

# MOTION

Student's Solution Copy [CODE - 27352]

NEET PATTERN TEST Brahmastra Major Test-01

13th NEET - Phase 13

KOTA

**Date: 09-Mar-2025**

**Duration: 3 Hours**

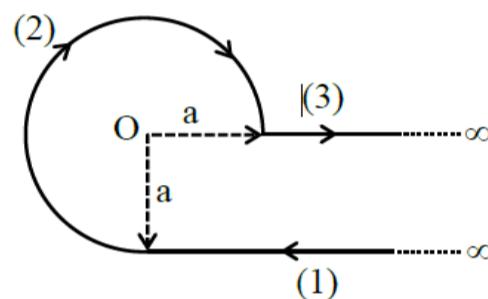
**Max Marks: 720**

## Physics - Section A

**1. Answer: 3**

**2. Answer: 1**

**Sol:**



$$\begin{aligned} B_1 &= \frac{\mu_0 i}{4\pi a} \otimes \\ B_2 &= \frac{\mu_0}{4\pi} \frac{i}{a} \left( \frac{3\pi}{2} \right) \otimes \\ B_3 &= 0 \\ B_{\text{net}} &= B_1 + B_2 + B_3 \\ &= 0 + \frac{3}{8} \frac{\mu_0 i}{a} + \frac{\mu_0 i}{4\pi a} \\ &= \frac{\mu_0 i}{4\pi} \left[ 1 + \frac{3\pi}{2} \right] \end{aligned}$$

**3. Answer: 4**

**4. Answer: 3**

**Sol:**

$$\vec{s} = 2t^2 \hat{j} + 5\hat{k}$$

at  $t = 1$  sec

$$\vec{V} = \frac{ds}{dt} = 4t\hat{j} + 0$$

$$\vec{V} = 4\hat{j} \text{ m/s}$$

**Sol:**

Force on the charge particle in uniform electric field,

$$F = ma = Eq \text{ or } a = qE/m$$

According to equation of motion,

$$v^2 = u^2 + 2as$$

$$\text{or } v^2 = 0 + 2 \left( \frac{qE}{m} \right) y$$

$$\text{K.E. } E = \frac{1}{2}mv^2$$

$$\frac{1}{2}m \left( \frac{2qE}{m} \right) y = qEy$$

**5. Answer: 2**

**6. Answer: 4**

**Sol:**

$$\begin{aligned} v &= \sqrt{\frac{Y}{\rho}} = \sqrt{\frac{3.2 \times 10^{11}}{8 \times 10^3}} \\ &= \sqrt{0.4 \times 10^8} \\ &= \sqrt{40 \times 10^6} \\ &= 6.32 \times 10^3 \text{ m/s} \end{aligned}$$

**Sol:**

we know that Bulk modulus  $B = V \frac{\Delta P}{\Delta V}$

$$\text{Also } V = \frac{4}{3}\pi R^3$$

$$\Delta V = 4\pi R^2 \Delta R$$

$$\text{So } B = \frac{4}{3}\pi R^3 \times \frac{P}{4\pi R^2 \Delta R} = \frac{R \times P}{3 \Delta R}$$

$$\therefore \frac{\Delta R}{R} = \frac{P}{3B}$$

**7. Answer: 4****Sol:**

$$\rho = \frac{m}{V} = \frac{m}{a.b.c.}$$

$$\left( \frac{d\rho}{\rho} \right) \% = \left( \frac{dm}{m} \% + \frac{da}{a} + \frac{db}{b} + \frac{dc}{c} \right) \%$$

$$\Rightarrow \frac{d\rho}{\rho} = (1.5 + 1 + 1 + 1)\%$$

$$\Rightarrow \frac{d\rho}{\rho} \% = 4.5\%$$

**9. Answer: 3****Sol:**

$$F_1 = F_2$$

$$\frac{mv_1^2}{R_1} = \frac{mv_2^2}{R_2}$$

$$\left( \frac{v_1}{v_2} \right)^2 = \frac{R_1}{R_2}$$

$$\frac{v_1}{v_2} = \left( \frac{3}{4} \right)^{\frac{1}{2}} = \frac{\sqrt{3}}{2}$$

**11. Answer: 4****Sol:**

According to Wien's displacement law,

$$\lambda_m T = \text{constant}$$

$$\therefore (\lambda_m)_P T_P = (\lambda_m)_Q T_Q$$

$$\text{or } \frac{T_P}{T_Q} = \frac{(\lambda_m)_Q}{(\lambda_m)_P} = \frac{900 \text{ nm}}{300 \text{ nm}} = 3$$

According to Stefan-Boltzmann law, rate of energy radiated by a body is

$$E = \sigma A T^4 = \sigma 4\pi R^2 T^4$$

(where, A = surface area =  $4\pi R^2$ )

$$\therefore \frac{E_P}{E_Q} = \left( \frac{R_P}{R_Q} \right)^2 \left( \frac{T_P}{T_Q} \right)^4 = \left( \frac{9 \text{ cm}}{27 \text{ cm}} \right)^2 (3)^4 = 9$$

**13. Answer: 4****Sol:**

Percentage error

$$\frac{\Delta A}{A} \times 100 = 3 \frac{\Delta P}{P} \times 100 + 2 \frac{\Delta Q}{Q} + \frac{1}{2} \frac{\Delta R}{R} \times 100 + \frac{\Delta S}{S} \times 100$$

$$= 3 \times 0.5 + 2 \times 1 + 0.5 \times 3 + 1.5 = 6.5 \%$$

**8. Answer: 2****Sol:**

The magnetic field produced due to the current wire is in inward direction and when we move square loop away from the wire the magnetic field line passing through square loop decreases and these continuous change in flux induced clockwise current in the square loop.

**10. Answer: 1****Sol:**

$$F = qE_{\text{dipole}}$$

$$\left( E_{\text{dipole}} \propto \frac{1}{r^3} \right)$$

$$\Rightarrow F \propto \frac{1}{r^3}$$

If distance is doubled then

$$\Rightarrow F_2 = \frac{F}{8}$$

**12. Answer: 2****Sol:**

Density of liquid,  $\rho_l = 760 \text{ kg/m}^3$

Density of mercury,  $\rho_m = 13600 \text{ kg/m}^3$

Height of liquid column in mercury barometer,

$$h_m = 76 \text{ cm} = 0.76 \text{ m}$$

If height of liquid in liquid column be  $h_l$ , then

$$\rho_{\text{liquid}} = \rho_{\text{mercury}}$$

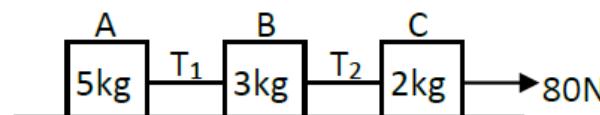
$$\Rightarrow h_l \rho_l g = h_m \rho_m g$$

$$\Rightarrow h_l = \frac{h_m \rho_m}{\rho_l} = \frac{0.76 \times 13600}{760}$$

$$= 13.6 \text{ m}$$

**14. Answer: 1**

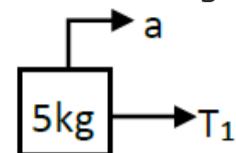
**Sol:**



The common acceleration is given by

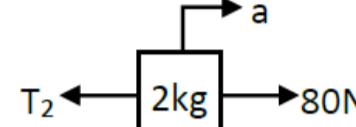
$$a = \frac{80}{10} = 8 \text{ m/s}^2$$

F.B.D of 5 kg



$$T_1 = 5(a)$$

$$T_1 = 5(8) = 40\text{N}$$



$$80 - T_2 = 2(8)$$

$$T_2 = 80 - 16 = 64 \text{ N}$$

**15. Answer: 4**

**Sol:**

Given :

$$I = I_A \sin \omega t + I_B \cos \omega t$$

$$\text{Rms value is given by } I_{\text{rms}} = \sqrt{\frac{\int I^2 dt}{\int dt}}$$

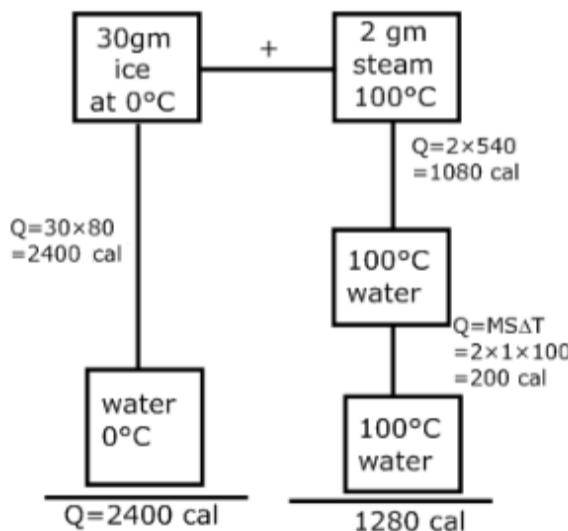
As we know that the avg value of

$$\sin(\theta) = \cos(\theta) = 0 \text{ and } \sin^2(\theta) = \cos^2(\theta) = 0$$

$$I_{\text{rms}} = \sqrt{\frac{I_A^2 + I_B^2}{2}}$$

**17. Answer: 1**

**Sol:**



final temp of the mixture = 0°C (Ice completely not melt)

**19. Answer: 1**

**Sol:**

$$Y = \frac{F/A}{x/L} = \frac{FL}{Ax} \Rightarrow \frac{F}{x} = \frac{YA}{L}$$

$$\therefore \text{Slope} = \frac{YA}{L} = \tan 60^\circ = \sqrt{3}$$

Therefore, the correct answer is (1)

**16. Answer: 2**

**Sol:**

The net gravitational force inside a spherical shell is zero.

**18. Answer: 2**

**Sol:**

$$F = \frac{dp}{dt} = m \frac{dv}{dt} = \frac{m \times 2v}{1/50} = 2 \times 10^4 \text{ N}$$

**20. Answer: 2**

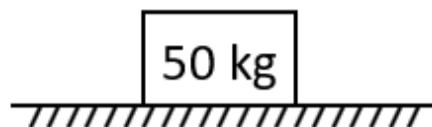
**Sol:**

Since, the velocity of an EM wave is given by the vector product of Electric field and magnetic field,

$$\vec{v} = \vec{E} \times \vec{B}$$

and wave is propagating in the +Z - direction.

$$\hat{k} = E_0 \hat{i} \times B_0 \hat{j}$$

**21. Answer: 4****Sol:**

$$\mu_k = 0.3$$

$$f_k = \mu_k N$$

$$= \mu_k mg$$

$$= 0.3 \times 50 \times 9.8$$

$$= 147 \text{ N}$$

**22. Answer: 2****Sol:**

$$g = \frac{g}{\left(1 + \frac{h}{R}\right)^2} = \frac{4g}{9} \quad \left(h = \frac{R}{2}\right)$$

$$\text{decrease} = g - g'$$

$$= g - \frac{4g}{9} = \frac{5g}{9}$$

**23. Answer: 3****Sol:**

Let the plank shifts to left by distance x

$$M(L-x) = 2Mx \Rightarrow x = \frac{L}{3}$$

**25. Answer: 3****Sol:**

Range of a projectile is given by

$$R = \frac{u^2 \sin(2 \times 15)}{g} = \frac{u^2}{2g}$$

$$\Rightarrow \frac{u^2}{g} = 100$$

$$R' = \frac{u^2 \sin(2 \times 45)}{g} = \frac{u^2}{g} = 100 \text{ m}$$

**27. Answer: 2****Sol:**

Given, refractive index =  $\frac{5}{3}$ , distance = 4 m

So, with the help of Pythagoras theorem

$$\sin(C) = \frac{x}{\sqrt{r^2+x^2}} = \frac{1}{\mu}$$

$$\Rightarrow r = \frac{h}{\sqrt{\mu^2-1}} = \frac{4}{\sqrt{\frac{5}{4}-1}} = \frac{4}{\sqrt{16/9}}$$

$$= \frac{4 \times 3}{4} = 3 \text{ m}$$

**29. Answer: 4****24. Answer: 1****Sol:**

To eject out electron from metal surface the incident wavelength should be less than threshold wavelength [ $\lambda_1 < \lambda_0$ ]

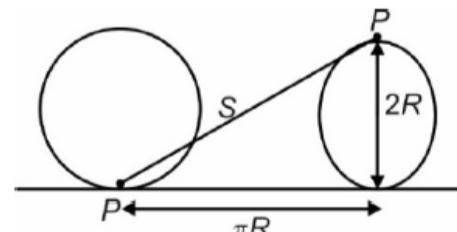
**26. Answer: 1****Sol:**

$$\text{Here, } R_{\text{eff}} = R_1 + R_2$$

or,  $\frac{L+L}{\sigma_{\text{eff}} A} = \frac{L}{\sigma_1 A} + \frac{L}{\sigma_2 A}$  (both wires are identical so have same cross section A )

$$\frac{2}{\sigma_{\text{eff}}} = \frac{1}{\sigma_1} + \frac{1}{\sigma_2}$$

$$\sigma_{\text{eff}} = \frac{2\sigma_1\sigma_2}{\sigma_1+\sigma_2}$$

**28. Answer: 2****Sol:**

$$|\vec{S}| = \sqrt{(\pi R)^2 + (2R)^2}$$

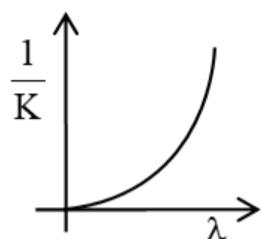
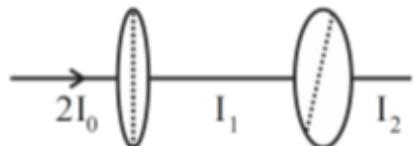
**30. Answer: 2**

**Sol:**

De-Broglie wavelength :

$$\lambda = \frac{h}{p} = \frac{h}{\sqrt{2mK}} \Rightarrow \lambda \propto \frac{1}{\sqrt{K}}$$

$$\Rightarrow \lambda^2 \propto \frac{1}{K} \quad \text{or} \quad \{y \propto x^2\}$$

**31. Answer: 3****Sol:**

$$I_1 = \frac{I_0}{2} = \frac{(2I_0)}{2} = I_0$$

$$I_2 = I_1 \cos^2 30^\circ$$

$$= I_0 \cdot \frac{3}{4} = \frac{3I_0}{4}$$

**33. Answer: 4****Sol:**

$$B(^1H^2) = 1.1 \text{ MeV}$$

$$B(^2He^4) = 7.0 \text{ MeV}$$

$$\text{Energy release} = 4(7.0) - 4(1.1)$$

$$= 28 - 4.4 = 23.6 \text{ MeV}$$

**35. Answer: 1****Sol:**

Since the lenses are identical in nature

$$\frac{1}{f_q} = \frac{1}{f_1} + \frac{1}{f_2} + \frac{1}{f_3} + \frac{1}{f_4} + \frac{1}{f_5}$$

Power

$$P(\text{dioptrre}) = \frac{1}{f(\text{in m})}$$

$$25 = \frac{5}{f}$$

$$f = \frac{1}{5} \text{ m} = 20 \text{ cm}$$

**37. Answer: 1****Sol:**

Use the concept of reversed and forward biasing.

**Sol:**

According to given figure, when we move from A to B.  
using KVL,

$$\begin{aligned} V_A - 9 - 3 \times 1 - 8 - 3 \times 2 - 7 &= V_B \\ &= V_A - V_B = 33 \text{ V} \end{aligned}$$

**32. Answer: 3****Sol:**

$$r = 1 \text{ m}$$

$$a = 6 \text{ rad/s}^2$$

$$\omega = 2\sqrt{2} \text{ rad/s}$$

$$a_{\text{net}} = \sqrt{(a_r)^2 + (a_t)^2}$$

$$a_r = \frac{v^2}{r} = \frac{8}{1} = 8$$

$$a_t = ra = 6$$

$$\therefore a_{\text{net}} = \sqrt{64 + 36}$$

$$= \sqrt{100}$$

$$= 10$$

**34. Answer: 2****Sol:**

Given,

$$P_1 = 6 \text{ kW}$$

$$P_2 = 2 \text{ kW}$$

$$P_{\text{series}} = \frac{P_1 P_2}{P_1 + P_2} \text{ and } P_{\text{parallel}} = P_1 + P_2$$

According to question,

$$\frac{P_{\text{series}}}{P_{\text{parallel}}} = \frac{\frac{6 \times 2}{6+2}}{6+2} = \frac{12}{8 \times 8} = \frac{3}{16}$$

**36. Answer: 1****Sol:**

Both (Assertion) and (Reason) are correct and (Reason) is not the correct explanation of (Assertion).

**38. Answer: 2****Sol:**

Use the concept of reversed and forward biasing.

**Sol:**

Magnifying power

$$m = \frac{f_0}{f_e}$$

there  $f_0 = 200$

$$f_e = 4$$

$$\text{So } m = f_0 / f_e$$

$$m = \frac{200}{4}$$

$$m = 50$$

Hint:

Recall magnification.

**39. Answer: 4****40. Answer: 3****Sol:**

As the capacitance in air is  $C = \frac{\epsilon_0 A}{d}$

when the dielectric slab of dielectric constant K is filled  $C' = \frac{K\epsilon_0 A}{d} = KC$

also we know that the potential difference is given by  $V = \frac{Q}{C}$  and energy is  $U = \frac{Q^2}{2C}$

If a dielectric slab of dielectric constant K is filled in between the plates of a capacitor after charging the capacitor (i.e., after removing the connection of battery with the plates of capacitor) the potential difference between the plates reduces to  $\frac{1}{K}$  times and the potential energy of capacitor reduces to  $\frac{1}{K}$  times but there is no change in the charge on the plates.

**41. Answer: 3****42. Answer: 3****Sol:**

From the given question

**Sol:**

$$\frac{\sqrt{3}a}{2}$$

$$I_1 = I_0$$

$$I_2 = 4I_0$$

the required ratio is given by

$$\frac{I_{\max}}{I_{\min}} = \frac{(\sqrt{I_1} + \sqrt{I_2})^2}{(\sqrt{I_1} - \sqrt{I_2})^2}$$

$$= \frac{9I_0^2}{I_0^2} = 9$$

**43. Answer: 3****44. Answer: 1****Sol:**

By theory

P-(iv), Q-(iii), R-(ii), S-(i)

**Sol:**

A piece of semiconductor is connected in series in an electric circuit. On increasing the temperature, the current in the circuit will increase because with rise in temperature, resistance of semiconductor decreases, hence overall resistance of the circuit increases, which in turn increases the current in the circuit.

**45. Answer: 2****Sol:**

$$P = \vec{F} \cdot \vec{v}$$

$$P = (10\hat{i} + 10\hat{j} + 20\hat{k})$$

$$(5\hat{i} - 3\hat{j} + 6\hat{k})$$

$$P = 50 - 30 + 120$$

$$P = 140W$$

**46. Answer: 1**

**Sol:**

$$N = \frac{W}{M_{\text{wt}}} \times N_A$$

$$\Rightarrow N = \frac{1}{2} \times N_A = 0.5 N_A \text{ molecules}$$

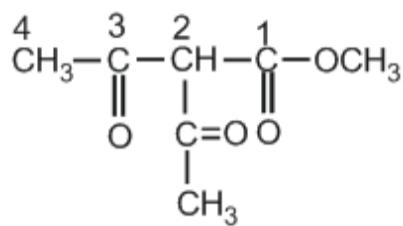
Option

$$(1) 14 \text{ gm } N_2 \Rightarrow \frac{14}{28} \times N_A = 0.5 N_A \text{ molecules}$$

**47. Answer: 3**

**Sol:**

The I.U.P.A.C. name of the given compounds



Methyl-2-acetyl-3-oxobutanoate

The principal functional group is ester group.

**48. Answer: 1**

**Sol:**

The given reaction is

$$\frac{1}{2} \times X_2 + \frac{3}{2} Y_2 \rightleftharpoons XY_3$$

$$\Delta S = S_{XY_3} - \left[ \frac{1}{2} S_{X_2} + \frac{3}{2} S_{Y_2} \right]$$

$$= 50 - \left[ \frac{1}{2} \times 60 + \frac{3}{2} \times 40 \right]$$

$$= 50 - [90] = -40 \text{ JK}^{-1} \text{ mol}^{-1}$$

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

$$\text{Eq. } (\Delta G=0) : T = \frac{\Delta H}{\Delta S} = \frac{-30 \times 1000}{-40}$$

$$= 750 \text{ K}$$

**49. Answer: 2**

**Sol:**

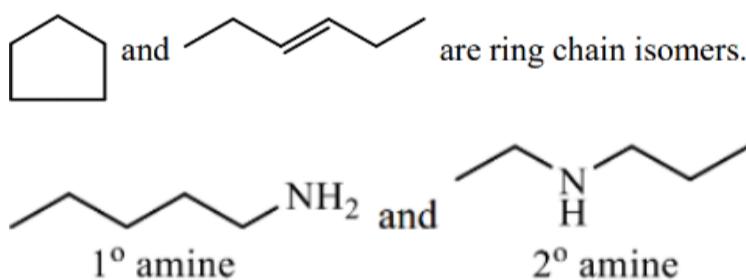
$$i = \frac{\text{normal Mol. wt.}}{\text{exp. Mol. wt.}} > 1$$

$$i = \text{normal Mol. wt.} > \text{exp. Mol. wt.}$$

The experimental molecular weight of an electrolyte will always be less than its calculated value because the value of  $i$  is greater than unity (i.e.  $i > 1$ ), for dissociation.

**51. Answer: 1**

**Sol:**



Both functional isomers.

**50. Answer: 3**

**Sol:**

Compound Oxidation state

$$\text{MnO}_2 \rightarrow +4$$

$$\text{KMnO}_4 \rightarrow +7$$

$$\text{MnO} \rightarrow +2$$

$$\text{K}_3 [\text{Mn}(\text{CN})_6] \rightarrow +3$$

↑ in +ve oxidation state ↓ in a atomic size.

**52. Answer: 4**

**Sol:**

Molarity of aqueous glucose = 1M

$$m = \frac{M \times 1000}{1000 \times d - M M_{\text{wt(solute)}}}$$

$$m = \frac{1 \times 1000}{1200 - 180} = 0.98$$

$$\Delta T_b = i \times K_b \times m$$

$$i=1 \text{ for glucose}$$

$$\Delta T_b = 0.98 \text{ K}_b$$

**53. Answer: 2**

**Sol:**

$$\Delta_f H_{\text{CO}_2} = \Delta_C H_{\text{graphite}}$$

$$q = \frac{\Delta_C H}{M_{\text{wt}}} \times w \Rightarrow 1000 = \frac{95}{12} \times w$$

$$\Rightarrow w = 126.3 \text{ gm}$$

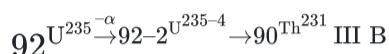
**Sol:**

Energy of electron in multielectron species are found according to Aufbau principle so.

- (1)  $(n + \ell)$  high energy high.
- (2)  $(n + \ell)$  same the  $n$  high energy high.

So	$n$	$\ell$	$n + \ell$
(I)	4	2	6
(II)	3	2	5
(III)	4	1	5
(IV)	3	1	4

Order of Energy  
 $I > II > III > IV$

**55. Answer: 3****Sol:****56. Answer: 3****Sol:**

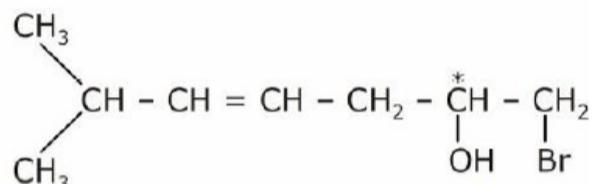
(I) For 1<sup>st</sup> order reaction,  $\alpha = 1 - e^{-kt}$

At  $t = 0$ ,  $\alpha = 0$  and at  $t$ ,  $\alpha \rightarrow 1$

(II)  $x = kt$  for zero order reaction

$$a_0\alpha = kt \Rightarrow \alpha = \left( \frac{k}{a_0} \right) t$$

$\therefore$  Straight line passing through origin.

**57. Answer: 3****Sol:**

asymmetric    T.S.I. =  $2^n = 2^2 = 4$

$n$  = no. of double bond + no. of chiral center =  $1 + 1 = 2$

(C) 4

**58. Answer: 4****Sol:**

O.N. of Mn

$\text{MnO}_4^{2-}$  & +6

$\text{MnO}_4^-$  & +7

$\text{MnO}_2$  & +4

So, +2 & +3 are not available

**59. Answer: 3****Sol:**

$$\lambda = K \frac{1000}{N}$$

**60. Answer: 4****Sol:**

Along the period EN increases so, non metallic character increases.

**61. Answer: 2****62. Answer: 4****Sol:**

In arrhenius equation,  $k = Ae^{\frac{E_a}{RT}}$

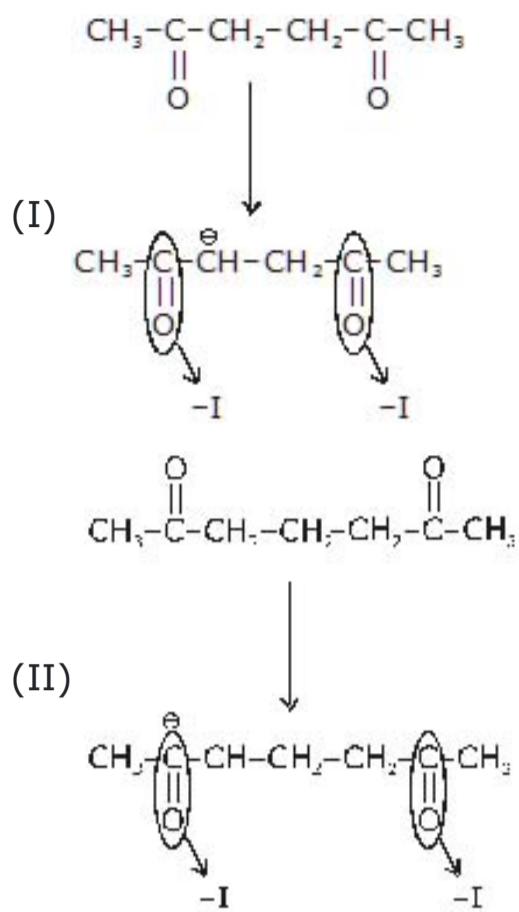
At very low temperature,

$$\frac{1}{T} \rightarrow \infty \text{ means } T = 0$$

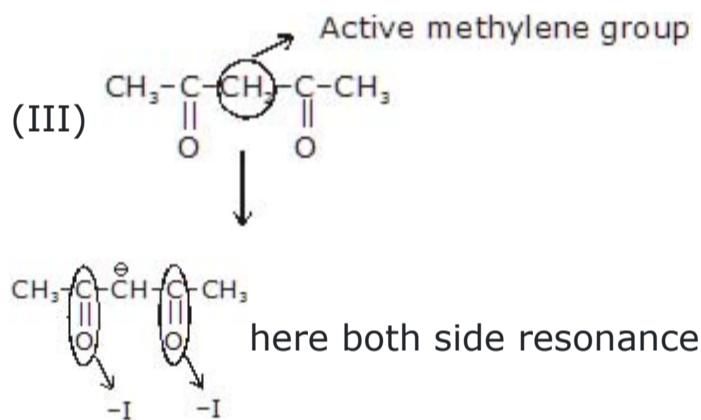
$$\therefore A \neq k$$

**Sol:**

III > I > II



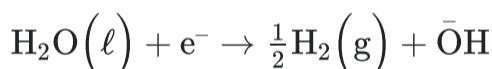
This is at more distance so least stable.



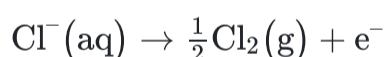
**63. Answer: 1**

**Sol:**

Reaction at cathode :



Reaction at anode



**64. Answer: 2**

**Sol:**

$\pi$  bond is stronger than  $\sigma$  bond.

**65. Answer: 1**

**66. Answer: 1**

**Sol:**



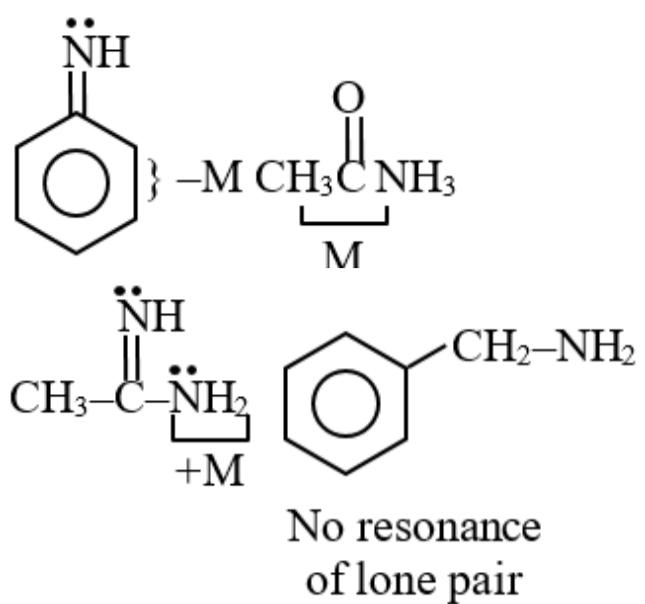
$$3 = 1 - 2$$

$$-FE^\circ = -2\text{F} \times 0.339 + 1 \times F \times 0.153$$

$$E^\circ = 0.678 - 0.153$$

$$E^\circ = 0.525$$

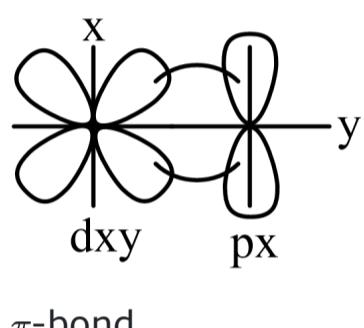
**Sol:**



(-M) of  $\text{CH}_3\text{C}-$  is greater than (-M)  
of -Ph that's why amide is weaker base  
than aniline.

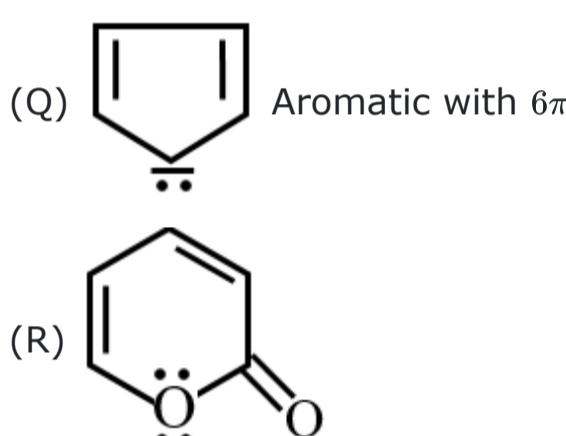
**67. Answer: 3**

**Sol:**



**68. Answer: 3**

**Sol:**



1 lone pair of will undergo resonance but  
the other will not.

$\therefore 6\pi$  delocalization

$\therefore$  Aromatic

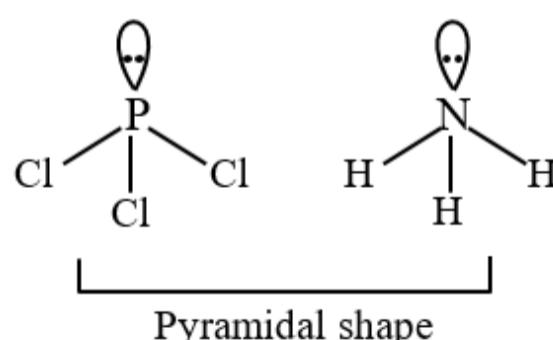
**69. Answer: 3**

**Sol:**

HCl, NaCl, NH<sub>4</sub>OH

**70. Answer: 3**

**Sol:**



**71. Answer: 3**

**Sol:**

- (I) It is 1° allylic :- Highly favoured S<sub>N</sub>2
- (II) It is 3° allylic :- Highly favoured S<sub>N</sub>1

**73. Answer: 1**

**72. Answer: 1**

**Sol:**

Fact

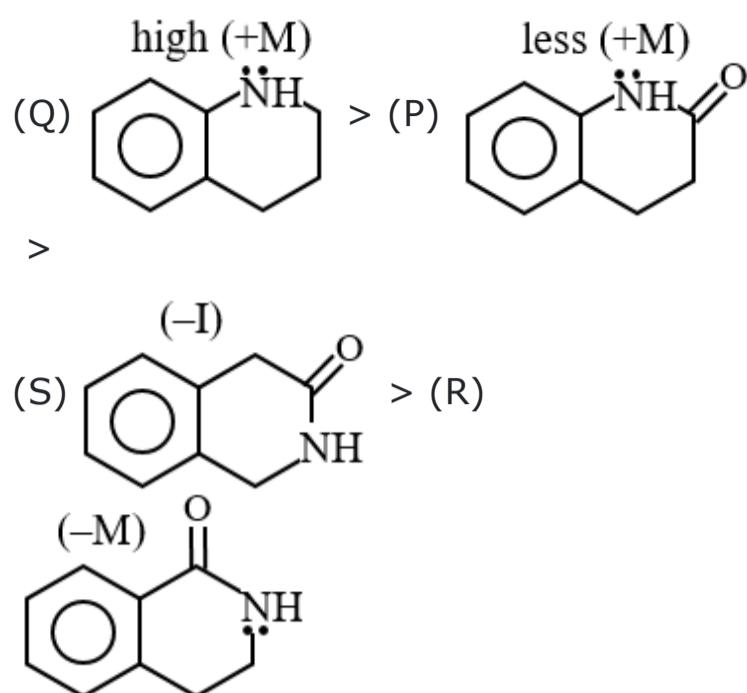
**74. Answer: 1**

**Sol:**

Both Assertion and Reason are correct and Reason is correct for the Assertion.

**Sol:**

Rate  $\alpha(+)$  effect on benzene ring

**75. Answer: 3****Sol:**

On mixing the two solution

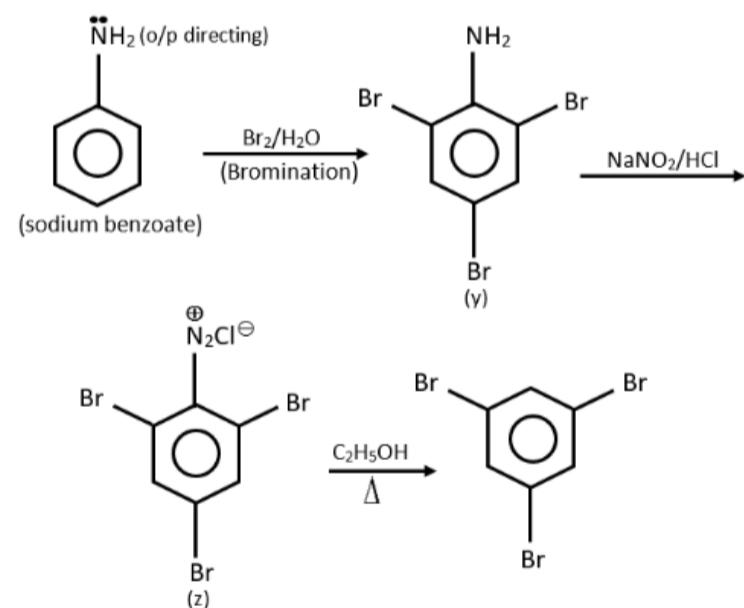
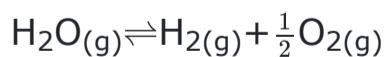
$$[\text{Ag}^+] = \frac{.01}{2} = 0.005\text{M}$$

$$[\text{Cl}^-] = \frac{.01}{2} = 0.005\text{M}$$

$$\text{IP of AgCl} = 0.005 \times 0.005 = 2.5 \times 10^{-5}$$

$$\therefore \text{IP} > K_{\text{sp}}$$

Precipitate occur

**77. Answer: 4****Sol:****79. Answer: 3****Sol:**

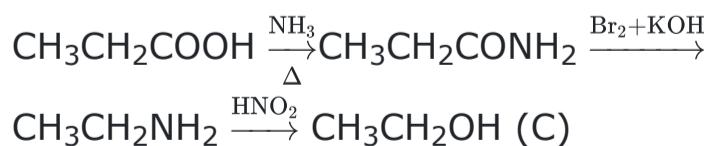
In this reaction volume is increasing in the forward reaction. So on increasing temperature reaction will proceed in forward direction.

**81. Answer: 2****76. Answer: 2****Sol:**

Both Assertion and Reason are correct but Reason is not correct for Assertion

**78. Answer: 2****Sol:**

All ligands are Lewis bases as they donate lone pair of electrons to the metal ion to form coordinate covalent bonds.

**80. Answer: 4****Sol:****82. Answer: 1**

**Sol:**

AgBr is sensitive to light which turns darks on contact with it, so it is used in photography. Photographic films and plates are made by coating a thin layer of silver bromide emulsion in gelatin over glass plates or celluloid films. Silver bromide is light sensitive, and when exposed to light, the bromide ion is ionized and the freed electron reduces a nearby silver ion

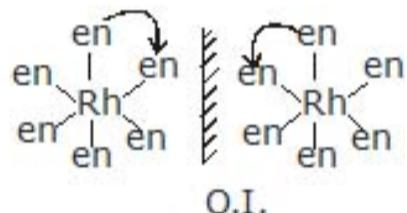
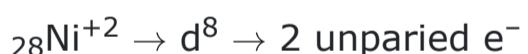
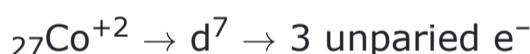
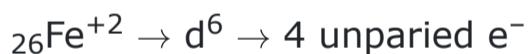
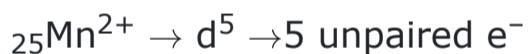
**83. Answer: 2****Sol:**

NaCl & KCl are soluble salts thus provide sufficient concentration of  $\text{Cl}^-$  while  $\text{Hg}_2\text{Cl}_2$  being insoluble salt do not provide sufficient concentration of  $\text{Cl}^-$  for chromyl chloride test.

**85. Answer: 1****Sol:**

(I) Cis $[\text{Co}(\text{NH}_3)_2]^{+3}$ , (III)  $[\text{Rh}(\text{en})_3]^{3+}$

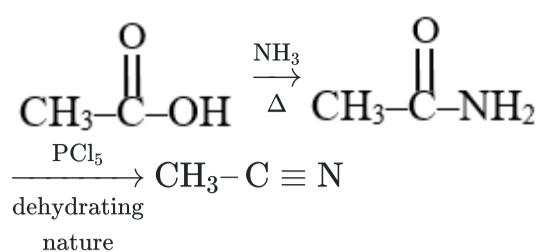
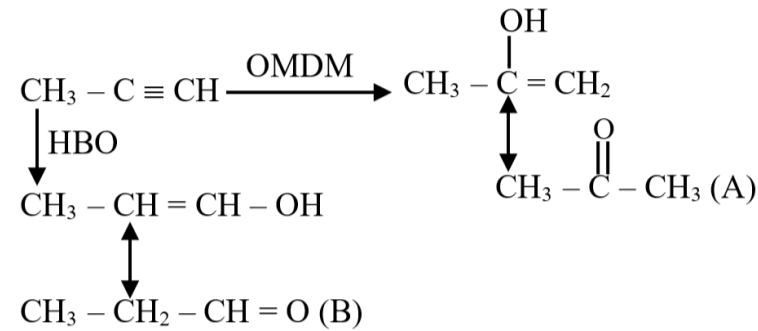
both are show optical isomerism.

**87. Answer: 1****Sol:**

$$\mu = \sqrt{n(n+2)} \text{B.M.}$$

$n$  = no. of unpaired electron

On increasing no. of unpaired electron, magnetic moment also increases.

**89. Answer: 2****Sol:****84. Answer: 2****Sol:****86. Answer: 3****Sol:**

Compound A, B, and D has anomeric carbon and convert into open chain compound which has aldehyde as functional group except the compound given in option C, which is glycosides.

**88. Answer: 3****Sol:**

In  $\text{KMnO}_4$ , Mn has an oxidation state of +7 therefore doesn't have an electron in d and s orbital which implies there is no d-d transition in  $\text{KMnO}_4$  and colour will appear due to charge transfer spectra.

$\text{K}_2\text{Cr}_2\text{O}_7 \rightarrow \text{Cr}$  has +6 oxidation state

$\text{Cr}^{+6} = [\text{Ar}] 3d^0 4s^0 \rightarrow$  Colour is due to charge transfer

$\text{K}_2\text{Cr}_2\text{O}_7$  &  $\text{KMnO}_4$  both are colored compounds due to charge transfer spectra.

**90. Answer: 1****Sol:**

Ca salts impart a brick red colour to the flame.

Sr gave crimson to red colour to a flame.

Na imparts a yellow colour to bunsen flame

Co imparts silver-white colour to bunsen flame.

**Sol:**

If

- (A) Al < Ga - due to d-e<sup>-</sup> contraction
- (B) Sn < Pb - due to lanthanoid contraction
- (C) In < Tl - due to lanthanoid contraction
- (D) He > Ne - Ionisation energy decreases moving down the group

**91. Answer: 2**

**Sol:**

Axile

**93. Answer: 1**

**Sol:**

The biological species concept, as first proposed by Mayr, groups the members of the same species organisms that can potentially interbreed to produce fertile offspring.

**95. Answer: 3**

**Sol:**

Statement I is incorrect but statement II is correct.

The **Annelids** are **coelomate** and triploblastic. Their body is **segmented**. **Arthropods** are metamerically **segmented** and **coelomate** animals.

Body is **unsegmented** with variety of shapes and covered with calcareous shell in molluscs. They are triploblastic and **coelomate** animals with Organ system level of organisation.

Organisms belonging to the phylums **Coelenterata, Echinodermata and Ctenophora exhibit radial symmetry**. Echinoderms have radial symmetry as adults and bilateral symmetry as larvae.

**97. Answer: 4**

**Sol:**

Class 12<sup>th</sup> NCERT Page No. 224

**92. Answer: 2**

**Sol:**

NCERT 11<sup>th</sup> Page No.308

**94. Answer: 4**

**96. Answer: 4**

**Sol:**

The following cells contributes to the formation of seminal plasma-

1) Prostate gland- It secretes a slightly alkaline fluid that constitutes around 30% of the volume of the semen along with spermatozoa and seminal vesicle fluid.

2) Seminal vesicles- It contributes around 50 - 70% of the fluid that ultimately becomes the semen.

3) Cowper's gland - It is also known as bulbourethral gland that contributes around 1% of the semen ejaculated.

**Hence, the correct answer is option "4".**

**98. Answer: 1**

**Sol:**

**Carbon fixation pathway in C3 plants** was discovered by Calvin, Benson and Basham in unicellular alga Chlorella using C-14 labelled carbon dioxide.

Radioactive isotope technique has helped in the investigation of Calvin cycle. With the help of **14C**, he discovered that PGA is the first CO<sub>2</sub> fixation product in photosynthesis of alga.

The **Moll's half leaf experiment** is popularly known to be performed to demonstrate the necessity of carbon dioxide for the process of photosynthesis to form starch.

The **flash photolysis method** was developed to study transient absorption of the samples.

**Inverted funnel experiment** to show that oxygen is produced during photosynthesis.

**99. Answer: 1**

**Sol:**

NCERT 11<sup>th</sup> Page No.311

**101. Answer: 2**

**Sol:**

Apocarpous, the gynoecium comprises two or more carpels that are free. For example- ranunculus. Hence, an apocarpous flower is found in ranunculus(buttercup).

**103. Answer: 3**

**Sol:**

Among the following option:

Option "3" is correct as Aschelminthes are pseudocoelomates and sexes are also separate (dioecious in nature).

Option "1" is incorrect as Porifera have internal fertilization, not external fertilization.

Option "2" is incorrect as Coelenterates have radial symmetry and do not exhibit asymmetry.

Option "4" is incorrect as Arthropoda has an open circulatory system, not a closed circulatory system.

**100. Answer: 1**

**Sol:**

11th NEW NCERT PAGE NO. 6

**102. Answer: 4**

**104. Answer: 2**

**Sol:**

Class 12<sup>th</sup> NCERT Page No. 35

**105. Answer: 2**

**Sol:**

Pyramid of energy is always upright

**106. Answer: 2**

**Sol:**

In C4 -plants every CO<sub>2</sub> molecule has to be fixed twice, so these plants are needed more energy for the synthesis of hexose sugar molecules than C3 -plants in which CO<sub>2</sub> has to be fixed only once.

18 ATP molecules are required by C3-plants for the synthesis of one molecule of hexose sugar while 30 ATP molecules are needed by the C4 -plants for the same.

Thus, C4 -plants have a need of 12 ATP molecules extra than C3 -plants for the synthesis of one molecule of hexose sugar.

**107. Answer: 2**

**108. Answer: 4**

**Sol:**

E. coli is a gram-negative, rod shaped, motile or nonmotile bacteria. E. coli contains a double stranded DNA as its genetic material. The DNA is not associated with any histone proteins so it is referred to as naked DNA. This DNA is circular with no free ends.

**Sol:**

### Depolarisation

When an electrical stimulus is given to a nerve fibre, an action potential is generated. The membrane becomes permeable to sodium ions than to potassium ions. This results into positive charge inside and negative charge outside the nerve fibre. Hence, the membrane is said to be depolarized. There is no significant role in Na-K ATPase pump.

### Polarisation

The main function of the Na-K ATPase pump is to maintain resting potential so that the cells will be keeping in a state of a low concentration of sodium ions and high levels of potassium ions within the cell (intracellular).

**109. Answer: 2**

**Sol:**

The law of segregation states that copies of genes separate or segregate so that each gamete receives only one allele.

As chromosomes separate into different gametes during meiosis, the two different alleles for a particular gene also segregate so that each gamete acquires one of the two alleles.

**Hence, the correct answer is option "2" - Alleles of a gene separate from each other leading to the separation of the types.**

**111. Answer: 1**

**Sol:**

<b>Animal</b>	-	<b>Planaria,</b>	<b>Phylum</b>	-
Platyhelminthes,			<b>Character</b>	-
Regeneration				

**110. Answer: 3**

**Sol:**

The spleen is the largest lymphatic organ in the body. Surrounded by a connective tissue capsule that extends inward to divide the organ into lobules, the spleen consists of two types of tissue called white pulp and red pulp. The white pulp is lymphatic tissue consisting mainly of lymphocytes around arteries.

**112. Answer: 3**

**Sol:**

Colostrum is the first milk which is released by the mammary gland after the delivery on birth of a newborn.

This milk is released after 2-3 days and is yellowish, thin fluid which is rich in protein, antibodies and is low in fat.

This milk is beneficial for the growth and development of newborn.

**Hence, the correct answer is option "3" - Protein, antibodies and low in fat.**

**113. Answer: 4**

**114. Answer: 2**

**Sol:**

Tropical rain forests are found in equatorial and subequatorial regions. The forests receive all the external inputs for optimum plant growth. Due to the abundant plant growth, tropical rain forests are home to a large number of animals. Therefore the density of organisms is high in it.

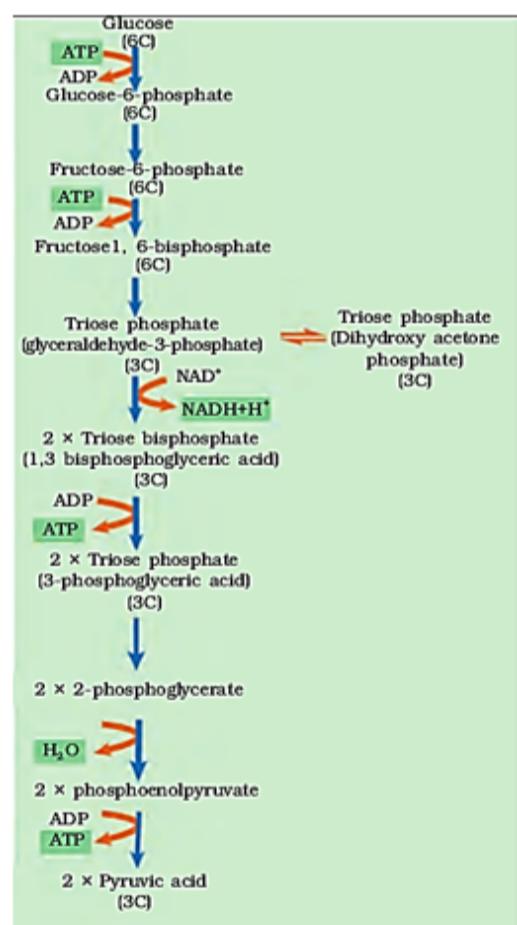
In grasslands fire occur periodically which prevent tree growth.

In savannah periods of drought are common.

In deciduous forests, vegetation composed primarily of broad-leaved trees that shed all their leaves during one season

**115. Answer: 3****Sol:**

Given reaction is the part of glycolysis.

**117. Answer: 3****Sol:**

Peptidoglycan

**119. Answer: 3****Sol:**

A crucial events in aerobic respiration are :

(i) The complete oxidation of pyruvate by the stepwise removal of all hydrogen atoms leaving 3 molecules of  $\text{CO}_2$ . This process takes place in the matrix of mitochondria and called Krebs' cycle.

(ii) The passing on of the electrons removed as part of the hydrogen atom to molecular  $\text{O}_2$  with simultaneous synthesis of ATP. This process is located on the inner membrane of the mitochondria and called ETS.

**116. Answer: 2****Sol:**

A resting neuron is negatively charged on the inside (due to the presence of chlorine ion and protein) and positively charged on the outside (due to the presence of sodium ions). In a resting neuron, there are concentration gradients across the membrane for  $\text{Na}^+$  and  $\text{K}^+$ .

These ionic gradients across the resting membrane are maintained by the active transport of ions by the sodium-potassium pump which transports 3  $\text{Na}^+$  outwards for 2  $\text{K}^+$  into the cell.

**118. Answer: 4****Sol:**

Consideration of one character at one time contribute to the success of Mendel.

**120. Answer: 1****Sol:**

Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**

**Sol:**

Mollusca—Those organisms who possess a covering of calcium carbonate over their body, it can cover the whole body or cover it partially.

Their body is divided into four parts;

- 1.) Head
- 2.) Mental
- 3.) Visceral hump
- 4.) Muscular foot

There is a cavity in their body for breathing and for removing waste. i.e. for excretion. The blood is pumped by the heart passes through large vessels into open spaces or body cavities in the case of the Mollusca.

Blue colour respiratory pigment hemocyanin is present.

**121. Answer: 2****Sol:**

**Medical Termination of Pregnancy** It is the intentional or voluntary termination of pregnancy before the full term. It is also called induced abortion.

About 45 to 50 million MTP are performed all over the world which accounts for 1/5 th of the total number of conceiving pregnancy. MTP was legalized by Government of India in 1971.

MTP is to get rid of unwanted pregnancy due to the failure of contraceptive, or rapes, and when continued pregnancy leads to harmful or fatal consequences for mother or foetus or both. MTP is considered safe during the first trimester of pregnancy

**123. Answer: 4****Sol:**

The hypophyseal portal system is a system of blood vessels in the brain that connects the hypothalamus with the anterior pituitary. Its main function is the transport and exchange of hormones to allow fast communication between both glands. It is present in higher vertebrates like amphibians, mammals, birds, and reptiles.

The main hormones transported by the system include gonadotropin-releasing hormone, corticotropin-releasing hormone, growth hormone-releasing hormone, and thyrotropin-releasing hormone.

**125. Answer: 4****122. Answer: 1****Sol:**

species → population → community → biome, Explanation: A number of species living in a particular area makes the population. Different population of a ecosystem forms community and communities in a geographical area are called biome.

**124. Answer: 1****Sol:****Phycomycetes (Algal fungi):**

- (a) Phycomycetes are called algal fungi (Phycus = alga) because of aquatic habitat and form of thallus.
- (b) They have aseptate and coenocytic mycelium.
- (c) Asexual reproduction occurs through zoospores and aplanospores produced in sporangia.
- (d) Sexual reproduction takes place by similar (isogamy) or dissimilar (anisogamy) or (oogamy) gametes, e.g., Rhizopus, Albugo etc.

**126. Answer: 4**

**Sol:**

11th Old NCERT PAGE NO. 70

**Sol:**

In regulation of kidney, an **excessive loss of fluid** from the body can activate these receptors which stimulate the hypothalamus to release antidiuretic hormone (**ADH**) or vasopressin from the neurohypophysis.

**DCT** : It helps in selective secretion of hydrogen and potassium ions and reabsorption of  $\text{HCO}_3^-$ .

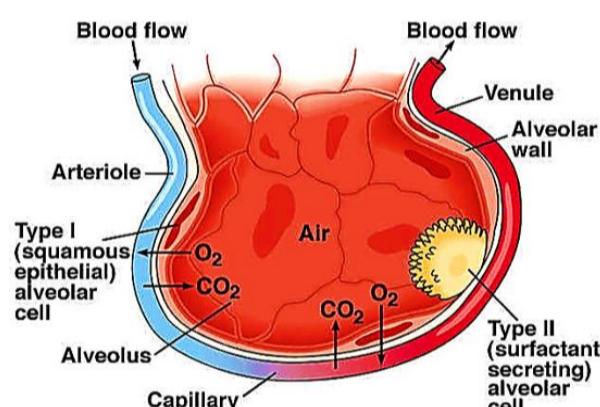
**PCT** : It helps to maintain the pH and ionic balance of the body fluids by selective secretion of hydrogen ions and ammonia into the filtrate and by absorption of  $\text{HCO}_3^-$  from it.

A **fall** in glomerular blood flow/glomerular blood pressure/GFR can activate the JG cells to release renin which converts angiotensinogen in blood to angiotensin I and further to **angiotensin II**.

**127. Answer: 1**

**Sol:**

The squamous epithelium is made of a single thin layer of flattened cells with irregular boundaries. They are found in the walls of blood vessels and air sacs of lungs and are involved in functions like forming a diffusion boundary. The edges of the squamous cells are irregular and there are special junctions between neighbouring cells which help to bind them firmly together. These are present in areas such as renal capsules of the kidney, the alveoli of the lungs and walls of the blood capillaries. It also presents in the hollow linings of the blood vessels and heart chambers to allow frictionless flow of fluids.



The cuboidal epithelium is composed of a single layer of cube-like cells. This is commonly found in ducts of glands and tubular parts of nephrons in kidneys and its main functions are secretion and absorption. The epithelium of proximal convoluted tubule (PCT) of nephron in the kidney has microvilli.

Hence, the correct answer is **Walls of blood vessels**.

**129. Answer: 3**

**128. Answer: 3**

**Sol:**

In 1953, Stanley Miller reported the production of biomolecules or organic compound like amino acid from simple gaseous starting materials, using an apparatus constructed to simulate the primordial Earth's atmosphere-ocean system. Miller introduced 200 ml of water, 100 mmHg of  $\text{H}_2$ , 200 mmHg of  $\text{CH}_4$ , and 200 mmHg of  $\text{NH}_3$  into the apparatus, then subjected this mixture, under reflux, to an electric discharge for a week, while the water was simultaneously heated. The purpose of this manuscript is to provide the reader with a general experimental protocol that can be used to conduct a Miller-Urey type spark discharge experiment, using a simplified 3 L reaction flask. Since the experiment involves exposing inflammable gases to a high voltage electric discharge, it is worth highlighting important steps that reduce the risk of explosion. The general procedures described in this work can be extrapolated to design and conduct a wide variety of electric discharge experiments simulating primitive planetary environments.

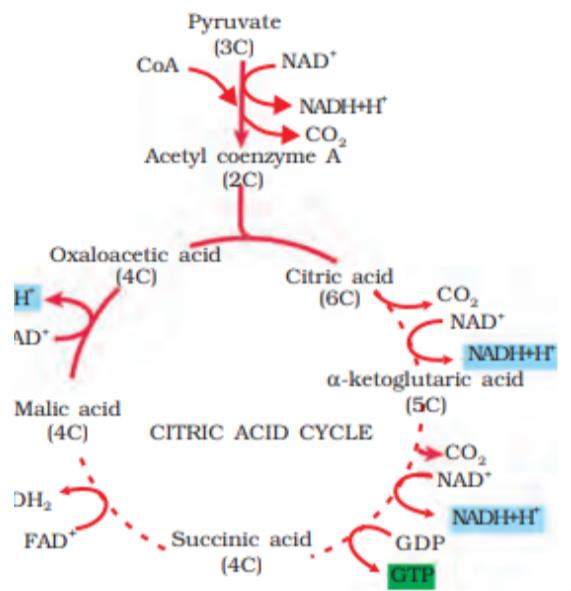
**130. Answer: 1**

**Sol:**

Phytoplankton, Explanation:  
Phytoplankton are small floating photosynthetic unicellular plant. In the aquatic ecosystem phytoplankton are producers that fix solar energy by the process of photosynthesis.

**131. Answer: 4****Sol:**

The **TCA cycle** starts with the condensation of acetyl group with oxaloacetic acid (OAA) and water to yield citric acid

**133. Answer: 3****Sol:**

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**135. Answer: 4****Sol:**

Amino acids: pyruvic acid; Fatty acids: acetyl CoA; Glycerol: dihydroxyacetone phosphate.

Interrelationship among metabolic pathways showing respiration-mediated breakdown of different organic molecules to  $\text{CO}_2$  and  $\text{H}_2\text{O}$ .

**132. Answer: 3****Sol:**

**Class XI NCERT Page No. 247, 248**

**134. Answer: 1****Sol:**

Among all the statements only incorrect option is "1".

In humans, a total of 23 pairs of chromosomes are present. Out of the 23 pairs, 22 pairs are the same in both (females and males).

Only 1 pair (Sex chromosome) is different.

In Males, the XY chromosome is present and In Females, the XX chromosome is present.

**Hence, the correct option is "1" - Humans contain 23 pairs of autosomes.**

**136. Answer: 3****Sol:**

NCERT 11<sup>th</sup> Page No.112, 113

**Sol:**

The urea cycle or ornithine cycle converts excess ammonia into urea in the mitochondria of liver cells. The urea forms, then enters the blood stream, is filtered by the kidneys and is ultimately excreted in the urine. Carbamoyl phosphate synthetase generates carbamoyl phosphate for both this pathway and the urea cycle. In mammals, two distinct carbamoyl phosphate synthetase isozymes are present. The mitochondrial enzyme uses  $\text{NH}_4^+$  as the nitrogen source, as is appropriate for its role in the urea cycle.

The intestines are a long, continuous tube running from the stomach to the anus. Most absorption of nutrients and water happen in the intestines. The intestines include the small intestine, large intestine, and rectum. The small intestine (small bowel) is about 20 feet long and about an inch in diameter.

The spleen is like a security guard for the body, letting healthy blood cells pass through it and stopping unhealthy ones in their tracks. The spleen recognises old, or damaged red blood cells and removes them from your body by breaking them down and saving any useful components, such as iron, in the process.

The kidneys are a pair of bean-shaped organs on either side of your spine, below your ribs and behind your belly. Each kidney is about 4 or 5 inches long, roughly the size of a large fist. The kidneys' job is to filter your blood.

**137. Answer: 2****Sol:**

Lamarckism is best known for its 'use and disuse theory' and theory related to 'inheritance of acquired characters'. According to Lamarck, continuous use of certain organs provides strength and development of such organs over generations. 'Inheritance of acquired character' says that these modified characteristics pass down through generations and give rise to completely new characteristics. One can explain giraffes' long necks by Lamarckism. According to this theory, initially, all giraffes had short necks. But they tried to get leaves from higher branches of the trees. They used more and more their necks which as a result got modified to the long necks in giraffes.

**139. Answer: 2****Sol:**

Class 11th NCERT Page No. 34

**138. Answer: 2****Sol:**

**Cuscuta, Orobanche, and Albugo are all genera of parasitic plants.** In an ecosystem, parasites are primary consumers that feed on a small portion of other living organisms.

**140. Answer: 3**

**Sol:**

In polygenic inheritance, a particular trait is controlled by 3 different genes. The given problem is of polygenic inheritance.

In this, phenotypic ratio is 1:6:15:20:15:6:1 instead of 27:9:9:3:3:3:1 in F<sub>2</sub> generation.

In the given example, the genotype of parents is AaBbCc and AaBbCc.

They will produce gametes ABC, ABc, Abc, abc, aBC, aBc, abC, AbC.

The phenotypic ratio will be 1:6:15:20:15:6:1.

Therefore, the value of x will be 6.

**141. Answer: 1****Sol:**

The **primary function of sweat glands** is to keep the core body temperature at approximately 37°C by releasing **sweat** in a hot environment or during physical activity. **Sweat glands** are innervated by neurons, so the process of **sweating** is controlled by the central nervous system. Evaporation of **sweat** requires a lot of heat. Thus, evaporation of **sweat** brings down the temperature.

**Excretion** is a process in which metabolic waste is eliminated from an organism. In vertebrates this is primarily carried out by the lungs, kidneys, and skin. This is in contrast with secretion, where the substance may have specific tasks after leaving the cell.

**Secretion**, is production and release of a useful substance by a gland or cell; also, the substance produced. Hence, the correct answer is thermoregulation.

**143. Answer: 2****Sol:**

The energy trapped by the producer, is then passed on to a consumer or the organism that ultimately dies.

Death of organism is the beginning of the detritus food chain/web. This chain begins with the dead organic matter. This consist of decomposers that are heterotrophs and these organisms derive their energy need from the dead organic matter which is also known as detritus.

**Hence, the correct answer is option "B" - DFC.**

**145. Answer: 3****142. Answer: 3****Sol:**

Wuchereria, the filarial worms cause a slowly developing chronic inflammation of the organs in which they live for many years, usually the lymphatic vessels of the lower limbs and the disease is called elephantiasis or filariasis. The genital organs are also often affected, resulting in gross deformities.

**144. Answer: 4****146. Answer: 3**

**Sol:**

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**147. Answer: 2**

**Sol:**

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

**148. Answer: 4**

**Sol:**

Arthur George Tansley coined the term 'ecosystem' in 1935 to describe the interactions between organisms and with their environment.

**149. Answer: 3**

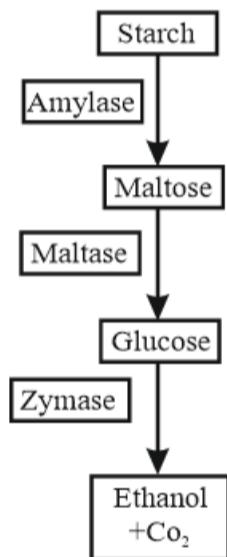
**Sol:**

11th NCERT, PAGE NO.- 248, 249, 251

**151. Answer: 3**

**Sol:**

Yeast (*Saccharomyces*) produces enzymes amylase, maltase and zymase. Amylase breaks down starch into maltose; Maltase converts maltose into glucose; glucose is converted by zymase to ethanol and  $\text{CO}_2$ .



**150. Answer: 3**

**Sol:**

The increase in the traits of hybrid strength due to crossing over is called hybrid vigor or heterosis. Hybrid vigor is directly proportional to the strength of heterozygosity.

**153. Answer: 4**

**Sol:**

AIDS is caused by the Human Immunodeficiency Virus (HIV), a member of a group of viruses called a retrovirus, which has an **envelope enclosing the RNA genome**. Transmission of HIV-infection generally occurs by-

- (a) Sexual contact with infected person.
- (b) By transfusion of contaminated blood and blood products.
- (c) By sharing infected needles as in the case of intravenous drug abusers.
- (d) From infected mother to her child through placenta.

**Hence correct option is "4"- An enveloped RNA genome containing retrovirus.**

**154. Answer: 1**

**Sol:**

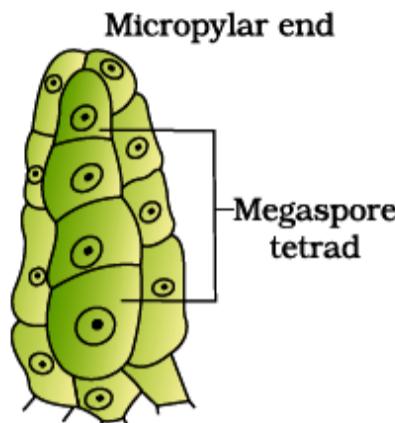
Class 12<sup>th</sup> NCERT Page No. 265

**155. Answer: 1**

**156. Answer: 4**

**Sol:**

Megaspore mother cell undergoes meiosis to form four haploid megasporangia which are arranged in a linear tetrad. Out of these four megasporangia, only one remains functional that develops into embryo sac or the female gametophyte and the rest three degenerate. The megaspore that remains functional can either be micropylar or chalazal depending upon the species.

**157. Answer: 4****Sol:**

Primary metabolites are those that are formed during the growth phase and supports in the overall development of cells. E.g., Carbohydrates, vitamins, proteins etc.

Secondary metabolites are those which are the end products of primary metabolites and are required for ecological activities of cells. E.g., alkaloids, flavonoids, rubber, essential oils, antibiotics, coloured pigments, scents, gums, spices. These all are secondary metabolites.

**159. Answer: 1****Sol:**

Transduction is the process by which a virus transfers genetic material from one bacterium to another. An example is the viral transfer of DNA from one bacterium to another, which is an example of horizontal gene transfer.

DNA replication is the biological process of producing two identical replicas of DNA from one original DNA molecule.

Translation is the process of translating the sequence of a messenger RNA (mRNA) molecule into a sequence of amino acids during protein synthesis.

Transcription is the process of making an RNA copy of a gene sequence.

**158. Answer: 3****Sol:**

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**160. Answer: 2****Sol:**

The **heterologous** host is one that **expresses** a product that is not **expressed** by the host but rather by **another host product**.

A **particular protein** produced by **yeast** can be **expressed** by **bacteria**. So, bacteria serve as a **heterologous** host. And the **protein-encoding gene** in the heterologous host is known as a **recombinant protein**.

**161. Answer: 3****162. Answer: 1**

**Sol:**

Plasmolysis is the characteristic feature of living walled cells all living walled cells plasmolysis when kept in a hypertonic solution Pickles. Meat and fish are preserved by salting similarly; jams and jellies are preserved by sweetening with sugars Salting and sweetening create hypertonic condition in which the fungi and bacteria get killed by plasmolysis.

**Sol:**

For some bryophytes and pteridophytes, their distribution is limited because of the need of water for the transport of male gametes and for the purpose of fertilisation.

In bryophytes and pteridophytes, transport of male gametes requires water. The male gametes, produced by reproductive structures called antheridia, are free-swimming sperm cells that need water to transport them to the female gametes, which are enclosed within structures called archegonia.

So both a and r correct but r is not correct explanation of a .

**163. Answer: 2****Sol:**

Carl Woese came up with the theory of life based on his discovery that the genes encoding ribosomal RNA are ancient and distributed over all lineages of life with little or no gene transfer. Therefore, rRNA A are commonly recommended as molecular clocks to the phylogeny.

**164. Answer: 1****Sol:**

In general, a vector has one or few recognition sites to facilitate gene cloning.

But if more than one recognition site is present in the vector, this makes gene cloning complicated as this will create several fragments to disturb the whole process..

**165. Answer: 1****Sol:**

Primary cell wall is capable of growth, which gradually diminishes as the cell matures. The primary cell wall encloses the secondary cell wall. The secondary cell wall is a structure found in many plant cells, located between the primary cell wall and the plasma membrane.

**166. Answer: 1****Sol:**

Nucellus , microspore mother cells (MMC), and megasporangium mother cells are part of sporophyte so these are diploid cells and their ploidy is  $2n$  while female gametophytes are part of gametophyte and ploidy is  $n$ . Female gametophyte of angiosperms is represented by the embryo sac. Angiosperms or flowering plants are characterized by the process of double fertilization. It involves the fusion of one male gamete ( $n$ ) with egg ( $n$ ) resulting in the formation of a diploid zygote ( $2n$ ). The other male gamete ( $n$ ) fuses with a secondary nucleus ( $2n$ ) to form a triploid endosperm ( $3n$ ) respectively.

**167. Answer: 1****168. Answer: 4****Sol:**

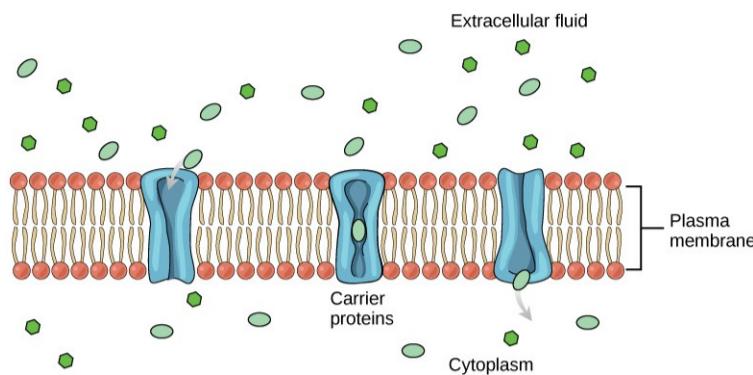
Amino acyl - tRNA synthetase enzyme / t-RNA ligase helps in joining the amino acids to their corresponding tRNA.

This enzyme is associated with the D-loop of t-RNA.

**Hence, the correct option is the "4" - D loop of tRNA.**

**Sol:**

The integral proteins involved in facilitated transport are collectively referred to as transport proteins; they function as either channels for the material or carriers. In both cases, they are transmembrane proteins. They may cross the plasma membrane with the aid of channel proteins.

**169. Answer: 1****Sol:**

On addition of chilled ethanol, purified DNA precipitates out. It can be seen as collection of fine threads in the suspension which can be removed by spooling.



Fig:-DNA that separates out  
can be removed by spooling

**Elution** is the **first step** in **gel electrophoresis**. In this process, a sample is **extracted** from a sample by washing it with a **solvent so** that it can be **read or studied easily**.

**Agarose gel electrophoresis** is performed to **separate the DNA fragments of varying lengths**. as the shorter DNA fragments will move faster as compared to the larger DNA fragments.

The **polymerase chain reaction** is a process that is used for the **amplification of DNA**.

**171. Answer: 2****170. Answer: 2****Sol:**

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**172. Answer: 3****Sol:**

During Meiosis the splitting of centromere occurs at Anaphase - II

**Sol:**

A bioreactor provides the optimal conditions for achieving the desired product by providing optimum growth conditions (temperature, pH, substrate, salts, vitamins, oxygen).

The most commonly used bioreactors are of stirring type

A stirred-tank reactor is usually cylindrical or with a curved base to facilitate the mixing of the reactor contents. The stirrer facilitates even mixing and oxygen availability throughout the bioreactor. Alternatively air can be bubbled through the reactor.

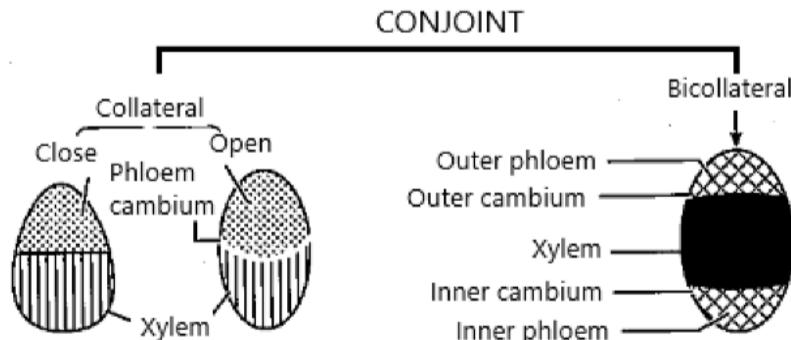
- (a) Sample stirred - tank bioreactor
- (b) Sparged stirred - tank bioreactor through which sterile air bubbles are sparged

**173. Answer: 1****Sol:**

In conjoint vascular bundle xylem and phloem are present on the same radius. These are of two types-

**1. Conjoint collateral** - In this type of vascular bundle xylem and phloem are present on the same radius and phloem present towards the periphery.

**2. Conjoint bicollateral and Open Vascular bundle** - There are two patches of phloem, one on each side of xylem, are found. There are two strips of cambium (outer and inner), one on each side of xylem, are found. Such type of vascular bundles are known as conjoint, bicollateral and open vascular bundle. Only outer cambium is functional.

**175. Answer: 4****Sol:**

Interzonal fibers appear soon after splitting of centromere in Anaphase

**174. Answer: 3****Sol:**

RNAi takes place in all eukaryotic organisms as a method of cellular defense. This method involves silencing of a specific mRNA due to a complementary dsRNA molecule that binds to and prevents translation of the mRNA (silencing). The source of this complementary RNA could be from an infection by viruses having RNA genomes or mobile genetic elements (transposons) that replicate via an RNA intermediate.

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**176. Answer: 1**

**Sol:**

Proinsulin is a single polypeptide chain composed of the B and A subunits of insulin joined by the C-peptide region. Proinsulin is converted to insulin during the maturation of secretory vesicles.

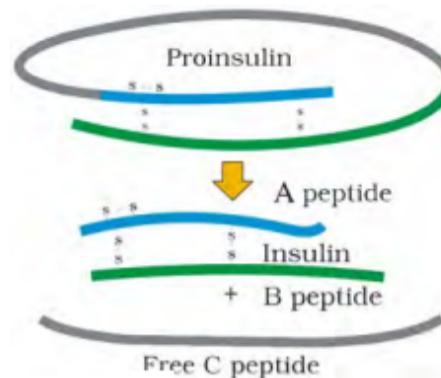


Figure: Maturation of pro-insulin into insulin

**177. Answer: 1****Sol:**

$G_1$  Phase is the first phase out of the four phases ( $G_1$ , S,  $G_2$ , M) of the cell cycle. It is a part of the interphase, where the cells synthesizes mRNA and proteins in preparation for subsequent steps leading to cell division.

**178. Answer: 2****Sol:**

A transgenic animal is defined as an animal that has foreign DNA (genes) introduced into its genome. In the case of transgenic animals, this foreign DNA is typically introduced by injecting DNA into the nucleus of a fertilized egg (zygote) at the earliest stages of development. This injection ensures that the foreign DNA integrates into the genome of the developing animal, which results in the foreign DNA being present in all the cells of the resulting animal as it grows and develops.

**179. Answer: 1****Sol:**

5-10% of the total cell cycle

**180. Answer: 4****Sol:**

The first clinical gene therapy was given in 1990 to a 4-year old girl with adenosine deaminase (ADA) deficiency. This enzyme is crucial for the immune system to function.

ELISA is based on the principle of antigen-antibody interaction. Infection by pathogen can be detected by the presence of antigens (proteins, glycoproteins, etc.) or by detecting the antibodies synthesised against the pathogen.