NEET-17-07-2022
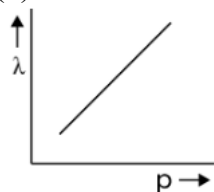# (Paper Code – Q6)

Physics
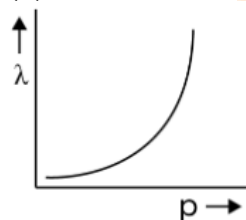
Question 1: The graph which shows the variation of the de Broglie wavelength (λ) of a particle and its associated momentum (p) is
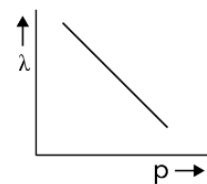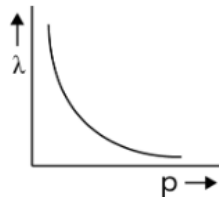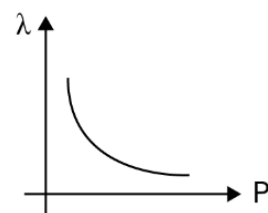**Options:**
(1)

(2)

(3)

(4)

Answer: (4)
Solution:

$$\lambda = \frac{h}{P}$$

Question 2: As the temperature increases, the electrical resistance:
Options:

(1) Increases for both conductors and semiconductors
(2) Decreases for both conductors and semiconductors
(3) Increases for conductors but decreases for semiconductors
(4) Decreases for conductors but increases for semiconductors

Answer: (3)

Solution:

As temperature increases, the resistance increases for conductors, but decreases for semi-conductors.

Question 3: Let T_1 and T_2 be the energy of an electron in the first and second excited states of hydrogen atom, respectively. According to the Bohr's model of an atom; the ratio $T_1 : T_2$ is:

Options:
(1) 1 : 4
(2) 4 : 1
(3) 4 : 9
(4) 9 : 4

Answer: (4)

Solution:

$E_n = -13.6 \dfrac{z^2}{n^2}$ $T_1 = E_2$ (First excited state = n = 2)

$\dfrac{T_1}{T_2} = \dfrac{E_2}{E_3} = \dfrac{3^2}{2^2} = \dfrac{9}{4}$ $T_2 = E_3$ (Second excited state = n = 3)

Question 4: Two objects of mass 10 kg and 20 kg respectively are connected to the two ends of a rigid rod of length 10 m with negligible mass. The distance of the center of mass of the system from the 10 kg mass is:
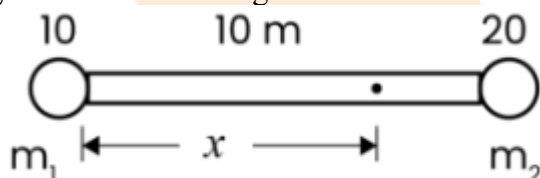
Options:
(1) $\dfrac{10}{3} m$

(2) $\dfrac{20}{3} m$

(3) 10 m
(4) 5 m

Answer: (2)

Solution:

$$x = \frac{m_2 r}{m_1 + m_2}$$

$$= \frac{20(20)}{20+10} = \frac{200}{30} = \frac{20}{3}$$

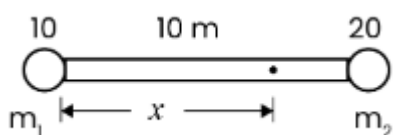**Question 5:** The ratio of the distance travelled by a freely falling body in the 1st, 2nd, 3rd and 4th second

Options:

(1) 1 : 2 : 3 : 4

(2) 1 : 4 : 9 : 16

(3) 1 : 3 : 5 : 7

(4) 1 : 1 : 1 : 1

Answer: (3)

Solution:

$x_1 : x_2 : x_3 : x_4$

$= 1 : 3 : 5 : 7$
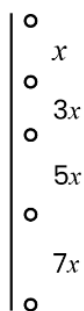
Question 6: The ratio of the radius of gyration of a thin uniform disc about an axis passing through its centre and normal to its plane to the radius of gyration of the disc about its diameter is

Options:

(1) 2 : 1

(2) $\sqrt{2} : 1$

(3) 4 : 1

(4) $1 : \sqrt{2}$

Answer: (2)

Solution:

$$I_1 = \frac{MR^2}{2} = MK_1^2$$

$$I_2 = \frac{MR^2}{4} = MK_2^2$$

$$K_1 = \frac{R}{\sqrt{2}}, K_2 = \frac{R}{2}$$

$$\frac{K_1}{K_2} = \frac{1}{\sqrt{2}} \frac{2}{1} = \frac{\sqrt{2}}{1}$$

Question 7: The angular speed of a fly wheel moving with uniform angular acceleration changes from 1200 rpm to 3120 rpm in 16 seconds. The angular acceleration in rad/s^2 is:

Options:

(1) 2π

(2) 4π

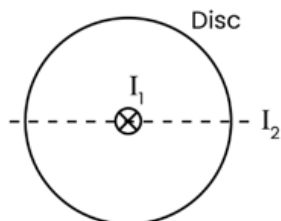(3) 12π

(4) 104π

Answer: (2)

Solution:

$\omega_1 = 1200 rpm$

$\omega_2 = 3120 rpm$

$t = 16 \sec$

$$\alpha = \frac{\omega_2 - \omega_1}{t} = \frac{(3120 - 1200)}{16}\left(\frac{2\pi}{60}\right)$$

$$= \frac{1920}{16} \times \frac{2\pi}{60} = \frac{64\pi}{16} = 4\pi$$

Question 8: An ideal gas undergoes four different processes from the same initial state as shown in the figure below. Those processes are adiabatic, isothermal, isobaric and isochoric. The curve which represents the adiabatic process among 1, 2, 3 and 4 is:
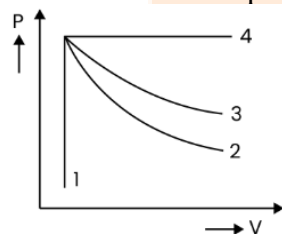
Options:

(1) 1

(2) 2

(3) 3

(4) 4

Answer: (2)

Solution:

1 - Isochoric

2 - Adiabatic

3 - Isothermal

4 - Isobaric

Question 9: Two hollow conducting spheres of radii R_1 and R_2 ($R_1 >> R_2$) have equal charges. The potential would be:

Options:

(1) More on bigger sphere

(2) More on smaller sphere
(3) Equal on both the sphere
(4) Dependent on the material properly of the sphere
Answer: (2)
Solution:

$$V = \frac{KQ}{R}$$

$$since R_1 > R_2$$

$$V_1 < V_2$$

Potential will be more on smaller sphere.

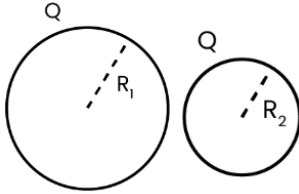**Question 10:** When light propagates through a material medium of relative permittivity ϵ_r, and relative permeability ϵ_r, the velocity of light, v is given by (c - velocity of light in vacuum)
Options:
(1) $v = c$

(2) $v = \sqrt{\dfrac{\mu_r}{\epsilon_r}}$

(3) $v = \sqrt{\dfrac{\epsilon_r}{\mu_r}}$

(4) $v = \dfrac{c}{\sqrt{\epsilon_r\,\mu_r}}$

Answer: (4)
Solution:

$$C = \frac{1}{\sqrt{\varepsilon_0 \mu_0}}$$

$$v = \frac{1}{\sqrt{\varepsilon_m \mu_m}}$$

$$= \frac{1}{\sqrt{\varepsilon_0 \varepsilon_r \mu_0 \mu_r}}$$

$$v = \frac{1}{\sqrt{\varepsilon_0 \mu_0}} \times \frac{1}{\sqrt{\varepsilon_r \mu_r}} = \boxed{\frac{C}{\sqrt{\varepsilon_r \mu_r}}}$$

Question 11: A long solenoid of radius 1 mm has 100 turns per mm. If 1 A current flows in the solenoid, the magnetic field strength at the centre of the solenoid is :
Options:
(1) 6.28×10^{-2} T
(2) 12.56×10^{-2} T

(3) 12.26 x 10^{-4} T
(4) 6.28 x 10^{-4} T
Answer: (2)
Solution:
r = 1 mm, n = 100 turns/mm, i = 1A

$$B = \mu_0 ni = 4\pi \times 10^{-7} \times \frac{100}{10^{-3}} \times 1$$

$$= 12.56 \times 10^{-2} T$$

Question 12: The peak voltage of the ac source is equal to :
Options:
(1) the value of voltage supplied to the circuit
(2) the rms value of the ac source
(3) $\sqrt{2}$ times the rms value of the ac source
(4) $1/\sqrt{2}$ times the rms value of the ac source
Answer: (3)
Solution:

$$V_{rms} = \frac{V_0}{\sqrt{2}} \Rightarrow V_0 = \sqrt{2}V_{rms}$$

Peak voltage of ac = $\sqrt{2}$ times the rms value of ac source.

Question 13: An electric lift with a maximum load of 2000 kg (lift + passengers) is moving up with a constant speed of 1.5 ms^{-1}. The frictional force opposing the motion is 3000N. The minimum power delivered by the motor to the lift in watts is:
(g =10 ms^{-2})
Options:
(1) 23000
(2) 20000
(3) 34500
(4) 23500
Answer: (3)
Solution:
a = 0
v = 1.5 m/s
friction = 3000 N
If a = 0
⇒ Motor force = Friction + weight
F$_{motor}$ = 3000 + 20,000 = 23000 N
P = F$_v$ = 23000 x 1.5 = 34,500 w

Question 14: In a Young's double slit experiment, a student observes 8 fringes in a certain segment of screen when a monochromatic light of 600 nm wavelength is used. If the wavelength of light is changed to 400 nm, then the number of fringes he would observe in the same region of the screen is
Options:
(1) 6
(2) 8
(3) 9

(4) 12

Answer: (4)

Solution:

$\dfrac{\lambda D}{d}$ = fringe width

$f\omega_i = (600)\dfrac{D}{d}$

$f\omega_f = (400)\dfrac{D}{d}$

$\Rightarrow (8)(600) = n(400)$

$\Rightarrow n = 12$

Question 15: A copper wire of length 10 m and radius $\left(10^{-2}/\sqrt{\pi}\right)$ has electrical resistance of 10 Ω. The current density in the wire for an electric field strength of (V/m) is:

Options:

(1) 10^4 A/m^2

(2) 10^6 A/m^2

(3) 10^{-5} A/m^2

(4) 10^5 A/m^2

Answer: (4)

Solution:

$\ell = 10m, r = \dfrac{10^{-2}}{\sqrt{\pi}}, R = 10\Omega$

$R = \dfrac{\rho\ell}{\pi r^2}$

$\Rightarrow 10 = \dfrac{\rho \times 10}{\pi \times \dfrac{10^{-4}}{\pi}}$

$\Rightarrow \rho = 10^{-4}$

$J = \dfrac{E}{\rho} = \dfrac{10}{10^{-4}} = 10^5 \, A/m^2$

Question 16: The dimensions [MLT^{-2}A^{-2}] belong to the:

Options:

(1) Magnetic flux

(2) Self inductance

(3) Magnetic permeability

(4) Electric permittivity

Answer: (3)

Solution:

[MLT^{-2}A^{-2}] Dimensions of 'μ$_0$'

Question 17: If the initial tension on a stretched string is doubled, then the ratio of the initial and final speeds of a transverse wave along the string is:

Options:

(1) 1 : 1

(2) $\sqrt{2}:1$

(3) $1:\sqrt{2}$

(4) $1:2$

Answer: (3)

Solution:

$$v = \sqrt{\frac{T}{\mu}}$$

$$T_f = 2T_i$$

$$\frac{v_i}{v_f} = \sqrt{\frac{T_i}{T_f}} = \sqrt{\frac{1}{2}}$$

Question 18: In half wave rectification, if the input frequency is 60 Hz, then the output frequency would be:

Options:

(1) Zero

(2) 30 Hz
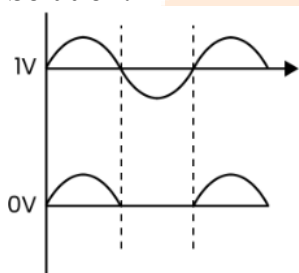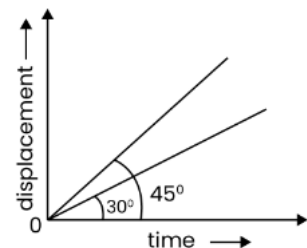
(3) 60 Hz

(4) 120 Hz

Answer: (3)

Solution:

Input frequency = 60 Hz

Output frequency = 60 Hz

Question 19: The displacement time graphs of two moving particles make angles of 30º and 45º with the x-axis as shown in the figure. The ratio of their respective velocity is

Options:

(1) $\sqrt{3}:1$

(2) $1:1$

(3) $1:2$

(4) $1:\sqrt{3}$

Answer: (4)

Solution:

$$\vec{v} = \frac{d\vec{s}}{dt}$$

$\Rightarrow$ slope of the graph

$$\frac{v_1}{v_2} = \frac{\tan 30°}{\tan 45°} = \frac{1}{\sqrt{3}}$$

Question 20: A square loop of side 1 m and resistance 1 Ω is placed in a magnetic field of 0.5 T. If the plane of loop is perpendicular to the direction of magnetic field, the magnetic flux through the loop is

Options:
(1) 2 weber
(2) 0.5 weber
(3) 1 weber
(4) Zero weber

Answer: (2)

Solution:

$$\phi = \int \vec{B}.\overrightarrow{dA} = BA\cos\theta$$
$$= 0.5(1)c0s0 = 0.5 Weber$$

Question 21: The energy that will be ideally radiated by a 100 kW transmitter in 1 hour is:

Options:
(1) 36 x 10^7 J
(2) 36 x 10^4 J
(3) 36 x 10^5 J
(4) 1 x 10^5 J

Answer: (1)

Solution:

Given Power = 100 kW = 100 x 10^3 W = 10^5 W

Time = 1 hr = 60 min = 60 x 60 = 3600 sec

$$Power = \frac{Energy}{Time}$$

Energy = Power x time

= 10^5 W x 3600 sec = 36 x 10^7 J

Question 22: A body of mass 60 g experiences a gravitational force of 3.0 N, when placed at a particular point. The magnitude of the gravitational field intensity at that point is :

Options:
(1) 0.05 N/kg
(2) 50 N/kg
(3) 20 N/kg
(4) 180 N/kg

Answer: (2)

Solution:

Given, Mass = 60 g

F = 3 N

Gravitational field

$$E_g = \frac{F}{M} = \frac{3 \times 10^2}{6} = \frac{300}{6} = 50N / kg$$

Question 23: Match List - I with List – II

List – I (Electromagnetic Waves)		List – II (Wavelength)	
(a)	Am radio waves	(i)	10^{-10} m
(b)	Microwaves	(ii)	10^2 m
(c)	Infrared radiations	(iii)	10^{-2} m

Choose the correct answer from the options given below:
Options:
(1) (a) - (iv), (b) - (iii), (c)-(ii), (d) - (i)
(2) (a) - (iii), (b) - (ii), (c)-(i), (d) - (iv)
(3) (a) - (iii), (b) - (iv), (c)-(ii), (d) - (i)
(4) (a) - (ii), (b) - (iii), (c)-(iv), (d) - (i)
Answer: (4)
Solution:
(a) - (ii), (b) - (iii), (c)-(iv), (d) - (i)
Wavelength Range = Radio > Micro > Infrared Radiations > X Rays.

Question 24: A shell of mass m is at rest initially. It explodes into three fragments having mass in the ratio 2 : 2: I. If the fragments having equal mass fly off along mutually perpendicular directions with speed v, the speed of the third (lighter) fragment is

Options:
(1) v
(2) $\sqrt{2}v$
(3) $2\sqrt{2}v$
(4) $3\sqrt{2}v$
Answer: (3)
Solution:
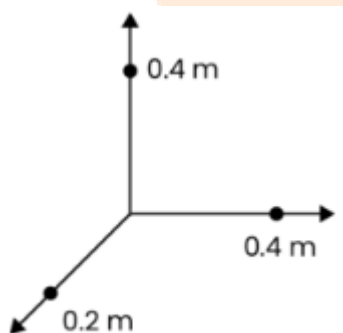
As total is m and ratio 2:2:1
We can write $2x + 2x + x = m$
$5x = m$
$x = 0.2m$
Now momentum of length mass be P'

$as \left| \vec{P_1} \right| = \left| \vec{P_2} \right| = P$

Then

$P' = \sqrt{P_1^2 + P_2^2}$

$0.2mv' = \sqrt{(0.4mv)^2 + (0.4mv)^2}$

$0.2mv' = \sqrt{2}(0.4mv)$

$v' = \sqrt{2}\dfrac{0.4}{0.2}v$

$v' = 2\sqrt{2}v$

Question 25: A biconvex lens has radii of curvature, 20 cm each. If the refractive index of the material of the lens is 1.5, the power of the lens is:
Options:
(1) +2D
(2) +20D
(3) +5D
(4) Infinity
Answer: (3)
Solution:
According to Formula
R1 = 20cm
R2 = 20 cm
μ = 1.5

$\dfrac{1}{f} = \left(\dfrac{\mu_1}{\mu_2} - 1 \right)\left(\dfrac{1}{R_1} - \dfrac{1}{R_2} \right)$

$\dfrac{1}{f}(1.5-1)\left(\dfrac{1}{20} - \left(-\dfrac{1}{20} \right) \right)$

$= \dfrac{0.5}{10}\left(\dfrac{2}{20} \right)$

$\dfrac{1}{f} = \dfrac{1}{20}$ or $f = 20cm$

Now, $P = \dfrac{1}{f}$

$P = \dfrac{1}{20 \times 10^{-2}}$

$P = \dfrac{100}{20} = 5D$

Question 26: Given below are two statements
Statement I : Biot-Savart's law gives on the expression for the magnetic field strength of an infinitesimal current element (Idl) of a current carrying conductor only.
Statement II: Biot-Savart's law is analogous to Coulomb's inverse square law of charge q, with the former being related to the field produced by a scalar source, Idl while the latter

being produced by a vector source, q. In light of above statements choose the most appropriate answer from the options given below:

Options:
(1) Both Statement I and Statement II are correct
(2) Both Statement I and Statement II are incorrect
(3) Statement I is correct and Statement II is incorrect
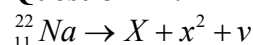(4) Statement I is incorrect and Statement II is correct

Answer: (3)

Solution:
The statement 1 is correct.
Statement II is incorrect as Idl is not scalar source and q is not vector source.

Question 27: In the given nuclear reaction, the element X is:
$$^{22}_{11}Na \rightarrow X + x^2 + v$$

Options:
(1) $^{23}_{11}Na$
(2) $^{23}_{10}Ne$
(3) $^{22}_{10}Ne$
(4) $^{22}_{12}Mg$

Answer: (3)

Solution:
The equation is
$$^{22}_{11}Na \rightarrow ^{22}_{10}Ne + e^+ + \infty$$
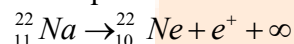
Question 28: Plane angle and solid angle have:

Options:
(1) Units but no dimensions
(2) Dimensions but no units
(3) No units and no dimensions
(4) Both units and dimensions

Answer: (1)

Solution:
Units but no dimensions
Plane angle and solid angle have units but no dimension.

Question 29: The angle between the electric lines of force and the equipotential surface is:

Options:
(1) 0°
(2) 45°
(3) 90°
(4) 180°

Answer: (3)

Solution:
The angle between electric lines of force and equipotential surface is 90°.

Question 30: A light ray falls on a glass surface of refractive index √3, at an angle 60°. The angle between the refracted and reflected rays would be:

Options:

(1) 30°
(2) 60°
(3) 90°
(4) 120°

Answer: (3)

Solution:

By Snell's Law $\left[\begin{array}{l} \text{Given} \angle i = 60° \\ \mu = \sqrt{3} \end{array}\right]$

$\mu = \dfrac{smi}{smi_2}$

$\sin t = \dfrac{\sin i}{\mu} = \dfrac{\sin 60}{\sqrt{3}} - \dfrac{\sqrt{3}}{2\sqrt{3}}$

$\sin t = \dfrac{1}{2}, so, \angle r = 30°$

So, Angle between refracted and reflected ray is

$\angle i + cr = \angle 60 + \angle 30 = \boxed{\angle 90°}$

Question 31: In the given circuits (a), (b) and (c), the potential drop across the two p-n junctions are equal in:

(a)

(b)

(c)
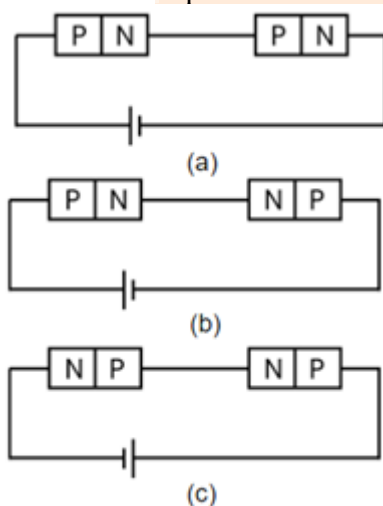
Options:
(1) Circuit (a) only
(2) Circuit (b) only
(3) Circuit (c) only
(4) Both circuits (a) and (c)

Answer: (4)

Solution:
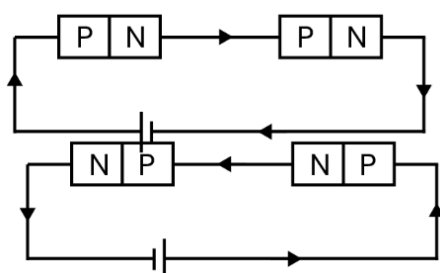
(a) and (c)

Question 32: A spherical ball is dropped in a long column of a highly viscous liquid. The curve in the graph shown, which represents the speed of the ball (v) as a function of time (t) is:
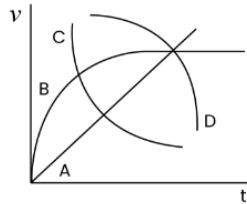
Options:
(1) A
(2) B
(3) C
(4) D
Answer: (2)
Solution:
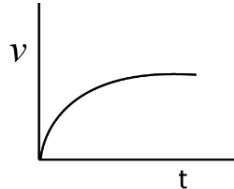
Ball will reach terminal speed after initial acceleration

Question 33: Two resistors of resistances, 100 Ω and 200 Ω are connected in parallel in an electrical circuit. The ratio of thermal energy developed in 100 Ω to that in 200 Ω in a given time is
Options:
(1) 1 : 2
(2) 2 : 1
(3) 1 : 4
(4) 4 : 1
Answer: (2)
Solution:

$$\frac{H_1}{H_2} = \frac{\dfrac{V^2}{R_1}}{\dfrac{V^2}{R_2}} = \frac{R_2}{R_1} = \frac{200}{100} = \frac{2}{1}$$

Question 34: When two monochromatic light of frequency ν and ν/2 are incident on a photoelectric metal, their stopping potential becomes $V_s/2$ and V_s respectively. The threshold frequency for this metal is:
Options:
(1) 2 ν
(2) 3 ν
(3) 2/3 ν
(4) 3/2 ν
Answer: (BONUS)

Solution:

$$2 \times \left(e\frac{V_s}{2} = hv - hv_0 \right)$$

$$ev_1 = \frac{hv}{2} - hv_0$$

$$O = \left(2hv - \frac{hv}{2} \right) - \left(2hv_0 - hv_0 \right)$$

$$hv_0 = \frac{3hv}{2}$$

$$\boxed{v_0 = \frac{3}{2}v}$$

Question 35: If a soap bubble expands, the pressure inside the bubble:
Options:
(1) decreases
(2) increases
(3) remains the same
(4) In equal to the atmospheric pressure
Answer: (1)
Solution:

$$\Delta p = \frac{\mu t}{R}$$

$$R \uparrow \Delta P \downarrow \text{ so } P \downarrow$$

Question 36: Two point charges -q and +q are placed at a distance of L, as shown in the figure.
The magnitude of electric field intensity at a distance R (R>>L) varies as:
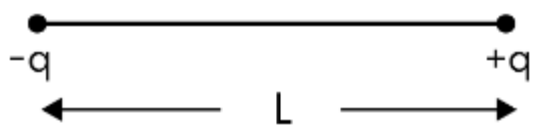
Options:

(1) $\dfrac{1}{R^2}$

(2) $\dfrac{1}{R^3}$

(3) $\dfrac{1}{R^4}$

(4) $\dfrac{1}{R^6}$

Answer: (2)
Solution:
It behave as a dipole

So, $E \propto \dfrac{1}{r^3}$

Question 37: The area of rectangular field (in m^2) of length 55.3 m and breadth 25 m after rounding off the value for correct significant digits is:

Options:
(1) 138 x 10^1
(2) 1382
(3) 1382.5
(4) 14 x 10^2

Answer: (4)

Solution:

55.3 x 25 = _____
3 SF   2 SF   2 SF
Option (4) 2 SF

Question 38: The truth table for the given logic circuit is:
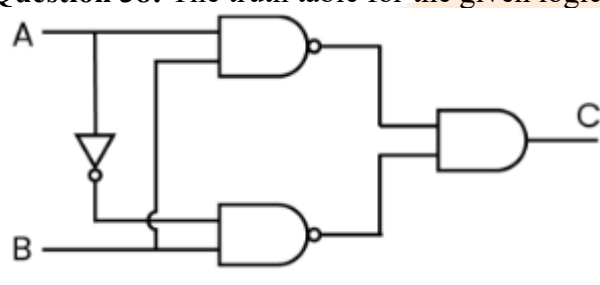
Options:
(1)

A	B	C
0	0	0
0	1	1
1	0	1
1	1	0

(2)

A	B	C
0	0	1
0	1	0
1	0	0
1	1	1

(3)

A	B	C
0	0	1
0	1	0
1	0	1
1	1	0

(4)

A	B	C
0	0	0
0	1	1
1	0	0
1	1	1

Answer: (3)

Solution:

A	B	$\overline{A}$	VAVD 1	VAVD 2	AVD

1	1		0	1	0
0	0		1	1	1
1	0		1	1	1
0	1		1	0	0

Question 39: Given below are two statements: One is labelled as Assertion (A) and the other is labelled as Reason (R).
Assertion (A): The stretching of a spring is determined by the shear modulus of the material of the spring.
Reason (R): A coil spring of copper has more tensile strength than a steel spring of same dimensions. In the light of the above statements choose the most appropriate answer from the options given below:
Options:
(1) Both Statement I and Statement II are correct
(2) Both Statement I and Statement II are incorrect
(3) Statement I is correct and Statement II is incorrect
(4) Statement I is incorrect and Statement II is correct
Answer: (3)
Solution:
(A) Shear True
(B) False

Question 40: From Ampere's circuital law for a long straight wire of circular cross-section carrying a steady current, the variation of magnetic field in the inside and outside region of the wire is:
Options:
(1) Uniform and remains constant for both the regions
(2) A linearly increasing function of distance up to the boundary of the wire and then linearly decreasing for the outside region
(3) A linearly increasing function of distance r up to the boundary of the wire and then decreasing one with 1/r dependence for the outside region
(4) A linearly decreasing function of distance up to the boundary of the wire and then a linearly increasing one for the outside region
Answer: (3)
Solution:
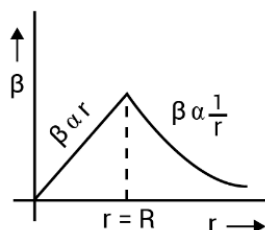
Question 41: A series LCR circuit with inductance 10 H, capacitance 10μF, resistance 50Ω is connected to an ac source of voltage, V =200 sin(100 t)volt. If the resonant frequency of the LCR circuit is v_0 and the frequency of the ac source is v, then:
Options:
(1) $v_0 = v = 50 Hz$

(2) $v_0 = v = \dfrac{50}{\pi} Hz$

(3) $v_0 = \dfrac{50}{\pi} Hz, v = 50 Hz$

(4) $v_0 = 100 Hz; v_0 = \dfrac{100}{\pi} Hz$

Answer: (2)
Solution:

$V = 200 \sin(100t)$

$\omega = 100$

$\Rightarrow 2\pi v = 100$

$\Rightarrow v = \dfrac{50}{\pi} H_2$

For resonance

$2\pi v_0 L = \dfrac{1}{2\pi v_0 c}$

$v_0 = \dfrac{1}{2\pi\sqrt{Lc}} = \dfrac{1}{2\pi\sqrt{10 \times 10 \times 10}} = 6$

$v_0 = \dfrac{10^3}{20\pi} = \dfrac{50}{\pi} H_2$

Question 42: Math List - I with List – II
Choose the correct answer from the options given below:

List – I		List – II	
(a)	Gravitational constant (G)	**(i)**	$[L^2 T^{-2}]$
(b)	Gravitational potential energy	**(ii)**	$[M^{-1} L^3 T^{-2}]$
(c)	Gravitational potential	**(iii)**	$[LT^{-2}]$
(d)	Gravitational intensity	**(iv)**	$[ML^2 T^{-2}]$

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

(a) Gravitational constant → (ii) $[M^{-1} L^3 T^{-2}]$

(b) Gravitational Potential energy → (iv) $[ML^2 T^{-2}]$

(c) Gravitational potential → (i) $[L^2 T^{-2}]$

(d) Gravitational intensity → (iii) $[LT^{-2}]$

Question 43: Two pendulums of length 121 cm and 100 cm start vibrating in phase. At some instant, the two are at their mean position in the same phase. The minimum number of vibrations of the shorter pendulum after which the two are again in phase at the mean position is :
Options:
(1) 11
(2) 9
(3) 10

(4) 8

Answer: (1)

Solution:

$$T_1 = 2\pi\sqrt{\frac{121}{g}} = 11T$$

$$T_2 = 2\pi\sqrt{\frac{10}{g}} = 10T$$

Both will insane phase meet after n, oscillation of T_1 and n_2 oscillation of T_2

$$n_1 \times 11T = n_2 \times 10T$$

$$\frac{n_1}{n_2} = \frac{10}{11}$$

So, first meet insane phase will be after 11 oscillations of the shorter pendulum.

Question 44: A big circular coil of 1000 turns and average radius 10 m is rotating about its horizontal diameter at 2 rad s^{-1}. If the vertical component of earth's magnetic field at that place is 2 × 10^{-5} T and electrical resistance of the coil is 12.56 Ω, then the maximum induced current in the coil will be:

Options:

(1) 0.25 A

(2) 1.5 A

(3) 1 A

(4) 2 A

Answer: (3)

Solution:

$$E_{max} = NWAB = 1000 \times 2 \times \pi \times (10)^2 \times 2 \times 10^{-5}$$
$$= 12.56V$$

$$I_{max} = \frac{E_{max}}{R} = \frac{12.56}{12.56} = 1A$$

Question 45: A capacitor of capacitance C =900 pF is charged rally by 100 V battery B as shown in figure (a). Then B is disconnected from the battery and connected to another uncharged capacitor of capacitance C=900 pF as shown in figure (b). The electrostatic energy stored by the system (b)is:

Options:

(1) 4.5 x 10^{-6} J

(2) 3.25 x 10^{-6} J

(3) 2.25 x 10^{-6} J
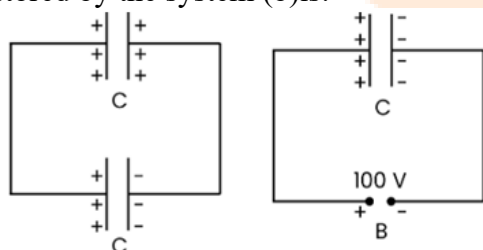
(4) 1.5 x 10^{-6} J

Answer: (3)

Solution:

Charge will remain constant

$(a) Q_a = 900 \times 100 = 9 \times 10^4 P$

$(b) \in_{eq} = 2C$

$$E_b = \frac{Q^2}{2(2c)} = \frac{\left(9 \times 10^4\right)^2 \times 10^{-24}}{4 \times 900 \times 10^{-12}}$$

$$E_b = \frac{81 \times 10^8 \times 10^{-12}}{36 \times 10^2} = 2.25 \times 10^{-6} J$$

Question 46: A nucleus of mass number 189 splits into two nuclei having mass number 125 and 64. The ratio of radius of two daughter nuclei respectively is:
Options:
(1) 1 : 1
(2) 4 : 5
(3) 5 : 4
(4) 25 : 16
Answer: (3)
Solution:
We know that

$$R = R_0 A^{\frac{1}{3}}$$

$$R_1 = R_0 (125)^{\frac{1}{3}} = 5R_0$$

$$R_2 = R_0 (64)^{\frac{1}{3}} = 4R_0$$

$$\frac{R_1}{R_2} = \frac{5}{4}$$

Question 47: A Wheatstone bridge is used to determine the value of unknown resistance X by adjusting the variable resistance Y as shown in the figure. For the most precise measurement of X, the resistances P and Q:
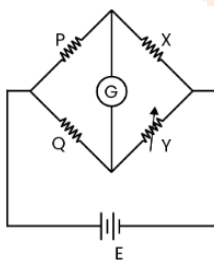
Options:
(1) Should be approximately equal to 2X
(2) Should be approximately equal and are small
(3) Should be very large and unequal
(4) Do not play any significant role
Answer: (2)
Solution:
For the most precise measurement of x the resistance P and Q should be approximately equal and are small.

Question 48: The volume occupied by the molecules contained in 4.5 kg water at STP, if the intermolecular forces vanish away is:

Options:

(1) 5.6×10^6 m^3

(2) 5.6×10^3 m^3

(3) 5.6×10^{-3} m^3

(4) 5.6 m^3

Answer: (4)

Solution:

$$V = \frac{nRT}{P} = \frac{\frac{4.5 \times 10^3}{10} \times 8.3 \times 273.15}{1 \times 10^5} \approx 5.6 m^3$$

Question 49: A ball is projected with a velocity, 10 ms^{-1}, at an angle of 60° with the vertical direction. Its speed at the highest point of its trajectory will be:

Options:

(1) Zero

(2) $5\sqrt{3} ms^{-1}$

(3) 5 ms^{-1}

(4) 10 ms^{-1}

Answer: (3)

Solution:

At highest point only horizontal component of velocity

$$V_H = V \cos 60° = 10 \times \frac{1}{2} = 5m / s$$

Question 50: Two transparent media. A and B are separated by a plane boundary. The speed of light in those media are 1.5×10^8 m/s and 2.0×10^8 m/s, respectively. The critical angle for a ray of light for these two media is:

Options:

(1) sin^{-1}(0.5000)

(2) sin^{-1}(0.750)

(3) tan^{-1}(0.500)

(4) tan^{-1}(0.750)

Answer: (2)

Solution:

$$\mu_A = \frac{3 \times 10^8}{1.5 \times 10^8} = 2$$

$$\mu_B = \frac{3.0 \times 10^8}{2.0 \times 10^8} = 1.5$$

$$\sin C = \frac{\mu_B}{\mu_A} = \frac{1.5}{2} = 0.75$$

$$C = \sin^{-1}\left(0.750\right)$$

Chemistry

Question 51: Gadolinium has a low value of third ionisation enthalpy because of
Options:
(1) small size
(2) high exchange enthalpy
(3) high electronegativity
(4) high basic character
Answer: (2)
Solution: Gd has low value of third ionisation enthalpy because of high exchange energy

Question 52: Which one is not correct mathematical equation for Dalton's Law of partial pressure? Here p = total pressure of gaseous mixture
Options:
(1) $p = p_1 + p_2 + p_3$

(2) $p = n_1 \dfrac{RT}{V} + n_2 \dfrac{RT}{V} + n_3 \dfrac{RT}{V}$

(3) $p_i = \chi_i p$, where p_i = partial pressure of ith gas; χ_i = mole fraction of ith gas in gaseous mixture

(4) $p_i = \chi_i p_i^o$, where χ_i = mole fraction of ith gas in gaseous mixture p_i^o = pressure of ith gas in pure state
Answer: (4)
Solution: $p_i = \chi_i p_i^o$ is not correct expression for Dalton's law

Question 53: Assertion (A): In a particular point defect, an ionic solid is electrically neutral, even if few of its cations are missing from its unit cells.
Reason(R): In an ionic solid, Frenkel defect arises due to dislocation of cation from its lattice site to interstitial site, maintaining overall electrical neutrality.
Choose the most appropriate answer from the options given below:
Options:
(1) Both (A) and (R) are correct and (R) is the correct explanation of (A)
(2) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
(3) (A) is correct but (R) is not correct
(4) (A) is not correct but (R) is correct
Answer: (2)
Solution: Both (A) and (R) are correct, but (R) is not correct expression of (A)

Question 54: The pH of the solution containing 50 mL each of 0.10 M sodium acetate and 0.01 M acetic acid is
[Given pK_a of CH_3COOH = 4.57]
Options:
(1) 5.57

(2) 3.57
(3) 4.57
(4) 2.57
Answer: (1)
Solution:

$$pH = pKa + log \frac{Salt}{Acid}$$

$$= 4.57 + log \frac{0.10}{0.01}$$

$$= 4.57 + log10$$

$$pH = 4.57 + 1 = 5.57$$

Question 55: Identify the incorrect statement from the following
Options:
(1) Alkali metals react with water to form their hydroxides
(2) The oxidation number of K in KO_2 is + 4.
(3) Ionisation enthalpy of alkali metals decreases from top to bottom in the group.
(4) Lithium is the strongest reducing agent among the alkali metals.
Answer: (2)
Solution: Oxidation number of K in KO_2 is not +4 but it is +1

Question 56: Statement I: The acidic strength of monosubstituted nitrophenol is higher than phenol because of electron withdrawing nitro group.
Statement II: o-nitrophenol, m-nitrophenol and p-nitrophenol will have same acidic strength as they have one nitro group attached to the phenolic ring.
Choose the most appropriate answer from the options given below:
Options:
(1) Both Statement I and Statement II are correct.
(2) Both Statement I and Statement II are incorrect.
(3) Statement I is correct but Statement II is incorrect.
(4) Statement I is incorrect but Statement II is correct.
Answer: (3)
Solution: S-I is correct but S-II is incorrect as o-, m- and p-nitrophenol are more acidic than phenol. o-,p- and m-nitrophenol have different acidic strength.

Question 57: What mass of 95% pure $CaCO_3$ will be required to neutralise 50 mL of 0.5 M HCl solution according to the following reaction?
$CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + CO_2(g) + 2H_2O(l)$
[Calculate upto second place of decimal point]
Options:
(1) 1.25g
(2) 1.32g
(3) 3.65g
(4) 9.50g
Answer: (2)

Solution: $n_{HCl} = \frac{0.5 \times 50}{1000} = 0.025$ mole

$W_{HCl} = 0.025 \times 36.5 = 0.9125$ g

$M.M_{CaCO_3} = 100$ g/mol

2×36.5 g HCl requires $CaCO_3$ = 100 g

0.9125 g HCl requires $CaCO_3 = \dfrac{100}{2 \times 36.5} \times 0.9125 = 1.25$ g

Mass of 95% pure $CaCO_3 = \dfrac{1.25 \times 100}{95} = 1.32$ g

Question 58: The lUPAC name of an element with atomic number 119 is
Options:
(1) ununennium
(2) unnilennium
(3) unununnium
(4) ununoctium
Answer: (1)
Solution: IUPAC name of an element with atomic number 119 is ununennium

Question 59: Choose the correct statement:
Options:
(1) Diamond and graphite have two dimensional network.
(2) Diamond is covalent and graphite is ionic.
(3) Diamond is sp^3 hybridised and graphite is sp^2 hybridized.
(4) Both diamond and graphite are used as dry lubricants.
Answer: (3)
Solution: Diamond - sp^3 hybridised
Graphite – sp^2 hybridised

Question 60: Statement I: In the coagulation of a negative sol, the flocculating power of the three given ions is in the order -
$Al^{3+} > Ba^{2+} > Na^+$
Statement II: In the coagulation of a positive sol, the flocculating power of the three given salts is in the order -
$NaCl > Na_2SO_4 > Na_3PO_4$
Choose the most appropriate answer from the options given below :
Options:
(1) Both Statement I and Statement II are correct.
(2) Both Statement I and Statement II are incorrect.
(3) Statement I is correct but Statement II is incorrect.
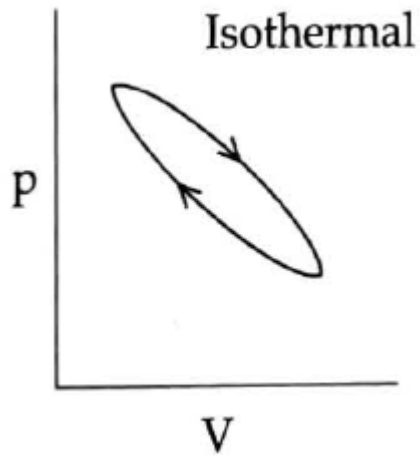(4) Statement I is incorrect but Statement II is correct.
Answer: (3)
Solution: Statement-I is correct but S-II is incorrect as per Hardy Schulze law.

Question 61: Which of the following p-V curve represents maximum work done?
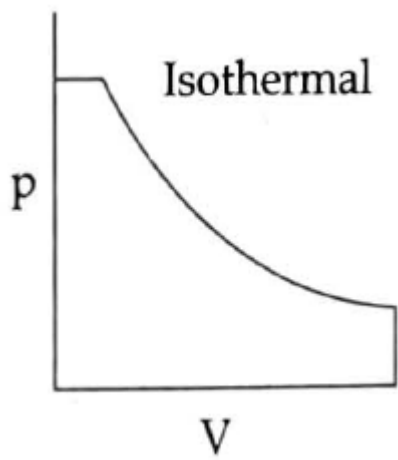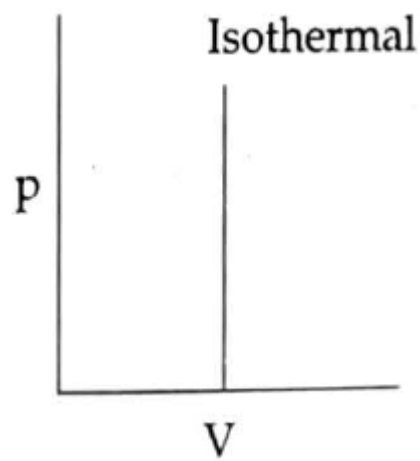**Options:**
(1)

(2)

(3)

(4)

Isothermal
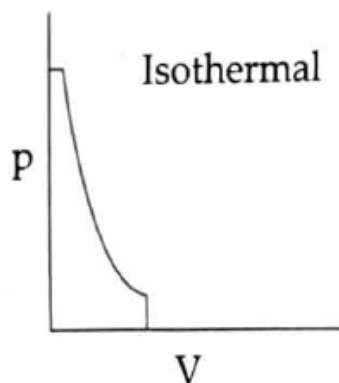
Answer: (2)
Solution: Option (2), represents maximum work done

Question 62: <u>Statement I:</u> Primary aliphatic amines react with HNO_2 to give unstable diazonium salts.
Statement II: Primary aromatic amines react with HNO_2 to form diazonium salts which are stable even above 300 K.
Choose the most appropriate answer from the options given below :
Options:
(1) Both Statement I and Statement II are correct.
(2) Both Statement I and Statement II are incorrect.
(3) Statement I is correct but Statement II is incorrect.
(4) Statement I is incorrect but Statement II is correct.
Answer: (3)
Solution: Primary aliphatic amines form highly unstable diazonium salts as they decompose even at low temperature and primary aromatic amines are unstable above 0-5ºC i.e., 273-278 K

Question 63: Which amongst the following is incorrect statement?
Options:
(1) The bond orders of O_2^+, O_2, O_2^- and O_2^{2-} are 2.5, 2, 1.5 and 1, respectively.
(2) C_2 molecule has four electrons in its two degenerate π molecular orbitals.
(3) H_2^+ ion has one electron.
(4) O_2^+ ion is diamagnetic.
Answer: (4)
Solution: O_2^+ ion is paramagnetic due to presence of unpaired electrons
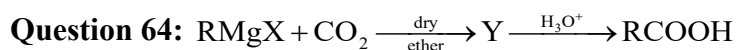
Question 64: $RMgX + CO_2 \xrightarrow[\text{ether}]{\text{dry}} Y \xrightarrow{H_3O^+} RCOOH$
What is Yin the above reaction?
Options:
(1) $RCOO^-Mg^+X$
(2) $R_3CO^-Mg^+X$
(3) $RCOO^- X^+$
(4) $(RCOO)_2Mg$
Answer: (1)
Solution:
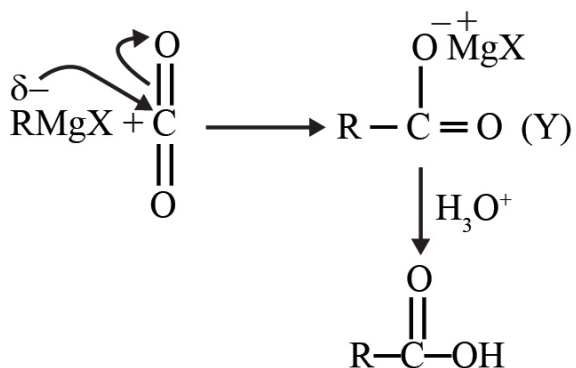
∴ The correct answer is option 1

Question 65: Which statement regarding polymers is not correct?
Options:
(1) Elastomers have polymer chains held together by weak intermolecular forces.
(2) Fibers possess high tensile strength.
(3) Thermoplastic polymers are capable of repeatedly softening and hardening on heating and cooling respectively.
(4) Thermosetting polymers are reusable.
Answer: (4)
Solution: Thermosetting polymers cannot be reshaped and reused.

Question 66: Given below are half cell reactions:
$MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{2+} + 4H_2O$,
$E^o_{Mn^{+2}/MnO_4^-} = -1.510$ V

$\frac{1}{2}O_2 + 2H^+ + 2e^- \rightarrow H_2O$,
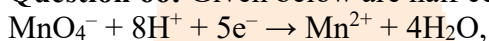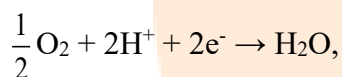
$E^o_{O_2/H_2O} = +1.223$ V

Will the permanganate ion, MnO_4^- liberate O_2 from water in the presence of an acid?
Options:
(1) Yes, because $E^o_{cell} = +0.287$V
(2) No, because $E^o_{cell} = -0.287$V
(3) Yes, because $E^o_{cell} = +2.733$ V
(4) No, because $E^o_{cell} = -2.733$ V
Answer: (1)
Solution: For the liberation of O_2, the required reaction is
$MnO_4^- + 4H_2O \rightarrow Mn^{2+} + H^+ + O_2$
For the reaction to be spontaneous, the E^o_{cell} is to be positive
$E^o_{cell} = E^o_{MnO_4^-/Mn^{+2}} + E^o_{H_2O/O_2}$
$= 1.510 + (-1.223) = 0.287$ V
Therefore, correct option is (1)
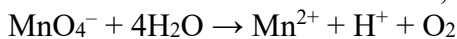
Question 67: The Kjeldahl' s method for the estimation of nitrogen can be used to estimate the amount of nitrogen in which one of the following compounds ?
Options:
(1)

NO_2

(2)

(3)

NH_2
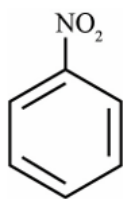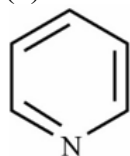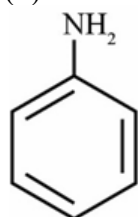
(4)
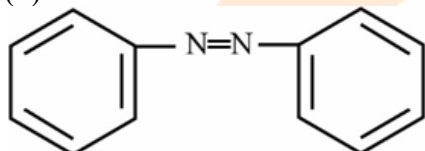
Answer: (3)

Solution: Kjeldahl method can't be used for compound containing nitrogen in the form of NO_2, azo groups or if the nitrogen is a part of ring as N of these compounds do not change to ammonium sulphate under these conditions.
Hence it can be only used for option 3.

Question 68: The incorrect statement regarding enzymes is :
Options:
(1) Enzymes are biocatalysts.
(2) Like chemical catalysts enzymes reduce the activation energy of bio processes .
(3) Enzymes are polysaccharides.
(4) Enzymes are very specific for a particular reaction and substrate.
Answer: (3)
Solution: Enzymes are globular proteins and not polysaccharides

Question 69: The IUPAC name of the complex $[Ag(H_2O)_2][Ag(CN)_2]$ is:
Options:
(1) dicyanidosilver(II) diaquaargentate(II)
(2) diaquasilver(II) dicyanidoargentate(II)
(3) dicyanidosilver(I) diaquaargentate(I)
(4) diaquasilver(I) dicyanidoargentate(I)
Answer: (4)
Solution: The IUPAC name of the complex $[Ag(H_2O)_2][Ag(CN)_2]$ is diaquasilver(I)dicyanidoargentate(I)

Question 70: Match List - I with List- II.

List-I (Drug class)	List-II (Drug molecule)
(a) Antacids	(i) Salvarsan
(b) Antihistamines	(ii) Morphine
(c) Analgesics	(iii) Cimetidine
(d) Antimicrobials	(iv) Seldane

Options:
(1) (a)-(iii), (b)-(ii), (c)-(iv), (d) - (i)
(2) (a)-(iii), (b)-(iv), (c)- (ii), (d)-(i)
(3) (a)-(i), (b)-(iv), (c)- (ii), (d)-(iii)
(4) (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)
Answer: (2)
Solution:
Antacids-Cimetidine
Antihistamines-Seldane
Analgesics-Morphine
Antimicrobials-Salvarsan

Question 71: Amongst the following which one will have maximum 'lone pair- lone pair' electron repulsions?
Options:
(1) ClF_3
(2) IF_5
(3) SF_4
(4) XeF_2
Answer: (4)
Solution: XeF_2 has two bond pair and three lone pair that gives it maximum lone pair-lone pair repulsion.

Question 72: At 298 K, the standard electrode potentials of Cu^{2+}/Cu, Zn^{2+}/Zn, Fe^{2+}/Fe and Ag^+/Ag are 0.34 V, - 0.76 V, - 0.44 V and 0.80 V, respectively.
On the basis of standard electrode potential, predict which of the following reaction cannot occur ?
Options:
(1) $CuSO_4(aq) + Zn(s) \rightarrow ZnSO_4(aq) + Cu(s)$
(2) $CuSO_4(aq) + Fe(s) \rightarrow FeSO_4(aq) + Cu(s)$
(3) $FeSO_4(aq) + Zn(s) \rightarrow ZnSO_4(aq) + Fe(s)$
(4) $2CuSO_4(aq) + 2Ag(s) \rightarrow 2Cu(s) + Ag_2SO_4(aq)$
Answer: (4)
Solution: $2CuSO_4(aq) + 2Ag(s) \rightarrow$ No reaction

Question 73: Identify the incorrect statement from the following.
Options:
(1) All the five 5d orbitals are different in size when compared to the respective 4d orbitals.

(2) All the five 4d orbitals have shapes similar to the respective 3d orbitals.
(3) In an atom, all the five 3d orbitals are equal in energy in free state.
(4) The shapes of d_{xy}, d_{yz}, and d_{zx} orbitals are similar to each other; and $d_{x^2-y^2}$ and d_{z^2} are similar to each other.

Answer: (4)
Solution:
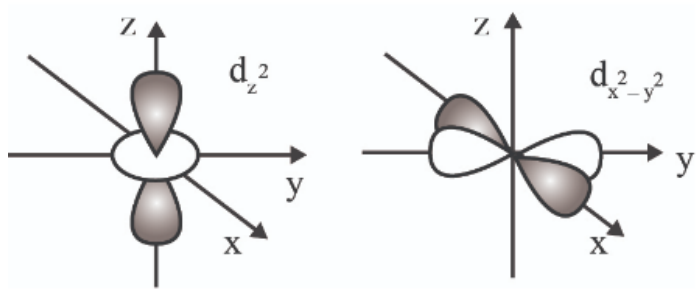
Question 74: In one molal solution that contains 0.5 mole of a solute, there is
Options:
(1) 500 mL of solvent
(2) 500 g of solvent
(3) 100 mL of solvent
(4) 1000 g of solvent
Answer: (2)
Solution:

$$m = \frac{\text{Moles of solute}}{\text{Mass of solvent(kg)}}$$

$$1 \text{ molal} = \frac{0.5}{\text{w of solvent in (kg)}}$$

w of solvent (kg) $= \dfrac{0.5}{1} = 0.5 \text{ kg} = 500 \text{ g}$

Question 75: Assertion (A): ICl is more reactive than I_2
Reason(R): I-Cl bond is weak than I-I bond
Choose the most appropriate answer from the options given below:
Options:
(1) Both (A) and (R) are correct and (R) is the correct explanation of (A)
(2) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
(3) (A) is correct but (R) is not correct
(4) (A) is not correct but (R) is correct
Answer: (1)
Solution: Both (A) and (R) are correct and (R) is correct explanation of (A)
   - Interhalogen species are more reactive than halogens, so A is right.
   - In general, interhalogens compounds are more reactive than halogens (except F).
   - This is because X-X' bond in interhalogens in weaker than X-X bond in halogens except F-F bond.

Question 76: Which compound amongst the following is not an aromatic compound?
Options:
(1)

(2)

(3)

(4)
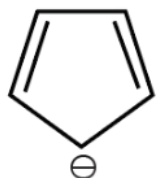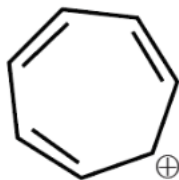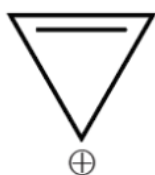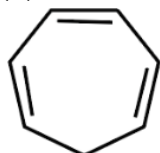
Answer: (4)
Solution: This is not an aromatic compound as it is non-planar.

Question 77: Statement I: The boiling points of the following hydrides of group 16 elements increases in the order-
$H_2O < H_2S < H_2Se < H_2Te$
Statement II: The boiling points of these hydrides increases with increase in molar mass.
In the light of the above statements, choose the most appropriate answer from the options given below:
Options:
(1) Both Statement I and Statement II are correct.
(2) Both Statement I and Statement II are incorrect.
(3) Statement I is correct but Statement II is incorrect.
(4) Statement I is incorrect but Statement II is correct.
Answer: (2)
Solution: Boiling point of H_2O is maximum due to hydrogen bonding
So, both S-I and S-II are false
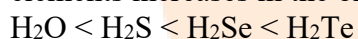
Question 78: Match List-I with List-II.

List-I	List-II
(a) Li	(i) absorbent for carbon dioxide
(b) Na	(ii) electrochemical cells
(c) KOH	(iii) coolant in fast breeder reactors

(d) Cs	(iv) photoelectric cell

Choose the correct answer from the options given below :
Options:
(1) (a)-(iv), (b)-(i), (c)-(iii), (d)-(ii)
(2) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)
(3) (a)-(i), (b)-(iii), (c)-(iv), (d)-(ii)
(4) (a)-(ii), (b)-(iii), (c)-(i), (d)-(iv)
Answer: (4)
Solution:
Li $\Rightarrow$ electrochemical cells
Na $\Rightarrow$ coolant in fast breeder reactors
KOH $\Rightarrow$ absorbent for carbon dioxide
Cs $\Rightarrow$ photoelectric cell

Question 79: Which of the following sequence of reactions is suitable to synthesize chlorobenzene?
Options:
(1) Benzene, Cl_2, anhydrous $FeCl_3$
(2) Phenol, $NaNO_2$, HCl, CuCl

(3) , HCl
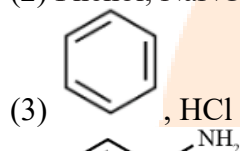
(4) , HCl, Heating

Answer: (1)
Solution:
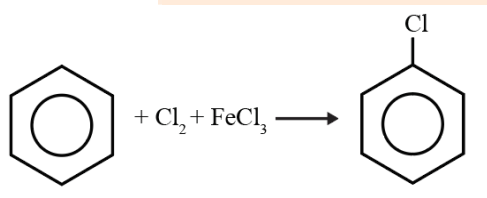
Question 80: Statement I: The boiling points of aldehydes and ketones are higher than hydrocarbons of comparable molecular masses because of weak molecular association in aldehydes and ketones due to dipole - dipole interactions
Statement II: The boiling points of aldehydes and ketones are lower than the alcohols of similar molecular masses due to the absence of H-bonding.
In the light of the above statements choose the most appropriate answer from the options given below:
Options:
(1) Both Statement I and Statement II are correct.
(2) Both Statement I and Statement II are incorrect.
(3) Statement I is correct but Statement II is incorrect.
(4) Statement I is incorrect but Statement II is correct.
Answer: (1)
Solution: Both S-I and S-II are correct

Question 81: Match List - I with List- II.

List-I (Products formed)	List-II (Reaction of carbonyl compound with)
(a) Cyanohydrin	(i) NH_2OH
(b) Acetal	(ii) RNH_2
(c) Schiff's base	(iii) alcohol
(d) Oxime	(iv) HCN

Choose the correct answer from the options given below :

Options:
(1) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)
(2) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)
(3) (a)-(i), (b)-(iii), (c)-(ii), (d)-(iv)
(4) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)
Answer: (4)
Solution:
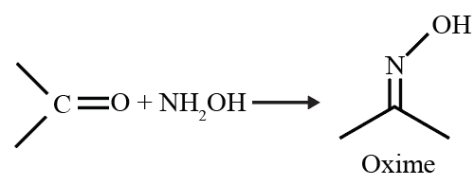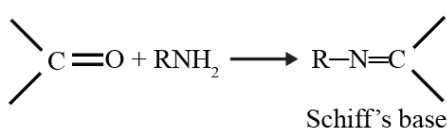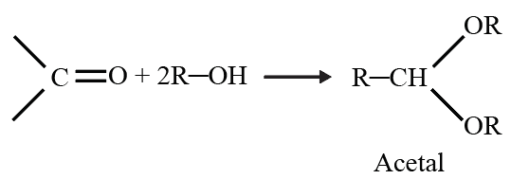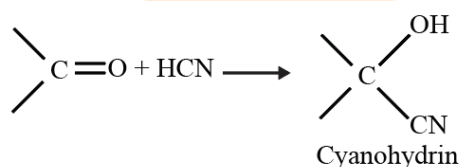
Question 82: The incorrect statement regarding chirality is:
Options:
(1) S_N1 reaction yields 1 : 1 mixture of both enantiomers.
(2) The product obtained by S_N2 reaction of haloalkane having chirality at the reactive site shows inversion of configuration.
(3) Enantiomers are superimposable mirror images on each other.
(4) A racemic mixture shows zero optical rotation.
Answer: (3)

Solution: Enantiomers are non-superimposable mirror images on each other.

Question 83: Match List - I with List- II.
Choose the correct answer from the options given below :

List-I (Hydrides)	List-II (Nature)
(a) MgH_2	(i) Electron precise
(b) GeH_4	(ii) Electron deficient
(c) B_2H_6	(iii) Electron rich
(d) HF	(iv) Ionic

Options:
(1) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)
(2) (a)-(iii), (b)-(i), (c)-(ii), (d)-(iv)
(3) (a)-(i), (b)-(ii), (c)-(iv), (d)-(iii)
(4) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)
Answer: (1)
Solution:
MgH_2-Ionic
GeH_4-Electron precise
B_2H_6-Electron deficient
HF-Electron rich

Question 84: Which of the following statement is not correct about diborane?
Options:
(1) There are two 3-centre-2-electron bonds.
(2) The four terminal B-H bonds are two centre two electron bonds.
(3) The four terminal Hydrogen atoms and the two Boron atoms lie in one plane.
(4) Both the Boron atoms are sp^2 hybridised.
Answer: (4)
Solution: Each boron atom in diborane is sp^3 hybridised

Question 85: The given graph is a representation of kinetics of a reaction.

Constant temperature T

y

x
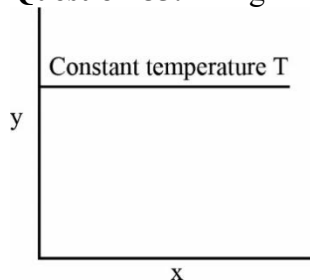
The y and x axes for zero and first order reactions, respectively are
Options:
(1) zero order (y = concentration and x = time), first order (y = $t_{1/2}$, and x = concentration)
(2) zero order (y = concentration and x = time), first order (y = rate constant and x = concentration)
(3) zero order (y = rate and x = concentration), first order (y = $t_{1/2}$ and x = concentration)
(4) zero order (y = rate and x = concentration), first order (y = rate and x = $t_{1/2}$)
Answer: (3)
Solution: Zero order = Rate is independent of concentration.
First order = Half life is independent of concentration.

Question 86: Match List-I with List-II.

List-I (Ores)	List-II (Composition)
(a) Haematite	(i) Fe_3O_4
(b) Magnetite	(ii) $ZnCO_3$
(c) Calamine	(iii) Fe_2O_3
(d) Kaolinite	(iv) $[Al_2(OH)_4Si_2O_5]$

Choose the correct answer from the options given below :
Options:
(1) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)
(2) (a)-(iii), (b)-(i), (c)-(ii), (d)-(iv)
(3) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)
(4) (a)-(i), (b)-(iii), (c)-(ii), (d)-(iv)
Answer: (2)
Solution:
(i) $Fe_3O_4 \Rightarrow$ Magnetite
(ii) $ZnCO_3 \Rightarrow$ Calamine
(iii) $Fe_2O_3 \Rightarrow$ Haematite
(iv) $[Al_2(OH)_4Si_2O_5] \Rightarrow$ Kaolinite

Question 87: A 10.0 L flask contains 64 g of oxygen at 27°C.
(Assume O_2 gas is behaving ideally). The pressure inside the flask in bar is (Given R = 0.0831 L bar K^{-1} mol^{-1})
Options:
(1) 2.5
(2) 498.6
(3) 49.8
(4) 4.9
Answer: (4)
Solution: PV = nRT
$$P = \frac{2 \times 0.0831 \times 298}{10} = 4.95 \, bar$$

Question 88: For a first order reaction A → Products, initial concentration of A is 0.1 M, which becomes 0.001M after 5 minutes. Rate constant for the reaction in min^{-1} is
Options:
(1) 1.3818
(2) 0.9212
(3) 0.4606
(4) 0.2303
Answer: (2)
Solution:

$$K = \frac{2.303}{t} \log\left(\frac{[A_0]}{[A]}\right)$$

$$= \frac{2.303}{t} \log\left(\frac{0.1}{0.001}\right)$$

$$= \frac{2.303}{5} \log 10^2 = 0.9212$$

Question 89: The order of energy absorbed which is responsible for the color of complexes
(A) $Ni(H_2O)_2(en)_2]^{2+}$
(B) $[Ni(H_2O)_4(en)]^{2+}$
(C) $[Ni(en)_3]^{2+}$
Options:
(1) A > B > C
(2) C > B > A
(3) C > A > B
(4) B > A > C
Answer: (3)
Solution: Higher the no. of strong field ligand, more is the Δ_o, more will be the energy absorbed by electrons, that further impart colour while jumping to lower energy orbitals.

Question 90: $3O_2$ (g) ⇌ $2O_3$(g)
for the above reaction at 298 K, K_c is found to be
3.0×10^{-59}. If the conc. of O_2 at equilibrium is 0.040 M then concentration of O_3 in M is.
Options:
(1) 4.38×10^{-32}
(2) 1.9×10^{-63}
(3) 2.4×10^{31}
(4) 1.2×10^{21}
Answer: (1)
Solution:
$K_c = 3.0 \times 10^{-59}$

$$K_c = \frac{[O_3]^2}{[O_2]^3} \quad \text{Let concentration of } O_3 = x$$

$$3.0 \times 10^{-59} = \frac{x^2}{(0.04)^3}$$

On solving
$x = 4.38 \times 10^{-32}$

Question 91: Find the emf of the cell

Ni(s) + 2 Ag$^+$ (0.001 M) → Ni^{2+} (0.001 M) + 2Ag(s)
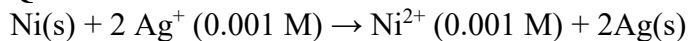
(Given that E°cell = 1.05 V, $\dfrac{2.303\,RT}{F} = 0.059$ at 298 K)

Options:
(1) 1.0385 V
(2) 1.385 V
(3) 0.9615 V
(4) 1.05 V

Answer: (3)

Solution:

Ni(s) + 2Ag$^+$ → Ni^{2+} + 2Ag

Anode: Ni → Ni^{2+} + 2e$^-$

Cathode: 2Ag$^+$ + 2e$^-$ → 2Ag
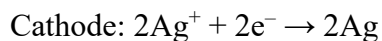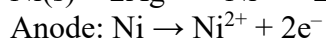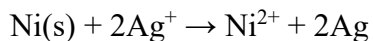
$$E_{cell} = E_{cell}^\circ - \frac{0.059}{n} \log \frac{\left[Ni^{2+} \right]}{\left[Ag^+ \right]^2}$$

$$= 1.05 - \frac{0.059}{2} \log \frac{(0.001)}{(0.001)^2} = 0.9615\,V$$

Question 92: Which one of the following is not formed when acetone reacts with 2-pentanone in the presence of dilute NaOH followed by heating?

Options:

(1)
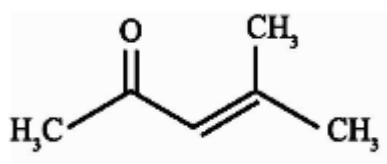
(2)
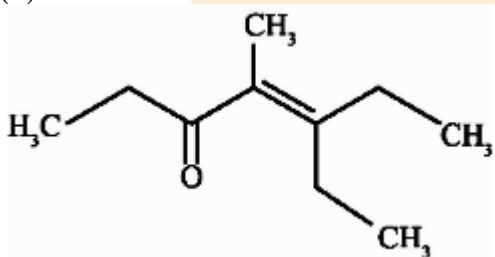
(3)

(4)
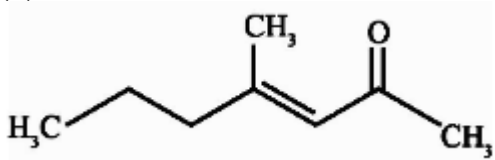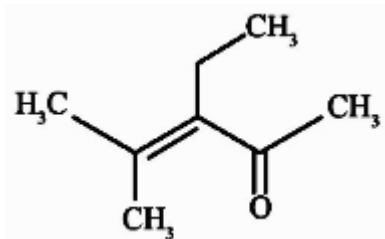
Answer: (2)
Solution:
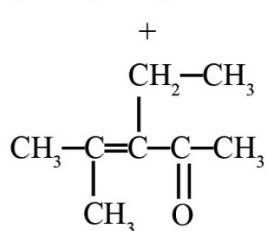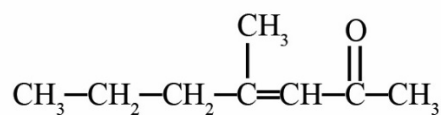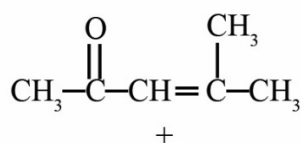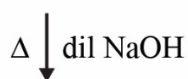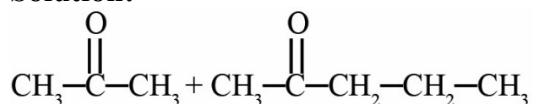
Question 93: The correct IUPAC name of the following compound is
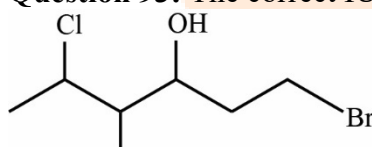
Options:
(1) 1 - bromo - 5 - chloro - 4 - methyl hexan - 3- ol
(2) 6 - bromo - 2 - chloro - 4 - methyl hexan - 4- ol
(3) 1 - bromo - 4 - chloro - 5 - chloro hexan - 3- ol
(4) 6 - bromo - 4 - chloro - 4 - chloro hexan - 4- ol
Answer: (1)
Solution:
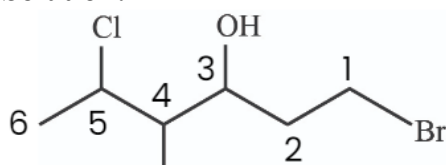
Question 94: If radius of second Bohr orbit of the He$^+$ ion is 105.8pm, What is the radius of third Bohr Orbit of Li^{2+} ion ?
Options:
(1) 158.7 pm

(2) 15.87 pm
(3) 1.587 pm
(4) 158.7 Å
Answer: (1)
Solution:

$$r \propto \frac{n^2}{Z} \Rightarrow \frac{r_1}{r_2} = \frac{n_1^2}{n_2^2} \times \frac{Z_2}{Z_1}$$

$$\Rightarrow \frac{105.8}{Li^{+2}} = \frac{4}{9} \times \frac{3}{2}$$

$$r_{Li^{+2}} = \frac{3 \times 105.8}{2} = 158.7 \, pm$$

Question 95: Compound X on reaction with O_3 followed by Zn/H_2O gives formaldehyde and 2-methyl propanal as products. The compound X is :
Options:
(1) 3 -Methylbut -1-ene
(2) 2-Methylbut -1-ene
(3) 2-Methylbut - 2-ene
(4) Pent - 2- ene
Answer: (1)
Solution:

$$CH_3-CH-CH=CH_2 + O_3 \xrightarrow{Zn/H_2O} \begin{matrix} H \\ \diagdown \\ H \diagup \end{matrix} C=O + CH_3-CH-CHO$$
$$\quad\quad | \quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad | $$
$$\quad CH_3 \quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad CH_3$$
$$\quad (X)$$
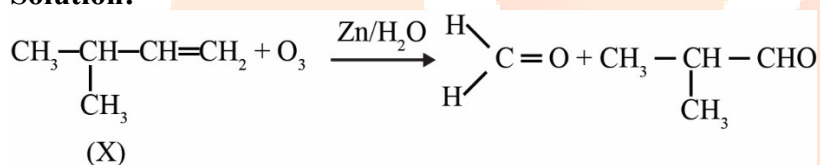
Question 96: In the neutral or faintly alkaline medium, $KMnO_4$ oxidises iodide into iodate. The change in oxidation state of manganese in this reaction is from
Options:
(1) +7 to +4
(2) +6 to +4
(3) +7 to +3
(4) +6 to +5
Answer: (1)
Solution:

$$2\overset{+7}{Mn}O_4^- + H_2O + I^- \rightarrow 2\overset{+4}{Mn}O_2 + 2OH^- + IO_3^-$$
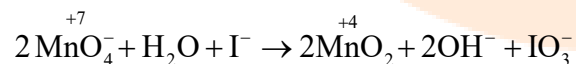
Question 97: The pollution due to oxides of sulphur gets enhanced due to the presence of:
(a) Particulate matter
(b) Ozone
(c) Hydrocarbons
(d) Hydrogen peroxide.
Choose the most appropriate answer from the options given below:
Options:
(1) (a), (d) only
(2) (a), (b), (d) only
(3) (b), (c), (d) only
(4) (a), (c), (d) only

Answer: (2)

Solution: The pollution due to oxides of sulphur gets enhanced due to the presence of particulate matter, ozone and hydrogen peroxide.

Question 98: Given below are two statements :

Statement I: In Lucas test, primary, secondary and tertiary alcohols are distinguished on the basis of their reactivity with conc. HCl +ZnCl2, knowns as Lucas Reagent.

Statement II: Primary alcohols are most reactive and immediately produce turbidity at room temperature on reaction with Lucas Reagent.

In the light of the above statements, choose the most appropriate answer from the options given below:

Options:

(1) Both statement I and Statement II are incorrect

(2) Both statement I and Statement II are incorrect

(3) Statement I is correct but Statement II is incorrect.

(4) Statement I is incorrect but statement II is correct

Answer: (3)

Solution: Alcohols reactivity: $3^o > 2^o > 1^o$

S-I is correct but S-II is incorrect as 3° alcohol produces the most stable carbocation and thus it is most reactive with Lucas reagent

Question 99: Copper crystallises in fcc unit cell with cell edge length of 3.608 x 10^{-8} cm. The density of copper is 8.92 g cm^{-3}. Calculate the atomic mass of copper

Options:

(1) 63.1 u

(2) 31.55 u

(3) 60 u

(4) 65 u

Answer: (1)

Solution: $d = \dfrac{Z \times M}{N_A \times a^3}$

$$M = \frac{8.92 \times 6.022 \times 10^{23} \times \left(3.608 \times 10^{-8}\right)^3}{4} = 63.1 \text{ u}$$

Question 100: The product formed from the following reaction sequence is

Options:

(1)

(2)

(3)

(4)
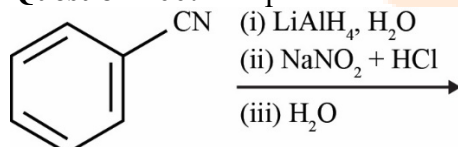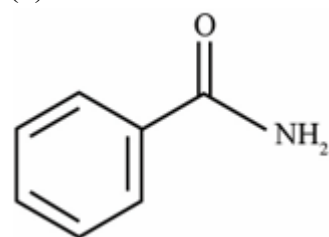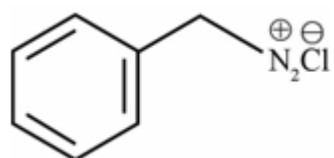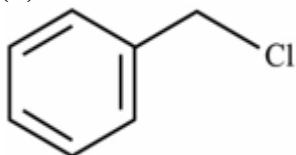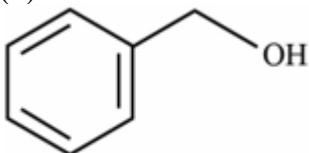
Answer: (4)
Solution:
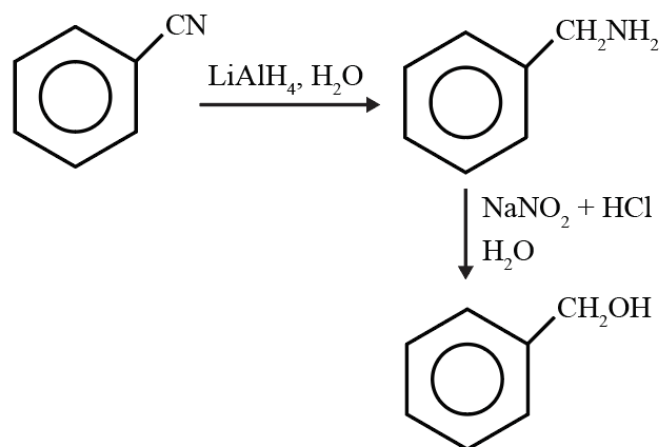
NEET-17-07-2022
(Paper Code – Q6)

Biology

Question 101: Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A): Polymerase chain reaction is used in DNA amplification.

Reason (R): The ampicillin resistant gene is used as a selectable marker to check transformation.

In the light of the above statements, choose the correct answer from the options given below:

Options:

(a) Both (A) and (R) are correct and (R) is the correct explanation of (A)

(b) Both (A) and (R) are correct but (R) is not the correct explanation of (A)

(c) (A) is correct but (R) is not correct

(d) (A) is not correct but (R) is correct

Answer: (b)

Solution: Polymerase chain reaction (PCR) is used in DNA amplification. Selectable markers are not used in PCR. Selectable markers like the antibiotic resistance genes are useful during transformation.

Question 102: The process of translation of mRNA to proteins begins as soon as:

Options:

(a) The small subunit of ribosome encounters mRNA

(b) The larger subunit of ribosome encounters mRNA

(c) Both the subunits join together to bind with mRNA

(d) The tRNA is activated and the larger subunit of ribosome encounters mRNA

Answer: (a)

Solution: Translation of mRNA or protein synthesis starts when the small subunit of the ribosome encounters an mRNA.

Question 103: The gaseous plant growth regulator is used in plants to:

Options:

(a) Speed up the malting process

(b) Promote root growth and root hair formation to increase the absorption surface

(c) Help overcome apical dominance

(d) Kill dicotyledonous weeds in the fields

Answer: (b)

Solution: Ethylene is a gaseous phytohormone that regulates both growth, and senescence.

• It is produced in large amounts by tissues undergoing senescence and ripening fruits.

• It promotes or inhibits growth and senescence processes in the plants.

• Ethylene inhibits lateral buds and causes apical dominance.

• Ethylene promotes femaleness in Pineapple and Cucumber.

• It increases the number of female flowers in cucumber plants, thereby increasing the final yield.

• The hormone also increases the absorption surface area of the root as it promotes root growth and root hair formation.

Question 104: Exoskeleton of arthropods is composed of:
Options:
(a) Cutin
(b) Cellulose
(c) Chitin
(d) Glucosamine
Answer: (c)
Solution: All arthropods have a hard exoskeleton made of chitin, a type of protein. This shell provides protection for the animals, and gives support for the attachment of the arthropod's muscles. Although arthropods grow, their exoskeletons do not grow with them.

Question 105: Which of the following is not observed during an apoplastic pathway?
Options:
(a) Movement of water occurs through intercellular spaces and wall of the cells
(b) The movement does not involve crossing of cell membrane
(c) The movement is aided by cytoplasmic streaming
(d) Apoplast is continuous and does not provide any barrier to water movement
Answer: (c)
Solution: Apoplast is the system of cell walls which is continuous throughout the plant except in some parts like Casparian strips in the roots. Therefore it cannot be aided by cytoplasmic streaming and cannot occur through plasmodesmata.

Question 106: Which of the following is not a method of *ex situ* conservation?
Options:
(a) *In vitro fertilization*
(b) National Parks
(c) Micropropagation
(d) Cryopreservation
Answer: (b)
Solution: National parks are a method of *in situ* conservation of biodiversity where organisms are protected within their natural habitat.

Question 107: Match List - I with List - II. Choose the correct answer from the options given below:

	List - I		List - II
(a)	Manganese	(i)	Activates the enzyme catalase
(b)	Magnesium	(ii)	Required for pollen germination
(c)	Boron	(iii)	Activates enzymes of respiration
(d)	Iron	(iv)	Functions in splitting of water during photosynthesis

Options:

(a) (a)- (iii); (b) - (iv); (c) - (i);(d) - (ii)
(b) (a)- (iv); (b) - (iii); (c) - (ii);(d) - (i)
(c) (a)- (iv); (b) - (i); (c) - (ii);(d) - (iii)
(d) (a)- (iii); (b) - (i); (c) - (ii);(d) - (iv)
Answer: (b)
Solution: Manganese sparks the photosynthesis process by splitting water after Photosystem II (PSII) fixes light to initiate the conversion of CO_2 and water into carbohydrates.
-Magnesium activates the enzymes of respiration, photosynthesis and is involved in the synthesis of DNA and RNA.
-Boron is required for pollen germination and pollen tube growth.
-Iron activates catalase. Catalase is an enzyme that contains four iron heme groups that allows it to react with the hydrogen peroxide.

Question 108: Which one of the following statements is not true regarding gel electrophoresis technique?
Options:
(a) The process of extraction of separated DNA strands from gel is called elution
(b) The separated DNA fragments are stained by using ethidium bromide
(c) The presence of chromogenic substrate gives blue coloured DNA bands on the gel
(d) Bright orange coloured bands of DNA can be observed in the gel when exposed to UV light
Answer: (c)
Solution: No chromogenic substrates are used during gel electrophoresis. Instead EtBr is used which intercalates between the DNA and it becomes visible under UV light. DNA bands are not visible in the gel unless they are illuminated by UV light.

Question 109: Which one of the following is not true regarding the release of energy during ATP synthesis through chemiosmosis? It involves:
Options:
(a) Breakdown of proton gradient
(b) Breakdown of electron gradient
(c) Movement of protons across the membrane to the stroma
(d) Reduction of NADP to $NADPH_2$ on the stroma side of the membrane
Answer: (b)
Solution: Chemiosmotic hypothesis explains the mechanism of ATP synthesis in the thylakoids of chloroplast. In photosynthesis, the synthesis of ATP is linked to the development of a proton gradient across the cell membrane. No electron gradient is formed during generation of ATP.

Question 110: DNA polymorphism forms the basis of:
Options:
(a) Genetic mapping
(b) DNA fingerprinting
(c) Both genetic mapping and DNA fingerprinting
(d) Translation
Answer: (b)
Solution: Polymorphism in DNA is the basis of DNA fingerprinting. Satellite DNA shows a high degree of polymorphism or variation, which is why satellite DNA regions are important in DNA fingerprinting.

Question 111: Habitat loss and fragmentation, over exploitation, alien species invasion and co-extinction are causes for:
Options:
(a) Population explosion
(b) Competition
(c) Biodiversity loss
(d) Natality
Answer: (c)
Solution: 'The Evil Quartet' of biodiversity loss is a concept that describes the reason that causes extinction of species. These main four reasons are overexploitation, loss of habitat, extinction of species continuously and introduction of the exotic species.

Question 112: The device which can remove particulate matter present in the exhaust from a thermal power plant is:
Options:
(a) STP
(b) Incinerator
(c) Electrostatic Precipitator
(d) Catalytic Convertor
Answer: (c)
Solution: Electrostatic precipitators (ESPs) are very efficient devices which remove 99% of particulate matter present in the industrial and thermal plant exhausts.

Question 113: Which one of the following plants does not show plasticity?
Options:
(a) Cotton
(b) Coriander
(c) Buttercup
(d) Maize
Answer: (d)
Solution: Plasticity is the ability of the plant to adjust to a particular environment by altering the rate of growth, development, and metabolism. For example, heterophylly in cotton, coriander, larkspur and buttercup. Maize does not show plasticity.

Question 114: Which one of the following statements cannot be connected to Predation?
Options:
(a) It helps in maintaining species diversity in a community
(b) It might lead to extinction of a species
(c) Both the interacting species are negatively impacted
(d) It is necessitated by nature to maintain the ecological balance
Answer: (c)
Solution: In predation, the predator is benefitted whereas the prey population is negatively impacted since they are preyed on by the predator.

Question 115: What amount of energy is released from glucose during lactic acid fermentation?
Options:
(a) Approximately 15%
(b) More than 18%
(c) About 10%

(d) Less than 7%
Answer: (d)
Solution: Less than seven percent of the energy in glucose is released in fermentation and moreover not all of it is stored as ATP.

Question 116: Given below are two statements:
Statement I : Mendel studied seven pairs of contrasting traits in pea plants and proposed the Laws of Inheritance
Statement II : Seven characters examined by Mendel in his experiment on pea plants were seed shape and colour, flower colour, pod shape and colour, flower position and stem height
In the light of the above statements, choose the correct answer from the options given below:
Options:
(a) Both Statement I and Statement II are correct
(b) Both Statement I and Statement II are incorrect
(c) Statement I is correct but Statement II is incorrect
(d) Statement I is incorrect but Statement II is correct
Answer: (a)
Solution: Mendel studied seven pairs of contrasting traits in pea plants and proposed the Laws of Inheritance. These seven pairs of contrasting traits were seed shape, seed colour, flower colour, pod shape, pod colour, flower position and stem height.

Question 117: Given below are two statements:
Statement I : Decomposition is a process in which the detritus is degraded into simpler substances by microbes.
Statement II: Decomposition is faster if the detritus is rich in lignin and chitin
In the light of the above statements, choose the correct answer from the options given below
Options:
(a) Both Statement I and Statement II are correct
(b) Both Statement I and Statement II are incorrect
(c) Statement I is correct but Statement II is incorrect
(d) Statement I is incorrect but Statement II is correct
Answer: (c)
Solution: Decomposition rate is slower if detritus is rich in lignin and chitin, and quicker, if detritus is rich in nitrogen and water - soluble substances like sugars.

Question 118: Read the following statements and choose the set of correct statements:
(a) Euchromatin is loosely packed chromatin
(b) Heterochromatin is transcriptionally active
(c) Histone octamer is wrapped by negatively charged DNA in nucleosome
(d) Histones are rich in lysine and arginine.
(e) A typical nucleosome contains 400 bp of DNA helix

Choose the correct answer from the options given below:
Options:
(a) (b), (d), (e) Only
(b) (a), (c), (d) Only
(c) (b), (e) Only
(d) (a), (c), (e) Only
Answer: (b)
Solution: Heterochromatin are regions of DNA that are tightly packed with histone proteins and are transcriptionally inactive, contrary to euchromatin. A nucleosome typically contains 200 bp of DNA helix.

Question 119: Which one of the following plants shows vexillary aestivation and diadelphous stamens?
Options:
(a) *Colchicum autumnale*
(b) *Pisum sativum*
(c) *Allium cepa*
(d) *Solanum nigrum*
Answer: (b)
Solution: *Pisum*, commonly known as a pea, shows vexillary aestivation and diadelphous stamens. *Colchicum autumnale, Solanum nigrum* and *Allium cepa* show valvate aestivation.

Question 120: In old trees the greater part of secondary xylem is dark brown and resistant to insect attack due to:
(a) Secretion of secondary metabolites and their deposition in the lumen of vessels.
(b) Deposition of organic compounds like tannins and resins in the central layers of the stem.
(c) Deposition of suberin and aromatic substances in the outer layer of the stem.
(d) Deposition of tannins, gum, resin and aromatic substances in the peripheral layers of the stem.
(e) Presence of parenchyma cells, functionally active xylem elements and essential oils.
Choose the correct answer from the options given below:
Options:
(a) (a) and (b) only
(b) (c) and (d) only
(c) (d) and (e) only
(d) (b) and (d) only
Answer: (a)
Solution: In old trees, the greater part of the secondary xylem is dark brown due to deposition of organic compounds like tannins, resins, oils, gums, aromatic substances and essential oils in the central or innermost layers of the stem. These substances make it hard, durable and resistant to the attacks of microorganisms and insects.

Question 121: Read the following statements about the vascular bundles
(a) In roots, xylem and phloem in a vascular bundle are arranged in an alternate manner along the different radii.
(b) Conjoint closed vascular bundles do not possess cambium
(c) In open vascular bundles, cambium is present in between xylem and phloem
(d) The vascular bundles of dicotyledonous stem possess endarch protoxylem
(e) In monocotyledonous root, usually there are more than six xylem bundles present
Choose the correct answer from the options given below:

Options:
(a) (a), (b) and (d) only
(b) (b), (c), (d) and (e) only
(c) (a), (b), (c) and (d) only
(d) (a), (c), (d) and (e) only
(e) All the options are correct.
Answer: (e)
Solution: All the given statements are correct:

• When xylem and phloem within a vascular bundle are arranged in an alternate manner along the different radii, the arrangement is called radial such as in roots.

• Conjoint, closed vascular bundles enclose both xylem and phloem. Xylem is found towards the inner surface and phloem towards the outer surface. Cambium is absent.

• Open vascular bundles are vascular bundles in which secondary growth is possible. This type of vascular bundle has cambium present in between the xylem and phloem.

• Vascular bundles of dicot stem are eight in number, arranged in the form of a broken ring. The vascular bundles are conjoint, collateral and open. Xylem is on the inner surface and phloem on the outer surface. Xylem is described as endarch.

• Vascular bundles in monocot roots are radial, polyarch and exarch. Large number (more than 6) of xylem and phloem groups alternate with each other.

Question 122: Which one of the following never occurs during mitotic cell division?
Options:
(a) Spindle fibres attach to kinetochores of chromosomes
(b) Movement of centrioles towards opposite poles
(c) Pairing of homologous chromosomes
(d) Coiling and condensation of the chromatids
Answer: (c)
Solution: In mitosis, homologous chromosomes do not pair together. They line up end-to-end so that when they divide, each daughter cell receives a sister chromatid from both members of the homologous pair.

Question 123: Production of Cucumber has increased manifold in recent years. Application of which of the following phytohormones has resulted in this increased yield as the hormone is known to produce female flowers in the plants?
Options:
(a) ABA
(b) Gibberellin
(c) Ethylene
(d) Cytokinin
Answer: (c)
Solution: Ethylene is a simple gaseous plant growth regulator (PGR). It promotes Femaleness (feminising effect) in Pineapple (Bromeliaceae) and Cucumber. Application of Ethylene increases the number of female flowers in cucumber plants, thereby increasing the final yield. Hence, Ethylene can be applied by the farmer to increase the number of female flowers in the cucumber plants.

Question 124: The flowers are Zygomorphic in:
(a) Mustard
(b) Gulmohar
(c) *Cassia*

(d) *Datura*
(e) Chilli
Choose the correct answer from the options given below:
Options:
(a) (a), (b), (c) only
(b) (b), (c) only
(c) (d), (e) only
(d) (c), (d), (e) only
Answer: (b)
Solution: Zygomorphic flowers are those which are only divided into two halves from one plane (bilaterally symmetrical). It includes pea, Gulmohar, *Cassia*, and beans.
Mustard, datura, and chilli are actinomorphic flowers as they can be divided into two halves from any plane (radially symmetrical) .

Question 125: Identify the correct set of statements:
(a) The leaflets are modified into pointed hard thorns in *Citrus* and *Bougainvillea*
(b) Axillary buds form slender and spirally coiled tendrils in cucumber and pumpkin
(c) Stem is flattened and fleshy on *Opuntia* and modified to perform the function of leaves
(d) *Rhizophora* shows vertically upward growing roots that help to get oxygen for respiration
(e) Subaerially growing stems in grasses and strawberry help in vegetative propagation
Choose the correct answer from the options given below:
Options:
(a) (b) and (c) only
(b) (a) and (d) only
(c) (b), (c), (d) and (e) only
(d) (a), (b), (d) and (e) only
Answer: (c)
Solution:
• Axillary buds of stems may also get modified into woody, straight and pointed thorns. Thorns are found in many plants such as *Citrus* and *Bougainvillea.*
• Stem tendrils which develop from axillary buds, are slender and spirally coiled and help plants to climb such as in cucumber, pumpkins and watermelon etc.
• Some plants of arid regions modify their stems into flattened structures such as *Opuntia*. They contain chlorophyll and carry out functions such as photosynthesis.
• *Rhizophora* grows in swampy areas and many of their roots come out of the ground and grow vertically upwards. Such roots, also known as pneumatophores, help to get oxygen for respiration.
• Underground stems of grass and strawberry, etc., spread to new niches and when older parts die new plants are formed (vegetative propagation).

Question 126: Which of the following is incorrectly matched?
Options:
(a) *Ectocarpus* - Fucoxanthin
(b) *Ulothrix* - Mannitol
(c) *Porphyra* - Floridian Starch
(d) *Volvox* - Starch
Answer: (b)
Solution: Brown algae or Phaeophyceae contain mannitol as stored food material. *Ulothrix* belongs to Chlorophyceae (green algae) and they contain starch as the reserve food material.

Question 127: Which one of the following produces nitrogen fixing nodules on the roots of *Alnus*?
Options:
(a) *Rhizobium*
(b) *Frankia*
(c) *Rhodospirillum*
(d) *Beijerinckia*
Answer: (b)
Solution: *Frankia* is a genus of nitrogen-fixing, filamentous bacteria that live in symbiosis with actinorhizal plants but this is non-leguminous. Hence nitrogen fixation in root nodules of *Alnus* is brought about by *Frankia*.

Question 128: Identify the incorrect statement related to Pollination:
Options:
(a) Pollination by water is quite rare in flowering plants
(b) Pollination by wind is more common amongst abiotic pollination
(c) Flowers produce foul odours to attract flies and beetles to get pollinated
(d) Moths and butterflies are the most dominant pollinating agents among insects
Answer: (d)
Solution: Among the animals, insects particularly bees are the dominant pollinating agents. Pollination carried out through water is called hydrophily. Pollination by water is quite rare in flowering plants (only 2%).
Pollination by wind is more common amongst abiotic pollination. Wind pollination requires the light and non-sticky pollen grains so that they can be transported in wind currents.
Some plants whose flowers are pollinated by flies and beetles smell this way(foul odour), mainly to attract flies and beetles, which normally lay their eggs in faeces and rotting materials.

Question 129: Given below are two statements:
Statement I : Cleistogamous flowers are invariably autogamous
Statement II : Cleistogamy is disadvantageous as there is no chance for cross pollination
In the light of the above statements, choose the correct answer from the options given below:
Options:
(a) Both Statement I and Statement II are correct
(b) Both Statement I and Statement II are incorrect
(c) Statement I is correct but Statement II is incorrect
(d) Statement I is incorrect but Statement II is correct
Answer: (a)
Solution: Cleistogamous flowers are the ones that do not open and show self-pollination. Hence, there is no cross pollination occurring at all in these plants, there is little to no variation, which is disadvantageous for the plants.

Question 130: Hydrocolloid carrageen is obtained from
Options:
(a) Chlorophyceae and Phaeophyceae
(b) Phaeophyceae and Rhodophyceae
(c) Rhodophyceae only
(d) Phaeophyceae only
Answer: (c)

Solution: Red algae and brown algae can be employed to produce hydrocolloids as thickening and gelling agents. Carrageen is one such hydrocolloid which is produced by red algae (Rhodophyceae)**.**

Question 131: What is the net gain of ATP when each molecule of glucose is converted to two molecules of pyruvic acid?
Options:
(a) Four
(b) Six
(c) Two
(d) Eight
Answer: (c)
Solution: Each glucose molecule generates two molecules of pyruvate. When a glucose molecule is partially oxidised to form two molecules of pyruvate, 4 molecules of ATP are produced. Out of this, two ATPs are utilised in the preparatory phase of glycolysis therefore there is a net gain of two ATP molecules.

Question 132: The appearance of recombination nodules on homologous chromosomes during meiosis characterizes**:**
Options:
(a) Synaptonemal complex
(b) Bivalent
(c) Sites at which crossing over occurs
(d) Terminalization
Answer: (c)
Solution: In the pachytene stage of prophase I, the non-sister chromatids of the homologous chromosomes cross-over and exchange of genetic material takes place. Recombination nodules are the sites at which the non-sister chromatids cross-over.

Question 133: Given below are two statements:
Statement I : The primary CO_2 acceptor in C_4 plants is phosphoenolpyruvate and is found in the mesophyll cells.
Statement II : Mesophyll cells of C_4 plants lack RuBisCo enzyme.
In the light of the above statements, choose the correct answer from the options given below:
Options:
(a) Both Statement I and Statement II are correct
(b) Both Statement I and Statement II are incorrect
(c) Statement I is correct but Statement II is incorrect
(d) Statement I is incorrect but Statement II is correct
Answer: (a)
Solution: PEP is the 3C compound and acts as the primary CO_2 acceptor in the mesophyll cells of C_4 plants, leading to the formation of OAA, a C_4 acid.
Ribulose-1,5-bisphosphate carboxylase (RUBISCO) is an enzyme found in the mesophyll cells present within the C_3 plants. In C_4 plants, this enzyme is found in the bundle sheath cells.

Question 134: "Girdling Experiment" was performed by plant physiologists to identify the plant tissue through which:
Options:
(a) Water is transported
(b) Food is transported

(c) For both water and food transportation
(d) Osmosis is observed
Answer: (b)
Solution: Girdling experiment is the process in which bark containing the phloem tissue is removed from the edges of the trunk. This experiment is performed to determine the tissues that are useful for transporting the food.
Since phloem tissues are present outside the xylem, therefore when a ring of bark is removed from a woody plant, the woody xylem part remains intact, which causes the water and the nutrients to reach the leaves. But translocation of food does not take place.

Question 135: XO type of sex determination can be found in
Options:
(a) *Drosophila*
(b) Birds
(c) Grasshoppers
(d) Monkeys
Answer: (c)
Solution: In organisms like crickets, grasshoppers, and some other insects, the female is XX and is the homogametic sex. The male is the heterogametic sex but only has one sex chromosome. The male in XX-XO systems produces gametes with (X) or without (O) a sex chromosome.

Question 136: Addition of more solutes in a given solution will:
Options:
(a) Raise its water potential
(b) Lower its water potential
(c) Make its water potential zero
(d) Not affect the water potential at all
Answer: (b)
Solution: Solutes reduce water potential (resulting in a negative) by consuming some of the potential energy available in the water. A low water potential means that water has a low force driving it to move from one area to another.

Question 137: If a geneticist uses the blind approach for sequencing the whole genome of an organism, followed by assignment of functions to different segment, the methodology adopted by him is called as:
Options:
(a) Sequence annotation
(b) Gene mapping
(c) Expressed sequence tags
(d) Bioinformatics
Answer: (a)
Solution: One of the methods of sequencing the entire genome of human beings in the Human Genome Project, was the Sequence annotation method. This blind approach involved sequencing the whole genome (coding and non-coding) and later assigning functions to the different regions.

Question 138: Which of the following occurs due to the presence of an autosome linked dominant trait?
Options:

(a) Sickle cell anaemia
(b) Myotonic dystrophy
(c) Haemophilia
(d) Thalassemia
Answer: (b)
Solution: Myotonic dystrophy is an autosomal dominant disorder, while both sickle cell anemia and thalassemia are autosomal recessive diseases, and haemophilia is a sex-linked recessive disease.

Question 139: Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R).
Assertion (A): Mendel's law of Independent assortment does not hold goods for the genes that are located closely on the same chromosome.
Reason (R): Closely located genes assort independently.
Answer from the options given below:
Options:
(a) Both (A) and (R) are correct and (R) is the correct explanation of (A)
(b) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
(c) (A) is correct but (R) is not correct
(d) (A) is not correct but (R) is correct
Answer: (c)
Solution: Mendel's law of Independent assortment states that the alleles of two different genes get sorted into gametes independently of one another. However, after Morgan's experiment, it was found that if the genes are grouped on the same chromosome, some genes were very tightly linked (showed very low recombination) while others were loosely linked (showed very high recombination). Due to the process of crossover or recombination, there is a chance for two genes on the same chromosome to behave independently or as if it is linked. Two different genes situated close together on the same chromosome tend to be inherited together, hence the law of Independent assortment does not hold goods for the genes that are located closely on the same chromosome. The isolation of alleles into gametes can be under the influence of linkage. The assertion statement is correct but the reason is false.

Question 140: Which part of the fruit, labelled in the given figure makes it a false fruit?
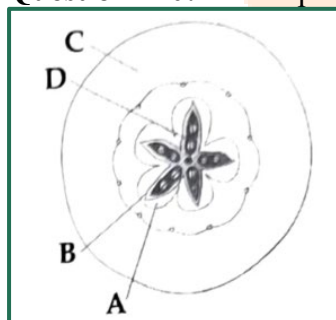
Options:
(a) A - Mesocarp
(b) B - Endocarp
(c) C - Thalamus
(d) D - Seed
Answer: (c)
Solution: Fruits are formed from the ovary of a flower after fertilisation. Such fruits are called true fruits. However, in a few species such as apple, strawberry, cashew, etc., some other parts

of the flower, such as the thalamus also contribute to fruit formation. Such fruits are called false fruits. The diagram shown here is of an apple. The parts labeled as A is mesocarp, B is endocarp, C is thalamus, and D is seed.
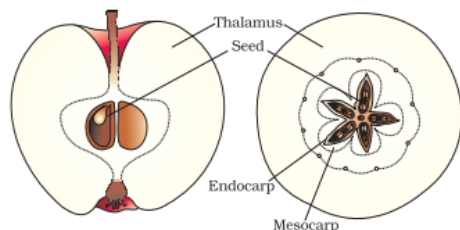
Question 141: Read the following statements on lipids and find out correct set of statements:
(a) Lecithin found in the plasma membrane is a glycolipid
(b) Saturated fatty acids possess one or more c = c bonds
(c) Gingely oil has lower melting point, hence remains as oil in winter
(d) Lipids are generally insoluble in water but soluble in some organic solvents
(e) When fatty acid is esterified with glycerol, monoglycerides are formed.
Choose the correct answer from the options given below
Options:
(a) (a), (b) and (c) only
(b) (a), (d) and (e) only
(c) (c), (d) and (e) only
(d) (a), (b) and (d) only
Answer: (c)
Solution: Some lipids have phosphorus and a phosphorylated organic compound in them. These are phospholipids. Example - Lecithin found in cell membranes is phospholipid and not glycolipid.
-Fatty acids could be saturated (without double bond) or unsaturated (with one or more C=C double bonds).
-Oils have a lower melting point (e.g., gingelly oil) and hence remain as oil in winters. So, this statement is correct.
-Lipids are all insoluble in polar solvents like water but highly soluble in the non-polar or weakly polar organic solvents, including ether, chloroform, benzene, and acetone. This is the correct statement.
-Many lipids have both glycerol and fatty acids. Here the fatty acids are found esterified with glycerol. They can then be monoglycerides, diglycerides and triglycerides. This statement is also correct.

Question 142: Transposons can be used during which one of the following?
Options:
(a) Polymerase chain reaction
(b) Gene silencing
(c) Autoradiography
(d) Gene sequencing
Answer: (d)
Solution: A transposable element (TE, transposon, or jumping gene) is a DNA sequence that can change its position within a genome. Transposons are currently being used to facilitate large-scale DNA sequencing in a cost-efficient and accurate manner. When using a transposon-based approach to genome sequencing, large clones are broken into smaller redundant and overlapping clones that are subsequently subjected to transposon mutagenesis.

Question 143: While explaining interspecific interaction of population, (+) sign is assigned for beneficial interaction, (-) sign is assigned for detrimental interaction and (0) for neutral interaction. Which of the following interactions can be assigned (+) for one species and (-) for another species involved in the interaction?
Options:
(a) Predation
(b) Amensalism
(c) Commensalism
(d) Competition
Answer: (a)
Solution: In case of predation, one organism is benefited while the other is harmed. Therefore predation can be denoted by (+/-).
In amensalism, one organism is harmed while the other is neither benefited, nor harmed (unaffected). Hence, it can be denoted as (-/0).
In commensalism, one organism is benefited while the other organism is unaffected. Hence it is (+/0).
In case of competition, both the organisms are harmed. Hence it is (-/-).

Question 144: In the following palindromic base sequence of DNA, which one can be cut easily by a particular restriction enzyme?
Options:
(a) 5' GATACT 3' ; 3' CTATGA 5'
(b) 5' GAATTC 3' ; 3' CTTAAG 5'
(c) 5' CTCAGT 3' ; 3' GAGTCA 5'
(d) 5' GTATTC 3' ; 3' CATAAG 5'
Answer: (b)
Solution: The sequence 5' GAATTC 3' ; 3' CTTAAG 5' is a palindromic sequence and therefore can be cut easily by a restriction endonuclease. The rest of the sequences are not palindromic. 5' GAATTC 3' ; 3' CTTAAG 5' is, in fact, the recognition sequence of the restriction enzyme *EcoR*I.

Question 145: Which one of the following will accelerate phosphorus cycle?
Options:
(a) Burning of fossil fuels
(b) Volcanic activity
(c) Weathering of rocks
(d) Rainfall and storms
Answer: (c)
Solution: Phosphorus moves in a cycle through rocks, water, soil and sediments and organisms. Over time, rain and weathering cause rocks to release phosphate ions and other minerals. This inorganic phosphate is then distributed in soils and water. Plants take up inorganic phosphate from the soil.

Question 146: The entire fleet of buses in Delhi were converted to CNG from diesel. In reference to this, which one of the following statements is false?
Options:
(a) CNG burns more efficiently than diesel
(b) The same diesel engine is used in CNG buses making the cost of conversion low
(c) It is cheaper than diesel
(d) It cannot be adulterated like diesel

Answer: (b)
Solution: Compressed natural gas (CNG) burns quite efficiently, unlike petrol or diesel, in automobiles and very little of it is left unburnt. CNG is cheaper than petrol or diesel and cannot be siphoned off by thieves and adulterated like petrol or diesel.

Question 147: Match the plant with the kind of life cycle it exhibits. Choose the correct answer from the options given below:

	List - I		List - II
(a)	*Spirogyra*	(i)	Dominant diploid sporophyte vascular plant, with highly reduced male or female gametophyte
(b)	Fern	(ii)	Dominant haploid free-living gametophyte
(c)	*Funaria*	(iii)	Dominant diploid sporophyte alternating with reduced gametophyte called prothallus
(d)	*Cycas*	(iv)	Dominant haploid leafy gametophyte alternating with partially dependent multicellular sporophyte

Options:
(a) (a)- (iv); (b) - (i); (c) - (ii);(d) - (iii)
(b) (a)- (ii); (b) - (iii); (c) - (iv);(d) - (i)
(c) (a)- (iii); (b) - (iv); (c) - (i);(d) - (ii)
(d) (a)- (ii); (b) - (iv); (c) - (i);(d) - (iii)
Answer: (b)
Solution: *Spirogyra*: Sporophytic generation is represented only by the one-celled zygote. There are no free-living sporophytes. The dominant, photosynthetic phase in such plants is the free-living gametophyte.
Fern: The diploid sporophyte is represented by a dominant, independent, photosynthetic, vascular plant body. It alternates with multicellular, saprophytic/autotrophic, independent but short-lived haploid gametophyte.
Funaria: Dominant haploid leafy gametophyte alternating with partially dependent multicellular sporophyte.
Cycas: Dominant diploid sporophyte vascular plant, with highly reduced male or female gametophyte. This is found in all gymnosperms (*Cycas*) and angiosperms.

Question 148: Match List - I with List - II. Choose the correct answer from the options given below:

	List - I		List - II
(a)	Metacentric chromosome	(i)	Centromere situated close to the end forming one extremely short and one long arms.

(b)	Acrocentric chromosome	(ii)	Centromeres at the terminal end
(c)	Sub-metacentric	(iii)	Centromere in the middle forming two equal arms of chromosomes
(d)	Telocentric chromosome	(iv)	Centromere slightly away from the middle forming one shorter arm and one longer arm

Options:
(a) (a)- (iii); (b) - (i); (c) - (iv);(d) - (ii)
(b) (a)- (i); (b) - (iii); (c) - (ii);(d) - (iv)
(c) (a)- (ii); (b) - (iii); (c) - (iv);(d) - (i)
(d) (a)- (i); (b) - (ii); (c) - (iii);(d) - (iv)
Answer: (a)
Solution: The metacentric chromosome has a middle centromere forming two equal arms of the chromosome.
- In the case of an acrocentric chromosome the centromere is situated close to its end forming one extremely short and one very long arm.
-The sub-metacentric chromosome has centromere slightly away from the middle of the chromosome resulting in one shorter arm and one longer arm.
-Telocentric chromosomes have a terminal centromere.

Question 149: The anatomy of springwood shows some peculiar features. Identify the correct set of statements about springwood.
(a) It is also called early wood.
(b) In the spring season cambium produces xylem elements with narrow vessels.
(c) It is lighter in colour.
(d) The springwood along with autumnwood shows alternate concentric rings forming annual rings.
(e) It has lower density
Choose the correct answer from the options given below:
Options:
(a) (a), (b), (d) and (e) only
(b) (a), (c), (d) and (e) only
(c) (a), (b), and (d) only
(d) (c), (d) and (e) only
Answer: (b)
Solution: In the spring season, cambium is very active. The wood formed during this season is called spring wood or early wood.
- In spring season, cambium produces a large number of xylary elements having vessels with wider cavities and not narrow cavities.
-The spring wood is lighter in colour.
-The two kinds of woods (spring and autumnwood) appear as alternate concentric rings that constitute an annual ring. Annual rings seen in a cut stem give an estimate of the age of the tree.
-Springwood has a lower density.

Question 150: What is the role of large bundle sheath cells found around the vascular bundles in C_4 plants?

Options:

(a) To provide the site of photorespiratory pathway

(b) To increase the number of chloroplast for the operation of Calvin cycle

(c) To enable the plant to tolerate high temperature

(d) To protect the vascular tissue from high light intensity

Answer: (b)

Solution: The particularly large cells around the vascular bundles of the C_4 plants are called bundle sheath cells, and the leaves which have such anatomy are said to have 'Kranz' anatomy. In C_4 plants the bundle sheath cells may form several layers around the vascular bundles; they are characterised by having a large number of chloroplasts, thick walls impervious to gaseous exchange and no intercellular spaces. So, bundle sheath cells found around the vascular bundles of C_4 plants increase the number of chloroplasts for the operation of the Calvin cycle.

Question 151: Given below are two statements :

Statement I : Fatty acids and glycerols cannot be absorbed into blood.

Statement II: Specialized lymphatic capillaries called lacteals carry chylomicrons into lymphatic vessels and ultimately into the blood.

In the light of the above statements, choose the most appropriate answer from the options given below :

Options:

(a) Both statement I and Statement II are correct

(b) Both statement I and statement II are incorrect

(c) Statement I is correct but statement II is incorrect

(d) Statement I is incorrect but statement II is correct

Answer: (a)

Solution: Both the statements are correct. Fatty acids and glycerol are insoluble, hence cannot be absorbed into the blood. They are first incorporated into small droplets called micelles which move into the intestinal mucosa. They are re-formed into very small protein coated fat globules called the chylomicrons which are transported into the lymph vessels (lacteals) in the villi. These lymph vessels ultimately release the absorbed substances into the bloodstream.

Question 152: Given below are two statements:

Statement I: The release of sperms into the seminiferous tubules is called spermiation.

Statement II: Spermiogenesis is the process of formation of sperms from spermatogonia.

In the light of the above statements, choose the most appropriate answer from the options given below:

Options:

(a) Both Statement I and Statement II are correct

(b) Both Statement I and Statement II are incorrect

(c) Statement I is correct but Statement II is incorrect

(d) Statement I is incorrect but Statement II is correct

Answer: (b)

Solution: Spermiogenesis is the process of transformation of spermatids to spermatozoa. Spermatids undergo morphological changes and transform into sperms. Spermiation is the process of release of sperms from seminiferous tubules, which remain embedded in the Sertoli cells after spermiogenesis.

Question 153: Which of the following is not the function of the conducting part of the respiratory system?
Options:
(a) It clears inhaled air from foreign particles
(b) Inhaled air is humidified
(c) Temperature of inhaled air is brought to body temperature
(d) Provides surface for diffusion of O_2 and CO_2
Answer: (d)
Solution: The part starting with the external nostrils up to the terminal bronchioles constitute the conducting part whereas the alveoli and their ducts form the respiratory or exchange part of the respiratory system. The conducting part transports the atmospheric air to the alveoli, clears it from foreign particles, humidifies and also brings the air to body temperature. Exchange part is the site of actual diffusion of O_2 and CO_2 between blood and atmospheric air.

Question 154: Identify the microorganism which is responsible for the production of an immunosuppressive molecule cyclosporin A:
Options:
(a) *Trichoderma polysporum*
(b) *Clostridium butylicum*
(c) *Aspergillus niger*
(d) *Streptococcus cerevisiae*
Answer: (a)
Solution: Cyclosporin is an effective immunosuppressant used in the treatment of autoimmune disorders (such as rheumatoid arthritis) and in organ transplantation to prevent rejection. Cyclosporin lowers the activity of T-cells and hence, suppressing the activity of the immune system. Cyclosporin is isolated from the fungus *Trichoderma polysporum*.

Question 155: Under normal physical conditions in human beings every 100 ml oxygenated blood can deliver_____ml of O_2 to the tissues.
Options:
(a) 2 ml
(b) 5 ml
(c) 4 ml
(d) 10 ml
Answer: (b)
Solution: Every 100 ml of oxygenated blood can deliver around 5 ml of O_2 to the tissues under normal physiological conditions.

Question 156: Tegmina in cockroach arises from
Options:
(a) Prothorax
(b) Mesothorax
(c) Metathorax
(d) Prothorax and Mesothorax
Answer: (b)
Solution: In cockroaches, the first pair of wings or the forewings are also called tegmina. They arise from the mesothorax.

Question 157: *In situ* conservation refers to:
Options:
(a) Protect and conserve the whole ecosystem
(b) Conserve only high risk species
(c) Conserve only endangered species
(d) Conserve only extinct species
Answer: (a)
Solution: *In situ* conservation of biodiversity attempts to conserve organisms at their natural habitat. It not only is aimed at protecting the organisms themselves, but also the ecosystem where they live.

Question 158: Detritivores breakdown detritus into smaller particles. This process is called:
Options:
(a) Catabolism
(b) Fragmentation
(c) Humification
(d) Decomposition
Answer: (b)
Solution: Fragmentation of detritus is done by detritivores. It is a process in which detritivores feed on the dead organic matter, turning it into smaller fragments.

Question 159: A dehydration reaction links two glucose molecules to produce maltose. If the formula for glucose is $C_6H_{12}O_6$ then what is the formula for maltose?
Options:
(a) $C_{12}H_{20}O_{10}$
(b) $C_{12}H_{24}O_{12}$
(c) $C_{12}H_{22}O_{11}$
(d) $C_{12}H_{24}O_{11}$
Answer: (c)
Solution: In a dehydration reaction, two molecules of the sugar glucose (monomers) combine to form a single molecule of the sugar maltose. Two glucose molecules should combine to form a disaccharide $C_{12}H_{24}O_{12}$. However, due to dehydration, one H_2O molecule is eliminated and the final product is $C_{12}H_{22}O_{11}$.
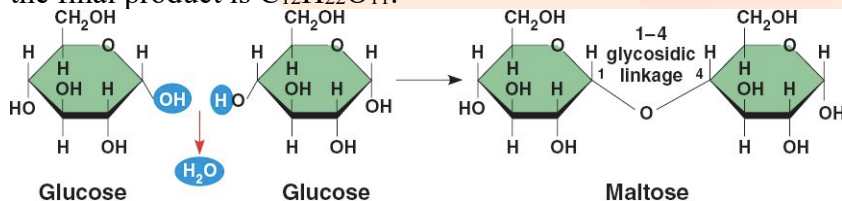
Question 160: Identify the asexual reproductive structure associated with *Penicillium*:
Options:
(a) Zoospores
(b) Conidia
(c) Gemmules
(d) Buds
Answer: (b)
Solution: In *Penicillium*, asexual spores called conidia produced exogenously on the special mycelium called conidiophores. Conidia, upon germination, produce mycelium.

Question 161: Select the incorrect statement with reference to mitosis:
Options:
(a) All the chromosomes lie at the equator at metaphase
(b) Spindle fibres attach to centromere of chromosomes
(c) Chromosomes decondense at the telophase stage
(d) Splitting of centromere occurs at anaphase
Answer: (b)
Solution: In mitosis, the metaphase is characterised by all the chromosomes coming to lie at the equator with one chromatid of each chromosome connected by its kinetochore to spindle fibres from one pole and its sister chromatid connected by its kinetochore to spindle fibres from the opposite pole.

Question 162: Which of the following statements with respect to Endoplasmic Reticulum is incorrect?
Options:
(a) RER has ribosomes attached to ER
(b) SER is devoid of ribosomes
(c) In prokaryotes only RER are present
(d) SER are the sites for lipid synthesis
Answer: (c)
Solution: Endoplasmic reticulum is not found in prokaryotes. Therefore, both RER and SER are absent in prokaryotic cells.

Question 163: In the taxonomic categories which hierarchical arrangement in ascending order is correct in the case of animals?
Options:
(a) Kingdom, Phylum, Class, Order, Family, Genus, Species
(b) Kingdom, Class, Phylum, Family, Order, Genus, Species
(c) Kingdom, Order, Class, Phylum, Family, Genus, Species
(d) Kingdom, Order, Phylum, Class, Family, Genus, Species
Answer: (a)
Solution: In the animal kingdom, there are seven main taxonomic ranks: kingdom, phylum or division, class, order, family, genus, species.
(* Language of question is wrongly framed. The word "ascending" in the question should be replaced by "descending".)

Question 164: In which of the following animals, does the digestive tract have additional chambers like crop and gizzard?
Options:
(a) *Corvus, Columba, Chameleon*
(b) *Bufo, Balaenoptera, Bangarus*
(c) *Catla, Columbia, Crocodilus*
(d) *Pavo, Psittacula, Corvus*
Answer: (d)
Solution: Crop and gizzard are part of the digestive tract of birds (class Aves) and insects (phylum Arthropoda). *Pavo, Psittacula, Corvus* are birds hence all three have crops and gizzard. *Chameleon*, *Bangarus* and *Crocodilus* are reptiles and reptiles do not have crop and gizzard in their digestive system. *Bufo* belongs to class Amphibia and *Balaenoptera* is a mammal.

Question 165: Given below are two statements:
Statement I: Mycoplasma can pass through less than 1 micron filter size.
Statement II: Mycoplasma are bacteria with a cell wall.
In the light of the above statements, choose the most appropriate answer from the options given below:
Options:
(a) Both Statement I and Statement II are correct
(b) Both Statement I and Statement II are incorrect
(c) Statement I is correct but Statement II is incorrect
(d) Statement I is incorrect but Statement II is correct
Answer: (c)
Solution: Mycoplasmas are the smallest cells which are only 0.3 μm in length hence they can pass through less than 1 micron filter. All prokaryotes have a cell wall surrounding the cell membrane except in mycoplasma. So, statement I is correct and statement II is incorrect.

Question 166: Which of the following is not a connective tissue?
Options:
(a) Blood
(b) Adipose tissue
(c) Cartilage
(d) Neuroglia
Answer: (d)
Solution: Neuroglia, also called glia or glial cells, are non-neuronal cells of the nervous system. Hence they are a component of the neural tissues and not connective tissues.

Question 167: Nitrogenous waste is excreted in the form of pellet or paste by:
Options:
(a) *Ornithorhynchus*
(b) *Salamandra*
(c) *Hippocampus*
(d) *Pavo*
Answer: (d)
Solution: Reptiles, birds, land snails and insects excrete nitrogenous wastes as uric acid in the form of pellet or paste with a minimum loss of water and are called uricotelic animals. *Pavo* (Peacock) belongs to class aves (birds). Hence, it excretes nitrogenous wastes in the form of pellets or paste. *Ornithorhynchus* (Platypus) is a mammal and is ureotelic (excretes urea). *Salamandra* (Salamander) is an amphibian and is ammonotelic (excretes ammonia). *Hippocampus* is a bony fish and is ammonotelic.

Question 168: Given below are two statements: one is labelled as
Assertion (A) and the other is labelled as Reason (R).
Assertion (A): All vertebrates are chordates but all chordates are not vertebrates
Reason (R): Notochord is replaced by the vertebral column in the adult vertebrates.
In the light of the above statements, choose the most appropriate answer from the options given below:
Options:
(a) Both (A) and (R) are correct and (R) is the correct explanation of (A)
(b) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
(c) (A) is correct but (R) is not correct

(d) (A) is not correct but (R) is correct

Answer: (a)

Solution: All vertebrates are chordates but all chordates are not vertebrates. This statement is true because all the features of chordates are present in all the vertebrates. In adult vertebrates, the notochord is replaced by the vertebral column and this is not the case for all chordates, hence the assertion is correct and reason is the correct explanation of assertion.

Question 169: Which of the following is a correct match for disease and its symptoms?

Options:

(a) Arthritis - Inflamed joints

(b) Tetany - high Ca^{2+} level causing rapid spasms

(c) Myasthenia gravis - Genetic disorder resulting in weakening and paralysis of skeletal muscle

(d) Muscular dystrophy - An autoimmune disorder causing progressive degeneration of skeletal muscle

Answer: (a)

Solution: Tetany - Tetany is a symptom characterized by the involuntary contraction of muscles that usually results from low calcium levels in the blood (i.e., hypocalcemia).
Myasthenia gravis - An autoimmune disorder in which antibodies destroy the communication between nerves and muscle, resulting in weakness of the skeletal muscles.
Muscular dystrophy - Genetic disorder that causes progressive weakness and loss of muscle mass.

Question 170: Given below are two statements: one is labelled as

Assertion (A) and the other is labelled as Reason (R).

Assertion (A): Osteoporosis is characterised by decreased bone mass and increased chances of fracture.

Reason (R): Common cause of osteoporosis is increased levels of oestrogen.

In the light of the above statements, choose the most appropriate answer from the options given b

Options:

(a) Both (A) and (R) are correct and (R) is the correct explanation of (A)

(b) Both (A) and (R) are correct but (R) is not the correct explanation of (A)

(c) (A) is correct but (R) is not correct

(d) (A) is not correct but (R) is correct

Answer: (c)

Solution: Estrogen helps keep the bones healthful and strong. As estrogen levels decrease, bone loss may occur. For example, women who are post-menopausal are at an increased risk of developing osteoporosis and bone fractures.

Question 171: In an *E. coli* strain the *i* gene gets mutated and its product can not bind the inducer molecule. If the growth medium is provided with lactose, what will be the outcome?

Options:

(a) Only z gene will get transcribed

(b) z, y, a genes will be transcribed

(c) z, y, a genes will not be translated

(d) RNA polymerase will bind the promoter region

Answer: (c)

Solution: The *i* gene codes for the repressor of the lac operon. An inducer (allolactose or an analog) binds to the repressor and prevents its binding to the operator, thereby releasing the repression and allowing transcription of the lac operon.

If the *i* gene is mutated in such a way that the repressor molecule is unable to bind with the inducer, the repressor which is now free from the inducer will now bind to the operator sequence. This will prevent the binding of RNA polymerase on the promoter sequence. Lactose in the medium cannot bind to the repressor as effectively as allolactose does. Therefore, lactose also cannot deactivate the repressor and prevent it from binding to the operator.

Thus if the operator is blocked by the repressor, there will be no transcription and the structural genes *z*, *y* and *a* will not get transcribed and translated.

Question 172: If the length of a DNA molecule is 1.1 metres, what will be the approximate number of base pairs?

Options:
(a) 3.3×10^9 bp
(b) 6.6×10^9 bp
(c) 3.3×10^6 bp
(d) 6.6×10^6 bp

Answer: (a)

Solution: The length between two base pairs is 0.34nm.

Total length of double helix DNA = total number of base pairs * distance between two bp

Hence, total no. of base pairs =

(Total length of double helix DNA) / (distance between two bp)

1.1m/0.34 nm

= $(1.1 \times 10^9$ nm) / (0.34 nm)

= 3.235×10^9 base pairs

= 3.3×10^9 base pairs

Question 173: Which of the following statements are true for spermatogenesis but do not hold true for Oogenesis?

(a) It results in the formation of haploid gametes
(b) Differentiation of gamete occurs after the completion of meiosis
(c) Meiosis occurs continuously in a mitotically dividing stem cell population
(d) It is controlled by the Luteinizing hormone (LH) and Follicle Stimulating Hormone (FSH) secreted by the anterior pituitary
(e) It is initiated at puberty

Choose the most appropriate answer from the options given below:

Options:
(a) (c) and (e) only
(b) (b) and (c) only
(c) (b), (d) and (e) only
(d) (b), (c) and (e) only

Answer: (a)

Solution: - Oogenesis begins at the fetal stages and not at puberty.

- Meiosis does not occur continuously in case of oogenesis since it is a discontinuous process in women. It starts dividing mitotically at the fetal stages to form a diploid primary oocyte. This primary oocyte enters meiosis but remains arrested at prophase I of meiosis up until

puberty, after which it resumes division and completes Meiosis I. Meiosis II is completed only after fertilization.

Question 174: Which of the following is present between the adjacent bones of the vertebral column?
Options:
(a) Intercalated discs
(b) Cartilage
(c) Areolar tissue
(d) Smooth muscle
Answer: (b)
Solution: White fibrous cartilage is present between vertebrae to allow limited movement. This ensures proper structural rigidity and body balance and yet, allows for limited movement required.

Question 175: Regarding Meiosis, which of the statement(s) is incorrect?
Options:
(a) There are two stages in Meiosis, Meiosis-I and II
(b) DNA replication occurs in S phase of Meiosis-II
(c) Pairing of homologous chromosomes and recombination occurs in Meiosis-I
(d) Four haploid cells are formed at the end of Meiosis-II
Answer: (b)
Solution: In meiosis, a cell undergoes two divisions, i.e. meiosis I and II. Meiosis I is reduction division and meiosis II is equational division (similar to mitosis). However, DNA replicates only once during meiosis, i.e. before meiosis I in S phase.

Question 176: Given below are two statements:
Statement I: Autoimmune disorder is a condition where the body defense mechanism recognizes its own cells as foreign bodies.
Statement II: Rheumatoid arthritis is a condition where the body does not attack self cells.
In the light of the above statements, choose the most appropriate answer from the options given below:
Options:
(a) Both Statement I and Statement II are correct
(b) Both Statement I and Statement II are incorrect
(c) Statement I is correct but Statement II is incorrect
(d) Statement I is incorrect but Statement II is correct
Answer: (c)
Solution: Rheumatoid arthritis, or RA, is an autoimmune and inflammatory disease, which means that your immune system attacks healthy cells in your body by mistake, causing inflammation (painful swelling) in the affected parts of the body. RA mainly attacks the joints, usually many joints at once.

Question 177: Natural selection where more individuals acquire a specific character value other than the mean character value, leads to:
Options:
(a) Stabilising change
(b) Directional change
(c) Disruptive change

(d) Random change

Answer: (b)

Solution: In some cases of natural selection, organisms which acquire a different value other than the mean value get selected. This is called directional selection.

Question 178: Given below are two statements:
Statement I: The coagulum is formed of a network of threads called thrombins.
Statement II: Spleen is the graveyard of erythrocytes.
In the light of the above statements, choose the most appropriate answer from the options given below:
Options:
(a) Both Statement I and Statement II are correct
(b) Both Statement I and Statement II are incorrect
(c) Statement I is correct but Statement II is incorrect
(d) Statement I is incorrect but Statement II is correct

Answer: (d)

Solution: Blood clot or coagulum is formed mainly of a network of threads called fibrins in which dead and damaged formed elements of blood are trapped, so the statement, coagulum is formed of a network of threads called thrombins is incorrect. RBCs have an average life span of 120 days after which they are destroyed in the spleen, hence the spleen is called the graveyard of RBCs).

Question 179: Breeding crops with higher levels of vitamins and minerals or higher proteins and healthier fats is called:
Options:
(a) Biomagnification
(b) Bioremediation
(c) Biofortification
(d) Bioaccumulation

Answer: (c)

Solution: Biofortification is the process of breeding staple crops to have higher levels of essential nutrients either through selective breeding or genetic modifications. For example, biofortification of wheat with zinc, golden rice.

Question 180: In gene therapy of Adenosine Deaminase (ADA) deficiency, the patient requires periodic infusion of genetically engineered lymphocytes because:
Options:
(a) Retroviral vector is introduced into these lymphocytes
(b) Gene isolated from marrow cells producing ADA is introduced into cells at embryonic stages
(c) Lymphocytes from patient's blood are grown in culture, outside the body
(d) Genetically engineered lymphocytes are not immortal cells.

Answer: (d)

Solution: In some children ADA deficiency can be cured by bone marrow transplantation; in others it can be treated by enzyme replacement therapy, in which functional ADA is given to the patient by injection. But the problem with both of these approaches is that they are not completely curative. As a first step towards gene therapy, lymphocytes from the blood of the patient are grown in a culture outside the body. A functional ADA cDNA (using a retroviral vector) is then introduced into these lymphocytes, which are subsequently returned to the

patient. However, as these cells are not immortal, the patient requires periodic infusion of such genetically engineered lymphocytes.

Question 181: At which stage of life the oogenesis process is initiated?
Options:
(a) Puberty
(b) Embryonic development stage
(c) Birth
(d) Adult
Answer: (b)
Solution: Oogenesis is the formation of the ova or the female sex gamete. It begins in the early fetus when primordial germ cells migrate from the yolk sac of the embryo to the genital ridge at 5–6 weeks of gestation.

Question 182: Lippes loop is a type of contraceptive used as:
Options:
(a) Cervical barrier
(b) Vault barrier
(c) Non-Medicated IUD
(d) Copper releasing IUD
Answer: (c)
Solution: Lippes loop is a non-medicated intrauterine device which helps in phagocytosis of spermatozoa within the uterus.

Question 183: Which of the following functions is not performed by secretions from salivary glands?
Options:
(a) Control bacterial population in mouth
(b) Digestion of complex carbohydrates
(c) Lubrication of oral cavity
(d) Digestion of disaccharides
Answer: (d)
Solution: Saliva contains the enzyme salivary amylase that helps digest the starches in food. About 30% of starch is hydrolysed here by this enzyme (optimum pH 6.8) into a disaccharide – maltose. However, maltose cannot be further digested by amylase in the buccal cavity. Succus entericus in the small intestine contains disaccharidases like maltase, which finally digests the disaccharides like maltose.

Question 184: If '8' *Drosophila* in a laboratory population of '80' died during a week, the death rate in the population is __ individuals per *Drosophila* per week.
Options:
(a) 0.1
(b) 10
(c) 1.0
(d) Zero
Answer: (a)
Solution: Death rate is given by = (number of dead individuals) / (total population). Therefore, the death rate of *Drosophila* in this case would be: 8/80 = 1/10 = 0.1.

Question 185: Given below are two statements:

Statement I: Restriction endonucleases recognise specific sequences to cut DNA known as palindromic nucleotide sequences.
Statement II: Restriction endonucleases cut the DNA strand a little away from the centre of the palindromic site.
In the light of the above statements, choose the most appropriate answer from the options given below:
Options:
(a) Both Statement I and Statement II are correct
(b) Both Statement I and Statement II are incorrect
(c) Statement I is correct but Statement II is incorrect
(d) Statement I is incorrect but Statement II is correct
Answer: (a)
Solution: Restriction endonucleases recognise specific sequences to cut DNA known as palindromic nucleotide sequences. However, the restriction enzymes cut the strand of DNA a little away from the centre of the palindrome site, but between the same two bases on the opposite strands.

Question 186: Which of the following is a correct statement?
Options:
(a) Cyanobacteria are a group of autotrophic organisms classified under Kingdom Monera.
(b) Bacteria are exclusively heterotrophic organisms
(c) Slime moulds are saprophytic organisms classified under Kingdom Monera.
(d) Mycoplasma have DNA, Ribosome and cell wall
Answer: (a)
Solution: The nutrition in bacteria is mainly autotrophic and heterotrophic. Phototrophic bacteria contain various pigments to synthesise their own food, while heterotrophic bacteria are dependent on other organisms for food. Parasitic bacteria fulfil their nutrition needs or requirements from the host cell. Slime moulds are saprophytes belonging to Kingdom Protista. Mycoplasma are prokaryotic organisms which do not possess a DNA or a cell wall.

Question 187: Statements related to human insulin are given below:
Which statement(s) is/are correct about genetically engineered Insulin?
(a) Pro-hormone insulin contain extra stretch of C-peptide
(b) A peptide and B-peptide chains of insulin were produced separately in *E. coli*, extracted and combined by creating a disulphide bond between them.
(c) Insulin used for treating Diabetes was extracted from Cattles and Pigs.
(d) Pro-hormone insulin needs to be processed for converting into a mature and functional hormone.
(e) Some patients develop allergic reactions to the foreign insulin.
Choose the most appropriate answer from the options given below:
Options:
(a) (a), (b) and (d) only
(b) (b) only
(c) (c) and (d) only
(d) (c), (d) and (e) only
Answer: (b)
Solution: In mammals, including humans, insulin is synthesised as a pro-hormone which contains an extra stretch called the C peptide. The pro-hormone needs to be processed before it becomes fully mature and functional. However, in case of genetically engineered insulin, there is no C-peptide, hence no proinsulin is formed. Genetically engineered insulin that is

used for diabetes is produced using yeast and bacteria, unlike natural insulin which was earlier extracted from pancreas of slaughtered cattle and pigs.

Question 188: Given below are two statements:
Statement I: In a scrubber, exhaust from the thermal plant is passed through the electric wires to charge the dust particles.
Statement II: Particular matter (PM 2.5) can not be removed by scrubber but can be removed by an electrostatic precipitator.
In the light of the above statements, choose the most appropriate answer from the options given below:
Options:
(a) Both Statement I and Statement II are correct
(b) Both Statement I and Statement II are incorrect
(c) Statement I is correct but Statement II is incorrect
(d) Statement I is incorrect but Statement II is correct
Answer: (b)
Solution: In an electrostatic precipitator:
• Electrode wires produce a corona that releases electrons.
• These electrons attach to dust particles and give them a net negative charge.
• Grounded collecting plates attract negatively charged dust particles.
• Thus dust particles are removed from air.
• A spray of water or lime is generated in the scrubber and exhaust is passed through this spray.
• Scrubber removes gases; like Sulphur dioxide from air.
Electrostatic precipitators are quite efficient in removing particulate matter from the air, but very small particulate matter (PM 2.5) cannot be removed by the precipitators.

Question 189: The recombination frequency between the genes a & c is 5%, b & c is 15%, b & d is 9%, a & b is 20%, c & d is 24% and a & d is 29%. What will be the sequence of these genes on a linear chromosome?
Options:
(a) a, d, b, c
(b) d, b, a, c
(c) a, b, c, d
(d) a, c, b, d
Answer: (d)
Solution: The frequency of recombination between gene pairs on the same chromosome can be used to measure the distance between genes. The distance between two genes is equal to this recombination frequency. If genes are located on the same chromosome, some genes can be very tightly linked hence showed very low recombination and low recombination frequency. If genes are loosely linked, they show higher recombination (high recombination frequency). As the recombination frequency is smallest in case of a and c, it means they are closely located to each other (linked genes). Recombination frequency of a and c is slightly higher but they can also be linked. The recombination frequency of a and d is highest hence the chances are more for these two genes to be located far apart. The correct sequence will be a-c-b-d.
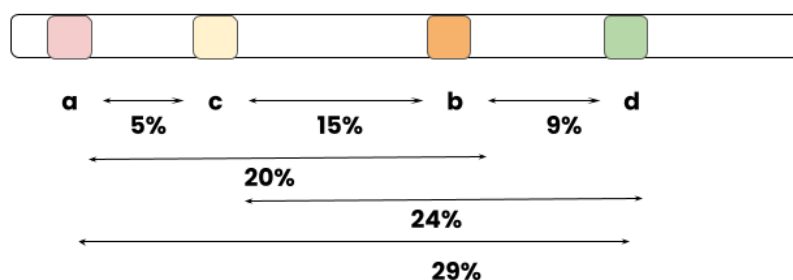
Question 190: Match list I with list II. Choose the correct answer from the options given below :

	List I		List II	
(a)	Glycogen	(i)	Hormone	
(b)	Globulin	(ii)	Biocatalyst	
(c)	Steroids	(iii)	Antibody	
(d)	Thrombin	(iv)	Storage product	

Options:
(a) (a)- (iii); (b) - (ii); (c) - (iv);(d) - (i)
(b) (a)- (iv); (b) - (ii); (c) - (i);(d) - (iii)
(c) (a)- (ii); (b) - (iv); (c) - (iii);(d) - (i)
(d) (a)- (iv); (b) - (iii); (c) - (i);(d) - (ii)
Answer: (d)
Solution: Glycogen is the storage carbohydrate of animals.
Globulins are involved in defense mechanisms of the body. An antibody, also known as an immunoglobulin.
Steroids are lipids as they are hydrophobic and insoluble in water. Many hormones in the human body are steroids. For example: Progesterone, Testosterone stc.
Thrombin is an enzyme in coagulation cascade, which converts inactive fibrinogens of the plasma into fibrins.

Question 191: Match list I with list II with respect to methods of contraception and their respective actions. Choose the correct answer from the options given below :

	List I		List II
(a)	Diaphragms	(i)	Inhibit ovulation and Implantation
(b)	Contraception	(ii)	Increase phagocytosis of sperm within

	Pills		Uterus
(c)	Intrauterine Devices	(iii)	Absences of Menstrual cycle and ovulation following partition
(d)	Lactational Amenorrhea	(iv)	They cover the cervix blocking the entry of sperms

Options:
(a) (a)- (iv); (b) - (i); (c) - (iii);(d) - (ii)
(b) (a)- (iv); (b) - (i); (c) - (ii);(d) - (iii)
(c) (a)- (ii); (b) - (iv); (c) - (i);(d) - (iii)
(d) (a)- (iii); (b) - (ii); (c) - (i);(d) - (iv)
Answer: (b)
Solution: Diaphragms are barrier methods of birth control used by women. They cover the cervix, blocking the entry of sperms into the vagina.
Contraceptive pills contain progesterone or progesterone-oestrogen combinations, and they can inhibit processes like ovulation and implantation.
Intrauterine devices can increase the phagocytosis of sperms within the uterus.
Lactational amenorrhoea refers to the period after childbirth when there is an absence of the menstrual cycle in a lactating woman, which reduces the chances of conception.

Question 192: Which of the following are not the effects of Parathyroid hormone ?
a. Stimulates the process of bone resorption,
b. Decreases Ca^{2+} level in blood,
c. Reabsorption of Ca^{2+} by renal tubules,
d. Decreases the absorption of Ca^{2+} from digested food,
e. Increases metabolism of carbohydrates.
Choose the most appropriate answer from the options given below
Options:
(a) (a) and (c) only
(b) (b), (d) and (e) only
(c) (a) and (e) only
(d) (b) and (c) only
Answer: (b)
Solution: Parathyroid hormone increases the Ca^{2+} levels in the blood. PTH acts on bones and stimulates the process of bone resorption (dissolution/ demineralisation). PTH also stimulates reabsorption of Ca^{2+} by the renal tubules and increases Ca^{2+} absorption from the digested food. PTH is a hypercalcemic hormone and along with TCT (thyrocalcitonin), it plays a significant role in calcium balance in the body.

Question 193: Select the incorrect statement with respect to acquired immunity:
Options:
(a) Primary response is produced when our body encounters a pathogen for the first time.
(b) Anamnestic response is elicited on subsequent encounters with the same pathogen
(c) Anamnestic response is due to memory of first encounter
(d) Acquired immunity is non-specific type of defense present at the time of birth
Answer: (d)

Solution: Non-specific type of defense present at the time of birth is innate immunity. Acquired immunity develops later in life upon encounter with antigens. It is therefore also called specific immunity, since it tailors its attack to a specific antigen previously encountered.

Question 194: Ten *E. coli* cells with ^{15}N- dsDNA are incubated in a medium containing ^{14}N nucleotides. After 60 minutes, how many *E. coli* cells will have DNA totally free from ^{15}N?
Options:
(a) 20 cells
(b) 40 cells
(c) 60 cells
(d) 80 cells
Answer: (c)
Solution: The bacterium *Escherichia coli* can divide every 20 minutes. Therefore, in 60 minutes, 3 rounds of divisions will take place.

First round of division:
20 daughter cells are formed from the 10 parent *E. coli* cells. All 20 cells have hybrid ^{15}N-^{14}N DNA.

Second round of division:
Each DNA forms two daughter cells, one of which is a hybrid and the other is completely ^{14}N-^{14}N. Therefore, 20 cells form 40 daughter DNA molecules, out of which 20 are hybrids and 20 are free from ^{15}N.

Third round of division:
20 ^{14}N-^{14}N cells from the previous generation give rise to 40 ^{14}N-^{14}N cells
20 hybrid cells from the previous generation give rise to 20 hybrids + 20 ^{14}N-^{14}N cells.

Therefore, the total number of ^{14}N-^{14}N cells at the end of 3 rounds of division is 40+20 = 60.

Question 195: If a colour blind female marries a man whose mother was also colour blind, what are the chances of her progeny having colour blindness ?
Options:
(a) 25%
(b) 50%
(c) 75%
(d) 100%
Answer: (d)
Solution: Colour blindness is a sex-linked recessive disorder due to defect in either red or green cone of eye resulting in failure to discriminate between red and green colour. This defect is due to mutation in certain genes present in the X chromosome. The female is colour blind which means she is homozygous ($X^C X^C$) for the disorder. The man she is marrying is also colorblind ($X^C Y$). Males have only one X chromosome and females have two. The X^C in male is coming from his mother's side.
If a female ($X^C X^C$) marries a man ($X^C Y$), the chances of her progeny having color blindness is 100% . If they have girls, all of them will be getting diseased X chromosomes (one from mother and one from father). If they have boys, all of them will be getting the diseased X chromosome from their mother.

Question 196: Which of the following is not a desirable feature of a cloning vector ?

Options:
(a) Presence of origin of replication
(b) Presence of a marker gene
(c) Presence of single restriction enzyme site
(d) Presence of two or more recognition sites
Answer: (d)
Solution: In order to link the alien DNA, the cloning vector needs to have very few, preferably single recognition sites for the commonly used restriction enzymes. Presence of more than one recognition sites within the vector will generate several fragments, which will complicate the gene cloning.

Question 197: Match list I with list II.

	List I		List II
(a)	Bronchioles	(i)	Dense Regular Connective Tissue
(b)	Goblet Cell	(ii)	Loose Connective Tissue
(c)	Tendons	(iii)	Glandular Tissue
(d)	Adipose Tissue	(iv)	Ciliated Epithelium

Options:
(a) (a)- (iv); (b) - (iii); (c) - (i);(d) - (ii)
(b) (a)- (i); (b) - (ii); (c) - (iii);(d) - (iv)
(c) (a)- (ii); (b) - (i); (c) - (iv);(d) - (iii)
(d) (a)- (iii); (b) - (iv); (c) - (ii);(d) - (i)
Answer: (a)
Solution: Bronchioles-If the columnar or cuboidal cells bear cilia on their free surface they are called ciliated epithelium.. They are mainly present in the inner surface of hollow organs like bronchioles and fallopian tubes.
Goblet cell-Columnar or cuboidal cells get specialised for secretion and are called glandular epithelium. Goblet cells of the alimentary canal is an example of glandular tissue.
Adipose tissue-Adipose tissue is a type of loose connective tissue located mainly beneath the skin. The cells of this tissue are specialised to store fats.
Tendons-Tendons are examples of dense regular connective tissues. They attach skeletal muscles to bones and ligaments which attach one bone to another are examples of this tissue

Question 198: Which one of the following statements is correct ?
Options:
(a) The atrioventricular node (AVN) generates an action potential to stimulate atrial contraction
(b) The tricuspid and the bicuspid valves open due to the pressure exerted by the simultaneous contraction of the atria
(c) Blood moves freely from atrium to the ventricle during joint diastole
(d) Increased ventricular pressure causes closing of the semilunar valves
Answer: (c)
Solution: The Sino-atrial node generates new action potential. With the decline of ventricular pressure, the tricuspid and bicuspid valves are pushed open by the pressure in the

atria exerted by the blood which was being emptied into them by the veins. Joint diastole refers to the phase in the cardiac cycle of the heart when both atria and ventricles are relaxed. During joint diastole, blood is poured into the left and right atria. Due to this filling of blood, atrioventricular valves (Bicuspid and Tricuspid valves) open and allow blood to flow from atria to ventricles. During ventricular diastole, the ventricular pressure falls causing the closure of semilunar valves and this prevents the backflow of blood into the ventricles.

Question 199: Select the incorrect statement regarding synapses :
Options:
(a) The membranes of presynaptic and postsynaptic neurons are in close proximity in an electrical synapse.
(b) Electrical current can flow directly from one neuron into the other across the electrical synapse.
(c) Chemical synapse use neurotransmitters
(d) Impulse transmission across a chemical synapse is always faster than that across an electrical synapse
Answer: (d)
Solution: A nerve impulse is transmitted from one neuron to another through junctions called synapses. There are two types of synapses, namely, electrical synapses and chemical synapses. Transmission of an impulse across electrical synapses is very similar to impulse conduction along a single axon. Impulse transmission across an electrical synapse is always faster than that across a chemical synapse.

Question 200: Which of the following statements is not true ?
Options:
(a) Analogous structures are a result of convergent evolution
(b) Sweet potato and potato is an example of analogy
(c) Homology indicates common ancestry
(d) Flippers of penguins and dolphins are a pair of homologous organs
Answer: (d)
Solution: Flippers of penguins and dolphins have a similar function as both help in swimming. Their origin is different hence they are called analogous organs. Analogous structures are a result of convergent evolution in which different structures evolve for the same function and hence have similarity.