Date: 23-Mar-2025

Duration: 3 Hours

Max Marks: 720

Physics - Section A

1.

Answer: 2

Sol:

$y = 10^{-4} \sin\left(600t - 2x + \frac{\pi}{3}\right)$

comparing with $y = A \sin (\omega t - kx + \phi)$

$\Rightarrow \omega = 600$

K =2.

$\therefore V = \frac{\omega}{K} = \frac{600}{2}$

$\therefore V = 300 \ \text{m/s}.$

2.

Answer: 3

Sol:

Displacement $=$
$\sum$ area

$= 16 - 8 + 16 - 8 = 16 \ \text{m}$

Distance$= \Sigma \mid \text{area} \mid = 48 \ \text{m}$

$\frac{\text{displacement}}{\text{Distance}} = \frac{1}{3}$

3.

Answer: 2

Sol:

Suppose the mass of the particle is m and the spring constant of spring is k. The acceleration due to gravity at earth's surface is $g = \frac{GM}{R^2}$ with usual symbols. The extension in the spring is mg/k.

Hence, $1 \ \text{cm} = \frac{GMm}{kR^2}$ ..... (i)
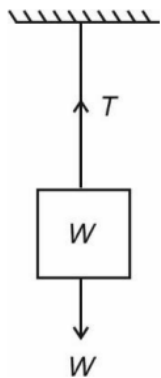
At a height h = 800 km, the extension is given by

$x = \frac{GMm}{k(R+h)^2}$ ....(ii)

x = 0.79 cm

4.

Answer: 1

Sol:

Longitudinal stress

$$= \frac{\text{Internal restoring force}}{\text{Area}} = \frac{F_{ext}}{\text{Area}}$$

$$\text{Stress} = \frac{W}{A}$$

5.

Answer: 2

Sol:

Atoms have permanent magnetic moment which are randomly oriented i.e. in absence of external magnetic field the magnetic moment of whole material zero.

6.

Answer: 3

Sol:

We know that

$$\frac{T - T_{FP}}{T_{BP} - T_{FP}} = \text{const.}$$

$$\frac{C - 0}{100 - 0} = \frac{F - 32}{212 - 32}$$

$$C = \frac{5}{9}(F - 32)$$

$$\Delta C = \frac{5}{9} \Delta F$$

$$40 = \frac{5}{9} \Delta F$$

$$\Rightarrow \Delta F = 72^o F$$

7.

Answer: 1

Sol:

Given:-

First overtone of a closed organ-pipe = Third harmonic of open organ pipe.

$$\frac{3V}{4l_C} = \frac{3V}{2l_0}$$

$$\Rightarrow \frac{l_C}{l_0} = \frac{1}{2}$$

8.

Answer: 3

Sol:

$\theta = 120 \times 2\pi$ rad

t = 3 min

= 180 s

$$\omega = \frac{\theta}{t}$$

$$= \frac{240\pi}{180} \text{rad/s} = \frac{4\pi}{3}$$
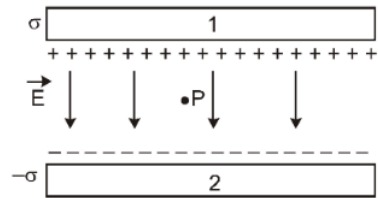
$$a_c = \omega^2 R$$

$$= \frac{16\pi^2}{9} \times 9$$

$$= 16\pi^2 \text{m/s}^2$$

9.

Answer: 3

Sol:

The situation is shown in the figure. Plate 1 has surface charge density σ and plate 2 has surface charge density σ. The electric field at point P due to charged plates add up, giving

$$E = \frac{\sigma}{2\varepsilon_0} + \frac{\sigma}{2\varepsilon_0} = \frac{\sigma}{\varepsilon_0}$$

Given,

$$\sigma = 26.4 \times 10^{-12} \text{C/m}^2$$

$$\varepsilon_0 = 8.85 \times 10^{-12} \text{N/m}^2$$

Hence, $E = \frac{26.4 \times 10^{-12}}{8.85 \times 10^{-12}} \approx 3 \text{N/C}$

10.

Answer: 3

Sol:

We know from stoke's Formula that Terminal velocity of a body in viscous fluid $F = 6\pi\eta r V_t$

also $V_t = \frac{2r^2(\rho - \sigma)}{9\eta}$

also heat developed(H) is due to the power requried to slow the body by the fluid

$$\therefore P = F.V$$

$$P \propto rV_t^2 \propto r^5$$

11.

Answer: 4

Sol:

$$B_{axis} = \frac{\mu_0 \, niR^2}{2(R^2 + x^2)^{3/2}}$$

$$B_{centre} = \frac{\mu_0 \, ni}{2R}$$

At $x = \sqrt{3}R$

$$B_{axis} = \frac{\mu_0 \, niR^2}{2(R^2 + 3R^2)^{3/2}} = \frac{\mu_0 \, ni}{16R}$$

12.

Answer: 3

Sol:

According to stefan's Boltzmann law, the energy radiated per unit time:

$$E = \sigma AT^4$$

It is given that: $E = 5.67 \times 10^4$

Therefore, $5.67 \times 10^4 = 5.67 \times 10^{-8} \times 1 \times T^4$

So, $T = 1000K$

$T = 1000 - 273 = 727°C$

13.

Answer: 1

Sol:

The equation of wave is form

$$y = A\sin(kx - wt)$$

As it is travelling from left to right

$$\therefore v = \frac{dy}{dt} = Aw\cos(kx - wt)$$

∴point of positive velocity are D,E and F

14.

Answer: 3

Sol:

The Force is given by

$$F = \left|\frac{\Delta P}{\Delta t}\right| = \left|\frac{P_2 - P_1}{\Delta t}\right|$$

$$F = \left|\frac{m(v_2 - v_1)}{\Delta t}\right|$$

$$F = \left|\frac{0.15(0 - 20)}{0.1}\right|$$

$$F = 30N$$

15.

Answer: 3

Sol:

Current, $I = \frac{V}{R}$ or $R = \frac{V}{I}$

Resistance of limiting resistor,

$$R = \frac{(6-2)V}{10 \times 10^{-6}A} = 400 \text{ k}\Omega$$

16.

Answer: 2

Sol:

In a circuit with a.c,source,choke coil which is essentially an inductor with high reactance, is used to decrease the current without loss of energy.No heat is generated so no loss of energy. When we use resistance to reduce current, there is loss of electrical energy in the form of heat generated

17.

Answer: 1

Sol:

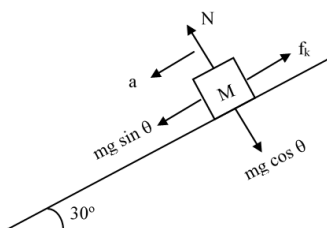$$f = \frac{I_{\max} - I_{\min}}{I_{\max} + I_{\min}}$$

18.

Answer: 3

Sol:

Particles having phase difference of π will move with same speed

19.

Answer: 2

Sol:

$$f_k = \mu N$$

$$N = mgcos\,\theta$$

$$f_k = \mu mgcos\theta$$

$$a = \frac{mgsin\theta - \mu mgcos\theta}{m}$$

$$a = gsin\,30° - \mu gcos30°$$

$$\frac{g}{4} = g\left[\frac{1}{2} - \frac{\sqrt{3}\mu}{2}\right]$$

$$\frac{1}{2} = 1 - \sqrt{3}\mu$$

$$\sqrt{3}\mu = \frac{1}{2}$$

$$\mu = \frac{1}{2\sqrt{3}}$$

20.

Answer: 4

Sol:

For scientist A which goes down in a mine

$$g' = g\left(1 - \frac{d}{R}\right)$$

For scientist B, which goes up in the air

$$g' = g\left(1 - \frac{2h}{R}\right)$$

So it is clear that value of g measured by each will decrease at different rates.

21.

Answer: 2

Sol:

de-Brogli wavelength, $\lambda = \frac{h}{mv}$

As both particle and electron are having same wavelength, therefore their momentum will be equal.

$$m_p v_p = m_e v_e$$

$$\Rightarrow v_p = \frac{m_e v_e}{m_p}$$

$$= \frac{9.1 \times 10^{-31} \times 3 \times 10^6}{10^{-6}}$$

$$\Rightarrow v_p = 2.7 \times 10^{-18}\,ms^{-1}$$

22.

Answer: 3

Sol:

$f_1 = -20cm$

$f_2 = 10cm$

f = focal length of the combination

$$\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2}$$

$$\Rightarrow \frac{1}{f} = \frac{1}{-20} + \frac{1}{10}$$

$$\Rightarrow \frac{1}{f} = \frac{-1+2}{20}$$

$$\Rightarrow f = 20cm.$$

Since power $\left(P\right) = \frac{100}{f(cm)}$

$$\therefore P = \frac{100}{20} = +5D$$

23.

Answer: 2

Sol:

From energy conservation

$$KE = P.E.$$

$$\frac{1}{2}I_{AOR}\omega^2 = Mgh_{cm}$$

For solid Sphere

$$\frac{1}{2}\left(\frac{1}{2}+1\right)mR^2\omega^2 = mgh_{cm} \cdots\cdots (!)$$

For cylinder

$$\frac{1}{2}\left(\frac{1}{2}+1\right)mR^2\omega^2 = mgh \text{ (cylinder)}$$

$(1)/(2)$

$$\therefore \frac{hs}{hc} = \left(\frac{14}{15}\right)$$

24.

Answer: 2

Sol:

At the highest point velocity is $u\cos\theta$.

$$\therefore u\cos\theta = \frac{\sqrt{3}u}{2} \Rightarrow \cos\theta = \frac{\sqrt{3}}{2}$$

$$\Rightarrow \theta = 30°$$

$$T = \frac{2\,u\sin 30°}{g} = \frac{u}{g}$$

25.

Answer: 1

Sol:

As we know, current density in the electron beam,

$$f = \frac{I}{A} = \frac{\frac{ne}{t}}{A} = \frac{ne}{tA}$$

substituting the values, we get

$$f = \frac{7\times10^{16}\times1.6\times10^{-19}}{1\times2\times10^{-6}} = 5.6\times10^3\,Am^{-2}$$

26.

Answer: 2

Sol:

Calculate B.E. per nucleon in both the cases.

27.

Answer: 3

Sol:

$$C = \sin^{-1}\left(\frac{\mu_w}{\mu_g}\right) = \sin^{-1}\left(\frac{8}{9}\right)$$

28.

Answer: 4

Sol:

Given angualr momentum $(L) = I\omega$;

Here I = moment of inertia

ω = angular velocity

Frequency $(f) = \frac{\omega}{2\pi} \Rightarrow \omega = 2\pi f \qquad \cdots (1)$

Kinetic energy $= \frac{1}{2}I\omega^2 \Rightarrow I = \frac{2K}{\omega^2} \qquad \cdots(2)$

Put (1) & (2) in angular momentum $(L) = I\omega$,

we get $L = \frac{K}{f\pi}$

$\therefore$ By using the condition given in the question

i.e., $f' = 2f$, $K' = \frac{K}{2}$

$L' = \frac{K}{4f\pi}$

$$\Rightarrow L' = \frac{L}{4}$$

29.

Answer: 1

Sol:

Rectification efficiency is th ratio of DC output power to the AC input power, i.e.

$$\eta = \frac{DC\ output\ power}{AC\ input\ power} \times 100$$

Hrere, DC output power = 20 W

AC input power = 60 W

Rectification efficiency, $\eta = \frac{20}{60}\times100 = 33.8\%$

30.

Answer: 4

Sol:

An accelerating charge produces an oscillating electric field. This oscillating electric field creates an oscillating magnetic field. This oscillating magnetic field then creates another oscillating electric field. This cycle of oscillating electric and magnetic fields keeps regenerating each other, producing EM waves and as electromagnetic (EM) waves, composed of oscillating electric and magnetic fields, do not transport electric charge themselves. They carry energy and momentum, but not charge.
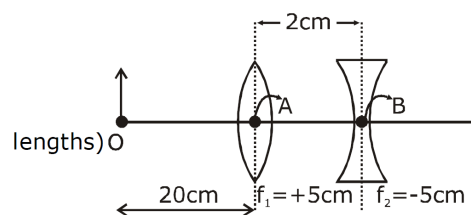
Electromagnetic (EM) waves do not travel at the same speed in all media; they travel at the speed of light (approximately 3 x 10^8 m/s) only in a vacuum, and their speed decreases when passing through matter.

Therefore correct answer is option 4.

31.

Answer: 3

Sol:

For first lens,

$\frac{1}{v} - \frac{1}{-20} = \frac{1}{5}$

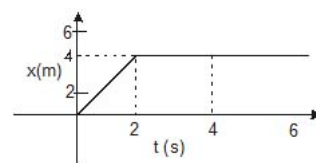$v = \frac{20}{3}$

For second lens,

u = 20/3 − 2 = 14/3

So, 1/v − 3/14 = −1/5

hence, v = 70 cm

32.

Answer: 2

Sol:

Velocity of particle upto $2 \sec$ (Just 2 second before)

$$= \frac{dx}{dt} = \frac{4}{2} = 2 \, m/s$$

Velocity of particle Just after 2 sec = 0 ......(As slope is zero)

Change in momentum=Impulse

$$\Delta p = m[0 - 2]$$
$$\Delta p = 0.1 \times (-2)$$
$$\Delta p = -0.2 \, kgm/s$$

33.

Answer: 2

Sol:

$$\frac{1}{C_{eq}} = \frac{1}{C} + \frac{1}{2C} + \frac{1}{4C} + \dots \infty$$

$$= \frac{1}{C}\left[1 + \frac{1}{2} + \frac{1}{2^2} + \dots \infty\right]$$

$$= \frac{1}{C}\left[\frac{1}{1-\frac{1}{2}}\right] = \frac{2}{C}$$

The equivalent capacitance between A and B

$$C_{eq} = \frac{C}{2}$$

34.

Answer: 2

Sol:

$$\lambda = \frac{h}{\sqrt{2\,mk}} \Rightarrow \lambda \propto \frac{1}{\sqrt{m}}$$

35.

Answer: 2

Sol:

In YDSE the intensity is given by

$I_1 = 4I_0 \cos^2 \frac{\Delta\phi}{2}$

Case I

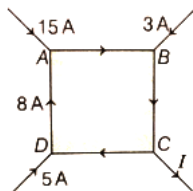$\Delta x = 0, I_1 = 4I_0$

Case II

$\Delta x = \frac{\lambda}{4}$

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

$\Rightarrow I_2 = 4I_0 \cos^2 \frac{\pi}{4} = 2I_0 \frac{I_1}{I_2} = \frac{2}{1}$

36.

Answer: 3

Sol:

Applyin Kirchhoff's first law at juntion A,B, C, D

At A, $I_{AB} = 15 + 8 = 23$ A

At B, $I_{BC} = 23 + 3 = 26$ A

At D, $I_{CD} = 8 - 5 = 3$ A

At D, $I_{CD} + I = I_{BC}$

or 3 + I = 26

I = 23 A

37.

Answer: 2

Sol:

As area under curve A is maximum.

For constant volume the most work is done in isobaric process

38.

Answer: 2

Sol:

By theory

39.

Answer: 1

Sol:

Slope of isothermal process:-

$\frac{dP}{dV} = \frac{-P}{V}$

Slope of adiabatic process :-

$\frac{dP}{dV} = \frac{-\gamma P}{V}$

From given diagram curve C and D has a positive slope so they can not be the answer. Curve A has a greater slope than curve B so curve B must be adiabatic and in the adiabatic process no heat exchange.

40.

Answer: 3

Sol:

In case of first spring F = $k_1 x_1$

$x_1 = \frac{F}{K_1}$ ...(1)

In case of second spring $\qquad$ F = $K_2 x_2$

$x_2 = \frac{F}{K_2}$ ...(2)

$\therefore K_1 > K_2 \Rightarrow x_2 > x_1$

$\Rightarrow$ More work is done by this force in case of second spring.

41.

Answer: 4

Sol:

In twisted wire, two halves each of resistance 2Ω are in parallel, so equivalent resistance will be $\frac{2}{2} = 1\Omega$.

42.

Answer: 4

Sol:

Given, $\overrightarrow{E} = E_0 x^{3/2}\hat{i}$ V/m

Electric field at x = 0

E = E$_0$ (0)

E = 0

Again, Elctric field at x = a

$\overrightarrow{E} = E_0 a^{3/2}\hat{i}$ V/m

If side of cube is a, then surface area of the face is a^2 therefore,

$\Rightarrow \phi = E.dS$

$\Rightarrow \phi = E_0 a^{3/2} \times a^2$

$\Rightarrow \phi = E_0 a^{7/2}$

43.

Answer: 2

Sol:

Given

Percentage error in its each side = 2%

$\frac{\Delta a}{a} \times 100 = 2\%$

Volume of cube

$V = a^3$

Percentage error in volume of the cube is

$\frac{\Delta V}{V} \times 100 = 3\left(\frac{\Delta a}{a} \times 100\right)$

$= 3 \times 2\%$

44.

Answer: 4

Sol:

f$_0$ = 4 cm ,   f$_e$ = 10 cm u$_0$ = − 5 cm

v$_e$ = − D

for objective lens

$\frac{1}{v_0} - \frac{1}{u_0} = \frac{1}{f_0}$ $\Rightarrow$ $\frac{1}{v_0} - \frac{1}{-5} = \frac{1}{4}$

$\frac{1}{v_0} = \frac{1}{4} - \frac{1}{5}$ $\Rightarrow$ $\frac{1}{v_0} = \frac{5-4}{20}$

v$_0$ = 20 cm
.........(i)

$M = \left[\frac{v_0}{|u_0|}\right] \times \left[1 + \frac{D}{f_e}\right]$ $\Rightarrow$ M = $\left[\frac{20}{-5}\right] \times \left[1 + \frac{25}{10}\right]$

M = − 4 × (3.5) $\Rightarrow$ M = -14
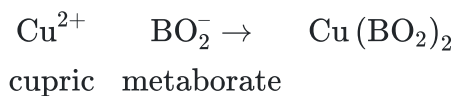
45.

Answer: 4

Sol:

$\sin\theta$ is the ratio of sides of triangle, Hence dimensions cancel each other. So all the ratios are dimensionless. Ex: Strain, Poision ratio, Refractive index. Hece dimension of $\sin\theta$ can be written as :
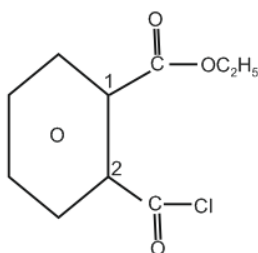
[M^0 L^0 T^0]

46.

Answer: 3

Sol:

$$Cu^{2+} \quad BO_2^- \rightarrow \quad Cu\,(BO_2)_2$$
cupric   metaborate

47.

Answer: 3

Sol:

Ethyl 2-(Chloro-carbonyl) benzene-carboxylate

48.

Answer: 2

Sol:

Molarity depends on temperature.

Molarity includes volume of solution which can change with change in temperature.

49.

Answer: 4

Sol:

$\Delta U = q + w$

$= 200J - 0.5\,atm(6 - 2)$

$= 200J - 2L\,atm$

$= 200J - 2 \times 101.3\,J(1L\,atm = 101.3J)$

$= -2.6J$

50.

Answer: 3

Sol:

$$\frac{P^o - P^o \times \frac{4}{5}}{P^o} = X_{solute}$$

$$\frac{1}{5} = \frac{w/60}{\frac{w}{60} + \frac{180}{18}}$$

w=150 g

51.

Answer: 4

Sol:

The energy of 2s orbitals is less than that of 2p orbitals in the case of hydrogen-like atoms. For Hydrogen like atoms which have single electron, energy of orbitals depend only on their principal quantum number, as there is no influence of other electrons like in multielectronic systems. The energy of 2s orbital is less than the energy of 2p orbital in case of hydrogen like atoms, hence this statement is incorrect.

52.

Answer: 1

Sol:

$C_2H_4(g) + H_2(g) \rightarrow C_2H_6(g)$

$\Delta_r H = \sum BE_R - \sum BE_P$

$= BE_{C=C} + 4BE_{C-H} + BE_{H-H} - BE_{C-C} - 6BE_{C-H}$

$= 600 + 4 \times 410 + 400 - 350 - 6 \times 410$

$= -170\,KJ/mol$

53.

Answer: 4

Sol:

Method-1

Given that

$W_{solute} = 1.25$ g

$W_{solvent} = 20$ g

$\Delta T_f = T_f - T_f' = 273 - 271.94 = 1.06K$

$K_f = 1.86$ K kg mol^{-1}

We know,

$MW_{solute} = \frac{K_f \times W_{solute} \times 1000}{\Delta T_f \times W_{solvent}}$ .... (1)

Put all the values in equation (1)

$MW_{solute} = \frac{1.86 \times 1.25 \times 1000}{1.06 \times 20}$

$= 109.66$ g/mole

Method-2

$\Delta T_f = K_f \times \frac{W_{solute} \times 1000}{M_{wt\ solute} \times W_2}$

$1.06 = \frac{1.86 \times 1.25 \times 1000}{W_{wt} \times 20}$

$W_{wt} = \frac{1.86 \times 1.25 \times 1000}{1.06 \times 20}$

$W_{wt} = 109.66$ gm

54.

Answer: 2

Sol:

(1) In $SiCl_4$, silicon has vacant d-orbitals which can be used for hydrolysis. Hence $SiCl_4$ can undergo hydrolysis.

(2) Under normal circumstances, carbon tetrachloride (CCl_4) is not hydrolyzed. This is because the lack of d-orbitals in carbon, which prevents it from forming five-coordinated.

(3) $BeCl_2.xH_2O$ can undergo hydrolysis because Be has vacant p orbital and electron deficient centre.

55.

Answer: 1

Sol:

$$\overset{4}{CH_3}-\overset{3}{CH_2}-\overset{2}{CH_2}-\overset{1}{CH_2}-OH \quad \text{and} \quad \overset{1}{CH_3}-\overset{2}{\underset{\underset{CH_3}{|}}{\overset{\overset{OH}{|}}{C}}}-\overset{3}{CH_3}$$
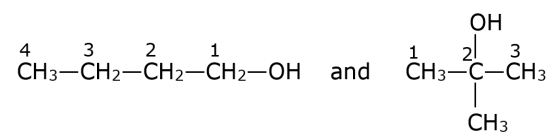
Chain isomers

56.

Answer: 3

Sol:

$$\underset{CH_3}{\overset{CH_3}{>}}C=C\underset{CH_3}{\overset{CH_3}{<}}$$ has highest C=C bond length (B.L.) because it has maximum hyperconjugation as it contains four methyl groups. More single bond character by hyperconjugation.

57.

Answer: 2

Sol:

The reduction half reaction is

$$\overset{+7}{M}nO_4^- \longrightarrow Mn^{2+} \quad \dots\dots\dots (1)$$

The oxidation half reaction is
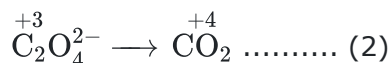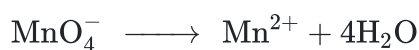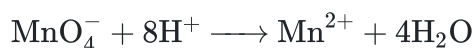
$$\overset{+3}{C_2}O_4^{2-} \longrightarrow \overset{+4}{C}O_2 \quad \dots\dots\dots (2)$$

Atoms other than H & O are balanced

$$MnO_4^- \longrightarrow Mn^{2+}$$

$$C_2O_4^{2-} \longrightarrow 2\,CO_2$$

Balanced O atoms by the addition of H_2O

$$MnO_4^- \longrightarrow Mn^{2+} + 4H_2O$$

$$C_2O_4^{2-} \longrightarrow 2\,CO_2$$

Balanced H atoms by the addition of H^+ ion

$$MnO_4^- + 8H^+ \longrightarrow Mn^{2+} + 4H_2O$$

$$C_2O_4^{2-} \longrightarrow 2\,CO_2$$

Balancing the charge by the addition of e^-

$$MnO_4^- + 8H^+ + 5e^- \to Mn^{2+} + 4H_2O \Big] \times 2$$

$$C_2O_4^{2-} \to 2\,CO_2 + 2e^- \,\Big] \times 5$$

$$2\,MnO_4^- + 16H^+ + 10e^- \to 2\,Mn^{2+} + 8H_2O$$

$$5C_2O_4^{2-} \longrightarrow 10\,CO_2 + 10e^-$$

_____

$$2\,MnO_4^- + 5C_2O_4^{2-} + 16H^+ \to$$
$$\qquad 2\,Mn^{2+} + 10\,CO_2 + 8H_2O$$
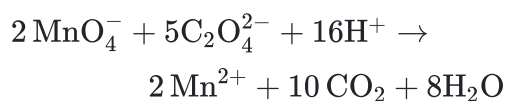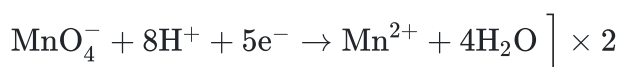
58.

Answer: 2

Sol:

$$C_t = \frac{C_0}{(2)^n}$$

$$(2)^n = \frac{800}{50} = 16$$

$$(2)^n = (2)^4$$

So, $n = 4$

$$4T_{1/2} = 200 \text{ sec}$$

$$T_{1/2} = 50 \text{ sec}$$

$$K = \frac{0.693}{T_{1/2}} = \frac{0.693}{50} = 1.386 \times 10^{-2} \text{ sec}^{-1}$$

59.

Answer: 1

Sol:

$$m = \frac{\frac{1.1}{267.5}}{0.1} = 0.04112 \text{ mol / kg}$$

$$\Delta T_f = iK_f\,m$$

0.306 = i×1.86×0.04112

4 = i

60.

Answer: 4

Sol:

DMG + $NiCl_2$ + NH_4OH → Red ppt (excess)

61.

Answer: 1

Sol:

By theory

62.

Answer: 3

Sol:

Nitrobenzene does not give Friedel crafts reaction.

63.

Answer: 1

Sol:

$$\log \frac{K_2}{K_1} = \frac{E_a}{2.303R} \left(\frac{T_2 - T_1}{T_1 T_2} \right)$$

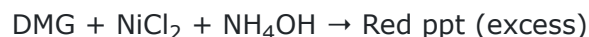$$\log 2 = \frac{E_a}{2.303 \times 8.314} \times \frac{10}{298 \times 308}$$

$E_a = 52.89$ kJ

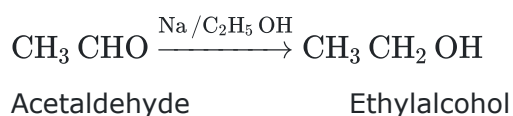**64.**

Answer: 1

Sol:

Fact

65.

Answer: 4

Sol:

$$\propto = \sqrt{\frac{K_a}{C}} = \sqrt{\frac{10^{-5}}{10^{-1}}} = 10^{-2}$$
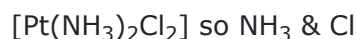
66.

Answer: 4

Sol:

I, IV

67.

Answer: 2

Sol:

$$CH_3\,CHO \xrightarrow{\text{Na}/C_2H_5\,OH} CH_3\,CH_2\,OH$$

Acetaldehyde   Ethylalcohol

68.

Answer: 1

Sol:

$1.1 \times 96500 \times 2 = 212.30$ kJ

69.

Answer: 1

Sol:

$[Pt(NH_3)_2Cl_2]$ so NH_3 & Cl

70.

Answer: 1

Sol:

$$C_6H_5CHO + CH_3COC_6H_5 \xrightarrow[-H_2O]{NaOH}$$

$$C_6H_5 - CH = CH - \overset{\displaystyle O}{\overset{\|}{C}} - C_6H_5$$
Benzyl acetophenone
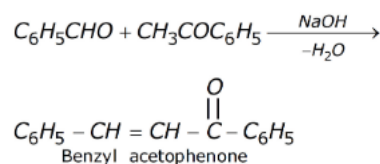
71.

Answer: 3

Sol:

The reduction potential of D (-0.402V) is minimum. So that oxidation potential of D($+0.402$) is maximum. D can oxidize itself and reduce others. The aqueous solution A will be present in its ionic form and can be reduced by D because A(-0.250) reduction potential is higher than D(-0.402).

72.

Answer: 3

Sol:

$$\left[Co\,(NH_3)_5\,Br \right] SO_4 \;\; \& \;\; \left[Co\,(NH_3)_5\,SO_4 \right] Br$$
are ionisation isomers.

Here there is replacement between the Br^- and SO_4^{2-}, hence we will get two isomers.
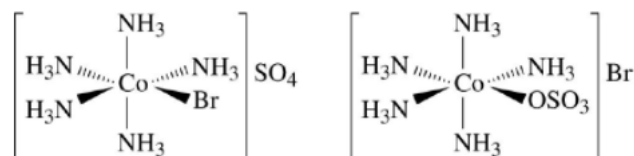
This is not possible in other compounds.

73.

Answer: 2

Sol:

$$CH_3 - \overset{\displaystyle O}{\overset{\|}{C}} - NH_2 + Br_2 + 4NaOH \longrightarrow$$
(acetamide)

$$CH_3 - NH_2 + Na_2CO_3 + 2NaBr + 2H_2O$$
(methylamine)

74.

Answer: 2

Sol:
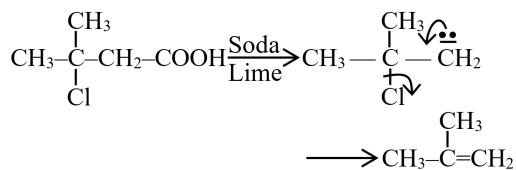
75.

Answer: 4

Sol:

Kohlrausch's law states that the equivalent conductivity of an electrolyte at infinite dilution is equal to the sum of the conductances of the anions and cations.

$A_2B \rightarrow 2A^+ + B^-$

$$\lambda^\infty_{A_2B} = 2\lambda^\infty_{(A^+)} + \lambda^\infty_{(B^{2-})}$$

76.

Answer: 1

Sol:

N_2^+ is more stable than N_2^-.

77.
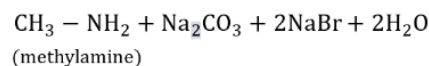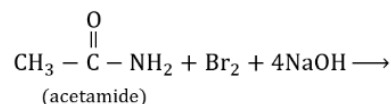
Answer: 1

Sol:
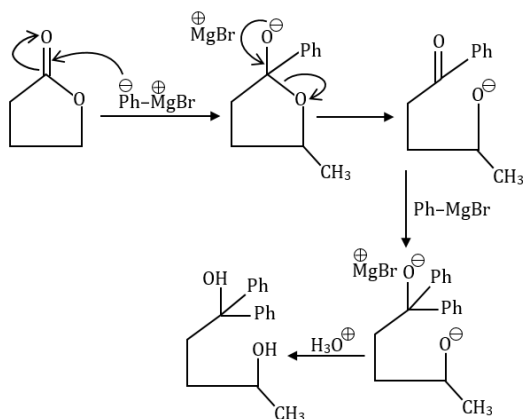
78.

Answer: 3

Sol:

According to Le Chatelier's principle adding heat to a solid and liquid in equilibrium with endothermic nature will cause the mass of solid to decrease.

Solid ⇌ Liquid; ΔH = +ve

Increase in temperature favours forward reaction. In endothermic reactions, (ΔH = +ve) heat is absorbed with the reactants. It means more energy is needed to overcome the forces of attraction between molecules and to separate them from one another than the energy gained when new bonds are formed.

79.

Answer: 1

Sol:

of 2s-2p mixing is not done, then molecule follow following arrangement.
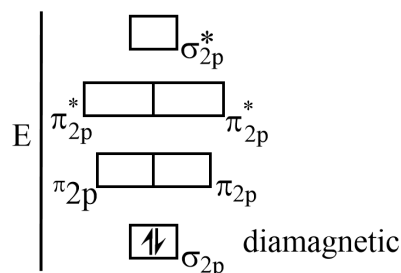
80.

Answer: 2

Sol:
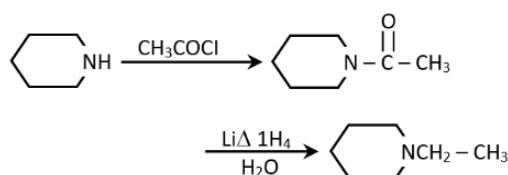
81.

Answer: 2

Sol:

	List-I (Molecules)		List-II (Correct observation Considering Molecular Orbital Theory)
P	O_2	A	Maximum unpaired electron
Q	N_2	D	s-p mixing
R	F_2	B	No multiple bond
S	O_2^+	C	Odd electron species

82.

Answer: 3

Sol:

Organic compounds containing both N and S give blood red colour in Lassaigne test due to the formation of $Fe(SCN)_2$

Thus, $H_2N(C_6H_4)SO_3H$ gives blood red colour in Lassaigne.s test of nitrogen.

83.

Answer: 2

Sol:

S.N= σ+lp

For $TeCl_4 \Rightarrow$ S.N. = 4+1

=5

So, sp^3d hybridisation

84.

Answer: 1

Sol:

Drago's molecule $(\approx 90^\circ)$

85.

Answer: 1

Sol:

Vitamin E is fat soluble and present in sunflower oil. Its deficiency increases muscular weakness.

86.

Answer: 3

Sol:

Br^- is replaced by I^- through SN_2 reaction mechanism. F^- is bad leaving group. So It is not replaced.

87.

Answer: 3

Sol:

Down the group, the electron density on central atom decreases and consequently its tendency to donate a pair of electron decreases and hence its basic strength decrease as we move from NH_3 to SbH_3.

Therefore the correct order is $NH_3 > PH_3 > AsH_3 > SbH_3$

88.

Answer: 3

Sol:

related to be element.

89.

Answer: 2

Sol:

The given electronic configuration are of N, Na, Ne, F respectively out of these, Na has the lowest I.E.

90.

Answer: 1

Sol:

For isoelectronic species ionic radii is directly proportional to magnitude of negative charge and indirectly

91.

Answer: 3

Sol:

Social animals are those animals which interact highly with other animals, usually of their own species, to the point of having a recognizable and distinct society. In the case of social animals, not having those social interactions can be detrimental to the animal's development; they are crucial. Social insects such as ants, bees, termites, and wasps are the main species known to have developed caste systems. In the colony of these insects, all animals follow a particular social order with a clear-cut differentiation of the functions each type is expected to perform. For example, some animals will be workers and soldiers and few will be specialised for reproduction.

92.

Answer: 2

Sol:

When complete stamens or only anther are attached to gynoecium is known as gynandrous. For example: Calotropis.

When stamens are attached to petals is known as epipetalous.

When stamens are attached to tepals is known as epiphyllous.

Hence, the correct answer is **Gynandrous**.

93.

Answer: 1

Sol:

Class 11th Old NCERT Page No. 270 & 271

94.

Answer: 3

Sol:

Both A and B statements are correct

95.

Answer: 3

Sol:

The blastocyst is a structure formed in the early development of mammals. The blastomeres in the blastocyst are arranged into an outer layer called trophoblast and an inner group of cells attached to trophoblast called the inner cell mass. The trophoblast layer then gets attached to the endometrium and the inner cell mass gets differentiated as the embryo.

[Blastocyst]
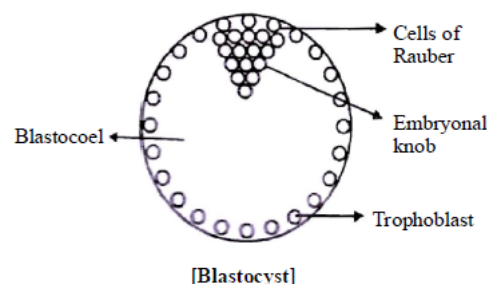
96.

Answer: 4

Sol:

The **living organisms are considered as self replicating, evolving and self regulatory** interactive systems capable of responding to external stimuli.

They **exhibit properties** such as metabolism, growth and consciousness etc..

all living organisms are linked to one another because they share **common genetic material i.e. DNA and RNA** but it can vary to some degrees.

97.

Answer: 4

Sol:

Both (2) and (3)

98.

Answer: 3

Sol:

Active binding sites for myosin on the actin filaments

99.

Answer: 4

Sol:

In liliaceae, flower is actinomorphic and axile placentation with many ovule.

100.

Answer: 1

Sol:

The rapid increase in numbers of a particular species, especially in the world's human population since the end of World War II, attributed to an accelerating birthrate, a decrease in infant mortality, and an increase in life expectancy. Poverty is believed to be the leading cause of overpopulation. A lack of educational resources, coupled with high death rates leading to higher birth rates, result in impoverished areas seeing large booms in population. Overpopulation pollutes the Earth and takes a lot of natural resources. It is also the driving force for global warming, environmental pollution, habitat loss, mass extinction, and intensive farming practices.

101.

Answer: 1

Sol:

As the solubility of CO_2 is 20-25 times higher than that of O_2, the amount of CO_2 that can diffuse through the diffusion membrane per unit difference in partial pressure is much higher compared to that of O_2.

102.

Answer: 3

Sol:

Removed during the maturation of pro-insulin to insulin

103.

Answer: 3

Sol:

The placenta works as an endocrine gland to supply the hormones for a healthy pregnancy.

The placenta is a fetomaternal organ ie., Chorion (fetal placenta) + Maternal placenta.

Hence, the statement which states that placenta formation is done only by maternal tissue is wrong.

Hence, the correct option is "3" - Placenta formation is done only by maternal tissue.

104.

Answer: 1

Sol:

11th NCERT PAGE NO. 6

105.

Answer: 3

Sol:

11 ncert page no 160

106.

Answer: 3

Sol:

Duration during which a nerve is not able to conduct another impulse after the conduction of one is called absolute refractory period.

The refractory period is a period during which a nerve or muscle is incapable of responding to stimulation immediately following a previous stimulation.

107.

Answer: 4

Sol:

11th Old NCERT PAGE NO. 68

108.

Answer: 2

Sol:

Class 11th NCERT-Page No.284

During **joint diastole**, all four chambers of the heart—the **right atrium, left atrium, right ventricle, and left ventricle**—are in a **relaxed state**. This is the resting phase of the cardiac cycle, allowing the heart to fill with blood. At this stage, the **tricuspid (right atrioventricular) and bicuspid (mitral or left atrioventricular) valves** are **open**, permitting blood to flow passively from the atria into the ventricles. Meanwhile, the **semilunar valves (pulmonary and aortic valves)** remain **closed** to prevent backflow of blood from the pulmonary artery and aorta into the ventricles. This phase ensures efficient blood circulation by preparing the ventricles for the next contraction (systole). Since the opening and closing of these valves regulate proper blood flow, the reason correctly explains the assertion, making both statements true.

109.

Answer: 3

Sol:

Assertion: RNAi involves silencing of a specific mRNA due to complementary dsRNA that binds to and prevents translation of the mRNA.

- **True.** RNA interference (RNAi) is a process in which double-stranded RNA (dsRNA) leads to the degradation or blocking of target mRNA, preventing translation.

Reason: RNAi takes place in all prokaryotic organisms as a method of cellular defense.

- **False.** RNAi is primarily found in **eukaryotic organisms** (e.g., plants, animals, fungi). Prokaryotes do not have RNAi.

110.

Answer: 2

Sol:

The ovulation in human females takes place in the ovulatory phase which takes place at the end of the follicular phase or proliferative phase.

It takes place on the 14th day of menstrual cycle.

Hence, the correct option is "2" - At the end of the follicular phase.

111.

Answer: 3

Sol:

Members of Cyanobacteria like *Nostoc* and *Anabaena* have the ability to fix atmospheric nitrogen in cells known as heterocysts.

112.

Answer: 4

Sol:

A stationary population is a special example of a stable population with a zero growth rate, neither growing nor shrinking in size, and is equivalent to a life table population. By definition, stable populations have age-specific fertility and mortality rates that remain constant over time. Stable populations with positive growth rates (r>0) grow steadily over time, negative growth rates (r<0) imply that the population is shrinking steadily.

113.

Answer: 1

Sol:

Class 11th NCERT Page No. 145

114.

Answer: 2

Sol:

Class11th NCERT Page No. 236

115.

Answer: 1

Sol:

In the dicot stem, the vascular bundles are arranged in a ring, with pith concentrated at the core of the stem, rather than being scattered throughout the plant interior. In dicot stem wedge shaped, definite and arranged in one or two rings. Vascular bundles are conjoint, collateral and open.

116.

Answer: 3

Sol:

Blood is made up of 55% plasma and 45% formed elements—red blood cells, white blood cells, and platelets. Blood is fluid connective tissue that circulates throughout the body.

Formed Elements consist of Erythrocytes (red blood cells that function in oxygen transport), Leukocytes (white blood cells that function in immunity), and Platelets (cell fragments that function in blood clotting).

Erythrocytes (red blood cells) Erythrocytes, or red blood cells, are the most numerous of the formed elements.

Normal red blood cells values at various ages are: Newborns: 4.8 - 7.2 million. Adults: (males): 4.6 - 6.0 million. (Females): 4.2-5.0 million.

The spleen plays an important role in the red blood cells also known as aserythrocytes and the digestive system. Old and damaged RBC's are destroyed in the spleen and It is known as the RBCs Graveyard.

117.

Answer: 4

Sol:

India has rich cultural and traditional heritage that includes spices, medicinal plants, biological pesticides and agricultural which is diversed.

Indian plants that have been either patented or attempts have been made to patent them by western nations for their commercial use includes black pepper, basmati rice, Indian mustard, Turmeric, neem, Pomegranate.

U.S, Germany, Japan are the main countries that have attempted for patenting these plants for their own country's benefits.

Hence, the correct answer is option "4" - All of the above have been targetted.

118.

Answer: 3

Sol:

A venereal disease involving inflammatory discharge from the urethra or vagina. Gonorrhoea is a sexually transmitted infection (STI).

Hepatitis B is a serious infection of the liver caused by a virus. Hepatitis B is a sexually transmitted disease that has a safe and effective vaccine to protect against infection.

Chlamydia is transmitted through sexual contact with the penis, vagina, mouth, or anus of an infected partner. Ejaculation does not have to occur for chlamydia to be transmitted or acquired.

119.

Answer: 2

Sol:

A, B and D

Class 11th New NCERT Page No. 11

120.

Answer: 2

Sol:

Natality in **population ecology** is the scientific term for birth rate. **Natality** is the number of births during a given time period in a **population** that are **added** to the **initial density.** An increase in the number of individuals in a population under given environmental conditions can be due to **natality and immigration. Natality** is the greatest influence on a **population's increase.**

The **natality rate** (or **birth rate**) could be **calculated precisely** by **dividing the number of births** by the total time at **risk of giving birth** among **all individuals.**

121.

Answer: 4

Sol:

Joseph Priestley (1733-1804) performed a series of experiments in 1770 and 1772 using a bell jar, a candle, a mouse, and a mint plant to demonstrate the role of air in the growth of green plants and the presence of oxygen gas.

In 1897, Theodor Wilhelm Engelmann conducted an experiment using Cladophora algae to study the action spectrum of photosynthesis.

In 1931, microbiologist Cornelius van Niel conducted experiments on purple and green sulfur bacteria to study photosynthesis.

Calvin and his colleagues used the unicellular green alga Chlorella and Scenedesmus to study the carbon-assimilation reactions of photosynthesis.

122.

Answer: 1

Sol:

11th NCERT, Page No.- 247

123.

Answer: 1

Sol:

In a young dicot stem, the cambium is single layered. It is made by the intrafascicular cambium present within the vascular bundles and the dedifferentiation of the parenchyma cells of the medullary rays between the vascular bundles, called interfascicular cambium. Their combination gives a circular cambium that produces xylem elements on the inner side and the phloem elements on the outer side.

124.

Answer: 3

Sol:

Blood enters glomerulus through efferent arterioles

125.

Answer: 4

Sol:

Lecithin is a phospholipid which consists of glycerol , two fatty acids , a phosphate group and choline.

Glycerol, also known as glycerin, is a trihydroxy propane lipid. It is made up of three hydroxyl groups attached to three carbons of propane.

Lipids having only single bonds are called saturated fatty acids and lipids having one or more C = C double bonds are called unsaturated fatty acids.

Palmitic acid has 16 carbon atoms including carboxyl carbon.

Arachidonic acid has 20 carbon atoms including the carboxyl carbon.

126.

Answer: 3

Sol:

In biology, **saltation** is a sudden and large mutational change from one generation to the next, potentially causing single-step speciation. This was historically offered as an alternative to Darwinism.

The term is used for non-gradual changes (especially single-step speciation) that are atypical of, or gradualism - involved in modern evolutionary theory. It was popular with early geneticists such as Hugo de Vries, William Bateson and Thomas Hunt Morgan.

127.

Answer: 1

Sol:

Fusion of protoplasms between two motile or non-motile gametes called **plasmogamy**.

Fusion of two nuclei called **karyogamy**. **Cytokinesis** is the division of the cytoplasm.

128.

Answer: 3

Sol:

A large population of insects feeds upon a very big tree. The insects, in turn, are eaten by small birds which in turn are fed upon by big birds. It showing the interaction between trees, insects, birds and big birds. Pyramid of number is spindle-shaped as the number of insects is maximum. The number of trees and birds are less than the insects. The number is gradually decreasing at each trophic level.

129.

Answer: 3

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.

$$RQ = \frac{Volume\ of\ CO_2}{Volume\ of\ O_2}$$

For example –

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, respectively.

When fats are used in respiration, the RQ is less than 1.

When proteins are respiratory substrates the ratio would be about 0.9.

130.

Answer: 1

Sol:

Class XI NCERT Page No. 243

131.

Answer: 3

Sol:

Pure breeding parents mean that the plant will always make offspring like itself when self-fertilized over many generations. If parents are not pure breeding, we can not be sure about the genotype of the parent before cross i.e. the character it is showing is due to homozygous or heterozygous genotype.

If parents are not pure breeding, no matter up to how many generations we cross plants offspring will be produced randomly with phenotypes that can not be predicted by Mendel's laws.

So, the correct option is 'Parents are pure breeding'.

132.

Answer: 1

Sol:

Protonephridia or flame cells are the excretory structures in Platyhelminthes.

Nephridia are the tubular excretory structures of earthworms and other annelids. It help to remove nitrogenous wastes and maintain a fluid and ionic balance.

Malpighian tubules are the excretory structures of most of the insects including cockroaches. It help in the removal of nitrogenous wastes and osmoregulation.

Antennal glands or green glands perform the excretory function in crustaceans like prawns.

133.

Answer: 4

Sol:

Platyhelminthes are bilaterally symmetrical, triploblastic and acoelomate animals with **organ level of organisation**.

Bilateral symmetry (body can be divided into 2 equal halves) is the **most common** found in Animals like annelids, arthropods, etc.

The body cavity is not lined by mesoderm, instead, the mesoderm is present as scattered pouches in between the ectoderm and endoderm. Such a body cavity is called **pseudocoelom** and the animals possessing them are called pseudocoelomates, e.g., **aschelminthes**

Platyhelminthes are **triploblastic animals** but they dont posses true coelom and are **acoelomates**.

Body cavity of **arthropoda** around viscera contain blood and the coelom filled with blood is called the **haemocoel**.

134.

Answer: 1

Sol:

Class 12th New NCERT Page No. 124

135.

Answer: 4

Sol:

In spirogyra, all the cells of the filament can form the gametes, which are morphologically similar and are referred to as isogametes. This phenomena of sexual reproduction are known as isogamous type of sexual reproduction. But at the time of conjugation one of the two isogametes shows motility and is considered as the male gamete. This phenomenon is referred to as physiological an isogamy, as they show dissimilar physiological function.

Oogamous, relating to or denoting reproduction by the union of mobile male and immobile female gametes.

Cleistogamy is a type of automatic self-pollination of certain plants that can propagate by using non-opening, self-pollinating flowers. Especially well known in peanuts, peas, and pansy this behaviour is most widespread in the grass family.

Isogamous is a type of sexual reproduction in which male and female gametes have similar morphology. They have similar shape and size.

136.

Answer: 4

Sol:

Based on the source of their nutrition or food, organisms occupy a specific place in the food chain that is known as their **trophic level**.

Producers belong to the first trophic level, herbivores (primary consumer) to the second and **carnivores (secondary consumer) to the third**

The important point to note is that the amount of energy **decreases at successive trophic levels**. The number of trophic levels in the grazing food chain is restricted as the transfer of energy follows **10 per cent law** – only 10 per cent of the energy is transferred to each trophic level from the lower trophic level.

Therefore, tiger at the apex will be at highest trophic level and lower enegy will be available. Hence the **correct** option is **D**

137.

Answer: 1

Sol:

Plants do not have a dedicated respiratory system or circulatory system, but they do breathe in and out oxygen and carbon dioxide because they have lenticels and stomata for gases exchange. The cells in the interior are dead and provide only mechanical support. Thus, most cells of a plant have at least a part of their surface in contact with air. This is also facilitated by the loose packing of parenchyma cells in leaves, stems and roots, which provide an interconnected network of air spaces.
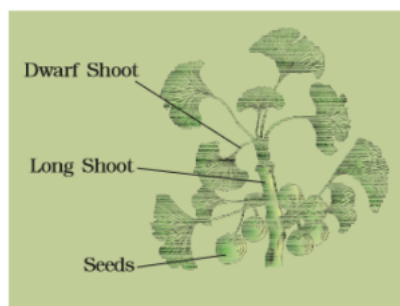
138.

Answer: 2

Sol:

Insulin is a hormone made by an organ located behind the stomach called the pancreas. There are specialised areas within the pancreas called islets of Langerhans while other are derived from cholesterol.

139.

Answer: 4

Sol:

Given image is of Ginkgo,

A=Dwarf shoot,

B=Long shoot,

C= Seeds

140.

Answer: 1

Sol:

More than two alternate forms of a gene present on the same locus are called multiple alleles and the mode of inheritance in these alleles is called multiple allelism.

Humans are diploid organisms and they possess two alleles of a particular gene but they exist at the population level also..

141.

Answer: 1

Sol:

In DCT, conditional reabsorption of Na+ and water takes place. It is also capable of reabsorption of HCO_3^- and selective secretion of hydrogen and potassium ions and NH_3 to maintain the pH and sodium-potassium balance in blood.

Collecting Duct is long duct extends from the cortex of the kidney to the inner parts of the medulla. It allows passage of small amounts of urea into the medullary interstitium to keep up the osmolarity. It also plays a role in the maintenance of pH and ionic balance of blood by the selective secretion of H^+ and K^+ ions.

142.

Answer: 2

Sol:

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

143.

Answer: 3

Sol:

An **ecological pyramid** is a graphical representation showing the relationship between different organisms in an ecosystem.

The **three types** of ecological pyramids that are usually studied are (a) **pyramid of number**; (b) **pyramid of biomass** and (c) **pyramid of energy**.

The **pyramid of biomass in sea** is generally **inverted and a**n inverted n**umber pyramid is found in parasitic food chains**.

144.

Answer: 2

Sol:

Leaf abscission is associated with an increase in ethylene production by petiole cells. Ethylene is a plant hormone known to promote abscission by inducing the formation of the abscission zone. This option accurately describes a key aspect of the abscission process.

Leaf senescence, which is the aging and eventual death of a leaf, typically precedes abscission.

Abscisic acid is involved in stress responses and stomatal closure rather than directly regulating abscission.

Abscission is an active process involving the formation of an abscission zone where cells actively separate.

145.

Answer: 1

Sol:

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146.

Answer: 3

Sol:

The relative growth of leaf A is higher than that of leaf B. The absolute growth rate is the total growth per unit time. In this case, the absolute growth rate for both leaves is 5 square centimetres per hour.
Relative growth is the rate of growth with respect to the initial size. Here, the relative growth rate for leaf A is higher because its surface area increased by 100%, while that of leaf B increased by only 10%.

147.

Answer: 3

Sol:

Cockroach, Scorpion, Spider, Belongs to the phylum arthropoda, they have a circumenteric ring and a double, solid, midventral nerve cord.
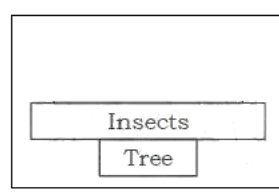
148.

Answer: 1

Sol:

A, B, D

Class 11th New NCERT Page No. 32

149.

Answer: 2

Sol:

Depending upon the given data, an inverted - shaped pyramid could be observed. This indicates the pyramid of numbers. In this, the number of the tree will remain only one. However, the number of insects will be in a large number.

150.

Answer: 2

Sol:

24

Class 12th NCERT Page no. 67

151.

Answer: 1

Sol:

11th NCERT Page No. 45-46

Non- chordates	Chordates
Gill slits are absent	Pharynx is perforated by gill slits.
Notochord is absent	Notochord is present
Central nervous system is ventral.	Central nervous system is dorsal.
Heart is dorsal if (present)	Heart is ventral
Post anal tail is absent	Post anal tail is present

152.

Answer: 1

Sol:

Microbes are used for production of enzymes such as lipases which are used in detergent formulations and are helpful in removing oily stains from the laundry.

153.

Answer: 4

Sol:

Conservation of wild life is necessary because:

We are **preserving and protecting** wild plants, animals, and their habitats to **protect vanishing wild animals.**

To protect the **ecosystem**, greater species diversity ensures **natural sustainability** for all life forms.

To **safeguard** the environment of the earth, healthy ecosystems can better withstand and recover from a **variety of disasters.**

154.

Answer: 4

Sol:

Ethylene is a simple gaseous PGR. It promotes female flowers in cucumbers thereby increasing the yield.

2, 4-D is a synthetic auxin, widely used to kill dicotyledonous weeds, does not affect mature monocotyledonous plants. It is used to prepare weed-free lawns by gardeners.

Gibberellins promotes bolting (internode elongation just prior to flowering) in beet, cabbages and many plants with rosette habit.

155.

Answer: 2

Sol:

Jim Corbett National Park was established in 1936, and it was named Hailey National Park after its founder Sir Malcolm Hailey. In 1956, in honour of Jim Corbett, who took the initiative for wildlife preservation in India, the Indian Government renamed it as Corbett National Park.

156.

Answer: 4

Sol:

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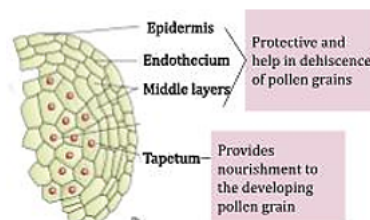
157.

Answer: 4

Sol:

(b), (c) and (d) only

158.

Answer: 2

Sol:

Microsporangia are sac-like structures present in angiosperm anthers. **epidermis, endothecium, middle layers, and tapetum.**

159.

Answer: 2

Sol:

Protein synthesis

160.

Answer: 2

Sol:

Statement I and II is correct, Explanation: DNA finger printing is highly reliable method of identification of individual involved in crimes. DNA a fingerprinting is a sure method in solving paternity and maternity disputes.DNA fingerprinting cannot be used to cure HIV infection.

161.

Answer: 2

Sol:

Only Statement I is correct

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162.

Answer: 1

Sol:

Hibiscus and papaver are the plants that contain multicarpellary and syncarpous gynoecium. Michelia are the plants that contain multicarpellary and apocarpous. Hibiscus and papaver are the plants that contain multicarpellary and syncarpous gynoecium. Michelia are the plants that contain multicarpellary and apocarpous.

163.

Answer: 2

Sol:

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164.

Answer: 2

Sol:

Ascaris, the common round worm and Wuchereria, the filarial worm, are some of the helminths which are known to be pathogenic to man. Ascaris, an intestinal parasite causes ascariasis. A healthy person acquires this infection through contaminated water, vegetables, fruits, etc.

Entamoeba histolytica is a protozoan parasite in the large intestine of human which causes amoebiasis (amoebic dysentery). Drinking water and food contaminated by the faecal matter are the main source of infection.

165.

Answer: 4

Sol:

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166.

Answer: 1

Sol:

Ovule is an integumented megasporangium found in spermatophytes which develops into seed after fertilization. An angiospermic ovule is typically an ovoid and whitish structure. It occurs inside ovary where it is attached to a parenchymatous cushion called placenta either singly or in a cluster. The ovule is stalked. The stalk is called funiculus or funicle. The point of attachment of the body of the ovule with the funiculus is known as hilum.

167.

Answer: 2

Sol:

For making of polypeptide chain of 20 amino acids required 21 codons, 20 codons code for amino acids and 1 will be termination codon or stop codon. Hence in a polypeptide chain 20 amino acid are present. 21 codons are present on mRNA which form this polypeptide chain.

168.

Answer: 4

Sol:

Innate immunity is non-specific type of defence, that is present at the time of birth. It consist of four types of barriers. These are —

Physical barriers : Skin on our body is the main barrier which prevents entry of the micro-organisms. Mucus coating of the epithelium lining the respiratory, gastrointestinal and urogenital tracts also help in trapping microbes entering our body.

Cellular barriers : Certain types of leukocytes (WBC) of our body like polymorpho-nuclear leukocytes (PMNL-neutrophils) and monocytes and natural killer (type of lymphocytes) in the blood as well as macrophages in tissues can phagocytose and destroy microbes.

Physiological barriers : Acid in the stomach, saliva in the mouth, tears from eyes–all prevent microbial growth.

Cytokine barriers : Virus-infected cells secrete proteins called interferons which protect non-infected cells from further viral infection.

169.

Answer: 2

Sol:

Centrosome is an organelle usually containing **two cylindrical structures** called **centrioles.**

Both the centrioles in a centrosome **lie perpendicular to each other** in which each has an **organisation like the cartwheel**.

The **centrioles form the basal body** of **cilia or flagella**, and **spindle fibres** that give rise to **spindle apparatus** during cell division in animal cells.

170.

Answer: 2

Sol:

Transcription is the process where an RNA molecule is synthesized from a DNA template. It involves the copying of a specific segment of DNA into RNA, which will later be used for protein synthesis during translation.

171.

Answer: 3

Sol:

- **(A) Biopsy – Histopathological studies for malignancy:**
  A biopsy involves taking a sample of tissue for microscopic examination to detect the presence of cancer cells. This is a correct match.

- **(B) Bone marrow test – To detect leukemia:**
  Bone marrow tests can help diagnose leukemia by examining the marrow for abnormal cells. This is also a correct match.

- **(C) MRI – Uses strong electric field and ionising radiations:**
  MRI (Magnetic Resonance Imaging) does **not** use ionizing radiation. It uses strong magnetic fields and radio waves to create images of organs and tissues. This makes the statement a mismatch.

- **(D) Computed tomography – Uses X-rays to generate 3-D image of organs:**
  A CT scan (or CAT scan) uses X-rays to generate detailed 3D images of internal structures, which is a correct match.

Thus, the mismatch is **(C)**, as MRI uses magnetic fields, not ionizing radiation.

172.

Answer: 1

Sol:

| Mitosis	Meiosis
1) It occurs in somatic cells.	1) It occurs in germ cells.
2) Nucleus divides only once.	2) Nucleus divides twice.
3) Two daughter cells are formed.	3) Four daughter cells are formed.
4) Daughter cells are diploid.	4) Daughter cells are haploid.

173.

Answer: 1

Sol:

Hershey–Chase experiments (Bacterial transformation) were a series of experiments conducted in 1952 by Alfred Hershey and Martha Chase that helped to confirm that DNA is genetic material. In their experiments, Hershey and Chase showed that when bacteriophages (T2), which are composed of DNA and protein (DNA of a virus is labelled with ^{32}P and the protein of the virus is labelled with ^{35}S), infect bacteria, their DNA enters the host bacterial cell (labelled with ^{32}P), but most of their protein does not. Hershey and Chase and subsequent discoveries all served to prove that DNA is the hereditary material

Hershey and Chase experiment
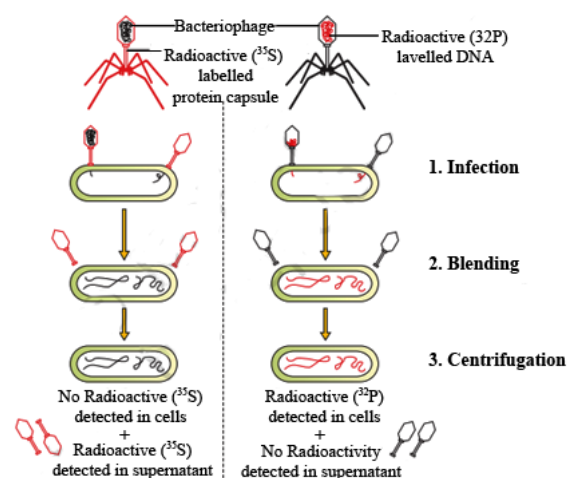
174.

Answer: 1

Sol:

The first restriction nuclease characterized was isolated from Haemophilus influenzae bacteria. The enzyme (HindII) cuts at a particular site within a specific sequence of six base pairs as follows. (Where nucleotides are shown in parenthesis, the enzyme recognizes either one of the two bases shown.)

175.

Answer: 3

Sol:

In oocytes of some vertebrates, diplotene can last for months or years.

So Diplotene is the longest stage in prophase-1.

Thus right answer is C.

176.

Answer: 2

Sol:

After completion of the biosynthetic stage, the product has to be subjected through a series of processes before it is ready for marketing as a finished product. The processes include separation and purification, which are collectively referred to as downstream processing.

177.

Answer: 4

Sol:

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Mitosis is a type of cell division that plays a crucial role in:

(a) Growth: Mitosis allows multicellular organisms to grow by increasing the number of cells.

(b) Healing and regeneration: Mitosis helps in repairing damaged tissues and regenerating lost or damaged cells.

(c) Repair: Mitosis replaces dead or damaged cells, maintaining tissue integrity

(d) Maintenance of cell size: By producing new cells, mitosis helps maintain the size and function of tissues and organs.

178.

Answer: 4

Sol:

Mutated gene does not appear on a photographic film as the probe has no complimentarity with it.

179.

Answer: 1

Sol:

During G1 phase the cell is metabolically active and continuously grows but does not replicate its DNA.

S or synthesis phase marks the period during which DNA synthesis or replication takes place. during the S phase, DNA replication begins in the nucleus, and the centriole duplicates in the cytoplasm.

During the G2 phase, proteins are synthesised in preparation for mitosis while cell growth continues.

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180.

Answer: 1

Sol:

Vectors, microinjection, gene gun (biolistic) are all techniques that are helpful in inserting a foreign DNA into the host cell.

Retroviruses are disarmed and they are used for delivering desirable genes into the animal cells.

PBR322 is an artificial plasmid, generally used in *E.coli* as cloning vector.

Plasmid - They are defined as a small circular, self-replicating ,and double stranded DNA molecule present in the bacterial cell, in addition to bacterial chromosome/extra chromosomal material known as nucleoid.