dihydrogen. At 1273 K over a Ni catalyst, methane and steam react:

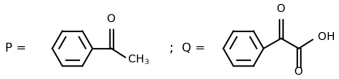
$CH_4(g) + H_2O(g)$ --Ni, 1273 K--> $CO(g) + 3H_2(g)$

The products are carbon monoxide and hydrogen. (The CO can be further reacted with steam in the water-gas shift step to give more H_2, but the direct products here are CO and H_2.)

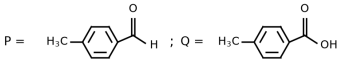
So the answer is CO and H_2 → option 3.

58. Compound P (C_8H_8O) gives a red-orange precipitate with 2,4-DNP reagent and it does not reduce Fehling's reagent. On drastic oxidation with chromic acid, P gives an aromatic product Q that produces effervescence on treating with aq. $NaHCO_3$. Compounds P and Q, respectively, are :

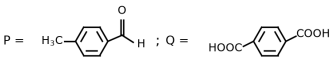
(1) P = acetophenone (C_6H_5–CO–CH_3); Q = phenylglyoxylic acid (C_6H_5–CO–COOH)



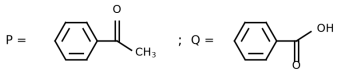
(2) P = p-methylbenzaldehyde (4-CH_3–C_6H_4–CHO); Q = p-toluic acid (4-CH_3–C_6H_4–COOH)



(3) P = p-methylbenzaldehyde (4-CH_3–C_6H_4–CHO); Q = terephthalic acid (benzene-1,4-dicarboxylic acid)



(4) P = acetophenone (C_6H_5–CO–CH_3); Q = benzoic acid (C_6H_5–COOH)



Answer (4)

Sol. The degree of unsaturation of C_8H_8O is 5: a benzene ring (4) plus one C=O. A positive 2,4-DNP test indicates a carbonyl group, and failure to reduce Fehling's rules out an aldehyde, so P is a ketone. The only aromatic C_8H_8O ketone is acetophenone $C_6H_5COCH_3$. On drastic oxidation with chromic acid the entire -$COCH_3$ side chain is degraded to a single -COOH on the ring, giving benzoic acid C_6H_5COOH, which liberates CO_2 with $NaHCO_3$: $C_6H_5COOH + NaHCO_3 \rightarrow C_6H_5COONa + H_2O + CO_2$.

59. Match List I with List II : List I List II A. C2H4 I. 3 σ bonds, 2 π bonds B. C2H2 II. 3 σ bonds, one lone pair C. CH4 III. 4 σ bonds D. NH3 IV. 5 σ bonds, 1 π bond Choose the correct answer from the options given below :

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

Answer (2)

Sol. l gives the sub-shell: l=0→ s, l=1→ p, l=2→ d, l=3→ f. So A (n=2,l=1) = 2p, B (n=4,l=0) = 4s, C (n=5,l=3) = 5f, D (n=3,l=2) = 3d. Hence A-II, B-III, C-IV, D-I.

60. The following two reactions give the same foul smelling product Z. X C2H5 Cl →Z X and Z, respectively, are :

(1) X = AgCN; Z = C2H5NC
(2) X = KCN; Z = C2H5CN
(3) X = AgCN; Z = C2H5CN
(4) X = KCN; Z = C2H5NC

Answer (1)

Sol. AgCN is a covalent, ambident nucleophile that bonds through nitrogen, so $C_2H_5Cl + AgCN \rightarrow C_2H_5NC + AgCl$ gives ethyl isocyanide (X = AgCN, Z = C_2H_5NC). In Reaction 2, $C_2H_5CONH_2$ undergoes Hofmann degradation to ethylamine $C_2H_5NH_2$ (Y), which on the carbylamine reaction ($CHCl_3$ + ethanolic KOH) also gives the foul-smelling isocyanide C_2H_5NC (Z). Both routes converge on the same isocyanide.

61. The number of hydrogen atoms present in 5.4 g of urea is: (Given: Molar mass of urea : 60 g mol–1 NA : 6.022 × 1023 particles mol–1)

(1) 1.084 × 1023
(2) 1.084 × 1022

(3) 2.168 × 1022
(4) 2.168 × 1023

Answer (4)

Sol. Urea NH_2CONH_2 has 4 H atoms per molecule.

Moles of urea = 5.4/60 = 0.09 mol.

H atoms = $0.09\times 4\times 6.022\times10^{23} = 2.168\times10^{23}$.

62. Identify the incorrect statement from the following:
(1) Nitrogen can form pπ-pπ multiple bonds with itself.
(2) P(C2H5)3 and As(C6H5)3 form dπ-dπ bond with transition metals.
(3) Phosphorus, arsenic and antimony show catenation property.
(4) Nitrogen can form dπ-pπ bond with oxygen.

Answer (4)

Sol. The oxidation number of K in KO_2 (potassium superoxide) is not +4; potassium is always +1. The superoxide ion O_2^- carries an overall -1 charge, so each O is -1/2 and K is +1.
Statements (a), (c) and (d) are correct properties of alkali metals. Hence statement (b) is the incorrect one.

63. Which one of the following is an ambidentate ligand?
(1) Ethane-1,2-diamine
(2) Ethylenediaminetetraacetate ion
(3) Thiocyanate
(4) Oxalate

Answer (3)

Sol. An ambidentate ligand has two different donor atoms but coordinates through only one of them at a time, so it can bind to the metal through either site.

The thiocyanate ion, SCN-, can coordinate either through sulfur (M-SCN, thiocyanato-S) or through nitrogen (M-NCS, thiocyanato-N / isothiocyanato). Having two distinct possible donor atoms makes it ambidentate (and gives rise to linkage isomerism).

The distractors differ in denticity, not ambidentacy: ethane-1,2-diamine (en) and oxalate $C_2O_4^{2-}$ are bidentate, and $EDTA^{4-}$ is hexadentate — each binds through a fixed set of donor atoms simultaneously.

Hence the ambidentate ligand is thiocyanate, option (C).

64. The correct order of increasing metallic character of Na, Be, P, Mg and Si is
(1) P < Si < Be < Mg < Na
(2) P < Si < Na < Mg < Be
(3) P < Mg < Be < Si < Na
(4) Be < Si < P < Mg < Na

Answer (1)

Sol. Metallic character decreases from left to right across a period and increases down a group; it varies inversely with electronegativity. Using approximate Pauling electronegativities Na 0.9 < Mg 1.2 < Be 1.5 < Si 1.8 < P 2.1, the increasing order of metallic character (least to most metallic) is P < Si < Be < Mg < Na.

65. Na Mg Be Si P 0.9 1.2 1.5 1.8 2.1 Match List I with List II: List I A. List II (I) (i) Oleum; (ii) NaOH, Δ; (iii) H+ B. CH3COOH → CH3CH2OH (II) (i) O2; (ii) H2O/H+ C. CH3CH2CH2OH → (III) (i) CH3OH, H+; (ii) H2, catalyst D (IV) (i) conc. H2SO4, Δ; (ii) H+/H2O - 31 - NEET (UG)-2026 (Code-11) Choose the correct answer from the options given below :

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

Answer (2)

Sol. A. Phenol from benzene/cumene via aerial oxidation — the cumene process uses (i) O_2 then (ii) H_2O/H^+, which hydrolyses cumene hydroperoxide to phenol and acetone. So A matches (II).
B. Carboxylic acid to alcohol: CH_3COOH is first esterified with CH_3OH/H^+ and the ester is then reduced with H_2/catalyst to CH_3CH_2OH. So B matches (III).
C. Dehydration of 1-propanol to propene needs conc. H_2SO_4, heat; the H^+/H_2O step represents the acid-catalysed mechanism. So C matches (IV).
D. Phenol via the benzenesulphonic-acid route: (i) oleum (sulphonation), (ii) NaOH, heat (alkali fusion to sodium phenoxide), (iii) H+ (acidification). So D matches (I).
Hence A-II, B-III, C-IV, D-I.

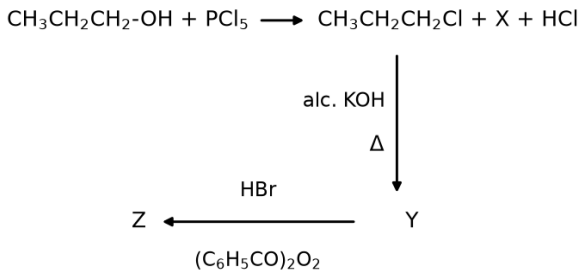
66. Although +3 oxidation state is most common in lanthanoids, cerium still shows +4 oxidation state because:

(1) After losing one more electron, it acquires 4f 14 electronic configuration.
(2) Its nearest inert gas is Radon.
(3) Its atomic number is 61.
(4) After losing one more electron, it acquires 4f 0 electronic configuration.

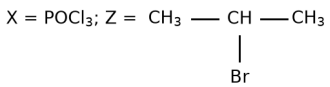
Answer (4)

Sol. Cerium in the +3 state is Ce^{3+} ([Xe] $4f^1$). On losing one more electron it forms Ce^{4+} with the configuration [Xe] $4f^0$, i.e. the stable, empty 4f (noble-gas [Xe]) configuration.
This extra stability of the $4f^0$ configuration is why cerium readily shows the +4 oxidation state, in addition to the usual +3 common to lanthanoids.

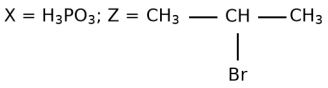
67. In the following reaction sequence, X and Z respectively are : $CH_3CH_2CH_2–OH + PCl_5 \rightarrow CH_3CH_2CH_2Cl + X + HCl$; $CH_3CH_2CH_2Cl$ —(alc. KOH, Δ)→ Y ; Y —(HBr, $(C_6H_5CO)_2O_2$)→ Z



(1) X = $POCl_3$; Z = $CH_3–CH(Br)–CH_3$ (isopropyl bromide)



(2) X = $POCl_3$; Z = $CH_3CH_2CH_2–Br$ (n-propyl bromide)
(3) X = H_3PO_3; Z = $CH_3–CH(Br)–CH_3$ (isopropyl bromide)



(4) X = H_3PO_3; Z = $CH_3CH_2CH_2$–Br (n-propyl bromide)

Answer (2)

Sol. Propan-1-ol with PCl_3 gives 1-chloropropane plus phosphorus oxychloride and HCl, so X = $POCl_3$ (this single-mole stoichiometry shown gives $POCl_3$, not H_3PO_3). Alcoholic KOH then dehydrohalogenates 1-chloropropane to propene (Y). Propene with HBr in the presence of peroxide adds anti-Markovnikov (peroxide effect), placing Br on the terminal carbon to give 1-bromopropane $CH_3CH_2CH_2Br$ (Z).

68. Match List I with List II : List I List II (Complex/ion) (Shape/geometry) A. [Pt(Cl2)(NH3)2] (I) Octahedral B. [Co(NH3)6]Cl3 (II) Trigonal bipyramidal C. [NiCl4]2– (III) Square planar D [Fe(CO)5] (IV) Tetrahedral Choose the correct answer from the options given below :

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

Answer (2)

Sol. Geometry follows from hybridisation in each case:

(a) $[PtCl_2(NH_3)_2]$: Pt(II), $5d^8$, strong-field ⇒ dsp^2 ⇒ square planar (iii).

(b) $[Co(NH_3)_6]^{3+}$: Co(III), $3d^6$, NH_3 strong-field ⇒ d^2sp^3 ⇒ octahedral (i).

(c) $[NiCl_4]^{2-}$: Ni(II), $3d^8$, weak-field Cl- ⇒ sp^3 ⇒ tetrahedral (iv).

(d) $[Fe(CO)_5]$: Fe(0), sp^3d (also written dsp^3) ⇒ trigonal bipyramidal (ii).

Thus (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii), option (B).

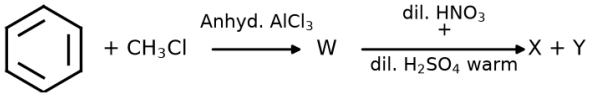
69. • In [Pt(Cl2)(NH3)2]; Pt has dsp2 hybridisation, so shape of complex is square planar. • In [Co(NH3)6]Cl3; Co has d2sp3 hybridisation so shape of complex is octahedral. • In [NiCl4]2–; Ni has sp3 hybridisation so shape of complex ion is tetrahedral. • In [Fe(CO)5]; shape of complex is trigonal bipyramidal. The functional group that can be identified through phthalein dye test is :

(1) Aldehyde
(2) Phenolic
(3) Carboxylic acid
(4) Alcohol

Answer (2)

Sol. In the phthalein dye test, a phenol is heated with phthalic anhydride in the presence of concentrated H_2SO_4 to give phenolphthalein. The product turns pink/red on addition of NaOH (alkali), confirming the presence of a phenolic (-OH) group. Aldehydes, carboxylic acids and alcohols do not respond to this test.

70. Two products X and Y are formed in the following reaction sequence: C_6H_6 + CH_3Cl —(Anhyd. $AlCl_3$)→ W —(dil. HNO_3 + dil. H_2SO_4, warm)→ X + Y. The suitable method that can be used for the separation of products X and Y is :



(1) Fractional distillation
(2) Sublimation
(3) Differential extraction
(4) Continuous extraction

Answer (1)

Sol. Nitration of phenol gives a mixture of o-nitrophenol and p-nitrophenol. These differ appreciably in boiling point (o-nitrophenol b.p. 222 ^°C, p-nitrophenol b.p. 238 ^°C), because o-nitrophenol has intramolecular H-bonding (more volatile) while p-nitrophenol has intermolecular H-bonding (less volatile). A mixture of two liquids/low-melting solids whose boiling points differ can be separated by fractional distillation (under reduced pressure). Hence the correct method is fractional distillation.

71. Identify the correct statements : (A) The molality of 2.5 g of ethanoic acid (Molar mass : 60 g mol–1) in 75 g of benzene solution is 0.556 m. (B) The molarity of a solution containing 5 g of NaOH (molar mass : 40 g mol –1) in 450 mL of solution is 0.278 M at 298 K. (C) Aquatic species are more comfortable in cold water. (D) The solubility of gas increases with decrease in pressure. (E) For a binary mixture of A and B, the number of moles of A and B are nA and nB respectively. The mole nA fraction of B will be xB = . nA + nB Choose the correct answer from the options given below :

(1) A, B and C only
(2) A and B only
(3) A and C only
(4) A, D and E only

Answer (1)

Sol. (A) Molality = (2.5/60)/(75/1000) = 0.0417/0.075 = 0.556 m — correct.
(B) Molarity = (5/40)/(450/1000) = 0.125/0.45 = 0.278 M — correct.
(C) Gas solubility increases as temperature falls, so cold water holds more dissolved O_2; aquatic species are more comfortable in cold water — correct.
(D) Solubility of a gas increases with increase in pressure (Henry's law), not with a decrease — FALSE.
(E) The expression n_A/(n_A + n_B) is actually x_A, not x_B — FALSE.
Correct statements: A, B and C → option (A).

72. During Lassaigne’s test, the elements present in an organic compound are converted from :

(1) Ionic form to ionic form
(2) Covalent form to ionic form
(3) Covalent form to covalent form
(4) Ionic form to covalent form

Answer (2)

Sol. In Lassaigne's (sodium fusion) test the organic compound is fused with sodium metal. This converts the covalently bonded elements (N, S, halogens) present in the compound into their water-soluble ionic forms (NaCN, Na_2S, NaX, etc.), which are then detected by inorganic qualitative tests. Hence the covalent form is converted to the ionic form.

73. A solution of copper sulphate is electrolysed for 10 minutes with a current of 1.5 amperes. The mass of copper deposited at cathode is : (Given : Molar mass of Cu = 63 g mol–1; 1 F = 96487 C mol–1)

(1) 1.7018 g
(2) 0.2938 g
(3) 2.4036 g
(4) 0.5876 g

Answer (2)

Sol. At the cathode: $Cu^{2+} + 2e^- \rightarrow Cu$ (n = 2).

Charge passed: $Q = I\,t = 1.5 \times (10 \times 60) = 1.5 \times 600 = 900$ C.

Using $w = (M \cdot Q)/(n \cdot F)$,
$w = (63 \times 900)/(2 \times 96487) = 56700/192974 \approx 0.2938$ g.

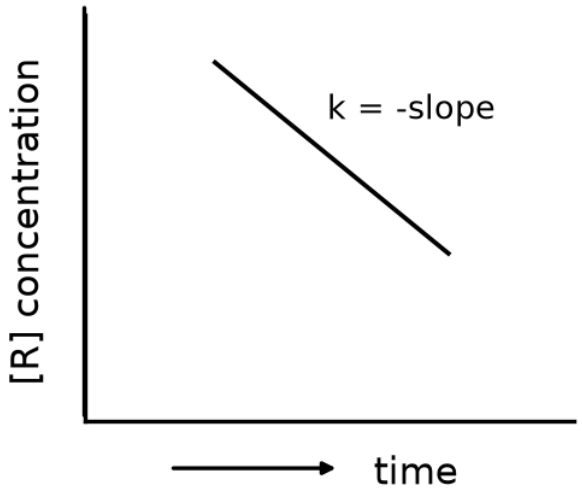
74. At a certain temperature, T (K), during a process, 500 J is absorbed by the system and work of 200 J is done by the system. Then change in internal energy of the system is :

(1) 400 J
(2) 300 J
(3) 700 J
(4) 500 J

Answer (2)

Sol. By the first law of thermodynamics,
$\Delta U = Q - W$,
where Q is the heat absorbed by the system and W is the work done by the system.
Given Q=+500 J (absorbed) and W=+200 J (done by the system),
$\Delta U = 500 - 200 = 300$ J.
This matches option (b).

75. For a certain reaction R → Product, the plot of concentration [R] vs time has a negative slope as shown. The order of reaction is :



(1) 0
(2) 1
(3) 2
(4) 2.5

Answer (1)

Sol. For a zero-order reaction, the integrated rate law is:
$[R] = [R]_0 - kt$
This is the equation of a straight line in [R] vs t with a constant negative slope equal to -k. Since the given plot is a straight line with constant negative slope, the reaction is zero order.

76. Identify the correct statement about CIF3 from the following options :
(1) It has T-shaped geometry with two lone pairs on Cl atom.
(2) It has T-shaped geometry with three lone pairs on Cl atom.
(3) It has a trigonal pyramidal geometry with two lone pairs on Cl atom.
(4) It has a planar trigonal geometry with two lone pairs on Cl atom.

Answer (1)

Sol. ClF_3 is AB3E2: Cl has 7 valence electrons, 3 bond pairs + 2 lone pairs (sp^3d). The two lone pairs occupy equatorial positions of the trigonal bipyramid, giving a T-shaped geometry.

77. In a test tube containing a salt, a few drops of dilute H_2SO_4 were added, which gave colourless vapours having the smell of vinegar. The vapours turned blue litmus paper red. Identify the correct anion from the following:
(1) Sulphide, S^{2-}
(2) Sulphate, SO_4^{2-}
(3) Acetate, CH_3COO^-
(4) Carbonate, CO_3^{2-}

Answer (3)

Sol. Principle: A dilute acid displaces a weaker/more volatile acid from its salt; identify the anion from the characteristic smell of the liberated acid.

The key clue is the 'smell of vinegar' — vinegar is dilute acetic acid, CH_3COOH. This tells us acetic acid vapours are being released, so the salt must contain the acetate ion:
$2CH_3COO^- + H_2SO_4 \rightarrow 2CH_3COOH\uparrow$ (vinegar smell) + SO_4^{2-}

The acidic acetic acid vapours turn blue litmus red, consistent with the observation. Sulphide would smell of rotten eggs (H_2S), carbonate would give odourless CO_2 (brisk effervescence), and sulphate gives no such vapour with dilute H_2SO_4.

So the anion is acetate, CH_3COO^- → option 3.

78. At 298 K, a certain buffer solution contains equal concentrations of X – and HX, Kb for X– is 10–10. What is the pH of this buffer solution?
(1) 2
(2) 4
(3) 6
(4) 10

Answer (2)

Sol. For a thin (small-angle) prism, the deviation $\delta = (\mu - 1)A = (1.5 - 1)(6°) = 0.5 \times 6° = 3°$.
The incident ray is horizontal and strikes the first face normally (no bending there), so the entire deviation appears at the second face. The emergent ray turns by $\delta = 3°$ relative to its incoming direction inside.
Measuring the angle of emergence (with respect to the normal of the emergent face), the geometry gives $e = 9°$.
(Using $i + e = A + \delta$ with the ray entering along the normal of the first face, the emergence angle works out to 9°.)

79. Calculate emf of the half cell given below : Pt (s) | H2(g, 2 atm) | HCl (aq, 0.02 M) EH° /H+ = 0 V 2 (Given: 2.303 RT = 0.059, log 2 = 0.3010) F

(1) –0.109 V
(2) 0.035 V
(3) –0.035 V
(4) 0.109 V

Answer (4)

Sol. For the hydrogen electrode the Nernst equation (NEET official key convention) is written with reaction quotient Q = ([H+]²)/(P_(H₂)) and n = 2:

E = E^° - 0.059/2log([H+]²)/(P_(H₂))

With [H+] = 0.02 M (from HCl) and P_(H₂) = 2 atm:

E = 0 - 0.0295log((0.02)²)/2 = -0.0295log(4×10⁻⁴)/2 = -0.0295log(2×10⁻⁴)

E = -0.0295 (log 2 - 4) = -0.0295 (0.301 - 4) = -0.0295×(-3.699)

E = +0.109 V, which is option (D).

80. The calculated ‘spin-only’ magnetic moment Ti2+ (3d2) is :

(1) 5.92 BM
(2) 3.87 BM
(3) 2.84 BM
(4) 4.90 BM

Answer (3)

Sol. The spin-only magnetic moment is μ = √(n(n+2)) BM, where n is the number of unpaired electrons.
Cr^{2+} has the configuration $3d^4$, giving n = 4 unpaired electrons.
μ = √(4(4+2)) = √(24) = 4.90 BM.
Hence the answer is option D.

81. Identify the incorrect statement from the following:

(1) Carbon has the ability to form pπ-pπ multiple bond with itself.
(2) ECl3 (E = B and Al) is a monomer when E = B and a dimer when E = Al.
(3) The order of catenation property of Group 14 elements is C >> Si > Ge ≈ Sn.
(4) Oxygen exhibits only –2 oxidation state.

Answer (4)

Sol. The oxidation number of K in KO_2 (potassium superoxide) is not +4; potassium is always +1.
The superoxide ion O_2^- carries an overall -1 charge, so each O is -1/2 and K is +1.
Statements (a), (c) and (d) are correct properties of alkali metals. Hence statement (b) is the incorrect one.

82. The correct formal charges on oxygen atoms numbered 2, 1 and 3 respectively are :

(1) –1, 0, +1
(2) 0, +1, –1
(3) 0, 0, 0
(4) +1, 0, –1

Answer (2)

Sol. Formal charge = V - L - 1/2S. Terminal O (2, double-bonded, 4 lone-pair electrons): 6 - 4 - 1/2(4) = 0; central O (1, one double + one single bond, 2 lone-pair electrons): 6 - 2 - 1/2(6) = +1;

terminal O (3, single-bonded, 6 lone-pair electrons): 6 - 6 - 1/2(2) = -1.

83. Phenolphthalein is used as an indicator for the titration of sodium hydroxide solution against a standard solution of oxalic acid. The colour change that is observed at an alkaline pH close to the equivalence point during this titration is:

(1) pinkish red to yellow
(2) yellow to pinkish red
(3) pink to colourless
(4) colourless to pink

Answer (4)

Sol. Principle: Phenolphthalein is colourless in acidic/neutral solution and pink in alkaline solution (it changes colour over roughly pH 8.2–10).

Before the end point the solution is acidic/neutral, so phenolphthalein is colourless. As the solution becomes alkaline on approaching the equivalence point (alkaline pH), phenolphthalein turns pink. Hence the colour change observed close to the equivalence point is colourless → pink.

So the answer is colourless to pink → option 4.

84. When 1 dm3 of CO2 gas is passed over hot coke the volume of gaseous mixture after complete reaction at STP becomes 1.4 dm3. The composition of the gaseous mixture at STP is:

(1) 0.8 dm3 of CO, 0.8 dm3 of CO2
(2) 0.8 dm3 of CO, 0.6 dm3 of CO2
(3) 0.6 dm3 of CO, 0.8 dm3 of CO2
(4) 0.6 dm3 of CO, 0.4 dm3 of CO2

Answer (2)

Sol. $CO_2 + C(s) \rightarrow 2CO$. By Gay-Lussac's law, volumes behave like moles.

Let x dm^3 of CO_2 react. Remaining CO_2 = 1-x; CO formed = 2x.

Total volume = (1-x) + 2x = 1 + x = 1.4 ⇒ x = 0.4.

CO = 2(0.4) = 0.8 dm^3; CO_2 left = 1 - 0.4 = 0.6 dm^3.

85. The major product Z formed in the following sequence of reactions is Cl 2 C2H6 → UV light X (monochlorinated product) NH (i) NaNO2 HCl 3 → Y →Z (ii) H O 2

(1) C2H5NO2
(2) C2H5 – N = N – OH
(3) C2H5OH
(4) C2H5NH2

Answer (3)

Sol. Free-radical chlorination of ethane gives chloroethane C_2H_5Cl (X). Ammonolysis (nucleophilic substitution by NH_3) gives ethylamine $C_2H_5NH_2$ (Y). A primary aliphatic amine on diazotisation with $NaNO_2$/HCl forms an unstable diazonium salt that is hydrolysed by water to the alcohol: $C_2H_5NH_2 \rightarrow [NaNO_2/HCl][H_2O]$ C_2H_5OH (Z, ethanol).

86. Given below is an expression for the rate constant of a first-order reaction occurring at a certain temperature, T (K). lnk = 14.34 − 1.25 × 104 T The energy of activation in kcal mol–1 for the reaction is : (Given: k in s–1, R = 1.987 cal mol–1 K–1)

(1) 24.84

(2) 14.34
(3) 18.63
(4) 12.42

Answer (1)

Sol. From the Arrhenius equation k=A e^(-E_a/RT), taking ln gives ln k=ln A-E_a/R·1/T.
Comparing with ln k=14.34-(1.25×10⁴)/T gives E_a/R=1.25×10⁴.
E_a=1.25×10⁴× R=1.25×10⁴×1.987=24837.5 cal mol^{-1}=24.84 kcal mol^{-1}.

87. Given below are certain reactions. Identify the reaction for which Kp ≠ Kc.
(1) $H_2O(g) + CO(g) \rightleftharpoons H_2(g) + CO_2(g)$
(2) $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$
(3) $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$
(4) $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$

Answer (2)

Sol. Principle: Kp = Kc(RT)^Δng, where Δng = (moles of gaseous products) − (moles of gaseous reactants). Kp = Kc only when Δng = 0; Kp ≠ Kc when Δng ≠ 0.

Check each:
1) $H_2O + CO \rightleftharpoons H_2 + CO_2$: Δng = 2 − 2 = 0 → Kp = Kc
2) $N_2 + 3H_2 \rightleftharpoons 2NH_3$: Δng = 2 − 4 = −2 ≠ 0 → Kp ≠ Kc ✓
3) $H_2 + I_2 \rightleftharpoons 2HI$: Δng = 2 − 2 = 0 → Kp = Kc
4) $N_2 + O_2 \rightleftharpoons 2NO$: Δng = 2 − 2 = 0 → Kp = Kc

Only the ammonia synthesis has Δng ≠ 0, so Kp ≠ Kc for it → option 2.

88. Identify the incorrect statement from the following :
(1) The largest and the smallest species among Mg, Mg2+, Al and Al3+ are Al and Mg2+ respectively.
(2) The IUPAC name of the element with atomic number 107 is Unnilseptium.
(3) The similarity in behaviour of Li with Mg is referred to as ‘diagonal relationship’
(4) The oxidation state and covalency of Al in [AlCl(H2O)5]2+ are 3 and 6, respectively.

Answer (1)

Sol. The oxidation number of K in KO_2 (potassium superoxide) is not +4; potassium is always +1. The superoxide ion O_2^- carries an overall -1 charge, so each O is -1/2 and K is +1.
Statements (a), (c) and (d) are correct properties of alkali metals. Hence statement (b) is the incorrect one.

89. Mixture of chloroform and acetone forms a solution with negative deviation from Raoult’s law due to :
(1) Increase in escaping tendency of molecules of each component.
(2) Formation of hydrogen bonding between acetone and chloroform
(3) Stronger intermolecular forces between chloroform molecules than those between chloroform and acetone molecules.
(4) Repulsive forces.

Answer (2)

Sol. Chloroform ($CHCl_3$) and acetone ($(CH_3)_2CO$) form a solution showing negative deviation. The acidic hydrogen of chloroform forms a new hydrogen bond with the carbonyl oxygen of acetone. This new A-B attraction is stronger than the A-A and B-B interactions, lowering the escaping tendency and hence the vapour pressure below the Raoult's law value → negative deviation.

90. The number of chlorine atoms present in the organic products X and Y of the following reactions, respectively, are :

(1) 3 and 3
(2) 6 and 3
(3) 6 and 6
(4) 3 and 3

Answer (3)

Sol. With anhydrous $AlCl_3$, benzene undergoes electrophilic aromatic substitution; exhaustive chlorination replaces all six ring hydrogens to give hexachlorobenzene C_6Cl_6 (X), which contains 6 chlorine atoms. Under UV light, Cl_2 adds across the ring by a free-radical addition: $C_6H_6 + 3\ Cl_2 \rightarrow C_6H_6Cl_6$ (benzene hexachloride / BHC, Y), also containing 6 chlorine atoms. Hence 6 and 6.

BIOLOGY (Q91 – Q180)

91. In angiosperms, root hairs arise from which one of the following regions of the root?
(1) The root cap zone
(2) The region of meristematic activity
(3) The region of elongation
(4) The region of maturation

Answer (4)

Sol. Root hairs are unicellular elongations (outgrowths) of the epidermal cells, and they develop in the region of maturation (the maturation/differentiation zone) where epidermal cells differentiate; they are absent in the root cap, meristematic and elongation zones. Their function is to absorb water and minerals from the soil.

NCERT Reference: NCERT Class XI, Ch 6 Anatomy of Flowering Plants, p.72, line ~3: "The root hairs are unicellular elongations of the epidermal cells and help absorb water and minerals from the soil." (Root hairs being epidermal outgrowths confirms the epidermal/maturation-zone origin.)

92. In which one of the following, the ovules are not enclosed by an ovary wall and remain exposed?
(1) Funaria
(2) Pinus
(3) Selaginella
(4) Wolffia

Answer (2)

Sol. Naked, exposed ovules not enclosed by an ovary wall are the hallmark of gymnosperms, and among the options Pinus is the gymnosperm. Funaria is a moss (bryophyte) and Selaginella is a pteridophyte — neither bears ovules — while Wolffia is an angiosperm in which ovules are enclosed within the ovary/fruit. Hence only Pinus fits the description.

NCERT Reference: Class XI Biology, Plant Kingdom, p.32, lines 28-29 — "the ovules are not enclosed by any ovary wall and remain exposed, both before and after fertilisation".

93. In the lac operon, the z gene codes for
(1) permease
(2) transacetylase
(3) beta-galactosidase
(4) the repressor of lac operon

Answer (3)

Sol. Answer: (C) beta-galactosidase. In the lac operon the z gene codes for beta-galactosidase, which hydrolyses lactose into galactose and glucose; the y gene codes for permease and the a gene for transacetylase, while the i gene codes for the repressor. NCERT Ch 5, p.100, lines 037-038: "The z gene codes for beta-galactosidase (β-gal), which is primarily responsible for the hydrolysis of the disaccharide, lactose into its monomeric units, galactose and glucose."

94. Exploring molecular, genetic and species-level diversity for products of economic importance is called
(1) Biofortification
(2) Bioremediation
(3) Bioprospecting
(4) Biomagnification

Answer (3)

Sol. Bioprospecting is the exploration of molecular, genetic and species-level diversity for products of economic importance, a narrowly utilitarian reason to conserve biodiversity. Biopiracy (1) is the unauthorized exploitation of bioresources/traditional knowledge, bioenergetics (2) concerns energy flow in organisms, and bioremediation (3) uses organisms to clean up pollutants - none fit the definition.

NCERT: NCERT Class XII Biology, Ch 13 Biodiversity and Conservation, p.223, lines 42-43: "'bioprospecting' (exploring molecular, genetic and species-level diversity for products of economic importance)".

95. Match List I with List II: List-I List-II A. Genetically modified organism (I) Agrobacterium tumefaciens B. Thermostable DNA polymerase (II) Bt cotton C. Ti plasmid (III) Thermus aquaticus D. pBR322 (IV) Escherichia coli Choose the correct answer from the options given below:

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

Answer (1)

Sol. A genetically modified organism — Bt cotton (II); thermostable DNA polymerase (Taq) — Thermus aquaticus (III); Ti plasmid — Agrobacterium tumefaciens (I); pBR322 — Escherichia coli cloning vector (IV). Only option 1 maps every pair correctly: A-II, B-III, C-I, D-IV. NCERT grounds Taq in Thermus aquaticus, the Ti plasmid in Agrobacterium, and pBR322 as an E. coli cloning vector (Fig. 9.4); Bt cotton is the standard GMO example.
NCERT Reference: Ch 9, p.169, line(s) 55 — "E. coli cloning vector pBR322"

96. Match List I with List II : List I List II A. Productivity I. Gross primary productivity minus respiration losses B. Net primary productivity II. Rate of formation of new organic matter by consumers C. Gross primary productivity III. Rate of biomass production D. Secondary productivity IV. Rate of production of organic matter during photosynthesis Choose the correct answer from the options given below :

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

Answer (1)

Sol. Productivity is the rate of biomass production (III); NPP is GPP minus respiration losses (I); GPP is the rate of production of organic matter during photosynthesis (IV); secondary productivity is the rate of formation of new organic matter by consumers (II). This gives A-III, B-I, C-IV, D-II, option (1)/(a). All four definitions are stated verbatim in NCERT section 12.2.

NCERT Reference: Ch 12, p.207 — “rate of formation of new organic matter by”

97. Since the origin and diversification of life on Earth, there have been five episodes of mass extinction of species. How is the sixth extinction, which is in progress, different from the previous episodes?

(1) The present net species extinction rate is zero.
(2) The current species extinction rate is nearly 10 times faster than in previous episodes.
(3) The present species extinction rates are 100 to 1000 times faster than in the pre-human times.
(4) The current species extinction rates are far lower than those in previous episodes.

Answer (3)

Sol. The difference between the ongoing Sixth Extinction and the five previous mass extinctions lies in the rate: current rates are 100 to 1,000 times faster than pre-human times, and human activities drive this acceleration. Option (1) is false (the net rate is high, not zero), option (2) understates the figure (it is 100-1000x, not ~10x), and option (4) is the opposite of the truth.

NCERT: NCERT Class XII Biology, Ch 13 Biodiversity and Conservation, p.222, lines 16-18: "the current species extinction rates are estimated to be 100 to 1,000 times faster than in the pre-human times and our activities are responsible for the faster rates."

98. Alpha-helix is found in which level of protein structure?
(1) Secondary structure
(2) Tertiary structure
(3) Primary structure
(4) Quaternary structure

Answer (1)

Sol. NCERT describes the protein thread as folding into a helix (like a revolving staircase), and states that only some portions adopt this helical arrangement, which constitutes the secondary structure. Only right-handed (alpha) helices are observed. The primary structure is the linear amino-acid sequence, the tertiary structure is the hollow-ball 3-D fold, and the quaternary structure is the arrangement of multiple subunits, so the alpha-helix belongs to the secondary level.

NCERT Reference: Ch 9, p.112, line ~14 — "Other regions of the protein thread are folded into other forms in what is called the secondary structure"

99. The main function of bulliform cells in grasses is :
(1) to make the leaf impermeable to fungal spores.
(2) to transport water.
(3) to perform photosynthesis.
(4) to minimize water loss during water stress.

Answer (4)

Sol. Bulliform cells are large, empty, colourless adaxial epidermal cells found along the veins in grass (isobilateral monocot) leaves. When turgid the leaf surface is exposed, but under water stress they become flaccid and make the leaf curl inwards, reducing the exposed surface area and thereby minimising water loss.

NCERT Reference: NCERT Class XI, Ch 6 Anatomy of Flowering Plants, p.77, line ~20: "These are called bulliform cells. When the bulliform cells in the leaves have absorbed water and are turgid, the leaf surface is exposed. When they are flaccid due to water stress, they make the leaves curl inwards to minimise water loss."

100. Identify the correct sequence of steps in each cycle of Polymerase Chain Reaction :
(1) Extension → Annealing → Denaturation
(2) Annealing → Denaturation → Extension
(3) Denaturation → Extension → Annealing
(4) Denaturation → Annealing → Extension

Answer (4)

Sol. Each cycle of PCR has three steps in fixed order: denaturation (separation of double-stranded DNA at high temperature), primer annealing (primers bind complementary regions), and extension of primers by DNA polymerase. This cyclic order amplifies the gene of interest. NCERT Reference:

Ch 9, p.172, line(s) 19 — "Polymerase chain reaction (PCR) : Each cycle has three steps: (i) Denaturation;"

101. Match List I with List II : List-I List-II (Phase of cell cycle) (Activity) A. G1 phase I. Actual cell division occurs B. S phase II. Cell is metabolically active and continuously grows but does not replicate its DNA C. G2 Phase III. Synthesis of DNA occurs and the amount of DNA per cell doubles D. M phase IV. Proteins are synthesized while cell growth continues Choose the correct answer from the options given below :

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

Answer (4)

Sol. In G1 (A) the cell is metabolically active and grows but does not replicate its DNA (II); in S phase (B) DNA is synthesised and the amount of DNA per cell doubles (III); in G2 (C) proteins are synthesised while cell growth continues (IV); and M phase (D) is when actual cell division occurs (I). This matches option (4); the distractors wrongly swap DNA synthesis or actual division across phases.

NCERT Reference: Ch 10, p.121, lines 37-39 — "the cell is metabolically active and continuously grows but does not replicate its DNA"

102. Which of the following statements are correct? A. The Amazon rainforest being cut and cleared for cultivation of soyabeans is an example of habitat loss. B. Steller’s sea cow and passenger pigeon became extinct due to over-exploitation by humans. C. The Nile perch introduced into Lake Victoria in East Africa helped in population growth of cichlid fish in the lake. D. Water hyacinth is an invasive species. E. When a species becomes extinct, the plant and animal species associated with it are not affected. Choose the correct answer from the options given below:

(1) A, B and E only
(2) A, B and D only
(3) C, D and E only
(4) B, C and D only

Answer (2)

Sol. A is correct - clearing the Amazon for soya bean cultivation is the textbook habitat-loss example. B is correct - Steller's sea cow and passenger pigeon went extinct due to over-exploitation. D is correct - water hyacinth (Eicchornia) is a named invasive species. C is wrong - the Nile perch introduced into Lake Victoria caused the extinction of more than 200 cichlid species, it did not aid their growth. E is wrong - co-extinction means associated species ARE affected when a species goes extinct. Hence only A, B and D are correct.

NCERT: NCERT Class XII Biology, Ch 13 Biodiversity and Conservation, p.222, lines 37-40: "The Amazon rain forest ... is being cut and cleared for cultivating soya beans"; p.223, lines 3-5: "Many species extinctions in the last 500 years (Steller's sea cow, passenger pigeon) were due to overexploitation by humans"; p.223, lines 12-14: "The Nile perch introduced into Lake Victoria ... led eventually to the extinction of an ecologically unique assemblage of more than 200 species of cichlid fish"; p.223, lines 22-23: "When a species becomes extinct, the plant and animal species associated with it in an obligatory way also become extinct."

103. Which of the following statements are correct with reference to a transcription unit? A. A transcription unit in DNA is defined primarily by three regions : promoter, structural gene

and terminator. B. The promoter is said to be located towards the 5′-end of the structural gene. C. The promoter is a DNA sequence that provides binding site for RNA polymerase. D. The promoter defines the template and coding strands. E. The terminator is located towards the 3′-end of the coding strand and it defines the end of the process of transcription. Choose the correct answer from the options given below:

(1) A, B, C and D only
(2) A, C, D and E only
(3) B, C, D and E only
(4) A, B, C , D and E

Answer (4)

Sol. Answer: (D) A, B, C, D and E. All five statements are correct: a transcription unit has three regions (promoter, structural gene, terminator); the promoter lies towards the 5'-end of the structural gene, provides the RNA polymerase binding site, and its presence defines the template and coding strands; the terminator lies towards the 3'-end of the coding strand and ends transcription. NCERT Ch 5, p.92, lines 019-026: "The promoter is said to be located towards 5'-end (upstream) of the structural gene... It is a DNA sequence that provides binding site for RNA polymerase, and it is the presence of a promoter in a transcription unit that also defines the template and coding strands... The terminator is located towards 3'-end (downstream) of the coding strand and it usually defines the end of the process of transcription."

104. Which one of the following statements is not true about the universal rules of binomial nomenclature?

(1) Biological names are generally in Latin
(2) Both the words in a biological name, when handwritten, are separately underlined or printed in italics
(3) The specific epithet in the biologial name starts with a small letter
(4) The first word in the biological name represents the specific epithet, while the second component denotes the genus

Answer (4)

Sol. The rule is the reverse: the FIRST word denotes the GENUS and the SECOND word denotes the specific epithet. Option D inverts this, so it is the false statement. A, B and C are all correct rules of binomial nomenclature.

NCERT Reference: Ch 1 The Living World, p.4, lines 42–44 — "The first word in a biological name represents the genus while the second component denotes the specific epithet."

105. Match List I with List II: List-I List-II A. Decomposition I. Accumulation of dark coloured amorphous colloidal substance B. Detritus II. Release of inorganic nutrients by the activity of microbes in soil C. Mineralisation III. Breaking down of complex organic matter into inorganic substances. D. Humification IV. Dead remains of plants and animals including fecal matter Choose the correct answer from the options given below:

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

Answer (2)

Sol. Decomposition = breaking down of complex organic matter into inorganic substances (III); Detritus = dead remains of plants and animals including fecal matter (IV); Mineralisation = release of inorganic nutrients by microbial activity in soil (II); Humification = accumulation of dark coloured amorphous colloidal substance, humus (I). This gives A-III, B-IV, C-II, D-I = option (2), i.e.

(b).

NCERT Reference: Ch 12, p.207 — “down complex organic matter into inorganic substances”

106. Which one of the following is the site for active ribosomal RNA synthesis?
(1) Centrosome
(2) Chromatin
(3) Nucleolus
(4) Kinetochore

Answer (3)

Sol. The nucleolus is a non-membrane-bound spherical structure in the nucleoplasm that is the site for active ribosomal RNA synthesis, with larger and more numerous nucleoli in cells actively making protein. The centrosome and kinetochore are associated with cell division, and chromatin is the nucleoprotein fibre material - none of these is the site of rRNA synthesis.

NCERT Reference: Ch 8, p.100, lines 42-43: "active ribosomal RNA synthesis. Larger and more numerous nucleoli are"

107. 2(C51H98C6) + 145 O2 → 102 CO2 + 98 H2O + energy The Respiratory Quotient (RQ) of a biomolecule used for respiration, as per the above equation would be :
(1) Between 0.5 and 0.95
(2) Less than 0.5
(3) 1.0
(4) Between 1.25 and 2

Answer (1)

Sol. RQ = volume of CO2 evolved / volume of O2 consumed = 102/145 ≈ 0.70. A value of ~0.7 indicates a fat/fatty-acid substrate (here tripalmitin), and 0.70 lies in the range 0.5–0.95. It is not 1.0 (that is carbohydrate), not <0.5, and not 1.25–2 (RQ >1 only for organic acids). This is exactly the tripalmitin example given in NCERT.

NCERT: Ch 12, p.164, line ~63: "When fats are used in respiration, the RQ is less than 1" (RQ = 102/145 = 0.7 for tripalmitin, a fat).

108. Match List I with List II : List-I List-II A. Incomplete dominance I. Human skin colour B. Co-dominance II. Inheritance of flower colour in Antirrhinum sp. C. Pleiotropy III. Phenylketonuria humans D. Polygenic inheritance IV. ABO blood groups disease Choose the correct answer from the options given below :
(1) A-II, B-IV, C-III, D-I
(2) A-I, B-III, C-II, D-IV
(3) A-I, B-IV, C-III, D-II
(4) A-II, B-I, C-III, D-IV

Answer (1)

Sol. Incomplete dominance is exemplified by flower colour inheritance in Antirrhinum (snapdragon) where the heterozygote is intermediate (A-II). Co-dominance is shown by the ABO blood groups where IA and IB both express (B-IV). Pleiotropy, a single gene with multiple effects, is illustrated by phenylketonuria in humans (C-III). Polygenic inheritance is exemplified by human skin colour (D-I). This gives option (1).

NCERT Reference: NCERT Class XII, Ch 4, p.60, lines 8-9: "The inheritance of flower colour in the dog flower (snapdragon or Antirrhinum sp.) is a good example to understand incomplete dominance." (See also p.69 lines 27-31 for pleiotropy/phenylketonuria and p.61 lines 15-17 for

co-dominance/ABO.)

109. Arrange the following steps of DNA fingerprinting in a correct sequence. A. Isolation of DNA and its digestion by restriction endonucleases. B. Hybridisation using a labelled VNTR probe. C. Transferring of separated DNA fragments to synthetic membranes. D. Detection of hybridised DNA fragments by autoradiography. E. Separation of DNA fragments by electrophoresis. Choose the correct answer from the options given below :

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

Answer (3)

Sol. Answer: (C) A, E, C, B, D. The correct order is: isolation and digestion of DNA (A), separation of fragments by electrophoresis (E), transfer (blotting) to synthetic membranes (C), hybridisation using labelled VNTR probe (B), and detection by autoradiography (D). NCERT Ch 5, p.106, lines 023-029: "(i) isolation of DNA, (ii) digestion of DNA by restriction endonucleases, (iii) separation of DNA fragments by electrophoresis, (iv) transferring (blotting) of separated DNA fragments to synthetic membranes... (v) hybridisation using labelled VNTR probe, and (vi) detection of hybridised DNA fragments by autoradiography."

110. A. Isolation of DNA and its digestion by restriction endonuclease. B. Probes made complementary to the VNTR locus are allowed to hybridise with the DNA fragments. C. The separated DNA fragments are transferred to synthetic membranes made of nylon or nitrocellulose. D. Finally, the hybridised DNA fragments are detected under X-rays in a technique called autoradiography. E. DNA fragments are separated based on their size by the technique of gel electrophoresis. Which of the following statements are correct with reference to packaging of DNA helix ? A. Histones are organized to form a unit of eight molecules called histone octamer. B. Histones are negatively charged basic proteins. C. Histones are rich in the basic amino acid residues - lysine and arginine. D. The positively charged DNA is wrapped around the histone octamer to form nucleosome. E. The packaging of chromatin at higher levels requires an additional set of proteins called non-histone chromosomal proteins. Choose the correct answer from the options given below :

(1) A, C and E only
(2) B, D and E only
(3) C, D and E only
(4) A, B and D only

Answer (1)

Sol. Answer: (A) A, C and E only. A, C and E are correct (histone octamer of eight molecules; histones rich in lysine and arginine; higher-level packaging needs NHC proteins). B is wrong because histones are POSITIVELY charged basic proteins, and D is wrong because the NEGATIVELY charged DNA (not positively charged) is wrapped around the histone octamer. NCERT Ch 5, p.83, lines 027-037: "There is a set of positively charged, basic proteins called histones... Histones are rich in the basic amino acid residues lysine and arginine... Histones are organised to form a unit of eight molecules called histone octamer. The negatively charged DNA is wrapped around the positively charged histone octamer to form a structure called nucleosome"; p.84, line 003: "Non-histone Chromosomal (NHC) proteins."

111. Find the incorrect statement(s) about photosynthesis from the following: A. The water splitting complex is associated with PS I. B. C4 plants use the C3 pathway of CO_2 fixation as the main biosynthetic pathway. C. In C4 plants, photorespiration does not occur. D. C3 plants exhibit ‘Kranz' anatomy. E. ATP synthesis in chloroplast occurs through chemiosmosis.

Choose the answer from the options given below:

(1) B and C only
(2) B only
(3) B and E only
(4) A and D only

Answer (4)

Sol. Statement A is incorrect: the water-splitting (oxygen-evolving) complex is associated with PS II, not PS I. Statement D is incorrect: it is C4 plants, not C3 plants, that exhibit 'Kranz' anatomy. Statements B (C4 plants use the C3/Calvin pathway as the main biosynthetic pathway), C (no photorespiration in C4 plants) and E (chloroplast ATP synthesis by chemiosmosis) are all correct. So the incorrect statements are A and D only.

NCERT: Class 11 Ch 11, p.139 [139:049]: "We need to emphasise here that the water splitting complex is associated"

112. Arrange the following steps of somatic hybridisation in the correct sequence.
A. Digestion of cell walls.
B. Isolation of naked protoplasts.
C. Fusion of protoplasts to get hybrid protoplast.
D. Isolation of single cells from two different varieties of plants.
E. Growing of hybrid protoplast to form a new plant.
Choose the correct answer from the options given below:

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

Answer (1)

Sol. Principle: In somatic hybridisation, protoplasts from two different plant varieties are fused and regenerated into a new hybrid plant. The logical order follows the actual laboratory procedure:

D. First, isolate single cells from two different varieties of plants (each with a desirable trait).
A. Digest their cell walls (using enzymes like cellulase and pectinase).
B. This yields naked protoplasts (bounded only by the plasma membrane).
C. Fuse the two protoplasts to obtain a hybrid protoplast.
E. Grow the hybrid protoplast to regenerate a whole new (somatic hybrid) plant.

So the correct sequence is D, A, B, C, E → option 1.

113. Match List-I with List-II : List-I List-II A. Conjunctive tissue I. Specialised cells in the vicinity of guard cells B. Casparian strips II. Endodermal cells rich in starch C. Subsidiary cells III. Tissue phloem D. Starch sheath IV. Endodermal cells with suberin deposition between xylem and Choose the correct answer from the options given below :

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

Answer (3)

Sol. Progestasert is a hormone releasing IUD (A-iii); Multiload 375 is a copper releasing IUD (B-iv); the diaphragm is a barrier made of rubber used by females (C-i); and Saheli is an oral (once-a-week) contraceptive for females (D-ii).

NCERT Reference: Reproductive Health, p.44 — "copper releasing IUDs (CuT, Cu7, Multiload 375) and the hormone releasing IUDs (Progestasert, LNG-20)"

114. Which one of the following is not a characteristic of plant cells in the phase of elongation?

(1) New cell wall deposition
(2) Cell enlargement
(3) Increased vacuolation
(4) Large conspicuous nuclei

Answer (4)

Sol. In the elongation phase the characteristics are increased vacuolation, cell enlargement and new cell wall deposition. Large conspicuous nuclei (along with protoplasm-rich cells) are features of the meristematic phase, not the elongation phase, so it is the exception.

NCERT: Ch 13, p.169, line ~3: "Increased vacuolation, cell enlargement and new cell wall deposition are the characteristics".

115. Match List-I with List-II List-I List-II (Growth Regulator) (Function/Effect) A. 2,4-D I. Brewing industry B. GA3 II. Stimulation of stomatal closure C. Kinetin III. Herbicide D. ABA IV. Nutrient mobilisation Choose the correct answer from the options given below :

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

Answer (1)

Sol. 2,4-D is a synthetic auxin widely used as a herbicide (III); GA3 speeds up the malting process in the brewing industry (I); Kinetin (a cytokinin) promotes nutrient mobilisation (IV); ABA stimulates stomatal closure (II). Only option A pairs all four correctly.

NCERT: Ch 13, p.176, line ~36: "GA3 is used to speed up the malting process in brewing industry".

116. List-I List-II (Growth Regulator) (Function/Effect) A. 2,4-D (Auxin) III. Herbicide B. GA3 (Gibberellic Acid) I. Brewing industry C. Kinetin (Cytokinin) IV. Nutrient mobilisation D. ABA (Abscisic Acid) II. Stimulation of stomatal closure The enzyme required for carboxylation in the Calvin cycle is

(1) Hexokinase
(2) PEP carboxylase
(3) RuBP carboxylase - oxygenase
(4) Carboxypeptidase

Answer (3)

Sol. The carboxylation step of the Calvin cycle is catalysed by RuBP carboxylase, more correctly called RuBP carboxylase-oxygenase (RuBisCO), which fixes CO_2 onto RuBP to form two molecules of 3-PGA. PEP carboxylase is the C4 mesophyll carboxylation enzyme, so it is a distractor. Hence the answer is RuBP carboxylase-oxygenase.

NCERT: Class 11 Ch 11, p.143 [143:041]: "or RuBisCO."

117. How many ATP and NADPH molecules are required to make one molecule of glucose through the Calvin pathway?

(1) 18 ATP and 12 NADPH

(2) 12 ATP and 18 NADPH
(3) 24 ATP and 18 NADPH
(4) 6 ATP and 12 NADPH

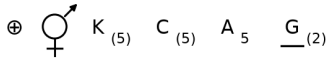
Answer (1)

Sol. Each turn of the Calvin cycle fixes one CO2 and uses 3 ATP and 2 NADPH. Making one glucose needs fixation of six CO2 (6 turns), so 6 x 3 = 18 ATP and 6 x 2 = 12 NADPH are required. NCERT's 'In/Out' table confirms 18 ATP and 12 NADPH per glucose.

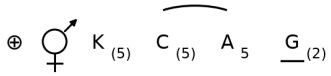
NCERT: Class 11 Ch 11, p.145 [145:016]: "18 ATP"

118. Which of the following floral formula is the correct floral formula of the Solanaceae family?

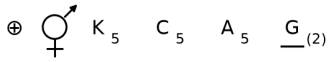
(1) ⊕ ♀♂ $K_{(5)}\ C_{(5)}\ A_5\ \underline{G}_{(2)}$ (united sepals & petals, stamens free, superior ovary; no epipetaly)



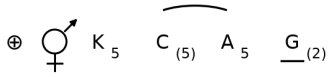
(2) ⊕ ♀♂ $K_{(5)}\ C_{(5)}\ A_5\ \underline{G}_{(2)}$ with epipetalous stamens (arc over C and A); superior ovary



(3) ⊕ ♀♂ $K_5\ C_5\ A_5\ \underline{G}_{(2)}$ (all whorls free; no epipetaly)



(4) ⊕ ♀♂ $K_5\ C_{(5)}\ A_5\ \underline{G}_{(2)}$ epipetalous but sepals free



Answer (2)

Sol. The Solanaceae flower is actinomorphic and bisexual with five united sepals and five united petals, five epipetalous stamens, and a bicarpellary syncarpous superior ovary, giving the floral formula ⊕ K(5) C(5) A5 G(2). The option showing this actinomorphic, gamosepalous and gamopetalous (fused) pentamerous formula with epipetalous stamens is the correct one (option 2 = B).

NCERT Reference: Ch 5, p.69, line(s) 5-10 — "Flower: bisexual, actinomorphic"

119. Which of the following is an in situ conservation method?

(1) Sacred Groves
(2) Wildlife Safari Parks
(3) Botanical Gardens
(4) Seed Banks

Answer (1)

Sol. Sacred groves are tracts of forest given total protection within their natural habitat, making them an in situ (on-site) conservation method. Wildlife safari parks (2) and botanical gardens (3) house species removed from their natural habitats, and seed banks (4) store seeds off-site, so all three are ex situ methods.

NCERT: NCERT Class XII Biology, Ch 13 Biodiversity and Conservation, p.225, lines 9-11: "tracts of forest were set aside, and all the trees and wildlife within were venerated and given total

protection. Such sacred groves are found in Khasi and Jaintia Hills..." (under the In situ conservation heading); contrast p.225, lines 16-19: "Ex situ Conservation ... Zoological parks, botanical gardens and wildlife safari parks serve this purpose."

120. Which of the following statements are not true regarding restriction endonucleases? A. They are called molecular scissors. B. These are the enzymes responsible for restricting the growth of bacteriophages in E. coli. C. They cut the DNA only at the centre of the palindromic sites. D. They remove nucleotides only from the ends of DNA fragments. E. They recognise specific palindromic base-pair sequences. Choose the answer from the options given below :

(1) A and B only
(2) A and E only
(3) D and E only
(4) C and D only

Answer (4)

Sol. The statements NOT true are C and D. Restriction endonucleases cut DNA a little away from the centre of the palindromic site (not exactly at the centre), so C is false; removing nucleotides only from the ends of DNA is the property of exonucleases, not restriction (endo)nucleases, so D is false. Statements A (molecular scissors), B (restrict bacteriophage growth in E. coli) and E (recognise palindromic sequences) are all true. The given key 'D' corresponds to option (4). NCERT Reference: Ch 9, p.167, line(s) 8 — "Restriction enzymes cut the strand of DNA a little away from the centre"

121. In racemose inflorescence, _____.

(1) The main axis terminates in a flower
(2) Flowers are solitary
(3) The growth is limited
(4) Flowers are borne in an acropetal succession

Answer (4)

Sol. In a racemose inflorescence the main axis continues to grow and does not terminate in a flower; the flowers are borne laterally in an acropetal succession (oldest at the base, youngest near the growing tip). Termination of the main axis in a flower and limited growth are features of the cymose type. Hence the correct statement is that flowers are borne in acropetal succession (option 4 = D).

NCERT Reference: Ch 5, p.61, line(s) 37-40 — "In racemose type of inflorescences the main axis continues to grow, the flowers are borne laterally in an acropetal succession"

122. Arrange the following in the correct developmental sequence related to microsporogenesis : A. Microspore tetrads B. Sporogenous tissue C. Pollen grains D. Pollen mother cells Choose the correct answer from the options given below :

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

Answer (2)

Sol. Answer: B (option 2: B, D, A, C). The sequence of microsporogenesis begins with the compactly arranged sporogenous tissue (B) at the centre of the young microsporangium. Its cells act as pollen mother cells / microspore mother cells (D), which undergo meiosis to form clusters of four cells, the microspore tetrads (A). As the anther matures the microspores dissociate and mature into pollen grains (C). Hence the order is B → D → A → C. NCERT: Ch 1, p.6, lines 3-9 — "As each cell of the sporogenous tissue is capable of giving rise to a microspore tetrad. Each one is a

potential pollen or microspore mother cell. The process of formation of microspores from a pollen mother cell (PMC) through meiosis is called microsporogenesis... As the anthers mature and dehydrate, the microspores dissociate from each other and develop into pollen grains."

123. Identify the correct statements about biomolecules. A. Lipids are generally water soluble. B. Proteins are polypeptides. C. Polysaccharides are long chains of sugars. D. Adenine and guanine are substituted pyrimidines. E. Almost all enzymes are proteins. Choose the correct answer from the options given below :

(1) B, D and E only
(2) B, C and E only
(3) A, B and C only
(4) C, D and E only

Answer (2)

Sol. Statement A is wrong because NCERT states lipids are generally water insoluble, not soluble. Statement D is wrong because adenine and guanine are substituted purines, not pyrimidines. Statements B (proteins are polypeptides), C (polysaccharides are long chains of sugars) and E (almost all enzymes are proteins) are all directly stated in NCERT, so B, C and E only are correct.

NCERT Reference: Ch 9, p.111, line ~21 — "Adenine and Guanine are substituted purines while the rest are substituted pyrimidines."

124. Which of the following statements are true with reference to the sex-determination in honeybees? A. An offspring formed from the union of a sperm and an egg, develops as a female (queen or worker). B. An unfertilized egg develops as a male by parthenogenesis. C. A male has half the number of chromosomes than that of a female. D. Males produce sperms by meiosis. E. Honeybees have a haplodiploid sex-determination system. Choose the correct answer from the options given below :

(1) A, B, C and E only
(2) B, C, D and E only
(3) A, B, C and D only
(4) A, B, D and E only

Answer (1)

Sol. In honeybees an offspring from the union of a sperm and egg develops as a diploid female (queen or worker) (A), an unfertilised egg develops into a haploid male by parthenogenesis (B), the male has half the chromosome number of the female (16 vs 32) (C), and this is a haplodiploid sex-determination system (E). Statement D is false because haploid males produce sperms by mitosis, not meiosis. Hence A, B, C and E only are correct.

NCERT Reference: NCERT Class XII, Ch 4, p.71, lines 33-44: "An offspring formed from the union of a sperm and an egg develops as a female (queen or worker), and an unfertilised egg develops as a male (drone) by means of parthenogenesis ... The females are diploid having 32 chromosomes and males are haploid, i.e., having 16 chromosomes. This is called as haplodiploid sex-determination system ... the males produce sperms by mitosis"

125. Heterophyllous development in response to environment is an example of which of the following phenomena?

(1) Redifferentiation
(2) Elasticity
(3) Dedifferentiation
(4) Plasticity

Answer (4)

Sol. Plants following different developmental pathways in response to environment is called plasticity; heterophyllous development (e.g., different leaf shapes in air vs water in buttercup) is its classic example. Dedifferentiation/Redifferentiation refer to cells regaining/losing division capacity, and elasticity is not a developmental term here.

NCERT: Ch 13, p.173, line ~9: "heterophyllous development due to environment ... This phenomenon of heterophylly is an example of plasticity".

126. Which of the following statements are correct regarding amino acids? A. They are substituted methanes. B. Serine is an aromatic amino acid. C. Valine is a neutral amino acid. D. Lysine is an acidic amino acid. Choose the correct answer from the options given below:

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

Answer (3)

Sol. Statement A is correct because amino acids have four substituent groups on the alpha-carbon and are described by NCERT as substituted methanes. Statement C is correct because valine is classified as a neutral amino acid. Statement B is wrong since serine has a hydroxy-methyl R group (alcoholic, not aromatic), and Statement D is wrong since lysine is a basic amino acid, not acidic — so A and C only.

NCERT Reference: Ch 9, p.106, line ~8 — "there are acidic (e.g., glutamic acid), basic (lysine) and neutral (valine) amino acids."

127. “The Evil Quartet” of biodiversity loss includes which of the following?

(1) Over-exploitation; Alien species invasions; Air pollution; Co-extinctions
(2) Habitat loss and fragmentation; Air pollution; Water pollution; Co-extinctions
(3) Habitat loss and fragmentation; over-exploitation; Alien species invasions; Co-extinctions
(4) Over-exploitation; Alien species invasions; Soil pollution; Co-extinctions

Answer (3)

Sol. The Evil Quartet of biodiversity loss comprises exactly four human-driven causes: habitat loss and fragmentation, over-exploitation, alien species invasions, and co-extinctions. Options (1), (2) and (4) wrongly include pollution categories (air, water, soil) that are not part of the Evil Quartet, so only (3) lists all four correct causes.

NCERT: NCERT Class XII Biology, Ch 13 Biodiversity and Conservation, p.222, lines 28-31 and continuing: "There are four major causes ('The Evil Quartet'...). (i) Habitat loss and fragmentation"; p.222, line 48: "Over-exploitation"; p.223, line 9: "Alien species invasions"; p.223, line 22: "Co-extinctions".

128. Match List-I with List-II: List-I (Process) List-II (Location) A. Glycolysis I. Inner mitochondrial membrane B. ETS II. Mitochondrial matrix C. Accumulation of protons III. Cytoplasm D. Krebs' cycle IV. Intermembrane space Choose the correct answer from the options given below:

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

Answer (3)

Sol. A. Glycolysis occurs in the cytoplasm (III). B. The ETS is located on the inner mitochondrial membrane (I). C. Accumulation of protons builds the gradient in the intermembrane space (IV). D. Krebs' cycle operates in the mitochondrial matrix (II). This gives A-III, B-I, C-IV, D-II.

NCERT: Ch 12, p.159, line ~72: "present in the inner mitochondrial membrane".

129. Which one of the following is a triploid cell?

(1) Synergid
(2) Central cell
(3) Zygote
(4) Primary endosperm cell

Answer (4)

Sol. Answer: D. During double fertilisation, one male gamete fuses with the egg (syngamy) to give the diploid (2n) zygote, while the second male gamete fuses with the two polar nuclei of the central cell (triple fusion) to give the triploid (3n) primary endosperm nucleus, after which the central cell becomes the triploid primary endosperm cell. The synergid is haploid and the zygote is diploid, so the only triploid cell among the options is the primary endosperm cell. NCERT: Ch 1, p.17, lines 19-25 — "The other male gamete moves towards the two polar nuclei located in the central cell and fuses with them to produce a triploid primary endosperm nucleus (PEN)... The central cell after triple fusion becomes the primary endosperm cell (PEC) and develops into the endosperm..."

130. Which one of the following types of pollination brings genetically different types of pollen grains to the stigma?

(1) Autogamy
(2) Xenogamy
(3) Geitonogamy
(4) Cleistogamy

Answer (2)

Sol. Answer: B. Xenogamy is the transfer of pollen grains from the anther to the stigma of a different plant, and it is the only kind of pollination that brings genetically different types of pollen to the stigma. Autogamy (within the same flower) and geitonogamy (another flower of the same plant) are genetically equivalent to self-pollination, and cleistogamy is invariably autogamous — none of these introduce genetically different pollen. NCERT: Ch 1, p.12, lines 43-48 — "Xenogamy – Transfer of pollen grains from anther to the stigma of a different plant... This is the only type of pollination which during pollination brings genetically different types of pollen grains to the stigma."

131. Match List I with List II : List I List II (Placentation) (Example) A. Marginal I. Mustard B. Axile II. Pea C. Parietal III. Marigold D. Basal IV. Lemon Choose the correct answer from the options given below :

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

Answer (1)

Sol. Marginal placentation (placenta along the ventral suture, two rows of ovules) occurs in Pea; axile placentation (ovules on a central axis of a multilocular ovary) occurs in lemon; parietal placentation (ovules on the inner wall of a one-chambered ovary with a false septum) occurs in mustard; and basal placentation (a single ovule at the ovary base) occurs in marigold. So A-II, B-IV, C-I, D-III, which is option (1) = A.

NCERT Reference: Ch 5, p.65, line(s) 27-39 — "In marginal placentation the placenta forms a ridge along the ventral suture of the ovary and the ovules are borne on this ridge forming two rows, as in pea"

132. The main criteria used for Five Kingdom Classification proposed By R.H. Whittaker (1969) included : A. Cell structure B. Body organization C. Presence of flagellum D. Reproduction E. Phylogenetic relationships Choose the correct answer from the options given below :

(1) A, B, C, D and E
(2) B, C and D only
(3) A, B, D and E only
(4) A, B and E only

Answer (3)

Sol. Whittaker's main criteria were cell structure, body organisation, mode of nutrition, reproduction and phylogenetic relationships. Among the listed options, A (cell structure), B (body organisation), D (reproduction) and E (phylogenetic relationships) are correct; C (presence of flagellum) was NOT a criterion, so it is excluded.

NCERT Reference: NCERT Class XI, Biological Classification, p.11, lines 20-22 — "the main criteria for classification used by him include cell structure, body organisation, mode of nutrition, reproduction and phylogenetic relationships"

133. Match List I with List II : List I List II A. Trypsin I. Intercellular ground substance B. Morphine II. Lectin C. Concanavalin A III. Enzyme D. Collagen IV. Alkaloid Choose the correct answer from the options given below :

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

Answer (1)

Sol. Trypsin is listed in NCERT Table 9.5 as an enzyme (A–III). Morphine is an alkaloid, a secondary metabolite in Table 9.3 (B–IV). Concanavalin A is the example given for lectins in Table 9.3 (C–II). Collagen is listed in Table 9.5 as the intercellular ground substance, and the text confirms it is the most abundant protein in the animal world (D–I). This matching uniquely fits option A.

NCERT Reference: Ch 9, p.110, line ~27 — "Collagen is the most abundant protein in animal world" (with Table 9.5, p.109: Collagen — Intercellular ground substance, Trypsin — Enzyme)

134. Trypsin is a proteolytic enzyme. • Morphine is a secondary metabolite that belongs to the category of alkaloid. • Concanavalin A is a lectin. • Collagen acts as an intercellular ground substance. Which of the following statements are correct with respect to DNA separation, isolation and visualization? A. The cutting of DNA is done by molecular scissors. B. The DNA fragments separate according to their size in an agarose gel, upon electrophoresis. C. The separated DNA fragments can be seen without staining when exposed to UV light. D. The separated DNA fragments, when stained with ethidium bromide, can be seen in visible light. Choose the correct answer from the options given below :

(1) B and D only
(2) A and B only
(3) B and C only

(4) A and D only

Answer (2)

Sol. Answer: (Option 1) B and D only

Solution: B is correct — DNA fragments separate by size in an agarose gel on electrophoresis. D is correct — fragments stained with ethidium bromide can be seen (as orange bands) under UV/visible light. A is wrong as stated because the cutting/molecular-scissors step concerns restriction digestion, not the separation-isolation-visualization process being asked. C is wrong — separated DNA cannot be seen WITHOUT staining; visualization requires ethidium bromide staining followed by UV exposure. Hence only B and D are correct.

NCERT Reference: Ch 9, p.168, line(s) 17-22 — "The separated DNA fragments can be visualised only after staining the DNA with a compound known as ethidium bromide followed by exposure to UV radiation (you cannot see pure DNA fragments in the visible light and"

135. Which one of the following disorders is caused by the substitution of Glutamic acid (Glu) by Valine (Val) at the sixth position of the beta globin chain of the haemoglobin molecule?

(1) Thalassemia
(2) Sickle-cell anaemia
(3) Phenylketonuria
(4) Haemophilia

Answer (2)

Sol. Sickle-cell anaemia is caused by the substitution of the amino acid Glutamic acid (Glu) by Valine (Val) at the sixth position of the beta globin chain of haemoglobin. This single amino acid change results from a point mutation and alters the haemoglobin molecule. Thalassemia, phenylketonuria and haemophilia have different molecular bases.

NCERT Reference: NCERT Class XII, Ch 4, p.75, lines 3-4: "(Glu) by Valine (Val) at the sixth position of the beta globin chain of the" (continuation of "The defect is caused by the substitution of Glutamic acid" on p.74, line 27)

136. Match List I with List II: List-I List-II A. Cortisol I. Stimulates the formation of alveoli in mammary glands B. Aldosterone II. Produces reactions C. Cholecystokinin III. Stimulates reabsorption of Na+ and water from renal tubule D. Progesterone IV. Stimulates secretion of pancreatic enzymes and bile juice anti-inflammatory Choose the correct answer from the options given below:

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

Answer (3)

Sol. Nicotine (A) stimulates the adrenal gland to release catecholamines (adrenaline/nor-adrenaline) into the blood → II. Morphine (B) is a very effective sedative and painkiller → III. Heroin (C) is a depressant that slows down body functions → IV. Cocaine (D) has a potent stimulating action producing a sense of euphoria and increased energy → I.
Why not the others: The other options misassign morphine and heroin (morphine = painkiller/sedative III, NOT depressant) or swap cocaine and nicotine, so only A–II, B–III, C–IV, D–I is

fully consistent with NCERT.

NCERT Reference: NCERT Ch7, p.143-144 (heroin p.143 l.3-4; cocaine p.143 l.18-21; morphine p.143 l.30; nicotine p.144 l.6-7): "heroin is a depressant and slows down body functions"

137. • Cortisol produces anti-inflammatory reactions and suppresses the immune response. • Aldosterone acts mainly at the renal tubules and stimulates the reabsorption of Na + and water and excretion of K+ and phosphate ions. • Cholecystokinin (CCK) acts on both pancreas and gall bladder and stimulates the secretion of pancreatic enzymes and bile juice, respectively. • Progesterone acts on the mammary glands and stimulates the formation of alveoli. Arrange the following events occuring in Renin-Angiotensin mechanism in the correct order: A. Increase in blood pressure and Glomerular filtration rate B. Reabsorption of Na+ and water from distal parts of tubule due to Aldosterone C. Fall in Glomerular filtration rate D. Vasoconstriction by Angiotensin II and release of Aldosterone. E. Renin converts Angiotensinogen into Angiotensin I, followed by Angiotensin II. Choose the correct answer from the options given below:

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

Answer (4)

Sol. The Renin-Angiotensin mechanism is triggered by a fall in glomerular blood pressure/GFR (C), which activates JG cells to release renin that converts angiotensinogen to angiotensin I and then angiotensin II (E). Angiotensin II, a powerful vasoconstrictor, raises glomerular pressure and activates the adrenal cortex to release aldosterone (D). Aldosterone then causes reabsorption of Na+ and water from the distal parts of the tubule (B), which leads to an increase in blood pressure and GFR (A). Correct order: C → E → D → B → A.

NCERT Reference: Ch 16, p.212, line(s) 23-32 — "renin which converts angiotensinogen in blood to angiotensin I and further to angiotensin II"

138. In humans, respiration occurs in the following steps. Arrange these steps in the correct order. A. Diffusion of O2 and CO2 between blood and tissues B. Diffusion of O2 and CO2 across alveolar membrane C. Pulmonary ventilation by which atmospheric air is drawn in and CO 2 rich alveolar air is released out D. Cellular respiration E. Transport of gases by the blood Choose the correct answer from the options given below

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

Answer (3)

Sol. NCERT lists respiration steps in order: (i) pulmonary ventilation drawing in air [C], (ii) diffusion of gases across the alveolar membrane [B], (iii) transport of gases by the blood [E], (iv) diffusion of O2 and CO2 between blood and tissues [A], and (v) utilisation of O2 by cells, i.e., cellular respiration [D]. This gives the order C, B, E, A, D.

NCERT: Ch 14, p.185, line 21 — "Breathing or pulmonary ventilation by which atmospheric air is drawn in"

139. Utilisation of O2 by the cells for catabolic reactions and resultant release of CO 2 The following are the stages of life cycle of Plasmodium. Arrange the stages in the proper order. A. The parasites reproduce asexually in RBCs, bursting the cells. B. The parasites reproduce

asexually in liver cells, bursting the cells and releasing into blood. C. Gametocytes develop in RBCs. D. Sporozoites reach the liver through the blood. E. Female mosquito injects sporozoites into humans during bite. Choose the correct answer from the options given below:

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

Answer (1)

Sol. The correct life-cycle order is: E — infected female (Anopheles) mosquito injects sporozoites into humans during the bite; D — the sporozoites reach the liver through the blood; B — the parasites multiply asexually in liver cells, bursting them and releasing into blood; A — the parasites then multiply asexually in RBCs, bursting the cells (releasing toxic haemozoin → chill and fever); C — finally gametocytes develop in the RBCs (to be picked up by the next mosquito).
NCERT: Plasmodium enters as sporozoites through the mosquito bite, multiplies first in liver cells, then attacks the RBCs causing their rupture.
Why not the others: Sequences beginning with A, B or C are wrong because the cycle in humans must begin with the mosquito injecting sporozoites (E); liver-stage multiplication (B) must precede RBC-stage multiplication (A); and gametocyte formation (C) is the last human-stage event.

NCERT Reference: NCERT Ch7, p.131, lines 34-42: "The parasites initially multiply within the liver cells and then attack the red blood cells"

140. When a female Anopheles mosquito bites an infected person, these parasites enter the mosquito's body and undergo further development. Insertion of a foreign DNA at BamHI site in an E.coli cloning vector pBR322 results in the loss of antibiotic resistance towards:

(1) Ampicillin and tetracycline
(2) Ampicillin
(3) Tetracycline
(4) Gentamycin

Answer (3)

Sol. In pBR322 the BamHI site lies within the tetracycline resistance gene. Insertion of foreign DNA at this site disrupts (inactivates) the tetracycline resistance gene, so the recombinant plasmids lose tetracycline resistance while still retaining ampicillin resistance (used for selection). Gentamycin is not a marker on pBR322.
NCERT Reference: Ch 9, p.169, line(s) 39-43 — "you can ligate a foreign DNA at the BamH I site of tetracycline resistance gene in the vector pBR322. The recombinant plasmids will lose tetracycline resistance due to insertion of foreign DNA"

141. The following reaction depicts the activity of a particular class of enzymes : Identify the enzymes class 'E' from the following options :

(1) Transferases
(2) Isomerases
(3) Lyases
(4) Ligases

Answer (3)

Sol. The figure shows a substrate X−C−C−Y losing the groups X and Y (as X−Y) to leave a C=C double bond, without using water. NCERT defines lyases as enzymes that catalyse removal of groups from substrates by mechanisms other than hydrolysis, leaving double bonds — exactly this reaction. Transferases transfer groups, isomerases rearrange isomers, and ligases join molecules, so none of those match.

NCERT Reference: Ch 9, p.117, line ~34 — "Lyases: Enzymes that catalyse removal of groups from substrates by mechanisms other than hydrolysis leaving double bonds."

142. • Transferases are the enzymes that catalyse a transfer of a group between a pair of substrates. • Isomerases catalyse inter-conversion of optical, geometric or positional isomers. • Ligases catalyse the linking together of 2 compounds. The specific receptors for neurotransmitters in a synapse are present on _____.

(1) Schwann cell
(2) Pre-synaptic membrane
(3) Myelin sheath
(4) Post-synaptic membrane

Answer (4)

Sol. When an impulse reaches the axon terminal, synaptic vesicles fuse with the membrane and release neurotransmitters into the synaptic cleft. These neurotransmitters then bind to their specific receptors present on the post-synaptic membrane, opening ion channels and generating a new potential. Thus the specific neurotransmitter receptors are located on the post-synaptic membrane.

NCERT Reference: Ch 18, p.235, lines 03-05 — "released neurotransmitters bind to their specific receptors, present on the post-synaptic membrane"

143. What is the probability of having children with 'O' blood group, where both mother and father are heterozygous for 'A' and 'B' blood group, respectively?

(1) 25%
(2) 0%
(3) 75%
(4) 50%

Answer (1)

Sol. A parent heterozygous for A blood group has genotype IAi and one heterozygous for B has IBi. Crossing IAi x IBi yields offspring in the ratio 1 IAIB (AB) : 1 IAi (A) : 1 IBi (B) : 1 ii (O). The ii (O blood group) class is 1 in 4, so the probability of an O-group child is 25%.

NCERT Reference: NCERT Class XII, Ch 4, p.61, lines 20-25: "The gene (I) has three alleles IA, IB and i ... allele i does not produce any sugar ... IA and IB are completely dominant over i" (so ii genotype gives O group; see Table 4.2, p.61 lines 67-70: "i i ... O").

144. Match List-I with List-II. List-I List-II (Respiratory Volume) (Capacity in mL) A. ERV (Expiratory Reserve Volume) I. 2500 – 3000 mL B. RV (Residual Volume) II. 500 mL C. IRV (Inspiratory Reserve Volume) III. 1000 – 1100 mL D TV (Tidal Volume) IV. 1100 – 1200 mL Choose the correct answer from the options given below :

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

Answer (1)

Sol. From NCERT values: ERV averages 1000-1100 mL (III), RV averages 1100-1200 mL (IV), IRV averages 2500-3000 mL (I), and TV is approx. 500 mL (II). This gives A-III, B-IV, C-I, D-II.

NCERT: Ch 14, p.186, line 93 — "This averages 1000 mL to 1100 mL"

145. Which of the following is not an example of convergent evolution?
(1) Flippers of penguins and dolphins
(2) Eyes of octopuses and mammals
(3) Fore limbs of whales and bats
(4) Wings of butterflies and birds

Answer (3)

Sol. NCERT Reference: Ch 6 Evolution, p.114, lines 6–13: "whales, bats, Cheetah and human (all mammals) share similarities in the pattern of bones of forelimbs ... the same structure developed along different directions due to adaptations to different needs. This is divergent evolution and these structures are homologous."

146. Male frogs can be distinguished from female frogs due to the presence of A. Bulging eyes B. Vocal sacs C. Webbed digits in feet D. Copulatory pad on first digit of fore limbs E. Olive green-coloured skin with dark irregular spots Choose the correct answer from the options given below
(1) B and C only
(2) C and E only
(3) A and B only
(4) B and D only

Answer (4)

Sol. Answer: (Option 1) B and D only

Solution: B is correct — DNA fragments separate by size in an agarose gel on electrophoresis. D is correct — fragments stained with ethidium bromide can be seen (as orange bands) under UV/visible light. A is wrong as stated because the cutting/molecular-scissors step concerns restriction digestion, not the separation-isolation-visualization process being asked. C is wrong — separated DNA cannot be seen WITHOUT staining; visualization requires ethidium bromide staining followed by UV exposure. Hence only B and D are correct.

NCERT Reference: Ch 9, p.168, line(s) 17-22 — "The separated DNA fragments can be visualised only after staining the DNA with a compound known as ethidium bromide followed by exposure to UV radiation (you cannot see pure DNA fragments in the visible light and"

147. A group of researchers procured some fish like animals and upon investigation the following characters were observed: A. Endoskeleton was made of cartilage. B. Ectoparasitic; as they were found attached on fish skin with their circular sucking mouth. C. Paired fins and scales were absent, but 7 pairs of gill slits were present. Which of the following species of animals did they consider to fit best with these characters?
(1) Scoliodon sp.
(2) Petromyzon sp.
(3) Exocoetus sp.
(4) Branchiostoma sp.

Answer (2)

Sol. Petromyzon (Lamprey) is a cyclostome with a cartilaginous cranium and vertebral column, a circular sucking jawless mouth, ectoparasitic habit on fishes, no scales or paired fins, and 6-15 pairs of gill slits (here 7). Scoliodon is a chondrichthyan, Exocoetus a bony fish, and Branchiostoma a cephalochordate, so they do not fit.

NCERT Reference: Page 47, line 14-19

148. Match List I with List II with respect to chronology of evolution of life forms List-I List-II A. About 65 mya (I) Jawless fish probably evolved B. About 500 mya (II) The dinosaurs suddenly disappeared from the earth C. About 350 mya (III) Seaweeds and probably existed D About 320 mya (IV) Invertebrates were formed and became active Choose the correct answer from the options given below:

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

Answer (4)

Sol. NCERT Reference: Ch 6 Evolution, p.122, lines 7–9: "By the time of 500 mya, invertebrates were formed and active. Jawless fish probably evolved around 350 mya. Sea weeds and few plants existed probably around 320 mya."

149. Match List I and List II List-I List-II A. Progestasert (I) Barrier made of rubber used by females B. Multiload 375 (II) Oral contraceptive C. Diaphragm (III) Hormone releasing IUD D Saheli (IV) Copper releasing IUD Choose the correct answer from the options given below:

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

Answer (1)

Sol. Progestasert is a hormone releasing IUD (A-iii); Multiload 375 is a copper releasing IUD (B-iv); the diaphragm is a barrier made of rubber used by females (C-i); and Saheli is an oral (once-a-week) contraceptive for females (D-ii).

NCERT Reference: Reproductive Health, p.44 — "copper releasing IUDs (CuT, Cu7, Multiload 375) and the hormone releasing IUDs (Progestasert, LNG-20)"

150. The WBC count of a person's blood sample is 8000/cu mm. How many eosinophils and lymphocytes would be in the same blood sample approximately?

(1) 300 – 500/cu mm and 1200 – 1500/cu mm respectively
(2) 160 – 240/cu mm and 1600 – 2000/cu mm respectively
(3) 300 – 500/cu mm and 500 – 700/cu mm respectively
(4) 100 – 120/cu mm and 160 – 200/cu mm respectively

Answer (2)

Sol. Eosinophils form 2-3 per cent of total WBCs, so 2-3% of 8000 = 160-240/cu mm. Lymphocytes form 20-25 per cent, so 20-25% of 8000 = 1600-2000/cu mm. These values match option B.

NCERT: Ch 15, p.195, line 03 — "Lymphocytes (20-25 per cent) are of two major types"

151. Match List I with List II: List I (Drug) List II (Effect) A. Nicotine I. Causes sense of euphoria and increased energy B. Morphine II. Stimulates adrenal gland to release catecholamines into blood circulation C. Heroin III. Effective sedative and painkiller D. Cocaine IV. A depressant; slows down body function Choose the correct answer from the options given below:

(1) A–III, B–II, C–IV, D–I

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

Answer (3)

Sol. Nicotine (A) stimulates the adrenal gland to release catecholamines (adrenaline/nor-adrenaline) into the blood → II. Morphine (B) is a very effective sedative and painkiller → III. Heroin (C) is a depressant that slows down body functions → IV. Cocaine (D) has a potent stimulating action producing a sense of euphoria and increased energy → I.
Why not the others: The other options misassign morphine and heroin (morphine = painkiller/sedative III, NOT depressant) or swap cocaine and nicotine, so only A–II, B–III, C–IV, D–I is fully consistent with NCERT.

NCERT Reference: NCERT Ch7, p.143-144 (heroin p.143 l.3-4; cocaine p.143 l.18-21; morphine p.143 l.30; nicotine p.144 l.6-7): "heroin is a depressant and slows down body functions"

152. The human protein named α-1-antitrypsin, obtained from transgenic animals, is used for the treatment of _____.
(1) Emphysema
(2) Alzheimer's disease
(3) Rheumatoid arthritis
(4) Cystic fibrosis

Answer (1)

Sol. Transgenic animals can be engineered to produce useful biological products by introducing the gene that codes for a particular human protein. The human protein α-1-antitrypsin so produced is used to treat emphysema. Alzheimer's, rheumatoid arthritis and cystic fibrosis are diseases for which transgenic animals serve only as disease models, not as a source of α-1-antitrypsin therapy.
NCERT Reference: Ch 10, p.184, line 7 — "human protein (α-1-antitrypsin) used to treat emphysema."

153. Select the set of fishes which belong to the class Osteichthyes:
(1) Devil fish, Cuttlefish and Hagfish
(2) Saw fish, Fighting fish and Dog fish
(3) Starfish, Hagfish and Cuttlefish
(4) Flying fish, Angel fish and Fighting fish

Answer (4)

Sol. Osteichthyes are bony fishes; Flying fish (Exocoetus), Angel fish (Pterophyllum) and Fighting fish (Betta) are all NCERT examples of this class. The other options mix in molluscs (Devil fish/Octopus, Cuttlefish), a cyclostome (Hagfish/Myxine), chondrichthyans (Saw fish/Pristis, Dog fish/Scoliodon) and an echinoderm (Starfish).

NCERT Reference: Page 48, line 33-36

154. Select the incorrect statements from the following: A. Digestive system in Platyhelminthes is incomplete. B. Bilateral symmetry is a characteristic feature of adult Echinoderms. C. Pseudocoelom is possessed by Aschelminthes. D. Notochord is persistent throughout life in the class Chondrichthyes. E. Members of class Reptilia maintain a constant body temperature. Choose the answer from the options given below:
(1) A and C only
(2) B and E only
(3) C and D only

(4) B and D only

Answer (2)

Sol. Statement B is wrong because adult echinoderms are radially symmetrical (only the larvae are bilaterally symmetrical), and statement E is wrong because reptiles are poikilotherms (cold-blooded) and cannot maintain a constant body temperature. Statements A, C and D are all correct, so the incorrect set is B and E, option (b).

NCERT Reference: Page 45, line 14-15

155. Non-membrane bound cell organelles found in both prokaryotic and eukaryotic cells are _____.

(1) Ribosomes
(2) Lysosomes
(3) Centrosomes
(4) Mitochondria

Answer (1)

Sol. Ribosomes are non-membrane-bound organelles composed of rRNA and protein, and they occur in BOTH prokaryotic cells (70S) and eukaryotic cells (80S, plus 70S in mitochondria and chloroplasts). Lysosomes, centrosomes and mitochondria are characteristic of eukaryotic cells (and lysosomes/mitochondria are membrane-bound), so they do not fit the 'non-membrane bound, present in both' criterion.

NCERT Reference: Ch 8, p.98, lines 31–34: "They are composed of ribonucleic acid (RNA) and proteins and are not surrounded by any membrane. The eukaryotic ribosomes are 80S while the prokaryotic ribosomes are 70S."

156. Which of the following equations depicts Verhulst-Pearl logistic population growth?

(1) dN K +N = rN . dt K
(2) dN K – N = rN dt K
(3) dN K – N = rN dt N
(4) K dN = rN dt K – N

Answer (2)

Sol. NCERT: Ch 11, p.196, lines 3-6 — "Where
N = Population density at time t
r = Intrinsic rate of natural increase
K = Carrying capacity"

157. • K = Carrying capacity • r • N = Population density at time ‘t’ = Intrinsic rate of natural increase Select the incorrect statement with reference to Rh grouping. A. Erythroblastosis foetalis is a condition observed having foetus with Rh –ve blood and mother with Rh+ve blood. B. Rh antigen is observed on RBCs in the majority of human beings. C. Before blood transfusion, Rh group should also be matched. D. Rh incompatibility is observed when a pregnant mother is Rh–ve and the foetus is Rh+ve. E. Erythroblastosis foetalis can be avoided by administering anti-Rh antibodies to the mother immediately after the delivery of the second child. Choose the answer from the options given below :

(1) C and D only
(2) A and B only
(3) A and E only
(4) B and C only

Answer (3)

Sol. The statements NOT true are C and D. Restriction endonucleases cut DNA a little away from the centre of the palindromic site (not exactly at the centre), so C is false; removing nucleotides only from the ends of DNA is the property of exonucleases, not restriction (endo)nucleases, so D is false. Statements A (molecular scissors), B (restrict bacteriophage growth in E. coli) and E (recognise palindromic sequences) are all true. The given key 'D' corresponds to option (4). NCERT Reference: Ch 9, p.167, line(s) 8 — "Restriction enzymes cut the strand of DNA a little away from the centre"

158. Match List I with List II: List I (Bioactive molecules) List II (Importance) A. Streptokinase I. Immunosuppressive agent B. Statins II. Removal of clots from the blood vessels C. Lipases III. Blood cholesterol-lowering agent D Cyclosporin A IV Detergent formulations Choose the correct answer from the options given below:

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

Answer (4)

Sol. Nicotine (A) stimulates the adrenal gland to release catecholamines (adrenaline/nor-adrenaline) into the blood → II. Morphine (B) is a very effective sedative and painkiller → III. Heroin (C) is a depressant that slows down body functions → IV. Cocaine (D) has a potent stimulating action producing a sense of euphoria and increased energy → I.
Why not the others: The other options misassign morphine and heroin (morphine = painkiller/sedative III, NOT depressant) or swap cocaine and nicotine, so only A–II, B–III, C–IV, D–I is fully consistent with NCERT.

NCERT Reference: NCERT Ch7, p.143-144 (heroin p.143 l.3-4; cocaine p.143 l.18-21; morphine p.143 l.30; nicotine p.144 l.6-7): "heroin is a depressant and slows down body functions"

159. Match List I with List II: List I List II A. Molluscs I. Pulmonary respiration only B. Reptiles II. Branchial respiration C. Adult amphibians III. Cellular respiration D Amoeba IV Pulmonary respiration and cutaneous Choose the correct answer from the options given below:

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

Answer (1)

Sol. Correct Answer (B): A-II, B-I, C-IV, D-III

Starch = storage polysaccharide → energy storage (II). Antibody = immunoglobulin → fights infection (I). Concanavalin A = a plant lectin (IV). Glut-4 = glucose transporter protein → glucose transport (III). So A-II, B-I, C-IV, D-III.

160. The sixth mutant codon of beta globin gene causing polymerization of Haemoglobin and change in RBC shape is _____.

(1) GUG
(2) AUG
(3) GAG
(4) CAG

Answer (1)

Sol. Answer: (A) GUG. In sickle cell anaemia, a single base-pair change in the beta globin gene alters the sixth codon from GAG (glutamate) to GUG (valine), causing polymerization of

haemoglobin and the sickle (changed) RBC shape. NCERT Ch 5, p.97, lines 014-017: "A classical example of point mutation is a change of single base pair in the gene for beta globin chain that results in the change of amino acid residue glutamate to valine. It results into a diseased condition called as sickle cell anemia."

161. Choose the correct statements regarding muscle contraction. A. A motor neuron carries a signal sent by the Central Nervous System (CNS) to the sarcolemma of the muscle fibre. B. The neural signal generates an action potential which causes the release of Ca ++ into sarcoplasm. C. Increase in Ca++ inactivates the actin for breaking cross bridges. D. Actin binds to the myosin head to form a cross bridge. E. Shortening of sarcomere takes place, by pulling actin filaments towards the centre of 'A' band. Choose the correct answer from the options given below :

(1) C and D only
(2) A and B only
(3) C and E only
(4) A, B, D and E only

Answer (4)

Sol. NCERT Ch 17, p.222, line 14: "causes the release of calcium ions into the sarcoplasm. Increase in"

162. Which of the following statements are correct with reference to human endoskeleton? A. Human skull is monocondylic. B. The joint between any two adjoining vertebrae is a cartilaginous joint. C. In human beings, the number of cervical vertebrae is seven. D. All ribs except the last 2 pairs are bicephalic. E. The occipital bone of skull is articulated with atlas vertebra. Choose the correct answer from the options given below:

(1) B and E only
(2) B, C and E only
(3) C, D and E only
(4) A, B and D only

Answer (2)

Sol. Statements A, B and D are correct per NCERT: the erythrocyte (RBC) membrane has approximately 52 per cent protein; the major phospholipids are arranged in a bilayer; and the hydrophobic tails point towards the inner part so the nonpolar tail is protected from the aqueous environment. Statement C is wrong because mesosomes (infoldings of plasma membrane) are a prokaryotic feature, not of eukaryotic cell membranes. Statement E is also out of context here, as NCERT describes glycocalyx as the outermost layer of the prokaryotic cell envelope, not of the eukaryotic plasma membrane.

NCERT Reference: Ch 8, p.93, lines 17-21 and 25-26: "The major lipids are phospholipids that are arranged in a bilayer... the hydrophobic tails towards the inner part. This ensures that the nonpolar tail of saturated hydrocarbons is protected from the aqueous environment... the membrane of the erythrocyte has approximately 52 per cent protein".

163. Spermatogonia undergo a series of cell divisions statements to produce sperms. Select the correct from the following : A. Spermatogonia always undergo meiotic cell division. B. Primary spermatocytes divide mitotically to produce secondary spermatocytes. C. Secondary spermatocytes, through their second meiotic division, produce haploid spermatids. D. Spermatids produce spermatozoa through mitosis. E. Spermatids transform into spermatozoa by spermiogenesis. Choose the correct answer from the options given below:

(1) A and E only
(2) C and E only

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

Answer (2)

Sol. Spermatogonia first multiply by mitosis; some (primary spermatocytes) undergo meiosis, so A (always meiotic) and B (primary spermatocytes divide mitotically) are false. C is true — secondary spermatocytes undergo the second meiotic division to produce haploid spermatids. D is false — spermatids transform into spermatozoa by spermiogenesis, not mitosis, so E is true. Hence only C and E are correct.
NCERT Reference: Ch 2, p.31, line 32 — "spermatocytes undergo the second meiotic"

164. The JGA (Juxta Glomerular Apparatus) is a special sensitive region formed by cellular modifications in _____ related to the same nephron.
(1) Distal convoluted tubule and efferent renal arteriole
(2) Proximal convoluted tubule and efferent renal arteriole
(3) Proximal convoluted tubule and afferent renal arteriole
(4) Distal convoluted tubule and afferent renal arteriole

Answer (4)

Sol. The juxta glomerular apparatus (JGA) is a special sensitive region of the nephron formed by cellular modifications in the distal convoluted tubule and the afferent arteriole at the location of their contact. It is not formed by the PCT or the efferent arteriole. Hence the correct pair is DCT and afferent arteriole.
NCERT Reference: Ch 16, p.209, line(s) 7-10 — "JGA is a special sensitive region formed by cellular modifications in the distal convoluted tubule and the afferent arteriole at the location of their contact."

165. Which one of the following is an appropriate example of sexual deceit?
(1) Female wasp and fig
(2) Ophrys and bumblebee
(3) Sea anemone and clown fish
(4) Cuckoo and crow

Answer (2)

Sol. NCERT: Ch 11, p.202, lines 27-34 — "The Mediterranean orchid Ophrys employs ‘sexual deceit’ to get pollination done by a species of bee. One petal of its flower bears an uncanny resemblance to the female of the bee in size, colour and markings. The male bee is attracted to what it perceives as a female, ‘pseudocopulates’ with the flower, and during that process is dusted with pollen from the flower."

166. Choose the correct statements regarding frog’s anatomy: A. Hepatic portal system is the special venous connection between liver and intestine. B. There are twelve pairs of cranial nerves arising from the brain. C. The ureters and oviducts open separately into the cloaca in female frogs. D. Hind-brain consists of cerebellum, medulla oblongata and optic lobes. E. Sinus venosus joins the right atrium of heart. Choose the correct answer from the options given below:
(1) A, B and C only
(2) B and D only
(3) B and C only
(4) A, C and E only

Answer (4)

Sol. Answer: (D) A, C and E only. A is correct (hepatic portal system links liver and intestine). C is correct (in female frogs the ureters and oviduct open separately into the cloaca). E is correct (the sinus venosus joins the right atrium). B is wrong — frogs have ten (not twelve) pairs of cranial nerves. D is wrong — the optic lobes belong to the mid-brain; the hind-brain consists only of cerebellum and medulla oblongata. NCERT (Class XI, Ch 7 Structural Organisation in Animals): p.82-83, lines 33-35 (portal systems), p.83 lines 3 (female ducts), 22 (ten cranial nerves), 28-30 (midbrain optic lobes; hindbrain cerebellum and medulla) and p.82 line 28 (sinus venosus) — "There are ten pairs of cranial nerves arising from the brain."

167. Match List I with List II related to embryonic development at various months of pregnancy: List-I List-II A. The foetus movement starts and hair appears on the head (I) 24 weeks of pregnancy B. The foetus develops limbs and digits (II) 20 weeks of pregnancy C. The foetus develops external genital organs (III) 8 weeks of pregnancy D. The foetus body is covered with fine hair; eyelids separate and eyelashes are formed (IV) 12 weeks of pregnancy Choose the correct answer from the options given below:

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

Answer (2)

Sol. NCERT timeline: first foetal movements and hair on the head appear in the fifth month, i.e. ~20 weeks (A-II); limbs and digits develop by the end of the second month, i.e. ~8 weeks (B-III); external genital organs are well-developed by the end of 12 weeks (C-IV); the body is covered with fine hair and eyelids separate with eyelashes formed by ~24 weeks (D-I). This matches option B. NCERT Reference: Ch 2, p.38, line 17 — "the head are usually observed during the fifth month. By the end of about"

168. In a population of a grasshopper species, the chromosome number of some members is 23 and some other members possess 24 chromosomes. The 23 and 24 chromosome-bearing members in this species are _____.

(1) females and males, respectively
(2) all males
(3) males and females, respectively
(4) all females

Answer (3)

Sol. Grasshopper shows XO type sex determination: males have only one X chromosome besides the autosomes (an odd total, 23), whereas females have a pair of X chromosomes (an even total, 24). Therefore the members with 23 chromosomes are males and those with 24 chromosomes are females.

NCERT Reference: NCERT Class XII, Ch 4, p.70, lines 27-31: "Grasshopper is an example of XO type of sex determination in which the males have only one X-chromosome besides the autosomes, whereas females have a pair of X-chromosomes."

169. In which animal do haploid cells divide mitotically to produce gametes?

(1) Male honeybees
(2) Male earthworms
(3) Male frogs
(4) Male grasshoppers

Answer (1)

Sol. Principle: Gametes are normally produced by meiosis in diploid organisms. The exception is an organism that is itself haploid — it cannot reduce ploidy further, so it makes gametes by mitosis.

In honeybees, sex is determined by ploidy: females (queen, workers) are diploid, but males (drones) develop from unfertilised eggs and are haploid (haplodiploidy / arrhenotoky). Since the male honeybee is already haploid, its cells cannot undergo meiosis to form gametes — instead the haploid cells divide by MITOSIS to produce sperm. (Females form gametes by meiosis.)

So the answer is male honeybees → option 1.

170. Arrange the following cell layers/structures around the female gamete, from outer to inner side : A. Zona pellucida B. Perivitelline space C. Corona radiata D. Plasma membrane of ovum Choose the correct answer from the options given below :

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

Answer (3)

Sol. From outermost to innermost around the secondary oocyte/ovum: the corona radiata (granulosa cells) lies outside, then the zona pellucida, then the perivitelline space, and finally the plasma membrane of the ovum. So the order is C (corona radiata), A (zona pellucida), B (perivitelline space), D (plasma membrane), i.e. option C.
NCERT Reference: Ch 2, p.33, line 13 — "membrane called zona pellucida"

171. What is the reason behind production of large holes in ‘Swiss Cheese’?

(1) The production of large amount of CO_2 by Propionibacterium sharmanii
(2) The production of large amount of CO_2 by Clostridium butylicum
(3) The production of large amount of CO_2 and H_2 by lactic acid bacteria called Lactobacillus
(4) The production of large amount of CO_2 and H_2 by Trichoderma polysporum

Answer (1)

Sol. The large holes (eyes) characteristic of Swiss cheese are caused by the large amount of CO_2 produced by the bacterium Propionibacterium sharmanii during ripening. The other microbes listed do not produce these holes in Swiss cheese.

NCERT Reference: Ch 8, p.151, line 34 — "production of a large amount of CO_2 by a bacterium named"

172. • Clostridium butylicum is commercially utilised for butyric acid production. • Curd is formed by Lactobacillus. The toxin proteins isolated from Bacillus thuringiensis, coded by which of the following genes would contrl cotton bollworms and corn borer, respectively?

(1) cryIAc and cryIAb
(2) cryIAc and cryIIAb
(3) cryIIAb and cryIAc
(4) cryIAc and cryIIIAb

Answer (1)

Sol. The proteins encoded by the genes cryIAc (and cryIIAb) control the cotton bollworms, while the protein of cryIAb controls corn borer. For cotton bollworm and corn borer respectively, the matching pair is cryIAc and cryIAb = option (a).
NCERT Reference: Ch 10, p.180, line 6 — "encoded by the genes cryIAc and cryIIAb control the

cotton bollworms,"; p.180, line 8 — "that of cryIAb controls corn borer."

173. Ecological pyramids represent the relationship between the organisms at different trophic levels and they are generally inverted for:

(1) Pyramid of number in grassland
(2) Pyramid of energy in pond ecosystem
(3) Pyramid of biomass in grassland
(4) Pyramid of biomass in sea

Answer (4)

Sol. Pyramids are generally upright (producers most abundant), with exceptions. The pyramid of number in grassland, pyramid of energy (always upright), and pyramid of biomass in grassland are all upright. The pyramid of biomass in a sea is generally inverted because the biomass of fishes exceeds that of phytoplankton, so the answer is (d).

NCERT Reference: Ch 12, p.213 — “The pyramid of biomass in sea is generally inverted”

174. Pyramid of number in grassland ecosystem is upright • Pyramid of energy in pond ecosystem is upright • Pyramid of biomass in grassland is upright • Pyramid of biomass in sea is inverted Choose the correct statement regarding GIFT to overcome infertility.

(1) Ova collected from a female donor are transferred to the uterus of an infertile female.
(2) Early embryos with up to 8 blastomeres are transferred to the uterus of an infertile female.
(3) Early embryos with up to 8 blastomeres are transferred into the fallopian tube of an infertile female.
(4) It is the transfer of an ovum collected from a donor into the fallopian tube of another female who cannot produce ovum but can provide suitable envoronment for fertilization and development.

Answer (4)

Sol. GIFT (Gamete Intra Fallopian Transfer) involves transferring an ovum from a donor into the fallopian tube of a female who cannot produce her own ovum but can provide a suitable environment for fertilisation and development. The distractors describe ZIFT/embryo transfer (up to 8 blastomeres into the fallopian tube) and IUT (into the uterus), not GIFT.

NCERT Reference: Reproductive Health, p.48 — "Transfer of an ovum collected from a donor into the fallopian tube (GIFT – gamete intra fallopian transfer) of another female who cannot produce one, but can provide suitable environment for fertilisation and further development"

175. Choose the correct statements regarding cell organelles and their inclusions. A. The endomembrane system includes Golgi complex, endoplasmic reticulum and mitochondria. B. Rough endoplasmic reticulum bears ribosomes on its surface. C. Both mitochondria and plastids have circular DNA. D. A network of microtubules, microfilaments and intermediate filaments present in the cytoplasm is called cytoskeleton. E. Mitochondrion is a single membrane-bound structure. Choose the correct answer from the options given below :

(1) A and B only
(2) A, B and C only
(3) C, D and E only
(4) B, C and D only

Answer (4)

Sol. B is true (RER bears ribosomes on its surface), C is true (both mitochondria and plastids contain circular DNA), and D is true (the cytoskeleton is a network of microtubules, microfilaments and intermediate filaments). A is false because the endomembrane system excludes

mitochondria, and E is false because the mitochondrion is a double-membrane-bound structure. Thus B, C, D are correct, option (4).

NCERT Reference: Ch 8, p.95, lines 41-42: "endoplasmic reticulun bearing ribosomes on their surface is called rough endoplasmic reticulum (RER)"; p.98, lines 45-47: "network of filamentous proteinaceous structures consisting of microtubules, microfilaments and intermediate filaments present in the cytoplasm is collectively referred to as the cytoskeleton"; p.96, line 51: "Each mitochondrion is a double membrane-bound structure".

176. Select the correct statements regarding cell membrane in eukaryotic cell. A. Membrane of human RBCs has approximately 52% protein. B. Major phospholipids are arranged in a bilayer. C. Extensions of the plasma membrane into the cell form mesosomes. D. Tails towards the inner part of lipids are hydrophobic and thus protected from aqueous medium. E. Glycocalyx is present on the outer surface of the plasma membrane. Choose the correct answer from the options given below:

(1) C, D and E only
(2) B, C and E only
(3) A, B and D only
(4) A, C and E only

Answer (3)

Sol. Answer: (A) A, C and E only. A, C and E are correct (histone octamer of eight molecules; histones rich in lysine and arginine; higher-level packaging needs NHC proteins). B is wrong because histones are POSITIVELY charged basic proteins, and D is wrong because the NEGATIVELY charged DNA (not positively charged) is wrapped around the histone octamer. NCERT Ch 5, p.83, lines 027-037: "There is a set of positively charged, basic proteins called histones... Histones are rich in the basic amino acid residues lysine and arginine... Histones are organised to form a unit of eight molecules called histone octamer. The negatively charged DNA is wrapped around the positively charged histone octamer to form a structure called nucleosome"; p.84, line 003: "Non-histone Chromosomal (NHC) proteins."

177. Match List I with List II related to muscular/skeletal system: List I List II A. Tetany (I) Inflammation of joints B. Arthritis (II) Autoimmune disorder neuromuscular junction C. Myasthenia gravis (III) Wild contraction in muscle due to low Ca++ in body fluid D Muscular dystrophy (IV) Progressive degeneration skeletal muscle affecting Choose the correct answer from the options given below:

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

Answer (1)

Sol. NCERT Ch 17, p.227, line 27: "Tetany: Rapid spasms (wild contractions) in muscle due to low Ca++ in"

178. Evolution of human appears parallel to the progressive development of brain and language skills. As such, the evolution of individual species in the sequence of their appearance is:

(1) Ramapithecus → Homo habilis → Homo erectus → Neanderthal → Homo sapiens
(2) Homo sapiens → Ramapithecus → Homo habilis → Neanderthal → Homo erectus
(3) Homo habilis → Homo erectus → Ramapithecus → Neanderthal → Homo sapiens
(4) Neanderthal → Ramapithecus → Homo habilis → Homo erectus → Homo sapiens

Answer (1)

Sol. NCERT Reference: Ch 6 Evolution, p.124, lines 30–43 and p.125, lines 6–9: "primates called Dryopithecus and Ramapithecus were existing ... was called Homo habilis. The brain capacities were between 650-800cc ... Homo erectus about 1.5 mya. Homo erectus had a large brain around 900cc."

179. The flightless bird with forelimbs modified as paddle-like structures suited for swimming is known as:

(1) Struthio
(2) Neophron
(3) Aptenodytes
(4) Psittacula

Answer (3)

Sol. Aptenodytes (Penguin) is a flightless bird whose forelimbs are modified into paddle-like flippers for swimming. Struthio (Ostrich) is flightless but adapted for running, while Neophron (Vulture) and Psittacula (Parrot) are flying birds.

NCERT Reference: Page 50, line 6-7

180. Neophron is vulture and Psittacula is a parrot. Both perform flight. • Struthio is ostrich and Aptenodytes is penguin. Both are flightless birds. • In penguins, forelimbs are modified into flippers (paddle like structure) and are used for swimming. In ostriches, forelimbs are small and used for balance while running, not for swimming. Choose the correct statements regarding population interactions between two species. A. In both parasitism and commensalism, only one species benefits and the other species is harmed. B. Both species benefit in mutualism. C. Both species benefit in commensalism. D. In parasitism, only one species benefits and the other species is harmed. E. In amensalism, one species is harmed and the other is unaffected. Choose the correct answer from the options given below:

(1) B and E only
(2) A and B only
(3) B, D and E only
(4) A and D only

Answer (3)

Sol. NCERT: Ch 11, p.197, lines 3-10 — "Both the species benefit in mutualism and both lose in competition in
their interactions with each other. In both parasitism and predation only
one species benefits (parasite and predator, respectively) and the interaction
is detrimental to the other species (host and prey, respectively).
The interaction where one species is benefitted and the other is neither
benefitted nor harmed is called commensalism. In amensalism on
the other hand one species is harmed whereas the other is
unaffected."

Answer Key — quick reference

Physics

1: D	2: D	3: D	4: C	5: C	6: D	7: A	8: C
9: D	10: C	11: D	12: B	13: D	14: D	15: A	16: B
17: A	18: D	19: D	20: C	21: B	22: D	23: A	24: C
25: C	26: C	27: A	28: C	29: D	30: D	31: D	32: A
33: D	34: D	35: B	36: A	37: D	38: D	39: A	40: B
41: C	42: C	43: B	44: A	45: C			

Chemistry

46: B	47: D	48: C	49: C	50: D	51: B	52: D	53: D
54: B	55: A	56: A	57: C	58: D	59: B	60: A	61: D
62: D	63: C	64: A	65: B	66: D	67: B	68: B	69: B
70: A	71: A	72: B	73: B	74: B	75: A	76: A	77: C
78: B	79: D	80: C	81: D	82: B	83: D	84: B	85: C
86: A	87: B	88: A	89: B	90: C			

Biology

91: D	92: B	93: C	94: C	95: A	96: A	97: C	98: A
99: D	100: D	101: D	102: B	103: D	104: D	105: B	106: C
107: A	108: A	109: C	110: A	111: D	112: A	113: C	114: D
115: A	116: C	117: A	118: B	119: A	120: D	121: D	122: B
123: B	124: A	125: D	126: C	127: C	128: C	129: D	130: B
131: A	132: C	133: A	134: B	135: B	136: C	137: D	138: C
139: A	140: C	141: C	142: D	143: A	144: A	145: C	146: D
147: B	148: D	149: A	150: B	151: C	152: A	153: D	154: B
155: A	156: B	157: C	158: D	159: A	160: A	161: D	162: B
163: B	164: D	165: B	166: D	167: B	168: C	169: A	170: C
171: A	172: A	173: D	174: D	175: D	176: C	177: A	178: A
179: C	180: C						

MedicNEET Predicted Batch — practise the concepts NEET actually repeats

The NEET 2026 May paper leaned on long, multi-fact questions that rewarded understanding over memory — exactly what the MedicNEET Predicted Batch builds. It ranks every concept by how often it repeats across 10 years of papers and walks you up it one level at a time from YOUR level, fresh question each round. Three real Predicted-Batch questions, to taste:

BIOLOGY (long-form) · Molecular Basis — DNA fingerprinting · ◆ long-form — the lengthy, multi-step style that defined NEET 2025 & 2026

Arrange the following steps of standard DNA fingerprinting in the correct sequential order:
1. Digestion of DNA by restriction endonucleases
2. Separation of DNA fragments by electrophoresis
3. Detection of hybridised DNA fragments using X-ray film
4. Transfer of separated DNA fragments to a nitrocellulose filter
5. Hybridisation with a radiolabelled VNTR probe
6. Isolation of DNA from a sample

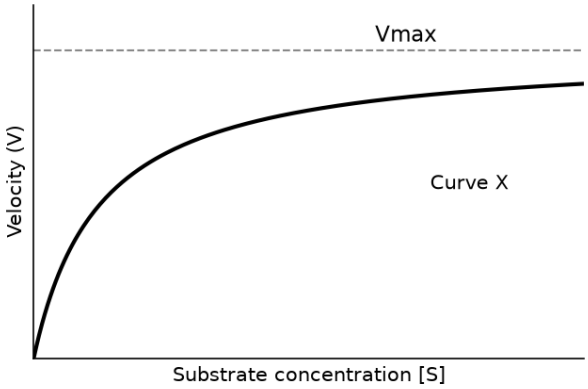
(1) 1 → 2 → 6 → 4 → 5 → 3
(2) 1 → 6 → 2 → 4 → 3 → 5
(3) 6 → 2 → 1 → 5 → 4 → 3
(4) 6 → 1 → 2 → 4 → 5 → 3

Answer (4)

Why: Correct order: isolate DNA (6) → cut with restriction enzymes (1) → separate by electrophoresis (2) → blot/transfer to filter (4) → hybridise with a labelled VNTR probe (5) → detect on X-ray film (3). This is the standard NCERT sequence, option D.

BIOLOGY (reasoning + figure) · Enzymes — the saturation plateau (Vmax) · ◆ 95% likely · Level 5 · figure-based reasoning

The graph shows the velocity of an enzyme reaction (V) versus substrate concentration [S]. Curve X rises steeply at low [S], then bends and runs almost flat at high [S]. What does the flat upper part represent, and why?



(1) It is the optimum pH of the enzyme, beyond which velocity cannot rise
(2) It shows the enzyme being denatured by excess substrate
(3) It is Vmax; the enzymes are saturated and no free enzyme is left to bind extra substrate
(4) It is the activation-energy barrier the substrate must cross before reacting

Answer (3)

Why: At high [S] every enzyme active site is occupied, so the reaction runs at its maximum velocity (Vmax). Adding more substrate cannot speed it up because there is no free enzyme left to

bind — the curve plateaus.

PHYSICS (reasoning) · Magnetism — a magnetic force does no work · ◆ 70% likely · Level 4 · reasoning

A charged particle moves in a uniform magnetic field. Which one of the following quantities changes with time?

(1) Its speed
(2) Its kinetic energy
(3) The direction of its velocity
(4) The magnitude of its momentum

Answer (3)

Why: The magnetic force is always perpendicular to the velocity, so it does no work — speed, kinetic energy and |momentum| stay constant. Only the DIRECTION of velocity turns. Trap: a changing velocity vector does not mean a changing speed.