PHYSICS

1. (d)

Given that,

$r_e = 0.51\ \overset{0}{A} = 0.51 \times 10^{-10} m$

As we know according to Bohr's model.

Mass of muon, $m_\mu = 207 \times m_e$

$$r_e \propto \frac{1}{m_e}$$

Now, At equilibrium

$$m_\mu r_\mu = m_e r_e$$

$$\therefore r_\mu = \frac{m_e}{m_\mu} \times r_e = \frac{m_e}{207 m_e} \times r_e = 2.56 \times 10^{-13}\, m$$

Similarly, energy of muon is given as

$$E_e \propto m_e \Rightarrow \frac{E_e}{E_\mu} = \frac{m_e}{m_\mu}$$

$$\therefore (E)_\mu = -13.6 \times 207$$

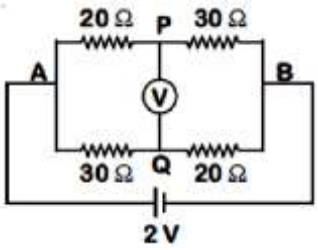
$= -2.8 keV$

2. (a)

Now, by applying the Kirchhoffs junction law.

Current in APE= $\frac{2}{50}$ A

Current in AQB= $\frac{2}{50}$ A



Δ V from A to P

$$V_A - \frac{2}{50} \times 20 = V_P$$

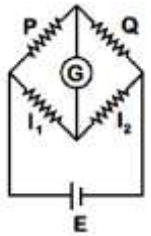
Δ V from A to Q

$$V_A - \frac{2}{50} \times 30 = V_Q$$

$$V_P + \frac{2}{50} \times 20 = V_Q + \frac{2}{50} \times 30 \Rightarrow V_P - V_Q = 0.4V$$

3. (a)

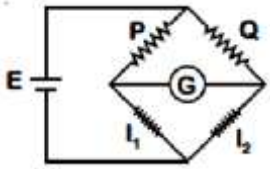
According to given condition for the balanced bridge connection, the relation between P, Q, l_1 and l_2 is $\frac{P}{Q} = \frac{I_1}{I_2}$



Now, if we interchange the position, the relation for P, Q, l_1 and l_2 will be

$$\frac{P}{I_1} = \frac{Q}{I_2}$$

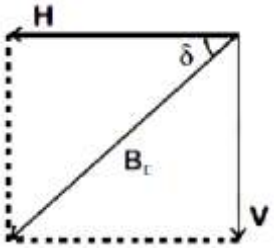
$$\frac{P}{Q} = \frac{I_1}{I_2}$$



As we can see from the above relation that on interchanging galvanometer and battery positions, the balance condition remains unchanged.

4. (c)

As we can see from the graph

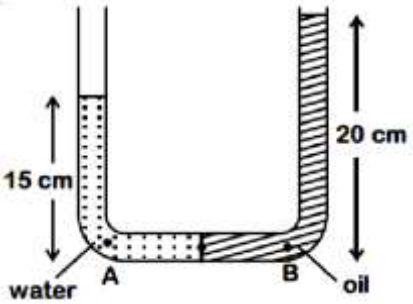


The relation for horizontal and vertical components of magnetic field of earth will be.

$H = B_E \cos \delta$

$V = B_E \sin \delta$

5. (c)



As we know, at equilibrium

Pressure at A = Pressure at B.

$P_a + 0.15 \times 10^3 \times g = P_a + 0.20 \times d_0 g$

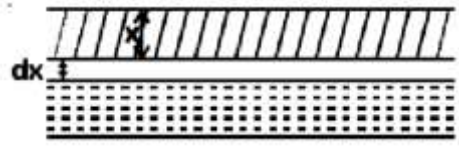
$$d_0 = \frac{0.15 \times 10^3}{0.20}$$

$= 0.75 \times 10^3$

$= 750 \text{ kg/m}^3$

6. (d)

For the given case, we can assume that at any instant thickness of ice is x, And time taken to form additional thickness (dx) is dt



$$mL = \frac{KA[26-0]dt}{x}$$

$$(Adx)\rho L = \frac{KA(26)dt}{x}$$

$$\frac{dx}{dt}=\frac{26K}{x\rho L}$$

7. (c)

Now, wavelength of light emitted by p-n junction diode of energy gap 1.9 eV.

$$\lambda=\frac{12400}{E_g\left(in\,eV\right)}\overset{0}{A}$$

$$=\frac{12400}{1.9}=6526\overset{0}{A}$$

=654nm

8. (b)

Now,

For the given case, consider when the output is low (Key is open) it can be denoted as '0'.

Similarly, when the output is high (Key is closed) it can be denoted as '1'.

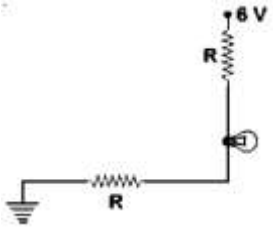
Hence,

Case-1:

When, A = 0, B = 0

LED will glow

$\therefore$ Y = 1

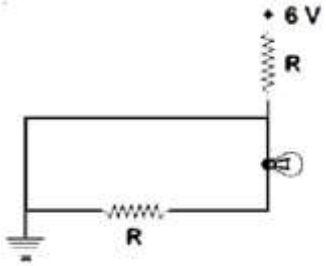


Case-2:

A = 0, B = 1

No current will through LED

$\therefore$ Y = 0



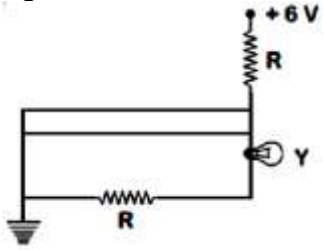
Case-3 : A = 1, B = 0

Again no current will through LED

$\therefore$ Y = 0

Case-4 : A = 1, B = 1

Again Y = 0



$\therefore$

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	0

Hence corresponding circuit will behave as NOR gate,

9. (b)

Now, as we know diatomic gases have 5 degrees of freedom, if vibrational mode is neglected.

$\therefore$ For Hydrogen $\gamma = 1 + \frac{2}{f} = 1 + \frac{2}{5} = \frac{7}{5}$

Similarly, for monoatomic gases like Helium, the degree of freedom will be 3.

$\therefore$ For Helium $\gamma = 1 + \frac{2}{f} = 1 + \frac{2}{3} = \frac{5}{3}$

If vibrational mode is also considered then degrees of freedom of diatomic gas molecules are 7.

For gas X, f = 7.

$\gamma = 1 + \frac{2}{f} = 1 + \frac{2}{7} = \frac{9}{7}$

$\therefore \left(\frac{7}{5}, \frac{5}{3}, \frac{9}{7}\right)$

10. (d)

Now,

Vernier scale division = VSD

Main scale division = MSD

Now,

nx VSD = (n-1) MSD

1 VSD = $\frac{(n-1)}{n}$ MSD

Least count L.C. = 1 MSD - 1 VSD

$= 1MSD - \frac{(n-1)}{n} MSD$

$= \frac{1}{n} MSD$

$= \frac{1}{n} \times \frac{1}{n} cm$

$= \frac{1}{n^2} cm$

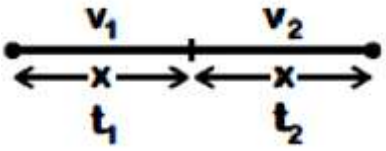
11. (c)

Consider,

Velocity travelled by person in time $t_1 = v_1$

Velocity travelled by person in time $t_2 = v_2$

Total distance travelled = 2x



As $t_1 = \frac{x}{v_1}$ and $t_2 = \frac{x}{v_2}$

$\therefore v = \frac{x + x}{t_1 + t_2}$

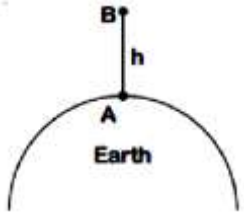
$= \frac{2x}{\frac{x}{v_1} + \frac{x}{v_2}} = \frac{2v_1 v_2}{v_1 + v_2}$

$\therefore \frac{2}{v} = \frac{1}{v_1} + \frac{1}{v_2}$

12. (c)

Given that,

Potential energy at ∞ distance from centre, $P.E_{\infty} = 0J$



Now,

$$(P.E)_A = -\frac{GMm}{R}$$

$$(P.E)_B = -\frac{GMm}{R+h}$$

$$\therefore \Delta U = (P.E)_B - (P.E)_A$$

$$= -\frac{GMm}{R+h} + \frac{GMm}{R} = \frac{GMmh}{(R)(R+h)}$$

13. (c)

Given that,

Mass of water at 100° C, $m_1 = 1$ g

Volume of water, $V_i = 1\ cm^3$

Latent heat of water, $L_1 = 2256$ J/g

Volume of steam, $V_2 = 1671\ cm^3$

Now,

$\Delta Q = Lx\ m$

$= 2256 \times 1 = 2256J$.....(i)

$\Delta W = Px[V_2 - V_1]$

$= 1 \times 10^5[1671 - 1] \times 10^{-6}$

$= 1670x10^5x10^{-6}$

$= 167J$.....(ii)

By first law of thermodynamics:

$\Delta Q = \Delta U + \Delta W$

$2256 = \Delta U + 167$

$\therefore\ \Delta U = 2089J$

14. (c)

Now,

$$\beta = \frac{D\lambda}{d}$$

$$\beta \propto \lambda$$

$$\therefore \frac{\beta'}{\beta} = \frac{\lambda'}{6000} \ldots.(ii)$$

$$\Rightarrow \lambda' = 0.7 \times 6000 \quad \left(as\ \beta' = \frac{100-30}{100} \times \beta = 0.7\beta\right)$$

$$\Rightarrow 4200\ \overset{0}{A}$$

15. (a)

Given that,

Work function, $\phi = 4.0$ V

Now,

Work function, $\phi = \frac{hc}{\lambda} \Rightarrow \lambda_0 = \frac{hc}{\phi}$

$$\therefore \lambda_0 = \frac{6.62 \times 10^{-34} \times 3 \times 10^8}{4 \times 1.6 \times 10^{-19}}$$

$$\lambda = \frac{12400}{4}$$
$$= 3100\,\overset{0}{A}$$
$$\therefore \lambda = 310nm$$

16. (b)

Now, for de Broglie waves

As $\lambda = \frac{h}{p} = \frac{h}{\sqrt{2mK.E}}$

$\therefore \lambda \infty \frac{1}{\sqrt{m}}$ [Kinetic energies are same]

$$\frac{\lambda_p}{\lambda_\alpha} = \sqrt{\frac{m_\alpha}{m_p}}$$
$$\frac{\lambda_p}{\lambda_\alpha} = \sqrt{\frac{4m_p}{m_p}}$$
$$\therefore \frac{\lambda_p}{\lambda_\alpha} = \frac{2}{1}$$

17. (a)

Given that,

Initial air temperature, $T_0 = 25°$ C

Initial temperature of object, $T_1 = 80°$ C

Final temperature of object, $T_2 = 70°$ C

Initial temperature of object, $T'_1 = 70°$ C

Final temperature of object, $T_2 = 60°$ C

Now,

By using Newton's law of cooling for the given case we get

$$\frac{\left(T_1^{'} - T_2^{'}\right)}{t} = K\left(\frac{T_1 + T_2}{2} - T_0\right)$$
$$\frac{(80-70)}{12} = K(75-25) \ldots.(\text{i})$$
$$\frac{(70-60)}{t'} = K(65-25) \ldots.(\text{ii})$$

Divide eq. (t) by (ii)

$$t' = 12 \times \frac{5}{4} = 15\,\text{min}$$

18. (a)

As $V_T = \frac{2a^2}{9\eta}(\rho - \sigma)g$

$$V_{T_1} = \frac{2\times(1)^2}{9\eta}(\rho_1 - 0.1\rho_2 g)$$
$$V_{T_1} = \frac{2\times 1}{9\eta}(8\rho_2 - 0.1\rho_2 g) \ldots..(\text{i})$$
$$V_{T_2} = \frac{2\times(2)^2}{9\eta}(\rho_2 - 0.1\rho_2 g) \ldots(\text{ii})$$
$$\therefore \frac{V_{T_1}}{V_{T_2}} = \frac{7.9}{4(0.9)} = \frac{79}{36}$$

19. (d)

Initial speed = 0

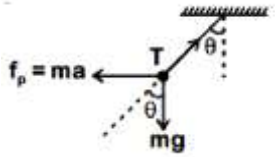
Final speed = V_0
Tangential acceleration = α r
$V^2 = u^2$-h2as20
V_0^2 =0 + 2rα (2α r)n

$$\alpha = \frac{V_0^2}{4\pi nr^2}$$

20. (a)

In both case elevator is an inertial frame of reference so effective gravity remains same from both the frames.So, time of fall remains same in both cases (since initial velocity is same in both frames).
Hence $t_1 = t_2$

21. (c)



Now, for the given case according to free body diagram and from the frame of truck
T$\sin\theta$ = ma
T$\cos\theta$ = mg

$$\tan\theta = \frac{a}{g}$$

$$\theta = \tan^{-1}\left(\frac{a}{g}\right)$$

22.(b)

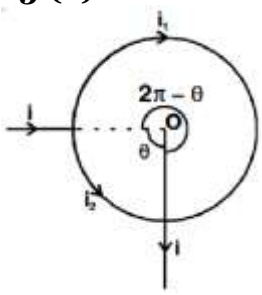
Magnetic field inside a toroid is given as

$$B = \frac{\mu_0 N.I}{2\pi R}$$

Here, $\frac{B_1}{B_2} = \frac{N_1 R_2}{N_2 R_1} = \frac{200}{100}\frac{20}{40} = 1$

So, $\frac{B_1}{B_2} = 1$

23.(b)



Net magnetic field at point TP'

$$B_{net} = \overline{B_1} + \overline{B_2}$$

Here $\overline{B_1}$ and $\overline{B_2}$ are equal in magnitude and opposite in direction.
Hence, $B_{net} = B_1 - B_2$

$$i_1 = i\left(\frac{\theta}{2\pi}\right) \Rightarrow B_1 = \frac{\mu_0 i_1}{2R}\left(\frac{2\pi-\theta}{2\pi}\right)$$

$$i_2 = i\left(\frac{2\pi-\theta}{2\pi}\right) \Rightarrow B_2 = \frac{\mu_0 i_2}{2R}\left(\frac{\theta}{2\pi}\right)$$

$$B_{net} = B_1 - B_2 = 0$$

24.(c)

A current which changes its direction periodically is called alternating current.
Hence given all options are AC.

25.(a)

Given that,

$Q_1 = \sigma 4\pi R_1^2 = \sigma 4\pi R^2$

$Q_2 = \sigma 4\pi (2R)^2 = \sigma 16\pi R^2$

After Redistribution of charges

$\frac{Q_1'}{Q_2'} = \frac{R}{2R} \Rightarrow Q_2' = Q_1' \ldots..(i)$

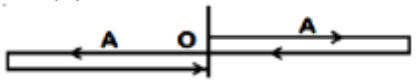
$Q_1' + Q_2' = 20\sigma\pi R \ldots.(ii)$

From eq. (i) and (ii)

$Q_1' = \frac{20}{3}\sigma\pi R^2 \Rightarrow \sigma_1' = \frac{5}{3}\sigma$

$Q_2' = \frac{40}{3}\sigma\pi R^2 \Rightarrow \sigma_2' = \frac{5}{6}\sigma$

26.(a)



In one time period total distance travelled by the particle is 4A.

27.(a)

For surface of earth time taken in falling h distance.

$t = \sqrt{\frac{2h}{g}}$

and $T = 2\pi\sqrt{\frac{I}{g}}$

Given t = 2T

$\frac{t}{T} = 2$

For surface of other planet

$g' = \frac{g}{2}$

Time taken in falling h distance

$t' = \sqrt{\frac{2h}{g'}} = \sqrt{2}t$

and $T' = 2\pi\sqrt{\frac{I}{g'}} = \sqrt{2}T$

Here $\frac{t'}{T'} = \frac{\sqrt{2}t}{\sqrt{2}T} = 2$

$t' = 2T'$

28.(d)

Given that,

l_1= 9.75 cm

l_2= 31.25cm

l_3 = 52.75 cm

e = end correction

Now, for an open-ended tube the relation of wavelength can be expressed as,

$\frac{\lambda}{4} + e = 9.75cm \ldots.(i)$

$\frac{3\lambda}{4} + e = 31.25cm \ldots..(ii)$

$$\frac{3\lambda}{4}-\frac{\lambda}{4}=31.25-9.75$$

$$\frac{\lambda}{2}=21.5$$

$$\lambda=43cm$$

$$v=\lambda\times f$$

$$v=43\times800$$

$$v=34400\times10^{-2}$$

v = 344 m/s

29.(b)

Now by applying law of conservation of linear momentum we get

$$\vec{P}_1=\vec{P}_f$$

$$m\vec{v}_i=\left(\frac{m}{6}\vec{v}_1+\frac{5m}{6}\vec{v}_2\right)$$

$$\vec{v}_i=\left(\frac{\vec{v}_1}{6}+\frac{5\vec{v}_2}{6}\right)$$

$$20\hat{i}+25j-12k=\frac{\left(100\hat{i}+35j+8k\right)}{6}+\frac{5\vec{v}_2}{6}$$

$$12\hat{i}+150j-72k=100\hat{i}+35j+8k+5\vec{v}_2$$

$$20\hat{i}+115j-60k=5\vec{v}_2$$

$$\vec{v}_2=\frac{20\hat{i}+115j-80k}{5}$$

$$\vec{v}_2=4\hat{i}+23j-16k$$

30. (a)

Given that,

Half life of radio active sample, $T_{1/2}$ = 2.2 x 10^9s

Rate of radioactive disintegration, R = 10^{10} /s

$$T_{1/2}=\frac{\ln 2}{\lambda}=\frac{0.693}{\lambda}$$

$$2.2\times10_9=\frac{0.693}{\lambda}$$

$$\lambda=\frac{0.693}{2.2\times10^9}=3.15\times10^{-10}$$

$R=\lambda N$ (R is activity)

$$N=\frac{R}{\lambda}=\frac{10^{10}}{3.15\times10^{-10}}=3.17\times10^{19}$$

31. (b)

Given that,

Time period of satellite, T = 24 h

Now,

By applying Kepler's third law we get

$$T^2\infty r^3$$

$$T^2\infty\left(R_E+h\right)^3$$

$$\frac{T_1^2}{T_2^2}=\frac{\left(R_E+6R_E\right)^3}{\left(R_E+2.5R_E\right)^3}$$

$$\frac{T_1^2}{T_2^2} = \frac{7^3}{\left(\frac{7}{3}\right)^3}$$

$$\frac{T_1^2}{T_2^2} = 8$$

$$T_2 = \frac{T_1}{2\sqrt{2}}$$

$$T_2 = \frac{24}{2\sqrt{2}}$$

$$T_2 = 6\sqrt{2}h$$

32.(b)

Given that,

Voltage of A.C source, V = 12 V

Current, l_1 = 0.2 A

$$I_1 = \frac{12}{\sqrt{R^2 + \left(X_L - X_C\right)^2}} = 0.2A$$

Now, In second case for DC source, capacitor would provide infinite resistance but current is present in circuit, it means resistor and inductor can be present in the circuit.

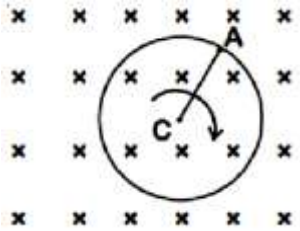
As the current with AC source and DC source are different, inductor must be present with resistance

33.(c)

Given that, Radius, R = 0,5 m

Angular velocity, ω = 10 rad/s

Magnetic field strength, B = 0.1



Now,

$$e = \frac{BI^2\omega}{2}$$

$$= \frac{1}{2} \times 0.1 \times \left(\frac{1}{2}\right)^2 \times 10$$

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

= 0.125 V

34.(b)

Now,

According to Maxwell's electromagnetic wave equation, the relation between velocity, permeability and permittivity.

$$v = \frac{1}{\sqrt{\mu \in}} = \frac{c}{\sqrt{\mu_r \in_r}}$$

$$= \frac{3 \times 10^8}{\sqrt{1 \times 1.44}}$$

$$= 2.5 \times 108 m/s$$

35.(c)

Now, according to Gauss law

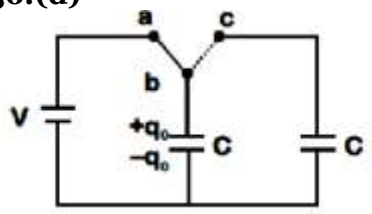
$$\phi_{Total} = \frac{q_{enclosed}}{\varepsilon_0}$$

Dipole have equal and opposite charge, so net charge inside the sphere will be zero ($q_{enclosed} = 0$)

$$\phi_{Total} = \frac{0}{\varepsilon_0}$$

$= 0$

36.(d)



$$U_i = \frac{1}{2}CV^2$$

On switching key at point c

$$\frac{q_0 - q}{C} = \frac{q}{C}$$

$$2q = q_0$$

$$q = \left(\frac{q_0}{2}\right)$$

$$U_f = \frac{1}{2}\left(\frac{q_0}{2}\right)^2 \times \frac{1}{C} + \frac{1}{2}\left(\frac{q_0}{2}\right)^2 \times \frac{1}{C}$$

$$U_f = \frac{q_0^2}{4C}$$

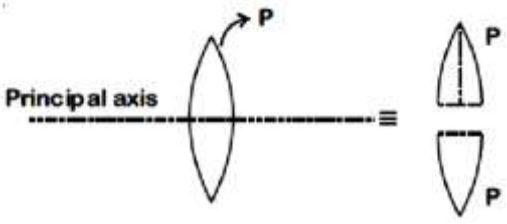
$$U_f = \frac{1}{4}CV^2$$

$$\text{loss} = \left(\frac{U_i - U_f}{U_i}\right) \times 100$$

$$= \frac{\left(\frac{1}{2} - \frac{1}{4}\right)CV^2}{\frac{1}{2}CV^2} \times 100$$

$= 50\%$

37. (a)



If lens is cut in two half as shown in the figure, then power of one part will be same, i,e, P, as focal length remains same,

38.(d)

Now,

Path difference for destructive interference in Young's double slit experiment

$$\Rightarrow \Delta X_n = \frac{(2n-1)}{2} \qquad n = 1, 2, 3....$$

$$\Delta X_{5^{th}} = \left(\frac{2 \times 5 - 1}{2}\right)\lambda = \frac{9\lambda}{2}$$

39. (d)

Given that,

Focal length, f = 25 cm

Refractive index, μ =1,5

Now,

Focal length oflens for given combination will be.

$$\frac{1}{f}=(\mu-1)\left(\frac{1}{R_1}-\frac{1}{R_2}\right)$$

$$\frac{1}{2}=(1.5-1)\left(\frac{1}{R}+\frac{1}{2R}\right)$$

$$\frac{1}{25}=0.5\left(\frac{3}{2R}\right)$$

$$2R=37.5cm$$

$$R=18.75cm$$

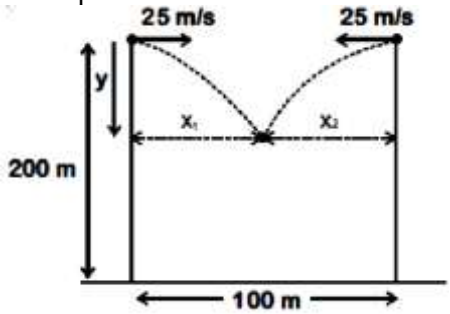
Hence radii are 18.75 cm, 37.5 cm

40. (b)

Given that,

Distance between two building, d = 100 m Height of each building, h = 200 m

Initial peed of bullet fired from each building, u = 25 m/s



Let bullets collide at time t

$x_1 + x_2 = 100$ m

25t + 25t= 100

t= 2s

$$y=\frac{1}{2}gt^2=\frac{1}{2}\times10\times2^2$$

= 20m

h = 200-20= 180m

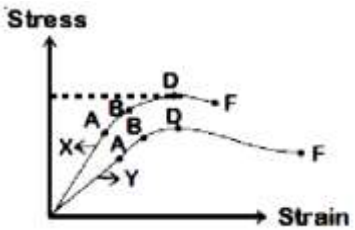
Hence bullets will collide after 2 s at height 180 m above the ground.

41. (c)

Now, for the given case, the fracture point and ultimate strength point for material are close.

As a result, material X is brittle, whereas material Y has two points that are far apart, making it ductile.

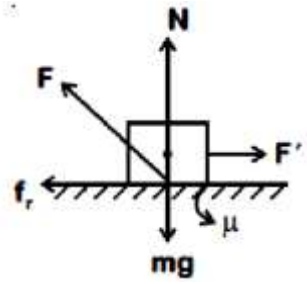
i,e X is brittle and Y is ductile in nature.



42.(d)

Now, for the given case the body does not move

Hence, we can say that body is in equilibrium,



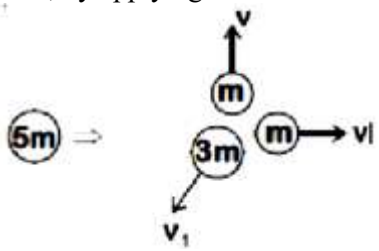
Consider
frictional force which is less than or equal to limiting friction = f_r
Normal force = N
Horizonal force = F
Coefficient of friction = μ
Now,
N = mg

$\therefore \vec{F} = \vec{N} + \vec{f_r}$

$\left|\vec{F}\right| \le (mg)^2 + (\mu mg)^2$

$\left|\vec{F}\right| \le mg\sqrt{1+\mu^2}$

43.(a)
Given that,
Initial mass, M = 5m
Initial velocity, u = 0 m/s
Now, by applying the law of conservation of linear momentum.



Thus, for the given case

$0 = mvj + mv\hat{i} + 3m\vec{v}_1$

$\vec{v}_1 = -\frac{v}{3}\left(\hat{i} + j\right)$

$V_1 = \frac{\sqrt{2}}{3}v$

$KE_i = 0$

$KE_f = \frac{1}{2}mv^2 + \frac{1}{2}mv^2 + \frac{1}{2}(3m)\left(\frac{\sqrt{2}}{3}\right)^2 v^2$

$= mv^2 + \frac{mv^2}{3} = \frac{4}{3}mv^2$

$\Delta KE = KE_f - KE_i = \frac{4}{3}mv^2$

44.(d)
From work-energy theorem we know that
Δ K = work = area under F - x graph
From x = 0 to x = 8 m

$\frac{1}{2}mv^2 = 100 + 30\ 2$

$v^2 = 520$

$v = \sqrt{520} \approx 23 m/s$

From x = 0to x=12m

$\frac{1}{2}mv^2 = 100 + 30 - 47.5 + 20$

$v = \sqrt{410}$

$v = 20.6\ m/s$

Hence appropriate option is 23 m/s and 20.6 m/s

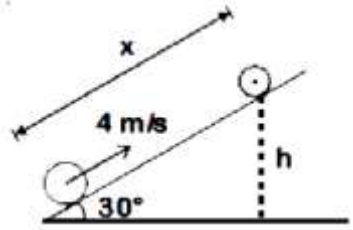
45.(a)

Now, by applying law of conservation of energy we get

$$\frac{1}{2}mv^2\left(1+\frac{K^2}{R^2}\right) = mgh$$

Thus, for the given case velocity of solid cylinder while rolling upward will be

$$v = \sqrt{\frac{2gh}{1+\frac{K^2}{R^2}}}$$



$$v^2 = \frac{2gh}{1+\frac{1}{2}} \ldots \left[\because \frac{K^2}{R^2} = \frac{1}{2} \text{tor solid cylinder}\right]$$

$$2gh = 4^2 \times \frac{3}{2}$$

$$h = \frac{12}{10} = 1.2m$$

$$\therefore x = \frac{h}{\sin 30^0}$$

$$= \frac{1.2}{\frac{1}{2}} = 2.4m$$

x = 2.4m

CHEMISTRY

46.(a)

Molar conductivity of AB is calculated as-

$\lambda_m^0(AB) = \lambda_m^0(A^+) + \lambda_m^0(B^-)$

So, $\lambda_m^0(CH_3COOH) = \lambda_m^0(CH_3COO^-) + \lambda_m^0(H^+)$

So, $\lambda_m^0(CH_3COOH)$

$$= \lambda_m^0(CH_3COOH) + \frac{1}{2}\lambda_m^0(H_2SO_4) - \frac{1}{2}\lambda_m^0(K_2SO_4)$$

$$= z + \frac{x}{2} - \frac{y}{2}$$

47.(a)

Half life for first order reaction is calculated by-

Hair lire period, $t_{\frac{1}{2}} = \frac{0.693}{k} = \frac{0.693}{2.303 \times 10^{-3}} s^{-1}$

=300.91s

Now, 40g $t_{1/2}$ 20 g $t_{1/2}$10g

So, 40 g substance requires 2 half-life periods to reduce upto 10 g
Time taken in reduction = 2 x 300.91 s
= 601.82
=602s

48. (c)

From Arrhenius equation,

$$\log\frac{k_{400}}{k_{200}}=\frac{E_a}{2.303R}\left[\frac{T_2-T_1}{T_1T_2}\right]$$

Since, given that $E_a = 0$

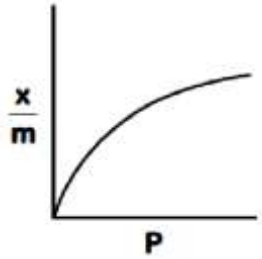
$$\therefore \log\frac{k_{400}}{k_{200}}=0\Rightarrow\frac{k_{400}}{k_{200}}=1$$

So, $k_{400}=k_{200}$

So rate constant at 400 k = 1.6 x 10^6 s^{-1}

49. (b)

According to Freundlich isotherm, graph between x/m and P is drawn as-



$$\frac{x}{m}=KP^{1/n}$$

(n>1)

So, $\frac{x}{m}=KP^{0.3}$ as $\frac{1}{n}=0.3$

So, Answer is (B).

50.(a)

Total number of electrons in O_2
8 + 8 = 16 electrons
Distribution of electrons in M0(molecular orbitals) follows the order as

$(\sigma 1s)^2,(\sigma^* 1s)^2,(\sigma 2s)^2,(\sigma^* 2s)^2,(\sigma 2p_z)^2,$

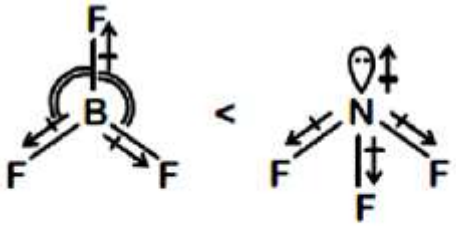
$(\pi 2p_x)^2(\pi^* 2p_x)^1$

$(\pi 2p_y)^2(2p_y)^1$

So, in O_2 molecule, there are two (2) unpaired electrons, so, it is a "paramagnetic" substance in nature.

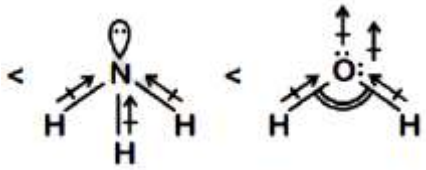
51. (a)

Dipole moment of a molecule is the vector sum of dipoles of bonds. So based on molecular geometry of following molecules,



Three equal vectors at 120° has resultant = 0 so nonpolarmolecule

Vectors not aligned in the same direction of lone pair so less dipole moment



Vectors alligned in same direction of lone pair

Maximum dipole moment

52. (b)

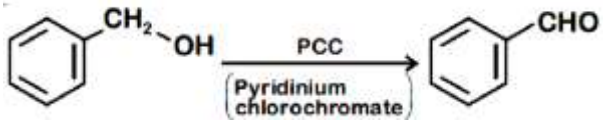
Crude sodium chloride generally obtained by crystallisation of brine solution contains Na_2SO_4, $CaSO_4$, $CaCl_2$ and $MgCl_2$ as impurities,

53. (b)

Out of alkali metal chlorides only LiCl forms a dihydrate, other metal chlorides (KCl, CsCl, RbCl) do not form hydrates.

54. (d)

PCC is oxidising agent.



PCC oxidises primary alcohol to aldehyde,

55. (b)

Secondary amines react with Hinsberg's reagent to give a product which is insoluble in alkali.

(a) is primary amine. (b) is secondary amine.

(c) is tertiary amine (d) is tertiary amine

56. (c)

During denaturation primary structure of proteins remain intact,

57. (d)

Polyacrylonitrile is used as a substitute for wool in making commercial fibre as orlon or acrilan.

58. (d)

Sucralose is trichloro derivative of sucrose. It is an artifical sweetner. It is stable at cooking temperature. It does not provide calories.

59. (d)

Let, volume of solution = 1 litre

Moles of NaOH = 2

Mass of NaOH solution = 1000 x 1.28 = 1280

g Mass of H_2O = (1280 - 2 x 40) = 1200 g = 1.2 kg

Molality Is calculated by-

$$\text{Molality [m]} = \frac{\text{Mole of NaOH}}{\text{Mass of solvent (kg)}}$$

60. (d)

Total number of nodes = (n - 1)

3 = n- 1

n = 4

n is principal quantum number,

Number of angular nodes = $l = 3 \Rightarrow$ f-subshell

$\therefore$ Correct answer is 4f.

61. (c)

$r_n = a_0 n^2$

$r_2 = 52.9 \times (2)^2$ pm

$n\lambda = 2\pi r$

$$\lambda = \frac{2\pi}{n} r$$

$$= \frac{2\pi}{2} \times 52.9 \times 4$$

$$\lambda = 211.6\pi pm$$

62.(a)

Ideal gas equation is-

PV = nRT

$$V = \frac{W}{M}\left(\frac{RT}{P}\right)$$

$$V = \frac{1.8}{18} \times \frac{0.083 \times 647}{1} = 5.37L$$

63.(c)

Work is calculated by-

$W = - P_{ext}(V_f - V_i)$

$= -10^5 (10^{-2}-10^{-3})$

= -900]

64.(a)

Since graph A to C represents adiabatic reversible expansion, so work is done on the expense of internal energy, therefore, internal energy is consumed and there is decrease in internal energy, So the temperature decreases, i.e., $T_c < T_A$

65.(a)

Na_2O is basic oxide $\Rightarrow$ (i) - (b)

Al_2O_3 is amphoteric oxide $\Rightarrow$ (ii) - (d)

N_2O is neutral $\Rightarrow$ (iii) - (a)

Cl_2O_7 is acidic oxide $\Rightarrow$ (iv) - (c)

66.(b)

(i) V_2O_5: Used in the oxidation of SO_2 used in the manufacture of H_2SO_4 (Contact process).

(ii) $TiCl_4$+ $Al(CH_3)_3$: Used in the polymerisation of ethylene

(iii) $PdCl_2$: Used in the oxidation of ethyne toethanal

(iv) Nickel Complex : Used in the polymerisation of alkynes

67.(d)

Stability of carbocation increases with hyperconjugation effect,

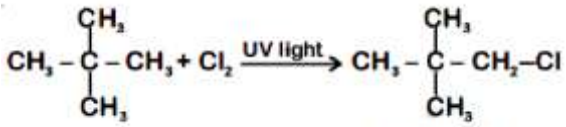
Stability of carbocation depends upon number of $\propto$-H because of +H effect i,e, hyperconjugation effect.

Among the given carbocations,

$CH_3 - \overset{\oplus}{C}H - CH_2 - CH_2 - CH_3$ is the most stable carbocation because number of $\propto$ -H is maximum (5 $\propto$ -H)

68. (c)

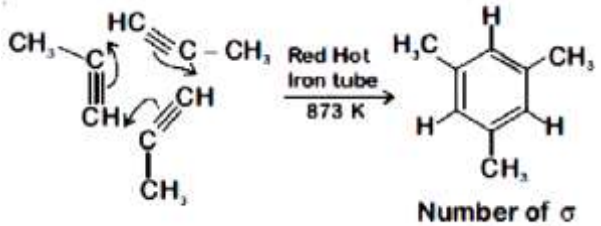
Chlorination of neopentane with Cl_2 in the presence of diffused sunlight gives only one mono-chloro compound.



1-chloro-2, 2-dimethyl propane

69.(b)

Number of sigma bonds in the compound A is calculated by-



70.(b)

$$AlCl_3 \xrightarrow[aq.sol.]{\text{Acidified}} \left[Al(H_2O)_6\right]^{3+}$$

Hybridisation in this co-ordination compound is sp^3d^2.

71. (d)

Solution: Silicones are used in cosmetic surgery. It is used in beauty products.

72.(a)

Gangue is the earthly or undesired material which is contaminating the ore.

73. (b)

$$\underset{(X)}{Ca_3P_2} + 6H_2O \rightarrow 3Ca(OH)_2 + \underset{\substack{(Y)\\ \text{rotton fishsmell}}}{2PH_3}$$

$$\underset{(Y)}{2PH_3} + 3CuSO_4 \rightarrow Cu_3P_2 + 3H_2SO_4$$

$$X = Cu_3P_2$$

74.(d)

H_3PO_2 has strongest reducing property.

Hypo phosphorous acid is a good reducing agent as it contains two P-H bonds.

$4AgNO_3 + 2H_2O + H_3PO_2 \rightarrow 4Ag + 4HNO_3 + H_3PO_4$

75.(b)

Oleum is '$H_2S_2O_7$', It is also known fumic sulfuric acid.

76.(d)

In neutral or faintly alkaline solutions, iodide ion is converted into iodate $\left(IO_3^-\right)$.

$$2MnO_{4^-} + H_2O + I^- \rightarrow 2MnO_2 + 2OH^- + IO_{3^-}$$

77.(a)

Crystal Field Stabilisation Energy (CFSE) in tetrahedral complex is calculated by-

$$\because \Delta_t = \frac{4}{9}\Delta_0$$

$$\Delta_t = \frac{4}{9} \times 18000 cm^{-1} = 8000 cm^{-1}$$

78.(a)

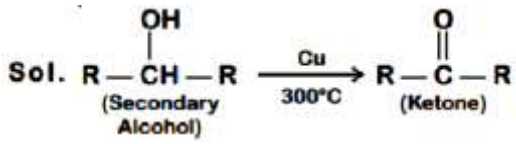
Liquified CO_2 (carbon dioxide) with a suitable detergent is used in dry cleaning,

79.(b)

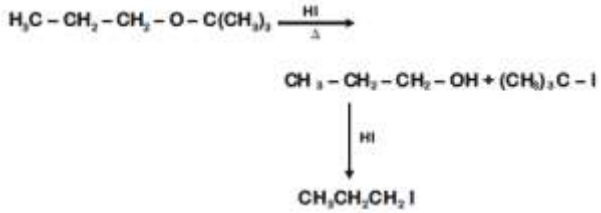
aq. NaOH is used in substitution reaction. Aryl halides do not give substitution reactions due to partial double bond character,

80. (d)

When vapours of a secondary alcohol is passed over heated copper at 573 K, the product formed is ketone.



81.(b)



82.(d)
$[OH^-] = [NaOH] = 0.01\ M = 10^{-2}\ M$
$pOH = -\log[OH^-] = -\log(10^{-2}) = 2$
pH and pOH will be-
pH = 14-pOH = 12

83.(d)
Substance which can release and accept H+ can act as both Bronsted base and acid, HC1 cannot accept H^+ therefore cannot act as Bronsted base and it can release H^+, so it is Bronsted acid.

84. (d)
Ksp of $CaF_2 = 5.3 \times 10^{-11}$
$CaF_2 \rightleftharpoons Ca^{2+} + 2F^-$
t=0, 0 0.1
At eq, s s + 0.1 ≈ 0.1
Ksp is calculated by-
$Ksp = [Ca^{2+}][F^-] = (s)(0.1)^2 15$

$$s = \frac{K_{sp}}{(0.1)^2} = \frac{5.3\times10^{-11}}{(0.1)^2} = 5.3\times10^{-9}\ molL^{-1}$$

85.(d)
The most appropriate oxidation state of Cr in CrO_6 is +6 although CrO_6 has doubtful existence.

86. (c)
The actual structure of $CuSO4 .5H_2O$ is $[Cu(H_2O)_4]SO_4 .H_2O$, so only one water molecule is associated with the molecule via hydrogen bond, Other $4H_2O$ molecule are bound with coordination bond.

87.(b)
$Ni_{0.98}O = (Ni^{2+})_x(Ni^{3+})_{0.98-x}(O^{2-})_1$
Net charge = 0
[x × 2] + [(0.98-x) 3+] [-2 x1] =0
x = 0.94
Fraction of nickel existing as-

$$Ni^{2+} = \frac{0.94}{0.98} = 0.959 \simeq 0.96$$

88. (b)
Solution exhibiting positive deviation from ideal behaviour must have weaker A-B interactions than A-A and B-B interactions,

89. (d)
Mole fraction of water vapour = 0,02
Mole fraction of dry air = 1 – 0.02 = 0,98
Total pressure of saturated air = 1.2 atm
Using Dalton's law of partial pressure,
$PX_{Dry\ air} = P_{Total}\ X_{Dry\ ari} = 1.2 \times 0.98$
= 1.176 atm

90. (b)
Lesser is the reduction potential greater is the reducing power.
Reduction Potential: $Ag^+/Ag > Cr^{3+}/Cr > Al^{3+}/ A1 > K^+/K$
Reducing Power : K > Al > Cr > Ag

BIOLOGY

91. (b)
Selectable markers help in identification and elimination of non-transformants whilst permitting selective

growth of transformants.

92.(b)

Endemic species are those species that are confined to a particular region only and not found anywhere else.

93.(a)

Ozone, in our atmosphere is found in two layers:
1. Stratosphere - good ozone, protects us from UV radiations
2. Troposphere - bad ozone, considered as a pollutant

94.(a)

Bioprospecting refers to exploring molecular, genetic and species level diversity for products of economic importance,

95.(d)

Polyblend is an innovative remedy for plastic waste, Polyblend is a fine powder of recycled plastic waste which after mixing with bitumen, is used to lay roads.

96.(a)

Female wasp and fig species show mutualism, Orchid and the tree on which it grows, cattle egret and grazing cattle, and sea anemone and clown fish show commensalism

97.(a)

Irrigation of agricultural field for a prolonged time without proper drainage leads to waterlogging in the soil, Waterlogging draws salt to the surface of the soil and causes salinity.

98. (d)

Methanogens are anaerobic chemoautotrophs. They grow in anaerobic conditions and breakdown cellulose rich food.

99.(b)

In mung bean, resistance to yellow vein mosaic virus and powdery mildew were induced b y mutations.

100. (d)

Coca alkaloids or cocaine is obtained from, Erythroxylum coca, a native to South America

101. (d)

Cyanobacteria like Anabaena, Nostoc etc, and Rhizobium are able to fix atmospheric nitrogen and act as biofertilizers. Rhizopus and Aspergilius are used in the production of other compounds of human benefit.

102. (a)

DNA fragments are negatively charged molecules separated by forcing them to move towards positive electrode i,e, anode,
Increasing the concentration of a gel reduces the migration speed of DNA,
Smaller the fragment size, farther the DNA moves from the point of loading i,e, the well.
DNA fragment can only be visualised under U V light after staining with ethidlum bromide and not directly.

103. (d)

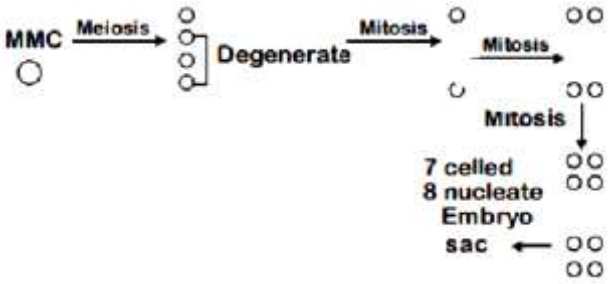
Restriction enzymes belong to a larger class of enzymes called nucleases. Nucleases are of two different kinds:
(a) Exonucleases which remove nucleotides from the end of a DNA molecule.
(b) Endonucleases. which break internal phosphodiester bonds at palindromic sites that are highly specific.
(c) DNA ligase helps in ligating/joining DNA fragments.

104. (b)

RNAi involves silencing of a specific mRNA and therefore the expression of a gene by formation of a dsRNA molecule, The dsRNA which is formed by binding of a complementary RNA (anti-sense RNA) molecule to original mRNA thereby preventing translation of the original mRNA

105. (c)

Monosporic embryo sac is the most common type of embryo sac in flowering plants which develops after one meiosis and three sequential mitosis in megaspore mother cell.



106. (a)
Genetic code is universal, non-ambiguous, non-overlapping and degenerate in nature,

107. (d)
A. Hershey and M, Chase using radiolabelled sulphur and phosphorus in bacteriophage, proved that DNA is the genetic material.

108. (d)
During transcription in eukaryotes, RNA polymerase I transcribes 5.8S,18S and 28S rRNA.

109. (c)
Klinefelter's syndrome is caused due to the presence of an additional copy of X-chromosome resulting into 44 + XXY type chromosome complement.

110. (b)
Initiation and termination factors involved in transcription in eukaryotes are σ and ρ, respectively.

111. (a)
- Agriculture began around 10,000 years back and human settlements started
- Homo habilisprobably did not eat meat.
- Dryopithecus and Ramapithecus primates existing 15 million years ago were hairy and walked like gorillas and chimpanzees.

112. (d)
With the help of Punnett square, the production of gametes, the formation of zygotes and the F_1 and F_2 plants can be understood,

113. (d)
PEP (Phosphoenol pyruvate) is the primary CO_2 acceptor in C_4 or Hatch and Slack pathway.

114. (d)
Auxins shows apical dominance, Elimination of auxins by the removal of shoot tips prevents apical dominance and promotes growth of lateral buds which is very useful in tea leaves production,

115. (a)
Azotobacteris an aerobic bacterium, Cladophora is a green alga. T.W. Engelmann split light into its spectral components and detected that aerobic bacteria accumulated mainly in the region of blue and red light of the split spectrum.

116. (d)
Gibberellins show bolting. When gibberellin is sprayed on sugarcane crop, the length of the stem increases.

117. (a)
Valilsneria shows epihydrophily. Male flowers after breakage, float on the surface of water and reach the female flowers.

118. (c)
Papaya is a dioecious plant in which male and female flowers are produced on two separate plants. Hence, it prevents both autogamy as well as geitonogamy. Castor and maize are monoecious and unisexual. Wheat is monoecious and bisexual.

119. (d)
Basal placentation: Sunflower
Axile placentation: China rose
Parietal placentation: Mustard
Free central placentation: Dianthus

120. (b)
(a) Golgi apparatus - (iii) Formation of glycoproteins and glycolipids
(b) Lysosomes - (iv) Digesting biomolecules

(c) Vacuoles - (ii) Trap waste and excretory products
(d) Ribosomes - (i) Synthesis of protein

121. (c)

Prosthetic groups are organic compounds that are tightly bound to the apoenzyme.
Coenzymes are associated with the apoenzyme but only for a short period of time i,e, transiently.

122. (c)

Crossing over takes place between non-sister chromatids of homologous chromosomes during the pachytene stage of prophase I.

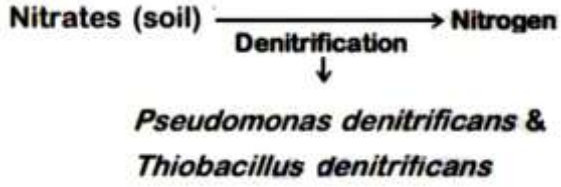
123. (c)

"Ramachandran plot" is used to confirm the structure of proteins, Ramachandran plot, is a way to v isualize energetically allowed regions for backbone dihedral angles ψ against ϕ of amino acid residues to protein structure.

124. (c)

Active transport is uphill transport which requires membrane proteins and ATP. It is highly selective

125. (d)



126. (d)

Solution: When a plant cell is placed in a hypotonic solution, water will flow into the cell as water moves from high water potential to low water potential,

127. (d)

Electron transport system is located in the inner mitochondrial membrane.

128. (a)

: The first word denoting the genus starts with a capital letter while the specific epithet starts with a small letter.

129. (c)

Mad cow disease in cattle is caused by prions. Prions are disease-causing agents having abnormally folded proteins.

130. (b)

Lichens are very good pollution indicators. They do not grow in polluted areas,

131. (b)

Halophiles live in salty areas,
Thermoacidophiles are present in hot springs,
Methanogens are present in the gut of several ruminants,
Cyanobacteria can be present in freshwater/ marine or terrestrial habitat

132. (b)

Vascular cambium is a secondary meristematic tissue, in dicot roots. It originates from the tissue located below the phloem bundles and a portion of pericycle tissue above the protoxylem.

133. (d)

In whorled phyllotaxy, more than two leaves arise at each node and form a whorl or a circle. Alstonla shows whorled phyllotaxy.

134. (d)

Intercalary meristems are found in grasses, where they help to regenerate the parts removed by the grazing herbivores.

135. (d)

Bicarpellary ovary with obliquely placed septum is seen in the members of family Solanaceae, e,g, Solanum.

136. (a)

A single outcross often helps to overcome inbreeding depression, Inbreeding increases homozygosity and close inbreeding usually reduces fertility and even productivity causing inbreeding depression.

137. (a)

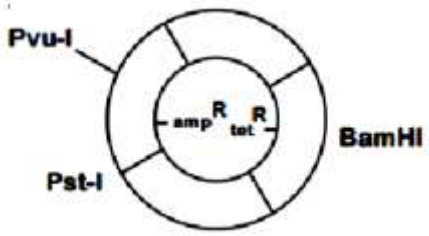
A good biocontrol agent should be species-specific and inactive on non-target organisms

138. (c)

a. Restriction endonuclease: Cuts DNA at specific position
b. Restriction exonuclease: Removes nucleotides from the ends of DNA
c. DNA ligase: Joins the DNA fragments
d. Taq polymerase: Extends primers on genomic DNA template

139. (b)

E.Coli cloning vector pBR322 contains antibiotic resistance genes for Ampicillin and Tetracycline.



140. (c)

Biopiracy is the term used to refer to the use of bio-resources by multinational companies and other organisations without proper authorisation from the countries and people concerned without compensatory payment. In biowar/warfare disease-producing microorganism, toxins, or organic biocides e,g, Bacillus anthracis or Yersinia pestis are used to destroy, injure or immobilize livestock, vegetation, or human life. Bioweapon involves the use of biological toxins or infectious agents such as bacteria, viruses and fungi with the intent to kill human, animal or plant, Bioethics is the study of the ethical issues emerging from advances in biology and medicine.

141. (d)

If two species compete for the same resource, they could avoid competition by choosing, for instance different times for feeding or different foraging patterns. Such mechanism is called resource partitioning.

142. (a)

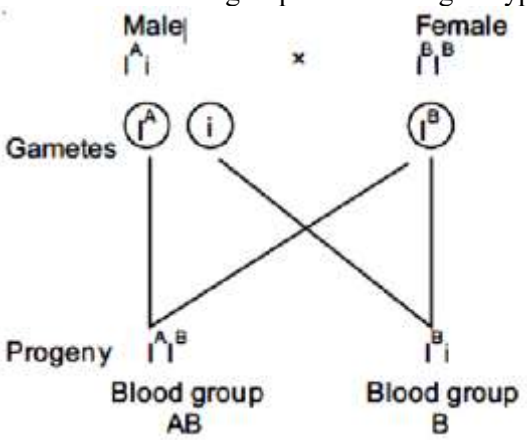
Introduction of the African catfish Clarias garlepinus for aquaculture purposes has become a threat to indigenous catfishes in our rivers. Clarias gariepinus is an alien species for the communities in Yamuna.

143. (d)

In eukaryotes, there are three types of RNA polymerases, RNA polymerase I transcribes rRNAs, RNA polymerase II transcribes hnRNAs, and RNA polymerase III transcribes tRNAs.

144. (b)

Male with blood group A can have genotype I^A i or I^A I^A .
Female with blood group B can have genotype I^BI^B, or I^Bi



145. (d)

When a population of a species invades a new area with many types of vacant habitats, they face different environmental pressures and eventually adapt exhibiting adaptive radiation.

146. (c)

'A' is a hormone such as FSH that cannot cross lipid bilayer therefore it interacts with the

membrane-bound receptors and does not enter the target cell, but generates second messengers. Peptide, polypeptide, protein hormones and catecholamines act through this mechanism.
'B' represents the extracellular receptors present on the cell surface that forms a hormone-receptor complex which brings about conformational changes in the cytoplasmic part of the receptor. This cytoplasmic part can produces second messengers such as Ca^{+2}, cAMP, IP_3 etc, which activates the existing enzyme system of the cell and accelerates the biochemical reactions in the cell. 'C' represents the second messenger.

147. (d)

Innate immunity is non-specific and is accomplished by providing different types of barriers to the entry of foreign agent or any pathogen into our body, Passive immunity is specific and is a branch of humoral immunity. Natural killer cells are a type of lymphocytes which will produce proteins called perforins that create pores on plasma membrane of tumor cells and virally infected cells through which ECF enters and kill the cells, Innate immunity does not produce memory cells hence, no secondary immune response is seen.

148. (b)

Gametogenesis $\rightarrow$ Gamete transfer $\rightarrow$ Syngamy $\rightarrow$ Zygote $\rightarrow$ Cell division (Cleavage) $\rightarrow$ Cell differentiation $\rightarrow$ Organogenesis
$\Rightarrow$ Gametogenesis $\rightarrow$ Formation of gametes
$\Rightarrow$ Gamete transfer $\rightarrow$ Insemination
$\Rightarrow$ Syngamy $\rightarrow$ Fusion of gametes and leading to the formation of zygote
$\Rightarrow$ Cleavage $\rightarrow$ Repeated cell division
$\Rightarrow$ Cell differentiation $\rightarrow$ Specialization of cell to perform specific function.
$\Rightarrow$ Organogenesis $\rightarrow$ Formation of organs

149. (d)

Foetal ejection reflex triggers release of oxytocin from the maternal anterior pituitary gland. Oxytocin acts on the uterine muscles and causes stronger uterine contractions. Milk ejection reflex is caused by combined neurogenic and hormonal reflexes that involve release of oxytocin from posterior pituitary gland.

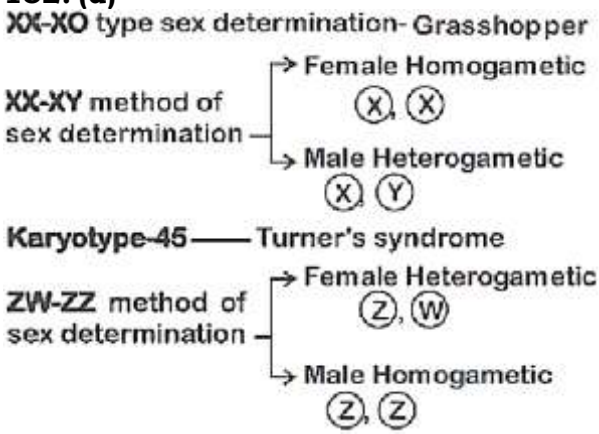
150. (a)

Ovulation is followed by the luteal phase during which the corpus luteum secretes estrogen and progesterone that exerts negative feedback on hypothalamus which in turn inhibits the release of FSH and LH. This prevents the development of new follicles during the luteal phase,

151. (a)

In Australia, marsupials and placental mammals have evolved to share many similar characteristics. This type of evolution may be referred to as convergent evolution. Many placental mammals resemble the marsupial mammals not only in structure but also in leading similar ways of life. These similarities in these two different types of mammals (Marsupials and placentals) w.r.t. ancestors are due to living in the similar ecological niches. Hence, when two different types of organisms converge towards functional similarity, one can conclude that convergent evolution has occurred.

152. (d)



153. (c)

5' TACGTACGTACGTAC 3' (Coding strand)
5' UACGUACGUACGUAC 3' (m-RNA)
In m-RNA, uracil is present in place of thymine in coding strand.

154. (d)
Cones are very sensitive to operate in day light, Rods are very sensitive in dim light. In cochlea, endolymph contains large amount of K^+ ions. Depolarization of sensory hair cells present in cochlea takes place by opening of mechanical gated K^+ channels.

155. (b)
Gliding joint is present between the carpals.
Hinge joint is present between hurnerus and ulna.
Pivot joint is present between atlas and axis.
Saddle joint is present between carpal and metacarpal of thumb,

156. (b)
Myasthenia gravis is an autoimmune disorder that affects neuromuscular junction leading to fatigue, weakening and paralysis of skeletal muscles. Arthritis is inflammation of joints. Gout is inflammation of joints due to accumulation of uric acid crystals. Osteoporosis is an age related disorder characterised by decreased bone mass and increased chances of fractures.

157. (c)
Artificial light, extended work time and reduced sleep-time disrupt the activity of the pineal gland, Melatonin hormone of pineal gland plays a very important role in the regulation of a 24-hours (diurnal) rhythm of our body. Melatonin helps in maintaining the normal rhythms of sleep-wake cycle and body temperature.

158. (c)
Parathyroid hormone (PTH) is a hypercalcemic hormone, i,e, it increases the blood Ca^{2+} level. PTH acts on bones and stimulates the process of bone resorption (dissolution/demineralisation). PTH also stimulates reabsorption of Ca^{2+} by the renal tubules and increases Ca^{2+} absorption from the digested food.

159. (d)
IDDs of all types are in general treated as a foreign body thus inviting phagocytic cells to the uterus. They increase phagocytosis of sperms within the uterus and Cu ions released suppress sperm motility and the fertilising capacity of sperms. IUDs need to be inserted by an experienced nurse and have to be replaced after few years depending on copper or hormonal level.

160. (d)
AIDS and Hepatitis B are sexually transmitted infections. However, they do not specifically affect the reproductive organs only. AIDS is an HIV infection affecting the immune system and opportunistic pathogens can infect various body organs. Hepatitis B affects liver. Agents causing genital herpes, genital warts and chlamydiasis produce lesions on genital organs and also directly affect the reproductive system.

161. (c)
During inspiration, the diaphragm and external intercostal muscles contract causing an increase in the volume of the thoracic cage. As a result intrapulmonary pressure decreases to a level less than atmospheric pressure, causing inspiration, Expiration is initiated due to relaxation of the diaphragm.

162. (c)
Maximum amount of air expired by a person after forceful inspiration or inspired after forceful expiration is known as vital capacity (4600 ml), Total amount of air in the lungs at the end of forceful inspiration is known as the total lung capacity (5800 ml).

163. (a)
SA node acts as pace-maker of heart because its auto-excitable tissue generates heart impulses at the highest rate (frequency).

164. (a)
The delay in transmission of impulse from SAN to the ventricles provided by AVN prevents simultaneous contraction of ventricles and auricles. This allows atria to empty completely before ventricles start con traction,

165. (c)
$\Rightarrow$ Descending limb of Henle's loop $\rightarrow$ Reabsorption of water only
$\Rightarrow$ PCT $\rightarrow$ Reabsorption of ions, water organic nutrients
$\Rightarrow$ Ascending limb of Henle's loop $\rightarrow$ Reabsorption of salts only.
$\Rightarrow$ DCT $\rightarrow$ Conditional reabsorption of sodium ions and water

166. (d)

Solution: Podocytes → Filtration slits
Protonephridia → Amphioxus
Nephridia → Annelids
Renal calculi → Crystallised oxalates

167. (a)
Crista ampullaris → Maintains the dynamic balance of the body
Otolith organ → Consists of two structures i.e. saccule and utricle. The projecting ridge of the saccule and utricle is called macula. The otolith organ maintains the static balance of the body.

168. (c)
The important function of Golgi apparatus is to process, package and transport materials for secretion. Therefore secretory cells have Golgi apparatus in highest number

169. (d)
Nucleolus is non-membranous nucleoplasmic structure in the nucleus. Nucleolus is the site of ribosomal RNA (rRNA) synthesis.

170. (c)
Organisms which have ribosomes of 70 S type are prokaryotes. Prokaryotes have double stranded circular naked DNA which is not enclosed in a membrane,

171. (c)
Meiosis I is reductional division, thus the resultant cell just after meiosis I will have half the number of chromosomes as compared to diploid parent cells. Therefore, if the parent cell has 4C amount of DNA the daughter cell will have 2C amount of DNA and each gamete will have 1C amount of DNA.

172. (c)
Lecithin is an example of phospholipids found in cell membrane. Casein is a phosphoprotein found in milk.

173. (c)
In active transport, materials are transported across a membrane with the help of mobile carrier proteins and ATP. In passive transport, substances move along the concentration gradient, i,e., from its higher concentration to its lower concentration.

174. (a)
Rennin is a milk digesting protein enzyme. Enterokinase converts trypsinogen into trypsin.
Fructose shows facilitated transport. Oxyntic cells secrete HC1 and intrinsic factors that are essential for the absorption of vitamin B_{12}.

175. (a)
Kwashiorkor is produced by protein deficiency but unaccompanied by calorie deficiency. It results from the replacement of mother's milk by a high calorie-low protein diet in a child, who is more than one year of age.

176. (c)
(a) Qphiurs is an echinoderm commonly known as brittle star.
(b) Physatia is a coelenterate (Cnidarian) commonly known as Portuguese man of war.
(c) Pinctada is pearl oyster belonging to taxon bivalve molluscs.
(d) Planaria belongs to Platyhelminthes (flatworms).

177. (a)
Annelids exhibit bilateral symmetry with metameric segmentation where external segments correspond to internal segments. Aschelminthes are pseudocoelomates and platyhelminthes are acoelomates. Adult echinoderms are bilaterally symmetrical.

178. (c)
The keys are based on the set of contrasting characters in a pair known as couplet.

179. (d)
• Tight junctions provide a barrier which prevents leakage of fluid across epithelial cells,
• Adherens junctions aid to cement adjacent cells to form a sheet.
• Gap junctions provide cytoplasmic channels to facilitate communication between adjacent cells.
• Synaptic junctions help in transmission of information through chemicals,

180. (b)
Cockroaches receive several images of an object with the help of ommatidia. This kind of vision possessed by cockroaches is known as mosaic vision which has more sensitivity but less resolution.