Date: 13-Apr-2025

Duration: 3 Hours

Max Marks: 720

Physics - Section A

1.

Answer: 2

Sol:

Moment of inertia about diameter of sphere
$I = \frac{2}{5}mr^2$

Moment of inertia about tangent at their common point

$I_1 = \left(\frac{2}{5}mr^2 + mr^2\right) \times 2 = \frac{14}{5}mr^2$

$I_1 = 7I$

The moment of inertia of both the spheres about the tangent at their common point is $7I$. So, option (2) is correct. Also, since no other options depict this answer, all the other options are incorrect.

2.

Answer: 1

Sol:

Slope of A $= v_A$

Slope of B $= v_B$

$(\text{ slope })_B > (\text{ slope })_A$

$v_B > v_A$

$x_A < x_B$

3.

Answer: 1

Sol:

Since the kinetic energy has been assumed to be negligible, the work done is equal to the change in its potential energy. Thus, work done by an external agent is the change in the potential energy.
W = ΔU = U_f − U_i = $U_{r=\infty}$ −$U_{r=R}$

$= 0-\left(-\frac{GMm}{R}\right)= \frac{GMm}{R} = \frac{gR^2 m}{R} = mgR$

4.

Answer: 1

Sol:

$l' = l_0(1 + \alpha \, \Delta \, \theta)$

$\therefore$ thermal strain $\frac{\Delta \ell}{\ell} = \alpha \, \Delta \, \theta$

Now $Y = \frac{F\ell}{AN}$

$\Rightarrow F = \frac{YA\Delta \ell}{\ell} = YA\alpha \, \Delta \, \theta$

$\Rightarrow \text{Force } = YA\alpha t$

5.

Answer: 4

Sol:

Radius of the steel wire, $r = 2 \times 10^{-3}$ m

Mass of the steel wire, m = 4 kg

$\text{Tensile stress} = \frac{F}{A}$

$g = 3.1\pi$ ms^{-2}

$= \frac{mg}{\pi r^2}$

$= \frac{4 \times 3.1\pi}{\pi \times 4 \times 10^{-6}} = 3.1 \times 10^6$

6.

Answer: 2

Sol:

$T = 2\pi\sqrt{\frac{I}{MB_H}}$

$\Rightarrow \frac{T_1}{T_2} = \sqrt{\frac{I_1}{I_2}}\sqrt{\frac{M_2}{M_1}}$

$\Rightarrow \frac{3}{4} = \sqrt{\frac{3}{2}}\sqrt{\frac{M_2}{M_1}}$

$\Rightarrow \frac{M_1}{M_2} = \frac{3}{2} \times \frac{16}{9} = \frac{8}{3}$

7.

Answer: 1

Sol:

$\tau_0 = (20 \sin 45°)(0.1)$
$+ 10(0) + (30 \sin 60°)(0.05)$

$\sqrt{2} + (1.5)\left(\frac{\sqrt{3}}{2}\right) = 2.71 \, \text{Nm}$

8.

Answer: 3

Sol:

According to Kepler's third law,

$T^2 \propto r^3$

$\Rightarrow \frac{T^2}{T_0^2} = \left(\frac{3R+R}{R}\right)^3 = 64$

$\therefore T = \sqrt{64 \times 90^2} = 720$ min.

9.

Answer: 1

Sol:

Given $x = 4t^2$

Now, velocity -

$v = \frac{dx}{dt}$

$\Rightarrow v = 8t$

At t = 5s

$v = 40 \text{m/s}$

10.

Answer: 4

Sol:

Pressure at surface = $P_{atm} = 1 \times 10^5$ Pa

$V_{surface}$ = ?

Pressure at h = 40 m depth

$P = P_{atm} + \rho gh$

$P = 10^5 + 10^3 \times 10 \times 40$

$P = 5 \times 10^5$ Pa

V= 1 cm^3

Temp. is constant

$P_1V_1 = P_2V_2$

$10^5 \times V = 5 \times 10^5 \times 1$

V = 5 cm^3

11.

Answer: 3

Sol:

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

$\frac{1}{f} = \frac{1}{-20} - \left(-\frac{1}{40}\right)$

$= \frac{-2+1}{40} = -\frac{1}{40}$

$f = -40$ cm

$P = -\frac{200}{0.40} = -2.5D$

12.

Answer: 2

Sol:

$E_{KP} = eV,$ $\therefore E_K = qV,$

$\therefore E_K \, \alpha q,$ $\therefore V = $ constant

$E_{KP} : E_{Kd} : E_{Ka} \, :: \, 1 : 1 : 2.$

13.

Answer: 1

Sol:

From equation of motion:

$mg - T = ma$

$\tau = mg. \frac{l}{2}$

$\alpha = \frac{\tau}{I} = \frac{3g}{2l}$

$a = \frac{L\alpha}{2}$

$mg - T = \frac{2 \, mg}{4}$

$T = \frac{mg}{4}$

14.

Answer: 4

Sol:

As x increases, electric force qE will accelerate the block while elastic force in spring kx will oppose the motion. The block will move away from its initial position x = 0 till it comes to rest, i.e., work done by the force is equal to the energy stored in the spring. So, if x_{max} is the maximum stretch of the spring.

$\frac{1}{2}kx_{max}^2 = \left(qE\right)x_{max} \Rightarrow x_{max} = \frac{2 \, qE}{k}$

$\Rightarrow x_{max} = \frac{2 \times \left(50 \times 10^{-6}\right) \times \left(5 \times 10^5\right)}{100} = 0.5 m$

15.

Answer: 1

Sol:

Given :

m = 5kg

R = 2m

Time t for 1 rev = 3.14 sec or π sec

θ for 1 rev = 2 π rad

Therefore $\omega = \frac{\theta}{t} = \frac{2\pi}{\pi} = 2 \text{ rad/s}$

Centrifugal force $F = mR\omega^2$

$F = 5 \times 2 \times 2^2 = 40 \text{ N}$

16.

Answer: 4

Sol:

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

$W = \text{Area of } \Delta \, AOD + \text{Area of } \Delta \, BOC$

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

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

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

17.

Answer: 3

Sol:

$P_{avg} = V_{rms}I_{rms}\cos\phi$

$= \frac{100}{\sqrt{2}} \times \frac{100}{\sqrt{2}} \times 10^{-3} \cos\left(\frac{\pi}{3}\right)$
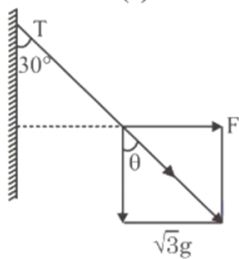
$= 2.5 \text{ watt}$

18.

Answer: 4

Sol:

For a system to be in equilibrium, the torques acting on it must balance. This is true only if the torques are taken about any point on the system or outside it.

19.

Answer: 1
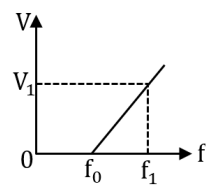
Sol:

$\theta = 30°$

$\cos\theta = \dfrac{\sqrt{3}\,\text{g}}{\text{T}}$

$\Rightarrow \dfrac{\sqrt{3}}{2} = \dfrac{\sqrt{3}\,\text{g}}{\text{T}}$

$\Rightarrow \text{T} = 20 \text{ N}$

20.

Answer: 3

Sol:

Here threshold frequecny= f_0

work function= hf_0

Energy associated with frequency $f_1 = hf_1$

From Einstein's law

KE_{max} = Energy of wave−work function

$KE_{max} = hf_1 - hf_0$

$KE_{max} = h(f_1 - f_0)$

$\therefore (3).$

21.

Answer: 3

Sol:

Step 1: Electric field due to infinite line charge

Electric field due to infinite line charge is given by:

$E = \dfrac{\lambda}{2\pi\in_0 d}$

$\Rightarrow \lambda = 2\pi \in_0 \text{ Ed } \dots \left(i\right)$

Where λ is the linear charge density and d is the perpendicular distance of point from the infinite line charge.

Step 2: Sustituting the values

$\therefore \dfrac{1}{4\pi\in_0} = 9 \times 10^9 \text{ Nm}^2 \text{ C}^{-2}$

$\Rightarrow 2\pi \in_0 = \dfrac{1}{18\times 10^9 \text{ Nm}^2 \text{ C}^{-2}}$

From eq $\left(i\right)$

$\lambda = \dfrac{1\times 9\times 10^4 \text{ NC}^{-1}\times 0.02\text{m}}{18\times 10^9 \text{ Nm}^2 \text{ C}^{-2}}$

$= 10^{-7} \text{ Cm}^{-1}$

22.

Answer: 1

Sol:

Force on each column = $\dfrac{mg}{4}$

Strain = $\dfrac{mg}{4\,AY}$

$\dfrac{50\times 10^3 \times 9.8}{4\times\pi\left[(1)^2 - (0.5)^2\right]\times 2\times 10^{11}}$

$= 2.6 \times 10^{-7}$

23.

Answer: 1

Sol:

As we know that the mass per unit area of disc is given by

$\sigma = \frac{\text{mass}}{\text{area}} = \frac{M}{\pi R^2}$

Therefore , Mass of the cut-out disc is

$m = \frac{M}{\pi R^2} \times \pi \left(\frac{R}{2}\right)^2 = \frac{M}{4}$

Let center of the disc is at the origin of the coordinates. Then we can write the COM of the system as

$X_{CM} = \frac{m_1 r_1 - m_2 r_2 + m_3 r_3}{m_1 - m_2 + m_3}$

$X_{CM} = \frac{M \times 0 - \frac{M}{4}\left(\frac{-R}{2}\right) + \frac{M}{4}\left(\frac{R}{2}\right)}{M - \frac{M}{4} + \frac{M}{4}} = \frac{R}{4}$

$y_{CM} = 0$

24.

Answer: 2

Sol:

As insulator plate is passed between the plates of the capacitor, its capacity increases first and then decreases as the plate slips out. As a result, positive charge on plate A increases first and then decreases, hence current in outer circuit flows from B to A and then from A to B.

25.

Answer: 4

Sol:

In the frame of wedge, the force diagram of block is shown in figure. From free body diagram of wedge.
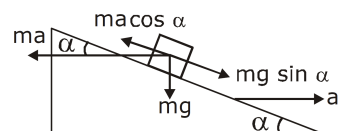
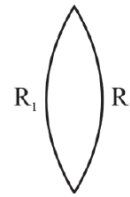For block to remain stationary.

ma cos α = mg sin α

or a = g tan α

26.

Answer: 3

Sol:

From the lens maker formula

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

$\frac{1}{20} = (\mu - 1)\left[\frac{1}{15} - \frac{1}{-30}\right]$

$\frac{1}{20} = (\mu - 1)\left[\frac{2+1}{30}\right]$

$\frac{1}{20} = (\mu - 1)\frac{3}{30}$

$0.5 = \mu - 1$

$\Rightarrow \mu = 1.5$

27.

Answer: 3

Sol:

From photo electric effect

$KE_{\max} = \frac{hc}{\lambda} - W_0$

$\frac{1}{2}mv^2 = \frac{hc}{\lambda} - W_0$

$v^2 = \frac{2hc}{m\lambda} - \frac{2W_0}{m}$

$v^2 = \frac{2hc - 2\lambda W_0}{m\lambda}$

$v = \left[\frac{2hc - 2\lambda W_0}{m\lambda}\right]^{\frac{1}{2}}$

28.

Answer: 1

Sol:

$\frac{1}{2} \times kx^2 = (mg\sin\theta)x$

$\frac{kx}{2} = mg \sin\theta$

$x = \frac{2mg\sin\theta}{K}$

29.

Answer: 3

Sol:

for P-type semiconductor the doping impurity should be trivallent.

30.

Answer: 3

Sol:

$$(BE)_W = 7.5 \times 120 = 900$$

$$(BE)_X = 8.0 \times 90 = 720$$
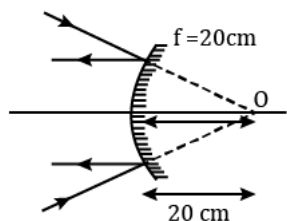
$$(BE)_Y = 8.5 \times 60 = 510$$

$$(BE)_Z = 3.0 \times 5.0 = 150$$

31.

Answer: 1

Sol:

The converging ray appears to converge on the focus of the convex mirror. Therefore after reflection they will travel parallel to the principle axis. So image will be formed at infinity.

$$u = 20 \, \text{cm} \ , \ f = 20 \, \text{cm}$$
$$\frac{1}{v} + \frac{1}{u} = \frac{1}{f} \Rightarrow \frac{1}{v} = \frac{1}{20} - \frac{1}{20}$$
$$v = \infty$$

32.

Answer: 2

Sol:

Applying work energy theorem between the initial point M and the final point (where the block comes to rest), we have

$W_{gravity} + W_{friction} = \Delta KE$

$$\Rightarrow Mg \ h - \mu \ Mg \ s = 0 - 0$$

Where, h is height of bowl and s is the distance travelled by block on the base.

$$\Rightarrow s = \frac{h}{\mu} = \frac{1.5}{0.2} = 7.5 \, \text{m}$$

Therefore, the block will come to rest at midpoint of PQ.

33.

Answer: 3

Sol:

$$\Delta \theta = \Delta \omega + du$$
$$= \left[\frac{1}{2} \times \left(2P_0 + 4P_0 \right) \times 4V_0 \right] + \left[\frac{5}{2} \left(20P_0V_0 - 2P_0V_0 \right) \right]$$
$$= 12P_0V_0 + 45P_0V_0$$
$$\Delta \theta = 57 \, P_0V_0$$

34.

Answer: 3

Sol:

$$\Delta E = Rcz^2 \left(\frac{1}{n_1^2} - \frac{1}{n_2^2} \right) = \frac{hc}{\lambda}$$

C→ Shortest

D→ longest

35.

Answer: 1

Sol:

In forward biasing, resistance is minimum across the diode so, the voltage across R is V only.

36.

Answer: 3

Sol:

$$v_{max} = \sqrt{\mu r g}$$
$$= \sqrt{0.75 \times 60 \times 9.8} = 21 \text{ m/s}$$

37.

Answer: 2
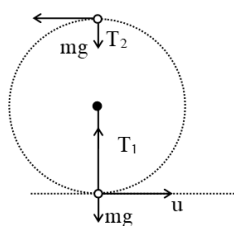
Sol:

Use KCL

38.

Answer: 4

Sol:

$$P_1 V_1 = P_2 V_2 \ [T = \text{ constant}]$$
$$P \propto \frac{1}{V}$$

39.

Answer: 3

Sol:

$$T_1 - mg = \frac{mu^2}{\ell} \qquad \text{......(i)}$$

$$T_2 + mg = \frac{mv^2}{\ell} \qquad \text{......(ii)}$$

and $0 + \frac{1}{2}mu^2 = mg\ 2l + \frac{1}{2}mv^2$

(i-ii) $T_1 - T_2 = \frac{m}{\ell}(u^2 - v^2) + 2mg$

$= \frac{m}{\ell}(4\ gl) + 2\ mg$

$T_1 - T_2 = 6\ mg.$

40.

Answer: 2

Sol:

$$R = \frac{\rho l}{A} \times \frac{l}{l} = \frac{\rho l^2}{V} = \frac{\rho^2 l^2}{m}$$

$$\therefore R \propto \frac{l^2}{m}$$

41.

Answer: 1

Sol:

If r is the radius of the star and T its temperature, then the energy emitted by the star per second through radiation in accordance with Stefan's law will be given by

$$A\sigma T^4 = 4\pi r^2 \sigma T^4$$
$$Q = 4\pi r^2 \sigma T^4$$
$$\Rightarrow T = \left(\frac{Q}{4\pi R^2 \sigma}\right)^{1/4}$$

42.

Answer: 3

Sol:

By theory

43.

Answer: 4

Sol:

Given :

$y_1 = a \sin \frac{2\pi}{\lambda}(vt-x)$ and $y_2 = a \cos \frac{2\pi}{\lambda}(vt-x)$

The phase difference between the waves

$\phi = \frac{\pi}{2}$
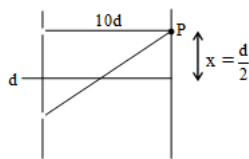
$$A = \sqrt{a_1^2 + a_2^2 + 2a_1 a_2 \cos\phi}$$
$$A = \sqrt{a^2 + a^2 + 2a.\, a \cos 90°}$$
$$A = \sqrt{2}a$$

44.

Answer: 1

Sol:

Path difference $= \Delta x = \frac{xd}{D}$ ......(1)

In front of one of the slits -

$x = \frac{d}{2}$ but $d = 5\lambda$

$x = \frac{5\lambda}{2}$ and $D = 10\,d$

So from equation (1)

Δx at $P = \frac{dx}{D} = \frac{d^2}{2D} = \frac{(5\lambda)^2}{2 \times 10 \times d}$

$\Delta x = \frac{(5\lambda)^2}{2 \times 10 \times 5\lambda} = \frac{\lambda}{4}$

So corresponding phase difference

$\phi = \frac{2\pi}{\lambda}(\Delta x) = \frac{2\pi}{\lambda} \times \frac{\lambda}{4} = \frac{\pi}{2}$

As $I = I_0 \cos^2\left(\frac{\phi}{2}\right)$

So, $I = I_0 \cos^2\left(\frac{\pi}{4}\right) = \frac{I_0}{2}$

45.

Answer: 1

Sol:

From the formula of force, we get the value of ε_0 as,

$F = \frac{1}{4\pi\varepsilon_0} \frac{q_1 q_2}{r^2}$

$\Rightarrow \varepsilon_0 = \frac{1}{4\pi F} \frac{q_1 q_2}{r^2}$

Substituting the dimensions for each quantity,

$[\varepsilon_0] = \frac{1}{[MLT^{-2}]} \times \frac{[IT]^2}{[L]^2}$

$\Rightarrow [\varepsilon_0] = [\mathbf{M^{-1}L^{-3}T^4I^2}]$

We know the unit of μ_0 is N/A^2

So, the dimension is given by,

$\mu_0 = {}^N\!/\!_{A^2} = \frac{[MLT^{-2}]}{[I^2]} = [\mathbf{MLT^{-2}I^{-2}}]$

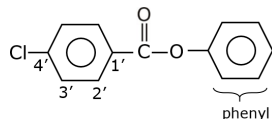So, B and C are the correct answers.

Answer: Option (1)

46.

Answer: 2

Sol:

Esters are named as ("alkyl alkanoate")

IUPAC name : Phenyl-4-chlorobenzenecarboxylate

Here, carboxylate is used for ester as its 'C' cannot be included in parent chain.
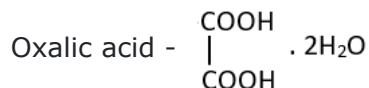
47.

Answer: 1

Sol:

Polarisability∝size

$$\xrightarrow{\underset{\text{Polarisability increases}}{He \quad Ne \quad Ar \quad Kr \quad Xe}}$$

48.

Answer: 4

Sol:

Weight of oxalic acid hydrated = 3.1500 g

Oxalic acid - $\begin{matrix} COOH \\ | \\ COOH \end{matrix}$. $2H_2O$

Molar mass of oxalic acid is

$12×2+4×16+2+2×16+4×1=126$ g mol^{-1}

$Molarity = \frac{No.\ of\ moles\ of\ solute}{Volume\ of\ solution\ in\ L}$

No. of moles $= \frac{Given\ mass}{Molar\ mass} = \frac{3.1500}{126} = 0.025$

$Molarity = \frac{0.025}{250} \times 1000$

$Molarity = 0.1\ M$

Hence, Both A and R is true and R is the correct explaination of A.

49.

Answer: 2

Sol:

ΔG = ΔH−TΔS

At equilibrium, ΔG = 0;

⇒ΔH = TΔS

$T_{vap} = \frac{\Delta H}{\Delta S} = \frac{40.73}{0.109} = 373.6K$

50.

Answer: 3

Sol:

$\triangle T_b = iK_b m$

(i) $[NaCl]_{effective} = i_{NaCl}[NaCl]$

$= 2×[0.15]=0.30M$

(2) $[Glucose]_{effective} = i_{glucose}[Glucose]$

$= 1×04=0.4M$

(3) $[CaCl_2]_{effective} = i_{CaCl_2}[CaCl_2]$

$= 3×[0.15]=0.45M$

(4) $[Urea]_{effective} = i_{urea}[Urea]$
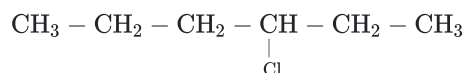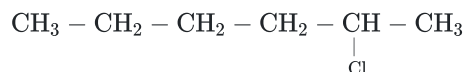
$= 1[0.15]=0.15M$

51.

Answer: 2

Sol:

Osmotic pressure = CRT where C = 1 m

$\pi = CRT = 1 \times 0.0821 \times 300 = 24.6\ atm$

52.

Answer: 2

Sol:

In n-hexane, there is a symmetry of the structure at third and fourth carbon. So, chlorine can attach to first, second, and third carbon to give 3 monochloro derivatives. These monochloro derivatives are:

$CH_3 - CH_2 - CH_2 - CH_2 - CH_2 - CH_2\,Cl$

$CH_3 - CH_2 - CH_2 - CH_2 - \underset{\underset{Cl}{|}}{CH} - CH_3$

$CH_3 - CH_2 - CH_2 - \underset{\underset{Cl}{|}}{CH} - CH_2 - CH_3$

53.

Answer: 1

Sol:

Tl^{3+} does not exist because of inert pair effect.

54.

Answer: 3

Sol:

Radial Node = $n - \ell - 1$

$\Rightarrow$ n = 3, $\ell = 1$, for 3p

= 3 − 1 − 1

= 1

55.

Answer: 1

Sol:

Statement -I: When strong acid react with strong base than enthalpy is more Neutralize but weak acid react with strong base enthalpy is less neutralize because heat is absorbed in the ionization process that means Enthalpy of neutralization of CH_3COOH by NaOH is less than that of HCl by NaOH.

Statement-II : Weak acid react with strong base enthalpy is less neutralize because heat is absorbed in the ionization process while Enthalpy of neutralization of CH_3COOH is less.

Hence Statement I and II is true and Statement-II is the correct explanation of Statement-I.

56.

Answer: 4

Sol:
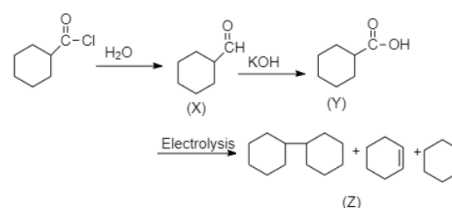
57.

Answer: 4

Sol:

Nesseler's reagent is K_2HgI_4 so it contains HgI_4^{-2} ion.
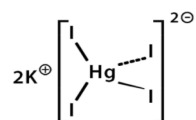
Molecular structure of nesseler's reagent.

58.

Answer: 3

Sol:
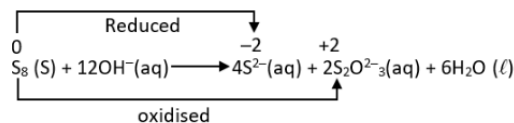
So, statement I is correct.

ClO_4^- does not disproportionate because Cl is already present in its highest oxidation state.

So, statement II is incorrect.

59.

Answer: 2

Sol:

For zero order

$t = \dfrac{x}{K}$

For completion x = a

$t = \dfrac{a}{K}$

60.

Answer: 3

Sol:

(a) 0.0005M H_2SO_4

$[H^+]=2\times0.0005$ M $=10^{-2}$ M

pH = $-\log[H^+]$

$= -\log 10^{-2} = 2$

(b) Na_2SO_4 is a neutral salt so its pH is 7

(c) 10^{-2}M NaOH

$[OH^-]=10^{-2}$M

$= -\log 10^{-2}$

$= 2$

pH = $14-2$

$= 12$

(d) 0.01M HCl

$[H^+] = 0.01$M$=10^{-2}$M

pH = $-\log 10^{-2}=2$

61.

Answer: 2

Sol:
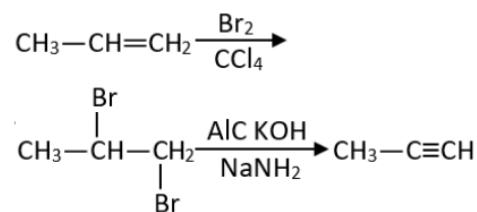
62.

Answer: 2

Sol:

According to the Pauling's electronegativity scale, O is next to F.

	electronegativity
F	3.98
O	3.4

63.

Answer: 4

Sol:

Given;

n = 1

a = 1.0 M

a – K = 0.25 M

                    t = 20 min

K = ?

$K = \frac{2.303}{t}\log\frac{a}{a-x}$

$K = \frac{2.303}{20}\log\frac{a}{1/4}$

$K = \frac{2.303}{10}\log 2$

$K = \frac{0.693}{10} = 0.0693$ min^{-1}

Or,

$1 \xrightarrow{T_{1/2}} 1/2 \xrightarrow{T_{1/2}} 1/4$

$2\, t_{1/2}=20$ min

$t_{1/2}=10$ min

$K = \frac{0.693}{10} = 0.0693$ min^{-1}

64.

Answer: 1

Sol:

According to Bronsted-Lowry theory, acid is a substance which donates an H^+ ion or a proton and forms its conjugate base and the base is a substance which accepts an H^+ ion or a proton and forms its conjugate acid.

$HPO_4^{-2} \rightarrow PO_4^{3-} + H^+$
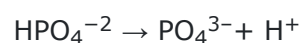
65.

Answer: 1

Sol:

(i) The nucleophile makes a rear attack in S_N2 reaction and expels the leaving group from front side.

(iii) The basicity of halides decreases in the order $F^- > Cl^- > Br^- > I^-$, but the nucleophillicity is reverse of it. (in polar protic solvents)

(v) Sigma complex or arenium ion is resonance stabilised.

The above statements are correct.

(ii) $CH_3O - CH = CH_2$ adds to HBr according to Markownikoff's rule

(iv) The rate of S_N2 reaction is faster in polar aprotic solvent.

66.

Answer: 4

Sol:

$Al_2O_3 \rightarrow$ Amphoteric

$N_2O_5 \rightarrow$ Acidic

$Bi_2O_3 \rightarrow$ Basic

$CO \rightarrow$ Neutral

The correct order is i-c, ii-b, iii-d, iv-a.

67.

Answer: 4

Sol:

Na_2S

$K_{sp} = x^x y^y s^{(x+y)}$

$= 2^2 . 1^1 . s^{(2+1)}$

$= 4.1.s^3 = 4s^3$

ZnS

$K_{sp} = 1^1 . 1^1 . s^{(1+1)}$

$= 1.s^2$

$= s^2$

CuS

$K_{sp} = 1^1 . 1^1 . s^{(1+1)}$

$= s^2$

$Na_2S > ZnS > CuS$

68.

Answer: 4

Sol:
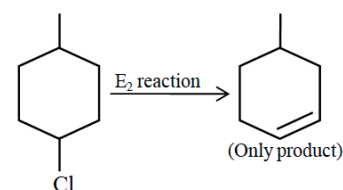
69.

Answer: 2

Sol:

1 debye $= 10^{-18}$ esu-cm

70.

Answer: 3

Sol:

If copper spoon is used to stir a aluminium nitrate solution

Then Cu is less reactive than Al so it can not be able to replace aluminium so no reaction will be occours

71.

Answer: 3

Sol:

Diazotisation

coupling reaction

72.

Answer: 1

Sol:

In PCl5, phosphorous undergoes sp3d hybridization and has trigonal bipyramidal geometry. It has two axial chlorine atoms & three equatorial chlorine atoms bonded to the central P. Hence bond angles for axial are 90°, Cl-P-Cl & for equatorial Cl-P-Cl it is 120°.
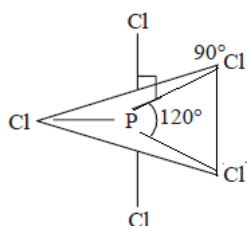
73.

Answer: 3

Sol:

Given,

$Fe^{2+} \mid Fe = -0.44V$

$Sn^{2+} \mid Sn = -0.14V$

For reaction,

$Fe + Sn^{2+} \rightarrow Fe^{2+} + Sn$

$Fe \rightarrow Fe^{2+} + 2e$; SRP

$= -0.44V \left(anode\right)$

$Sn^{2+} + 2e \rightarrow Sn;\ SRP$
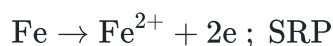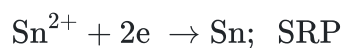
$= -.14V \left(cathode\right)$

We know that,

$E^0 \left(cell\right)$

$= E^0\ Cathode - E^0\ anode$

$= -0.14 - \left(-0.44\right)$

$= +.30\ V$

Answer - $E^0_{cell} = +.30V$

74.

Answer: 1

Sol:
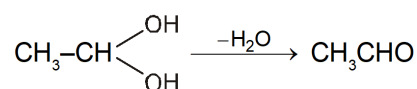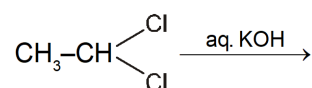
75.

Answer: 3

Sol:

One by pπ–pπ overlap & other by pπ–dπ overlap

76.

Answer: 1

Sol:

With increasing dilution

Specific conductance or

conductivity decreases

whereas molar conductance increases

$$\lambda_m = \frac{k.1000}{m} \quad m \propto \frac{1}{V}$$

77.

Answer: 3

Sol:

An organic compound form yellow precipitate of iodoform with I_2 in presence of alkali, if it has $CH_3\,CO$ group directly or it has
$2HI + 3NaI + CH_3\,COONa + 3H_2O$

$$CH_2\,CH(OH)\,CH_3 + I_2 \xrightarrow{NaOH} CH_3\,COCH_3$$

$CH_3\,COCH_3 + 3I_2 + 4NaOH \rightarrow \underset{yellow\ ppt.}{CHI_3} \downarrow$
$+3NaI + CH_3\,COONa + 3H_2O$

$CH_3\,CH_2\,CH(OH)\,CH_3 + I_2 \rightarrow \underset{\text{Ethyl methyl ketone}}{CH_3CH_2\underset{O}{\overset{\|}{C}}CH_3 + 2HI}$

It gives iodoform test.

$CH_3CH_2\underset{O}{\overset{\|}{C}}CH_3 + 3I_2 + 4NaOH \rightarrow$
$\underset{Yellow\ ppt.}{CHI_3} \downarrow +3NaI + CH_3\,CH_2\,COONa + 3H_2O$

$$CH_3\,OH + I_2 \rightarrow HCHO + 2\,HI$$
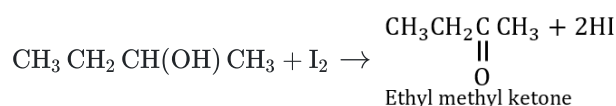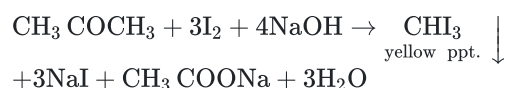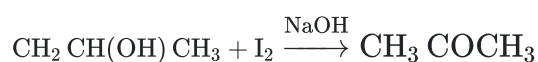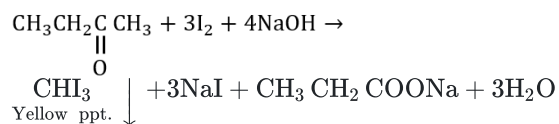
It does not have methyl ketonic group, so it does not give yellow ppt. with I_2 in presence of alkali.

$CH_3CH_2OH + I_2 \rightarrow CH_3\underset{O}{\overset{\|}{CH}} + 2HI$

It gives iodoform test.

$CH_3\underset{O}{\overset{\|}{CH}} + 3I_2 + 4NaOH \rightarrow CHI_3 \underset{ppt.}{Yellow}$
$+HCOONa + 3NaI + 2H_2O$
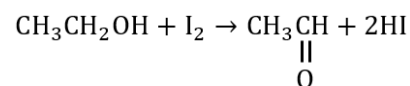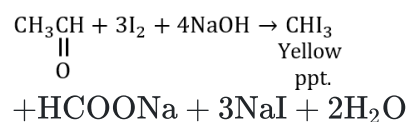
78.

Answer: 1

Sol:

The molecular orbital of O_2 is:
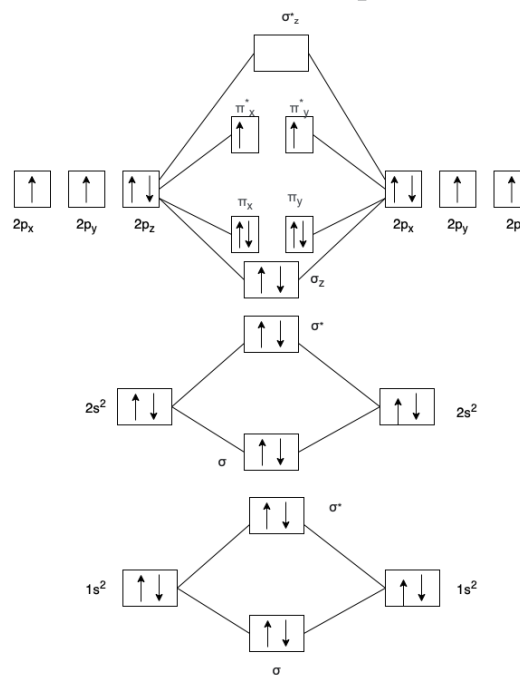
Figure: Molecular orbital of O_2

From the above we can see that the next electron is going to be filled in $\pi^*_{2p_x}$

1. The next electron is going to be filled in $\pi^*_{2p_x}$ for O_2^-. Hence this is **correct**.

2. The π_{2p_y} orbital is already filled in O_2. Hence this is **incorrect**.

3. The π_{2p_x} orbital is already filled in O_2. Hence this is **incorrect**.

4. The $\sigma^*_{2p_z}$ will be filled for the next third and fourth electrons. Hence this is **incorrect**.

79.

Answer: 1

Sol:

$A_{2(g)} + B_{2(g)} \rightleftharpoons 2AB_{(g)}\ \Delta H = +$
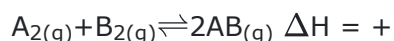
Since it is case of $\Delta n_g = 2-2 = 0$

So by increase of pressure equilibrium never be shift this because $\Delta n_{(g)} = 0$

80.

Answer: 3

Sol:
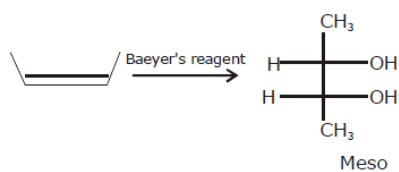
81.

Answer: 4

Sol:
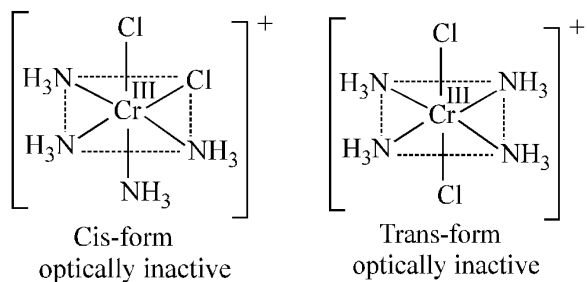
82.

Answer: 3

Sol:

This reaction occurs by S_N1 mechanism as stable benzyl carbocation is possible it means I^- goes with benzyl carbocation to give benzyl iodide the other product is phenol.

83.

Answer: 3

Sol:

Co $\rightarrow$ $3d^7 4S^2$

$Co^{3+} \rightarrow 3d^6 4S^0$

OX $\Rightarrow$

$$\begin{array}{c} O \\ \parallel \\ C=O^\ominus \\ \mid \\ C=O \\ \mid \\ C-O^\ominus \\ \parallel \\ O \end{array}$$ (2 negative charge)

$[Co\,(oxl_3]^{3-}$

$\downarrow$

Co^{3+} change in complex

$Co^{3+} \rightarrow 3d^6 4S^0$

| ⇅ | ↑ | ↑ | ↑ | ↑ | G.S Co^{3+}

Co^{3+} has more zeft value. in case of ox^{--} ions pairing is possible.

| ⇅ | ↑ | ↑ | ↑ | ↑ | after pairing

| ↑↓ | ↑↓ | ↑↓ | |

electron only more eg to t_2g and eg to t_2g only d^4, d^5, d^6, d^7, d^8, d^9 pairing is possible t_2g orbital electron half sleep pairing not possible.

| ↑↓ | ↑↓ | ↑↓ | | | | |

$\underbrace{OX^2 \; OX^2}_{d^2} \; \underbrace{OX^2}_{s} \; \underbrace{OX^2 \; OX^2 \; OX^2}_{P_x P_y P_z} \longrightarrow d^2Sp^3$

d^2sp^3 hybridization one possible pairing electron d^6 case so, he is diamagnetic in nature.

II $[Co\,(NH_3)_6]^{3+}$

$\downarrow$

     d^6 C,N $\rightarrow$ donor is S.F.L So, pairing is Possible. diamagnetic in nature.

III $[CoF_6]^{3-}$

     —

$Co^{3+} \rightarrow F^\ominus$ is W.F.L ligand.

$I^\ominus < Br^\ominus < Cl^\ominus < F^\ominus$ (order of strong ligand in halogan but all halogen is W.F.L ligand)

| ↑↓ | ↑ | ↑ | ↑ | ↑ |

$\downarrow$

Pairing is not possible.

| ↑↓ | ↑ | ↑ | ↑ | ↑ | | | | |

$\underbrace{F_s}_{} \; \underbrace{F \; F \; F}_{P_x \, P_y \, P_z} \; \underbrace{F \; F \; F}_{d_{xy} \; dx^2-y^2 \; dz^2}$

Sp^3d^2

84.

Answer: 1

Sol:

Aromatic by $6\pi e$

Non-aromatic

Anti-aromatic by $4\pi e$

Order of stability - Aromatic > Non aromatic > Antiaromatic

85.

Answer: 1

Sol:

 square coplanar

$(s + p_x + p_y + d_{x2-y2})$ all equatorial.

dps^2 type of hybridization is seen specially in case of transition metal ions. The orbitals involved in this type of hybridization are $d_{x^2-y^2}$, S and two P orbitals. The four dsp^2 hybrid orbitals adopt square planner geometry.

86.

Answer: 3

Sol:

 on reaction with $NaNO_2\,/\,HCI$ then $\beta-$

napthol form red dye but do not.

87.

Answer: 1

Sol:

Zn^{+2} consist of paired electron so it is diamagnetic in Nature. Its outer most configuration is $3d^{10}$

| ↑↓ | ↑↓ | ↑↓ | ↑↓ | ↑↓ |

88.

Answer: 4

Sol:

Nessler reagent is used for detection of NH_4^+.

Nessler reagent gives a brown ppt with NH_4^+ ion.

$NH_4Cl + 2K_2[HgI_4] + 4\,KOH \rightarrow$

$\quad \underset{\substack{\text{Iodide of million's base} \\ \text{(Brown ppt.)}}}{NH_2 - Hg - O - Hg - I} + 7\,KI + KCl + 3H_2O$
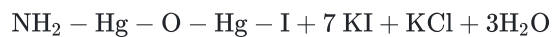
89.

Answer: 1

Sol:

Out of Ti^{4+}, Cu^{2+}, Co^{3+} & Fe^{2+} only Ti^{4+} is diamagnetic with $3d^0$. Thus due to absence of dl-electrons it is colourless.

90.

Answer: 2

Sol:

$$Cu^{2+} + CN\overset{\ominus}{S} \longrightarrow \underset{\text{(white ppt)}}{Cu\ CNS}$$

$$Fe^{3+} + 6\,CNS \longrightarrow \underset{\text{Blood red colour}}{\left[Fe(CNS)_6\right]^{3-}}$$
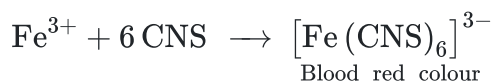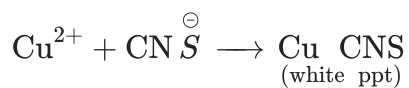
Al^{3+} & Zn^{2+} not give reaction with CNS

91.

Answer: 2

Sol:

Indigo dye is derived from several plant species across the world, but most significantly from the Indigofera genus of plants from the legume family. The floral formula is repersented by % ♀ $K_{(5)}$ $C_{1+2+(2)}$ $A_{(9)+1}$ $\underline{G}_1$.

92.

Answer: 4

Sol:

Intercalated discs are communication junctions found in the cardiac muscles. They allow the cells of the cardiac tissue to contract as a unit. These are characteristic features of cardiac muscles. These are not found in smooth muscles.

Smooth muscles are found in the walls of internal hollow organs such as the blood vessels, alimentary canal, and reproductive tract.

Smooth muscles lack striations and are hence called smooth muscles or non-striated muscles.

The activities of these muscles are not under the voluntary control of the nervous system. So these muscles are called involuntary muscles.

11th NCERT Page No: 105

93.

Answer: 3

Sol:

In the case of C_3 plants, 3 molecules of ATP and 2 molecules of $NADPH_2$ are required per carbon atom fixed into sugars making the total requirement to produce one molecule of hexose sugar as 18 molecules of ATP and 12 molecules of $NADPH_2$.

In C_4 plants, 5 molecules of ATP and 2 molecules of $NADPH_2$ are required per carbon atom fixed into sugars making the total requirement to produce one molecule of hexose sugar as 30 molecules of ATP and 12 molecules of $NADPH_2$.

Hence, the correct answer is 18 & 30 molecules of ATP respectively.

94.

Answer: 2

Sol:

12th NCERT, Page No.- 38

95.

Answer: 4

Sol:

Class 12th NCERT Page No. 169

96.

Answer: 1

Sol:

Female wasp and fig species

12th NCERT PAGE NO.- 202

97.

Answer: 1

Sol:

11th NEW NCERT PAGE NO. 6

98.

Answer: 1

Sol:

About 70% of carbon dioxide is transported as sodium bicarbonate. As CO_2 diffuses into the blood plasma, a large part of it combines with water to form carbonic acid in the presence of the enzyme carbonic anhydrase.

Carbonic anhydrase is a zinc enzyme that speeds up the formation of carbonic acid.

99.

Answer: 2

Sol:

11th Old NCERT PAGE NO. 71

100.

Answer: 1

Sol:

11th NCERT, Page No. : 317, 318

101.

Answer: 3

Sol:

Class 11th NCERT Page No. 211, 212, 213

102.

Answer: 4

Sol:

12th NCERT PAGE NO.- 31

103.

Answer: 2

Sol:

Class 12th NCERT Page No. 170

104.

Answer: 3

Sol:

Predators are prudent in nature, if predator is too efficient and overexploits its prey, then the prey might become extinct and following it, the predator will also become extinct for lack of food.

The most imporatant thing about predtor they do not over exploit their prey .

105.

Answer: 1

Sol:

In most common bee species, worker bees are infertile due to enforced altruistic kin selection, and thus never reproduce. Workers are nevertheless considered female for anatomical and genetic reasons.

106.

Answer: 2

Sol:

(i) Inspiratory capacity (IC) : Tidal volume $+$ Inspiratory reserve volume $(\text{TV} + \text{IRV})$

(ii) **Vital Capacity (VC)** : Tidal volume $+$ Inspiratory Reserve Volume $+$ Expiratory Reserve Volume $(\text{TV} + \text{ERV} + \text{IRV})$

(iii) **Residual Volume (RV)** : Volume of air remaining in the lungs after a forcible expiration.

107.

Answer: 2

Sol:

The given diagram is of cymose.

The arrangement of older flowers at the apex and fresh flowers and buds at the base is known as basipetal order. The primary axis of a cymose inflorescence terminates in a flower, limiting its expansion.

108.

Answer: 3

Sol:

Annealing: In this process temperature is lowered to approximately 5 °C below the melting temperature (Tm) of the primers (often 45–60 °C) to promote primer binding to the template.

109.

Answer: 3

Sol:

11th NCERT, Page No. - 319

110.

Answer: 3

Sol:

Class 11th NCERT Page No. 209

111.

Answer: 2

Sol:

12th NCERT, Page No.- 37

112.

Answer: 1

Sol:

Exotic species :- plant species introduced from other countries which are not otherwise found local are termed exotic

large varieties of exotic species have been introduced from other parts of the world through the ages in India. e.g., water hyacinth and Lantana camara.

113.

Answer: 3

Sol:

Mycoplasma is the smallest cell which does not possess cell wall as an outer covering but has cell membrane as an outer covering. As they do not have cell wall they do not get affected by the antibiotics and causes severe diseases to the plants and animals.

114.

Answer: 3

Sol:

11th OLD NCERT, PAGE NO.- 281

115.

Answer: 2

Sol:

Biolistics is one of the methods of transformation. It is one of the methods of direct gene delivery into host cells. It is also known as a **gene gun.** In this method, plant cells are **bombarded** with **high-velocity microparticles** of **gold or tungsten coated with DNA.** Gold or tungsten are inert in nature, so they do not alter the chemical composition of cells.

116.

Answer: 3

Sol:

Class 12th NCERT Page No. 74

117.

Answer: 4

Sol:

The hypothalamus has the largest amount of nuclei that can be monitored and controlled too, so it is the key brain region for controlling the process of homeostasis and temperature.

Hypothalamus also controls sexual desires and also controls pituitary hormone secretion.

118.

Answer: 1

Sol:

Molecular O_2 is both is only e⁻ acceptor. Pyruvate dehydrogenase converts pyruvic acid to acetyl CoA.

Oxalosuccinic acid is converted into α - ketoglutaric acid by decarboxylase enzyme in TCA cycle.

119.

Answer: 3

Sol:

12th NCERT, Page No.- 48

120.

Answer: 2

Sol:

Mutualism (+, +) or Symbiosis (co-evolution, co-existance and co-extinction) Positive inter specific interation in which members of two different species completely depend on each other for growth and survival It is an obligatory relationship.

Th**e female wasp** uses the fruit not only as an **oviposition (egg-laying)** site but uses the developing seeds with in the fruit for nourishing its larva. The wasp pollinates the fig inflorescence while searching for suitable egg-laying sites. In return for the favour of pollination the **fig offers** the wasp some of its developing seeds, as **food** for the developing wasp larvae.

121.

Answer: 2

Sol:

Prokaryotes (bacteria and archaea) reproduce asexually through binary fission. Most prokaryotes reproduce rapidly.

Transduction is the transfer of genetic material from one strain to other via viral particles. The virus infects bacteria and released viral particles carry part of bacterial genetic material which is then transferred to next host bacterium.

Conjugation is transfer of genetic material between two bacterial strains via conjugation tube. Conjugation and transduction are the methods of sexual reproduction in bacteria which occur during unfavourable conditions.

Yeasts reproduce by budding wherein a bud on the side of yeast cell, the nucleus divides, and a daughter nucleus migrates into the bud. The buds may either remain attached to parent cell or separates to form an independent cell.

122.

Answer: 3

Sol:

The sympathetic nervous system (SNS) releases the hormones (catecholamines - epinephrine and norepinephrine) to accelerate the heart rate. The parasympathetic nervous system (PNS) releases the hormone acetylcholine to slow the heart rate.

Adrenaline or epinephrine is secreted from adrenal medulla in response to stress conditions in the body. When the hemostasis of the body is disturbed, adrenaline is released which increases alertness, piloerection, increase in heart beat and strength of heart contraction. They are considered as fight or flight reactions induced by adrenaline.

123.

Answer: 1

Sol:

- **Radial vascular bundles**:
  In this arrangement, **xylem and phloem are present on alternating separate radii**. This type of vascular bundle is commonly found in **roots**.

- **Conjoint vascular bundles**:
  In this arrangement, **xylem and phloem are present on the same radius**. This type of vascular bundle is found in **stems and leaves**.

- 11th New NCERT PAGE NO. 73

124.

Answer: 1

Sol:

Diabetes is caused by insulin deficiency or insulin resistance. Diabetes mellitus is caused by a relative or absolute deficiency of insulin action.

Deficiency of iodine in our diet results in hypothyroidism and enlargement of the thyroid gland, commonly called goitre.

Underproduction of hormones by the adrenal cortex alters carbohydrate metabolism causing acute weakness and fatigue leading to a disease called Addison's disease.

Deficiency of Corticoids either glucorticoids or mineralocorticoids leads to Addison's disease.

Acromegaly is a condition in which there is hypersecretion of growth hormone in adults.

So, option 1 is the correct answer.

125.

Answer: 2

Sol:

The complete combustion of glucose, which produces CO_2 and H_2O as end products, yields energy most of which is given out as heat.

If this energy is to be useful to the cell, it should be able to utilise it to synthesise other molecules that the cell requires. The strategy that the plant cell uses is to catabolise the glucose molecule in such a way that not all the liberated energy goes out as heat. The key is to oxidise glucose not in one step but in several small steps enabling some steps to be just large enough such that the energy released can be coupled to ATP synthesis.

126.

Answer: 1

Sol:

12th NCERT, PAGE NO.- 118

127.

Answer: 2

Sol:

Bacillus thuringiensis secretes specific proteins known as **"cry proteins"** that are toxic to insects. A few of the **BT crops include cotton, brinjal, and corn.**

This toxin protects Bt crops and transgenic crops from the pest attack. The Bt toxin of *Bacillus thuringiensis* is a **crystalline proteinaceous delta endotoxin** coded by **CRY** genes. These genes are present on the **plasmid.**

When insects **ingest** these toxin crystals, their **alkaline digestive tracts denature** the **insoluble crystals** and turn them into soluble ones. The **toxin binds** to the **insect midgut** cell membrane, and when it **paralyses** the **digestive tract** and forms a pore, at last the insect **stops eating and death** occurs.

128.

Answer: 4

Sol:

In ecology, the term "niche" describes the role an organism plays in a community. A species' niche encompasses both the physical and environmental conditions it requires and the interactions it has with other species.

129.

Answer: 3

Sol:

A virus is a small parasite that cannot reproduce by itself outside the host because it lacks the cellular machinery that a (host) cell possesses." The host's cellular machinery allows viruses to produce RNA from their DNA (a process called transcription) and to build proteins based on the instructions encoded in their RNA (a process called translation). Hence, viruses cannot multiply of their own because they lack cellular machinery to use its genetic material.

130.

Answer: 1

Sol:

11th OLD NCERT, PAGE NO.- 298

131.

Answer: 2

Sol:

Parenchyma cells are generally thin walled. An example of thick-walled parenchyma in dicot root is Pericycle.

It is a thin layer of plant tissue between the endodermis and the phloem.

132.

Answer: 4

Sol:

Steroid hormones are lipid-soluble and can pass through the cell membrane. Once inside the cell, they typically bind to specific intracellular receptors. The hormone-receptor complex then moves into the nucleus, where it can directly bind to DNA and regulate gene expression, leading to changes in cellular activities.
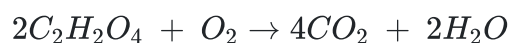
133.

Answer: 2

Sol:

During aerobic respiration, O_2 is consumed and CO_2 is released. The ratio of the volume of CO_2 evolved to the volume of O_2 consumed in respiration is called the respiratory quotient (RQ) or respiratory ratio.

$$RQ = Volume\ of\ CO_2\ evolved$$
$$Volume\ of\ CO_2\ evolved \big/ Volume\ of\ CO_2\ consumed$$

For example –

Reaction of oxidation of oxalic acid is as follows –

$$2C_2H_2O_4 + O_2 \rightarrow 4CO_2 + 2H_2O$$
$$RQ = {CO_2}\big/{O_2 = {4}\big/{1}} = 4$$

When carbohydrates are used as substrate and are completely oxidised, the RQ will be 1, because equal amounts of CO_2 and O_2 are evolved and consumed.

$$2(C_{51}H_{98}O_6) + 145O_2$$
$$\rightarrow 102CO_2 + 98H_2O + Energy$$
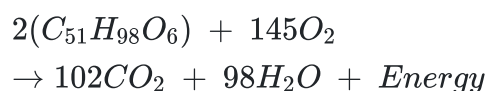
$Tripalmitin$

$$RQ = {102CO_2}\big/{145O_2}$$
$$= 0.7$$

134.

Answer: 3

Sol:

12th NCERT, PAGE NO.- 115

135.

Answer: 4

Sol:

Class 12th NCERT Page No. 180

136.

Answer: 1

Sol:

The **biosphere** is a global ecosystem composed of living organisms **(biotic)** and the nonliving **(abiotic)** factors from which they derive energy and nutrients. It is a relatively thin life-supporting stratum of Earth's surface, extending from a few kilometres into the atmosphere to the deep-sea vents of the ocean.

The biosphere is a system characterized by the continuous cycling of matter and an accompanying flow of solar energy in which certain large molecules and cells are self-reproducing.

137.

Answer: 2

Sol:

The gymnosperms are **heterosporous**; they produce **haploid microspores and megaspores.**

In **pinus and cycas** endosperm is formed before fertilization and hence is **haploid**.

Hence the **correc**t option is **B**

138.

Answer: 3

Sol:

Class XIth NCERT Page No. 206

139.

Answer: 2

Sol:

When the modified allele is equivalent to the unmodified allele then it will produce the same phenotype/trait.

(when modified allele produces normal / less efficient enzyme then it will function as unmodified allele and shows the same phenotype character)

i.e., result in the transformation of substrate S. Such equivalent allele pairs are very common.

140.

Answer: 3

Sol:

Plant hormone auxin helps to initiate rooting in stem cuttings, and induces flowering in pineapples.

Ethylene is used to initiate flowering and for Synchronization fruit set up in pineapples.

141.

Answer: 4

Sol:

When a rDNA is inserted within the coding sequence of an enzyme - beta-galactosidase, it is commonly known as Insertional inactivation.

This inactivates the enzyme and the non-recombinants will appear as blue-coloured colonies and recombinants will appear colourless in the presence of chromogenic substrate.

Hence, the correct answer is option "4".

142.

Answer: 3

Sol:

Animals that feed on plants/plant origin are known as secondary producers.

An herbivore is an organism that mostly feeds on plants. Herbivores range in size from tiny insects such as aphids to large, lumbering elephants. Herbivores are a major part of the food web, a description of which organisms eat other organisms in the wild.

Thus, they are herbivores in nature.

143.

Answer: 2

Sol:

Albuminous cells and sieve cells

11th NCERT, PAGE NO.- 33

144.

Answer: 1

Sol:

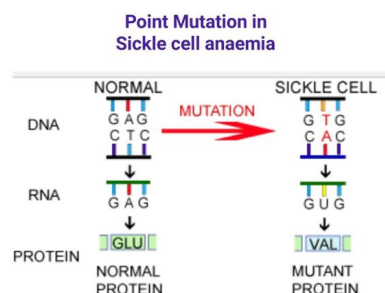**Class XIth NCERT Page No. 209**

145.

Answer: 2

Sol:

Sickle-cell anaemia is an inherited genetic condition in which affected individuals contain red blood cells that under low oxygen tension become biconcave disc to elongated and curved.

With sickle cell disease, an inherited group of disorders, red blood cells contort into a sickle shape. The cells die early, leaving a shortage of healthy red blood cells (sickle cell anaemia) and can block blood flow causing pain (sickle cell crisis). Infections, pain and fatigue are symptoms of sickle cell disease.

146.

Answer: 3

Sol:

12th NCERT Page No. 178

147.

Answer: 4

Sol:

Class 12th NCERT Page No. 184, 185

148.

Answer: 3

Sol:

Sunken stomata are found in plants with water scarcity i.e. xerophytes.
Opuntia sp. (cactus) is a xerophyte that grows in arid regions.

149.

Answer: 4

Sol:

Bryophytes are also called amphibians of the plant kingdom because these plants can live in soil but are dependent on water for sexual reproduction.

150.

Answer: 2

Sol:

No only the egg is responsible for the sex of the chicks. If the egg containing Z chromosome combines with a sperm then it will result into male formation and if the egg containing W chromosome combines with the sperm, it will result into female formation.

151.

Answer: 4

Sol:

Class 11th NCERT Page No. 175

152.

Answer: 1

Sol:

Biomolecules, i.e., chemical compounds found in living organisms are of two types. One, those which have molecular weights less than one thousand dalton and are usually referred to as micromolecules or simply biomolecules while macromolecules (biomacromolecules) are found in the acid insoluble fraction which have molecular weights more than one thousand dalton.

153.

Answer: 4

Sol:

The **Wildlife Protection Act, 1972,** is an important tool in the legislative framework for preserving species and ecosystems against **violations like poaching, hunting, and cutting down** the forest for commercial uses or profits.

So, maintaining the ecological process and maintaining biological diversity are the aims of **wildlife conservation.**

Hence, the correct answer is option "4", I and IV.

154.

Answer: 1

Sol:

Some microorganisms, like baker's yeast, carry out the process of fermentation (anaerobic respiration). Yeasts carry on alcoholic fermentation. The alcohol and carbon dioxide produced by yeast are vapourised during the baking process. Escape of carbon dioxide during baking process makes bread porous and light in weight.

155.

Answer: 2

Sol:

Codominant genes

156.

Answer: 3

Sol:

Class 12th NCERT Page No. 8.13

157.

Answer: 2

Sol:

Tendons connect skeletal muscles to bones. Tendons are soft, fibrous tissues that transfer force from muscles to the skeleton, allowing for movement around a joint.

The skin is made of stratified squamous epithelium. Stratified squamous epithelium is a type of epithelium that forms barriers to antigens.

The cartilage at the tip of the nose is hyaline cartilage, which is a flexible connective tissue that provides support. Hyaline cartilage is also found in the ears and trachea.

Ligaments attach bones to bones. Ligaments are long, fibrous bands of tissue that hold bones together and keep them stable.

158.

Answer: 4

Sol:

The 'Red Data Book' keeps into account the rare and endangered species of animals, plants, and fungi as well as some local subspecies, that inhabit a small territory, state, or country.
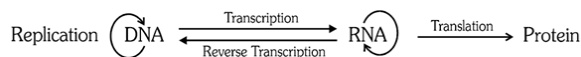
Hence, the correct answer is option "4".

159.

Answer: 4

Sol:

The formation of DNA from RNA is known as Reverse transcription or central dogma reverse by reverse transcriptase enzyme. It was discovered by Temin and Baltimore in Rous - sarcoma virus. So it is also called Teminism.

Replication $\bigcirc$ DNA $\underset{\text{Reverse Transcription}}{\overset{\text{Transcription}}{\rightleftarrows}}$ RNA $\xrightarrow{\text{Translation}}$ Protein

160.

Answer: 3

Sol:

Class 12 NCERT Page No. 11

161.

Answer: 2

Sol:

Both (A) and (B) are true, but (R) is not the correct explanation of A

Female cockroaches produce egg cases called oothecae to protect and stabilize their eggs from the external environment.

An ootheca is a dark reddish-brown to blackish-brown capsule that contains cockroach eggs. The female cockroach produces an average of 9–10 oothecae, each containing 14–16 eggs.

162.

Answer: 2

Sol:

Histones are highly alkaline proteins found in eukaryotic cell nuclei that package and order the DNA into structural units called nucleosomes. They are the chief protein components of chromatin, acting as spools around which DNA winds and play a role in gene regulation. Without histones, the unwound DNA in chromosomes would be very long (a length to width ratio of more than 10 million to 1 in human DNA).
For example, each human cell has about 1.8 meters of DNA, (approx. 6 ft) but wound on the histones it has about 90 micrometers (0.09 mm) of chromatin, which, when duplicated and condensed during mitosis, result in about 120 micrometers of chromosomes. So, DNA is accommodated by super-coiling in nucleosomes.

163.

Answer: 2

Sol:

In lac operon, the repressor protein combines with the operator gene controls its functioning.

164.

Answer: 4

Sol:

Class 12th NCERT Page No. 10

165.

Answer: 4

Sol:

In animals like Annelids, Arthropods, Molluscs, and Chordates, organs have associated to form functional systems, each system concerned with a specific physiological function. This pattern is called organ system level of organisation.

Animals like annelids, arthropods, etc., where the body can be divided into identical left and right halves in only one plane, exhibit bilateral symmetry.

The body cavity, is lined by mesoderm is called coelom. Animals possessing coelom are called coelomates, e.g., annelids, molluscs, arthropods, echinoderms, hemichordates and chordates.

166.

Answer: 4

Sol:

In plant cells centrioles are not present. Gurad cell is found in stomata of plants.

167.

Answer: 2

Sol:

12th - NCERT, PAGE NO.- 100

168.

Answer: 4

Sol:

b and d

11th NCERT Page No. 42, 43 (platyhelminthes & aschelminthes)

169.

Answer: 4

Sol:

Both (1) & (2)

11th NCERT PAGE NO.- 101

170.

Answer: 1

Sol:

The transformation experiments conducted by Frederick Griffith in 1928, are of greater importance in establishing the nature of genetic material and he used two strains of bacterium Diplococcus or Streptococcus pneumoniae or Pneumococcus i.e., S-III and R-II.
• Smooth (S) or capsulated type which have a mucous coat and produce shiny colonies. These bacteria are virulent and cause pneumonia.
• Rough (R) or non-capsulated type in which mucous coat is absent and produce rough colonies. These bacteria are nonvirulent and do not cause pneumonia.
In this experiment, bacteria from the III-S strain were killed by heat, and their remains were added to II-R strain bacteria. While neither alone harmed the mice, the combination was able to kill its host. Griffith was also able to isolate both live II-R and live III-S strains of pneumococcus from the blood of these dead mice. Griffith concluded that the type II-R had been "transformed" into the lethal III-S strain by a "transforming principle" that was somehow part of the dead III-S strain bacteria.

171.

Answer: 2

Sol:

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

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172.

Answer: 2

Sol:

Consisting of two chromatid which remain attached to centromere

173.

Answer: 4

Sol:

Each skeleton nucleotide monomer consists of a pentose sugar, which is attached to two other groups; a phosphate group and a nitrogenous base. The nitrogenous base is either a double-ringed structure known as a purine or a single ringed structure known as a pyrimidine.

174.

Answer: 2

Sol:

11th NCERT, Page No.- 47

175.

Answer: 1

Sol:

The phase between two successive M-phases is called interphase. The M-phase represents the phase when the actual cell division or mitosis occurs and the interphase represents the phase between two successive M phases. It is significant to note that in the 24 hour average duration of cell cycle of a human cell, cell division proper lasts for only about an hour. The interphase lasts more than 95% of the duration of cell cycle.

176.

Answer: 3

Sol:

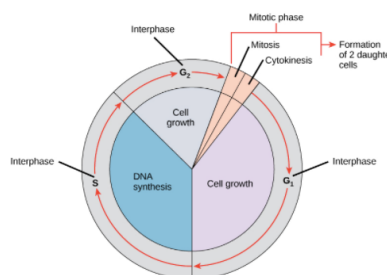**(A)** is true statement but **(R)** is false.**(A)**

Class 12th NCERT Page No.153 & 154

177.

Answer: 3

Sol:

A cell cycle is a series of events that takes place in a cell as it grows and divides.

178.

Answer: 1

Sol:

12th NCERT, PAGE NO.- 153, 156, 157

179.

Answer: 2

Sol:

Mitosis is that type of division in which chromosomes replicate and become equally distributed both quantitatively and qualitatively into 2 daughter nuclei so that the daughter cells come to have the same number and type of chromosomes as are present in the parent cell. It is therefore also called equational division. Mitosis occurs in the formation of somatic body cells and is hence often named as somatic cell division.

It is the most common method of division which brings about growth in multicellular organisms and increase in population of unicellular organisms. Uncontrolled mitotic division leads to cancer.

Meiosis is a double division which occurs in a diploid cell and gives rise to 4 haploid cells each having half the number of chromosomes as compared to the parent cell.

180.

Answer: 2

Sol:

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