DATE : 13/05/2012

Code - A

Aakash Institute
Premier Institute in India for Medical Entrance Exams.
(Division of Aakash Educational Services Ltd.)
Regd. Office : Aakash Tower, Plot No.-4, Sec-11, MLU, Dwarka, New Delhi-110075
Ph.: 011-47623456 Fax : 011-47623472

Time : 3 hrs.

Solutions

for

CBSE Final Exam. 2012

Max. Marks: 480

1. The dimensions of $(\mu_0\varepsilon_0)^{-1/2}$ are

(1) $[L^{1/2}T^{-1/2}]$ (2) $[L^{-1}T]$

(3) $[LT^{-1}]$ (4) $[L^{1/2}T^{1/2}]$

Ans. (3)

Sol. $c = \dfrac{1}{\sqrt{\mu_0\varepsilon_0}}$

2. A stone is dropped from a height h. It hits the ground with a certain momentum P. If the same stone is dropped from a height 100% more than the previous height, the momentum when it hits the ground will change by

(1) 68% (2) 41%

(3) 200% (4) 100%

Ans. (2)

Sol. $P = \sqrt{2mE} = \sqrt{2m^2gh} = m\sqrt{2gh}$

$P' = m\sqrt{2g2h} = \sqrt{2}P = 1.41\,P$

$\Rightarrow \dfrac{P'-P}{P}\times 100\% = 41\%$

3. A car of mass m is moving on a level circular track of radius R. If μ_s represents the static friction between the road and tyres of the car, the maximum speed of the car in circular motion is given by

(1) $\sqrt{\mu_s mRg}$ (2) $\sqrt{\dfrac{Rg}{\mu_s}}$

(3) $\sqrt{mRg/\mu_s}$ (4) $\sqrt{\mu_s Rg}$

Ans. (4)

Sol. $\mu_s mg = \dfrac{mv_{max}^2}{R}$

$\Rightarrow v_{max} = \sqrt{\mu_s Rg}$

4. A car of mass m starts from rest and accelerates so that the instantaneous power delivered to the car has a constant magnitude P_0. The instantaneous velocity of this car is proportional to

(1) t^2P_0

(2) $t^{1/2}$

(3) $t^{-1/2}$

(4) $\dfrac{t}{\sqrt{m}}$

Ans. (2)

Sol. $P_0 = mav = m\dfrac{dv}{dt}v$

$\Rightarrow \int_0^v v\,dv = \dfrac{P}{m}\int_0^t dt$

$\Rightarrow \dfrac{v^2}{2} = \dfrac{Pt}{m}$

$\Rightarrow v = \sqrt{\dfrac{2Pt}{m}}$

$\Rightarrow v \propto t^{\frac{1}{2}}$

5. A circular platform is mounted on a frictionless vertical axle. Its radius R = 2 m and its moment of inertia about the axle is 200 kg m^2. It is initially at rest. A 50 kg man stands on the edge of the platform and begins to walk along the edge at the speed of 1 ms^{-1} relative to the ground. Time taken by the man to complete one revolution is

(1) π s (2) $\frac{3\pi}{2}$ s

(3) 2π s (4) $\frac{\pi}{2}$ s

Ans. (3)

Sol. Gain of angular speed of disc

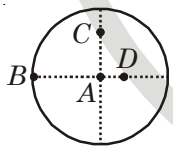
$$\omega' = \frac{mvR}{I} = \frac{50\times1\times2}{200} = \frac{100}{200} = \frac{1}{2} \text{ rad/s}$$

Angular speed of man $(\omega) = \frac{v}{r} = \frac{1}{2}$ rad/s

$$\omega_{rel} = \frac{1}{2} + \frac{1}{2} = 1 \text{ rad/s}$$

$$T = \frac{2\pi}{\omega} = \frac{2\pi}{1} = 2\pi \text{ s}$$

6. The moment of inertia of a uniform circular disc is maximum about an axis perpendicular to the disc and passing through



(1) B (2) C

(3) D (4) A

Ans. (1)

Sol. Parallel axis theorem

$I = I_{CM} + Mh^2$

$h_B > h_C > h_D > h_A \rightarrow I_B > I_C > I_D > I_A$

7. Three masses are placed on the x-axis : 300 g at origin, 500 g at x = 40 cm and 400 g at x = 70 cm. The distance of the centre of mass from the origin is

(1) 40 cm (2) 45 cm

(3) 50 cm (4) 30 cm

Ans. (1)

Sol. $X_{cm} = \frac{m_1x_1 + m_2x_2 + m_3x_3}{m_1 + m_2 + m_3}$

$$= \frac{300\times0 + 500\times40 + 400\times70}{1200}$$

$$= \frac{20000 + 28000}{1200} = \frac{48000}{120} = 40 \text{ cm}$$

8. If v_e is escape velocity and v_o is orbital velocity of a satellite for orbit close to the earth's surface, then these are related by

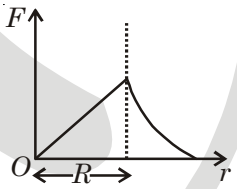
(1) $v_o = \sqrt{2}\,v_e$ (2) $v_o = v_e$

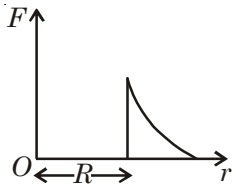
(3) $v_e = \sqrt{2v_o}$ (4) $v_e = \sqrt{2}\,v_o$

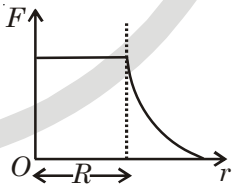
Ans. (4)

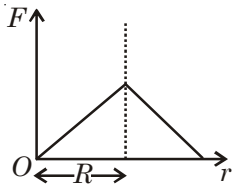
Sol. $v_0 = \sqrt{\frac{GM}{R}}$, $v_e = \sqrt{\frac{2GM}{R}} = \sqrt{2}\,v_0$

9. Which one of the following plots represents the variation of gravitational field on a particle with distance r due to a thin spherical shell of radius R? (r is measured from the centre of the spherical shell)

(1) 

(2) 

(3) 

(4) 

Ans. (2)

Sol. E_{ln} = Zero

$$E_0 = \frac{GM}{r^2}$$

10. A slab of stone of area 0.36 m^2 and thickness 0.1 m is exposed on the lower surface to steam at 100°C. A block of ice at 0°C rests on the upper surface of the slab. In one hour 4.8 kg of ice is melted. The thermal conductivity of slab is (Given latent heat of fusion of ice = 3.36 × 10^5 J kg^{-1})

(1) 1.24 J/m/s/°C (2) 1.29 J/m/s/°C

(3) 2.05 J/m/s/°C (4) 1.02 J/m/s/°C

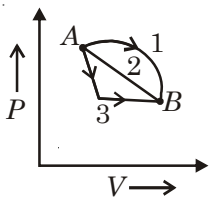
Ans. (1)

Sol. $ML = \dfrac{KAt(\theta_1 - \theta_2)}{d}$

$\Rightarrow \quad 4.8 \times 3.36 \times 10 = \dfrac{K \times 0.36 \times 3600 \times 100}{(0.1)}$

$\Rightarrow \quad K = 1.24$ J/m/s/°C

11. An ideal gas goes from state A to state B via three different processes as indicated in the P-V diagram



If Q_1, Q_2, Q_3 indicate the heat absorbed by the gas along the three processes and ΔU_1, ΔU_2, ΔU_3 indicate the change in internal energy along the three processes respectively, then

(1) $Q_1 > Q_2 > Q_3$ and $\Delta U_1 = \Delta U_2 = \Delta U_3$

(2) $Q_3 > Q_2 > Q_1$ and $\Delta U_1 = \Delta U_2 = \Delta U_3$

(3) $Q_1 = Q_2 = Q_3$ and $\Delta U_1 > \Delta U_2 > \Delta U_3$

(4) $Q_3 > Q_2 > Q_1$ and $\Delta U_1 > \Delta U_2 > \Delta U_3$

Ans. (1)

Sol. $\Delta U_1 = \Delta U_2 = \Delta U_3$

and $W_1 > W_2 > W_3$

$\Rightarrow \quad Q_1 > Q_2 > Q_3$

12. The equation of a simple harmonic wave is given by :

$$y = 3\sin\frac{\pi}{2}(50t - x)$$

where x and y are in metres an t is in seconds. The ratio of maximum particle velocity to the wave velocity is

(1) 2π (2) $\dfrac{3}{2}\pi$

(3) 3π (4) $\dfrac{2}{3}\pi$

Ans. (2)

Sol. $\dfrac{V_{p_{max}}}{V} = \dfrac{\omega A}{\left(\dfrac{\omega}{K}\right)} = KA = \dfrac{\pi}{2} \times 3 = \dfrac{3\pi}{2}$

13. A train moving at a speed of 220 ms^{-1} towards a stationary object, emits a sound of frequency 1000 Hz. Some of the sound reaching the object gets reflected back to the train as echo. The frequency of the echo as detected by the driver of the train is

(Speed of sound in air is 330 ms^{-1})

(1) 3500 Hz

(2) 4000 Hz

(3) 5000 Hz

(4) 3000 Hz

Ans. (3)

Sol. $f' = \left(\dfrac{v + v_0}{v - v_s}\right) f$

$= \left(\dfrac{330 + 220}{330 - 220}\right) \times 1000$

$= \dfrac{550}{110} \times 1000$

$= 5000$ Hz

14. A parallel plate capacitor has a uniform electric field E in the space between the plates. If the distance between the plates is d and area of each plate is A, the energy stored in the capacitor is

(1) $\dfrac{1}{2}\varepsilon_0 E^2$ (2) $E^2 \dfrac{Ad}{\varepsilon_0}$

(3) $\dfrac{1}{2}\varepsilon_0 E^2 Ad$ (4) $\varepsilon_0 EAd$

Ans. (3)

Sol. $E = U_E \times V = \dfrac{1}{2}\varepsilon_0 E^2 Ad$

15. Two metallic spheres of radii 1 cm and 3 cm are given charges of -1×10^{-2} C and 5×10^{-2} C, respectively. If these are connected by a conducting wire, the final charge on the bigger sphere is

(1) 2×10^{-2} C (2) 3×10^{-2} C

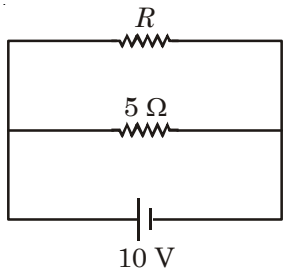
(3) 4×10^{-2} C (4) 1×10^{-2} C

Ans. (2)

Sol. $Q_2 = \dfrac{QR_2}{R_1 + R_2} = \dfrac{(-1+5) \times 10^{-2} \times 3}{1+3}$

$= 3 \times 10^{-2}$ C

16. The power dissipated in the circuit shown in the figure is 30 watts. The value of R is



(1) 20 Ω (2) 15 Ω

(3) 10 Ω (4) 30 Ω

Ans. (3)

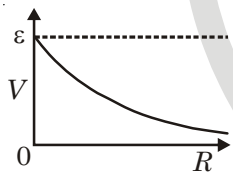
Sol. $P = \frac{V^2}{R_1} + \frac{V^2}{R_2}$

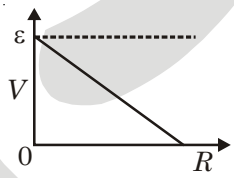
$\Rightarrow \frac{10^2}{R} = 30 - \frac{10^2}{5}$

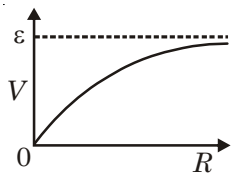
$\Rightarrow \frac{100}{R} = 30 - 20$

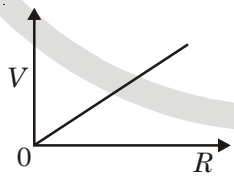
$\Rightarrow R = 10\ \Omega$

17. A cell having an emf ε and internal resistance r is connected across a variable external resistance R. As the resistance R is increased, the plot of potential difference V across R is given by

(1) 

(2) 

(3) 

(4) 

Ans. (3)

Sol. $V = \frac{\varepsilon R}{R + r} = \frac{\varepsilon}{1 + \frac{r}{R}}$

18. A proton carrying 1 MeV kinetic energy is moving in a circular path of radius R in uniform magnetic field. What should be the energy of an α-particle to describe a circle of same radius in the same field?

(1) 2 MeV (2) 1 MeV

(3) 0.5 MeV (4) 4 MeV

Ans. (2)

Sol. $R = \frac{\sqrt{2ME}}{qB}$

$\Rightarrow \frac{\sqrt{M_p E_p}}{q_p} = \frac{\sqrt{M_\alpha E_\alpha}}{q_\alpha}$

$\Rightarrow E_\alpha = \left(\frac{q_\alpha}{q_p}\right)^2 \left(\frac{M_p}{M_\alpha}\right) E_p$

$= 4 \times \frac{1}{4} \times 1\ \text{MeV} = 1\ \text{MeV}$

19. A magnetic needle suspended parallel to a magnetic field requires $\sqrt{3}$ J of work to turn it through 60°. The torque needed to maintain the needle in this position will be

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

(3) $\sqrt{3}$ J (4) $\frac{3}{2}$ J

Ans. (2)

Sol. $W = MB(\cos 0 - \cos 60) = MB \times \frac{1}{2} = \sqrt{3}$

$\Rightarrow MB = 2\sqrt{3}$

$\tau = MB \sin 60 = 2\sqrt{3} \times \frac{\sqrt{3}}{2} = 3$ J

20. The instantaneous values of alternating current and voltages in a circuit are given as

$i = \frac{1}{\sqrt{2}} \sin(100\pi t)$ ampere

$e = \frac{1}{\sqrt{2}} \sin\left(100\pi t + \frac{\pi}{3}\right)$ volt

The average power in Watts consumed in the circuit is

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

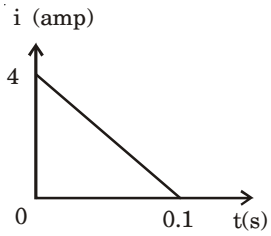
(3) $\frac{1}{2}$ (4) $\frac{1}{8}$

Ans. (4)

Sol. $P_{av} = \frac{E_0 I_0}{2} \cos\phi = \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}} \times \frac{1}{2} \times \cos\frac{\pi}{3}$

$= \frac{1}{8}$ W

21. In a coil of resistance 10 Ω, the induced current developed by changing magnetic flux through it, is shown in figure as a function of time. The magnitude of change in flux through the coil in Weber is



(1) 8 (2) 2

(3) 6 (4) 4

Ans. (2)

Sol. $Q = \frac{\Delta\phi}{R}$

$\Delta\phi = RQ = 10 \times \frac{1}{2} \times (0.1 \times 4) = 2$ Wb

22. The ratio of amplitude of magnetic field to the amplitude of electric field for an electromagnetic wave propagating in vacuum is equal to

(1) The speed of light in vacuum

(2) Reciprocal of speed of light in vacuum

(3) The ratio of magnetic permeability to the electric susceptibility of vacuum

(4) Unity

Ans. (2)

Sol. $c = \frac{E}{B}$

23. For the angle of minimum deviation of a prism to be equal to its refracting angle, the prism must be made of a material whose refractive index

(1) lies between $\sqrt{2}$ and 1

(2) lies between 2 and $\sqrt{2}$

(3) is less than 1

(4) is greater than 2

Ans. (2)

Sol. $\delta_{min} = (i + e) - A$

$A = 2i - A$

$i = A,\ r_1 = r_2 = \frac{A}{2}$

$\mu = \frac{\sin i}{\sin r} = 2\cos\frac{A}{2}$

24. A rod of length 10 cm lies along the principal axis of a concave mirror of focal length 10 cm in such a way that its end closer to the pole is 20 cm away from the mirror. The length of the image is

(1) 10 cm (2) 15 cm

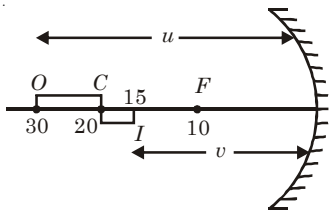
(3) 2.5 cm (4) 5 cm

Ans. (4)

Sol. $u = -30$

$f = -10$

$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$



$\frac{1}{v} = \frac{1}{f} - \frac{1}{u}$

$= \frac{1}{-10} - \frac{1}{-30} = \frac{1}{30} - \frac{1}{10} = \frac{1-3}{30} = \frac{-2}{30}$

$v = -15$

Length of image = 20 – 15 = 5 cm

25. If the momentum of an electron is changed by P, then the de-Broglie wavelength associated with it changes by 0.5%. The initial momentum of electron will be

(1) 200 P (2) 400 P

(3) $\frac{P}{200}$ (4) 100 P

Ans. (1)

Sol. $\lambda = \frac{h}{p}$

$\left|\frac{\Delta\lambda}{\lambda}\right| = \left|\frac{\Delta p}{p}\right|$

$p = \frac{\Delta p}{\left(\frac{\Delta\lambda}{\lambda}\right)} = \frac{P}{0.005} = 200P$

26. Two radiations of photons energies 1 eV and 2.5 eV, successively illuminate a photosensitive metallic surface of work function 0.5 eV. The ratio of the maximum speeds of the emitted electrons is

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

(3) 1 : 1 (4) 1 : 5

Ans. (2)

Sol. $v \propto \sqrt{E}$

$\frac{v_1}{v_2} = \sqrt{\frac{1-0.5}{2.5-0.5}} = \sqrt{\frac{0.5}{2}} = \sqrt{\frac{1}{4}} = \frac{1}{2}$

27. The transition from the state $n = 3$ to $n = 1$ in a hydrogen like atom results in ultraviolet radiation. Infrared radiation will be obtained in the transition from

(1) $2 \rightarrow 1$

(2) $3 \rightarrow 2$

(3) $4 \rightarrow 2$

(4) $4 \rightarrow 2$

Ans. (4)

Sol. $3 \rightarrow 1$ $UV \rightarrow$ Hydrogen atom

$\left.\begin{matrix} 3 \rightarrow 2 \\ 4 \rightarrow 2 \end{matrix}\right| \rightarrow$ Visible

$4 \rightarrow 3 \rightarrow$ Infrared

28. The half life of a radioactive nucleus is 50 days. The time interval $(t_2 - t_1)$ between the time t_2 when $\frac{2}{3}$ of it has decayed and the time t_1 when $\frac{1}{3}$ of it had decayed as

(1) 30 days (2) 50 days

(3) 60 days (4) 15 days

Ans. (2)

Sol. $t_1 \rightarrow$ time at which $\frac{2}{3}$ is active *i.e.* A_1

$t_2 \rightarrow$ time at which $\frac{1}{3}$ is active *i.e.* A_2

$\frac{A_1}{A_2} = 2$ so one half life is required (50 days).

29. The input resistance of a silicon transistor is 100 Ω. Base current is changed by 40 μA which results in a change in collector current by 2 mA. This transistor is used as a common emitter amplifier with a load resistance of 4 KΩ. The voltage gain of the amplifier is

(1) 2000 (2) 3000

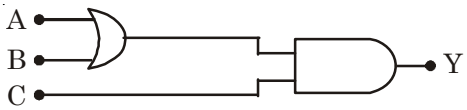
(3) 4000 (4) 1000

Ans. (1)

Sol. $\beta = \frac{\Delta I_C}{\Delta I_B} = \frac{2 \text{ mA}}{40 \ \mu A} = \frac{2 \times 10^{-3}}{40 \times 10^{-6}} = 0.5 \times 10^2 = 50$

$A_v = \beta \frac{R_L}{R_i} = 50 \times \frac{4 \text{ k}\Omega}{100 \ \Omega} = 2000$

30. To get an output Y = 1 in given circuit which of the following input will be correct



	A	B	C
(1)	1	0	0
(2)	1	0	1
(3)	1	1	0
(4)	0	1	0

Ans. (2)

Sol. $y = (A + B) \cdot C$

C should be 1

Either of A and B OR both A and B are 1.

31. Given that the equilibrium constant for the reaction

$2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2\ SO_{3(g)}$

has a value of 278 at a particular temperature. What is the value of the equilibrium constant for the following reaction at the same temperature ?

$SO_{3(g)} \rightleftharpoons SO_{2(g)} + \frac{1}{2} O_{2(g)}$

(1) 1.8×10^{-3} (2) 3.6×10^{-3}

(3) 6.0×10^{-2} (4) 1.3×10^{-5}

Ans. (3)

Sol. $2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$

$k_1 = \frac{[SO_3]^2}{[SO_2]^2[O_2]} = 278$

$SO_3(g) \rightleftharpoons SO_2(g) + \frac{1}{2}O_2(g)$

$k = \frac{[SO_2][O_2]^{\frac{1}{2}}}{[SO_3]}$

$\frac{1}{k} = \frac{[SO_3]}{[SO_2][O_2]^{\frac{1}{2}}}$

$\left(\frac{1}{k_2}\right)^2 = \frac{[SO_3]^2}{[SO_2]^2[O_2]} = 278$

$\frac{1}{k_2} = \sqrt{278}$

$k_2 = \frac{1}{\sqrt{278}} = 0.0614 = 6.14 \times 10^{-2}$

32. Structure of a mixed oxide is cubic close packed (c.c.p.). The cubic unit cell of mixed oxide is composed of oxide ions. One fourth of the tetrahedral voids are occupied by divalent metal A and the octahedral voids are occupied by a monovalent metal B. The formula of the oxide is :

(1) ABO_2

(2) A_2BO_2

(3) $A_2B_3O_4$

(4) AB_2O_2

Ans. (4)

Sol. Number of O^{-2} ions = 4

Number of $A = \frac{1}{4} \times 8 = 2$

Number of B = 4

Formula = $A_2B_4O_4 = AB_2O_2$

33. Given the reaction between 2 gases represented by A_2 and B_2 to give the compound $AB_{(g)}$.

$A_{2(g)} + B_{2(g)} \rightleftharpoons 2AB_{(g)}$.

At equilibrium, the concentration

of $A_2 = 3.0 \times 10^{-3}$ M

of $B_2 = 4.2 \times 10^{-3}$ M

of AB = 2.8×10^{-3} M

If the reaction takes place in a sealed vessel at 527°C, then the value of K_c will be :

(1) 2.0

(2) 1.9

(3) 0.62

(4) 4.5

Ans. (3)

Sol. $K_c = \frac{[AB]^2}{[A_2][B_2]}$

$= \frac{[2.8 \times 10^{-3}]^2}{3 \times 10^{-3} \times 4.2 \times 10^{-3}}$

$= \frac{7.84 \times 10^{-6}}{12.6 \times 10^{-6}} = \frac{7.84}{12.6} = 0.622$

34. Activation energy (E_a) and rate constants (k_1 and k_2) of a chemical reaction at two different temperatures (T_1 and T_2) are related by

(1) $\ln \frac{k_2}{k_1} = -\frac{E_a}{R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$

(2) $\ln \frac{k_2}{k_1} = -\frac{E_a}{R}\left(\frac{1}{T_2} - \frac{1}{T_1}\right)$

(3) $\ln \frac{k_2}{k_1} = -\frac{E_a}{R}\left(\frac{1}{T_2} + \frac{1}{T_1}\right)$

(4) $\ln \frac{k_2}{k_1} = \frac{E_a}{R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$

Ans. (2, 4)

Sol. Fact

35. During change of O_2 to O_2^- ion, the electron adds on which one of the following orbitals?

(1) π^* orbitals

(2) π orbitals

(3) σ^* orbitals

(4) σ orbitals

Ans. (1)

Sol. Electron is added in π^* orbitals.

36. Standard reduction potentials of the half reactions are given below

$F_{2(g)} + 2e^- \rightarrow 2F^-_{(aq)}$; $E^o = +2.85$ V

$Cl_{2(g)} + 2e^- \rightarrow 2Cl^-_{(aq)}$; $E^o = +1.36$ V

$Br_{2(l)} + 2e^- \rightarrow 2Br^-_{(aq)}$; $E^o = +1.06$ V

$I_{2(s)} + 2e^- \rightarrow 2I^-_{(aq)}$; $E^o = +0.53$ V

The strongest oxidising and reducing agents respectively are

(1) F_2 and I^- (2) Br_2 and Cl^-

(3) Cl_2 and Br^- (4) Cl_2 and I_2

Ans. (1)

Sol. Reduction potential is highest for F_2 and lowest for I^-.

37. A certain gas takes three times as long to effuse out as helium. Its molecular mass will be

(1) 27 u (2) 36 u

(3) 64 u (4) 9 u

Ans. (2)

Sol. $\frac{r_{He}}{r_X} = \sqrt{\frac{M_X}{M_{He}}}$

or $\frac{V_{He}}{t_{He}} \times \frac{t_X}{V_X} = \sqrt{\frac{M_X}{4}}$

$\frac{3}{1} = \sqrt{\frac{M_X}{4}}$

or $9 = \frac{M_X}{4}$

$M_X = 36$

38. The orbital angular momentum of a p-electron is given as

(1) $\frac{h}{\sqrt{2}\pi}$ (2) $\sqrt{3}\frac{h}{2\pi}$

(3) $\sqrt{\frac{3}{2}}\frac{h}{\pi}$ (4) $\sqrt{6}\cdot\frac{h}{2\pi}$

Ans. (1)

Sol. For *p*-orbital $l = 1$

Orbital angular momentum $= \sqrt{l(l+1)}\frac{h}{2\pi}$

$= \sqrt{1(1+1)}\frac{h}{2\pi}$

$= \sqrt{2}\frac{h}{2\pi}$

$= \frac{h}{\sqrt{2}\pi}$

39. Vapour pressure of chloroform ($CHCl_3$) and dichloromethane (CH_2Cl_2) at 25°C are 200 mmHg and 41.5 mmHg respectively. Vapour pressure of the solution obtained by mixing 25.5 g of $CHCl_3$ and 40 g of CH_2Cl_2 at the same temperature will be (Molecular mass of $CHCl_3$ = 119.5 u and molecular mass of CH_2Cl_2 = 85 u)

(1) 173.9 mmHg (2) 615.0 mmHg

(3) 347.9 mmHg (4) 285.5 mmHg

Ans. (No one is correct option)

Sol. $n_{CHCl_3} = \frac{25.5}{119.5} = 0.21$

$n_{CH_2Cl_2} = \frac{40}{85} = 0.47$

$n_{Total} = 0.68$

$X_{CHCl_3} = \frac{0.21}{0.68} = 0.31$

$X_{CH_2Cl_2} = \frac{0.47}{0.68} = 0.69$

$P_{CHCl_3} = P^\circ_{CHCl_3} \cdot X_{CHCl_3} = 200 \times 0.31 = 62$

$X_{CH_2Cl_2} = P^\circ_{CH_2Cl_2} \cdot X_{CH_2Cl_2} = 41.5 \times 0.69 = 28.63$

$P_{solution} = 62 + 28.63 = 90.63$ mm

40. Molar conductivities $\left(\Lambda^\circ_m\right)$ at infinite dilution of NaCl, HCl and CH_3COONa are 126.4, 425.9 and 91.0 S cm^2 mol^{-1} respectively Λ°_m for CH_3COOH will be

(1) 425.5 S cm^2 mol^{-1} (2) 180.5 S cm^2 mol^{-1}

(3) 290.8 S cm^2 mol^{-1} (4) 390.5 S cm^2 mol^{-1}

Ans. (4)

Sol. $\Lambda^\circ_{m(CH_3COOH)} = \Lambda^\circ_{m(CH_3COONa)} + \Lambda^\circ_{m(HCl)} - \Lambda^\circ_{m(NaCl)}$

$= 91 + 425.9 - 126.4$

$= 390.5$ S cm^2 mol^{-1}

41. For real gases van der Waals equation is written as $\left(p + \frac{an^2}{V^2}\right)(V - nb) = n\,RT$

where 'a' and 'b' are van der Waals constants.

Two sets of gases are :

(I) O_2, CO_2, H_2 and He

(II) CH_4, O_2 and H_2

The gases given in set-I in increasing order of 'b' and gases given in set-II in decreasing order of 'a', are arranged below. Select the correct order from the following :

(1) (I) He < H_2 < CO_2 < O_2 (II) CH_2 > H_2 > O_2

(2) (I) O_2 < He < H_2 < CO_2 (II) H_2 > O_2 > CH_4

(3) (I) H_2 < He < O_2 < CO_2 (II) CH_4 > O_2 > H_2

(4) (I) H_2 < O_2 <He < CO_2 (II) O_2 > CH_4 > H_2

Ans. (3)

42. Equal volumes of two monoatomic gases, A and B, at same temperature and pressure are mixed. The ratio of specific heats (C_p/C_v) of the mixture will be:

(1) 0.83 (2) 1.50

(3) 3.3 (4) 1.67

Ans. (4)

Sol. For monoatomic gas $\frac{C_p}{C_v} = 1.67$.

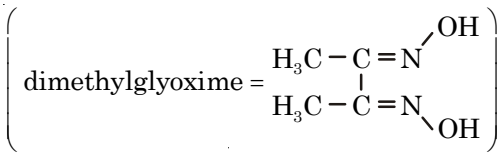
43. Red precipitate is obtained when ethanol solution of dimethylglyoxime is added to ammoniacal Ni(II). Which of the following statements is not true?

(1) Red complex has a square planar geometry.

(2) Complex has symmetrical H-bonding

(3) Red complex has a tetrahedral geometry

(4) Dimethylglyoxime functions as bidentate ligand



Ans. (3)

44. Low spin complex of d^6–cation in an octahedral field will have the following energy:

(1) $\frac{-12}{5}\Delta_o + P$ (2) $\frac{-12}{5}\Delta_o + 3P$

(3) $\frac{-2}{5}\Delta_o + 2P$ (4) $\frac{-2}{5}\Delta_o + P$

(Δ_o = Crystal Field Splitting Energy in an octahedral field, P = Electron pairing energy)

Ans. (2)

45. Which one of the following does not correctly represent the correct order of the property indicated against it?

(1) Ti < V < Cr < Mn : increasing number of oxidation states

(2) $Ti^{3+} < V^{3+} < Cr^{3+} < Mn^{3+}$: increasing magnetic moment

(3) Ti < V < Cr < Mn : increasing melting points

(4) Ti < V < Mn < Cr : increasing 2nd ionization enthalpy

Ans. (3)

Sol. M.P. increases from Ti to Cr and then decreases.

46. Four successive members of the first series of the transition metals are listed below. For which one of them the standard potential $\left(E^o_{M^{2+}/M}\right)$ value has a positive sign?

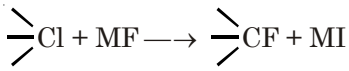
(1) Co (Z = 27) (2) Ni (Z = 28)

(3) Cu (Z = 29) (4) Fe (Z = 26)

Ans. (3)

Sol. $E^\circ_{Cu^{+2}/Cu}$ = +0.34 volt

47. In the replacement reaction



The reaction will be most favourable if M happens to be

(1) Na (2) K

(3) Rb (4) Li

Ans. (3)

Sol. The reaction is SN^1. The reaction will be more favoured when there is more release of F^- which depends upon polarising power of metal. Size of Rb is largest among the given options so more release of F^- will take place.

48. In which of the following arrangements the given sequence is not strictly according to the property indicated against it?

(1) HF < HCl < HBr < HI : increasing acidic strength

(2) $H_2O < H_2S < H_2Se < H_2Te$: increasing pK_a values

(3) $NH_3 < PH_3 < AsH_3 < SbH_3$: increasing acidic character

(4) $CO_2 < SiO_2 < SnO_2 < PbO_2$: increasing oxidising power

Ans. (2)

Sol. $H_2O < H_2S < H_2Se < H_2Te$

Acidic nature increases so pK_a decreases in the same order.

49. Four diatomic species are listed below. Identify the correct order in which the bond order is increasing in them

(1) $NO < O_2^- < C_2^{2-} < He_2^+$

(2) $O_2^- < NO < C_2^{2-} < He_2^+$

(3) $C_2^{2-} < He_2^+ < O_2^- < NO$

(4) $He_2^+ < O_2^- < NO < C_2^{2-}$

Ans. (4)

Sol. Fact

50. The catalytic activity of transition metals and their compounds is ascribed mainly to

(1) Their magnetic behaviour

(2) Their unfilled *d*-orbitals

(3) Their ability to adopt variable oxidation states

(4) Their chemical reactivity

Ans. (3)

Sol. Catalytic property of transition metal is mainly due to ability to adopt multiple oxidation state and complex formation.

51. Which of the following exhibits only +3 oxidation state?

(1) U

(2) Th

(3) Ac

(4) Pa

Ans. (3)

Sol. Actinium exhibit only + 3 oxidation state.

52. The Gibb's energy for the decomposition of Al_2O_3 at 500°C is as follows :

$$\frac{2}{3}Al_2O_3 \longrightarrow \frac{4}{3}Al + O_2;\ \Delta_rG = +960\ kJ\ mol^{-1}$$

The potential difference needed for the electrolytic reduction of aluminium oxide (Al_2O_3) at 500°C is at least:

(1) 4.5 V

(2) 3.0 V

(3) 2.5 V

(4) 5.0 V

Ans. (3)

Sol. $\Delta G = -nFE°$

53. Chloroamphenicol is an

(1) Antifertility drug

(2) Antihistaminic

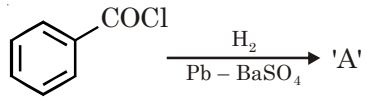
(3) Antispetic and disinfectant

(4) Antibiotic-broad spectrum

Ans. (4)

Sol. Fact

54. Consider the following reaction



The product 'A; is

(1) C_6H_5CHO

(2) C_6H_5OH

(3) $C_6H_5COCH_3$

(4) C_6H_5Cl

Ans. (1)

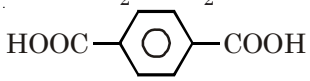
Sol. It is Rosenmund reduction.

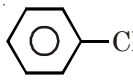
55. Which one of the following sets forms the biodegradable polymer?

(1) $CH_2 = CH - CN$ and
$CH_2 = CH - CH = CH_2$

(2) $H_2N - CH_2 - COOH$ and
$H_2N - (CH_2)_5 - COOH$

(3) $HO - CH_2 - CH_2 - OH$ and

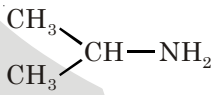


(4)  $CH = CH_2$ and
$CH_2 = CH - CH = CH_2$

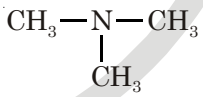
Ans. (2)

Sol. Nylon-2-nylon-6 is a biodegradable polymer which monomer is $H_2N - CH_2 - COOH$ and $H_2N - (CH_2)_5 - COOH$

56. An organic compound (C_3H_9N) (A), when treated with nitrous acid, gave an alcohol and N_2 gas was evolved. (A) on warming with $CHCl_3$ and caustic potash gave (C) which on reduction gave isopropylmethylamine. Predict the structure of (A).

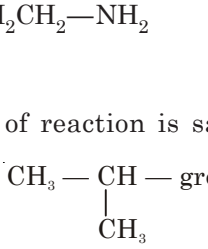
(1) 

(2) $CH_3CH_2—NH—CH_3$

(3) 

(4) $CH_3CH_2CH_2—NH_2$

Ans. (1)

Sol. Condition of reaction is satisfied by 1° amine containing  group.

57. Which of the following reagents will be able to distinguish between 1-butyne and 2-butyne?

(1) $NaNH_2$ (2) HCl

(3) O_2 (4) Br_2

Ans. (1)

Sol. $NaNH_2$ reacts with but-1-yne due to presence of acidic hydrogen but not with but-2-yne.

58. Consider the reaction

$RCHO + NH_2NH_2 \longrightarrow RCH = N - NH_2$

What sort of reaction is it?

(1) Electrophilic addition - elimination reaction

(2) Free radical addition - elimination reaction

(3) Electrophilic substitution - elimination reaction

(4) Nucleophilic addition - elimination reaction

Ans. (4)

Sol. It is the nucleophilic addition elimination reaction of aldehyde.

59. Which of the following compounds will give a yellow precipitate with iodine and alkali?

(1) Acetophenone

(2) Methyl acetate

(3) Acetamide

(4) 2-hydroxypropane

Ans. (1, 4)

Sol. Both Acetophenone and 2-hydroxypropane give iodoform reaction.

60. Which of the following compounds can be used as antifreeze in automobile radiators?

(1) Methyl alcohol

(2) Glycol

(3) Nitrophenol

(4) Ethyl alcohol

Ans. (2)

Sol. Glycol act as antifreeze substance.

61. How many organisms in the list given below are autotrophs?

Lactobacillus, Nostoc, Chara, Nitrosomonas, Nitrobacter, Streptomyces, Sacharomyces, Trypansoma, Porphyra, Wolfia

(1) Four (2) Five

(3) Six (4) Three

Ans. (3)

Sol. *Nostoc*, *Porphyra*, *Wolfia*, *Chara* → Photosynthetic autotrophs

Nitrosomonas, *Nitrobacter* → Chemosynthetic autotrophs

62. Read the following five statements (A - E) and answer as asked next to them.

(A) In *Equisetum*, the female gametophyte is retained on the parent sporophyte.

(B) In Ginkgo male gametophyte is not independent.

(C) The sporophyte in *Riccia* is more developed than that in *Polytrichum*.

(D) Sexual reproduction in *Volvox* is isogamous.

(E) The spores of slime molds lack cell walls.

How many of the above statements are **correct**?

(1) Two (2) Three

(3) Four (4) One

Ans. (4)

Sol. *Equisetum* → Homosporous pteridophyte

63. Which one of the following pairs is **wrongly** matched?

(1) *Ginkgo* - Archegonia

(2) *Salvinia* - Prothallus

(3) Viroids - RNA

(4) Mustard - Synergids

Ans. (2)

Sol. *Salvinia* → Heterosporous pteridophyte

64. In the five-kingdom classification, *Chlamydomonas* and *Chlorella* have been included in

(1) Protista (2) Algae

(3) Plantae (4) Monera

Ans. (1)

Sol. Kingdom Protista has brought together *Chlamydomonas*, *Chlorella* (earlier placed in Algae within plants and both having cell walls) with *Paramoecium* and *Amoeba* (which were earlier placed in animal kingdom) which lack it.

65. For its activity, carboxypeptidase requires

(1) Zinc (2) Iron

(3) Niacin (4) Copper

Ans. (1)

Sol. Zinc is a cofactor for the proteolytic enzyme carboxypeptidase.

66. Which one of the following structures is an organelle within an organelle?

(1) Ribosome (2) Peroxisome

(3) ER (4) Mesosome

Ans. (1)

Sol. Ribosome is found in chloroplast and mitochondria.

67. Which one of the following is a **wrong** statement regarding mutations?

(1) Deletion and insertion of base pairs cause frame-shift mutations

(2) Cancer cells commonly show chromosomal aberrations

(3) UV and Gamma rays are mutagens

(4) Change in a single base pair of DNA does not cause mutation

Ans. (4)

Sol. Change in a single base pair of DNA is called point mutation.

68. A test cross is carried out to

(1) Determine the genotype of a plant at F_2

(2) Predict whether two traits are linked

(3) Assess the number of alleles of a gene

(4) Determine whether two species or varieties will breed successfully

Ans. (1)

Sol. To determine the genotype of a tall plant at F_2, Mendel crossed the tall plant from F_2 with a dwarf plant. This is called a test cross.

69. Read the following four statements (A - D)

(A) In transcription, adenosine pairs with uracil.

(B) Regulation of *lac* operon by repressor is referred to as positive regulation.

(C) The human genome has approximately 50,000 genes.

(D) Haemophilia is a sex-linked recessive disease.

How many of the above statements are **right**?

(1) Two (2) Three

(3) Four (4) One

Ans. (1)

Sol. (B) Negative control

(C) 30,000 genes

70. Which one of the following organisms is **correctly** matched with its three characteristics?

(1) Pea : C_3 pathway, Endospermic seed, Vexillary aestivation

(2) Tomato : Twisted aestivation, Axile placentation, Berry

(3) Onion : Bulb, Imbricate aestivation, Axile placentation

(4) Maize : C_3 pathway, Closed vascular bundles, Scutellum

Ans. (4)

Sol. Maize is a C_4 plant having C_3 as well as C_4 pathway.

71. How many plants in the list given below have marginal placentation?

Mustard, Gram, Tulip, Asparagus, Arhar, Sun hemp, Chilli, Colchicine, Onion, Moong, Pea, Tobacco, Lupin

(1) Four (2) Five

(3) Six (4) Three

Ans. (3)

Sol. Gram, Arhar, Sun hemp, Moong, Pea, Lupin → Plants of Fabaceae family.

72. Read the following four statements (A - D)

(A) Both, photophosphorylation and oxidative phosphorylation involve uphill transport of protons across the membrane.

(B) In dicot stems, a new cambium originates from cells of pericycle at the time of secondary growth.

(C) Stamens in flowers of *Gloriosa* and *Petunia* are polyandrous.

(D) Symbiotic nitrogen-fixers occur in free-living state also in soil.

How many of the above statements are **right**?

(1) Two (2) Three

(3) Four (4) One

Ans. (1)

Sol. *Petunia* → A_5

Gloriosa → A_{3+3}

73. Through their effect on plant growth regulators, what do the temperature and light control in the plants?

(1) Apical dominance (2) Flowering

(3) Closure of stomata (4) Fruit elongation

Ans. (2)

Sol. Many of the extrinsic factors such as temperature and light, control plant growth and development via PGR. Some of such events could be : Vernalisation, flowering, dormancy, seed germination, plant movements etc.

74. Which one of the following generally acts as an antagonist to gibberellins?

(1) Zeatin (2) Ethylene

(3) ABA (4) IAA

Ans. (3)

Sol. ABA = Antigibberellic acid

75. As compared to a dicot root, a monocot root has

(1) More abundant secondary xylem

(2) Many xylem bundles

(3) Inconspicuous annual rings

(4) Relatively thicker periderm

Ans. (2)

Sol. Monocot root has polyarch condition.

76. For its action, nitrogenase requires

(1) High input of energy

(2) Light

(3) Mn^{2+}

(4) Super oxygen radicals

Ans. (1)

Sol. ATP for each NH_3 produced.

77. Vernalisation stimulates flowering in

(1) Zamikand (2) Turmeric

(3) Carrot (4) Ginger

Ans. (3)

Sol. Subjecting the growing of a biennial plant (e.g., Sugarbeet, Cabbage, Carrot) to a cold treatment stimulates a subsequent photoperiodic flowering response.

78. What is the function of germ pore?

(1) Emergence of radicle

(2) Absorption of water for seed germination

(3) Initiation of pollen tube

(4) Release of male gametes

Ans. (3)

Sol. Pollen grain germinates on the stigma to produce a pollen tube through one of the germ pores.

79. Which one of the following statements is **wrong**?

(1) When pollen is shed at two-celled stage, double fertilization does not take place

(2) Vegetative cell is larger than generative cell

(3) Pollen grains in some plants remain viable for months

(4) Intine is made up of cellulose and pectin

Ans. (1)

Sol. Double fertilisation event is unique to angiosperms.

80. Plants with ovaries having only one or a few ovules, are generally pollinated by

(1) Bees (2) Butterflies

(3) Birds (4) Wind

Ans. (4)

Sol. Wind pollination is quite common in grasses (basal placentation).

81. Sacred groves are specially useful in

(1) Generating environmental awareness

(2) Preventing soil erosion

(3) Year-round flow of water in rivers

(4) Conserving rare and threatened species

Ans. (4)

Sol. In Meghalaya, sacred groves are the last refuges for a large number of rare and threatened plants.

82. The rate of formation of new organic matter by rabbit in a grassland, is called

(1) Net productivity

(2) Secondary productivity

(3) Net primary productivity

(4) Gross primary productivity

Ans. (2)

Sol. Secondary productivity is defined as the rate of formation of new organic matter by consumers.

83. *Cuscuta* is an example of

(1) Ectoparasitism (2) Brood parasitism

(3) Predation (4) Endoparasitism

Ans. (1)

Sol. It is a total stem parasite.

84. The second stage of hydrosere is occupied by plants like

(1) *Azolla*

(2) *Typha*

(3) *Salix*

(4) *Vallisneria*

Ans. (4)

Sol. Submerged plant stage

85. Green revolution in India occurred during

(1) 1960's (2) 1970's

(3) 1980's (4) 1950's

Ans. (1)

Sol. 1960 decade is the phase of green revolution.

86. In gobar gas, the maximum amount is that of

(1) Butane

(2) Methane

(3) Propane

(4) Carbon dioxide

Ans. (2)

Sol. Large amount of methane along with CO_2 and H_2.

87. Read the following statements (A - D)

(A) Colostrum is recommended for the new born because it is rich in antigens

(B) Chikengunya is caused by a Gram negative bacterium

(C) Tissue culture has proved useful in obtaining virus-free plants

(D) Beer is manufactured by distillation of fermented grape juice

How many of the above statements are **wrong**?

(1) Two (2) Three

(3) Four (4) One

Ans. (2)

Sol. A, B and D statements are wrong

The correct statements for

A : Colostrum is recommended for the new born because it is rich in antibodies.

B : Chikungunya is caused by arbovirus.

D : Beer is manufactured without distillation of fermented grape juice.

88. Tobacco plants resistant to a nematode have been developed by the introduction of DNA that produced (in the host cells)

(1) Both sense and anti-sense RNA

(2) A particular hormone

(3) An antifeedant

(4) A toxic protein

Ans. (1)

Sol. Tobacco plants resistant to a nematode have been developed by the introduction of DNA that produces both sense and anti-sense RNA in the host cells.

89. Biolistics (gene-gun) is suitable for

(1) Disarming pathogen vectors

(2) Transformation of plant cells

(3) Constructing recombinant DNA by joining with vectors

(4) DNA finger printing

Ans. (2)

Sol. Biolistic (gene gun) is suitable for transformation of plant cells.

90. In genetic engineering, the antibiotics are used :

(1) As selectable markers

(2) To select healthy vectors

(3) As sequences from where replication starts

(4) To keep the cultures free of infection

Ans. (1)

Sol. In genetic engineering, the antibiotics are used as selectable markers.

91. Which one of the following pairs of animals are similar to each other pertaining to the feature stated against them?

(1) *Pteropus and Ornithorhyncus*-Viviparity

(2) Garden lizard and Crocodile - Three chambered heart

(3) *Ascaris* and *Ancylostoma* - Metameric segmentation

(4) Sea horse and Flying fish - Cold blooded (poikilothermal)

Ans. (4)

Sol. Sea horse is *Hippocampus*

Flying fish is *Exocoetus*

Both are fishes and cold blooded animals.

92. Which one of the following categories of animals, is correctly described **with no single exception in it?**

(1) All reptiles possess scales, have a three chambered heart and are cold blooded (poikilothermal)

(2) All bony fishes have four pairs of gills and an operculum on each side

(3) All sponges are marine and have collared cells

(4) All mammals are viviparous and possess diaphragm for breathing

Ans. (2)

Sol. All bony fishes have four pair of gills and an operculum on each side without any exception.

93. Which one of the following organisms is **scientifically correctly named, correctly printed** according to the International Rules of Nomenclature and **correctly described**?

(1) *Musca domestica* - The common house lizard, a reptile

(2) *Plasmodium falciparum* - A protozoan pathogen causing the most serious type of malaria

(3) *Felis tigris* - The Indian tiger, well protected in Gir forests

(4) *E.coli* - Full name *Entamoeba coli*, a commonly occurring bacterium in human intestine

Ans. (2)

Sol. *Plasmodium falciparum* is a protozoan pathogen causing malignant malaria

94. Which one of the following cellular parts is **correctly** described?

(1) Thylakoids - flattened membranous sacs forming the grana of chloroplasts

(2) Centrioles - sites for active RNA synthesis

(3) Ribosomes - those on chloroplasts are larger (80s) while those in the cytoplasm are smaller (70 s)

(4) Lysosomes - optimally active at a pH of about 8.5

Ans. (1)

Sol. Nucleolus : Sites for active RNA synthesis

Lysosomes : Acidic pH

95. Identify the meiotic stage in which the homologous chromosomes separate while the sister chromatids remain associated at their centromeres :

(1) Metaphase I (2) Metaphase II

(3) Anaphase I (4) Anaphase II

Ans. (3)

Sol. Anaphase, Anaphase II → division of centromere.

96. Which one of the following biomolecules is **correctly** characterised?

(1) Lecithin - a phosphorylated glyceride found in cell membrane

(2) Palmitic acid - an unsaturated fatty acid with 18 carbon atoms

(3) Adenylic acid - adenosine with a glucose phosphate molecule

(4) Alanine amino acid - Contains an amino group and an acidic group anywhere in the molecule

Ans. (1)

Sol. Lecithin is a phospholipid present in the cell membranes.

97. The idea of mutations was brought forth by :

(1) **Hugo de Vries**, who worked on evening primrose

(2) **Gregor Mendel,** who worked on *Pisum sativum*

(3) **Hardy Weinberg**, who worked on allele frequencies in a population

(4) **Charles Darwin,** who observed a wide variety of organisms during sea voyage

Ans. (1)

Sol. Hugo de Vries, worked on evening primrose and gave the concept of mutation.

98. What is it that forms the basis of DNA Fingerprinting?

(1) The relative proportions of purines and pyrimidines in DNA

(2) The relative difference in the DNA occurrence in blood, skin and saliva

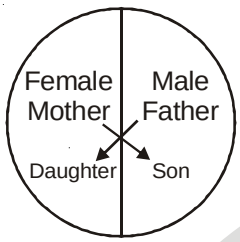
(3) The relative amount of DNA in the ridges and grooves of the fingerprints

(4) Satellite DNA occurring as highly repeated short DNA segments

Ans. (4)

Sol. Satellite DNA normally do not code for any proteins, but they form a large portion of human genome. These sequence show high degree of polymorphism and form the basis of DNA finger printing.

99. Represented below is the inheritance pattern of a certain type of traits in humans. Which one of the following conditions could be an example of this pattern?



(1) Phenylketonuria

(2) Sickle cell anaemia

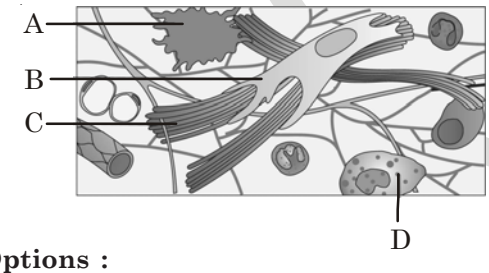
(3) Haemophilia

(4) Thalassemia

Ans. (3)

Sol. Criss-cross inheritance is a feature of X-linked recessive traits.

100. Given below is the diagrammatic sketch of a certain type of connective tissue. Identify the parts labelled A, B, C and D and select the right option about them.



Options :

	Part-A	Part-B	Part-C	Part-D
(1)	Macro-phage	Fibroblast	Collagen fibres	Mast cells
(2)	Mast cell	Macro-Phage	Fibroblast	Collagen fibres
(3)	Macro-phage	Collagen fibres	Fibroblast	Mast cell
(4)	Mast cell	Collagen fibres	Fibroblast	Macro-phage

Ans. (1)

101. Which one of the following options gives the **correct** categorisation of six animals according to the type of nitrogenous wastes (A, B, C) they give out?

	A AMMONO TELIC	B UREOTELIC	C URICOTELIC
(1)	Pigeon, Humans	Aquatic Amphibia, Lizards	Cockroach, Frog
(2)	Frog, Lizards	Aquatic Amphibia, Humans	Cockroach, Pigeon
(3)	Aquatic Amphibia	Frog, Humans	Pigeon, Lizards, Cockroach
(4)	Aquatic Amphibia	Cockroach, Humans	Frog, Pigeon, Lizards

Ans. (3)

102. Where do certain symbiotic microorganisms normally occur in human body?

(1) Caecum

(2) Oral lining and tongue surface

(3) Vermiform appendix and rectum

(4) Duodenum

Ans. (1)

Sol. Caecum is a small blind sac that hosts some symbiotic micro-organisms.

103. Which one of the following pairs of chemical substances, is **correctly** categorised?

(1) Calcitonin and thymosin – Thyroid hormones

(2) Pepsin and prolactin – Two digestive enzymes secreted in stomach

(3) Troponin and myosin – Complex proteins in striated muscles

(4) Secretin and rhodopsin – polypeptide hormones

Ans. (3)

Sol. Troponin and myosin are complex proteins in striated muscles.

104. The supportive skeletal structures in the human external ears and in the nose tip are examples of

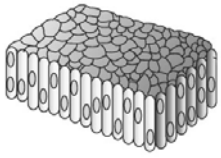
(1) Ligament (2) Areolar tissue

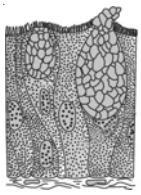
(3) Bone (4) Cartilage

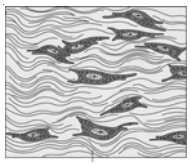
Ans. (4)

Sol. In ear pinna and tip of nose elastic cartilage is present.

105. The four sketches (A, B, C and D) given below, represent four different types of animal tissues. Which one of these is correctly identified in the options given, along with its correct location and function?

(A) 

(B) 

(C) 

(D) 

		Tissue	Location	Function
(1)	(B)	Glandular epithelium	Intestine	Secretion
(2)	(C)	Collagen fibres	Cartilage	Attach skeletal muscles to bones
(3)	(D)	Smooth muscle tissue	Heart	Heart contraction
(4)	(A)	Columnar epithelium	Nephron	Secretion and absorption

Ans. (1)

106. A fall in glomerular filtration rate (GFR) activates

(1) Juxta glomerular cells to release renin

(2) Adrenal cortex to release aldosterone

(3) Adrenal medulla to release adrenaline

(4) Posterior pituitary to release vasopressin

Ans. (1)

Sol. A fall in GFR activates JG cells to release renin.

107. Which one of the following characteristics is common both in humans and adult frogs?

(1) Four-chambered heart

(2) Internal fertilisation

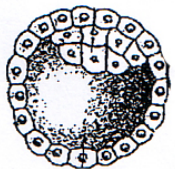
(3) Nucleated RBCs

(4) Ureotelic mode of excretion

Ans. (4)

Sol. Adult frogs and humans are ureotelic.

108. Identify the human development stage shown below as well as the related right place of its occurrence in a normal pregnant woman, and select the right option for the two together.



Options :

	Developmental stage	Site of occurrence
(1)	Late morula	Middle part of Fallopian tube
(2)	Blastula	End part of Fallopian tube
(3)	Blastocyst	Uterine wall
(4)	8 - celled morula	Starting point of Fallopian tube

Ans. (3)

109. Which one of the following human organs is often called the "graveyard" of RBCs?

(1) Gall bladder (2) Kidney

(3) Spleen (4) Liver

Ans. (3)

110. The secretory phase in the human menstrual cycle is also called

(1) Luteal phase and lasts for about 6 days

(2) Follicular phase lasting for about 6 days

(3) Luteal phase and lasts for about 13 days

(4) Follicular phase and lasts for about 13 days

Ans. (3)

Sol. Secretory phase in the human menstrual cycle is also called as luteal phase which is of about 13-14 days.

111. Select the correct statement about biodiversity

(1) The desert areas of Rajasthan and Gujarat have a very high level of desert animal species as well as numerous rare animals

(2) Large scale planting of BT cotton has no adverse effect on biodiversity

(3) Western Ghats have a very high degree of species richness and endemism

(4) Conservation of biodiversity in just a fad pursued by the developed countries

Ans. (3)

Sol. Western Ghats → Hot spot

112. The domestic sewage in large cities

(1) Has a high BOD as it containing both aerobic and anaerobic bacteria

(2) Is processed by aerobic and then anaerobic bacteria in the secondary treatment in Sewage Treatment Plants (STPs)

(3) When treated in STPs does not really require the aeration step as the sewage contains adequate oxygen

(4) Has very high amounts of suspended solids and dissolved salts

Ans. (2)

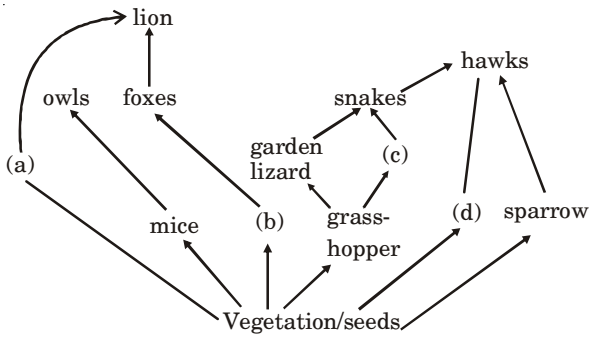
Sol. A mere 0.1% impurities make domestic sewage unfit for human use.

113. Which one of the following sets of items in the options (1) - (4) are correctly categorised with one exception in it?

	Items	Category	Exception
(1)	UAA, UAG, UGA	Stop codons	UAG
(2)	Kangaroo, Koala, Wombat	Australian marsupials	Wombat
(3)	*Plasmodium, Cuscuta, Trypanosoma*	Protozoan parasites	*Cuscuta*
(4)	Typhoid, Pneumonia, Diphtheria	Bacterial diseases	Diphtheria

Ans. (3)

114. Identify the likely organisms (a), (b), (c) and (d) in the food web shown below



Options

	(a)	(b)	(c)	(d)
(1)	Deer	Rabbit	Frog	Rat
(2)	Dog	Squirrel	Bat	Deer
(3)	Rat	Dog	Tortoise	Crow
(4)	Squirrel	Cat	Rat	Pigeon

Ans. (1)

Sol. Herbivores → rabbit, deer, field mouse

Primary carnivore → frog

115. Consider the following four statements (a-d) and select the option which includes all the **correct** ones only

a. Single cell *Spirulina* can produce large quantities of food rich in protein, minerals, vitamins etc.

b. Body weight-wise the micro-organism *Methylophilus methylotrophus* may be able to produce several times more proteins than the cows per day.

c. Common button mushrooms are a very rich source of vitamin C.

d. A rice variety has been developed which is very rich in calcium

Options

(1) Statements (c), (d)

(2) Statements (a), (c) and (d)

(3) Statements (b), (c) and (d)

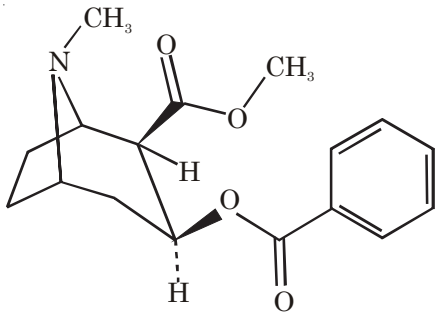
(4) Statements (a), (b)

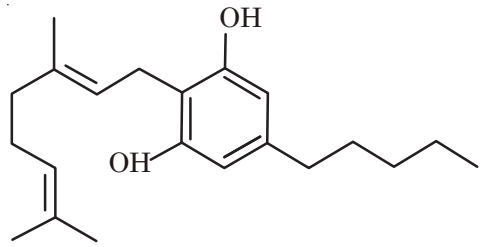
Ans. (4)

Sol. It has been possible to develop an iron fortified rice variety containing over five times.

116. Identify the molecules (a) and (b) shown below and select the right option giving their source and use

(a)



(b) 

Options :

	Molecule	Source	Use
(1)	(a) Cocaine	*Erythroxylum coca*	Accelerates the transport of dopamine
(2)	(b) Heroin	*Cannabis sativa*	Depressant and slows down body functions
(3)	(b) Cannabinoid	*Atropa belladona*	Produces halluci-nations
(4)	(a) Morphine	*Papaver somniferum*	Sedative and pain killer

Ans. (4)

117. Which one of the following statements is correct with respect to immunity?

(1) Preformed antibodies need to be injected to treat the bite by a viper snake

(2) The antibodies against small pox pathogen are produced by T-lymphocytes

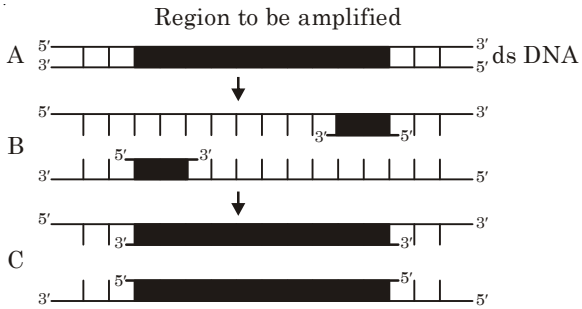
(3) Antibodies are protein molecules, each of which has four light chains

(4) Rejection of a kidney graft is the function of B-lymphocytes

Ans. (1)

Sol. Preformed antibodies need to be injected to treat the bite by a viper.

118. The figure below shows three steps (A, B, C) of Polymerase Chain Reaction (PCR). Select the option giving correct identification together with what it represents?



(1) B-Denaturation at a temperature of about 98°C separating the two DNA strands

(2) A - Denaturation at a temperature of about 50°C

(3) C - Extension in the presence of heat stable DNA polymerase

(4) A - Annealing with two sets of primers

Ans. (1)

119. The first clinical gene therapy was given for treating?

(1) Diabetes mellitus

(2) Chicken pox

(3) Rheumatoid arthritis

(4) Adenosine deaminase deficiency

Ans. (4)

120. Which one of the following represents a palindromic sequence in DNA?

(1) 5′ - GAATTC - 3′
3′ - CTTAAG - 5′

(2) 5′ - CCAATG - 3′
3′ - CAATCC - 5′

(3) 5′ - CATTAG - 3′
3′ - GATAAC - 5′

(4) 5′ - GATACC - 3′
3′ - CCTAAG - 5′

Ans. (1)

Sol. Palindromic sequence in DNA should read the same provided that orientation of reading is kept the same.

❑ ❑ ❑