AIPMT – 2014 TEST PAPER WITH SOLUTIONS
(HELD ON SUNDAY 04th MAY, 2014)

1. If force (F), velocity (V) and time (T) are taken as fundamental units, then the dimensions of mass are:-

(1) $[F\ V\ T^{-1}]$ (2) $[F\ V\ T^{-2}]$
(3) $[F\ V^{-1}\ T^{-1}]$ (4) $[F\ V^{-1}\ T]$

Ans. (4)

Sol. $[\text{mass}] = \left[\dfrac{\text{Force}}{\text{Acceleration}}\right] = \left[\dfrac{\text{Force}}{\text{Velocity / time}}\right]$

$= [F\ V^{-1}\ T]$

2. A projectile is fired from the surface of the earth with a velocity of 5 ms^{-1} and angle θ with the horizontal. Another projectile fired from another planet with a velocity of 3 ms^{-1} at the same angle follows a trajectory which is identical with the trajectory of the projectile fired from the earth. The value of the acceleration due to gravity on the planet is (in ms^{-2}) given $g = 9.8\ m/s^2$

(1) 3.5 (2) 5.9 (3) 16.3 (4) 110.8

Ans. (1)

Sol. As Range $= \dfrac{u^2 \sin 2\theta}{g}$ so $g \propto u^2$

Therefore $g_{planet} = \left(\dfrac{3}{5}\right)^2 (9.8\ m/s^2) = 3.5\ m/s^2$

3. A particle is moving such that its position coordinate (x, y) are

(2m, 3m) at time t = 0

(6m, 7m) at time t = 2 s and

(13m, 14m) at time t = 5s.

Average velocity vector ($\vec{V}_{av}$) from t = 0 to t = 5 s is :-

(1) $\dfrac{1}{5}(13\hat{i} + 14\hat{j})$ (2) $\dfrac{7}{3}(\hat{i}+\hat{j})$

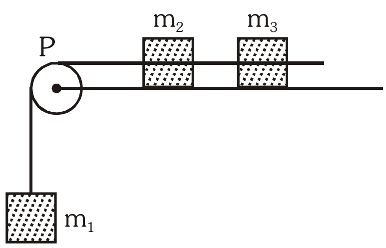
(3) $2(\hat{i}+\hat{j})$ (4) $\dfrac{11}{5}(\hat{i}+\hat{j})$

Ans. (4)

Sol. $\vec{v}_{av} = \dfrac{\Delta\vec{r}}{\Delta t} = \dfrac{(13-2)\hat{i} + (14-3)\hat{j}}{5-0} = \dfrac{11}{5}(\hat{i}+\hat{j})$

4. A system consists of three masses m_1, m_2 and m_3 connected by a string passing over a pulley P. The mass m_1 hangs freely and m_2 and m_3 are on a rough horizontal table (the coefficient of friction = μ). The pulley is frictionless and of negligible mass. The downward acceleration of mass m_1 is :

(Assume $m_1 = m_2 = m_3 = m$)



(1) $\dfrac{g(1-g\mu)}{9}$ (2) $\dfrac{2g\mu}{3}$

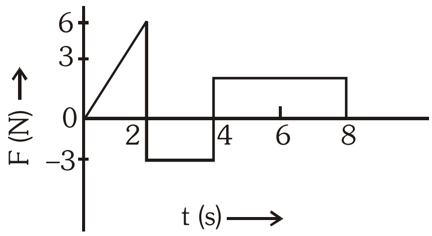
(3) $\dfrac{g(1-2\mu)}{3}$ (4) $\dfrac{g(1-2\mu)}{2}$

Ans. (3)

Sol. Acceleration $= \dfrac{\text{Net force in the direction of motion}}{\text{Total mass of system}}$

$= \dfrac{m_1 g - \mu(m_2+m_3)g}{m_1+m_2+m_3} = \dfrac{g}{3}(1-2\mu)$

5. The force 'F' acting on a particle of mass 'm' is indicated by the force-time graph shown below. The change in momentum of the particle over the time interval from zero to 8 s is :-



(1) 24 Ns (2) 20 Ns (3) 12 Ns (4) 6 Ns

Ans. (3)

Sol. Change in momentum,

$\Delta p = \int F dt$

= Area of F-t graph

$= \dfrac{1}{2} \times 2 \times 6 - 3 \times 2 + 4 \times 3$

= 12 N-s

6. A balloon with mass 'm' is descending down with an acceleration 'a' (where a < g). How much mass should be removed from it so that it starts moving up with an acceleration 'a' ?

(1) $\frac{2ma}{g+a}$ (2) $\frac{2ma}{g-a}$

(3) $\frac{ma}{g+a}$ (4) $\frac{ma}{g-a}$

Ans. (1)

Sol. Let upthrust of air be F_a then

for downward motion

$mg - F_a = ma$

for upward motion

$F_a - (m - \Delta m) = (m - \Delta m)a$

Therefore $\Delta m = \frac{2ma}{g+a}$

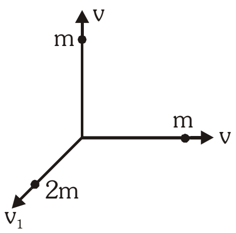
7. A body of mass (4m) is lying in x-y plane at rest. It suddenly explodes into three pieces. Two pieces, each of mass (m) move perpendicular to each other with equal speeds (v). The total kinetic energy generated due to explosion is :-

(1) mv^2 (2) $\frac{3}{2}mv^2$

(3) $2\ mv^2$ (4) $4\ mv^2$

Ans. (2)

Sol.



By conservation of linear momentum

$$2mv_1 = \sqrt{2}\ mv \Rightarrow v_1 = \frac{v}{\sqrt{2}}$$

$$\text{Total KE generated} = \frac{1}{2}mv^2 + \frac{1}{2}mv^2 + \frac{1}{2}(2m)v_1^2$$

$$= mv^2 + \frac{mv^2}{2} = \frac{3}{2}mv^2$$

8. The oscillation of a body on a smooth horizontal surface is represented by the equation,

$X = A\cos(\omega t)$

where X = displacement at time t

ω = frequency of oscillation

Which one of the following graphs shows correctly the variation 'a' with 't' ?

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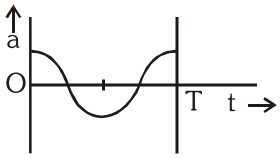

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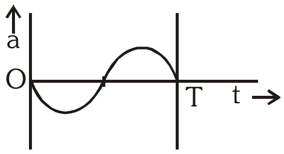

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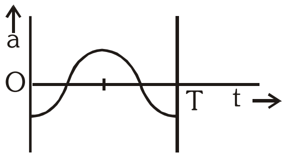

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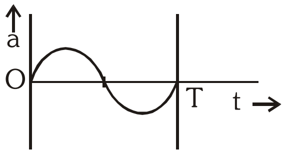


Ans. (3)

Sol. Displacement, $x = A\cos(\omega t)$

Velocity, $v = \frac{dx}{dt} = -A\omega\sin(\omega t)$

Acceleration, $a = \frac{dv}{dt} = -A\omega^2\cos(\omega t)$

9. A solid cylinder of mass 50 kg and radius 0.5 m is free to rotate about the horizontal axis. A massless string is wound round the cylinder with one end attached to it and other hanging freely. Tension in the string required to produce an angular acceleration of 2 revolutions s^{-2} is :-

(1) 25 N (2) 50 N (3) 78.5 N (4) 157 N

Ans. (4)

Sol. Here α = 2 revolutions/s^2 = 4π rad/s^2

$$I = \frac{1}{2}MR^2 = \frac{1}{2}(50)\ (0.5)^2 = \frac{25}{4}\text{Kg-m}^2$$

As $\tau = I\alpha$ so $TR = I\alpha$

$$\Rightarrow T = \frac{I\alpha}{R} = \frac{\left(\frac{25}{4}\right)(4\pi)}{(0.5)}\text{N} = 50\ \pi\text{N} = 157\ \text{N}$$

10. The ratio of the accelerations for a soldi sphere (mass 'm' and radius 'R') rolling down an incline of angle 'θ' without slipping and slipping down the incline without rolling is :-

(1) 5 : 7 (2) 2 : 3

(3) 2 : 5 (4) 7 : 5

Ans. (1)

Sol. For rolling motion without slipping on inclined plane

$$a_1 = \frac{g\sin\theta}{1+\frac{K^2}{R^2}}$$

and for slipping motion on inclined plane

$a_2 = g\sin\theta$

$$\text{Required ratio} = \frac{a_1}{a_2} = \frac{1}{1+\frac{K^2}{R^2}} = \frac{1}{1+\frac{2}{5}} = \frac{5}{7}$$

11. A black hole is an object whose gravitational field is so strong that even light cannot escape from it. To what approximate radius would earth (mass = 5.98×10^{24} kg) have to be compressed to be a black hole ?

(1) 10^{-9} m (2) 10^{-6} m

(3) 10^{-2} m (4) 100 m

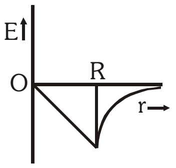
Ans. (3)

Sol. Escape velocity $= \sqrt{\frac{2GM}{R}} = c$ = speed of light

$$\Rightarrow R = \frac{2GM}{c^2} = \frac{2\times 6.6\times 10^{-11}\times 5.98\times 10^{24}}{(3\times 10^8)^2}\text{m}$$

$= 10^{-2}$ m

12. Dependence of intensity of gravitational field (E) of earth with distance (r) from centre of earth is correctly represented by :-

(1)


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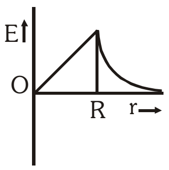

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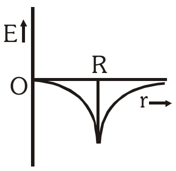

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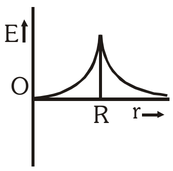


Ans. (1)

13. Copper of fixed volume 'V; is drawn into wire of length 'l'. When this wire is subjected to a constant force 'F', the extension produced in the wire is 'Δl'. Which of the following graphs is a straight line ?

(1) Δl versus $\frac{1}{l}$ (2) Δl versus l^2

(3) Δl versus $\frac{1}{l^2}$ (4) Δl versus l

Ans. (2)

Sol. $Y = \dfrac{\frac{F}{A}}{\frac{\Delta \ell}{\ell}} \Rightarrow \Delta\ell = \dfrac{F\ell}{AY}$

But $V = A\ell$ so $A = \dfrac{V}{\ell}$

Therefore $\Delta\ell = \dfrac{F\ell^2}{VY} \propto \ell^2$

14. A certain number of sphereical drops of a liquid of radius 'r' coalesce to form a single drop of radius 'R' and volume 'V'. If 'T' is the surface tension of the liquid, then :

(1) energy $= 4VT\left(\frac{1}{r}-\frac{1}{R}\right)$ is released

(2) energy $= 3VT\left(\frac{1}{r}+\frac{1}{R}\right)$ is absorbed

(3) energy $= 3VT\left(\frac{1}{r}-\frac{1}{R}\right)$ is released

(4) Energy is neither released nor absorbed

Ans. (3)

Sol. As surface area decreases so energy is released.

Released energy

$= 4\pi R^2T[n^{1/3}-1]$ where $R = n^{1/3}r$

$$= 4\pi R^3T\left[\frac{1}{r}-\frac{1}{R}\right]$$

$$= 3VT\left[\frac{1}{r}-\frac{1}{R}\right]$$

15. Steam at 100°C is passed into 20 g of water at 10°C. When water acquires a temperature of 80°C, the mass of water present will be :
[Take specific heat of water = 1 cal g^{-1} °C^{-1} and latent heat of steam = 540 cal g^{-1}]
(1) 24 g (2) 31.5 g
(3) 42.5 g (4) 22.5 g

Ans. **(4)**

Sol. Heat lost = Heat gained
$mL_v + ms_w\Delta\theta = m_W s_W \Delta\theta$
$\Rightarrow m \times 540 + m \times 1 \times (100 - 80)$
$= 20 \times 1 \times (80 - 10)$
$\Rightarrow m = 2.5$ g
Total mass of water = (20 + 2.5)g = 22.5g

16. Certain quantity of water cools from 70°C to 60°C in the first 5 minutes and to 54°C in the next 5 minutes. The temperature of the surroundings is:-
(1) 45°C (2) 20°C (3) 42°C (4) 10°C

Ans. **(1)**

Sol. By Newton's law of colling

$$\frac{\theta_1 - \theta_2}{t} = k\left[\frac{\theta_1 + \theta_2}{2} - \theta_0\right]$$

$$\Rightarrow \frac{70-60}{5} = k\left[\frac{70+60}{2} - \theta_0\right]$$

$\Rightarrow 2 = k[65 - \theta_0]$ .... (i)

and $\frac{60-54}{5} = k\left[\frac{60+54}{2} - \theta_0\right]$

$\Rightarrow \frac{6}{5} = k[57 - \theta_0]$ .... (ii)

By dividing (i) by (ii) we have

$$\frac{10}{5} = \frac{65-\theta_0}{37-\theta_0} \qquad \Rightarrow \theta_0 = 45°$$

17. A monoatomic gas at a pressure P, having a volume V expands isothermally to a volume 2V and then adibatically to a volume 16V. The final pressure of the gas is : (take $\gamma = \frac{5}{3}$)
(1) 64P (2) 32P
(3) $\frac{P}{64}$ (4) 16P

Ans. **(3)**

Sol. For isothermal process $P_1V_1 = P_2V_2$

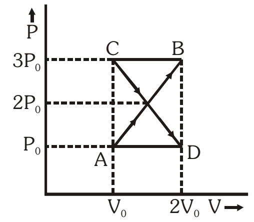
$\Rightarrow PV = P_2(2V) \Rightarrow P_2 = \frac{P}{2}$

For adiabatic process $P_2V_2^{\gamma} = P_3V_3^{\gamma}$

$$\Rightarrow \left(\frac{P}{2}\right)(2v)^{\gamma} = P_3(16v)^{\gamma}$$

$$\Rightarrow P_3 = \frac{3}{2}\left(\frac{1}{8}\right)^{5/3} = \frac{P}{64}$$

18. A thermodynamic system undergoes cyclic process ABCDA as shown in fig. The work done by the system in the cycle is :-



(1) P_0V_0 (2) $2P_0V_0$
(3) $\frac{P_0V_0}{2}$ (4) Zero

Ans. **(4)**

Sol. Work done by the system in the cycle
= Area under P–V curve & V-axis

$$= \frac{1}{2}(2P_0 - P_0)(2V_0 - V_0) + \left[-\left(\frac{1}{2}\right)(3P_0 - 2P_0)(2V_0 - V_0)\right]$$

$$= \frac{P_0V_0}{2} - \frac{P_0V_0}{2} = 0$$

19. The mean free path of molecules of a gas, (radius 'r') is inversely proportional to :-
(1) r^3 (2) r^2 (3) r (4) $\sqrt{r}$

Ans. **(2)**

Sol. Mean free path $\lambda_m = \frac{1}{\sqrt{2}\pi d^2 n}$

where d = diameter of molecule

$\Rightarrow \lambda_m \propto \frac{1}{r^2}$

20. If n_1, n_2 and n_3 are the fundamental frequencies of three segments into which a string is divided, then the original fundamental frequency n of the string is given by :-

(1) $\frac{1}{n}=\frac{1}{n_1}+\frac{1}{n_2}+\frac{1}{n_3}$

(2) $\frac{1}{\sqrt{n}}=\frac{1}{\sqrt{n_1}}+\frac{1}{\sqrt{n_2}}+\frac{1}{\sqrt{n_3}}$

(3) $\sqrt{n}=\sqrt{n_1}+\sqrt{n_2}+\sqrt{n_3}$

(3) $n = n_1 + n_2 + n_3$

Ans. (1)

Sol. Total length of string $\ell = \ell_1 + \ell_2 + \ell_3$

But frequency $\propto \frac{1}{\text{length}}$

so $\frac{1}{n}=\frac{1}{n_1}+\frac{1}{n_2}+\frac{1}{n_3}$

21. The number of possible natural oscillation of air column in a pipe closed at one end of length 85 cm whose frequencies lie below 1250 Hz are : (velocity of sound = 340 ms^{-1})

(1) 4 (2) 5 (3) 7 (4) 6

Ans. (4)

Sol. Frequency COP, $f_n = (2n + 1)\frac{v}{4R}$

for $n = 0$, $f_0 = 100$ Hz
$n = 1$, $f_1 = 300$ Hz
$n = 2$, $f_2 = 500$ Hz
$n = 3$, $f_3 = 700$ Hz
$n = 4$, $f_4 = 900$ Hz
$n = 5$, $f_5 = 1100$ Hz

Which are less than 1250 Hz.

22. A speeding motorcyclist sees trafic jam ahead of him. He slows down to 36 km/hour. He finds that traffic has eased and a car moving ahead of him at 18 km/hour is honking at a frequency of 1392 Hz. If the speeds of sound is 343 m/s, the frequency of the honk as heard by him will be :-

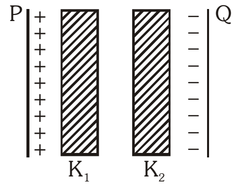
(1) 1332 Hz (2) 1372 Hz
(3) 1412 Hz (4) 1464 Hz

Ans. (3)

Sol. Apparent frequency

$$n' = n\left(\frac{v+v_0}{v+v_3}\right) = 1392\left(\frac{343+10}{343+5}\right) = 1412 \text{ Hz.}$$

23. Two thin dielectric slabs of dielectric constants K_1 and K_2 ($K_1 < K_2$) are inserted between plates of a parallel plate capacitor, as shown in the figure. The variation of electric field 'E' between the plates with distance 'd' as measured from plate P is correctly shown by :-



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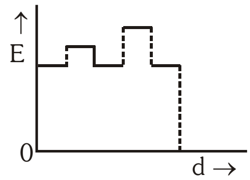

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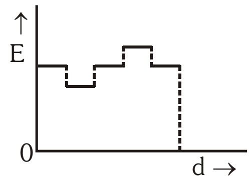

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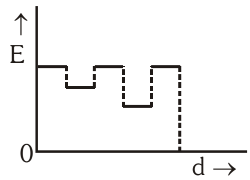

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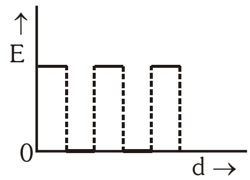


Ans. (3)

Sol. Electric field, $E \propto \frac{1}{K}$

As $K_1 < K_2$ so $E_1 > E_2$

24. A conducting sphere of radius R is given a charge Q. The electric potential and the electric field at the centre of the sphere respectively are :-

(1) Zero and $\frac{Q}{4\pi\epsilon_0 R^2}$

(2) $\frac{Q}{4\pi\epsilon_0 R}$ and Zero

(3) $\frac{Q}{4\pi\epsilon_0 R}$ and $\frac{Q}{4\pi\epsilon_0 R^2}$

(4) Both are zero

Ans. (2)

Sol. At centre, $E = 0$ & $V = \frac{Q}{4\pi\epsilon_0 R}$

25. In a region, the potential is represented by V(x, y, z) = 6x – 8xy – 8y + 6yz, where V is in volts and x, y, z are in metres. The electric force experienced by a charge of 2 coulomb situated at point (1, 1, 1) is :-

(1) $6\sqrt{5}$ N (2) 30 N

(3) 24 N (4) $4\sqrt{35}$ N

Ans. **(4)**

Sol. $\vec{E} = -\frac{\partial V}{\partial x}\hat{i} - \frac{\partial V}{\partial y}\hat{j} - \frac{\partial V}{\partial z}\hat{k}$

$= -[(6 - 8y)\hat{i} + (-8x - 8 + 6z)\hat{j} + (6y)\hat{k}]$

At (1, 1, 1), $\vec{E} = 2\hat{i} + 10\hat{j} - 6\hat{k}$

$\Rightarrow (\vec{E}) = \sqrt{2^2 + 10^2 + 6^2} = \sqrt{140} = 2\sqrt{35}$

26. Two cities are 150 km apart. Electric power is sent from one city to another city through copper wires. The fall of potential per km is 8 volt and the average resistance per km is 0.5 Ω. the power loss in the wires is :-

(1) 19.2 W (2) 19.2 kW

(3) 19.2 J (4) 12.2 kW

Ans. **(2)**

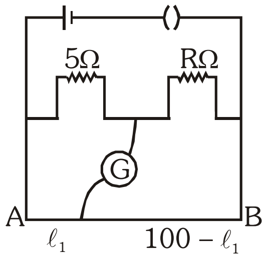
Sol. Resistance = (0.5Ω/km) (150 km) = 75Ω

Total voltage drop = (8 V/km) (150 km) = 1200V

Power loss = $\frac{(\Delta V)^2}{R} = \frac{(1200)^2}{75}$ W

= 19200 W = 19.2 kW

27. The resistance in the two arms of the meter bridge are 5Ω and RΩ, respectively. When the resistance R is shunted with an equal resistance, the new balance point is at 1.6 ℓ_1. The resistance 'R' is :-



(1) 10Ω (2) 15Ω (3) 20Ω (4) 25Ω

Ans. **(2)**

Sol. $\frac{5}{R} = \frac{\ell_1}{100 - \ell_1}$ and $\frac{5}{R/2} = \frac{1.6\ell_1}{100 - 1.6\ell_1}$

$\Rightarrow$ R = 15Ω

28. A potentiometer circuit has been set up for finding the internal resistance of a given cell. The main battery used across the potentiometer wire, has an emf of 2.0 V and a negligible internal resistance. The potentiometer wire itself is 4m long, When the resistace R, connected across the given cell, has values of.

(i) infinity (ii) 9.5Ω

The balancing lengths', on the potentiometer wire are found to be 3 m and 2.85 m, respectively. The value of internal resistance of the cell is

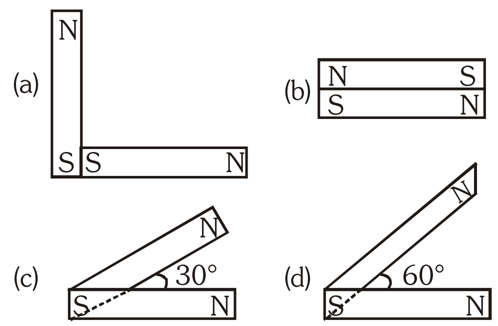
(1) 0.25Ω (2) 0.95Ω (3) 0.5Ω (4) 0.75Ω

Ans. **(3)**

Sol. Internal resistance, r = $\left(\frac{E - V}{V}\right)R = \left(\frac{\ell_1 - \ell_2}{\ell_2}\right)R$

$= \left(\frac{3 - 2.85}{2.85}\right)(9.5)\Omega = 0.5\Omega$

29. Following figures show the arrangement of bar magnets in different configurations. Each magnet has magnetic dipole moment $\vec{m}$. Which configuration has highest net magnetic diple moment ?



(1) (a) (2) (b) (3) (c) (4) (d)

Ans. **(3)**

Sol. Net magnetic moment = 2 Mcos$\frac{\theta}{2}$

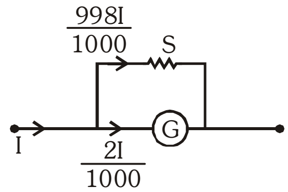
which is maximumfor option (3)

30. In an ammeter 0.2% of main current passes through the galvanometer. If resistance of galvanometer is G, the resistance of ammeter will be :-

(1) $\frac{1}{499}$G (2) $\frac{499}{500}$G (3) $\frac{1}{500}$G (4) $\frac{500}{499}$G

Ans. **(3)**

Sol.



$$\left(\frac{2I}{1000}\right)G = \left(\frac{998I}{1000}\right)S$$

$$\Rightarrow\ S = \frac{G}{499}$$

Total resistance of Ammeter

$$R = \frac{SG}{S+G} = \frac{\left(\frac{G}{499}\right)F}{\left(\frac{G}{499}\right)+G} = \frac{G}{500}$$

31. Two identical long conducting wires AOB and COD are placed at right angle to each other, with one above other such that 'O' is their common point for the two. The wires carry I_1 and I_2 currents respectively. Point 'P' is lying at distance 'd' from 'O' along a direction perpendicular to the plane containing the wires. The magnetic field at the point 'P' will be :-

(1) $\frac{\mu_0}{2\pi d}\left(\frac{I_1}{I_2}\right)$ (2) $\frac{\mu_0}{2\pi d}(I_1+I_2)$

(3) $\frac{\mu_0}{2\pi d}(I_1^2-I_2^2)$ (4) $\frac{\mu_0}{2\pi d}(I_1^2+I_2^2)^{1/2}$

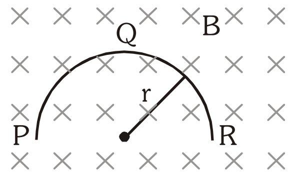
Ans. (4)

Sol. Net magnetic field, $B = \sqrt{B_1^2+B_2^2}$

$$= \sqrt{\left(\frac{\mu_0 I_1}{2\pi d}\right)^2+\left(\frac{\mu_0 I_2}{2\pi d}\right)^2}$$

$$= \frac{\mu_0}{2\pi d}\sqrt{I_1^2+I_2^2}$$

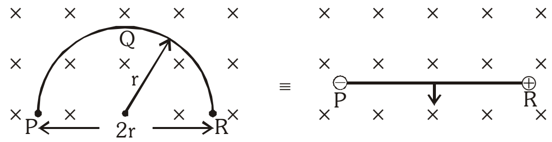
32. A thin semicircular conducting ring (PQR) of radius 'r' is falling with its plane vertical in a horizontal magnetic field B, as shown in figure. The potential difference developed across the ring when its speed is v, is :-



(1) Zero
(2) $Bv\pi r^2/2$ and P is at higher potnetial
(3) πrBv and R is at higher potnetial
(4) 2rBv and R is at higher potential

Ans. (4)

Sol.



Induced emf = Bv(2r) = 2rBv

33. A transformer having efficiency of 90% is working on 200V and 3kW power supply. If the current in the secondary coil is 6A, the voltage across the secondary coil and the current in the primary coil respectively are :-

(1) 300 V, 15A (2) 450 V, 15A
(3) 450V, 13.5A (4) 600V, 15A

Ans. (2)

Sol. $\eta = \frac{V_S I_S}{V_P I_P} \Rightarrow 0.9 = \frac{V_S(6)}{3\times 10^3} \Rightarrow V_S = 450V$

As $V_P I_P = 3000$ so $I_P = \frac{3000}{200}A = 15A$

34. Light with an energy flux of $25\times10^4\ Wm^{-2}$ falls on a perfectly reflecting surface at normal incidence. If the surface area is 15 cm^2, the average force exerted on the surface is :-

(1) 1.25×10^{-6} N (2) 2.50×10^{-6} N
(3) 1.20×10^{-6} N (4) 3.0×10^{-6} N

Ans. (2)

Sol. Average force $F_{av} = \frac{\Delta p}{\Delta t} = \frac{2IA}{c}$

$$= \frac{2\times25\times10^4\times15\times10^{-4}}{3\times10^8}$$

$$= 2.50\times10^{-6}\ N$$

35. A beam of light of $\lambda = 600$ nm from a distant source falls on a single slit 1 mm wide and the resulting diffraction pattern is observed on a screen 2 m away. The distance between first dark fringes on either side of the central bright fringe is :-

(1) 1.2 cm (2) 1.2 mm

(3) 2.4 cm (4) 2.4 mm

Ans. (4)

Sol. Width of central bright fringe

$$= \frac{2\lambda D}{\lambda} = \frac{2\times 600\times 10^{-6}\times 2}{1\times 10^{-3}}\text{m}$$

$= 2.4 \times 10^{-3}$ m

$= 2.4$ mm

36. In the Young's double-slit experiment, the intensity of light at a point on the screen where the path difference is λ is K, (λ being the wave length of light used). The intensity at a poijnt where the path difference is $\lambda/4$, will be :-

(1) K (2) K/4

(3) K/2 (4) Zero

Ans. (3)

Sol. For path difference λ, phase difference = 2π rad

For path difference $\frac{\lambda}{4}$, phase difference = $\frac{\pi}{2}$ rad

As $K = 4I_0$ so intensity at given point where path difference is $\frac{\lambda}{4}$

$$K' = 4I_0 \cos^2\left(\frac{\pi}{4}\right) = 2I_0 = \frac{K}{2}$$

37. If the focal length of objective lens is increased then magnefying power of :-

(1) microscope will increase but that of telescope decrease.

(2) microscope and telescope both will increase.

(3) microscope and telescope both will decrease

(4) microscope will decrease but that of telescope increase.

Ans. (4)

Sol. Magnifying power of Microscope = $\frac{LD}{f_0 f_e} \propto \frac{1}{f_0}$

Magnifying power of Telescope = $\frac{f_0}{f_e} \propto f_0$

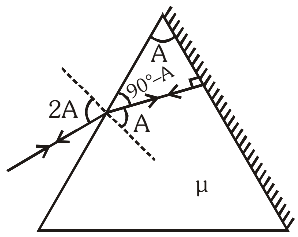
38. The angle of a prism is 'A'. One of its refracting surfaces is silvered. Light rays falling at an angle of incidence 2A on the first surface returns back through the same path after suffering reflection at the silvered surface. The refractive index μ, of the prism is :-

(1) 2sinA (2) 2cos A

(3) $\frac{1}{2}$cosA (4) tanA

Ans. (2)

Sol.



By Snell's law

(1) $\sin 2A = (\mu)\sin A \Rightarrow \mu = 2\cos A$

39. When the energy of the incident radiation is incredased by 20%, the kinetic energy of the photoelectrons emitted from a metal surface increased from 0.5 eV to 0.8 eV. The work function of the metal is :-

(1) 0.65 eV (2) 1.0 eV

(3) 1.3 eV (4) 1.5 eV

Ans. (2)

Sol. By using $h\nu = \phi_0 + K_{max}$

We have

$h\nu = \phi_0 + 0.5$ .... (i)

and $1.2h\nu = \phi_0 + 0.8$ ...... (ii)

Therefore $\phi_0 = 1.0$ eV

40. If the kinetic energy of the particle is increased to 16 times its previous value, the percentage change in the de-Broglie wavelength of the particle is :-

(1) 25 (2) 75 (3) 60 (4) 50

Ans. (2)

Sol. $l = \frac{h}{\sqrt{2mK}}$

$$\frac{\lambda_1}{\lambda_2} = \sqrt{\frac{K_2}{K_1}} = \sqrt{\frac{16K}{K}} = \frac{4}{1}$$

$$= \frac{1-4}{4}\times 100 = -75\%$$

41. Hydrogne atom is ground state is excited by a monochromatic radiation of λ = 975 Å. Number of spectral lines in the resulting spectrum emitted will be

(1) 3 (2) 2
(3) 6 (4) 10

Ans. (3)

42. The Binding energy per nucleon of ${}_3^7Li$ and ${}_2^4He$ nuclei are 5.60 MeV and 7.06 MeV, respectively.

In the nuclear reaction ${}_3^7Li + {}_1^1H \rightarrow {}_2^4He + Q$, the value of energy Q released is :-

(1) 19.6 MeV (2) –2.4 MeV
(3) 8.4 MeV (4) 17.3 MeV

Ans. (4)

Sol. BE of ${}_2He^4$ = 4 × 7.06 = 28.24 MeV
BE of ${}_3^7Li$ = 7 × 5.60 = 39.20 MeV

$${}_3^7Li + {}_1^1H \longrightarrow {}_2He^4 + {}_2He^4 + Q$$

39.20 28.24 × 2

Q = 56.48 – 39.20 = 17.28 MeV

43. A radio isotope 'X' with a half life 1.4×10^9 years decays to 'Y' which is stable. A sample of the rock from a cave was found to contain 'X' and 'Y' in the ratio 1 : 7. The age of the rock is :

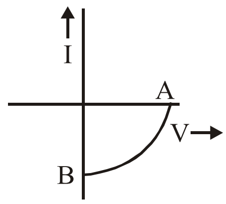
(1) 1.96×10^9 years
(2) 3.92×10^9 years
(3) 4.20×10^9 years
(4) 8.40×10^9 years

Ans. (3)

Sol. As $\frac{N_x}{N_y} = \frac{1}{7} \Rightarrow \frac{N_x}{N_x + N_y} = \frac{1}{8} = \left(\frac{1}{2}\right)^3$

so $t = 3T_{1/2} = 3 \times 1.4 \times 10^9$ yrs. $= 4.2 \times 10^9$ yrs.

44. The given graph represents V - I characteristic for a semiconductor device.



Which of the following statement is **correct** ?

(1) It is V - I characteristic for solar cell where, point A represents open circuit voltage and point B short circuit current.
(2) It is a for a solar cell and point A and B represent open circuit voltage and current, respectively.
(3) It is for a photodiode and points A and B represent open circuit voltage and current, respectively.
(4) It is for a LED and points A and B represent open circuit voltage and short circuit current, respectively.

Ans. (1)

45. The barrier potential of a p-n junction depends on:

(a) type of semi conductor material
(g) amount of doping
(c) temperature

Which one of the following is correct ?

(1) (a) and (b) only
(2) (b) only
(3) (b) and (c)only
(4) (a), (b) and (c)

Ans. (4)

AIPMT – 2014 TEST PAPER WITH SOLUTIONS
(HELD ON SUNDAY 04th MAY, 2014)

46. What is the maximum number of orbitals that can be identified with the following quantum numbers?
$n = 3,\ \ell = 1,\ m_\ell = 0$
(1) 1 (2) 2 (3) 3 (4) 4

Ans. (1)

Sol. $n = 3,\ \ell = 1,\ m = 0$
Orbital is $3p_z$.

47. Calculate the energy in joule corresponding to light of wavelength 45 nm :
(Planck's constant $h = 6.63 \times 10^{-34}$ Js; speed of light $c = 3 \times 10^{8}\ ms^{-1}$)
(1) 6.67×10^{15} (2) 6.67×10^{11}
(3) 4.42×10^{-15} (4) 4.42×10^{-18}

Ans. (4)

Sol. $E = \dfrac{hc}{\lambda} = \dfrac{6.63\times10^{-34}\times3\times10^{8}}{45\times10^{-9}}$

$E = 4.42 \times 10^{-18}$ J

48. Equal masses of H_2,O_2 and methane have been taken in a container of volume V at temeprature 27°C in identical conditions. The ratio of the volumes of gases $H_2 : O_2$: methane would be :
(1) 8 : 16 : 1 (2) 16 : 8 : 1
(3) 16 : 1 : 2 (4) 8 : 1 : 2

Ans. (3)

Sol. According to Avogadro's hypothesis volume $\propto$ moles

$$n_{H_2} = \frac{w}{2}$$

$$n_{O_2} = \frac{w}{32}$$

$$n_{CH_4} = \frac{w}{16}$$

So, ratio is $\dfrac{w}{2} : \dfrac{w}{32} : \dfrac{w}{16}$

= 16 : 1 : 2

49. If a is the length of the side of a cube, the distance between the body centered atom and one corner atom in the cube will be :
(1) $\dfrac{2}{\sqrt{3}}a$ (2) $\dfrac{4}{\sqrt{3}}a$
(3) $\dfrac{\sqrt{3}}{4}a$ (4) $\dfrac{\sqrt{3}}{2}a$

Ans. (4)

Sol. The distance between the body centred atom and one corner atom is $\dfrac{\sqrt{3}a}{2}$

50. Which property of colloids is **not** dependent on the charge on colloidal particles ?
(1) Coagulation (2) Electrophoresis
(3) Electro - osmosis (4) Tynadall effect

Ans. (4)

Sol. Tyndall effect is optical property.

51. Which of the following salts will give highest pH in water ?
(1) KCl (2) NaCl (3) Na_2CO_3 (4) $CuSO_4$

Ans. (3)

Sol. Na_2CO_3 will give highest pH in water because it is salt of strong base and weak acid

52. Of the following 0.10m aqueous solutions, which one will exhibit the largest freezing point depression?
(1) KCl (2) $C_6H_{12}O_6$
(3) $Al_2(SO_4)_3$ (4) K_2SO_4

Ans. (3)

Sol. Depression in freezing point $\propto$ vant Hoff's factor
(i) for $Al_2(SO_4)_3 \rightarrow\ i = 5$

53. When 22.4 litres of H_2(g) is mixed with 11.2 litres of Cl_2(g), each at S.T.P., the moles of HCl (g) formed is equal to :-
(1) 1 mol of HCl (g)
(2) 2 mol of HCl (g)
(3) 0.5 mol of HCl (g)
(4) 1.5 mol of HCl (g)

Ans. (1)

Sol. $n_{H_2} = \dfrac{V(L)}{22.4L} = \dfrac{22.4}{22.4} = 1$

$n_{Cl_2} = \dfrac{11.2}{22.4} = 0.5$ mole

	$H_{2(g)}$ +	$Cl_{2(g)}$ $\rightarrow$	$2HCl_{(g)}$
initially -	1mole	0.5 mole	0
after reaction	(1-0.5)		0.5×2
	=0.5 mole	0	= 1 mole

54. When 0.1 mol MnO_4^{2-} is oxidised the quantity of electricity required to completely oxidise MnO_4^{2-} to MnO_4^- is :-

(1) 96500 C (2) 2×96500 C

(3) 9650 C (4) 96.50 C

Ans. **(3)**

Sol. $\overset{+6}{Mn}O_4^{-2} \rightarrow \overset{+7}{Mn}O_4^- + e^-$

0.1 mole 0.1 mole

charge required = 0.1 F = 0.1×96500

= 9650 C

55. Using the Gibbs energy change, $\Delta G° = +63.3$kJ, for the following raction,

$Ag_2CO_3 \rightleftharpoons 2Ag^+ (aq) + CO_3^{2-}$ (aq)

the K_{sp} of Ag_2CO_3(s) in water at 25°C is :-

($R = 8.314$ J K^{-1} mol^{-1})

(1) 3.2×10^{-26} (2) 8.0×10^{-12}

(3) 2.9×10^{-3} (4) 7.9×10^{-2}

Ans. **(2)**

Sol. $\Delta G° = -2.303$ RT log K_{sp}

$63.3 \times 1000 = -2.303 \times 8.314 \times 298$ log Ksp

log Ksp = –11.09

Ksp = $10^{-11.09} = 8 \times 10^{-12}$

56. The weight of silver (at wt. = 108) displaced by a quantity of electricity which displaces 5600 mL of O_2 at STP will be :-

(1) 5.4 g (2) 10.8 g (3) 54.9 g (4) 108.0 g

Ans. **(4)**

Sol. According to faraday's 2nd law

$$\frac{w_{Ag}}{E_{Ag}} = \frac{w_{O_2}}{E_{O_2}}$$

$$\frac{w_{Ag}}{108} = \frac{\left(\frac{5600}{22400}\right) \times 32}{8}$$

$\therefore$ $w_{Ag} = 108$g

57. Which of the following statements is correct for the spontaneous adsorption of a gas ?

(1) ΔS is negative and, therefore, ΔH should be highly positive

(2) ΔS is negative and therefore, ΔH should be highly negative

(3) ΔS is positive and, therefore, ΔH should be negative

(4) ΔS is positive and, therefore, ΔH should also be highly positive

Ans. **(2)**

Sol. During adsorption entropy decreases, so $\Delta S < 0$.

$\Delta G = \Delta H - T\Delta S$

For spontaneous adsorption $\Delta G < 0$ so ΔH should be highly negative.

58. For the reaction :

$X_2O_4(\ell) \longrightarrow 2XO_2(g)$

$\Delta U = 2.1$ k cal, $\Delta S = 20$ cal K^{-1} at 300 K

Hence ΔG is :-

(1) 2.7 k cal

(2) – 2.7 k cal

(3) 9.3 k cal

(4) – 9.3 k cal

Ans. **(4)**

Sol. According to Le-Chatelier's Principle

→ In exothermic reactions low temperature favours the forward reaction

→ On increasing pressure equilibrium shifts towards less number of moles.

59. For a given exothermic reaction, K_p and K'_p are the equilibrium constants at temperatures T_1 and T_2, respectively. Assuming that heat of reaction is constant in temperature range between T_1 and T_2, it is readily observed that :-

(1) $K_p > K'_p$ (2) $K_p < K'_p$

(3) $K_p = K'_p$ (4) $K_p = \frac{1}{K'_p}$

Ans. **(2)**

Sol. $X_2O_4\ (\ell) \rightarrow 2\ XO_2(g)$; $\Delta n_g = 2 - 0 = 2$

$\Delta H = \Delta U + \Delta n_g RT$

$= 2.1 + 2 \times \frac{2}{1000} \times 300$

$\Delta H = 3.3$ kcal

$\Delta G = \Delta H - T.\Delta S$

$= 3.3 - 300 \times \frac{20}{1000}$; $\Delta G = -2.7$ Kcal

60. Which of the following orders of ionic radii is correctly represented ?

(1) $H^- > H^+ > H$ (2) $Na^+ > F^- > O^{2-}$

(3) $F^- > O^{2-} > Na^+$ (4) $Al^{3+} > Mg^{2+} > N^{3-}$

Ans. **(1)**

Sol. In exothermic reactions on increasing temperature value of K_p decreases.

So, $K_p > K_p'$

61. 1.0 g of magnesium is burnt with 0.56 g O_2 in a closed vessel. Which reactant is left in excess and how much ?
(At. wt. Mg = 24 ; O = 16)

(1) Mg, 0.16 g (2) O_2, 0.16 g
(3) Mg, 0.44 g (4) O_2, 0.28 g

Ans. (B)

62. The pair of compounds that can exist together is:-

(1) Mg, 0.16 g (2) O_2, 0.16 g
(3) Mg, 0.44 g (4) O_2, 0.28 g

Ans. (1)

Sol. $n_{Mg} = \frac{1}{24}$ mole, $n_{O_2} = \frac{0.56}{32}$ moles

$$Mg(s) + \frac{1}{2}O_2(g) \rightarrow MgO(s)$$

Initially $\frac{1}{24}$ mole $\frac{0.56}{32}$ mole

0.0416 mole 0.0175 mole 0

after $(0.0416 - 2 \times 0.0175)$ 0 2×0.0175 mole

reaction 0.0066 mole

$\therefore$ mass of Mg = $0.0066 \times 24g = 0.16$ g

63. The pair of compounds that can exist together is:-

(1) $FeCl_3$, $SnCl_2$ (2) $HgCl_2$, $SnCl_2$
(3) $FeCl_2$, $SnCl_2$ (4) $FeCl_3$, KI

Ans. (3)

Sol. Both are reducing agent

64. Be^{2+} is isoelectronic with which of the following ions ?

(1) H^+ (2) Li^+
(3) Na^+ (4) Mg^{2+}

Ans. (2)

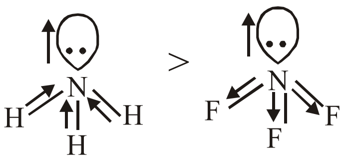
Sol. Li^+, Be^{+2} & Li^+ both have 2 electron.

65. Which of the following molecules has the maximum dipolement ?

(1) CO_2 (2) CH_4
(3) NH_3 (4) NF_3

Ans. (3)

Sol.



μ = 1.4 D 0.23 D

66. Which one of the following species has plane triangular shape ?

(1) N_3^- (2) NO_3^-
(3) NO_2^- (4) CO_2

Ans. (2)

Sol. NO_3^- has sp^2 hybridisation i.e. why has planar shape.

67. Acidity of diprotic acids in aqueous solutions increases in the order :-

(1) $H_2S < H_2Se < H_2Te$
(2) $H_2Se < H_2S < H_2Te$
(3) $H_2Te < H_2S < H_2Se$
(4) $H_2Se < H_2Te < H_2S$

Ans. (1)

Sol. On moving down the group bond length increases so liberation tendency of H will be more.

68. (a) $H_2O_2 + O_3 \rightarrow H_2O + 2O_2$

(b) $H_2O_2 + Ag_2O \rightarrow 2Ag + H_2O + O_2$

Role of hydrogen peroxide in the above reactions is respectively -

(1) Oxidizing in (a) and reducing in (b)
(2) Reducing in (a) and oxidizing in (b)
(3) Reducing in (a) and (b)
(4) Oxidizing in (a) and (b)

Ans. (3)

69. Artificial sweetner which is stable under cold conditions only is :-

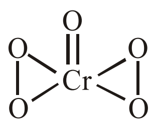
(1) Saccharine (2) Sucralose
(3) Aspartame (4) Alitame

Ans. (3)

70. In acidic medium, H_2O_2 changes $Cr_2O_7^{-2}$ to CrO_5 which has two (–O–O) bonds. Oxidation state of Cr in CrO_5 is :-

(1) + 5 (2) + 3
(3) + 6 (4) – 10

Ans. (3)

Sol. 

CrO_5 has 2 peroxy linkage.

71. The reaction of aqueous $KMnO_4$ with H_2O_2 in acidic conditions gives :-

(1) Mn^{4+} and O_2 (2) Mn^{2+} and O_2
(3) Mn^{2+} and O_3 (4) Mn^{4+} and MnO_2

Ans. (2)

Sol. $KMnO_4$ is a strong oxidising agent & wll oxidise H_2O_2 to O_2.

72. Among the following complexes the one which shows Zero crystal field stabilization energy (CFSE):-

(1) $[Mn(H_2O)_6]^{3+}$ (2) $[Fe(H_2O)_6]^{3+}$
(3) $[Co(H_2O)_6]^{2+}$ (4) $[Co(H_2O)_6]^{3+}$

Ans. (2)

Sol. Due to d^5 configuration and H_2O is a weak ligand.

73. Magnetic moment 2.83 BM is given by which of the following ions ?

(At. nos. Ti = 22, Cr = 24, Mn = 25, Ni = 28):-

(1) Ti^{3+} (2) Ni^{2+} (3) Cr^{3+} (4) Mn^{2+}

Ans. (2)

Sol. Ni^{+2} has two unpaired electron.

74. Which of the following complexes is :-

(1) mer-$[Co(NH_3)_3Cl_3]$ (2) cis-$[PtCl_2(NH_3)_2]$
(3) cis-$K_2[PtCl_2Br_2]$ (4) Na_2CoCl_4

Ans. (2)

Sol. Cis-platin is used as an anticancer unit.

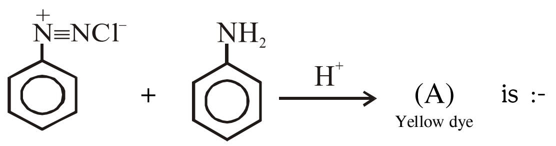
75. Reason of lanthanoid contraction is :-

(1) Negligible screening effect of 'f' orbitals
(2) Increasing nuclear charge
(3) Decreasing nuclear charge
(4) Decreasing screening effect

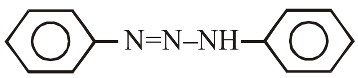
Ans. (1)

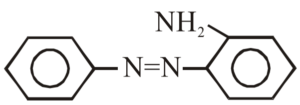
Sol. Due to poor shielding of f-orbitals nucleus will exert a strong attraction. Cauces lanthanoid contraction.

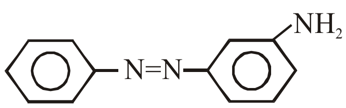
76. In the following reaction, the product (A)

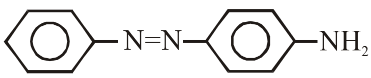


is :-

(1) 

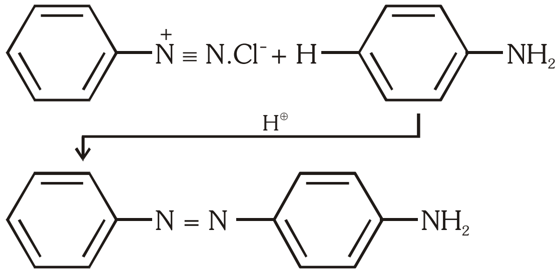
(2) 

(3) 

(4) 

Ans. (4)

Sol. This is an example of electrophilic substritituion reaction [coupling reaction]



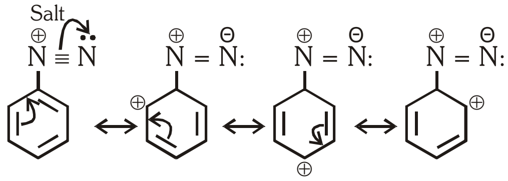
p-Aninoazobenzene
(yellow dye)
$+Cl^{\ominus} + H_2O$

77. Which of the following will be most stable diazonium salt $RN_2^+X^-$?

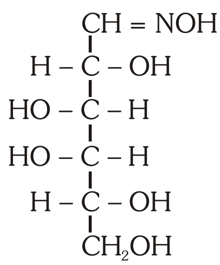
(1) $CH_3N_2^+X^-$ (2) $C_6H_5N_2^+X^-$
(3) $CH_3CH_2N_2^+X^-$ (4) $C_6H_5CH_2N_2^+X^-$

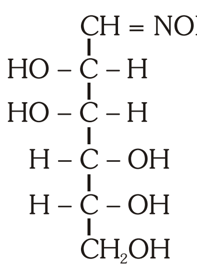
Ans. (2)

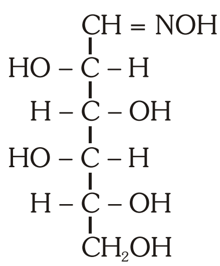
Sol. Primary aliphatic amines form highly unstable alkyldiazonium salts. Primary aromatic amines form arene diazonium salts which are stable for a short time in solution at low temperature (273 – 278 K). The stability of arenediazonium can be explained on the basis of resonance.

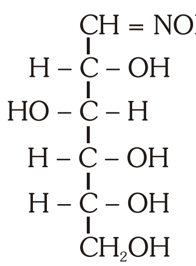


78. D (+) glucose reacts with hydroxylamine and yields an oxime. The structure of the oxime would be :

(1) 

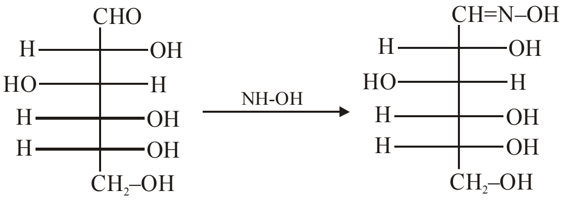
(2) 

(3) 

(4) 

Ans. **(4)**

Sol. Glucose reacts with hydroxyl amine to form an oxime.



D(+)glucose

79. Which of the following hormones is produced under the condition of stress which stimulates glycogenolysis in the liver of human beings?

(1) Thyroxin

(2) Insulin

(3) Adrenaline

(4) Estradiol

Ans. **(3)**

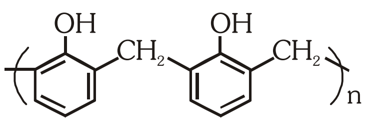
Sol. Adrenaline commonly known as fight or flight hormone, it is produced by the adrenal glands after receving a message from the brain that a stressful situation has presented itself.

80. Which one of the following is an example of a thermosetting polymer?

(1) $\left(CH_2-\underset{Cl}{\underset{|}{C}}=CH-CH_2\right)_n$

(2) $\left(CH_2-\underset{Cl}{\underset{|}{CH}}\right)_n$

(3) $\left(\overset{H}{\overset{|}{N}}-(CH_2)_6-\overset{H}{\overset{|}{N}}-\overset{O}{\overset{||}{C}}-(CH_2)_4-\overset{O}{\overset{||}{C}}\right)_n$

(4) 

Ans. **(4)**

Sol. Thermosetting polymers are cross linked or heavily branched molecules, which on heating undergo extensive cross linking in moulds and again become in fusible. Most common examples are bakelite.

81. Which of the following organic compounds polymerizes to form the polyester Dacron?

(1) Propylene and para HO – (C_6H_4) – OH

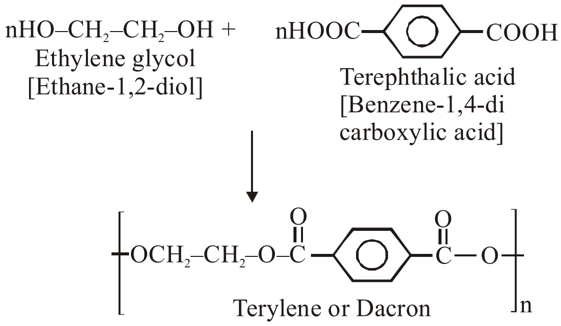
(2) Benzoic acid an ethanol

(3) Terephthalic acid and ethylene glycol

(4) Benzoic acid and para HO – (C_6H_4) – OH

Ans. **(3)**

Sol. Dacron or terylene is the best known example of polyesters. It is manufactured by heating a mixture of ethylene glycol and terephthalic acid at 420 to 460 K in the presence of zinc acetate-antimaony trioxide catalyst.



82. Which of the following is not a common component of Photochemical Smog?

(1) Ozone (2) Acrolein

(3) Peroxyacetyl nitrate (4) Chlorofluorocarbons

Ans. **(4)**

Sol. The common components of photochemical smog are ozone, nitric oxide, ocrolein, for malde nyde and peroxyacehyl nitrate (PAN).

Hence (FC is not common component of photochemical smog.

83. In the Kjeldahl's method for estimation of nitrogen present in a soil sample, ammonia evolved from 0.75 g of sample neutralized 10 mL of 1 M H_2SO_4. The percentage of nitrogen in the soil is :

(1) 37.33 (2) 45.33

(3) 35.33 (4) 43.33

Ans. **(1)**

Sol. $\because$ M $\times$ V (ml) = m mol

10 m mol H_2SO_4 = 20 m mol of NH_3

$[H_2SO_4 + 2NH_3 \rightarrow (NH_4)_2SO_4]$

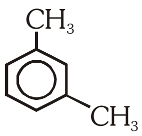
1 mol NH_3 contains 14 g nitrogen

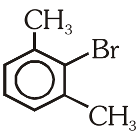
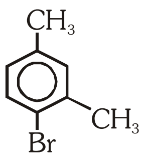
20×10^{-3} mol NH_3 contains $14 \times 20 \times 10^{-3}$ nitrogen

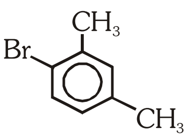
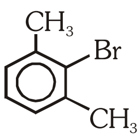
0.75 g of sample contains

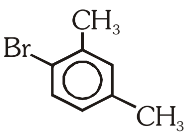
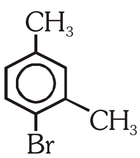
$$\%\ \text{Nitrogen} = \frac{14 \times 20 \times 10^{-3}}{0.75} \times 100 = 37.33\%$$

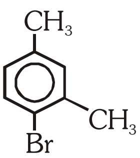
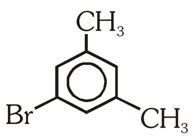
84. What products are formed when the following compounds is treated with Br_2 in the presence of $FeBr_3$?



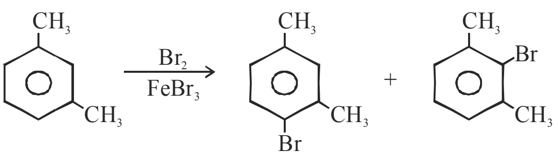
(1)  and 

(2)  and 

(3)  and 

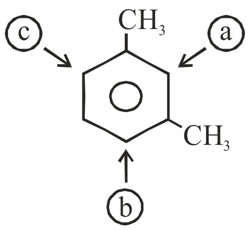
(4)  and 

Ans. (1,2)

Sol. 

(major) (minor)

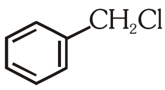
In the above compound 1,3-Dimethylbenzene, sites for the attacking electrophile are



attack of electrophile on sites (b) & (c) results in same compound as product.

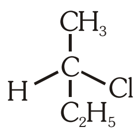
Although tendency of electrophile to attack on site (a) is very less due to high steric hinderance so respective product is favoured with very very less amount.

85. Which of the following compounds will undergo racemisation when solution of KOH hydrolyses?

(i) 

(ii) $CH_3CH_2CH_2Cl$

(iii) $H_3C - \underset{}{\overset{CH_3}{\overset{|}{C}H}} - CH_2Cl$

(iv) 

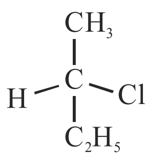
(1) (i) and (ii)

(2) (ii) and (iv)

(3) (iii) and (iv)

(4) (i) and (iv)

Ans. (B)

Sol. Only compound (iv)  results in formation of racemic product due to chirality.

86. Among the following sets of reactants which one produces anisole?

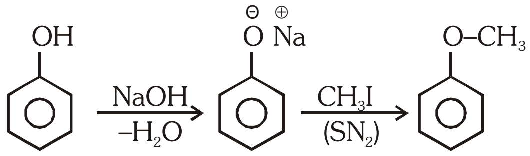
(1) CH_3CHO ; RMgX

(2) C_6H_5OH ; NaOH ; CH_3I

(3) C_6H_5OH ; neutral $FeCl_3$

(4) $C_6H_5 - CH_3$; CH_3COCl; $AlCl_3$

Ans. (2)

Sol. 

87. Which of the following will not be soluble in sodium hydrogen carbonate?

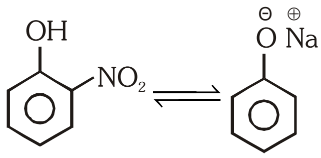
(1) 2, 4, 6-trinitrophenol

(2) Benzoic acid

(3) o-Nitrophenol

(4) Benzenesulphonic acid

Ans. (3)

Sol. 

+ H_2Co_3 carbonic acid

while 2.4.6-Trinitro phenot, benzoic acid and benzene sulphonic acid are sobuble in $NaHO_3$.

OR

Acid + $NaHCO_3$ → salt + H_2Co_3

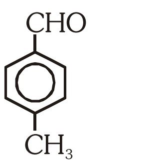
Reaction is possible in forward direction if acid is more acidic then H_2Co_3.

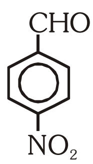
O-nitrophenol is less acidic than H_2Co_3, hence does not soluble in sodium hydrogen carbonate.

88. Which one is most reactive towards Nucleophilic addition reaction?

(1) 

(2) 

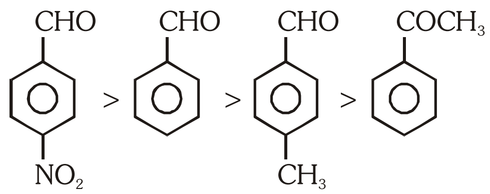
(3) 

(4) 

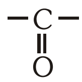
Ans. (4)

Sol. Reactivity of carbonyl compounds towards NAR depends on steric and electronic effects.

NAR reactivity :



–M of $-NO_2$

increase (+)ve charge on sp^2c of 

89. Identify Z in the sequence of reactions:

$$CH_3CH_2CH = CH_1 \xrightarrow{HBr/H_2O_2} Y \xrightarrow{C_2H_5ONa} Z$$

(1) $CH_3 - (CH_2)_3 - O - CH_2CH_3$

(2) $(CH_3)_2)CH_2 - O - CH_2CH_3$

(3) $CH_3(CH_2)_4 - O - CH_3$

(4) $CH_3CH_2 - CH(CH_3) - O - CH_2CH_3$

Ans. (1)

Sol. $CH_3-CH_2CH=CH_2 \xrightarrow[\text{(Peroxide effect)}]{HBr/H_2O_2}$

$CH_3-CH_2-CH_2-CH_2Br$
(y)

↓

$CH_3-(CH_2)_3-O-CH_2-CH_3$
(z)

90. Which of the following organic compounds has same hybridization as its combustion product (CO_2)?

(1) Ethane (2) Ethyne

(3) Ethene (4) Ethanol

Ans. (2)

Sol. $$C_2H_2 + \frac{5}{2}O_2 \longrightarrow 2CO_2 + H_2O$$

Both HC≡CH & CO_2 has same hybridisation of carbon atom. (sp).

AIPMT – 2014 TEST PAPER WITH SOLUTIONS (HELD ON SUNDAY 04th MAY, 2014)

91. Which one of the following shows isogamy with non-flagellated gametes?
(1) *Sargassum* (2) *Ectocarpus*
(3) *Ulothrix* (4) *Spirogyra*

Ans. (4)

92. Five kingdom system of classification suggested by R.H. Whittaker is **not** based on :
(1) Presence or absence of a well defined nucleus.
(2) Mode of reproduction.
(3) Mode of nutrition.
(4) Complexity of body organisation.

Ans. (1)

93. Which one of the following fungi contains hallucinogens ?
(1) *Morchella esculenta* (2) *Amanita muscaria*
(3) *Neurospora sp.* (4) *Ustilago sp.*

Ans. (2)

94. Archaebacteria differ from eubacteria in :
(1) Cell membrane
(2) Mode of nutrition
(3) Cell shape
(4) Mode of reproduction

Ans. (1)

95. Which one of the following is wrong about *Chara*?
(1) Upper oogonium and lower round antheridium.
(2) Globule and nucule present on the same plant.
(3) Upper antheridium and lower oogonium
(4) Globule is male reproductive structure

Ans. (3)

96. Which of the following is responsible for peat formation ?
(1) *Marchanita* (2) *Riccia*
(3) *Funaria* (4) *Sphagnum*

Ans. (4)

97. Placenta and pericarp are both edible portions in:
(1) Apple (2) Banana
(3) Tomato (4) Potato

Ans. (3)

98. When the margins of sepals or petals overlap one another without any particular direction, the condition is termed as :
(1) Vexillary (2) Imbricate
(3) Twisted (4) Valvate

Ans. (2)

99. You are given a fairly old piece of dicot stem and a dicot root. Which of the following anatomical structures will you use to distinguish between the two?
(1) Secondary xylem (2) Secondary phloem
(3) Protoxylem (4) Cortical cells

Ans. (3)

100. Which one of the following statements is correct ?
(1) The seed in grasses is not endospermic.
(2) Mango is a parthenocarpic fruit.
(3) A proteinaceous aleurone layer is present in maize grain.
(4) A sterile pistil is called a staminode.

Ans. (3)

101. Tracheids differ from other tracheary elements in :
(1) having casparian strips
(2) being imperforate
(3) lacking nucleus
(4) being lignified

Ans. (2)

102. An example of ediple underground stem is :
(1) Carrot (2) Groundnut
(3) Sweet potato (4) Potato

Ans. (4)

103. Which structures perform the function of mitochondria in bacteria ?
(1) Nucleoid (2) Ribosomes
(3) Cell wall (4) Mesosomes

Ans. (4)

104. The solid linear cytoskeletal elements having a diameter of 6 nm and made up of a single type of monomer are known as :
(1) Microtubules
(2) Microfilaments
(3) Intermediate filaments
(4) Lamins

Ans. (2)

105. The osmotic expansion of a cell kept in water is chiefly regulated by :
(1) Mitochondria (2) Vacuoles
(3) Plastids (4) Ribosomes

Ans. (2)

106. During which phase(s) of cell cycle, amount of DNA in a cell remains at 4C level if the initial amount is denoted as 2C ?
(1) G_0 and G_1
(2) G_1 and S
(3) Only G_2
(4) G_2 and M

Ans. (4)

107. Match the following and select the **correct** answer :

(a) Centriole	(i) Infoldings in mitochondria
(b) Chlorophyll	(ii) Thylakoids
(c) Cristae	(iii) Nucleic acids
(d) Ribozymes	(iv) Basal body cilia or fiagella

	(a)	(b)	(c)	(d)
(1)	(iv)	(ii)	(i)	(iii)
(2)	(i)	(ii)	(iv)	(iii)
(3)	(i)	(iii)	(ii)	(iv)
(4)	(iv)	(iii)	(i)	(ii)

Ans. (1)

108. Dr. F. Went noted that if coleoptile tips were removed and placed on agar for one hour, the agar would produce a bending when placed on one side of freshly-cut coleoptile stumps. Of what significance is this experiment ?

(1) It made possible the isolation and exact identification of auxin.
(2) It is the basis for quantitative determination of small amounts of growth-promoting substances.
(3) It supports the hypothesis that IAA is auxin.
(4) It demonstrated polar movement of auxins.

Ans. (2)

109. Deficiency symptoms of nitrogen and potassium are visible first in :

(1) Senescent leaves (2) Young leaves
(3) Roots (4) Buds

Ans. (1)

110. In which one of the following processes CO_2 in **not** released ?

(1) Aerobic respiration in plants
(2) Aerobic respiration in animals
(3) Alcoholic fermentation
(4) Lactate fermentation

Ans. (4)

111. Anoxygenic photosynthesis is characteristic of :

(1) Rhodospirillum (2) Spirogyra
(3) Chlamydomonas (4) Ulva

Ans. (1)

112. A few normal seedlings of tomato were kept in a dark room. After a few days they were found to have become white-coloured like albinos. Which of the following terms will you use to describe them?

(1) Mutated (2) Embolised
(3) Etiolated (4) Defoliated

Ans. (3)

113. Which one of the following growth regulators is known as stress hormone ?

(1) Abscissic acid (2) Ethylene
(3) GA_3 (4) Indole acetic acid

Ans. (1)

114. Geitonogamy involves :

(1) fertilization of a flower by the pollen from another flower of the same plant.
(2) fertilization of a flower by the pollen from the same flower.
(3) fertilization of a flower by the pollen from a flower of another plant in the same population.
(4) fertilization of a flower by the pollen from a flower of another plant belonging to a distant population.

Ans. (1)

115. Male gametopyte with least number of cell is present in :

(1) Pteris (2) Funaria
(3) Lilium (4) Pinus

Ans. (1)

116. An aggregate fruit is one which develops from :

(1) Multicarpellary syncarpous gynoecium
(2) Multicarpellary apocarpus gynoecium
(3) Complete inflorescence
(4) Multicarpellary superior ovary

Ans. (2)

117. Pollen tablets are available in the market for :

(1) In vitro fertilization
(2) Breeding programmes
(3) Supplementing food
(4) Ex situ conservation

Ans. (3)

118. Function of filiform apparatus is to :-

(1) Recognize the suitable pollen at stigma
(2) Stimulate division of generative cell
(3) Produce nectar
(4) Guide the entry of pollen tube

Ans. (4)

119. Non-albuminous seed is produced in :-

(1) Maize (2) Castor
(3) Wheat (4) Pea

Ans. (4)

120. Which of the following shows coiled RNA strand and capsomeres?

(1) Polio virus (2) Tobacco masaic virus
(3) Measles virus (4) Retrovirus

Ans. (2)

121. Which one of the following is **wrongly** matched?

(1) Transcription – Writing information from DNA to t–RNA.
(2) Translation – Using information in m–RNA to make protein
(3) Repressor protein – Binds to operator to stop enzyme synthesis.
(4) Operon – Structural genes, operator and promoter.

Ans. (1)

122. Transformation was discovered by :-
(1) Meselson and Stahl
(2) Hershey and Chase
(3) Griffith
(4) Watson and Crick

Ans. (3)

123. Fruit colour in squash in an example of :-
(1) Recessive epistasis
(2) Dominant epistasis
(3) Complementary genes
(4) Inhibitory genes

Ans. (2)

124. Viruses have :-
(1) DNA enclosed in a protein coat
(2) Prokaryotic nucleus
(3) Single chromosome
(4) Both DNA and RNA

Ans. (1)

125. The first human hormone produced by recombinant DNA technology is :-
(1) Insulin (2) Estrogen
(3) Thyroxin (4) Progesterone

Ans. (1)

126. An analysis of chromosomal DNA using the Southern hybridization technique **does not** use :-
(1) Electrophoresis (2) Blotting
(3) Autoradiography (4) PCR

Ans. (4)

127. In vitroclonal propagation in plants is characterized by :-
(1) PCR and RAPD
(2) Northern blotting
(3) Electrophoresis and HPLC
(4) Microscopy

Ans. (1)

Sol. RAPD markers are suitable for detecting somaclonal variation

128. An alga which can be employed as food for human being is :-
(1) Ulothrix (2) Chlorella
(3) Spirogyra (4) Polysiphonia

Ans. (2)

129. Which vector can clone only a small fragment of DNA?
(1) Bacterial artificial chromosome
(2) Yeast artificial chromosome
(3) Plasmid
(4) Cosmid

Ans. (3)

130. An example of ex situ conservation is :-
(1) National Park (2) Seed Bank
(3) Wildlife Sanctuary (4) Sacred Grove

Ans. (2)

131. A location with luxuriant growth of lichens on the trees indicates that the :-
(1) Trees are very healthy
(2) Trees are heavily infested
(3) Location is highly polluted
(4) Location is not polluted

Ans. (4)

132. Match the following and select the **correct** option :-

(a)	Earthworm	(i)	Pioneer species
(b)	Succession	(ii)	Detritivore
(c)	Ecosystem service	(iii)	Natality
(d)	Population growth	(iv)	Pollination

	(a)	**(b)**	**(c)**	**(d)**
(1)	(i)	(ii)	(iii)	(iv)
(2)	(iv)	(i)	(iii)	(ii)
(3)	(iii)	(ii)	(iv)	(i)
(4)	(ii)	(i)	(iv)	(iii)

Ans. (4)

133. A species facing extremely high risk of extinction in the immediate future is called :-
(1) Vulnerable (2) Endemic
(3) Critically Endangered (4) Extinct

Ans. (3)

134. The zone of atmosphere in which the ozone layer is present is called :-
(1) Ionosphere (2) Mesosphere
(3) Stratosphere (4) Troposphere

Ans. (3)

135. The organization which publishes the Red List of species is :-
(1) ICFRE (2) IUCN
(3) UNEP (4) WWF

Ans. (2)

136. Select the Taxon mentioned that represents both marine and fresh water species :-
(1) Echinoderms (2) Ctenophora
(3) Cephalochordata (4) Cnidaria

Ans. (4)

137. Which one of the following living organisms completely lacks a cell wall?
(1) Cyanobacteria (2) Sea – fan(Gorgonia)
(3) Saccharomyces (4) Blue–green algae

Ans. (2)

138. *Planaria* possess high capacity of :-
(1) Metamorphosis
(2) Regeneration
(3) Alternation of generation
(4) Bioluminescence

Ans. (2)

139. A marine cartilaginous fish that can produce electric current is :-
(1) Pristis (2) Torpedo
(3) Trygon (4) Scoliodon

Ans. (2)

140. Choose the correctly matched pair :-
(1) Tendon–Specialized connective tissue
(2) Adipose tissue – Dense connective tissue
(3) Areolar tissue – Loose connective tissue
(4) Cartilage–Loose connective tissue

Ans. (3)

141. Choose the correctly matched pair :-
(1) Inner lining of salivary ducts – Ciliated epithelim
(2) Moist surface of buccal cavity – Glandular epithelium
(3) Tubular parts of nephrons – Cuboidal epithelium
(4) Inner surface of bronchioles – Squamous epithelium

Ans. (3)

142. In 'S' phase of the cell cycle :-
(1) Amount of DNA doubles in each cell.
(2) Amount of DNA remains same in each cell.
(3) Chromosome number is increased.
(4) Amount of DNA is reduced to half in each cell.

Ans. (1)

143. The motile bacteria are able to move by :-
(1) Fimbriae (2) Flagella
(3) Cilia (4) Pili

Ans. (2)

144. Select the option which is **not correct** with respect to enzyme action :-
(1) Substrate binds with enzyme at its active site.
(2) Addition of lot of succinate does not reverse the inhibition of succinic dehydrogenase by malonate.
(3) A non-competitive inhibitor binds the enzyme at a site distinct from that which binds the substrate.
(4) Malonate is a competitive inhibitor of succinic dehydrogenase.

Ans. (2)

145. Which one of the following is a non - reducing carbohydrate ?
(1) Maltose (2) Sucrose
(3) Lactose (4) Ribose 5 - phosphate

Ans. (2)

146. The enzyme recombinase is required at which stage of meiosis :
(1) Pachytene (2) Zygotene
(3) Diplotene (4) Diakinesis

Ans. (1)

147. The initial step in the digestion of milk in humans is carried out by ?
(1) Lipase (2) Trypsin
(3) Rennin (4) Pepsin

Ans. (3)

148. Fructose is absorbed into the blood through mucosa cells of intestine by the process called :
(1) active transport
(2) facilitated transport
(3) simple diffusion
(4) co-transport mechanism

Ans. (2)

149. Approximately seventy percent of carbon-dioxide absorbed by the blood will be transported to the lungs :
(1) as bicarbonate ions
(2) in the form of dissolved gas molecules
(3) by binding to R.B.C.
(4) as carbamino - haemoglobin

Ans. (1)

150. Person with blood group AB is considered as universal recipient because he has :
(1) both A and B antigens on RBC but no antibodies in the plasma.
(2) both A and B antibodies in the plasma.
(3) no antigen on RBC and no antibody in the plasma.
(4) both A and B antigens in the plasma but no antibodies.

Ans. (1)

151. How do parasympathetic neural signals affect the working of the heart ?
(1) Reduce both heart rate and cardiac output.
(2) Heart rate is increased without affecting the cardiac output.
(3) Both heart rate and cardiac output increase.
(4) Heart rate decreases but cardiac output increases.

Ans. (1)

152. Which of the following causes an increase in sodium reabsorption in the distal convoluted tubule ?
(1) Increase in aldosterone levels
(2) Increase in antidiuretic hormone levels
(3) Decrease in aldosterone levels
(4) Decrease in antidiuretic hormone levels

Ans. (1)

153. Select the correct matching of the type of the joint with the example in human skeletal system :

	Type of joint	Example
(1)	Cartilaginous joint	between frontal and pariental
(2)	Pivot joint	between third and fourth cervical vertebrae
(3)	Hinge joint	between humerus and pectoral girdle
(4)	Gliding joint	between carpals

Ans. (4)

154. Stimulation of a muscle fiber by a motor neuron occurs at :
(1) the neuromuscular junction
(2) the transverse tubules
(3) the myofibril
(4) the sacroplasmic reticulum

Ans. (1)

155. Injury localized to the hypothalamus would most likely disrupt :
(1) short - term memory.
(2) co-ordination during locomotion.
(3) executive functions, such as decision making.
(4) regulation of body temperature.

Ans. (4)

156. Which one of the following statements is **not correct** ?
(1) Retinal is the light absorbing portion of visual photo pigments.
(2) In retina the rods have the photopigment rhodopsin while cones have three different photopigments.
(3) Retinal is a derivative of Vitamin C.
(4) Rhodopsin is the purplish red protein present in rods only.

Ans. (3)

157. Identify the hormone with its **correct** matching of source and function :
(1) Oxytocin - posterior pituitary, growth and maintenance of mammary glands.
(2) Melatonin - pineal gland, regulates the normal rhythm of sleepwake cycle.
(3) Progesterone - corpus-luteum, stimulatiuon of growth and activities of female secondary sex organs.
(4) Atrial natriuretic factor - ventricular wall increases the blood pressure.

Ans. (2)

158. Fight-or-flight reactions cause activation of :
(1) the parathyroid glands, leading to increased metabolic rate.
(2) the kidney, leading to suppression of renin-angiotensin-aldosterone pathway.
(3) the adrenal medulla, leading to increased secretion of epinephrine and norepinephrene.
(4) the pancreas leading to a reduction in the blood sugar levels.

Ans. (3)

159. The shared terminal duct of the reproductive and urinary system in the human male is :
(1) Urethra (2) Ureter
(3) Vas deferens (4) Vasa efferentia

Ans. (1)

160. The main function of mammalian corpus luteum is to produce :
(1) estrogen only
(2) progesterone
(3) human chorionic gonadotropin
(4) relaxin only

Ans. (1)

161. Select the correct option desccribing gonadotropin activity in a normal pregnant female :
(1) High level of FSH and LH stimulates the thickening of endometrium.
(2) High level of FSH and LH facilitate implantation of the embryo.
(3) High level of hCG stimulates the synthesis of estrogen and progesterone.
(4) High level of hCG stimulates the thickening of endometrium.

Ans. (3)

162. Tubectomy is a method of sterilization in which :
(1) small part of the fallopian tube is removed or tied up.
(2) ovaries are removed surgically.
(3) small part of vas deferens is removed or tied up.
(4) uterus is removed surgically.

Ans. (1)

163. Which of the following is a hormone releasing Intra Uterine Device (IUD) ?
(1) Multiload 375 (2) LNG - 20
(3) Cervical cap (4) Vault

Ans. (2)

164. Assisted reproductive technology, IVF involves transfer of :
(1) Ovum into the fallopian tube.
(2) Zygote into the fallopian tube.
(3) Zygote into the uterus.
(4) Embryo with 16 blastomeres into the fallopian tube.

Ans. (2)

165. A man whose father was colour blind marries a woman who had a colour blind mother and normal father. What percentage of male children of this couple will be colour blind ?
(1) 25% (2) 0% (3) 50% (4) 75%

Ans. (3)

166. In a population of 1000 individuals 360 belong to genotype AA, 480 to Aa and the remaining 160 to aa. Based on this data, the frequency of allele A in the population is :-
(1) 0.4 (2) 0.5 (3) 0.6 (4) 0.7

Ans. (3)

167. A human female with Tunner's syndrome :-
(1) has 45 chromosomes with XO.
(2) has one additional X chromosome.
(3) exhibits male characters.
(4) is able to produce children with normal husband.

Ans. (1)

168. Select the correct option :-

	Direction of RNA synthesis	Direction of reading of the template DNA strand
1	5′—3′	3′—5′
2	3′—5′	5′—3′
3	5′—3′	5′—3′
4	3′—5′	3′—5′

Ans. (1)

169. Commonly used vectors for human genome sequencing are :-
(1) T-DNA
(2) BAC and YAC
(3) Expression Vectors
(4) T/A Cloning Vectors

Ans. (2)

170. Forelimbs of cat, lizard used in walking; forelimbs of whale used in swimming and forelimbs of bats used in flying are an example of :-
(1) Analogous organs (2) Adaptive radiation
(3) Homologous organs (4) Convergent evolution

Ans. (3)

171. Which one of the following are analogous structures :-
(1) Wings of Bat and Wings of Pigeon.
(2) Gills of Prawn and Lungs of Man.
(3) Thorns of *Bougainvillea* and Tendrils of *Cucurbita*
(4) Flippers of Dolphin and Legs of Horse

Ans. (2)

172. Which is the particular type of drug that is obtained from the plant whose one flowering branch is shown below :-

(1) Hallucinogen (2) Depressant
(3) Stimulant (4) Pain - killer

Ans. (1)

173. At which stage of HIV infection does one usually show symptoms of AIDS :-
(1) Within 15 days of sexual contact with an infected person.
(2) When the infected retro virus enters host cells.
(3) When HIV damages large number of helper T-Lymphocytes.
(4) When the viral DNA is produced by reverse transcriptase.

Ans. (3)

174. To obtain virus - free healthy plants from a diseased one by tissue culture technique, which part/parts of the diseased plant will be taken :-
(1) Apical meristem only
(2) Palisade parenchyma
(3) Both apical and axillary meristems
(4) Epidermis only

Ans. (3)

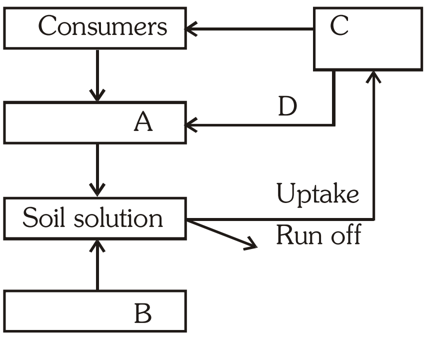
175. What gases are produced in anaerobic sludge digesters :-
(1) Methane and CO_2 only
(2) Methane, Hydrogen Sulphide and CO_2
(3) Methane, Hydrogen Sulphide and O_2
(4) Hydrogen Sulphide and CO_2

Ans. (2)

176. Just as a person moving from Delhi to Shimla to escape the heat for the duration of hot summer, thousands of migratory birds from. Siberia and other extremely cold northern regions move to :-
(1) Western Chat
(2) Meghalaya
(3) Corbett National Park
(4) Keolado National Park

Ans. (4)

177. Given below is a simplified model of phosphorus cycling in a terrestrial ecosystem with four blanks (A-D). Identify the blanks :-

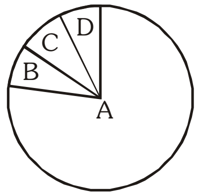


Options :

	A	B	C	D
1	Rock minerals	Detritus	Litter fall	Producers
2	Litter fall	Producers	Rock minerals	Detritus
3	Detritus	Rock minerals	Producer	Litter fall
4	Producers	Litter fall	Rock minerals	Detritus

Ans. (3)

178. Given below is the representation of the extent of global diversity of *invertebrates.* What groups the four portions (A-D) represent respectively :-



Options :

	A	B	C	D
1	Insects	Crustaceans	Other animal groups	Molluscs
2	Crustacea-ns	Insects	Molluscs	Other animal groups
3	Molluscs	Other animal groups	Crustaceans	Insects
4	Insects	Molluscs	Crustaceans	Other animal groups

Ans. (4)

179. A scrubber in the exhaust of a chemical industrial plant removes :-
(1) gases like sulphur dioxide
(2) particulate matter of the size 5 micrometer or above
(3) gases like ozone and methane
(4) particularte matter of the size 2.5 micrometer or less

Ans. (1)

180. If 20 J of energy is trapped at producer level, then how much energy will be available to peacock as food in the following chain ?
plant $\rightarrow$ mice $\rightarrow$ snake $\rightarrow$ peacock :-
(1) 0.02 J (2) 0.002 J
(3) 0.2 J (4) 0.0002 J

Ans. (1)