



Student's Solution Copy [CODE - 27649]

NEET PATTERN TEST Brahmastra Major Test-05

13th NEET - Phase 12

KOTA

Date: 30-Mar-2025

Duration: 3 Hours

Max Marks: 720

Physics - Section A

1. Answer: 4

Sol:

$$PV = \mu RT$$

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

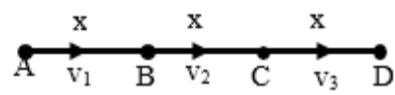
3. Answer: 3

Sol:

$$\text{Let } AB = x$$

$$BC = x$$

$$2x + CD = 3x$$



$$\langle v \rangle = \frac{\text{Total distance}}{\text{Total time}}$$

$$= \frac{3x}{\frac{x}{v_1} + \frac{x}{v_2} + \frac{x}{v_3}}$$

$$= \frac{3}{\left[\frac{1}{v_1} + \frac{1}{v_2} + \frac{1}{v_3} \right]} = \frac{3}{\left[\frac{v_2 v_3 + v_1 v_3 + v_1 v_2}{v_1 v_2 v_3} \right]}$$

$$\langle v \rangle = \frac{3v_1 v_2 v_3}{[v_1 v_2 + v_2 v_3 + v_3 v_1]}$$

Hence option (3) is correct.

5. Answer: 3

Sol:

Work is done on/by the system is equivalent to energy supplied/extracted from the system, Hence dimensions of work and all types of energy are same.

$$[W] = [K_E] = [M^1 L^2 T^{-2}]$$

2. Answer: 3

Sol:

$$E_{\text{net}} = E_Q + E_{-2Q} + E_{3Q}$$

$$= + \frac{Q}{2A\varepsilon_0} \hat{i} - \frac{2Q}{2A\varepsilon_0} \hat{i} - \frac{3Q}{2A\varepsilon_0} \hat{i}$$

$$= - \frac{2Q}{A\varepsilon_0} \hat{i}$$

4. Answer: 4

Sol:

For loop A

$$I_A = \frac{Nq}{\frac{2\pi}{\omega}}$$

$$I_A = \frac{Nq\omega}{2\pi}$$

For loop B

$$I_B = 0$$

because net incoming or outgoing charge will cancel each other

$$I_A - I_B = \frac{Nq\omega}{2\pi}$$

6. Answer: 2

Sol:

As the weight of wire acts at centre of gravity.

∴ Only half the length of wire gets extended.

$$\text{Now } Y = \frac{F}{A} \cdot \frac{(L/2)}{\Delta l} = \frac{Mg(L/2)}{A\Delta l}$$

$$\Rightarrow \Delta l = \frac{MgL}{2AY} \Rightarrow \frac{\rho ALgL}{2AY}$$

$$\therefore \Delta l = \frac{\rho L^2 g}{2Y}$$

7. Answer: 2

8. Answer: 3

Sol:

Let the equilibrium temperature to be found be T . Now, we consider T to be greater than T_1 and T_2 but smaller than T_3 .

Since there is no loss of heat energy. Hence, we get,

Heat lost by M_3 = Heat regained by M_1 + Heat regained by M_2 so, we get,

$$\begin{aligned} \Rightarrow M_1 s (T_1 - T) \\ = M_2 s (T - T_2) + M_3 s (T - T_3) \end{aligned}$$

Dividing both sides by s , we get,

$$\begin{aligned} \Rightarrow M_1 (T_1 - T) \\ = M_2 (T - T_2) + M_3 (T - T_3) \end{aligned}$$

Opening the brackets and solving for T , we get,

$$T = \frac{M_1 T_1 + M_2 T_2 + M_3 T_3}{M_1 + M_2 + M_3}$$

9. Answer: 2**Sol:**

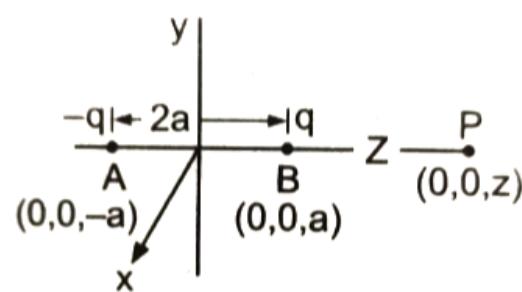
Least count of any given instrument is the smallest measurement that can be done by this instrument.

Example : Vernier calipers has least count of 0.01 cm

Sol:

Potential at P due to $(+q)$ charge,

$$V_1 = \frac{1}{4\pi\epsilon_0} \cdot \frac{q}{(z-a)}$$



Potential at P due to $(-q)$ charge,

$$V_2 = \frac{1}{4\pi\epsilon_0} \cdot \frac{-q}{(z+a)}$$

Total potential at P due to electric dipole,

$$\begin{aligned} &= \frac{1}{4\pi\epsilon_0} \cdot \frac{q}{(z-a)} + \frac{1}{4\pi\epsilon_0} \cdot \frac{q}{(z+a)} \\ &= \frac{q}{4\pi\epsilon_0} \cdot \frac{(z+a-z+a)}{(z-a)(z+a)} \\ V &= \frac{2qa}{4\pi\epsilon_0(z^2-a^2)} \end{aligned}$$

10. Answer: 4**Sol:**

Given equation

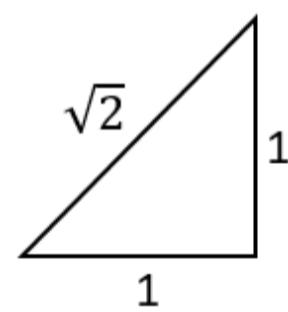
$$y = x - \frac{x^2}{20} \dots\dots (1)$$

Comparing with the standard equation

$$y = x \tan \theta - \frac{1}{2} \frac{gx^2}{u^2 \cos^2 \theta} \dots\dots (2)$$

From equation (1) & (2)

$$\tan \theta = 1$$



$$\sin \theta = \frac{1}{\sqrt{2}}$$

$$\cos \theta = \frac{1}{\sqrt{2}}$$

$$\text{and } \frac{gx^2}{2u^2 \cos^2 \theta} = \frac{x^2}{20}$$

$$u = 10\sqrt{2}$$

As maximum height is given by

$$H_{\max} = \frac{u^2 \sin^2 \theta}{2g}$$

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

$$= \frac{100 \times 2 \times 1}{2 \times 10 \times 2}$$

$$H_{\max} = 5 \text{ m}$$

11. Answer: 2**Sol:**

$$v_1 = 0.5 \text{ m/s}$$

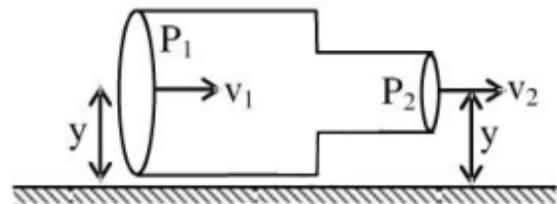
$$P_1 = 10^3 \text{ N/m}^2$$

$$v_2 = 0.7 \text{ m/s}$$

$$P_2 = ?$$

\therefore bernoulli's equation is,

$$P + \frac{1}{2}\rho v^2 + \rho gh = \text{constant}$$



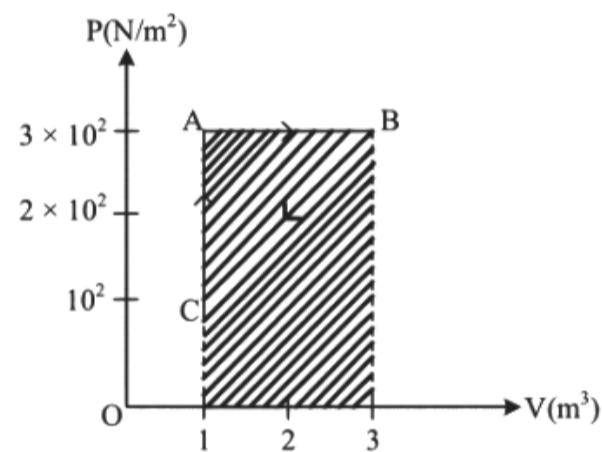
$$P_1 + \frac{1}{2}\rho v_1^2 + \rho gh_1 = P_2 + \frac{1}{2}\rho v_2^2 + \rho gh_2$$

$$\Rightarrow P_1 + \frac{\rho}{2}v_1^2 + \rho gy = P_2 + \frac{\rho}{2}v_2^2 + \rho gy$$

$$\Rightarrow P_1 - P_2 = \frac{\rho}{2}(v_2^2 - v_1^2)$$

$$\Rightarrow 10^3 - P_2 = \frac{1000}{2} [(0.7)^2 - (0.5)^2]$$

$$\Rightarrow P_2 = 880 \text{ N/m}^2$$

13. Answer: 4**Sol:**

AB is isobaric process

$$W_{AB} = P(V_2 - V_1)$$

$$W_{AB} = 3 \times 10^2 (3 - 1)$$

$$W_{AB} = 3 \times 100 \times 2$$

$$W_{AB} = 600 \text{ J}$$

15. Answer: 1**Sol:**

Work done against gravity $mgh = 2 \times 10 \times 10 = 200 \text{ J}$

Work done against friction = (Total work done - work done against gravity) = $300 - 200 = 100 \text{ J}$

12. Answer: 3**Sol:**

$$U = \frac{1}{2}LI^2 = \frac{1}{2} \times 100 \times 10^{-3} \times 1^2 = 0.05 \text{ J}$$

14. Answer: 3**Sol:**

At Earth,

$$g_e = 9.8 \frac{\text{m}}{\text{s}^2} \text{ and safe height is } h_e = 2\text{m}$$

At Planet,

$$g_p = 1.96 \frac{\text{m}}{\text{s}^2} \text{ and } h_p = ?$$

on comparing the above two equations

$$\frac{g_p}{g_e} = \frac{1}{5}$$

From the energy conservation

$$E_p = E_e$$

$$mg_p h_p = mg_e h_e$$

$$\frac{g_p}{g_e} = \frac{h_e}{h_p}$$

$$\text{hence, } h_p = 5 \times 2 = 10 \text{ m}$$

16. Answer: 4**Sol:**

$$a_c = \frac{(m_2 - m_1)g}{(m_1 + m_2)}$$

$$\frac{g}{8} = \left(\frac{m_2 - m_1}{m_1 + m_2} \right) g$$

$$\frac{1}{8} = \left(\frac{\frac{m_2}{m_1} - 1}{\frac{m_2}{m_1} + 1} \right)$$

$$\frac{m_2}{m_1} + 1 = 8 \frac{m_2}{m_1} - 8 \Rightarrow \frac{7m_2}{m_1} = 9$$

$$\boxed{\frac{m_2}{m_1} = \frac{9}{7}}$$

17. Answer: 3**18. Answer: 4**

Sol:

Current lags voltage in inductive circuit
i.e.

$$X_L > X_C$$

$$\omega L > \frac{1}{\omega C}$$

$$\omega > \frac{1}{\sqrt{LC}}$$

$$\omega > \omega_0$$

19. Answer: 2**Sol:**

Area of square plates is more than the area of the circular disc.

Hence ,The centre of mass will be shifted inside the square plate due to its greater mass.

Sol:

Isothermal process $\Delta T = 0$

$$\Delta U = \frac{f}{2} n R \Delta T$$

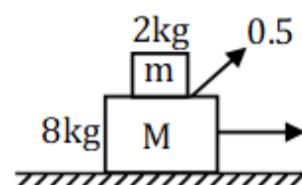
$$\Delta U = 0$$

No change in internal energy

$$\Delta Q = \Delta W (1^{\text{st}} \text{ law})$$

$$\Delta Q = +\text{ve}$$

$$\Delta W = +\text{ve}$$

20. Answer: 3**Sol:**

$$(a_A)_{\max} = 0.5 g = 4.9 \text{ m/s}^2$$

For moving together



$$\begin{aligned} F_{\max} &= m_T a_A \\ &= 10 \times 4.9 \\ &= 49 \text{ N} \end{aligned}$$

21. Answer: 1**Sol:**

By theory

22. Answer: 1**Sol:**

The poynting vector represents the directional energy flux (the energy transfer for unit area per unit time) of an EM field.

Its direction must be mutually & perpendicular to both the electric & magnetic field.

$$= (\vec{E} \times \vec{H})$$

$$\text{as } \vec{B} = \mu_0 \vec{H}$$

23. Answer: 4**Sol:**

By KVL in each branch

$$\frac{9-0}{0.5} + \frac{12}{1} = \frac{V_c - 9}{2}$$

$$18 + 12 = \frac{V_c - 9}{2}$$

$$V_c = 69 \text{ V}$$

24. Answer: 1**Sol:**

The strain at tension T_1 is $\Delta L_1 = L_1 - L$
The strain at tension T_2 is $\Delta L_2 = L_2 - L$

Let L = unstretched length suppose the young modeles wire is Y .

$$\frac{T_1/A}{\Delta L_1/L} = \frac{T_2/A}{\Delta L_2/L}$$

$$\Rightarrow \frac{T_1}{A} \times \frac{L}{\Delta L_1} = \frac{T_2}{A} \times \frac{L}{\Delta L_2}$$

$$\Rightarrow \frac{T_1}{(L_1 - L)} = \frac{T_2}{(L_2 - L)}$$

$$T_1(L_2 - L) = T_2(L_1 - L)$$

$$L = \frac{T_2 L_1 - T_1 L_2}{T_2 - T_1}$$

25. Answer: 3**Sol:**

Thrust

$$F = u \left(\frac{dm}{dt} \right) = 5 \times 10^4 \times 40 = 2 \times 10^6 N$$

27. Answer: 3**Sol:**

Let v = rms speed of N_2 molecule at 300 K

$$\text{or } v = \sqrt{\frac{3kT}{m}}$$

where, k = Boltzamann constant

$$= 1.38 \times 10^{-23} \text{ JK}^{-1}$$

$$\text{or } v = \sqrt{\frac{3 \times 1.38 \times 10^{-23} \times 300}{28.0152 \times 1.67 \times 10^{-27}}}$$

$$= 5.15 \times 10^2 \text{ ms}^{-1}$$

Using the formula, $\lambda = \frac{h}{mv}$, we get

$$\lambda = \frac{6.62 \times 10^{-34}}{28.0152 \times 1.67 \times 10^{-27} \times 5.15 \times 10^2}$$

$$= 2.75 \times 10^{-11} \text{ m}$$

29. Answer: 3**Sol:**

Applying KVL in loop

ABCPA, ABFEA, ABGHA and ABJIA, we get

$$30 - i_2 \times 11 = -25 \dots \text{(i)}$$

$$20 + i_2 \times 5 = 25 \dots \text{(ii)}$$

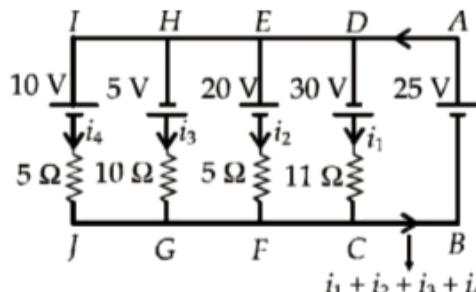
$$5 - i_3 \times 10 = -25 \dots \text{(iv)}$$

$$10 + i_4 \times 5 = 25 \dots \text{(iv)}$$

Solving equations (i), (ii), (iii) and (iv) we get

$$i_1$$

$$= 5 \text{ A}, i_2 = 1 \text{ A}, i_3 = 3 \text{ A} \text{ and } i_4 = 3 \text{ A}$$



Hence, current flowing through 25 V cell is 12 A

31. Answer: 1**26. Answer: 4****Sol:**

Normal force will provide the necessary centripetal force.

$$\Rightarrow N = m\omega^2 R$$

$$\text{Also, } \omega = \frac{2\pi}{T}$$

$$\Rightarrow N = (0.2) \left(\frac{4\pi^2}{T^2} \right) (0.2)$$

$$= 0.2 \times \frac{4 \times (3.14)^2}{(40)^2} \times 0.2$$

$$\therefore N = 9.859 \times 10^{-4} \text{ N}$$

28. Answer: 4**Sol:**

$$d = l_1 + l_2 - A$$

$$55^\circ = 15^\circ + l_2 - 60^\circ, l_2 = 100^\circ$$

29. Answer: 3**30. Answer: 1****Sol:**

Gien mass $M = 500 \text{ g} = 0.5 \text{ kg}$ and radius $R = 10 \text{ cm} = 0.1 \text{ m}$

Moment of inertia of a solid cylinder,
 $I = \frac{1}{2} MR^2$

$$= \frac{1}{2} \times 0.5 \times (0.1)^2$$

$$= 2.5 \times 10^{-3} \text{ kg-m}^2$$

So, the correct answer is option 1.

32. Answer: 3

Sol:

This is because in heavy nuclei, the N/Z ratio becomes larger in order to maintain their stability and reduce instability caused due to the repulsion among the protons. The neutrons exert only attractive short-range nuclear forces on each other as well as on the neighbouring protons, whereas the protons exert attractive short-range nuclear forces on each other as well as the electrostatic repulsive force. Thus, the nuclei with high mass number, in order to be stable, have large neutron to proton ratio (N/Z).

33. Answer: 3**Sol:**

$$m_1g - T_1 = m_1a \quad \dots \dots \dots (i)$$

$$T_2 - m_2g = m_2a \quad \dots \dots \dots (ii)$$

$$\therefore (T_1 - T_2) + (m_1 + m_2)a = (m_1 - m_2)g$$

$$\Rightarrow T_1 - T_2 = (m_1 - m_2)a = (m_1 - m_2)g$$

$$\tau = (T_1 - T_2)R = I\alpha$$

$$= (1/2)mR^2(a/R) \quad \dots \dots \dots (iii)$$

$$\Rightarrow (T_1 - T_2) = (1/2)ma \quad \dots \dots \dots (iv)$$

From (iii) and (iv)

$$(1/2)ma = (m_1 - m_2)g - (m_1 + m_2)a$$

$$\Rightarrow a = \frac{m_1 - m_2}{m_1 + m_2 + (m/2)}g$$

35. Answer: 1**Sol:**

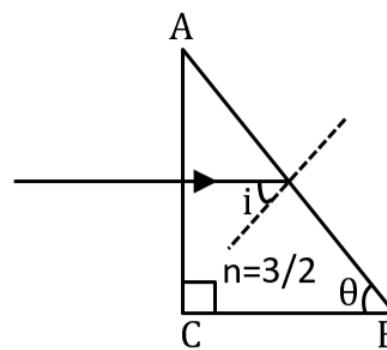
As we know that the displacement current is obtain by the changing electric field hence to obtain the changing electric field potential difference should be change with the time .

or

When potential difference between the plates of a capacitor changes with time then variable electric field is set up between the plates and this variable electric field gives rise to displacement current.

37. Answer: 1**Sol:**

Light ray will pass the surface AC without bending since it is incident normally. Suppose it strikes the surface AB at an angle of incidence i .



$$i = 90^\circ - \theta$$

For the required condition :

$$90^\circ - \theta > C$$

$$\text{or } \sin(90^\circ - \theta) > \sin C$$

$$\text{or } \cos \theta > \sin C = \frac{1}{3/2} = \frac{2}{3}$$

$$\text{or } \theta < \cos^{-1} \frac{2}{3}$$

34. Answer: 3**Sol:**

$$As, \frac{nr}{m} = R$$

$$\frac{n \times 1}{m} = 30 \text{ or } n = 30m$$

$$\text{Current, } I = \frac{nE}{2R} \text{ or}$$

$$1.5 = \frac{n \times 1.5}{2 \times 30} \text{ or } n = 60 \dots \dots (ii)$$

From eqs. (i) and (ii), we get

$$m = 60/30 = 2 \text{ and } mn = 120$$

36. Answer: 3**Sol:**

$$\text{Given, } I_1 = I$$

$$I_2 = 4I$$

$$\text{At point A : } \Delta\phi_1 = \frac{\pi}{2}$$

$$I_R = I_1 + I_2 + 2\sqrt{I_1 I_2} \cos \Delta\phi \quad \dots \dots (1)$$

From equation (1)

$$I_{R_1} = I_1 + I_2 = \partial I \quad \dots \dots (2)$$

$$\text{At point B : } \Delta\phi_2 = \pi$$

$$\text{So, } I_{R_2} = [\sqrt{I_1} - \sqrt{I_2}]^2 = I \quad \dots \dots (3)$$

$$\text{Now, } I_{R_1} - I_{R_2} = 4I$$

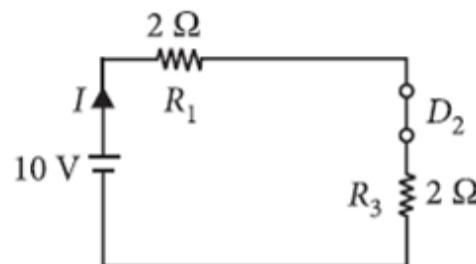
38. Answer: 4

Sol:

In full wave rectification, output signal (ripple) frequency is double that of input frequency. So, output frequency is 200 Hz.

39. Answer: 1**Sol:**

Diode D_1 is reverse biased so, it will block the current and diode D_2 is forward biased, so it will pass the current.



Hence, equivalent circuit becomes as shown in the figure. Current in the circuit = Current flowing through the resistance $R_1 = \frac{10}{2+2} = 2.5 \text{ A}$

41. Answer: 3**Sol:**

Given

$$\text{Total energy} = 2\text{J}$$

Let the amplitude be A.

Total energy is given as,

$$\therefore \frac{1}{2}KA^2 = 2$$

$$\frac{400}{2}A^2 = 2$$

$$200A^2 = 2$$

$$A^2 = \frac{1}{100}$$

$$A = \frac{1}{10}$$

$$\therefore a_{\max} = \omega^2 A$$

$$a_{\max} = \frac{K}{m} A$$

$$= \frac{400}{1} \times \frac{1}{10}$$

$$= 40 \text{ m/s}^2$$

43. Answer: 3**Sol:**

$$\begin{aligned} T &= 2\pi\sqrt{\frac{1}{g}} \Rightarrow T \propto \frac{1}{\sqrt{g}} \\ \Rightarrow \frac{\Delta T}{T} \times 100 &= -\frac{1}{2} \left(\frac{\Delta g}{g} \right) \times 100 \\ &= -\frac{1}{2} (-2\%) = 1\% \end{aligned}$$

40. Answer: 2**Sol:**

$$I' = I_1 + I_2 + 2\sqrt{I_1 I_2} \cos \varphi$$

$$I_1 = I, I_2 = 9I, \varphi = \pi$$

$$I' = I + 9I + 2\sqrt{9I^2 \cos \pi} = 10I - 6I = 4I$$

42. Answer: 1**Sol:**

Consider each one third of the assembly as a separate capacitor. The three positive plates are connected together at point A and the three negative plates are connected together at point B. Thus, the three capacitors are joined in parallel. As the plate area is one third of the original for each part, the capacitances of these parts will be $K_1 C/3, K_2 C/3$ and $K_3 C/3$. The equivalent capacitance is, therefore,

$$C_{eq} = \left(K_1 + K_2 + K_3 \right) \frac{C}{3}$$

44. Answer: 1**Sol:**

The beat frequency = $|f_1 - f_2|$, where $f = c/\lambda$

$$f_{\text{beat}} = \left| \frac{392}{0.98} - \frac{392}{1} \right| \text{Hz}$$

$$f_{\text{beat}} = 8 \text{ Hz}$$

Sol:

We have

$$c = v_1 = \frac{x}{t_1} \dots \dots \dots (i)$$

$$\text{and } v_2 = \frac{10x}{t_2}$$

from (i), we get

$$x = ct_1$$

$$\therefore v_2 = \frac{10ct_1}{t_2} = 10c \frac{t_1}{t_2}$$

We have

$$\mu = \frac{c}{v}$$

$$\mu = \frac{ct_2}{10ct_1}$$

$$\mu = \frac{t_2}{10t_1}$$

From critical angle

$$\sin i_c = \frac{1}{\mu}$$

$$\therefore i_c = \sin^{-1} \left(\frac{1}{\mu} \right)$$

$$i_c = \sin^{-1} \left(\frac{10t_1}{t_2} \right)$$

45. Answer: 1

Sol:

$$y = a \sin (\omega t - Kx) \dots \dots \dots (1)$$

$$y = a \cos(\omega t - Kx)$$

$$\Rightarrow y = a \sin \left(\omega t - Kx + \frac{\pi}{2} \right) \dots \dots \dots (2)$$

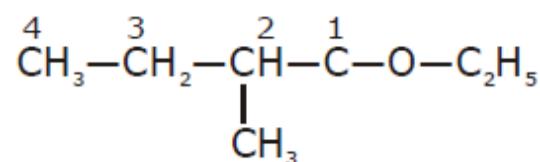
From (1) and (2)

The phase difference :

$$\Delta\phi = \frac{\pi}{2}$$

46. Answer: 3

Sol:



47. Answer: 4

48. Answer: 3

Sol:

$$\text{No. of moles} = \frac{\text{No. of atoms}}{N_A}$$

$$\text{No. of atoms} = \text{No. of moles} \times N_A \times \text{atomicity}$$

$$(1) \text{ No. of atoms} = \frac{1}{24} \times N_A \times 1$$

$$= \frac{N_A}{24} = 0.041 N_A$$

$$(2) \text{ No. of atoms} = \frac{1}{32} \times N_A \times 2$$

$$= \frac{N_A}{16} = 0.062 N_A$$

$$(3) \text{ No. of atoms} = \frac{1}{7} \times N_A \times 1$$

$$= \frac{N_A}{7} = 0.142 N_A$$

$$(4) \text{ No. of atoms} = \frac{1}{108} \times N_A \times 1$$

$$= 0.009 N_A$$

Sol:

Part 1: Work Done on System

When work done is positive, it is said to be work is done on the system.

Part 2: Formula Used

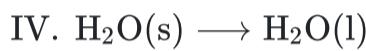
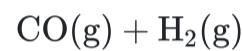
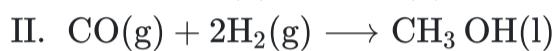
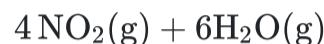
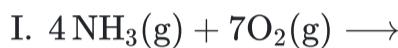
$$W = -\Delta n_g RT$$

Where,

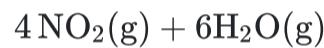
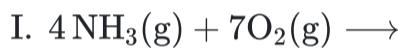
Δn_g = difference of gaseous moles between the reactant and product.

Part 3: Calculation of Δn_g

When the value of Δn_g is negative, then the value of work done is came to be positive and then the work is done on the system.



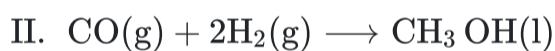
In reaction (I):



The Δn_g for the above reaction is calculated as $\Delta n_g = 10 - 11 = -1$.

In the above reaction the value of Δn_g is negative, thus the work is done on the system.

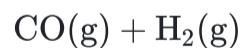
In reaction (II):



The Δn_g for the above reaction is calculated as $\Delta n_g = 0 - 3 = -3$.

In the above reaction the value of Δn_g is negative, thus the work is done on the system.

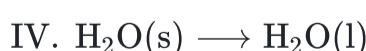
In reaction (III):



The Δn_g for the above reaction is calculated as $\Delta n_g = 2 - 1 = 1$.

In the above reaction the value of Δn_g is positive, thus the work is done on the surrounding.

In reaction (IV):



$$d_{\text{ice}} < d_{\text{water}}$$

$$V_{\text{ice}} > V_{\text{water}}$$

$$\Delta V = -ve$$

$$W = -P\Delta V$$

$$W = +ve$$

In the above reaction the value of ΔV is negative, thus the work is done on the system

49. Answer: 2

Sol:

$$\frac{W}{E} = N \times V$$

$$\frac{W}{40} = 0.1 \times \frac{1500}{1000}$$

$$W = 6 \text{ gm}$$

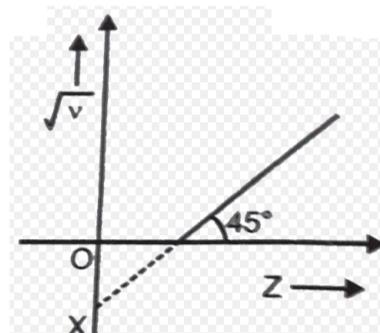
50. Answer: 1

Sol:

Properties of the elements are a periodic function of atomic number only.

In Modern Periodic Table, elements are arranged by using observation of Moseley's experiment.

$$\sqrt{\nu} = a(Z - b)$$



51. Answer: 1

Sol:



200 cm³ of 0.2 M NaOH

$$= \frac{200 \times 0.2}{1000} = 0.04 \text{ mol}$$

50 cm³ of 0.1 M HCl

$$= \frac{50 \times 0.1}{1000} = 0.005 \text{ mol}$$

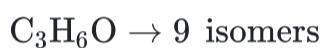
HCl is in excess hence NaOH is neutralized completely

Thus, only 0.04 mol NaOH is neutralized

$$\Delta H^0 = 57.3 \times 0.04 = -2.292 \text{ kJ}$$

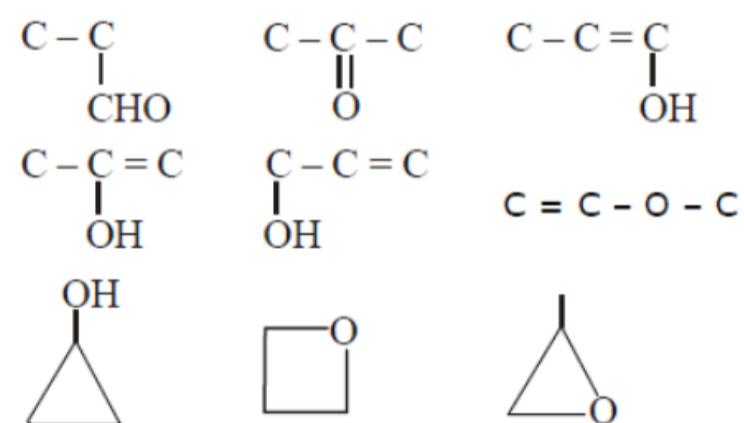
52. Answer: 3

Sol:



1 aldehyde / 1 ketone / 1 = +1 OH / 1 = +1 ether

1 Ring + 1 OH / 1 Ring + 1 Ether



53. Answer: 4

Sol:

$$\frac{1}{\lambda} = R \cdot Z^2 \left(\frac{1}{n_1^2} - \frac{1}{n_2^2} \right)$$

In paschen series max. wavelength for Li⁺² will be for n₁=3, n₂=4

$$\therefore \frac{1}{\lambda_{\max}} = R(3)^2 \left(\frac{1}{9} - \frac{1}{16} \right) = \frac{7R}{16}$$

$$\lambda_{\max} = \frac{16}{7R} = \frac{16}{7} \times 912 = 2084.5 \text{ \AA}$$

54. Answer: 3

Sol:

for KCl, i = 2

for sugar, i = 1

Colligative property \propto no. of solute particles

$$\text{therefore, } \frac{(\text{colligative property})_{KCl}}{(\text{colligative property})_{\text{Sugar}}} = \frac{2}{1} = 2$$

55. Answer: 3

56. Answer: 3

Sol:

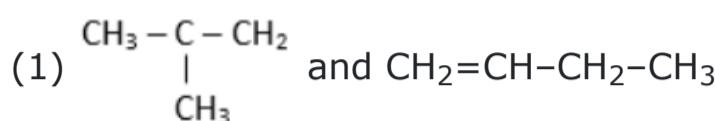
Fact

Sol:

The elements with the same valence electrons belong to the same group.

The pair of atomic numbers 13 and 31, represents elements belonging to the same group.

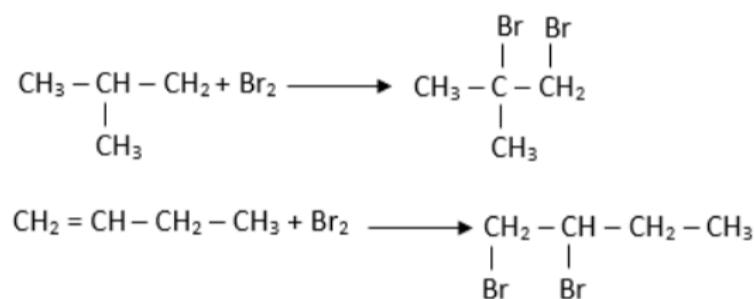
They correspond to Al and Ga. They belong to group 13 or IIIA.

57. Answer: 4**Sol:**

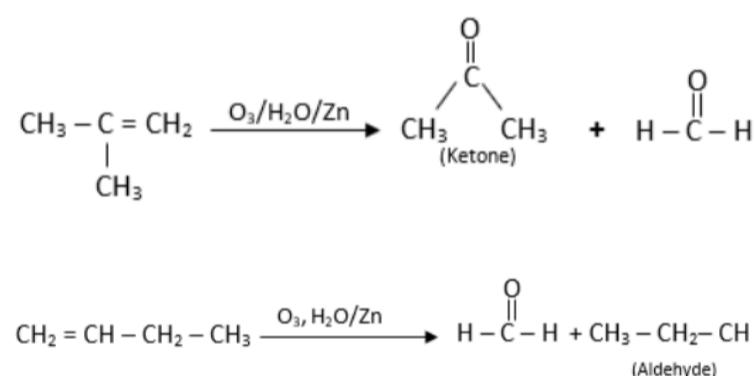
gives alcohol with bayer's reagent.

(2) 2-methyl propene and 1-butene gives no reaction with ammonical AgNO_3 reagent

(3)



(4)

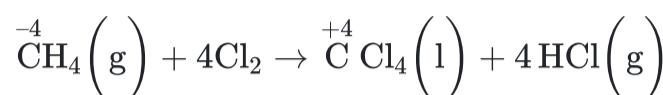
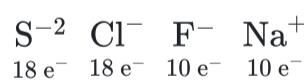
**59. Answer: 2****Sol:**

$$P_A = P_A^o \cdot X_A = 240 \times \frac{2}{3} = 160 \text{ torr};$$

$$P_B = P_B^o \cdot X_B = 150 \times \frac{1}{3} = 50 \text{ torr}$$

$$P_{\text{Total}} = 160 + 50 = 210 \text{ torr}$$

Since observed vapor pressure is less than expected. This means that solution exhibits negative deviation.

58. Answer: 2**Sol:****60. Answer: 2****Sol:**

1. In isoelectronic species, more the negative charge, more will be the ionic radius (because effective nuclear charge decreases) and vice-versa.

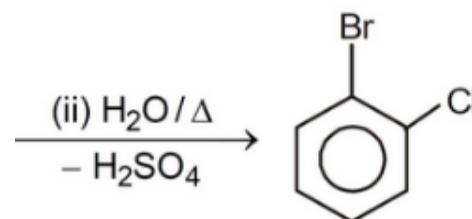
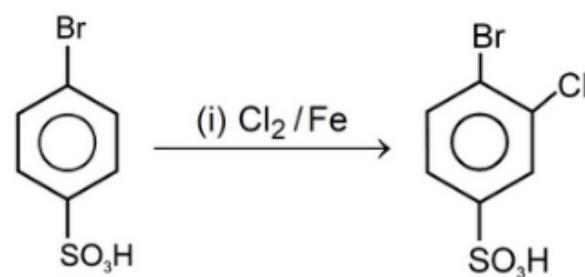
In between Na^+ and F^- : $\text{F}^- > \text{Na}^+$ (isoelectronic species)

then in between F^- and Cl^- : $\text{Cl}^- > \text{F}^-$ (down the group, size increases).

then in between Cl^- and S^{2-} : $\text{S}^{2-} > \text{Cl}^-$ (isoelectronic species)

61. Answer: 2**62. Answer: 3**

Sol:



69. Answer: 1

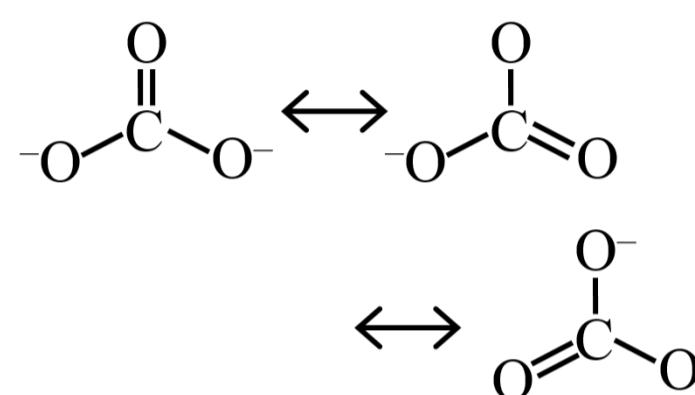
Sol:

$$E^\circ_{\text{Pb}^{2+}/\text{Pb}} > E^\circ_{\text{Fe}^{2+}/\text{Fe}}$$

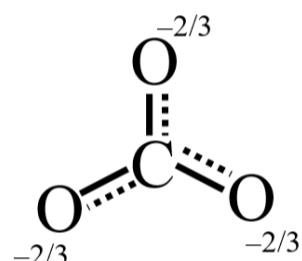
So, Fe will oxidise and Pb²⁺ will reduce.

70. Answer: 4

Sol:

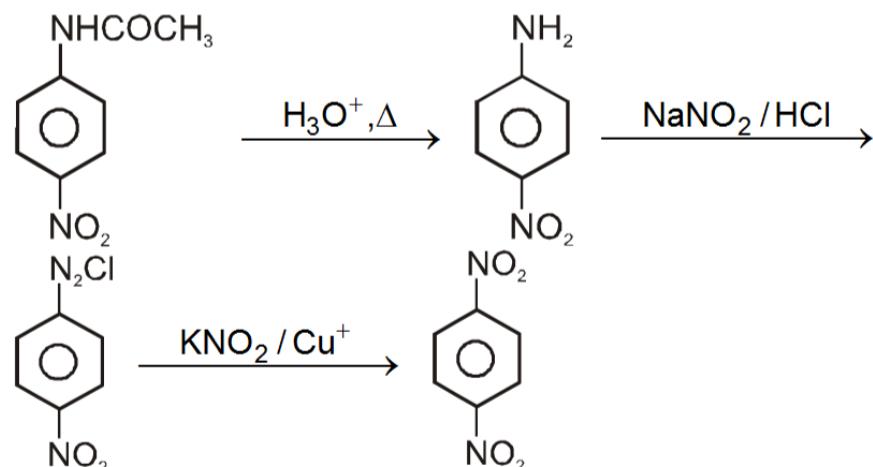


Resonance hybrid :



71. Answer: 4

Sol:



72. Answer: 1

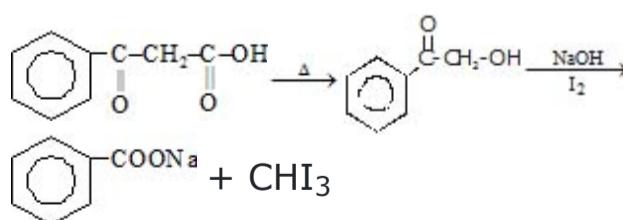
Sol:

Chemically, rust is $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$

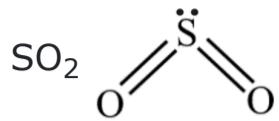
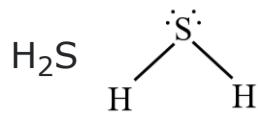
73. Answer: 4

74. Answer: 4

Sol:



Sol:



$$S = C = S \quad \mu = 0$$

CS_2 is linear having zero dipole moment.

75. Answer: 4

Sol:

$$K_p = K_c (RT)^{\Delta ng}$$

$$K_p = 7.90 \times 10^{-3} (0.0821 \times 1115)^{1/2}$$

$$K_p = 7.56 \times 10^{-2}$$

76. Answer: 4

Sol:

Two and both are pi bond

77. Answer: 1

Sol:

KMnO_4 & $\text{CrO}_3/\text{H}_2\text{O}$ being comparatively stronger oxidizing agents oxidize ethanol into Acetic acid.

PCC is moderate oxidizing agent that can convert ethanol to ethanal.

78. Answer: 2

Sol:

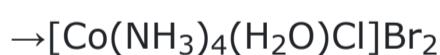
$$\rho = x \Rightarrow k = 1/x$$

$$\lambda_{eq} = \frac{1000}{NX}$$

79. Answer: 2

Sol:

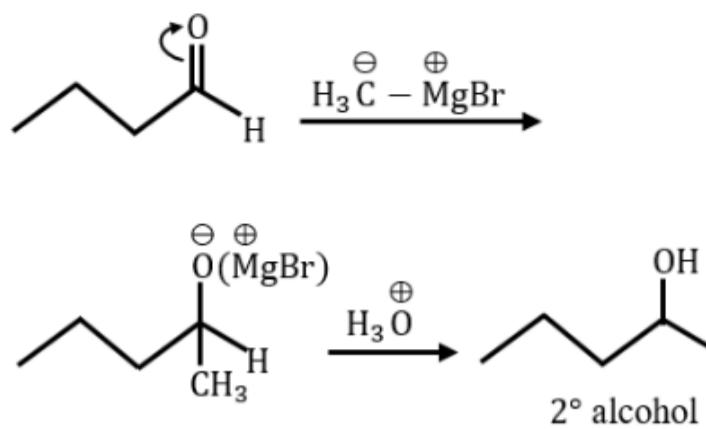
Tetraammineaquachloro cobalt (III)Bromide



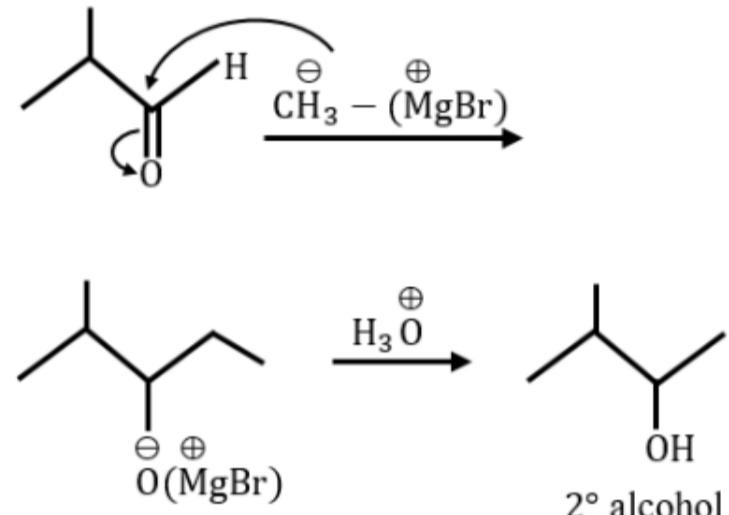
80. Answer: 1

Sol:

(a)



(b)

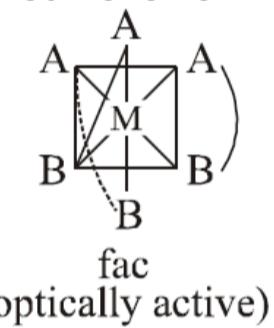
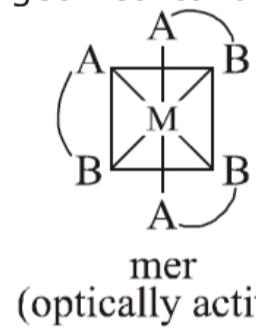


Here, only two isomers are possible.

81. Answer: 1

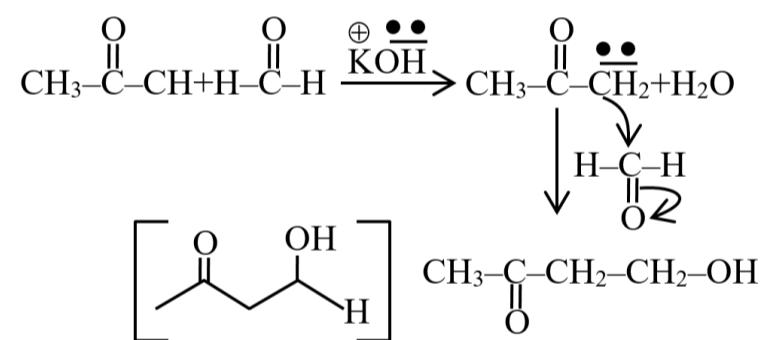
Sol:

Complexes of $M(AB)_3$ type shows both geometrical and optical isomerisms.



82. Answer: 3

Sol:



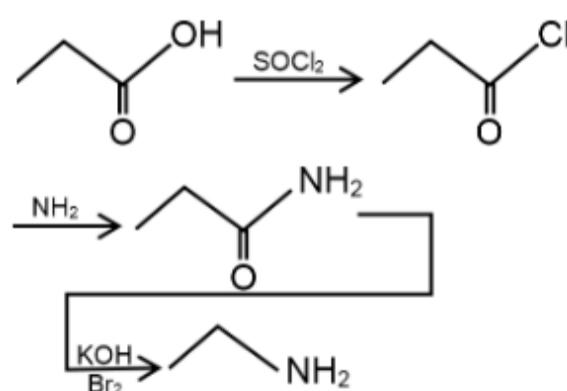
83. Answer: 1

Sol:

Ruby has Al_2O_3 & Cr^{3+} is present as a impurity in it in which and transition occure which is responsible for red colour of ruby.

84. Answer: 2

Sol:



85. Answer: 2

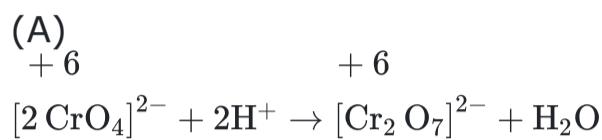
86. Answer: 4

Sol:

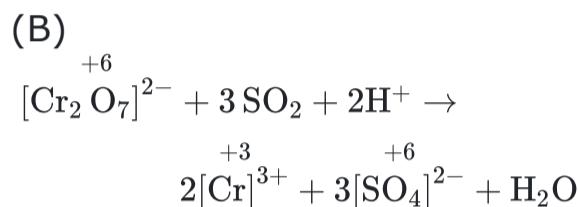
Delay in clotting of blood due to the deficiency of vitamin K.

Sol:

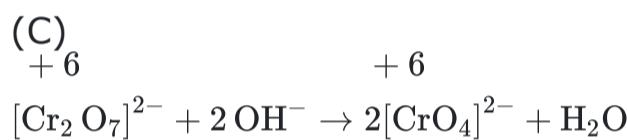
The ability of oxygen to stabilize the higher oxidation state exceeds that of fluorine. Also, the ability of oxygen to form multiple bonds with metals favors. Therefore, the highest Mn fluoride is MnF_4 whereas highest oxide is Mn_2O_7 . In Mn_2O_7 , each Mn is tetrahedrally surrounded by O's including a Mn – O – Mn bridge.

87. Answer: 2**Sol:**

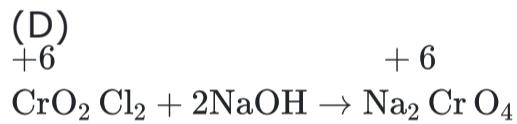
No change in oxidation number.



Oxidation number changes.



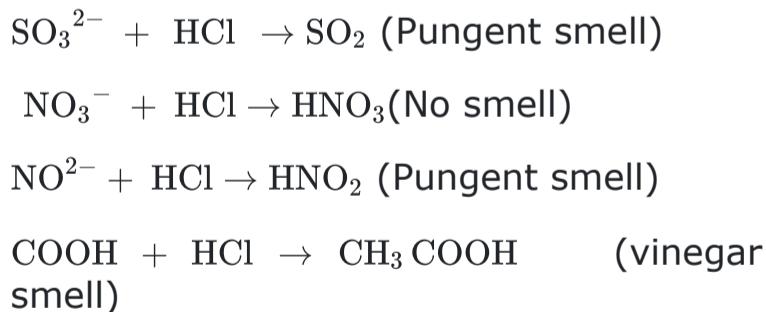
No change in oxidation number.



No change in oxidation number.

89. Answer: 4**Sol:**

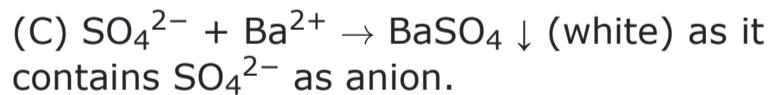
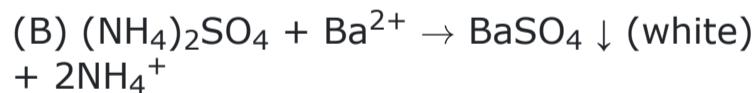
Acetate salt produces acetic acid on treatment with dil. acid. Which smells like vinegar.

**88. Answer: 1****Sol:**

As a 3rd group NH_4Cl is added in excess to reduce concentration of OH^- ions through common ion effect otherwise at higher concentration of OH^- 4th group radicals & Mg^{2+} will also form ppt of hydroxide along with ppt of 3rd group hydroxide.

90. Answer: 4**Sol:**

(A) As K_{sp} of hydroxides of Al^{3+} , Fe^{3+} & Cr^{3+} are low and NH_4Cl suppresses the ionization of NH_4OH



91. Answer: 2

Sol:

The triceps muscle connects the humerus (upper arm bone) to the ulna (forearm bone), specifically by attaching to the olecranon process of the ulna, effectively acting as the primary extensor muscle at the elbow joint; meaning it straightens the elbow when contracting.

92. Answer: 1

Sol:

In **Ascending imbricate** the odd petal is posterior and completely inside. One of the anterior petals is completely outside. The remaining petals show regular overlapping in ascending manner.

In Diplostemonous conditions, sometimes there are two whorls of stamens. The first whorl alternating with petals (antisepalous) and the second whorl alternating with sepals (antipetalous).

Such conditions belong to plant family Papilionaceae or Fabaceae.

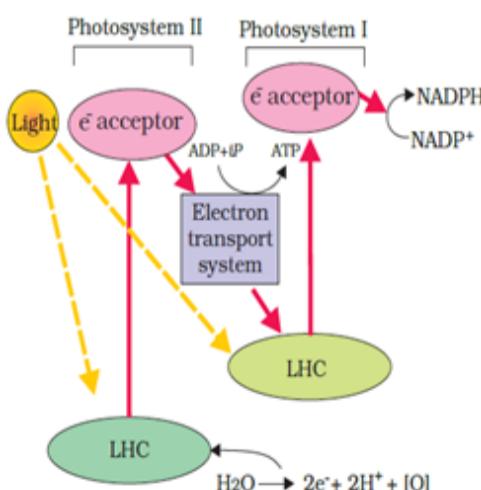
Mimosaceae is commonly called Acacia family. It includes 40 genera and 2000 species.

Caesalpiniaceae has Pinnate Leaves and Raceme or panicle Inflorescence. The **Solanaceae** or nightshades are an economically important family consisting of herbs, shrubs, or trees. Hence, the correct answer is Papilionaceae.

93. Answer: 3

Sol:

During non-cyclic photophosphorylation, electrons are continuously lost from the reaction centre of PS II. The electrons that were moved from photosystem II must be replaced. This is achieved by electrons available due to splitting of water. The splitting of water is associated with the PS II; water is split into 2H^+ , $[\text{O}]$ and electrons. This creates oxygen, one of the net products of photosynthesis. The electrons needed to replace those removed from photosystem I are provided by photosystem II.



94. Answer: 4

Sol:

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95. Answer: 1

96. Answer: 4

Sol:

New 12th ncert, Pag no. 27;32;30;26

Sol:

Genetic engineering is performed in order to introduce the new and desired traits in an organism that does not occur naturally in their genomic map. The desired trait can be obtained by adding, deleting, or modifying some genomic sequences.

Plasmids are used in genetic engineering process because of their ability to show resistance towards restriction enzymes and they are able to carry a foreign gene.

Hence, the correct answer is option "1".

97. Answer: 2**Sol:**

When it comes to **unicellular organisms** like bacteria, unicellular algae or Amoeba, **reproduction is synonymous with growth**, i.e., increase in number of cells.

In these, growth and reproduction takes place simultaneously and not separately.

In the first option **Mango is a angiosperm** where reproduction leads to formation of new fruits and growth implies quality and size of cell.

In the third option **tomato also belongs to flowering plants** ie angiosperms.

In the fourth option **potato** also has growth and reproduction as independent events.

99. Answer: 1**Sol:**

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98. Answer: 4**Sol:**

NCERT XIth Page No. 73

100. Answer: 3**Sol:**

In mango and coconut, the fruit is known as a drupe. They develop from monocarpellary superior ovaries and are one seeded. In mango the pericarp is well differentiated into an outer thin epicarp, a middle fleshy edible mesocarp and an inner stony hard endocarp.

101. Answer: 1**Sol:**

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102. Answer: 3**Sol:**

Co-evolution, sexual deceit and pseudo-copulation,
Explanation: Mediterranean orchid Ophrys ensures pollination by coevolution, sexual deceit and pseudo-copulation. One petal of flower bears an uncanny resemblance to female of bee in size, colour and markings.

103. Answer: 3**104. Answer: 4****Sol:**

LH and FSH decrease gradually during the follicular phase

Sol:

If Bam HI is used during formation of recombinant DNA then non-recombinant bacteria will grow on the medium that contain both ampicillin and tetracycline.

Hence, teh correct answer is option "3".

105. Answer: 3**Sol:**

11th NCERT PAGE NO. 11

106. Answer: 4**Sol:**

Pneumonia is the inflammation and consolidation of the lungs tissue as a result of infection, inhalation of foreign particles, or irradiation.

Many organisms, including viruses and fungi, can cause pneumonia, but the most common causes are bacteria, in particular species of Streptococcus and Mycoplasma.

Although viral pneumonia does occur, viruses more commonly play a part in weakening the lung, thus inviting secondary pneumonia caused by bacteria.

Fungal pneumonia can develop very rapidly and may be fatal, but it usually occurs in hospitalized persons who, because of impaired immunity, have reduced resistance to infection.

107. Answer: 3**Sol:**

(1) CNS, (2) PNS, (3) ANS, (4) Sympathetic nervous System, (5) Parasympathetic nervous system

The **human neural system** is divided into two parts:

- (i) the central neural system (**CNS**)
- (ii) the peripheral neural system (**PNS**)

The **CNS** includes the **brain and the spinal cord** and is the site of information processing and control.

The **PNS** is divided into two divisions called **somatic neural system and autonomic neural system**.

The **autonomic neural system** is further classified into **sympathetic neural system and parasympathetic neural system**.

108. Answer: 1**Sol:**

Monocots

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109. Answer: 3**110. Answer: 3**

Sol:

the C₃ pathway requires 18 molecules of ATP for the synthesis of one molecule of glucose, whereas the NADP-ME type C₄ pathway used by maize and sugarcane requires 30 molecules of ATP.

Sol:

If an organism is living as a parasite it must have adhesive organs for its attachment to the host.

Digestive system is not needed since they can absorb the nutrients directly through their skin.

there is no need of sense organs as they are completely dependent on the host and everything is available.

But they must have a high reproductive ability since there are chances that everyone won't survive.'

Thus the right answer is option 3.

111. Answer: 1**Sol:**

The cutting of DNA by restriction endonucleases results in the fragments of DNA. These fragments can be separated by a technique known as gel electrophoresis. Since DNA fragments are negatively charged molecules they can be separated by forcing them to move towards the anode under an electric field through a medium/matrix.

113. Answer: 3**Sol:**

Deuteromycetes are called "Imperfect Fungi" because their sexual reproduction is unknown. They reproduce asexually by conidia. Examples: Alternaria, Trichoderma, Colletotrichum.

112. Answer: 2**Sol:**

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114. Answer: 4**Sol:**

An ECG (electrocardiogram) is a test to check the electrical activity of the heart.

ECG measures the atrial and ventricular depolarization and repolarization in the form of waves.

It comprises of three waves:

- 1) P wave,
- 2) QRS complex and
- 3) T wave.

P wave in ECG represents atrial depolarization known as the electrical excitation of atria.

QRS complex represents ventricular depolarization.

T wave represents ventricular repolarization.

Hence, the correct answer is option "4" - Electrical excitation of atria.

115. Answer: 3**116. Answer: 3****Sol:**

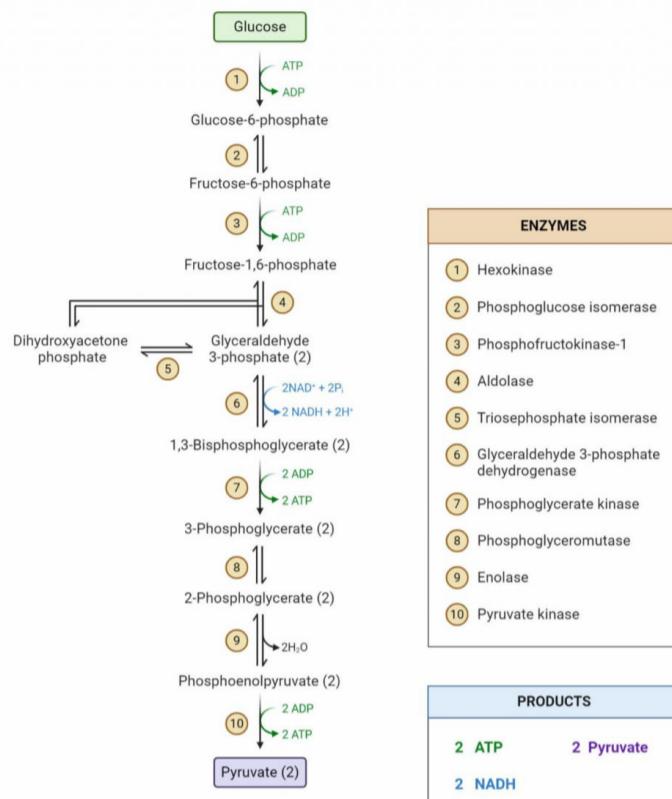
C

Sol:

Conn's syndrome is a rare health problem that occurs when the adrenal glands make too much aldosterone. This problem is also known as primary hyperaldosteronism. Aldosterone is a hormone that controls salt and potassium levels in the blood. Too much leads to high blood pressure.

117. Answer: 4**Sol:**

Glycolysis is the first step in the breakdown of glucose to extract energy for cellular metabolism.

Glycolysis and Glycolytic Enzymes

9th step signifies removal of water and hence dehydration

119. Answer: 2**118. Answer: 1****Sol:**

S-shaped, Explanation: Human population growth curve is S-shaped in which at initial stage growth is slow followed by exponential growth and finally again start declining to follow sigmoid curve growth.

120. Answer: 4**Sol:**

Nearly 45 to 50 million MTPs are performed in a year all over the world which is 1/5 (20%) of the total number of conceived pregnancies in a year.

So the right answer is 45-50 and 1/5.

Hence, the correct option is "4" - a - 45 to 50, b - 1/5th.

Sol:

The presence of chromogenic substrate gives blue coloured DNA bands on the gel. This statement is not true. Chromogenic substrates are usually used in other techniques.

Ethidium bromide is a commonly used fluorescent dye that intercalates between the base pairs of DNA. It binds to the DNA fragments present in the gel, allowing them to be visualized under UV light. This statement is true as the staining of DNA fragments with ethidium bromide is a common step in gel electrophoresis.

Bright orange coloured bands of DNA can be observed in the gel when exposed to UV light. This statement is true. After staining the DNA fragments with ethidium bromide, they can be visualized as bright orange bands when the gel is exposed to UV light. Ethidium bromide fluoresces under UV light, and the DNA fragments that have bound to the dye will appear as distinct bands.

The process of extraction of separated DNA strands from gel is called elution. This statement is true. Elution is the process of extracting the separated DNA strands from the gel matrix. It involves cutting out the desired DNA band from the gel and using various methods such as electroelution or using a gel extraction kit to separate the DNA from the gel and purify it for further analysis.

121. Answer: 3**Sol:**

The plastid in Euglena is prokaryotic in structure and composition, and the plastid originated from the endosymbiotic invasion of an organism that is similar to a primitive blue-green alga or the contemporary proplastid.

123. Answer: 2**Sol:**

Passes non-infectious RNA

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122. Answer: 3**Sol:**

RBC 5 millions to 5.5 millions of RBCs mm^{-3} of blood.

WBC 6000 – 8000 mm^{-3} of blood.

Platelet 1,500,00 – 3,500,00 platelets mm^{-3} .

124. Answer: 3**Sol:**

Anterior pituitary secretes following hormones :-

1. Growth hormone
2. Prolactin
3. TSH
4. ACTH
5. LH
6. FSH

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125. Answer: 3**Sol:**

According to histogen theory, as proposed by Hanstein, the root and shoot apices have three distinct meristematic regions called histogens. These are namely; dermatogen, periblem and plerome. The dermatogens make anticlinal divisions, periblem forms cortex and plerome serve as the progenitor of stele. Monocotyledons have a fourth histogen, calyptrogen; that makes root cap.

127. Answer: 3**Sol:**

Decomposers like bacteria and fungi are those which decomposes the waster organic matter like dead bodies and excretions and release energy back in the environment. Hence, if all the bacteria and fungi are destroyed, dead bodies and excretions will pile up.

If decomposers are extinct then they dont decompose plants ,and the nutrients will remian or accumulate in the plant they are not available for the other living organism.

Thus the right answer is option C.

129. Answer: 2**Sol:**

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126. Answer: 3**Sol:**

Kreb's cycle starts with the condensation of (2C) Acetyl Co. A with (4C) OAA & forms (6C) citric acid.

FAD is reduced during the conversion of succinic acid into fumaric acid.

Substrate level phosphorylation occurs during the conversion of succinyl CoA to succinic acid.

Out of 4 oxidation steps at 3 steps, NAD⁺ is reduced into NADH + H⁺

128. Answer: 3**Sol:**

Phylum Porifera have a canal system (a complex system of pores), Aschelminthes have muscular pharynx, Annelids have segmentation (metameric), Arthropods have jointed appendages, Echinodermata have water vascular system.

130. Answer: 3**Sol:**

In **micturition**, the stretch receptors on the walls of the bladder send signals to the CNS. The CNS passes on motor messages to **initiate the contraction of smooth muscles** of the bladder and simultaneous relaxation of the urethral sphincter causing the release of urine. The process of release of urine is called micturition and the neural mechanisms causing it is called the micturition reflex.

131. Answer: 3**Sol:**

The adrenal gland secretes the hormone which saves lives. The gland secretes three main hormones: epinephrine, norepinephrine and cortisol. These three are regarded as the major stress hormones which help to escape a stressful situation. Epinephrine is widely referred to as the 'flight or fight hormone' which allows for an immediate reaction to either escape or counter it in a stress situation. Norepinephrine has similar roles to epinephrine, and during stress, it increases sensitivity. Cortisol helps preserve 'fluid balance' and 'blood pressure' under stress.

132. Answer: 2**Sol:**

Meristematic tissue has a capacity to divide and give rise to new cells. Girth increase in the tree is shown by mitotic activity in secondary meristem or cambium. Cells produced by cambium are added on its both sides. Cells which are inside are differentiated into xylem and those on the outside are differentiated into the phloem.

133. Answer: 4**Sol:**

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134. Answer: 1**Sol:**

Plant decomposers are saprophytic fungi and bacteria that absorb nutrients from non living organic material such as fallen plants material and the wastes of living organisms and convert them into organic forms. The bacteria belong to kingdom monera while fungi belong to fungi.

135. Answer: 1**Sol:**

Horseshoe crabs (Limulus) are **marine arthropods** that belong to the family **Limulidae** and the order **Xiphosura**. They are mostly found in soft, sandy, or muddy bottoms around **shallow ocean water**. They are considered living **fossils**.

XIth NCERT Page No. 53**137. Answer: 1****Sol:**

Seed habit found in vascular plants is the most successful way in which sexual reproduction has taken place. *Selaginella* and *Salvinia* are heterosporous meaning they produce two kinds of spores:

- Microspores (small): Gives rise to the male gametophyte.
- Megaspores (big): Gives rise to the female gametophyte.

These newly formed gametophytes are retained on the parent sporophytes. Formation of zygote and stages of embryo take place within female gametophyte. This is a precursor to the seed habit and hence considered an important step in evolution.

139. Answer: 3**Sol:**

Mendel studied inheritance of seven pairs of contrasting characters in pea plant. The green pod colour was dominant over yellow pod colour. The grey seed coat colour was dominant over white. Axile flower position was dominant over terminal. Tall plants were dominant over dwarf ones. To confirm the dominance, two pure breeding plants showing contrasting traits were crossed. According to law of dominance, only dominant trait was expressed in progeny.

141. Answer: 1**136. Answer: 3****Sol:**

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138. Answer: 2**Sol:**

The proximity between the Henle's loop and vasa recta, as well as the counter current in them help in maintaining an increasing osmolarity towards the inner medullary interstitium, i.e., from 300 mOsmol⁻¹ in the cortex to about 1200 mOsmol⁻¹ in the inner medulla. This gradient is mainly caused by NaCl and urea. NaCl is transported by the ascending limb of Henle's loop which is exchanged with the descending limb of vasa recta. NaCl is returned to the interstitium by the ascending portion of vasa recta.

140. Answer: 2**Sol:**

Phases of plant cell growth includes:
 Meristematic phase- The cells in the apex region of root and shoot have large nuclei, rich in protoplasm and cell walls are thin.
 Elongation phase- In this phase, cells enlarge, size of vacuole increases and new cell wall deposition takes place.
 Maturation phase- In this phase, cells mature and attains maximum size.
 Differentiation- In this region, cells divide continuously.

Thus, the correct answer is 'Elongation.'

142. Answer: 3

Sol:

Gross primary productivity, or GPP, is the rate at which organic molecules are formed in an autotroph in unit time. It includes the organic matter used up in respiration during the measurement period. It is also known as total (Gross) photosynthesis. A considerable amount of GPP is utilised by plants in respiration.

Sol:

Only statement I is correct but statement II is incorrect.

The water vascular system is the most distinctive feature of echinoderms, such as sea stars and sea urchins. This system is a hydraulic system that helps echinoderms with respiration, food and waste transportation, and locomotion.

Echinoderms have radial symmetry as adults and bilateral symmetry as larvae.

143. Answer: 2**Sol:**

The cell wall is the outermost layer that protects the cell from bursting and swelling. So, if there is no cell wall there will be no barrier, the molecules can move from outside to inside, and inside to outside.

Cellulose, galactans, mannans & CaCO₃" made cell wall is present in **algae**.

The cell wall in **fungi** is composed mainly of **glucans, chitin and glycoproteins**.

Plant cell walls are primarily made of **cellulose**.

some **protists** have cell walls composed of **polymers** and some are made up of **cellulose**.

Hence, the correct option is "B" - Algae.

145. Answer: 2**Sol:**

Here, both type of traits are transmitting in a single individual. It means both are dominant at a time or codominant, e.g., blood groups of human being and roan colour in cattles. Codominance is a condition in which two different alleles for a genetic trait, both are expressed. Codominance is a relationship between two versions of a gene. Individuals receive one version of a gene, called an allele, from each parent.

147. Answer: 2**Sol:**

The tiger biomass shall be. According to 10% law of lindemann, if 1 tonne (1000kg) biomass is present in grass, only 10% of it means 100 kg will go into deer and in tiger the biomass will be only 10kg, i.g. 10% of deer' biomass.

144. Answer: 1**Sol:**

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

Mammals, many terrestrial amphibians and marine fishes mainly excrete urea and are called ureotelic animals.

Reptiles, birds, land snails and insects excrete nitrogenous wastes as uric acid in the form of pellet or paste with a minimum loss of water and are called uricotelic animals.

146. Answer: 2**Sol:**

Among the given options, the incorrect one is cytokinin - synchronise fruit set in pineapples.

Ethylene is highly effective in fruit ripening as it helps in flowering and also promotes fruit set synchronisation in pineapples.

Hence, the correct answer is option "2".

148. Answer: 1

Sol:

Class Chondrichthyes includes marine animals with streamlined body and have cartilaginous endoskeleton.

Mammals are viviparous and some are oviparous also ie egg laying mammals like duck-billed platypus.

Reptiles have 3 chambered heart except crocodile which has 4 chambered heart.

All chordata do not have jaws, in some chordates animals jaw is absent called as agnatha.

149. Answer: 3

Sol:

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150. Answer: 4

Sol:

7.5 cm

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151. Answer: 4

Sol:

Gibberellins are responsible for breaking dormancy of seeds and buds and induce growth. They are essential for many developmental processes in plants, including seed germination, stem elongation, leaf expansion, trichome development and pollen maturation.

152. Answer: 2

Sol:

Biosphere(Largest level)-

It is the highest level of organization. It is the global system that consists of all the living things, non-living things and other factors which supports life.

Biosphere reserves differ from National parks and Wildlife sanctuaries, because people are the integral part of the biosphere system.

Hence, the correct answer is option "2".

153. Answer: 4

Sol:

Ciliated epithelium is mainly present in the **inner surface of hollow** organs like **bronchioles and fallopian tubes**. The function is to move particles or **mucus** in a **specific direction** over the **epithelium**. Some of the **columnar or cuboidal cells** get specialised for **secretion and are called glandular epithelium**. **Goblet cells** are **unicellular glands**. **Tendons** are **dense regular connective tissues**. They attach **skeletal muscles to bones**. **Adipose tissue** is a type of **loose connective tissue** located mainly **beneath the skin**. The cells of this tissue are specialised to **store fats**.

154. Answer: 3

Sol:

Cyclosporin A, that is used as an immunosuppressive agent in organ-transplant patients, is produced by the fungus Trichoderma polysporum.

155. Answer: 1

156. Answer: 3

Sol:

Colour blindness is an X-linked recessive disorder. Father transmits its X chromosome to the daughters so the colour blind father will inherit its affected X chromosome to the daughter.

When a color blind father and a mother who carries the color blind gene have children, there is a 50% chance that their sons will be color blind. Their daughters, however, will have a 50% chance of being color blind and 100% chance of being carriers of the gene.

Sol:

During the development of **microsporangium**, each cell of the **sporogenous tissue** acts as a **pollen mother cell** and gives rise to a microspore tetrad, containing four haploid microspores by the process of meiosis (microsporogenesis). As the anther matures, these microspores dissociate and develop into **pollen grains**.

Megasporangium is a technical term for an ovule.

Microsporangium: A sporangial structure that contains microspores, which are the pollen sacs that give rise to male gametes in an angiosperm.

In an angiosperm, a **functional megasporangium** develops into an **embryo sac**.

157. Answer: 3**Sol:**

Biosphere reserves are protected areas meant for the conservation of plants and animals.

It also restores the traditional life of the tribals living in that vicinity. They conserve the biodiversity of that area.

They are identified by the **Man and Biosphere Reserve Program** to promote sustainable development. This program was initiated by **UNESCO in 1971**.

The **Nilgiri Biosphere Reserve** was the first biosphere reserve in India, established in **1986**.

Its objectives upon establishment were to **conserve genetic diversity, restore ecosystems, and promote sustainable development**.

159. Answer: 1**Sol:**

a. AUG is a codon that has a dual function. It codes for the amino acid methionine, and it also serves as the start codon for protein synthesis.

b. UGG is a non-degenerate codon, which means that it codes for only one amino acid, tryptophan.

c. GUG is an ambiguous codon, which means that it can code for two different amino acids, valine or methionine.

d. UAA is a stop codon, which means that it signals the end of protein synthesis.

158. Answer: 2**Sol:**

A frogs take in oxygen and release carbon dioxide. They get oxygen by breathing through lungs, the lining of their mouths and their skin. When a frog is out of the water, its skin takes oxygen from the air. On dry land, they will die if their mouth is forcibly closed for some time.

Frogs have a three-chambered heart. It consists of two atria and one ventricle.

Tadpoles eliminate nitrogenous wastes as ammonia (ammonotelic), but adult frog mainly eliminates urea (ureotelic). They are not uricotelic.

Frogs habitat is in or near pond.

160. Answer: 2

Sol:

The female gametophyte develops within the ovule and generally consists of three antipodal cells, one central cell, two synergid cells, and one egg cell. The female gametophyte is also commonly called the embryo sac or megagametophyte.

"Megasporangium" is a technical term given to an ovule, which contains nucellus, integuments and funiculus through which it is adhered to the placenta. Male gametes are contained within pollen grains, which are released from the anthers. Triple fusion refers to the fusion of three haploid nuclei at the time of fertilisation in the embryo sac. The fusion of the second male gamete with the two centrally located polar nuclei produces a triploid primary endosperm nucleus (PEN).

161. Answer: 1**Sol:**

Centrosome is an organelle usually containing two cylindrical structures called centrioles. Centrosome is not present in cells of higher plants as plant cells have rigid cell wall that does not undergo changes in shape during mitosis.

163. Answer: 4**Sol:**

Heinz L. Fraenkel-Conrat established that RNA can be genetic material. RNA is the first genetic material in cells because:

- RNA is capable of both storing genetic information and catalysing chemical reactions.
- Essential life processes like metabolism, translation, splicing, etc. evolved around RNA.
- It has the tendency of self-replication.

The correct answer is option D

162. Answer: 3**Sol:**

As a protein is imagined as a line, the left end represented by the first amino acid and the right end is represented by the last amino acid. The first amino acid is also called N-terminal amino acid. The last amino acid is called the C-terminal amino acid.

164. Answer: 1**Sol:**

Seeds are n and ovules will also be same so

100 seeds = 100 Ovules

If ovules are 100 then the pollen tetrad will be 25.

For the formation of 100 seeds 100 meiosis (because one megasporangium cell gives rise to one female gamete and one microsporangium cell gives rise to 4 male gametes so total $100+25 = 125$ meiosis is required).

One pollen grain will give rise to two male gametes by the meiotic division of generative cells

$100 \times 2 = 200$ male gametes.

Thus the right answer is option A.

165. Answer: 4**166. Answer: 3****Sol:**

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Sol:

Though most of the protein synthesis occurs on the ribosomes in the cytoplasm, a number of proteins of the matrix and inner membrane of mitochondria are synthesised on the mitoribosomes (ribosomes present in the mitochondrion).

167. Answer: 1**Sol:**

Griffith experiment was a stepping stone for the discovery of genetic material. Frederick Griffith experiments were conducted with *Diplococcus pneumoniae*/*Streptococcus pneumoniae*. It was the first experiment suggesting that bacteria are capable of transferring genetic information through a process known as transformation.

169. Answer: 1**Sol:**

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168. Answer: 3**Sol:**

The eukaryotic cells generally contain the 80S type of ribosome in the endoplasmic reticulum and as free ribosome in the cytoplasm. Mitochondria is an organelle containing its independent genetic material called the extrachromosomal DNA.

170. Answer: 1**Sol:**

Purine is a heterocyclic aromatic nitrogenous base. It has nitrogen (N) present in the positions 1, 3, 7, and 9.

**171. Answer: 3****Sol:**

Chloroplasts are roughly 5 – 10 μm in length & width 2 – 4 μm . They are enclosed in a chloroplast envelope, which consists of a double membrane with outer and inner layers, between which is a gap called the intermembrane space.

173. Answer: 3**Sol:**

Translational unit - Sequence of RNA with start codon only

172. Answer: 2**Sol:**

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

174. Answer: 1**Sol:**

During Zygotene the chromosomes show bivalent stage because homologous chromosome comes together and meet the chromatids of other homologous chromosome making a tetrad.

: Bivalent is half the number of chromosomes because each bivalent has 2 chromosomes in it.

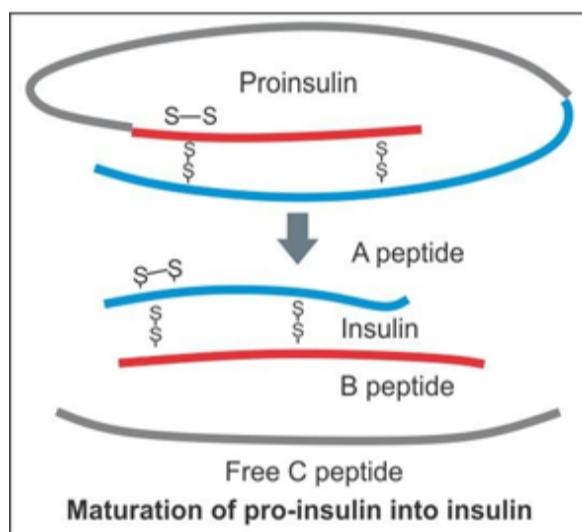
175. Answer: 2**176. Answer: 4**

Sol:

A nematode *Meloidegyne incognitia* infects the roots of tobacco plants which reduces the production of tobacco. It can be prevented by using RNA interference process, which is checked by silencing of specific mRNA due to a complementary dsRNA. dsRNA binds and prevents the translation of mRNA (silencing).

177. Answer: 1**Sol:**

Humulin is composed of two peptide chains referred to as the A chain and B chain. A and B chains are linked together by two **disulfide bonds**, and an additional **disulfide** is formed within the A chain.

**179. Answer: 4****Sol:**

If the gene isolate from marrow cells producing ADA is introduced into cells at early embryonic stages, it could be a permanent cure. A functional ADA cDNA (using a retroviral vector) is then introduced into these lymphocytes, which are subsequently returned to the patient. However, as these cells are not immortal, the patient requires periodic infusion of such genetically engineered lymphocytes.

Sol:

Meiosis results in $2N \rightarrow N$; mitosis results in $2N \rightarrow 2N$. In meiosis a diploid cell that has $2n$ chromosomes produces four cells, each of which contains n chromosomes.

During mitosis one cell divides once to form two identical cells in which the chromosome number is the same as the parental cell ($2N$).

Nullification of syngamy is not done by mitosis.

178. Answer: 1**Sol:**

Interphase generally lasts at least 12 to 24 hours in mammalian tissue. During this period, the cell is constantly synthesizing RNA, producing protein and growing in size. Interphase can be divided into 4 steps: Gap 0 (G0), Gap 1 (G1), S (synthesis) phase, Gap 2 (G2). Gap 0 (G0):

There are times when a cell will leave the cycle and quit dividing Gap 1 (G1):

Cells increase in size in Gap 1, produce RNA and synthesize protein. S Phase: To produce two similar daughter cells, DNA replication occurs during this S (synthesis) phase. Gap 2 (G2): During the gap between DNA synthesis and mitosis, the cell will continue to grow and produce new proteins.

180. Answer: 4**Sol:**

Bt toxin belongs to the protein family known as PFT (Pore forming toxins). These toxins are known as vegetative insecticidal proteins. They show their insecticidal properties against lepidopteran, coleopteran, diptera and some invertebrates including nematodes.

Lepidopterans can kill army worm and tobacco bud worm, Dipterans kill flies, Coleopterans produce a protein which is harmful for beetles.

Hence, the correct answer is option "4".