

Question no. 1

An electron with speed v and a photon with speed c have the same de Broglie wavelength. If kinetic energy and momentum of electron is E_e and P_e and that of photon is E_{ph} and P_{ph} respectively, then

$$(1) \frac{E_e}{E_{ph}} = \frac{2c}{v}$$

$$(2) \frac{E_e}{E_{ph}} = \frac{v}{2c}$$

$$(3) \frac{p_e}{p_{ph}} = \frac{2c}{v}$$

$$(4) \frac{p_e}{p_{ph}} = \frac{v}{2c}$$

$$\lambda = \frac{h}{P} \checkmark$$

$$e^- \rightarrow v$$

$$p_{ph}^* \rightarrow c$$

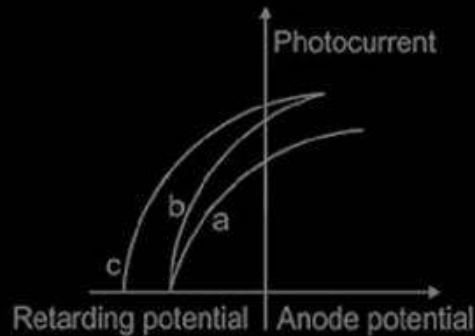
$$P_e = P_{ph}$$

$$\frac{E_e}{E_{ph}} = \frac{\frac{1}{2} m v^2}{p_{ph} c} = \frac{\frac{1}{2} \cancel{m v} v}{p_{ph} c} = \frac{v}{2c}$$

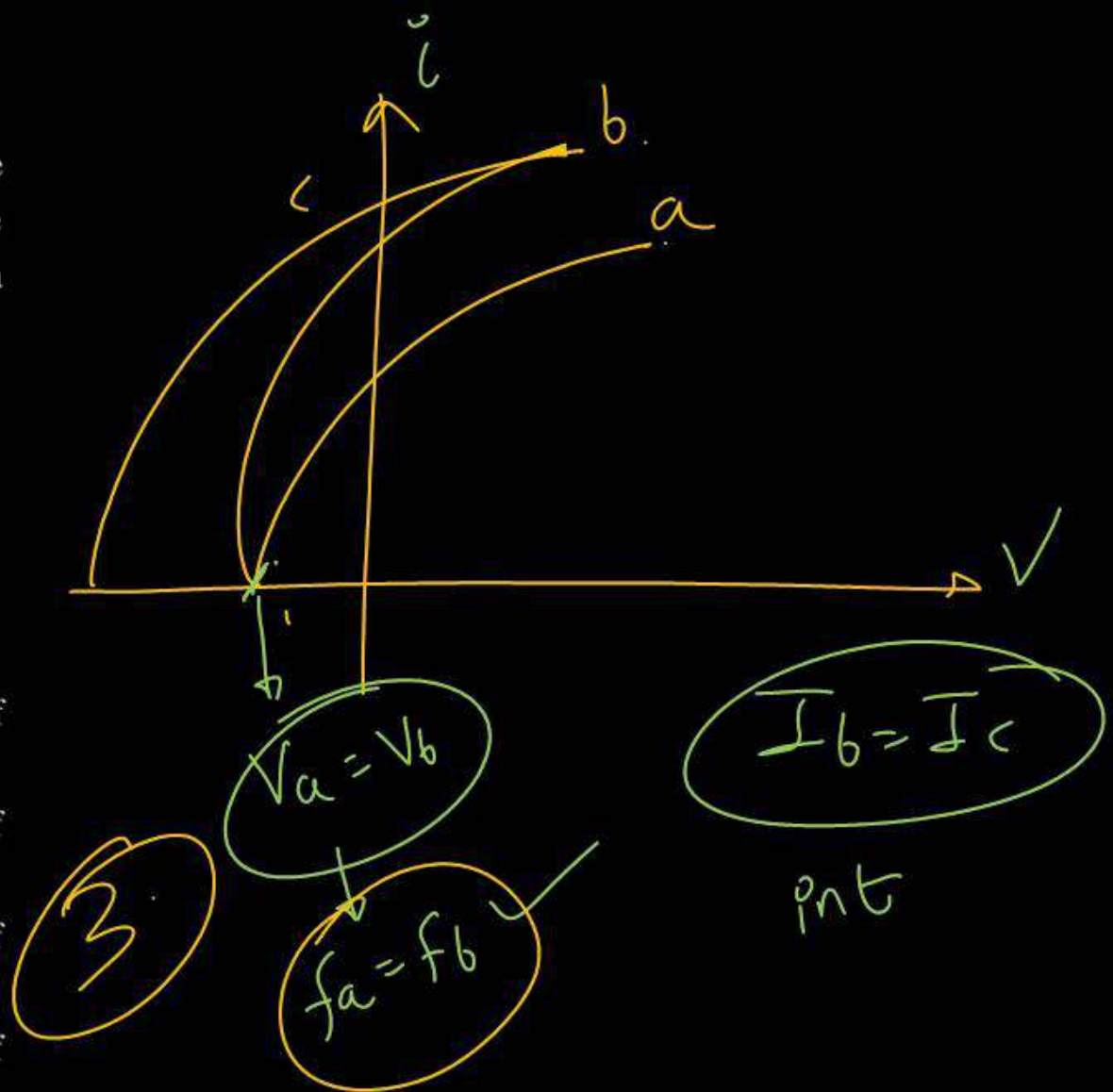
(2)

Question no. 2

The figure shows a plot of photo current versus anode potential for a photo sensitive surface for three different radiations. Which one of the following is a correct statement?

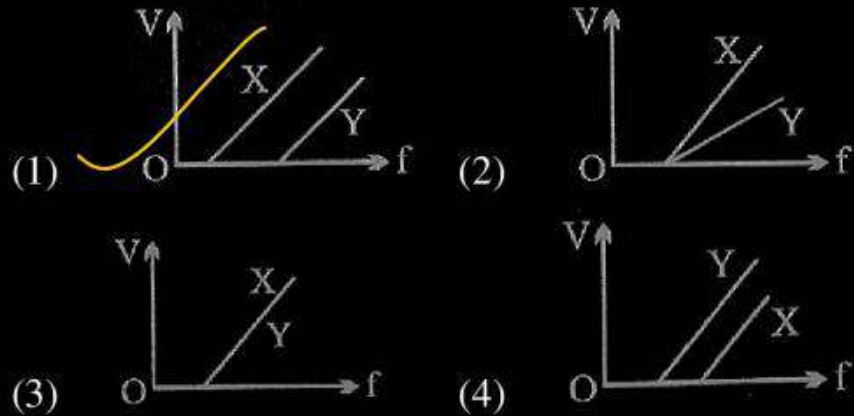


- (1) Curves (b) and (c) represent incident radiation of same frequency having same intensity.
- (2) Curves (a) and (b) represent incident radiation of different frequency and different intensity.
- (3) Curve (a) and (b) represent incident radiations of same frequency but different intensity.
- (4) Curve (b) and (c) represent incident radiations of different frequency and different intensity.



Question no. 3

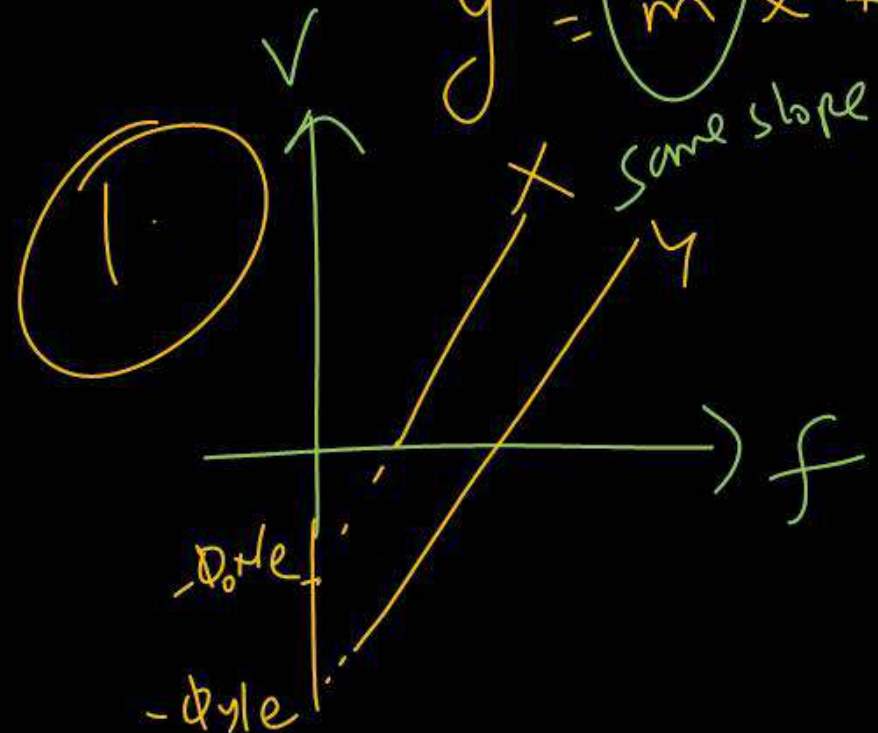
In a photoelectric experiment, electrons are ejected from metals X and Y by light of intensity I and frequency f . The potential V required to stop the electrons is measured for various frequency. If Y has a greater work function than X, which one of the following graphs best illustrates the expected results?



$$eV_{st} = h\nu - \phi_0$$

$$V_{st} = \left(\frac{h}{e}\right)\nu - \left(\frac{\phi_0}{e}\right)$$

$$y = mx + c$$



Question no. 4

A particle A of mass m and initial velocity v collides with a particle B of mass $\frac{m}{2}$ which is at rest. The collision is head on, and elastic. The ratio of the de-Broglie wavelengths λ_A to λ_B after the collision is

- (1) $\frac{\lambda_A}{\lambda_B} = \frac{2}{3}$
 (3) $\frac{\lambda_A}{\lambda_B} = \frac{1}{3}$

- (2) $\frac{\lambda_A}{\lambda_B} = \frac{1}{2}$
 (4) $\frac{\lambda_A}{\lambda_B} = 2$

4



$$mv + 0 = mv' + \frac{m}{2}v''$$

$$v = v' + \frac{v''}{2} \quad \text{--- (1)}$$

$$v'' - v' = v \quad \text{--- (2)}$$



$$e = 1 = \frac{v'' - v'}{v}$$

$$\lambda \propto \frac{1}{p}$$

$$\frac{\lambda_A}{\lambda_B} = \frac{m_B v_B}{m_A v_A} = \frac{m/2 \times v}{m \times \frac{v}{2}} = 2$$

$$v' + \frac{v''}{2} = v'' - v' \quad \rightarrow \quad 2v' = \frac{v''}{2}$$

Question no. 5

The kinetic energy of emitted electron is E when the light incident on the metal has wavelength λ . To double the kinetic energy, the incident light must have wavelength :

(1) $\frac{hc}{E\lambda - hc}$

(2) $\frac{hc\lambda}{E\lambda + hc}$

(3) $\frac{h\lambda}{E\lambda + hc}$

(4) $\frac{hc\lambda}{E\lambda - hc}$

$$\frac{hc + E\lambda}{dhc} = \frac{1}{\lambda'}$$

$$\lambda' = \frac{dhc}{hc + E\lambda}$$

$$\frac{hc}{\lambda} - \phi_0 = E \quad \checkmark$$

$$\frac{hc}{\lambda'} - \phi_0 = 2E \quad \checkmark$$

$$\frac{hc}{\lambda'} - E = \frac{hc}{\lambda} - 2E$$

$$\frac{hc}{\lambda'} + E = \frac{hc}{\lambda}$$

Question no. 6

Let K_1 and K_2 be the maximum kinetic energies of photoelectrons emitted when two monochromatic beams of wavelength λ_1 and λ_2 , respectively are incident on a metallic surface. If $\lambda_1 = 3\lambda_2$ then:

(1) $K_1 > \frac{K_2}{3}$

(2) $K_1 < \frac{K_2}{3}$

(3) $K_1 = \frac{K_2}{3}$

(4) $K_2 = \frac{K_1}{3}$

$$\frac{hc}{3\lambda_2} - \phi_0 = K_1 \quad \text{--- (1)}$$

$$\frac{hc}{\lambda_2} - \phi_0 = K_2 \quad \text{--- (2)}$$

$$\frac{hc}{\lambda_2} = \phi_0 + K_2$$

put in (1)

$$\frac{\phi_0 + K_2}{3} - \phi_0 = K_1$$

$$\phi_0 + K_2 - 3\phi_0 = 3K_1$$

$$K_2 - 3\phi_0 = 3K_1$$

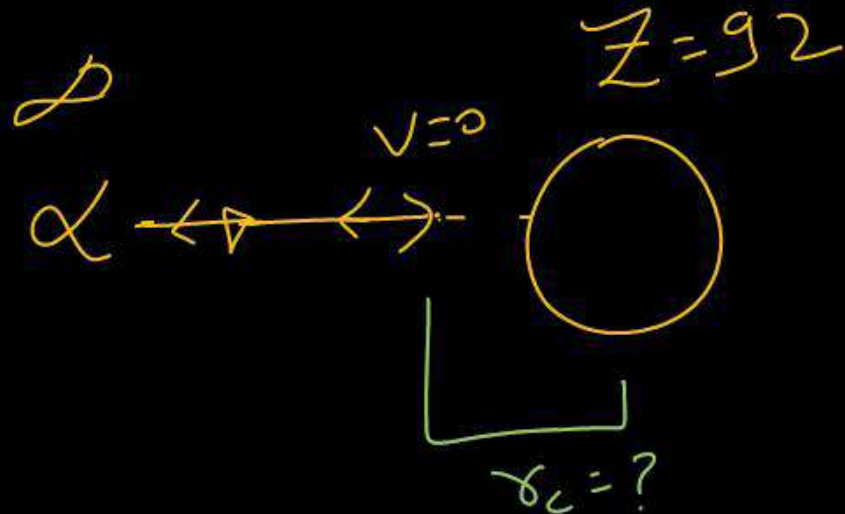
$\frac{K_2}{3} > K_1$ $\phi_0 > 0$ $K_2 > 3K_1$

2

Question no. 7

An α -particle of energy 5 MeV is scattered through 180° by a fixed uranium nucleus. The distance of the closest approach is of the order :

- (1) 1A (2) 10^{-10} cm
 (3) 10^{-12} cm (4) 10^{-15} cm



$$K_\alpha = \frac{k(2e)(92e)}{r_c}$$

$$5 \times 10^6 \times 1.6 \times 10^{-19} \text{ J} = \frac{9 \times 10^9 \times 184 \times e \times e}{r_c}$$

$$r_c = \frac{9 \times 10^9 \times 184 \times e}{5 \times 1.6 \times 10^6}$$

3
 $5.3 \times 10^{-12} \text{ cm}$

Question no. 8

The radiation corresponding to $3 \rightarrow 2$ transition of hydrogen atom falls on a metal surface to produce photoelectrons. These electrons are made to enter a magnetic field of $3 \times 10^{-4} \text{ T}$. If the radius of the largest circular path followed by these electrons is 10.0 mm, the work function of the metal is close to:

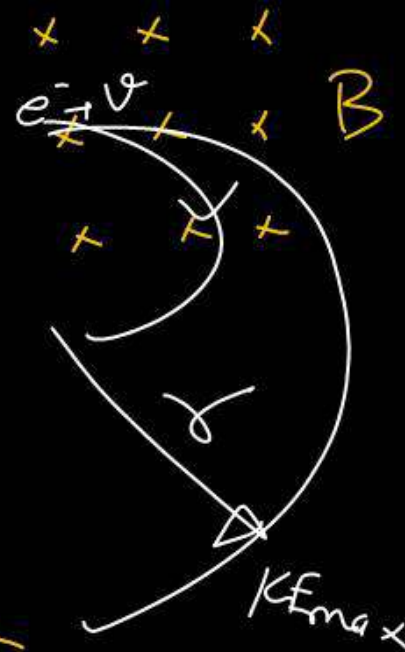
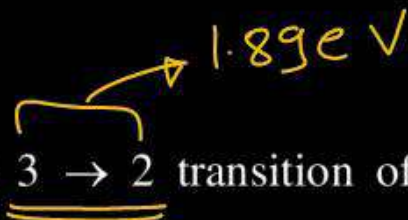
- (1) 1.8 eV (2) 1.1 eV
 (3) 0.8 eV (4) 1.6 eV

$$E - \phi_0 = K_{F_{\max}}$$

$$1.89 - \phi_0 = 0.80$$

$$\phi_0 = 1.09 \text{ eV} \approx 1.1 \text{ eV}$$

(2)



$$K_{\max} = \left(\frac{q^2 v^2}{2m} \right) eV$$

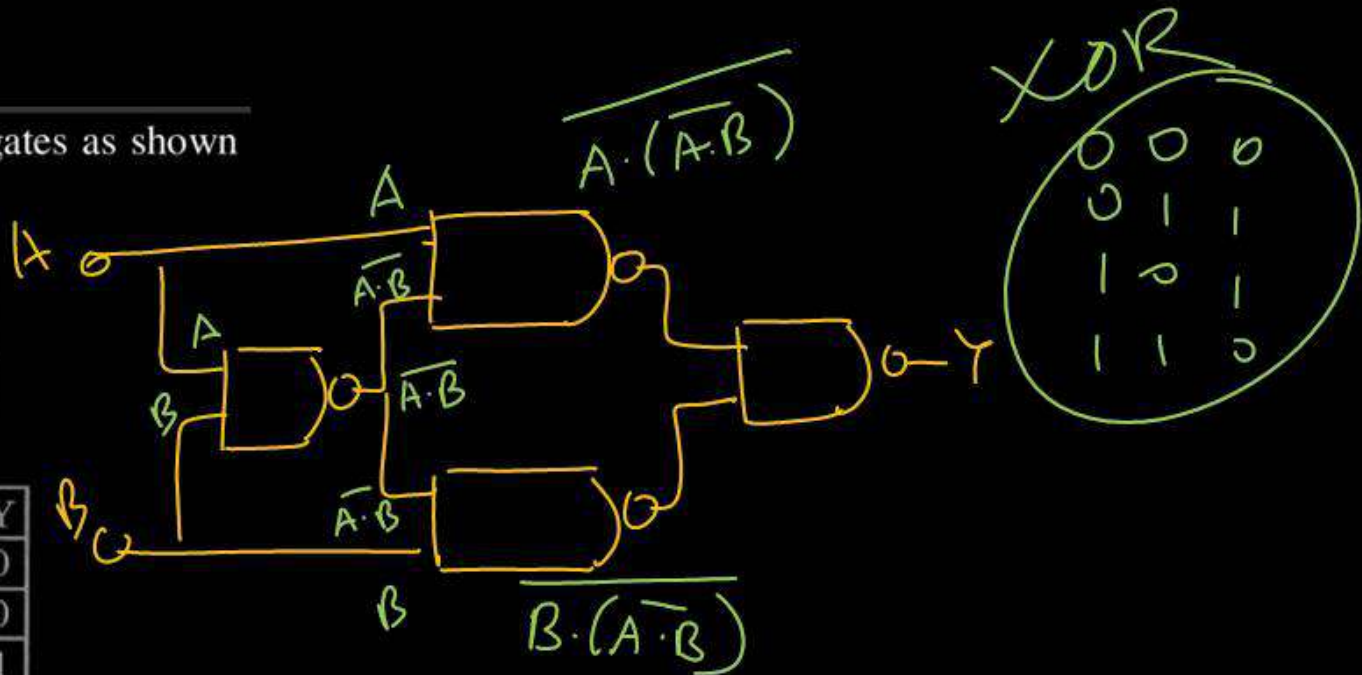
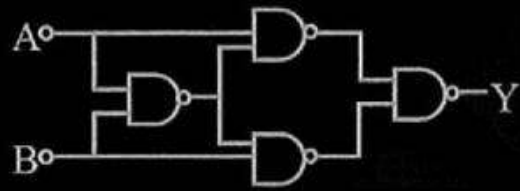
$$r = \frac{\sqrt{2mK}}{qB}$$

$$K_{F_{\max}} = \frac{10^{-4} \times 1.6 \times 10^{-19} \times 9 \times 10^{-8}}{2 \times 9 \times 10^{-31}} \text{ eV}$$

$$K_{F_{\max}} = 0.8 \text{ eV}$$

Question no. 9

Truth table for system of four NAND gates as shown in figure is:



XOR

0	0	0
0	1	1
1	0	1
1	1	0

(1)

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

(2)

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

(3)

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

(4)

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

$$Y = \overline{A \cdot (\overline{A \cdot B}) \cdot (B \cdot (\overline{A \cdot B}))}$$

$$Y = A \cdot (\overline{A \cdot B}) + B \cdot (\overline{A \cdot B})$$

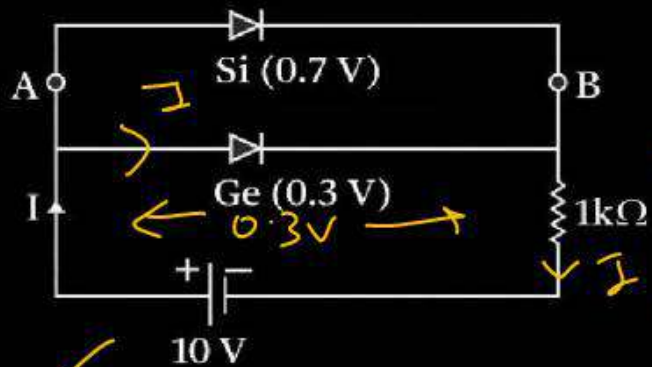
$$Y = A \cdot (\overline{A} + \overline{B}) + B \cdot (\overline{A} + \overline{B})$$

XOR

$$Y = A\overline{B} + B\overline{A}$$

Question no. 10

Value I will be:



Handwritten calculation: $9.7V$
 $I = \frac{9.7}{1000} = 9.7mA$

- (1) 9.7 mA
- (2) 9.3 mA
- (3) 9.5 mA
- (4) 10 mA

Handwritten circled number 1

Question no. 11

In semiconductors at room temperature

- (1) The valence band is partially empty and the conduction band is partially filled
- (2) The valence band is completely filled and the conduction band is partially filled ~~X~~
- (3) The valence band is completely filled ~~X~~
- (4) The conduction band is completely empty ~~X~~

1

Question no. 12

The cause of the potential barrier in a p-n diode is

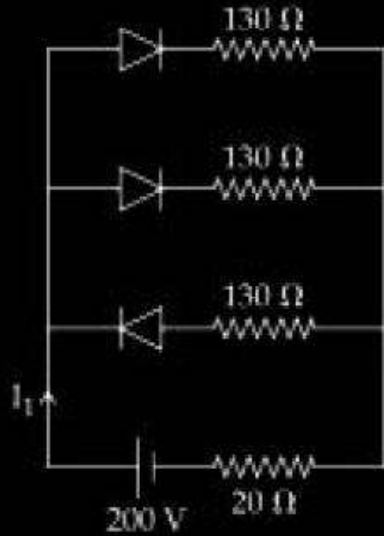
- (1) Depletion of negative charges near the junction
- (2) Concentration of positive charges near the junction
- (3) Depletion of positive charges near the junction.
- (4) Concentration of positive and negative charges near the junction.

Immobile +ve & -ve ions.

4

Question no. 13

In the given figure, each diode has a forward bias resistance of 30Ω and infinite resistance in reverse bias. The current I_1 will be

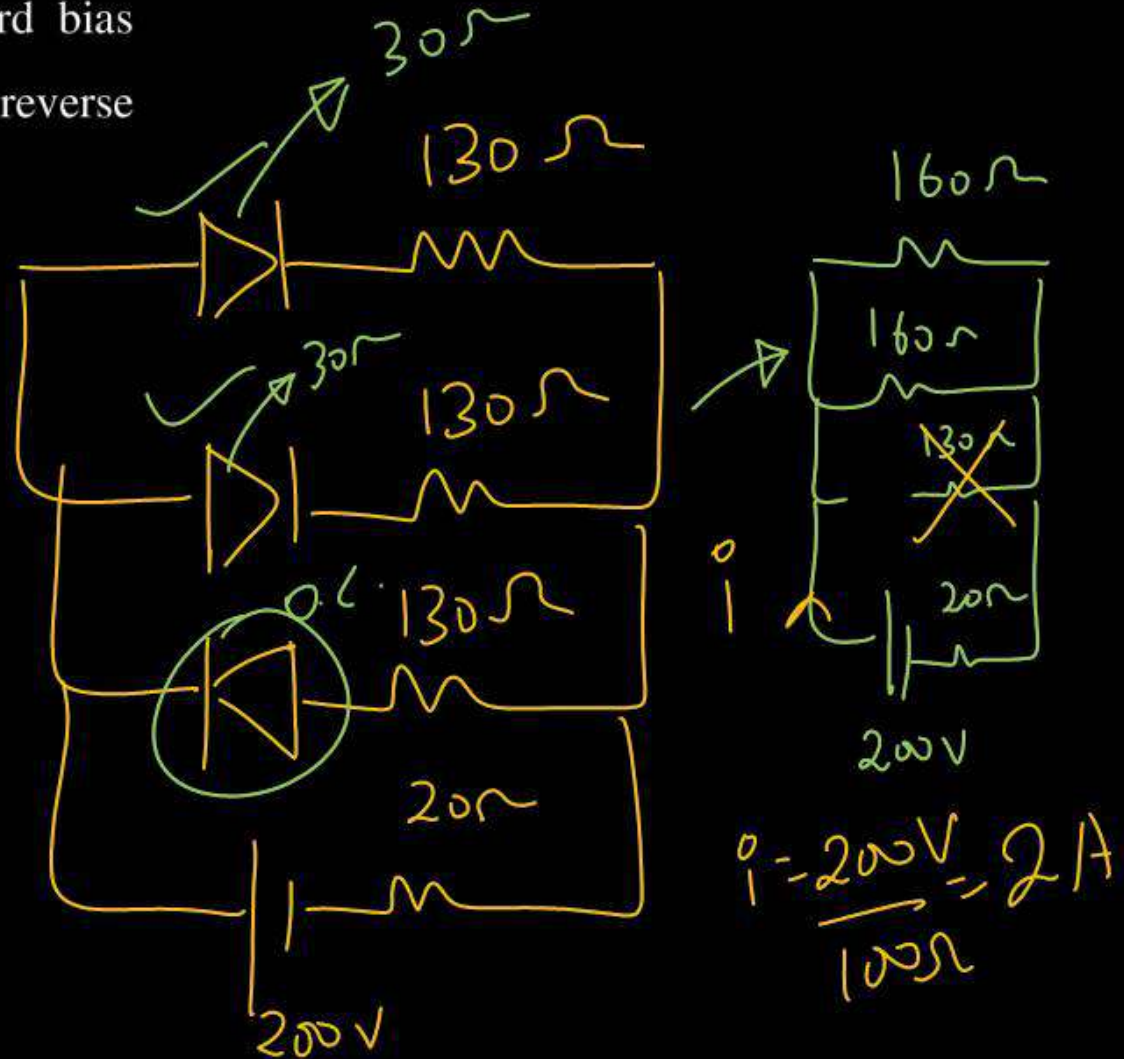


(1) 3.75 A

(2) 2.35 A

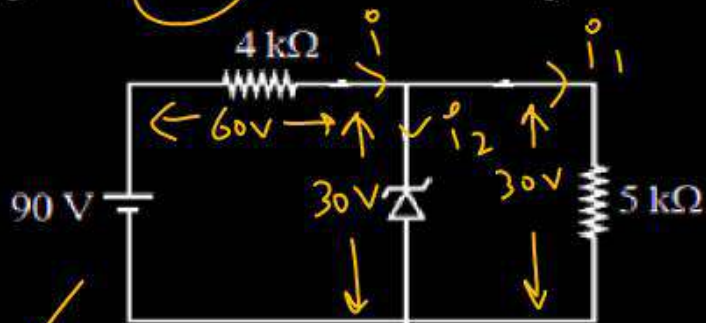
(3) 2 A

(4) 2.73 A



Question no. 14

The zener diode has $V_z = 30\text{ V}$. The current passing through the diode for the following circuit is _____ mA.



(1) 9

(2) 6

(3) 15

(4) Zero

$$i_0 = \frac{60}{4k\Omega} = 15\text{ mA}$$

$$i_1 = \frac{30}{5k\Omega} = 6\text{ mA}$$

$$i_2 = i_0 - i_1$$

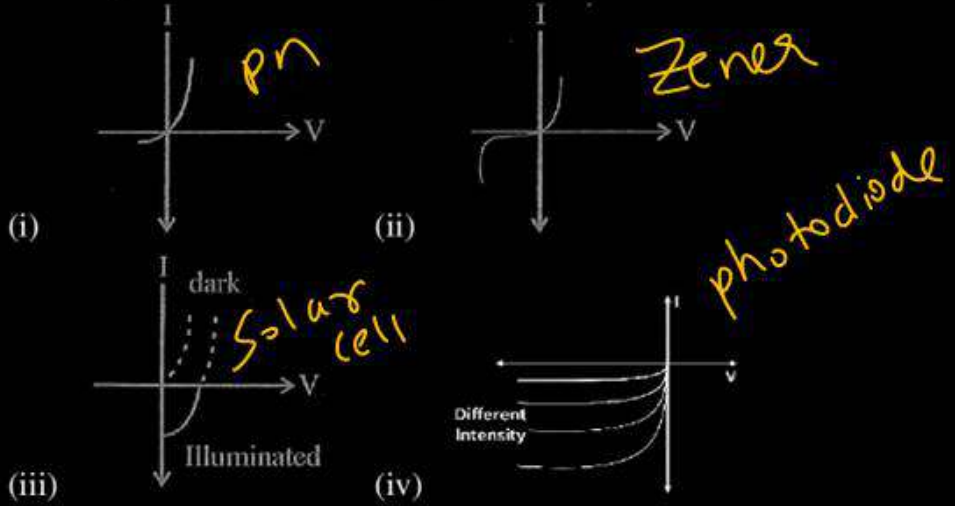
$$= 15 - 6$$

$$= 9\text{ mA}$$

1

Question no. 15

Identify the semiconductor devices whose characteristics are given below, the order (i), (ii), (iii), (iv).



- (1) Solar cell, photo diode, Zener diode, simple diode
- (2) Zener diode, Solar cell, simple diode, photo diode.
- (3) Simple diode, Zener diode, Solar cell, photo diode.
- (4) Zener diode, Simple diode, photo diode, Solar cell

3

Question no. 16

Magnetic field in a plane electromagnetic wave is given by $\vec{B} = B_0 \sin(kx + \omega t) \hat{j}T$. Expression for corresponding electric field will be : (c is speed of light)

- (1) $\vec{E} = B_0 c \sin(kx + \omega t) \hat{k}V/m$
- (2) $\vec{E} = \frac{B_0}{c} \sin(kx + \omega t) \hat{k}V/m$
- (3) $\vec{E} = -B_0 c \sin(kx + \omega t) \hat{k}V/m$
- (4) $\vec{E} = B_0 c \sin(kx - \omega t) \hat{k}V/m$



$$E_0 = B_0 c$$

$$\vec{E} = E_0 \sin(kx + \omega t) \hat{k}$$

$$\vec{E} = (B_0 c) \sin(kx + \omega t) \hat{k}$$

$$\vec{E} = (B_0 c) \sin(kx + \omega t) \hat{k}$$

Dirac

Question no. 17

In a photoelectric experiment, increasing the intensity of incident light:

- (1) ~~X~~ Increases the number of photons incident and also increases the K.E. of the ejected electrons
- (2) ~~X~~ Increases the frequency of photons incident and increases the K.E. of the ejected electrons.
- (3) Increases the ~~frequency~~ of photons incident and the K.E. of the ejected electrons remains unchanged.
- (4) Increases the number of photons incident and the K.E. of the ejected electrons remains unchanged.

$I \uparrow$, No of Photons \uparrow

No change in f, λ

$$E = \phi + K$$

$$\frac{h\nu}{\lambda}$$

No change

Question no. 18

A photoelectric surface is illuminated successively by monochromatic light of wavelengths λ and $\frac{\lambda}{2}$. If the maximum kinetic energy of the emitted photoelectrons in the second case is 3 times that in the first case, the work function of the surface is:

- (1) ~~$\frac{hc}{2\lambda}$~~
- (2) $\frac{hc}{\lambda}$
- (3) $\frac{hc}{3\lambda}$
- (4) $\frac{3hc}{\lambda}$

$$\begin{aligned}
 &K_2 = 3K_1 \\
 &\phi = \varphi \\
 &\left. \begin{array}{l} \frac{hc}{\lambda} = \phi + K \\ \frac{hc}{\lambda} = \phi + K_1 \end{array} \right\}
 \end{aligned}$$

$$\frac{2hc}{\lambda} = \phi + K_2$$

$$\frac{2hc}{\lambda} - \phi = 3\left(\frac{hc}{\lambda} - \phi\right)$$

$$\frac{2hc}{\lambda} - \phi = \frac{3hc}{\lambda} - 3\phi$$

$$2\phi = \frac{2hc}{\lambda} - \frac{2hc}{\lambda} = \frac{hc}{\lambda}$$

$$\phi = \frac{hc}{2\lambda}$$

Question no. 19

This question has Statement-1 and Statement-2. Of the four choices given after the statements, choose the one that best describes the two statements.

~~Statement -1:~~ A metallic surface is irradiated by a monochromatic light of frequency $\nu > \nu_0$ (ν_0 the threshold frequency). The maximum kinetic energy and the stopping potential are K_{\max} and V_0 respectively. If the frequency incident on the surface is doubled, both the K_{\max} and V_0 are also doubled.

~~Statement-2~~ The maximum kinetic energy and the stopping potential of photoelectrons emitted from a surface are linearly dependent on the frequency of incident light.

- (1) Statement-1 is true, Statement-2 is true, Statement-2 is the correct explanation of Statement-1.
- (2) Statement-1 is true, Statement-2 is true, Statement-2 is not the correct explanation of Statement-1.
- (3) ~~Statement-1 is false, Statement-2 is true.~~
- (4) Statement-1 is true, Statement-2 is false.

$$E = \phi + K$$

$$hf = hf_0 + K_{\max} \rightarrow K_{\max} = hf - hf_0$$

$$hf = hf_0 + eV_0 \rightarrow 2hf - hf_0 = K_2$$

$$2(hf - hf_0) \quad \times$$

Question no. 20

The wavelength of radiation emitted is λ_0 when an electron jumps from third to second orbit of hydrogen atom. For the electron to jump from the fourth to the second orbit of the hydrogen atom, the wavelength of radiation emitted will be

- (1) $\frac{16}{25}\lambda_0$
 (3) $\frac{27}{20}\lambda_0$

- (2) $\frac{20}{27}\lambda_0$
 (4) $\frac{25}{16}\lambda_0$

3 → 2

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

$$\frac{1}{\lambda_0} = R \left(\frac{1}{4} - \frac{1}{9} \right)$$

$$\frac{1}{\lambda_0} = R \left(\frac{5}{36} \right)$$

$$\frac{\frac{1}{\lambda_0}}{\frac{1}{\lambda_2}} = \frac{\frac{5}{36} R}{\frac{3}{16} R} = \frac{20}{27}$$

$$\frac{\lambda_2}{\lambda_0} = \frac{20}{27}$$

$$\lambda_2 = \frac{20 \lambda_0}{27}$$

4 → 2

$$\frac{1}{\lambda_2} = R \left(\frac{1}{4} - \frac{1}{16} \right)$$

$$\frac{1}{\lambda_2} = R \left(\frac{4-1}{16} \right) = \frac{3R}{16}$$

Question no. 21

When a microgram of matter is converted into energy, the amount of energy released will be

- (1) 9×10^{14} J (2) 9×10^{10} J
(3) ~~9×10^7~~ J (4) 9×10^4 J

$$E = mc^2$$

$$E = 10^{-6} \times 10^{-3} \times 9 \times 10^{16} \text{ J}$$

$$E = 9 \times 10^7 \text{ J}$$

Question no. 22

If the binding energy per nucleon of deuteron is 1.115 MeV, its mass defect in atomic mass unit is

(1) 0.00048

~~(2) 0.0024~~



(3) 0.0012

(4) 0.0006

$$\Delta E_T = 2 \times 1.115 \times \underline{\underline{\text{mev}}}$$

$$\Delta E = \Delta m \times \underline{\underline{931 \text{ Mev}}}$$

$$\underline{\underline{\text{A.m.u}}}$$

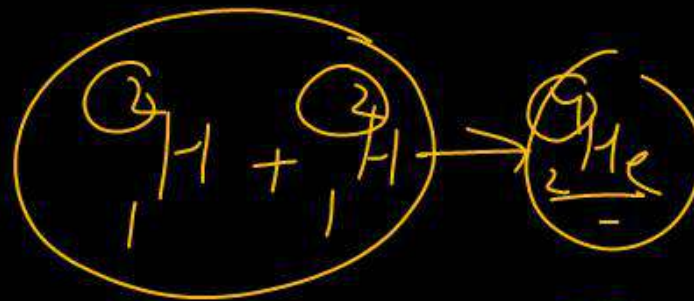
$$\Delta m = \frac{\Delta E}{931 \text{ Mev}} = \frac{2 \times 1.115 \text{ Mev}}{931 \text{ Mev}}$$

$$\Rightarrow \underline{\underline{\frac{2.220}{931}}}$$

Question no. 23

The binding energy per nucleon of deuteron (${}^2_1\text{H}$) and helium nucleus (${}^4_2\text{He}$) is 1.1 MeV and 7 MeV respectively. If two deuteron nuclei react to form a single helium nucleus, then the energy released is

- (1) 13.9 MeV (2) 26.9 MeV
 (3) ~~23.6 MeV~~ (4) 19.2 MeV



$$D \rightarrow 4 \times 1.1 \rightarrow \underline{4.4}$$

$$He \rightarrow 4 \times 7 \Rightarrow \underline{28}$$

$$E = \underline{\underline{28 - 4.4}}$$

Question no. 24

Consider the nuclear reaction $\underline{X}^{200} \rightarrow \underline{A}^{110} + \underline{B}^{80}$. If the binding energy per nucleon for X, A and B are 7.4 MeV, 8.2 MeV and 8.1 MeV respectively, then the energy released in the reaction is

- (1) 70 MeV (2) 200 MeV
 (3) 190 MeV (4) 1480 MeV

$$\begin{array}{l}
 X \rightarrow 200 \times 7.4 \Rightarrow \underline{\underline{1480}} \\
 A \rightarrow 110 \times 8.2 \Rightarrow \underline{\underline{902}} \\
 B \rightarrow 80 \times 8.1 \Rightarrow \underline{\underline{648}}
 \end{array}
 \left. \vphantom{\begin{array}{l} X \\ A \\ B \end{array}} \right\} \rightarrow \underline{\underline{1550}}$$

70 MeV

Question no. 25

The energy released in the fission of 1 kg of ${}_{92}\text{U}^{235}$ is

(Energy per fission = 200 MeV)

(1) 5.1×10^{26} eV

(2) 5.1×10^{26} J

~~(3) 8.2×10^{13} J~~

~~(4) 8.2×10^{13} MeV~~

$$n = \frac{m}{M} = \frac{1}{235 \times 10^{-3}}$$

$$n \rightarrow \frac{1000}{235}$$

$$N_{\text{atom}} \rightarrow \frac{1000}{235} \times 6.023 \times 10^{23}$$

$$E_T = \frac{6.023 \times 10^{23}}{235} \times 200 \times 10^6 \times 1.6 \times 10^{-19} \text{ J}$$

$$E_T = \frac{6.02 \times 200 \times 10^{13} \times 1.6}{235} \text{ J}$$

Question no. 26

Hydrogen atom from excited state comes to the ground by emitting a photon of wavelength λ . The value of principle quantum number n of the excited state will be.

(1) $\sqrt{\frac{\lambda R}{\lambda - 1}}$

(2) $\sqrt{\frac{\lambda R}{\lambda R - 1}}$

(3) $\sqrt{\frac{\lambda}{\lambda R - 1}}$

(4) $\sqrt{\frac{\lambda R^2}{\lambda R - 1}}$

$$\frac{1}{\lambda} = R \left(\frac{1}{1} - \frac{1}{n^2} \right)$$

$$\frac{1}{\lambda} = R - \frac{R}{n^2}$$

$$\frac{R}{n^2} = R - \frac{1}{\lambda}$$

$$\frac{R}{n^2} = \frac{\lambda R - 1}{\lambda}$$

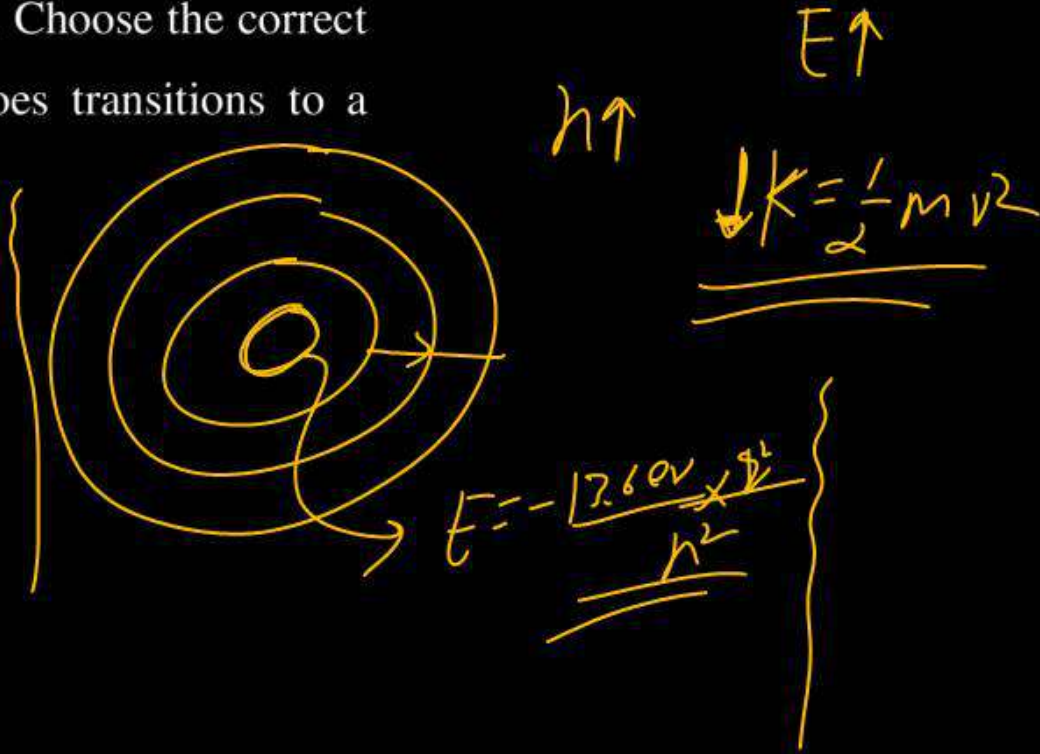
$$\frac{R^2}{R} = \frac{\lambda}{\lambda R - 1}$$

$$n = \sqrt{\frac{R \lambda}{\lambda R - 1}}$$

Question no. 27

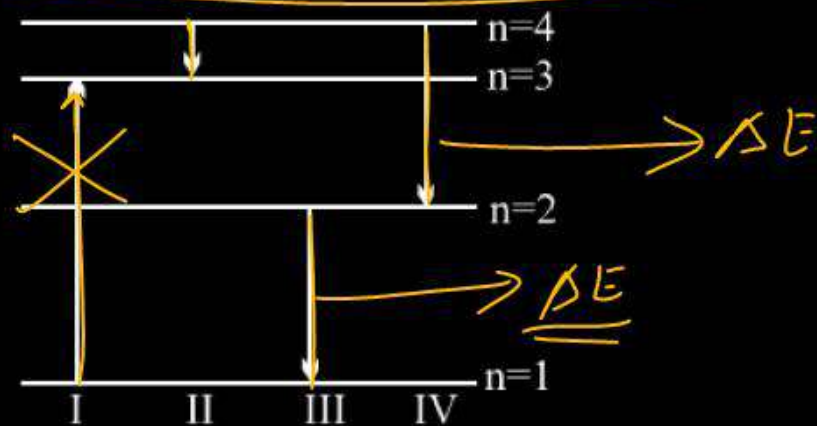
In Bohr's atomic model of hydrogen, let K , P and E are the kinetic energy, potential energy and total energy of the electron respectively. Choose the correct option when the electron undergoes transitions to a higher level:

- (1) All K , P and E increase.
- ✓ (2) K decreases P and E increase
- (3) P decreases K and E increase
- (4) K increases P and E decrease



Question no. 28

The diagram shown the energy levels for an electron in a certain atom. Which transition shown represents the emission of a photon with the most energy?



(1) IV

(2) III

(3) II

(4) I

Question no. 29

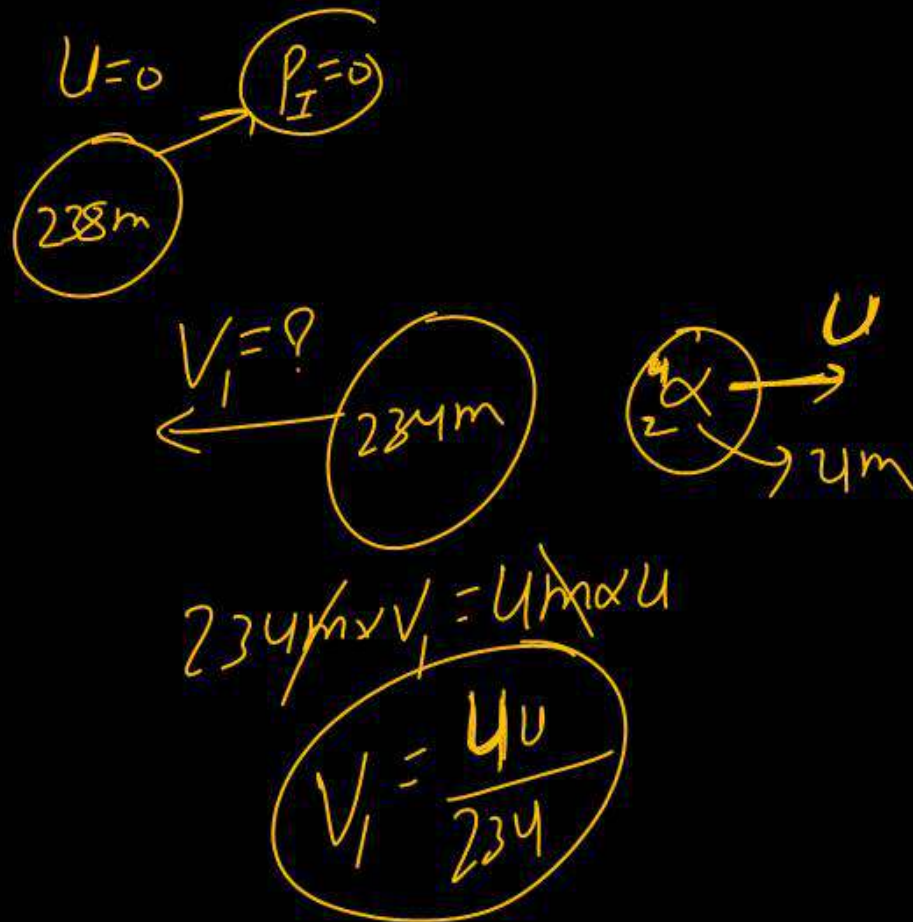
When a U^{238} nucleus originally at rest, decays by emitting an alpha particle having a speed 'u', the recoil speed of the residual nucleus is

(1) $\frac{4u}{238}$

(2) $-\frac{4u}{234}$

(3) $\frac{4u}{234}$

(4) $-\frac{4u}{238}$



Question no. 30

According to Ampere–Maxwell's circuital law:

$$(1) \quad \oint \mathbf{E} \cdot d\mathbf{S} = \frac{q}{\epsilon_0}$$

$$(2) \quad \oint \mathbf{E} \cdot d\mathbf{l} = \frac{q\phi_E}{dt}$$

$$(3) \quad \oint \mathbf{E} \cdot d\mathbf{S} = 0$$

$$(4) \quad \oint \bar{\mathbf{B}} \cdot d\bar{\mathbf{l}} = \mu_0 \left(I_C + \epsilon_0 \frac{d\phi_E}{dt} \right)$$

Question no. 31

If ϵ_0 and μ_0 are the electric permittivity and magnetic permeability in a free space, ϵ and μ are the corresponding quantities in a medium, the index of refraction of the medium is

(1) $\sqrt{\frac{\epsilon_0 \mu_0}{\epsilon \mu}}$

(2) $\sqrt{\frac{\epsilon \mu}{\epsilon_0 \mu_0}}$

(3) $\sqrt{\frac{\epsilon_0 \mu}{\epsilon \mu_0}}$

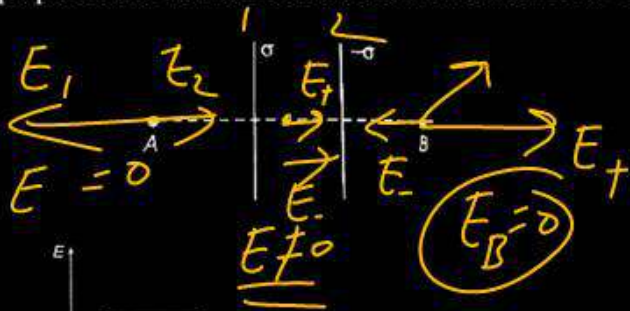
(4) $\sqrt{\frac{\epsilon}{\epsilon_0}}$

$$n = \frac{c}{v} = \frac{1}{\frac{\sqrt{\mu_0 \epsilon}}{\sqrt{\mu_0 \epsilon_0}}}$$

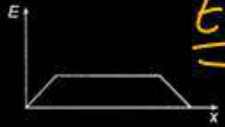
$$n = \sqrt{\frac{\mu \epsilon}{\mu_0 \epsilon_0}}$$

Question no. 32

Two large parallel sheets charged uniformly with surface charge density σ and $-\sigma$ are located as shown in the figure. Which one of the following graphs shows the variation of electric field along a line perpendicular to the sheets as one moves from A to B?



(1)



(2)



(3)

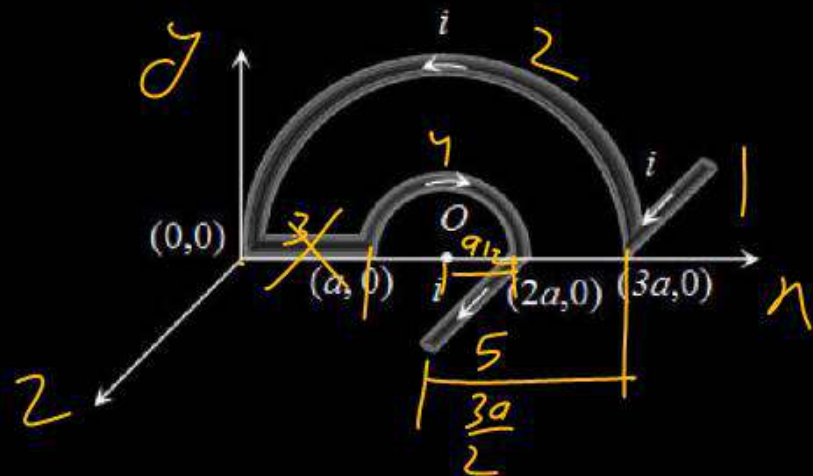


(4)



Question no. 33

In the given figure net magnetic field at O will be



(1) $\frac{2\mu_0 i}{3\pi a} \sqrt{4 - \pi^2}$

(2) $\frac{\mu_0 i}{3\pi a} \sqrt{4 + \pi^2}$

(3) $\frac{2\mu_0 i}{3\pi a^2} \sqrt{4 + \pi^2}$

(4) $\frac{2\mu_0 i}{3\pi a} \sqrt{(4 - \pi^2)}$

$$B_1 = \frac{\mu_0 I \times 2}{4\pi \times 3a}$$

$$B_5 = \frac{\mu_0 I \times 2}{4\pi \times a}$$

} B_{15}
y

$$B_2 = \frac{\mu_0 I \times 2}{4\pi \times 3a} \times \pi$$

$$B_4 = \frac{\mu_0 I \times 2}{4\pi a} \times \pi$$

} B_{24}
+z

$$-z$$

Question no. 34

A source of monochromatic light liberates 9×10^{20} photon per second with wavelength 600 nm when operated at 400 W. The number of photon emitted per second wavelength of 800 nm by the source of monochromatic light operating at same power will be:

(1) ~~12×10^{20}~~

(2) 6×10^{20}

(3) 9×10^{20}

(4) 24×10^{20}

$h \rightarrow$ No. of Photon Per sec

$$E = \frac{hc}{\lambda}$$

$$P = \frac{n \times hc}{\lambda} \frac{J}{s}$$

$$P_1 = P_2$$

$$\frac{9 \times 10^{20} \times hc}{600 \times 10^{-9}} = h_2 \times \frac{hc}{800 \times 10^{-9}}$$

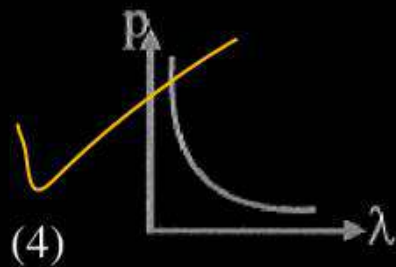
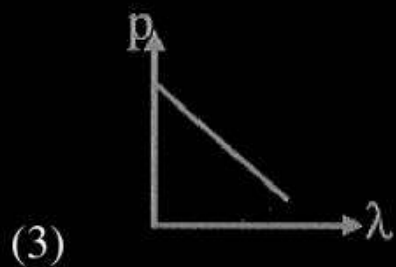
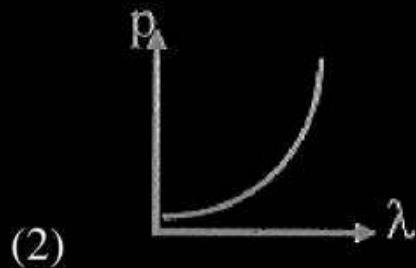
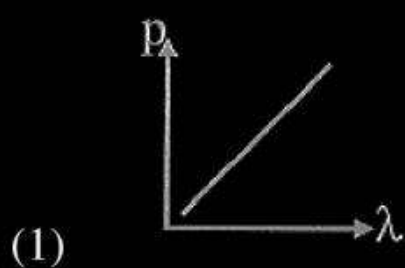
$$12 \times 10^{20} = h_2$$

Question no. 35

Which of the following figure represents the variation of particle momentum (p) and associated de Broglie wavelength (λ)?

$$\lambda = \frac{h}{p} \rightarrow \text{const.}$$

$$\lambda \propto \frac{1}{p}$$



Question no. 36

A moving proton and electron have the same de-Broglie wavelength. If K and P denote the K.E. and momentum respectively. Then choose the correct option

- (1) ✓ $K_p < K_e$ and $P_p = P_e$
 (2) $K_p = K_e$ and $P_p = P_e$
 (3) $K_p < K_e$ and $P_p < P_e$
 (4) $K_p > K_e$ and $P_p = P_e$

$$\lambda = \text{const}$$

$$\lambda = \frac{h}{p}$$

$$p = \frac{h}{\lambda} \rightarrow \text{const}$$

$$\lambda \rightarrow \text{const}$$

$$p = \text{const}$$

$$\boxed{\underline{p_e} = \underline{p_p}}$$

$$m_p > m_e$$

$$K = \frac{p^2}{2m} \rightarrow \text{const}$$

\downarrow
 u

$$K \propto \frac{1}{m}$$

$$\underline{\underline{K_p < K_e}}$$

Question no. 37

The de-Broglie wavelength of a particle having kinetic energy E is λ . How much extra energy must be given to this particle so that the de-Broglie wavelength reduces to 75% of the initial value?

(1) $\frac{1}{9}E$

✓ (2) $\frac{7}{9}E$

(3) E

(4) $\frac{16}{9}E$

$$1 = \frac{h \cdot \cancel{\omega} t}{\sqrt{2mE}}$$

\downarrow const

$$\lambda^2 E = \text{const}$$

$$\lambda_1^2 \cdot E_1 = \lambda_2^2 \cdot E_2$$

$$\cancel{\lambda}^2 \cdot E = \left(\frac{3}{4}\cancel{\lambda}\right)^2 \cdot E_2$$

$$\frac{16E}{9} = E_2$$

$$\frac{16E - 9E}{9}$$

$\left(\frac{7E}{9}\right)$

$$\begin{aligned} \text{extra energy} &= E_2 - E_1 \\ &= \frac{16E}{9} - E \end{aligned}$$

Question no. 38

Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R.

Assertion A: The photoelectric effect does not take place, if the energy of the incident radiation is less than the work function of a metal.

Reason R: Kinetic energy of the photoelectrons is zero, if the energy of the incident radiation is equal to the work function of a metal.

In the light of the above statements, choose the most appropriate answer from the options given below.

- (1) Both A and R are correct and R is the correct explanation of A.
- (2) Both A and R are correct but R is not the correct explanation of A.
- (3) A is correct but R is not correct.
- (4) A is not correct but R is correct.

$$E = \phi + K$$

$$\phi = \phi + K$$

$$\underline{\underline{K = 0}}$$

Question no. 39

When the wavelength of radiation falling on a metal is changed from 500 nm to 200 nm, the maximum kinetic energy of the photoelectrons becomes three times larger. The work function of the metal is close to:

- (1) 0.81 eV (2) 1.02 eV
 (3) 0.52 eV (4) 0.61 eV

$$E_1 = \frac{hc}{\lambda_1}$$

$$E_1 = \frac{1240}{500}$$

$$E_1 = 2.48 \text{ (eV)}$$

$$E_2 = \frac{hc}{\lambda_2 \text{ (nm)}}$$

$$E_2 = \frac{1240}{200}$$

$$E_2 = 6.20 \text{ (eV)}$$

$$E_1 = \phi + K$$

$$2.48 = \phi + K$$

$$2.48 - \phi = K$$

- (1)

$$E_2 = \phi + 3K$$

$$6.20 = \phi + 3(2.48 - \phi)$$

$$6.20 = \phi + 3 \times 2.48 - 3\phi$$

$$2\phi = 7.44 - 6.20$$

$$2\phi = 1.24$$

$$\phi = 0.62 \text{ (A)}$$

$$\phi = 0.61 \text{ (V (correct))}$$

$$\frac{7.44}{6.20} = 1.24$$

Question no. 40

Read the following statements :

- A. Volume of the nucleus is directly proportional to the mass number.
- B. Volume of the nucleus is independent of mass number.
- C. Density of the nucleus is directly proportional to the mass number.
- D. Density of the nucleus is directly proportional to the cube root of the mass number.
- E. Density of the nucleus is independent of the mass number.

Choose the correct option from the following option.

- (1) A and D only
- (2) A and E only
- (3) B and E only
- (4) A and C only

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

$$R = R_0 A^{1/3}$$

$$V = \frac{4}{3} \pi (R_0 A^{1/3})^3$$

$$V = \frac{4}{3} \pi R_0^3 A$$

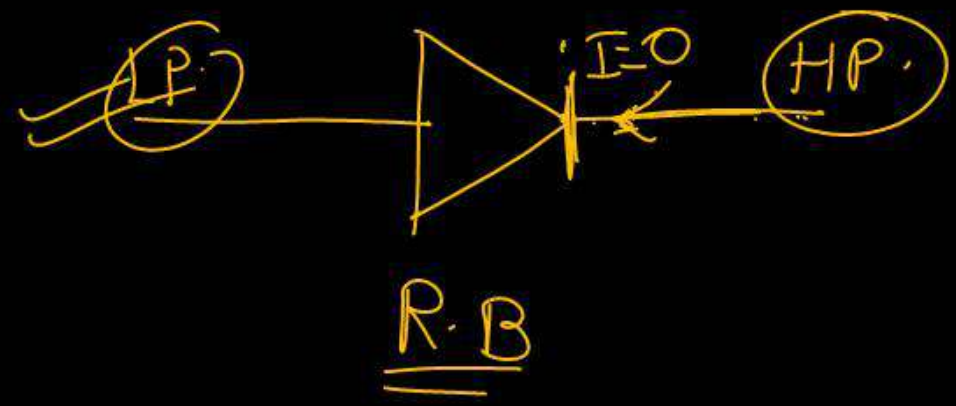
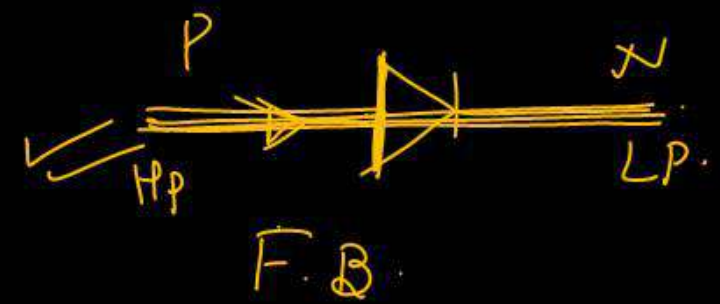
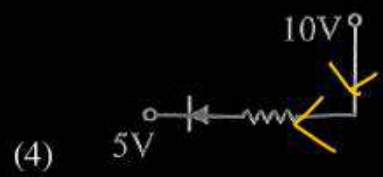
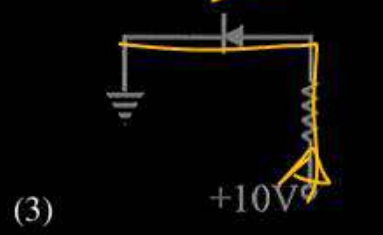
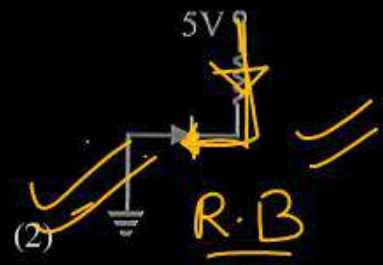
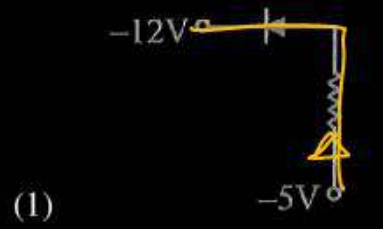
$$\underline{\underline{V \propto A}}$$

$$\rho = \frac{\pi \cancel{m} \cancel{A}}{\frac{4}{3} \pi \cancel{R_0^3} \cancel{A}}$$

$$\underline{\underline{\rho = \text{const}}}$$

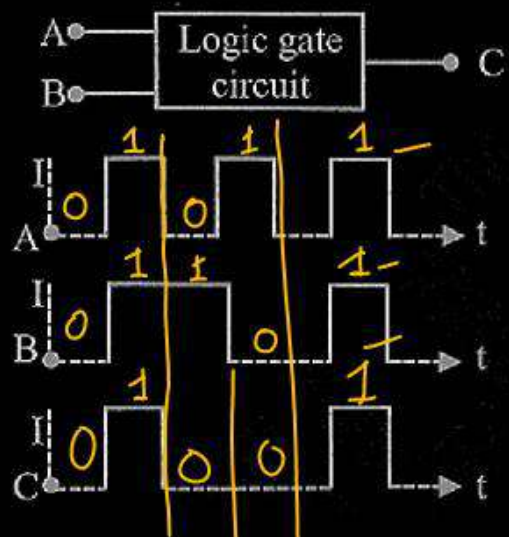
Question no. 41

In given diagram which p-n junction is reverse biased:



Question no. 42

The following figure shows a logic gate circuit with two inputs A and B and the output C. The voltage waveforms of A, B and C are as shown below.



The logic circuit gate is:

- (1) AND gate
- (2) NAND gate
- (3) NOR gate
- (4) OR gate

Question no. 43

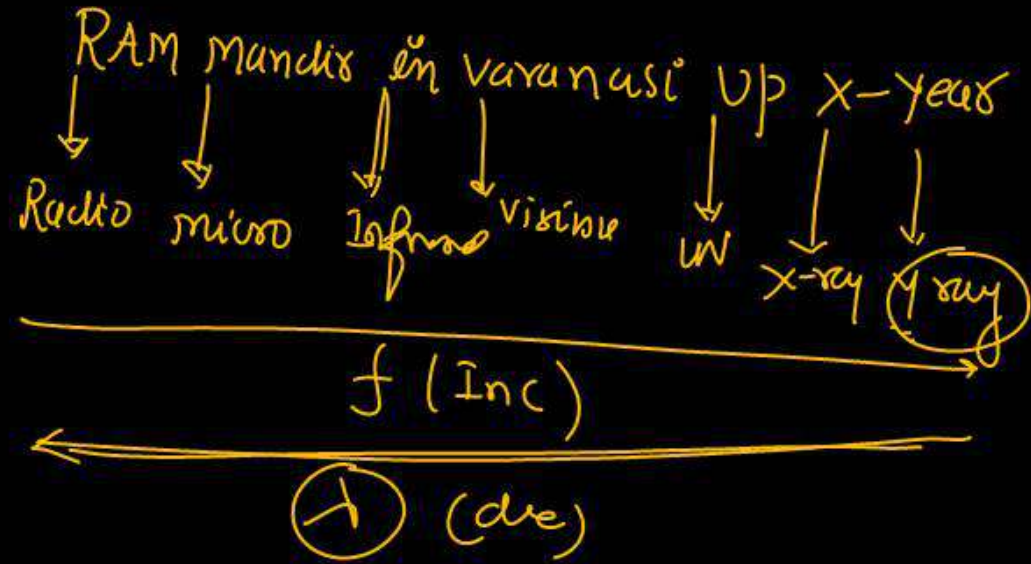
Which one of the option represents correct ascending order of wavelengths?

- (1) $\lambda_{\text{visible}} < \lambda_{\text{X-ray}} < \lambda_{\text{gamma-ray}} < \lambda_{\text{microwave}}$
- (B) $\lambda_{\text{gamma-ray}} < \lambda_{\text{X-ray}} < \lambda_{\text{visible}} < \lambda_{\text{microwave}}$
- (3) $\lambda_{\text{X-ray}} < \lambda_{\text{gamma-ray}} < \lambda_{\text{visible}} < \lambda_{\text{microwave}}$
- (4) $\lambda_{\text{microwave}} < \lambda_{\text{visible}} < \lambda_{\text{gamma-ray}} < \lambda_{\text{X-ray}}$

$$c = f \lambda$$

$$f \propto \frac{1}{\lambda}$$

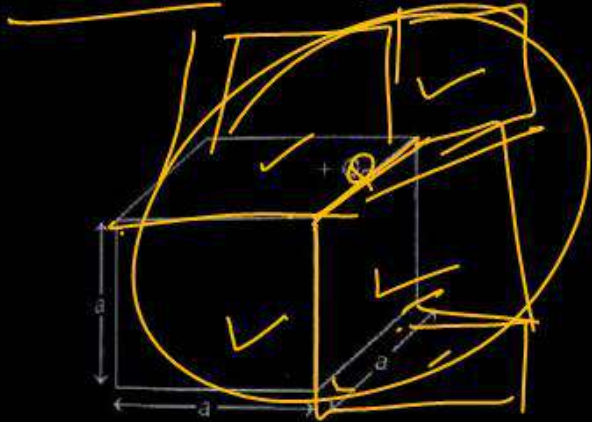
$$\lambda \propto \frac{1}{f}$$



$$\lambda_{\text{ray}} < \lambda_{\text{X-ray}} < \lambda_{\text{visible}} < \lambda_{\text{microwave}}$$

Question no. 44

In figure +Q charge is located at one of the edge of the cube, then electric flux through cube due to +Q charge is:



$$\phi = \frac{q_{\text{enclosed}}}{\epsilon_0}$$

$$4\phi_{\text{cube}} = \frac{Q}{\epsilon_0}$$

$$\phi_{\text{cube}} = \frac{Q}{4\epsilon_0}$$

(1) $\frac{+Q}{\epsilon_0}$

(2) $\frac{+Q}{2\epsilon_0}$

(3) $\frac{+Q}{4\epsilon_0}$

(4) $\frac{+Q}{8\epsilon_0}$

Question no. 45

Match the column I and column II and choose the correct answer –

	Column-I		Column-II
A		i	Semi-conductor (Germanium)
B		ii	Copper
C		iii	Nichrome

A → ii

B → iii

C → i

(1) A → ii, B → iii, C → i

(2) A → i, B → ii, C → iii

(3) A → iii, B → i, C → ii

(4) A → ii, B → i, C → iii

Correct order of atomic size is—

- (1) ~~B < Al < Ga < In < Tl~~
- (2) ~~C < Si < Sn < Ge < Pb~~
- (3) ✓ B < Ga < Al < In < Tl
- (4) ~~C < Pb < Ge < Sn < Si~~

3

group-14

C
Si
Ge
Sn
Pb

↓ size ↑

Size

Down the group
Size ↑

Period (L → R)
Size ↓

group-13

B Al Ga In Tl

B < Ga < Al < In < Tl

135 pm 143 pm

Question no. 47

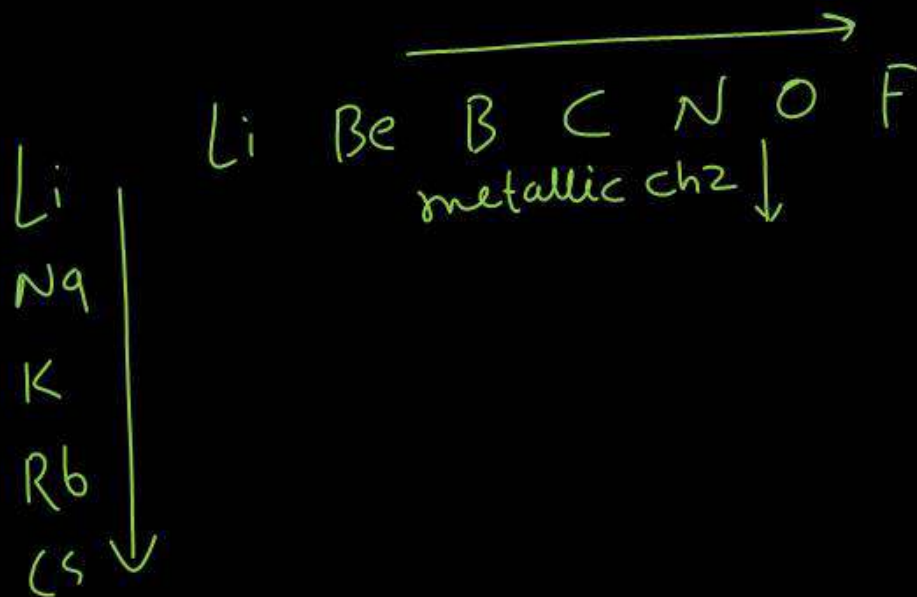
Which property decreases from left to right across the period and increases from top to bottom in group?

- (i) Atomic radius ✓
- (ii) Electronegativity *along the period* ↑
- (iii) Ionisation energy — / ——— ↑
- (iv) Metallic character ✓

- (1) ~~(i) only~~
- (2) ~~(i), (ii) and (iii)~~
- (3) ~~(i), (iii) and (iv)~~
- (4) ~~(i) and (iv)~~

✓
(4)

Period (L→R) → ↓
Down the group → ↑



Question no. 48

Select the option in which all the information about element "Ununtriium" are correct :

(2)

	Block	Group	Period	Valence shell configuration
(1)	s	2	7	7s²
(2)	p	13	7	7s ² , 7p ¹
(3)	p	13	6	6s ² , 6p ¹
(4)	d	12	6	6s²

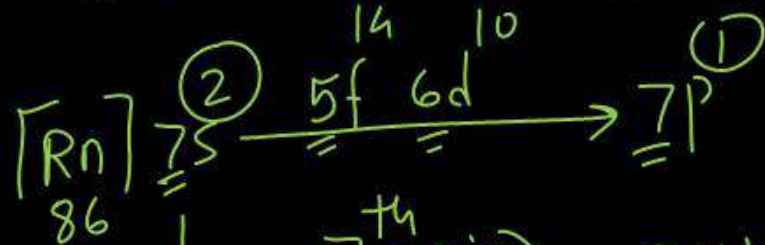
(2)

group-13 ns² np¹
7s² 7p¹

un-un-tri-ium

$$1-1-3 = Z$$

(113)



7th period

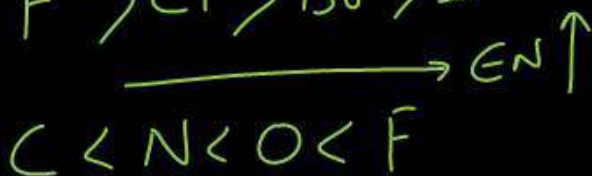
$$2+1+10 = 13$$

group No. in p-Block = last s e⁻ + last p e⁻ + 10

The correct order of electronegativity is:



2



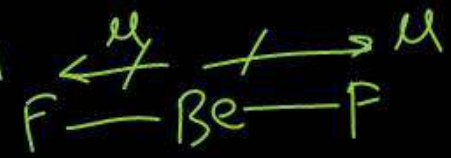
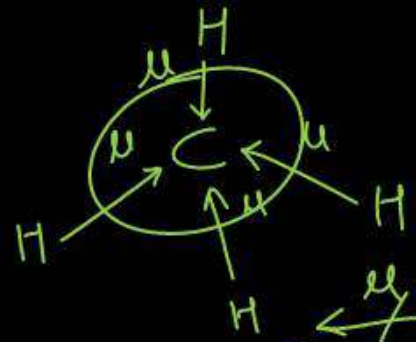
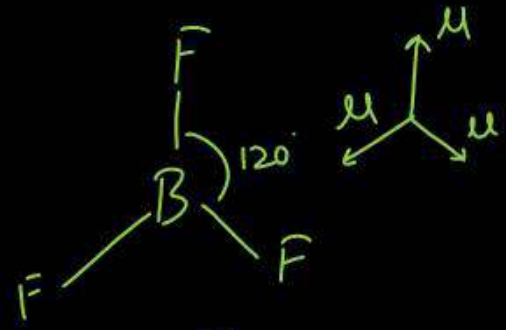
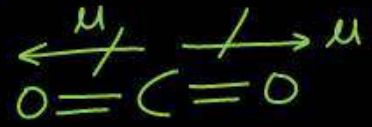
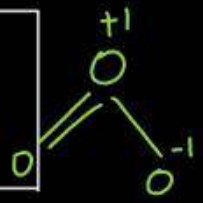
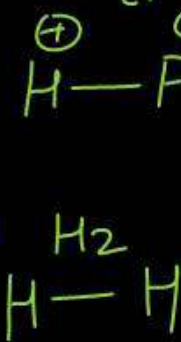
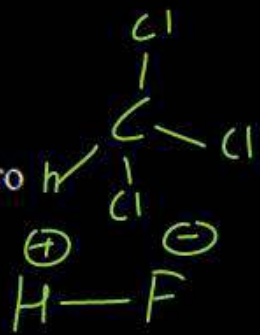
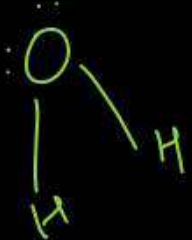
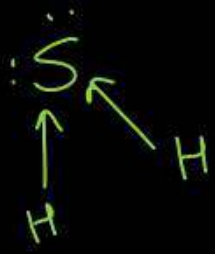
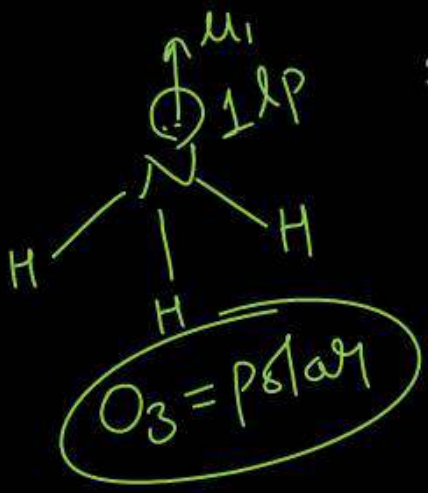
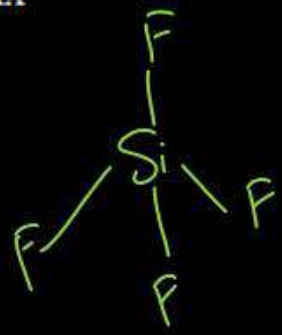
Question no. 50

How many molecules from the following have zero dipole moment?

- | | | | | | |
|-----------------|-------------------|------------------|------------------|------------------|-----------------|
| HF | H ₂ | H ₂ S | CO ₂ | NH ₃ | BF ₃ |
| CH ₄ | CHCl ₃ | SiF ₄ | H ₂ O | BeF ₂ | O ₃ |

- (1) Four (2) Five
 (3) Six (4) Seven

✓ Six



- μ = 0
 H₂
 CO₂
 BF₃
 CH₄
 SiF₄
 BeF₂

Question no. 51

Match Column I with Column II and choose the correct combination from the options given.

	Column I (Electronic configuration)		Column II (Corresponding elements)
A.	$[\text{Xe}] 4f^{14} 5d^2 6s^2$ 54 $Z=72$	p.	Inner-transition Element
B.	$[\text{Xe}] 4f^{14} 5d^{10} 6s^2 6p^6 7s^2$ 54 $Z=88$	q.	Representative element s+p
C.	$[\text{Rn}] 5f^{14} 6d^1 7s^2$ 86 $Z=103$	r.	d-block element
D.	$[\text{Xe}] 4f^{14} 5d^{10} 6s^2$ 54 $Z=80$	s.	Transition element
		t.	s-block element

- (1) A → r, s; B → q, t; C → p; D → r
 (2) A → p, r; B → p, q, r; C → p, s; D → t
 (3) A → q, t; B → p; C → r; D → r, s
 (4) A → t; B → p, r; C → p, s; D → p, q, r

A → r, s
 B → t, q
 C → p
 D → r

1

Handwritten notes and diagrams:

- Diagram 1: $[\text{Xe}] 6s^2 \xrightarrow{4f^{14} 5d^2} 6p$
- Diagram 2: $[\text{Rn}] 7s^2$
- Diagram 3: $[\text{Rn}] 7s^2 \xrightarrow{5f^{14} 6d^1} 7p$
- Diagram 4: $[\text{Xe}] 6s^2 4f^{14} 5d^{10}$ with $Z = \text{Hg} 80$ circled below.

Question no. 53

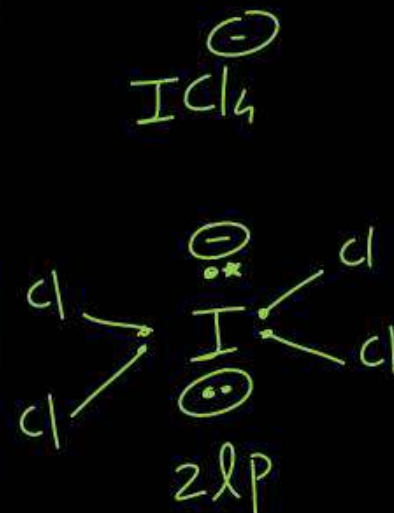
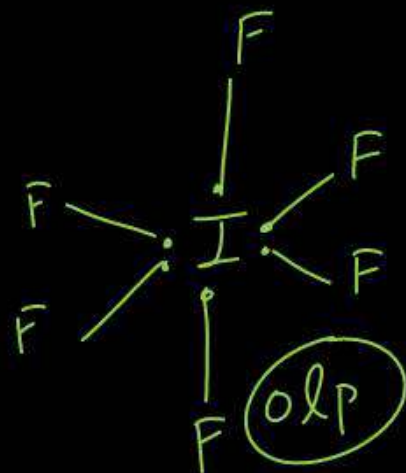
Match List-I with List-II.

	List I (Molecules / ions)		List-II (No. of lone pairs of e-on central atom)
A.	IF_7	I.	Three
B.	ICl_4^-	II.	One
C.	XeF_6	III.	Two
D.	XeF_2	IV.	Zero

Choose the correct answer from options given below:

- ~~A-IV, B-I, C-II, D-III~~
- ~~A-II, B-I, C-IV, D-III~~
- ~~A-II, B-III, C-IV, D-I~~
- A-IV, B-III, C-II, D-I

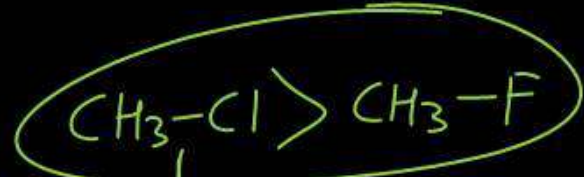
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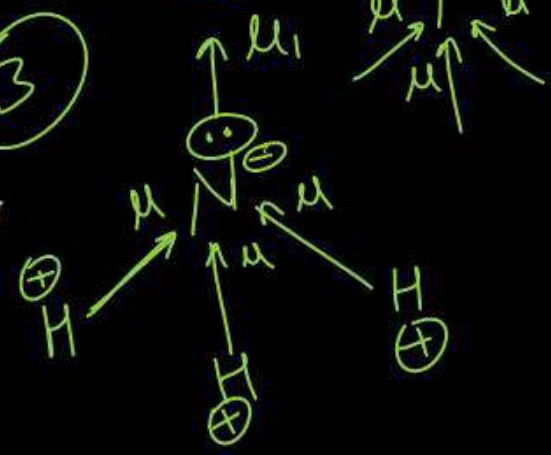
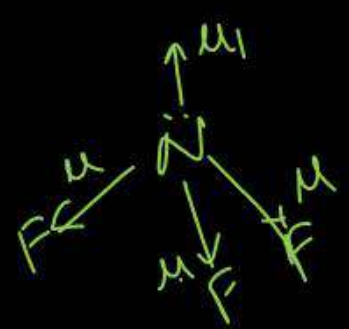
Question no. 54

Which of the following orders for dipole moments are correct-

- (A) Dipole moment: $\text{CH}_3\text{F} > \text{CH}_3\text{Cl} > \text{CH}_3\text{Br} > \text{CH}_3\text{I}$ x
 - (B) Dipole moment: $\text{HF} > \text{HCl} > \text{HBr} > \text{HI}$
 - (C) Dipole moment: $\text{H}_2\text{S} > \text{H}_2\text{O} > \text{CO}_2$
 - (D) Dipole moment: $\text{NH}_3 > \text{NF}_3 > \text{BF}_3$ $\mu=0$
- (1) A, B and C only
 (2) A and B only
 (3) B and D only
 (4) A, B, C and D only



→ polarity $\text{C-Cl} < \text{C-F}$
 → B.l. $\text{C-Cl} >> \text{C-F}$
 → μ $\text{C-Cl} > \text{C-F}$
 4xd



(3)

Question no. 55

Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A) : The resultant dipole moment of NH_3 is greater than that of NF_3 .

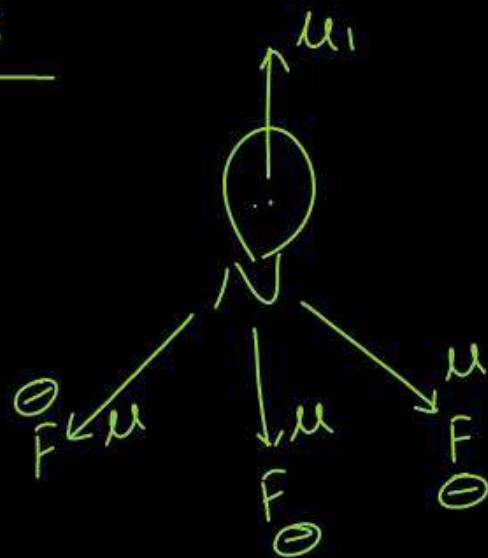
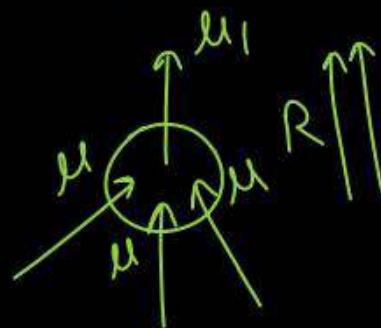
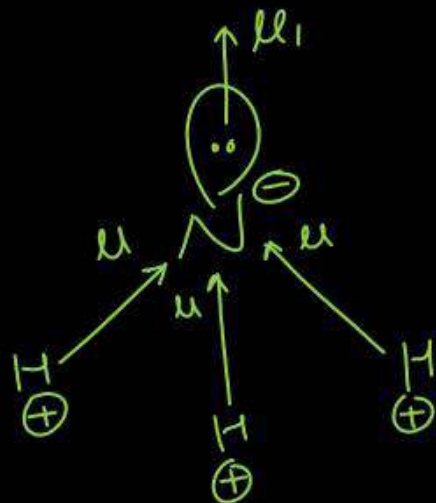
Reason (R) : In NH_3 , the orbital dipole due to lone pair is in the same direction as the resultant dipole moment of the N - H bonds.

In the light of the above statements, choose the correct answer from the options given below:

- (1) (A) is true but (R) is false.
- (2) Both (A) and (R) are true but (R) is not the correct explanation of (A).
- (3) Both (A) and (R) are true and (R) is the correct explanation of (A).
- (4) Assertion (A) is false but Reason (R) is true.

3

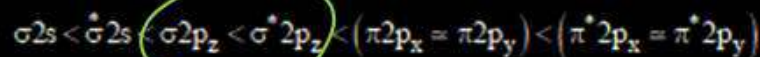
$$\mu_{\text{NH}_3} > \mu_{\text{NF}_3}$$



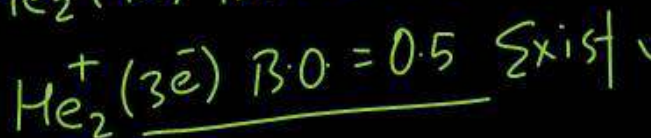
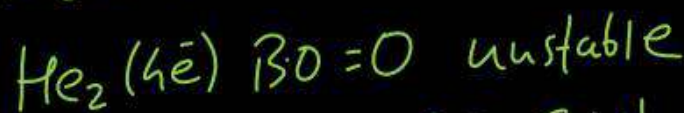
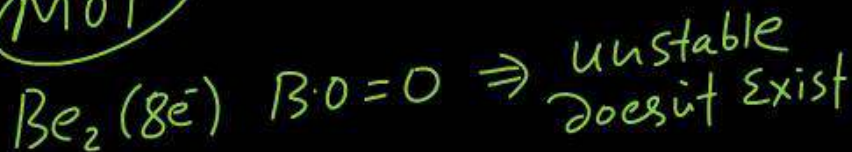
Question no. 56

Which of the following statements is not correct from the view point of molecular orbital theory?

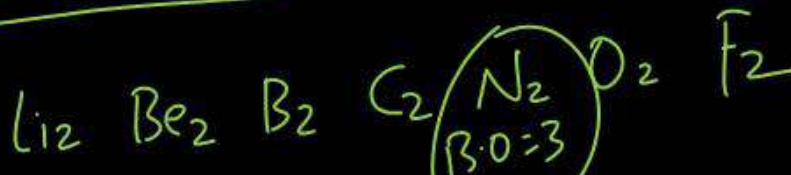
- (1) Be₂ is not a stable molecule ✓
- (2) He₂ is not stable but He₂⁺ is expected to exist ✓
- (3) Bond strength of N₂ is maximum amongst the homonuclear diatomic molecules belonging to the second period. ✓
- (4) The order of energies of molecular orbitals in N₂ molecule is



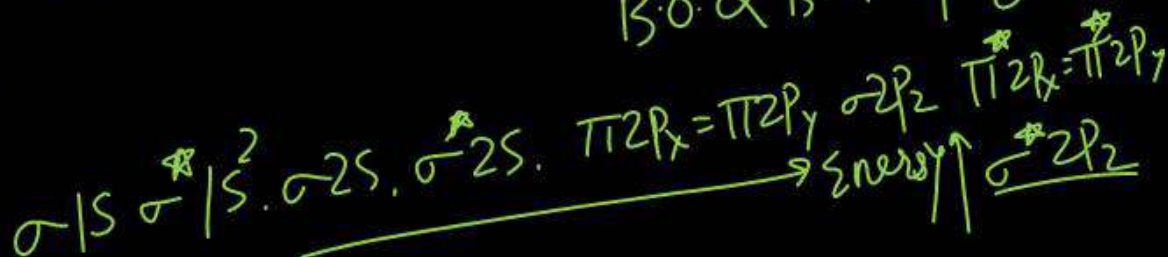
MOT



h

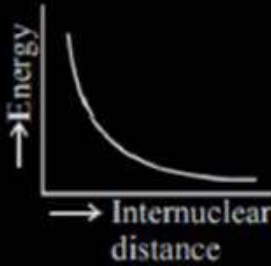
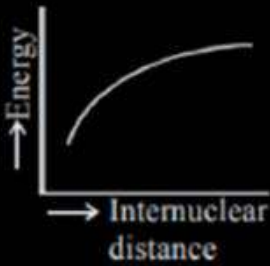
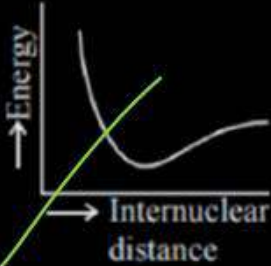
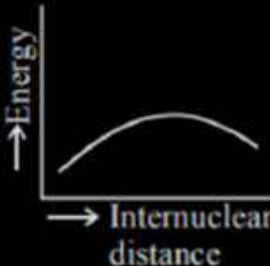


B.O ∝ Bond strength

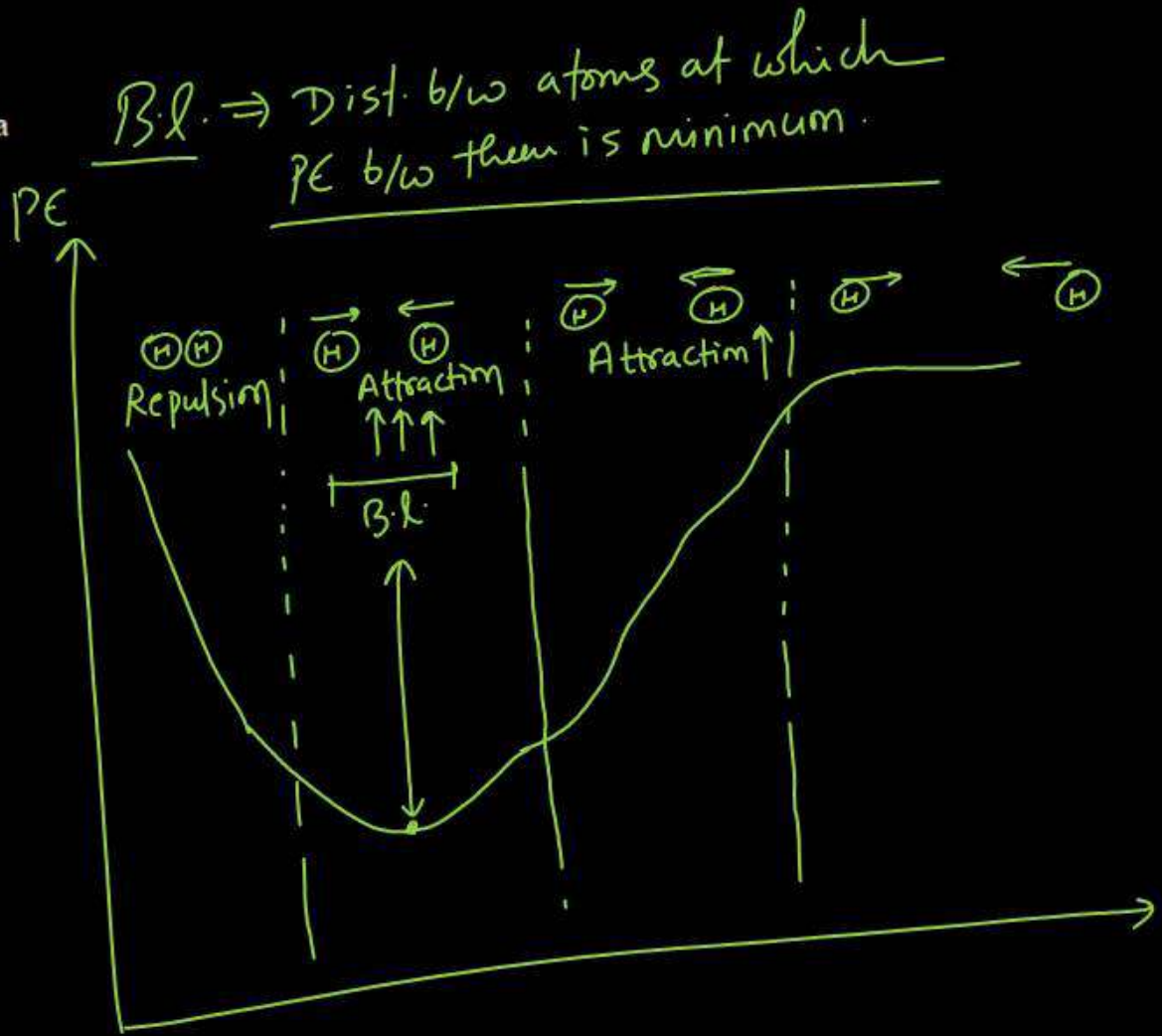


Question no. 57

The potential energy curve for the H_2 molecule as a function of internuclear distance is

- (1) 
- (2) 
- (3) 
- (4) 

3



Which of following is incorrectly matched?

(1) Mn_2O_7 : Basic oxide X

(2) Al_2O_3 : Amphoteric oxide ✓

(3) Cl_2O_7 : Acidic oxide ✓

(4) N_2O : Neutral oxide ✓

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

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

+7
 $\text{Mn}_2\text{O}_7 \rightarrow \text{acidic}$

Metal oxide - Basic Nature

Non-metal oxide - acidic Nature

Neutral oxide - $\text{CO}, \text{NO}, \text{N}_2\text{O}, \text{H}_2\text{O}$

Amphoteric oxide

$\text{BeO}, \text{ZnO}, \text{SnO}, \text{PbO}$
 $\text{Al}_2\text{O}_3, \text{As}_2\text{O}_3, \text{Sb}_2\text{O}_3, \text{Cr}_2\text{O}_3$
 $\text{PbO}_2, \text{SnO}_2, \text{V}_2\text{O}_5, \text{MnO}_2$

1

Question no. 59

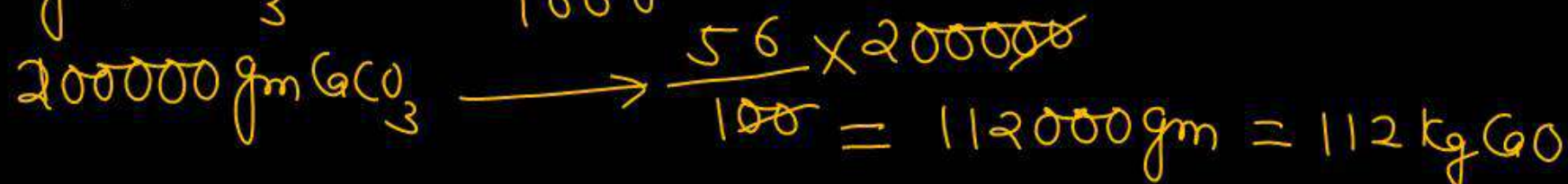
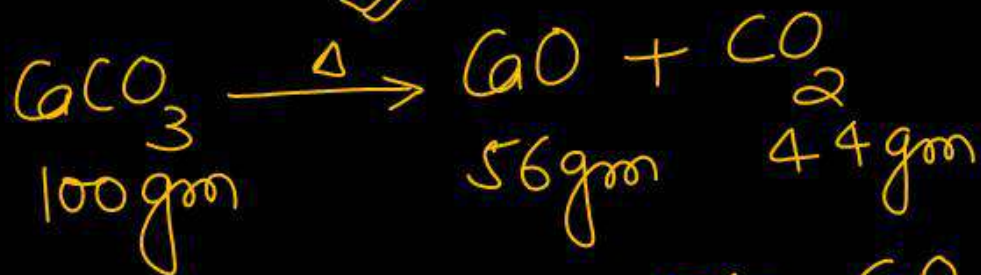
The mass of CaO that can be prepared by heating 200 kg of limestone (CaCO_3) which is 95% pure is -

- (1) 104.4 kg (2) 105.4 kg
 (3) 212.8 kg (4) ~~106.4 kg~~

Since CaCO_3 is 95% pure

$$= \frac{95}{100} \times 112 \text{ kg}$$

$$= 106.4 \text{ kg}$$

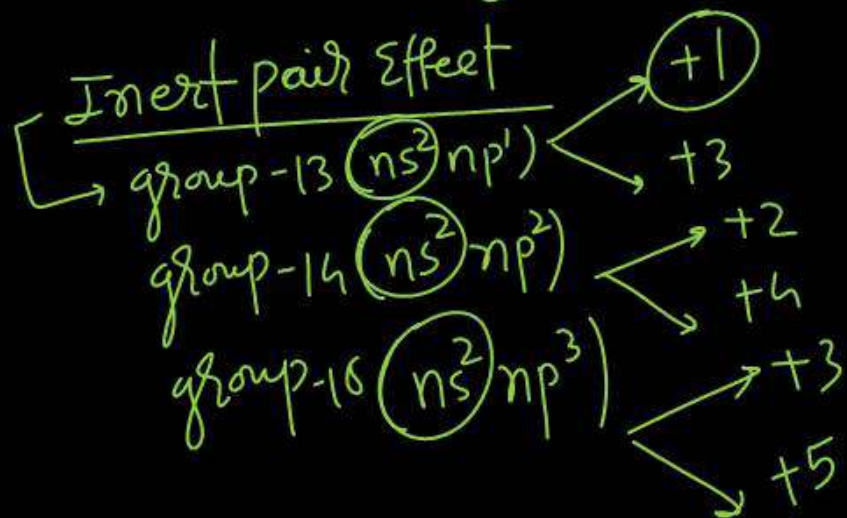


Question no. 60

The stability of +1 oxidation state among Al, Ga, In and Tl increases in the sequence

- (1) $Tl < In < Ga < Al$ (2) $In < Tl < Ga < Al$
 (3) $Ga < In < Al < Tl$ (4) $Al^{+1} < Ga^{+1} < In^{+1} < Tl^{+1}$

(4)



Down the group
 Stability of lower o.s. ↑
 Stability of higher o.s. ↓

Question no. 61

For saturated solution of CaF_2 , choose the correct relationship:

(1) $\Lambda_m^\infty(\text{CaF}_2) = \lambda_{\text{eq}}^\infty(\text{Ca}^{2+}) + 2\lambda_{\text{eq}}^\infty(\text{F}^-)$

(2) $\Lambda_m^\infty \text{CaF}_2 = 2 \left[\lambda_{\text{eq}}^\infty(\text{Ca}^{2+}) + \lambda_{\text{eq}}^\infty(\text{F}^-) \right]$

(3) $\Lambda_m^\infty \text{CaF}_2 = 2 \left[\lambda_{\text{eq}}^\infty(\text{Ca}^{2+}) + 2\lambda_{\text{eq}}^\infty(\text{F}^-) \right]$

(4) $\Lambda_m^\infty \text{CaF}_2 = \frac{1}{2} \left[\lambda_{\text{eq}}^\infty(\text{Ca}^{2+}) + \lambda_{\text{eq}}^\infty(\text{F}^-) \right]$

2

CaF_2

$\lambda_{\text{eq}} \text{Ca}^{+2}$

$\lambda_{\text{eq}} \text{F}^-$

CaF_2

$\eta = 2$

$$\lambda_{\text{eq}} = \lambda_{\text{eq}} \text{Ca}^{+2} + \lambda_{\text{eq}} \text{F}^-$$

$$\lambda_m = \lambda_m \text{Ca}^{+2} + 2\lambda_m \text{F}^-$$

$$\lambda_m = \eta \times \lambda_{\text{eq}}$$

$$\lambda_m = 2 \times \lambda_{\text{eq}}$$

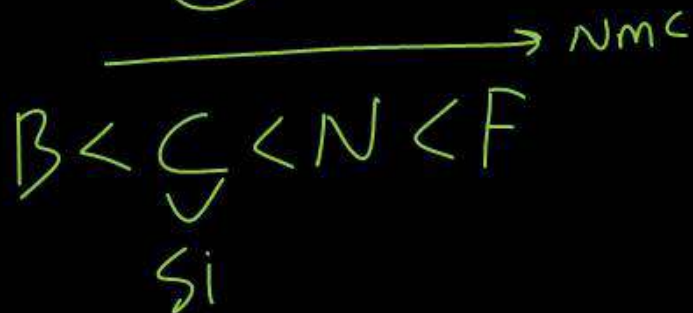
$$\lambda_m = 2 \left[\lambda_{\text{eq}} \text{Ca}^{+2} + \lambda_{\text{eq}} \text{F}^- \right]$$

Correct order of non-metallic character is

(1) ~~B > C > Si > N > F~~ (2) ~~Si > C > B > N > F~~

(3) F > N > C > B > Si (4) F > N > C > Si > B

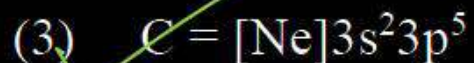
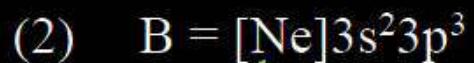
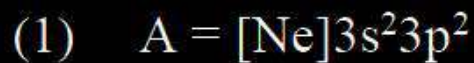
3



Non-metallic ch₂ \propto EN
 \downarrow Down the group
 \uparrow along the period

Question no. 63

Four elements A, B, C and D have electronic configurations given below, which one has highest ionization energy?



3



4 orbit 4th period size ↑ I.E ↓



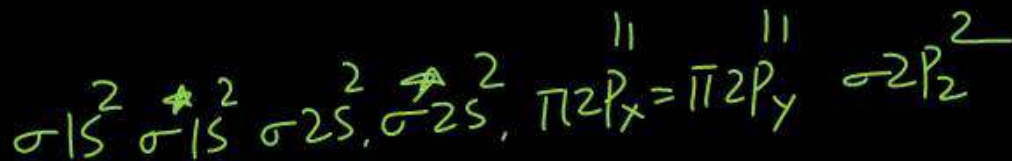
In which of the following molecule last electron is filled in $\sigma 2p_z$ molecular orbital?

(1) C_2

(2) N_2

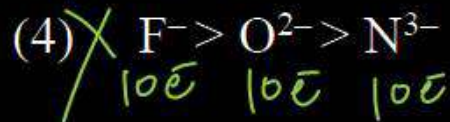
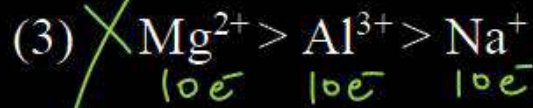
(3) B_2

(4) O_2



(2)

The correct order of radii is:



ion of same element $\propto \frac{1}{Z_i}$



Size $\propto \frac{1}{+ve}$

Size $\propto \frac{-ve}{+ve}$

Question no. 66

How many of the following orders for electron affinity are correct—

- (a) ~~O < N < Cl < S~~
- (b) ✓ I < Br < F < Cl
- (c) ✓ Ar < N < O < Cl
- (d) ✓ N < O < S
- (e) ✓ O < Te < Se < S

- (1) Two
- (3) ✓ Four

- (2) Three
- (4) Five

3

O
S
Se
Te
Po
EA ↓

Ne < Be < N
Ar < Mg
EA low
ΔHeg = +ve

EA Cl max

F Cl Br I
Cl > F > Br > I

S > Se > Te > Po > O
EA ↓

Question no. 67

The successive ionization enthalpies (in kJ/mol) for an element are shown below.

IE ₁	IE ₂	IE ₃	IE ₄	IE ₅
577	1820	2740	11600	14800

2

What is the electronic configuration of this element?

- (1) $1s^2 2s^2 2p^6 3s^1$
- (2) $1s^2 2s^2 2p^6 3s^2 3p^1$ ✓
- (3) $1s^2 2s^2 2p^6 3s^2 3p^3$
- (4) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^3$ ns^2

noble gas config.
 $ns^2 np^6$

Question no. 68

Which of the following configurations have maximum electron affinity, Electronegativity, and Ionization energy respectively?

- $A = 1s^2 2s^2 2p^6 \rightarrow \text{Ne} (Z=10)$
 $B = 1s^2 2s^2 2p^6 3s^2 3p^5 \rightarrow \text{Cl} (Z=17)$
 $C = 1s^2 2s^2 2p^5 \rightarrow \text{F} (Z=9)$
 $D = 1s^2 2s^2 2p^6 3s^1 \rightarrow \text{Na} (Z=11)$
- (1) C, B, D
 (2) B, C, A
 (3) D, C, A
 (4) A, C, B

EA B
 EN C
 IE A

2

Question no. 69

In ionic bond, $A^+ B^-$ is most likely to be formed when

- (1) The ionization energy of A is ~~high~~ and the electron affinity of B is low
- (2) The ionization energy of A is low and the electron affinity of B is high
- (3) The ionization energy of A is ~~high~~ and the electron affinity of B is high
- (4) The ionization energy of A is low and the electron affinity of B is low

2

$IE \downarrow$
 \Downarrow
cation
easy

$EA \uparrow$ High
 \Downarrow
anion
easy

Question no. 70

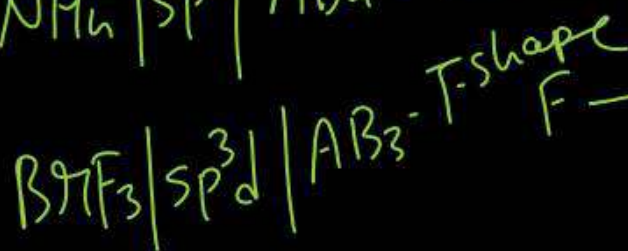
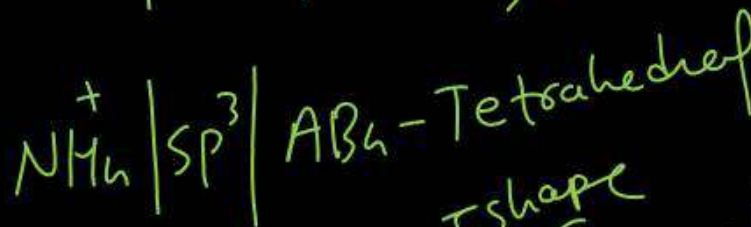
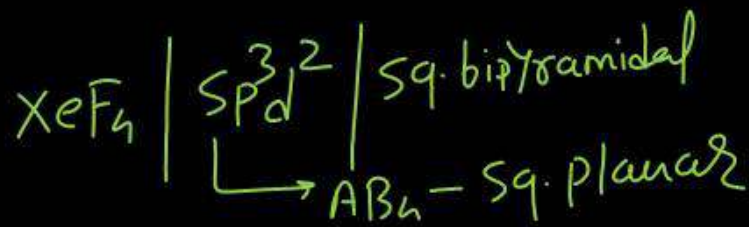
Match List-I with List-II.

	List I (Molecule)		List-II (Shape)
A.	XeF ₄	I.	See-saw
B.	SF ₄	II.	Square planar
C.	NH ₄ ⁺	III.	Bent T-shaped
D.	BrF ₃	IV.	Tetrahedral

Choose the correct answer from options given below:

- (1) ~~A-IV, B-I, C-II, D-III~~
 (2) ~~A-II, B-I, C-III, D-IV~~
 (3) A-II, B-I, C-IV, D-III
 (4) ~~A-IV, B-III, C-II, D-I~~

3

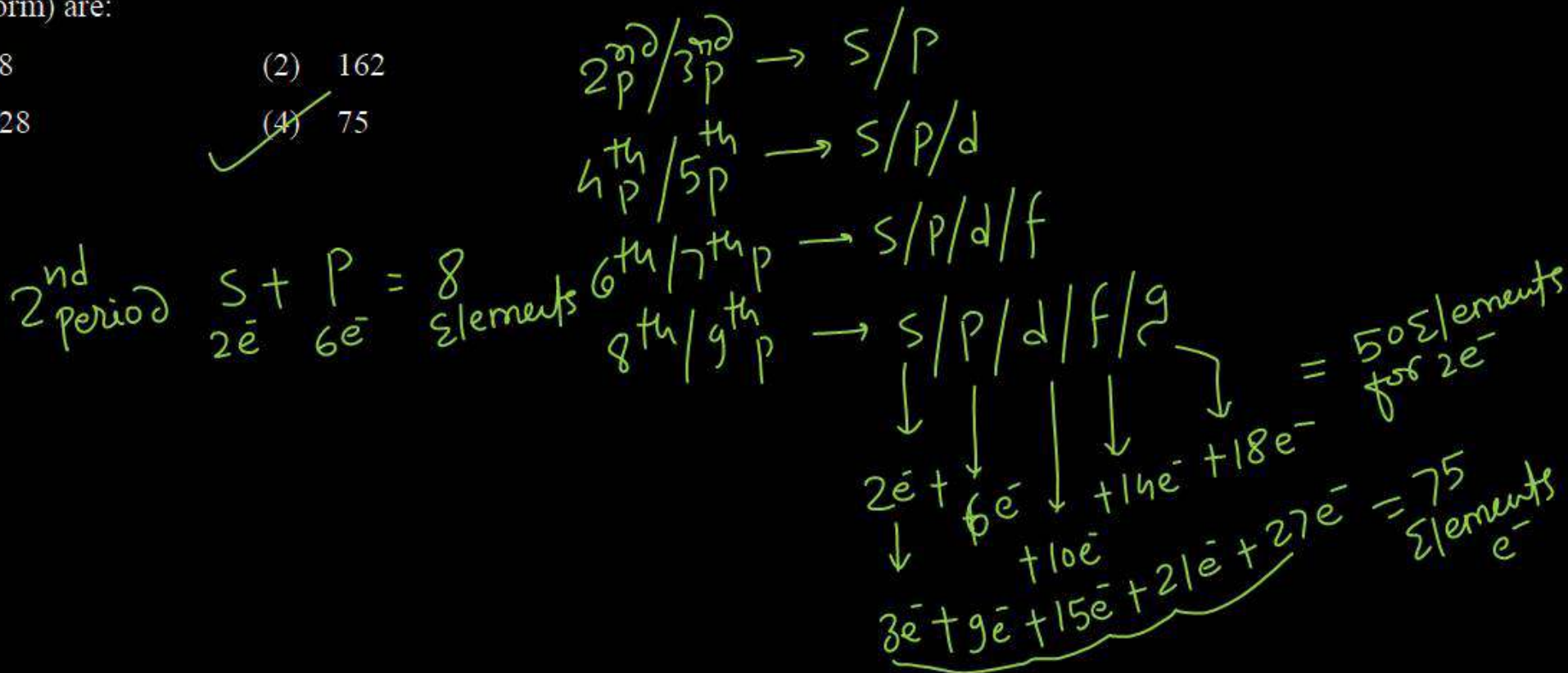


Question no. 71

If each orbital can hold a maximum of three electrons, the number of elements in 9th period of periodic table (long form) are:

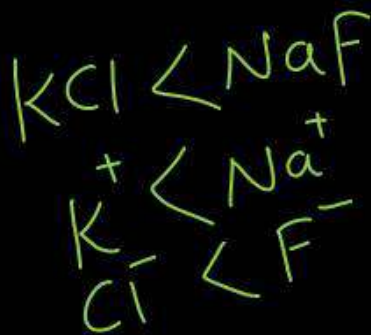
- (1) 48 (2) 162
 (3) 128 (4) 75

76 77

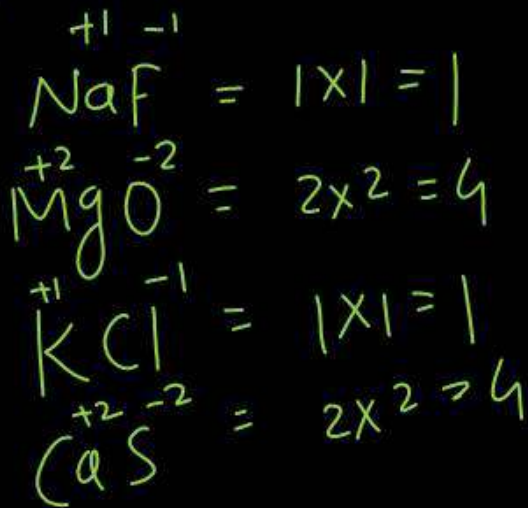


When NaF, MgO, KCl and CaS are listed in the order of increasing lattice energy, which is the correct order?

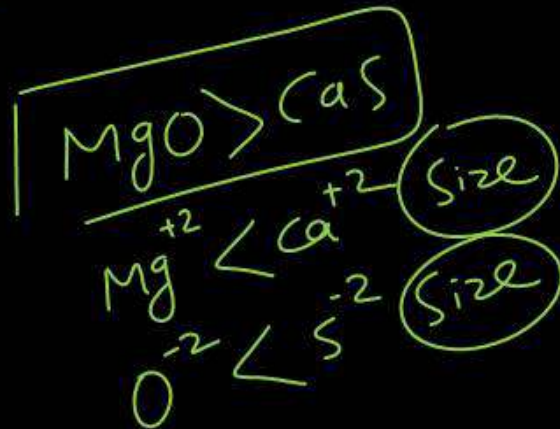
- (1) ~~MgO, NaF, KCl, CaS~~
- (2) ~~CaS, MgO, KCl, NaF~~
- (3) ~~KCl, CaS, NaF, MgO~~
- (4) KCl, NaF, CaS, MgO



4

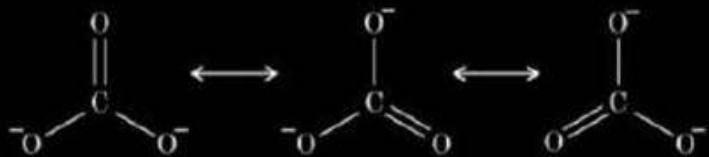


$$E \propto \frac{\text{charge}(q_1, q_2)}{\text{Size}}$$

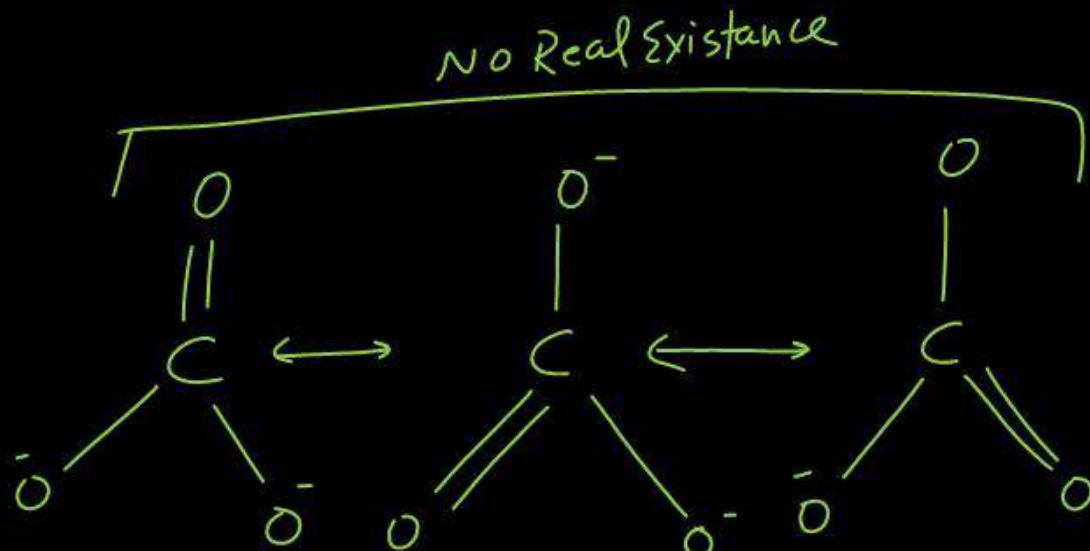


Question no. 73

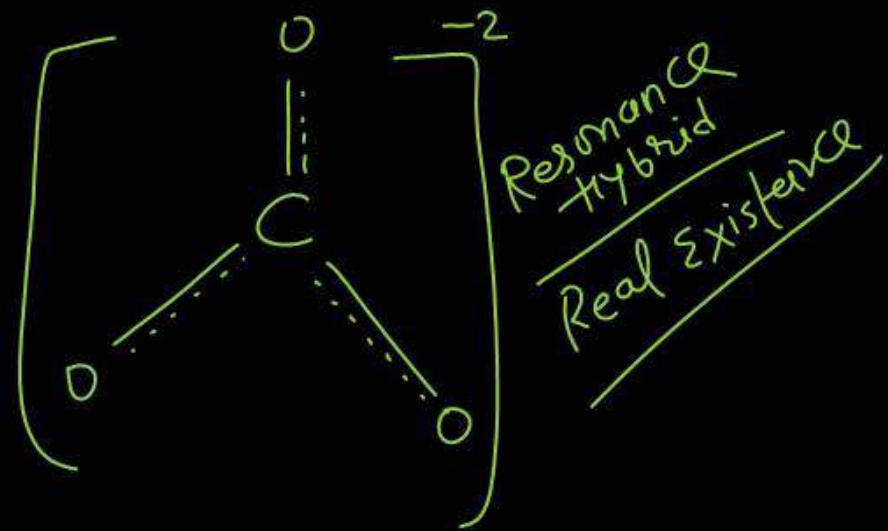
Which of the given option is correct about resonating structures of carbonate ion (CO_3^{2-})?



- (1) ~~X~~ All these structures are in dynamic equilibrium with each other.
- (2) ~~X~~ Each structure exists for equal amount of time.
- (3) CO_3^{2-} has a single structure i.e., resonance hybrid of the above three structures.
- (4) ~~X~~ It is possible to identify each structure individually by some physical or chemical method.



3



Which of the following order is correct according to indicated property -

$\text{acidity} \propto \text{EN}$

$\text{Basicity} \propto \frac{1}{\text{EN}}$



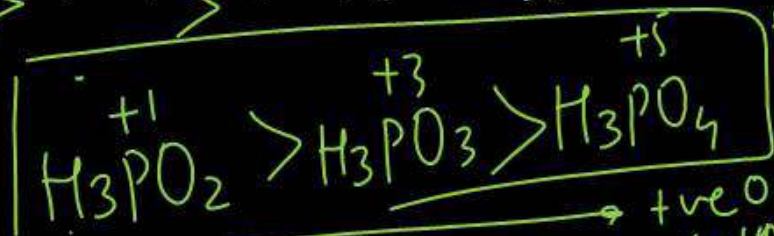
$\text{EN} \downarrow \text{Basicity} \uparrow$



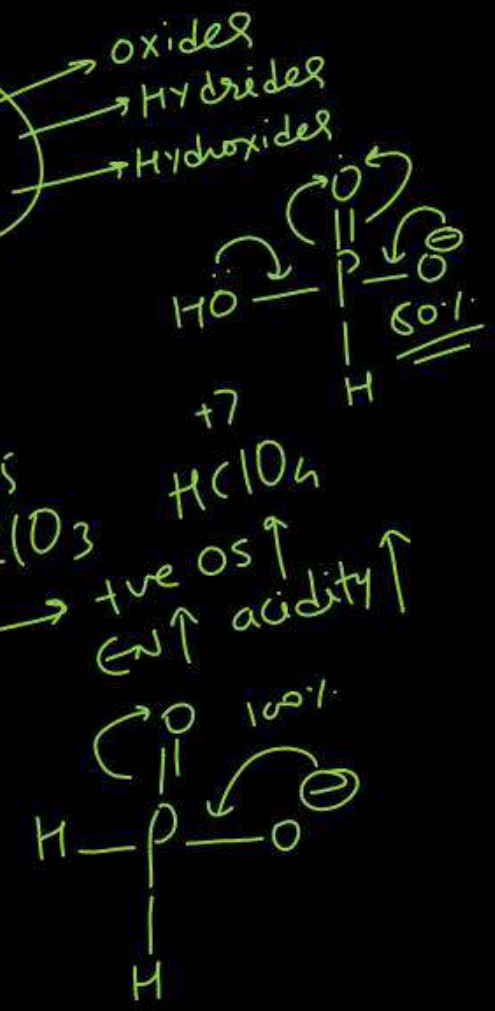
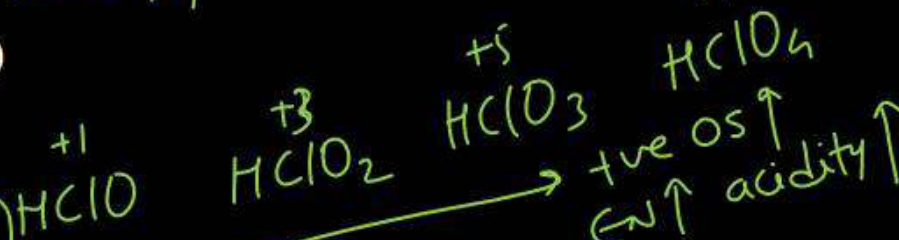
$\text{EN} \uparrow \text{acidity} \uparrow$



①



$\text{+ve OS} \uparrow \text{EN} \uparrow \text{acidity} \downarrow$



Question no. 75

The moles of O_2 required for reacting with 6.8 gm of ammonia according to following reaction is -



(1) 5

(2) 2.5

(3) 1

~~(4) 0.5~~

Handwritten solution:

$$4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O$$

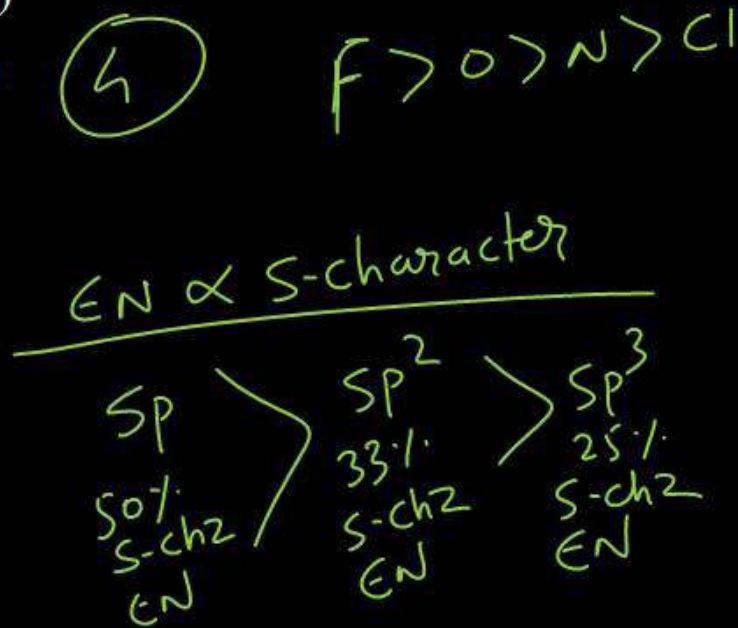
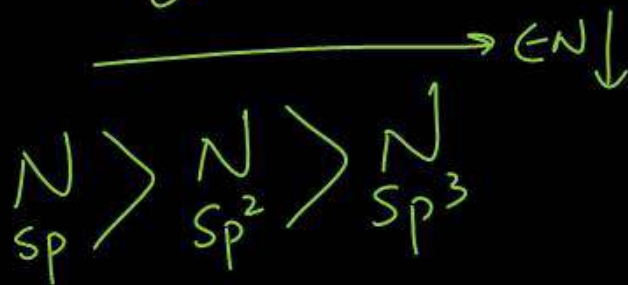
4 mol 5 mol

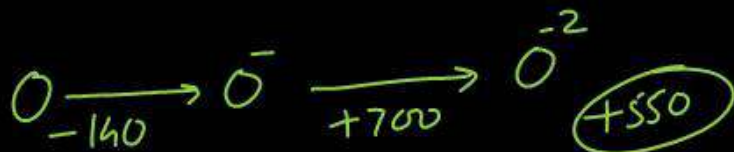
$$\text{mol} = \frac{6.8}{17} = 0.4 \text{ mol}$$

0.5 mol O_2

Which of the following species has the highest electronegativity?

- (1) C (~~sp~~-hybridised) (2) N (sp^2 -hybridised)
 (3) C (~~sp^2~~ -hybridised) (4) \checkmark N (sp -hybridised)





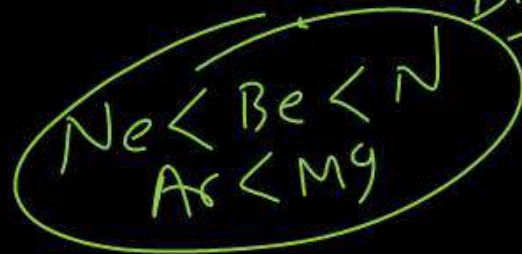
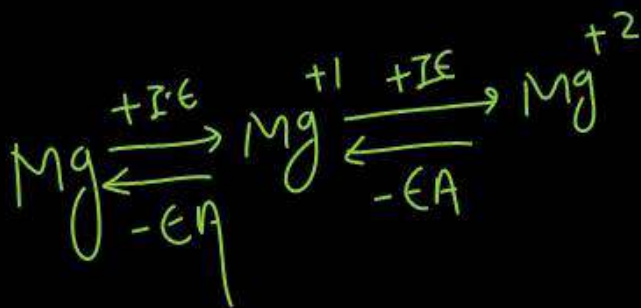
Select the correct statement:

(1) ~~X~~ $O(g) \rightarrow O^{2-}(g)$ is exothermic step.

(2) ~~X~~ $Mg^{2+}(g) \rightarrow Mg(g)$ is endothermic step. $\xrightarrow{e^- \text{ addition}}$

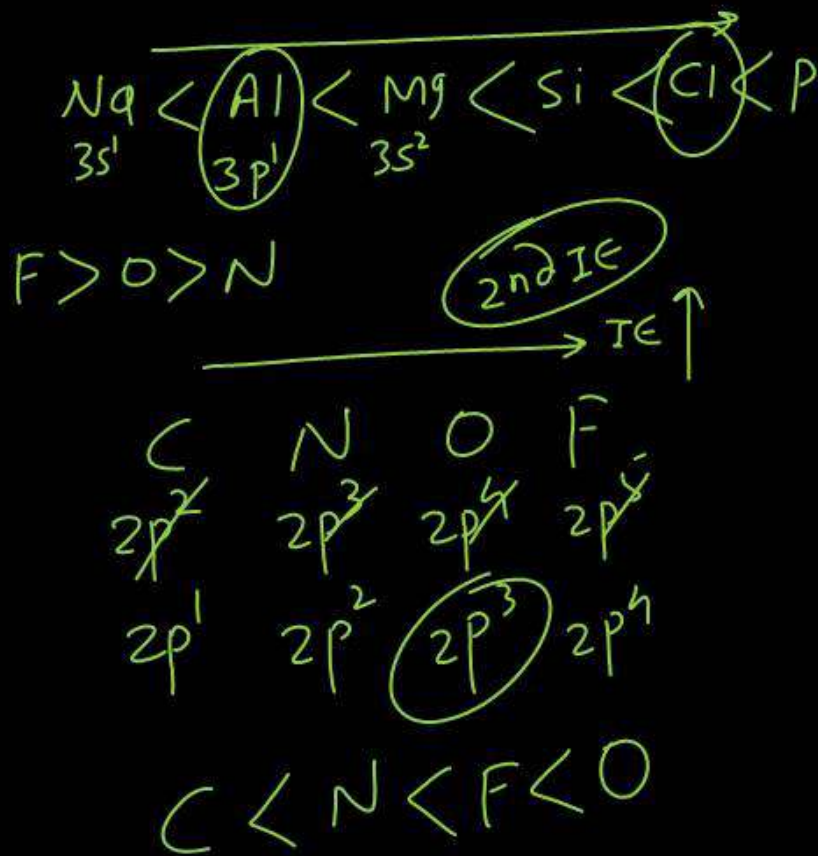
(3) \checkmark $N(g) \rightarrow N^-(g)$ is endothermic step. $\Delta H_{eg} = +ve$ $N(2p^3) \rightarrow N^-(2p^4)$

(4) ~~X~~ $Fe^{2+}(g) \rightarrow Fe^{3+}(g)$ is exothermic step. $\xrightarrow{e^- \text{ removal}}$ $\Delta H_{IE} = +ve$ Endothermic
 $EA = -ve$ $\Delta H_{eg} = +ve$



How many of the following orders given below are in accordance with suggested properties –

- (a) I^{st} ionisation potential : $\text{Na} < \text{Mg} < \text{Si} < \text{P}$ ✓
- (b) Electronegativity : $\text{P} < \text{Si} < \text{N} < \text{C}$ ✗
- (c) Electron affinity : $\text{N} < \text{O} < \text{S} < \text{Cl}$ ✓
- (d) 2^{nd} ionisation potential : $\text{C} < \text{N} < \text{O} < \text{F}$ ✗
- (e) Electropositive character : $\text{Cu} < \text{Mg} < \text{Na}$ ✓
- (1) Two (2) Three
- (3) Four (4) Five



Which is a true statement?

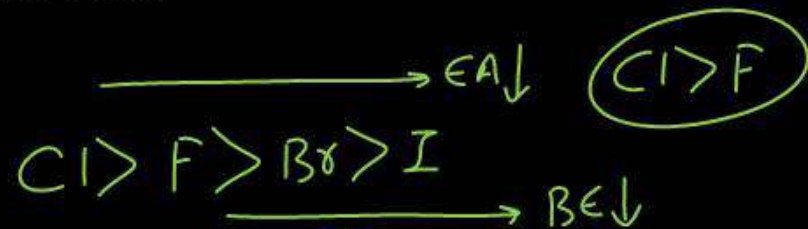
- (1) Larger is the value of ionisation energy easier is the formation of cation
- (2) Larger is the value of electron affinity easier is the formation of anion (2)
- (3) Larger is the value of ionisation energy as well as electron affinity the smaller is the electronegativity of atom
- (4) Larger is the Z_{eff} larger is the size of atom

$$E_N \text{ Mullikan scale} = \frac{IE + EA}{2}$$

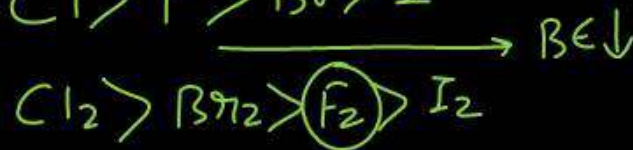
$$Z_{\text{eff}} \propto \frac{1}{\text{Size}}$$

How many of the following orders are correct for halogens –

(a) ~~Electron affinity = Cl > F > Br > I~~



(b) ~~Bond energy = Cl₂ > F₂ > Br₂ > I₂~~



(c) ~~Ionization energy = F > Cl > Br > I~~

(d) ~~Oxidising strength = F₂ > Cl₂ > Br₂ > I₂~~

→ Tendency for reduction ↓

(d) ~~Bond length = F₂ < Cl₂ < Br₂ < I₂~~

→ size ↑ BL ↑

(1) Two

(2) Three

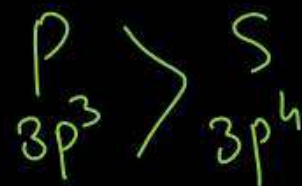
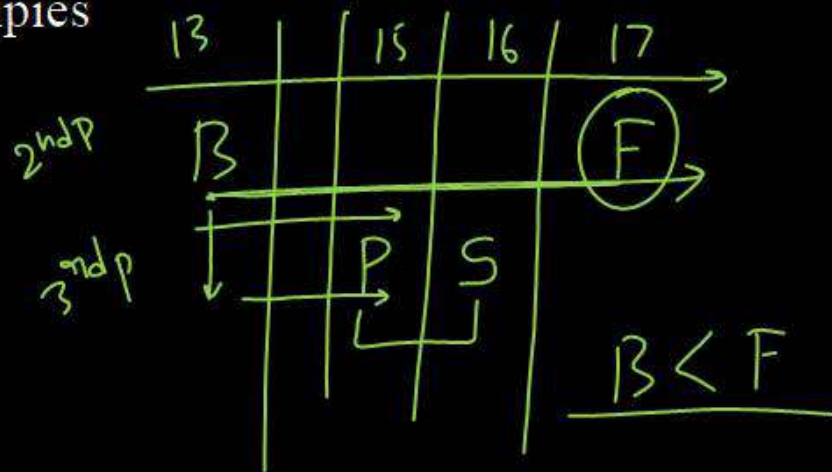
(3) ~~Four~~

(4) Five

Question no. 81

The increasing order of the first ionization enthalpies of the elements B, P, S, and F is

- (1) ~~$F < S < P < B$~~ (2) ~~$P < S < B < F$~~
 (3) ~~$B < P < S < F$~~ (4) $B < S < P < F$

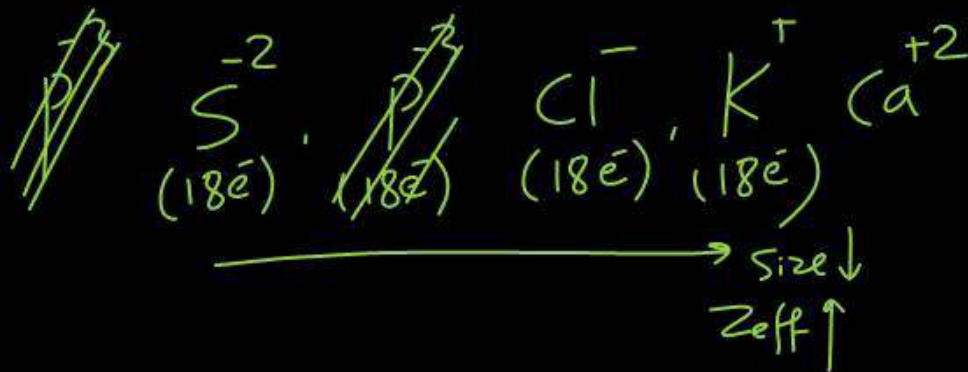


The statement (s) that are correct about the species S^{2-} , Cl^- , K^+ and Ca^{2+} .

- A. All are isoelectronic
- B. All have the same nuclear charge
- C. S^{2-} has the largest ionic radii.
- D. Ca^{2+} has the smallest ionic radii.

Choose the correct answer from options given below.

- (1) A, C and D only (2) C and D only
- (3) A, B, C and D (4) B, C and D only



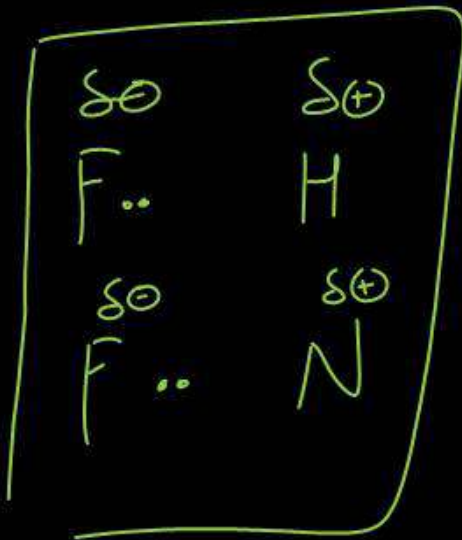
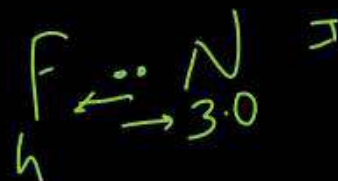
Question no. 83

Which of the following statements are not correct?

- A. The electron gain enthalpy of F is more negative than that of Cl.
- B. Ionization enthalpy decreases in a group of periodic table.
- C. The electronegativity of an atom depends upon the atom bonded to it.
- D. Al_2O_3 and NO are examples of amphoteric oxides. *neutral*



(4)

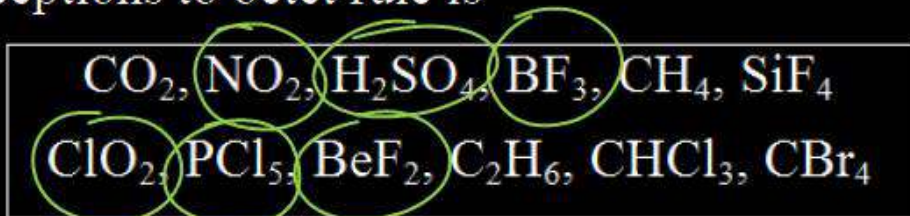


Choose the correct answer from options given below:

- (1) B and D only (2) A, B, C and D
- (3) A, C and D only (4) A and D only



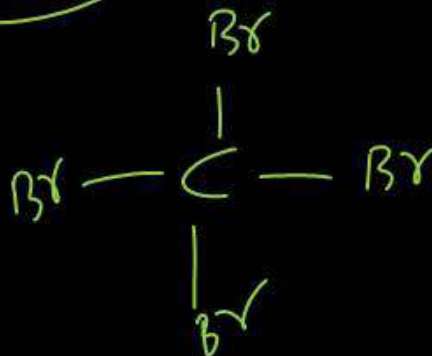
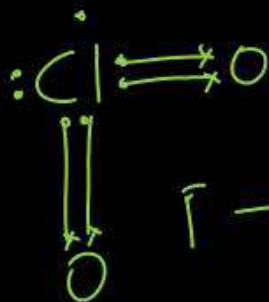
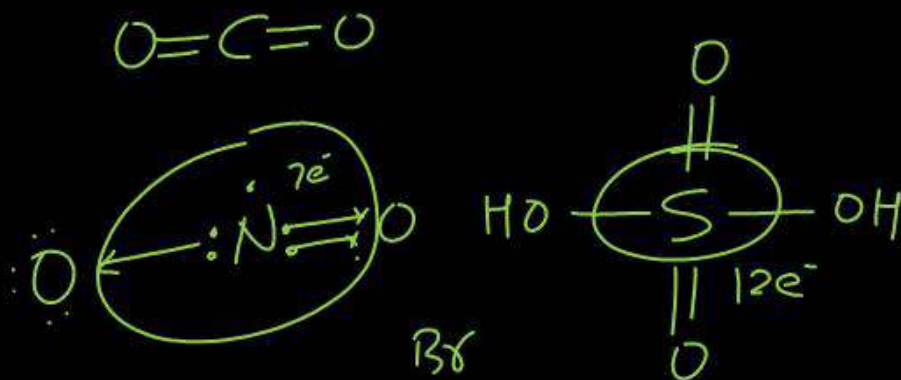
Number of molecules from the following which are exceptions to octet rule is –



- (1) Four
 (3) Six

3

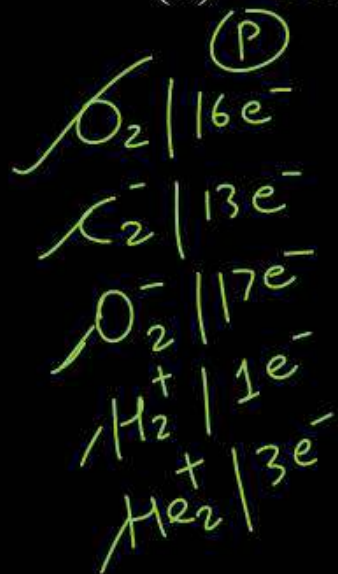
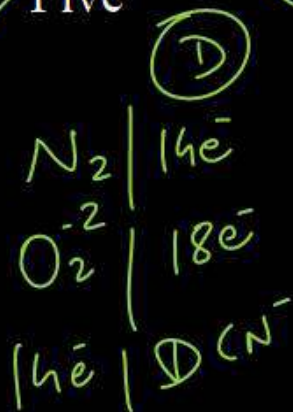
- (2) Five
 (4) Zero



The total number of species from the following that are paramagnetic in nature –



- (1) Three (2) Four
 (3) Five (4) Six



(3)

No. of e^- even \rightarrow Diamagnetic
 (Except 10 & 16e⁻)

No. of e^- odd \rightarrow Paramagnetic
 + 10e⁻
 + 16e⁻

Which of the following order of energies of molecular orbitals of O_2 is correct?

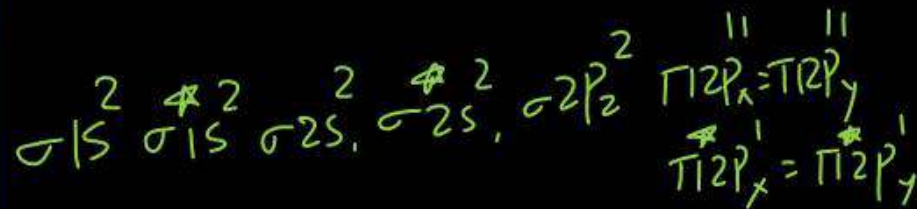
(1) $(\pi 2p_y) < (\sigma 2p_z) < (\pi^* 2p_x) \approx (\pi^* 2p_y)$

(2) $(\sigma 2p_z) < (\pi 2p_y) < (\pi^* 2p_x) \approx (\pi^* 2p_y)$

(3) $(\pi 2p_y) < (\sigma 2p_z) < (\pi^* 2p_x) < (\pi^* 2p_y)$

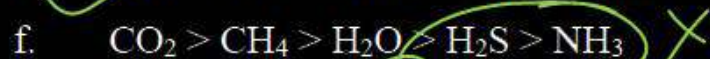
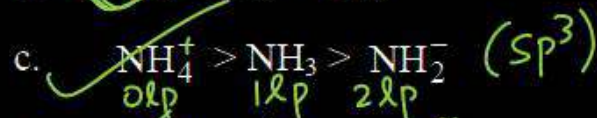
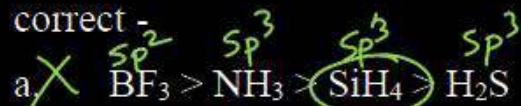
(4) $(\pi^* 2p_x) \approx (\pi^* 2p_y) < (\pi 2p_y) < (\sigma 2p_z)$

(2)



Question no. 87

How many of the following orders for bond angle is correct -



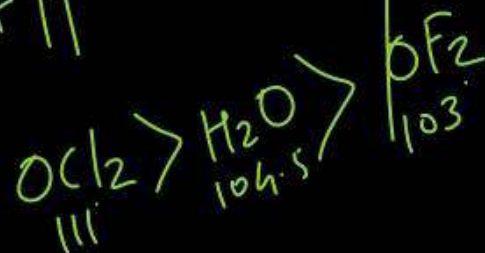
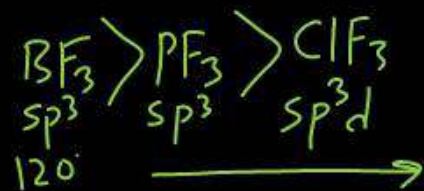
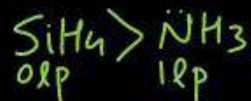
(1) Four

(2) Five

(3) Six

(4) Seven

2



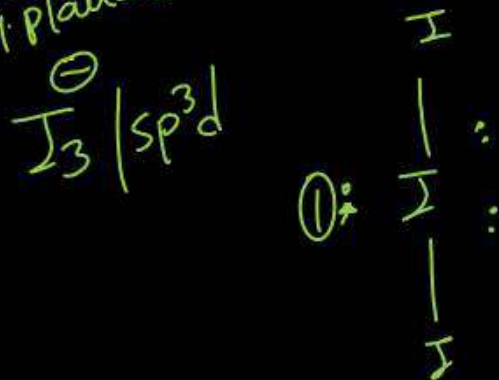
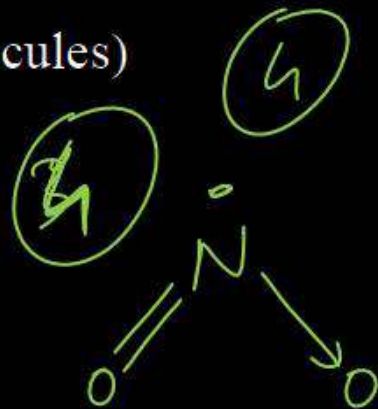
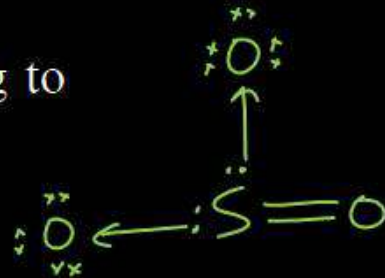
$$\text{BA} \propto \frac{1}{\text{Hybrid orbital}} \propto \frac{1}{\text{lp on CA}} \propto \text{EN on CA}$$

if C.A. is same

$$\text{BA} \propto \frac{1}{\text{EN of side atom}}$$

Which of the following set is not correct according to properties given –

- (1) $\text{SO}_3, \text{O}_3, \text{NH}_4^+$ (all have coordinate bonds)
- (2) $\text{H}_2\text{O}, \text{NO}_2, \text{ClO}_2^-$ (all are 'V' shaped molecules)
 sp^2 sp^2 sp^3
- (3) $\text{I}_3^-, \text{ICl}_2^-, \text{NO}_2^+$; (all are linear molecules)
- (4) ~~$\text{SF}_4, \text{SiF}_4, \text{XeF}_4$~~ (all tetrahedral in shape)
K-shape sp sq. planar



The first order rate constant k is related to temperature as $\log k = 15.0 - (10^6/T)$. Which of the following pair of value is correct?

- (1) $A = 10^{15}$ and $E = 1.9 \times 10^4$ kJ
- (2) $A = 10^{-15}$ and $E = 40$ kJ
- (3) $A = 10^{15}$ and $E = 40$ kJ
- (4) $A = 10^{-15}$ and $E = 1.9 \times 10^4$ kJ

$$\log k = \log A - \frac{E_a}{2.303R}$$

$$\log k = 15 - \frac{10^6}{T}$$

$$\log A = 15$$

$$A = 10^{15}$$

$$\frac{+ E_a}{2.303R} = + 10^6$$

$$E_a = 2.303 \times 10^6 \times 8.314$$

$$= 19.2 \times 10^6 = 1.9 \times 10^7 \text{ J}$$

$$E_a = 1.9 \times 10^4 \text{ kJ}$$

Question no. 90

For an ideal binary solution with $p_A^\circ > p_B^\circ$ which relation between X_A , X_B , Y_A and Y_B is correct -

X_A = mole fraction of A in liquid phase

X_B = mole fraction of B in liquid phase

Y_A = mole fraction of A in vapour phase

Y_B = mole fraction of B in vapour phase

(1) $X_A = Y_A$

(2) $X_A > Y_A$

(3) $\frac{X_A}{X_B} < \frac{Y_A}{Y_B}$

(4) X_A , Y_A , X_B and Y_B cannot be correlated

$$P_A = P_A^\circ X_A, P_B = P_B^\circ X_B, P_S = P_A + P_B$$

$$Y_A = \frac{P_A^\circ X_A}{P_S}, Y_B = \frac{P_B^\circ X_B}{P_S}$$

$$\frac{Y_A}{Y_B} = \frac{P_A^\circ X_A / P_S}{P_B^\circ X_B / P_S} = \frac{P_A^\circ X_A}{P_B^\circ X_B}$$

$$\frac{Y_A}{Y_B} = \frac{P_A^\circ X_A}{P_B^\circ X_B} \quad P_A^\circ > P_B^\circ$$

$$\frac{Y_A}{Y_B} > \frac{X_A}{X_B}$$

Identify the incorrect option with respect to antagonistic hormones:

- (1) Thyrocalcitonin and parathyroid hormone.
- (2) Adrenaline and noradrenaline
- (3) Insulin and glucagon
- (4) Somatostatin and somatotocrinin

$$\lambda = \frac{h}{p}$$

$$e^- \rightarrow v$$

$$p_{ph} * \rightarrow c$$

$$p_c = p_{ph}$$

$$\frac{E_e = \frac{1}{2} m v^2}{E_{ph}} = \frac{p_{ph} c}{p_{ph} c} = \frac{\cancel{m} v}{\cancel{p_{ph} c}} = \frac{v}{2c}$$

2

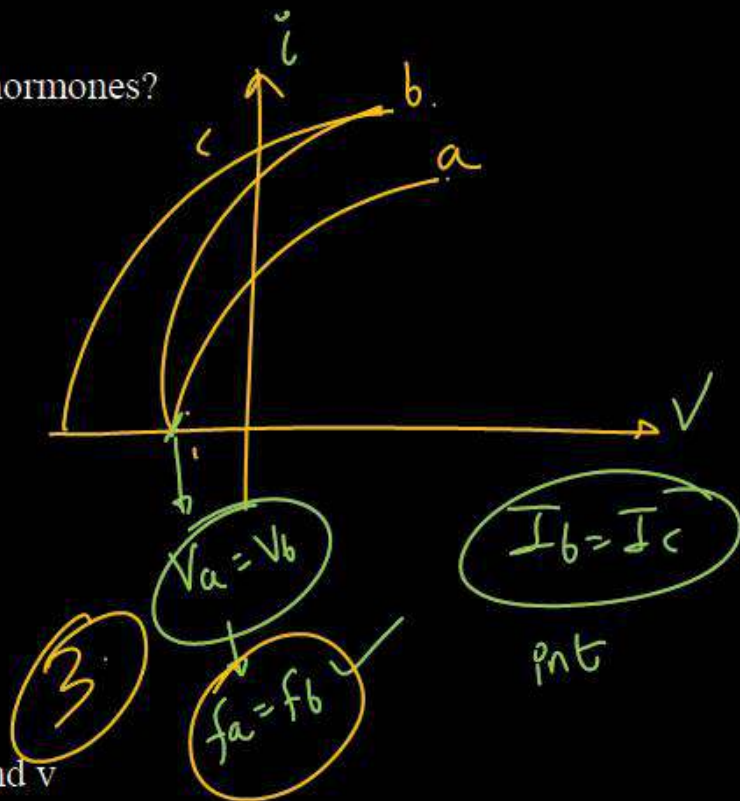
Question no. 92

Which of the following organs produces hormones?

- i. Kidney
- ii. Heart
- iii. Mammary gland
- iv. Gonads
- v. Gastrointestinal tract
- vi. Gall bladder

Choose the correct option.

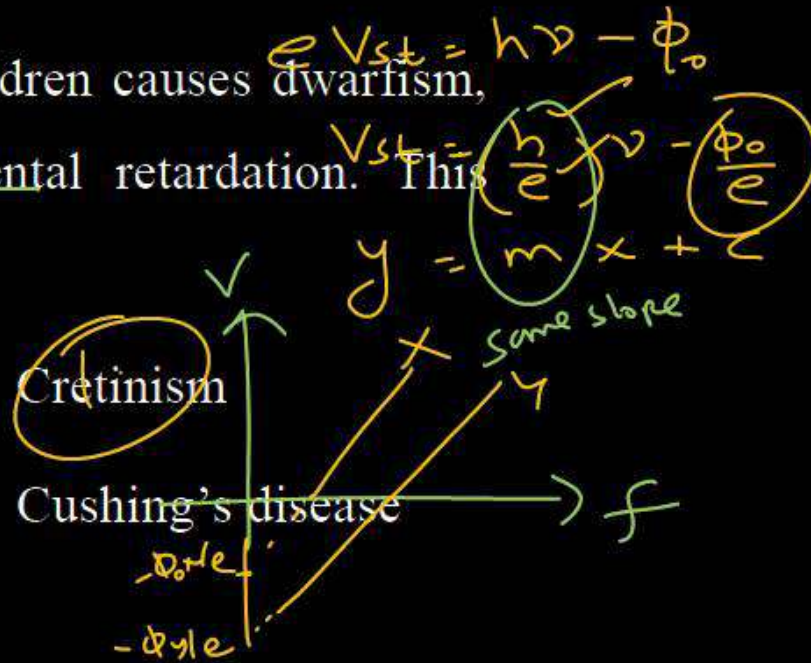
- (1) i, ii and vi
- (2) i, ii, iv and v
- (3) i, ii and iii
- (4) iii and vi



Deficiency of thyroxine in children causes dwarfism, low IQ, deaf-mutism and mental retardation. This condition is called.

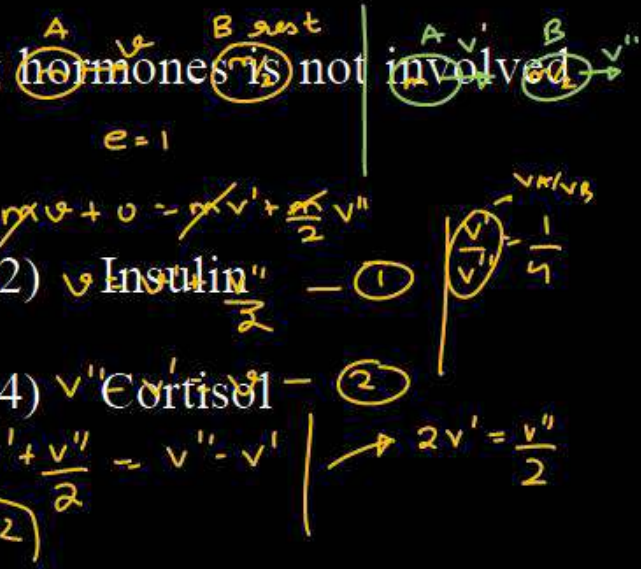
- (1) Myxoedema
(3) Grave's disease

- (2) Cretinism
(4) Cushing's disease



Which one of the following hormones is not involved in sugar metabolism?

- (1) Aldosterone (4) (2) Insulin (1) (3) Glucagon (2) (4) Cortisol (2)



$\frac{dA}{dt} = \frac{m_A v_B}{m_A v_A} = \frac{v''}{2v'}$
 $\frac{dA}{dB} = \frac{m_B v_B}{m_A v_A} = \frac{v''}{2v'} = 2$

Select the set of disorders which are caused due to hypersecretion of hormones

(1) ~~Acromegaly and diabetes mellitus~~

(2) ~~Exophthalmic goitre and gigantism~~

(3) Tetany and diabetes insipidus

(4) ~~Cretinism and acromegaly~~

$$\frac{hc}{\lambda} - \phi_0 = E \quad \checkmark$$

$$\frac{hc}{\lambda} - \phi_0 = 2E \quad \checkmark$$

$$\frac{hc}{\lambda} - E = \frac{hc}{\lambda'} - 2E$$

$$\frac{hc}{\lambda} + E = \frac{hc}{\lambda'}$$

$$\frac{hc + E\lambda}{\lambda} = 1$$

$$\lambda' = \frac{hc}{hc + E\lambda}$$

Question no. 96

Find out the correct match w.r.t. hormone and its function.

- (1) ~~FSH~~ - Causes ovulation and promotes formation of corpus luteum
- (2) Prolactin - Causes ejection of milk from mammary glands
- (3) TSH - Stimulates release of thyroxine from thymus
- (4) ~~MSH~~ - Acts on melanocytes and causes skin pigmentation

$$\frac{hc}{3\lambda_2} - \phi_0 = K_1 \quad \text{--- (1)}$$

$$\frac{hc}{\lambda_2} - \phi_0 = K_2 \quad \text{--- (2)}$$

$$\frac{hc}{\lambda_2} = \phi_0 + K_2$$

put in (1)

$$\frac{\phi_0 + K_2}{3} - \phi_0 = K_1$$

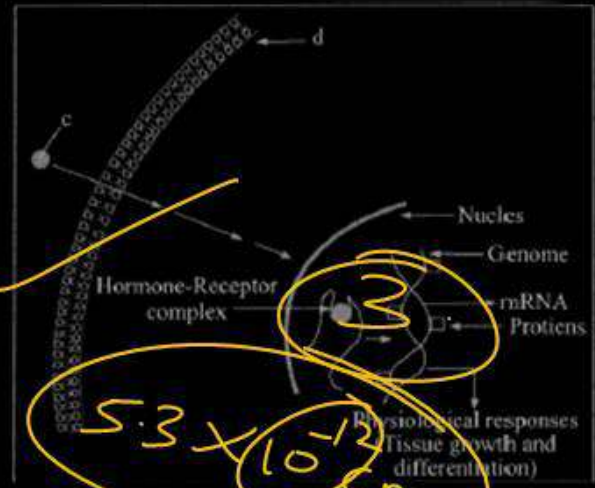
$$\phi_0 + K_2 - 3\phi_0 = 3K_1$$

$$K_2 - 2\phi_0 = 3K_1$$

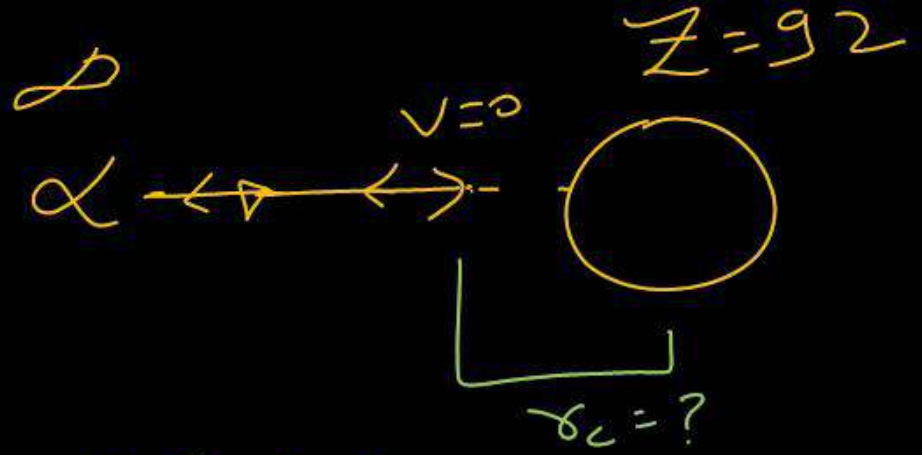
$$K_2 > 3K_1$$

Question no. 97

Consider the following figure for mechanism of hormone action. Which of the following set of hormones show the given mechanism of action?



- (1) Oestrogen and progesterone
- (2) Cortisol and aldosterone
- (3) Thyroxine and FSH
- (4) Insulin and oxytocin



$$K_\alpha = K(2e)(92e)$$

$$5 \times 10^6 \times 1.6 \times 10^{-19} \text{ J} = \frac{9 \times 10^9 \times 184 \times e \times e}{\delta_c}$$

$$\delta_c = \frac{9 \times 10^9 \times 184 \times e}{5 \times 1.6 \times 10^6}$$

Question no. 98

Which of the following hormones plays a significant role in calcium balance in the body?

- A. Thyroxine
- B. Melatonin
- C. thyrocalcitonin
- D. Parathyroid hormone

- (1) A and B (2) C and D
- (3) A and C (4) B and D

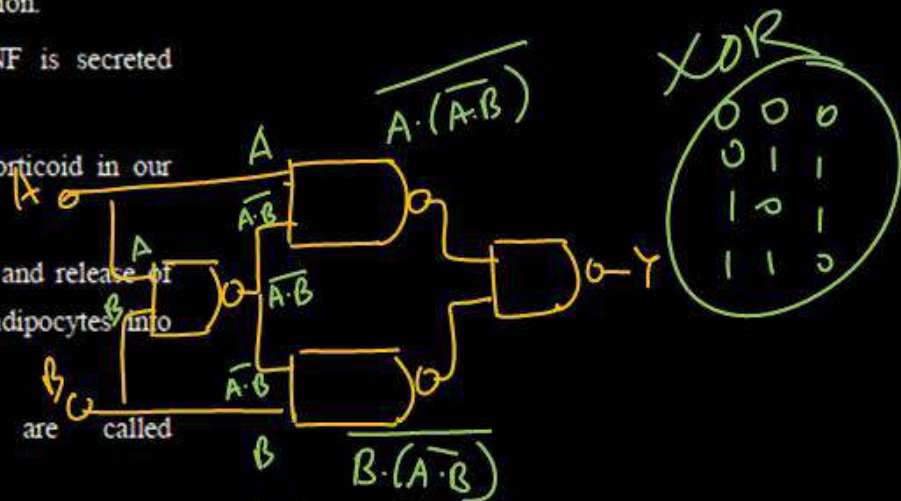
Handwritten calculations and diagrams:

1.89 eV
 $K_{\text{max}} = \left(\frac{\delta^2 q^2 B^2}{2m} \right) \text{ eV}$
 $K_{\text{max}} = \frac{10^{-4} \times 1.6 \times 10^{-19} \times 8 \times 10^{-8}}{2 \times 9 \times 10^{-31}} \text{ eV}$
 $K_{\text{max}} = 0.8 \text{ eV}$
 $\phi_0 = 1.89 - 0.8 = 1.09 \text{ eV}$
 $\delta = \frac{\sqrt{2mK}}{qB}$

Question no. 99

Find out which of the following statements are true (T)/ false (F) and choose the correct option.

- i. When blood pressure falls, ANF is secreted which constricts blood vessels.
- ii. Aldosterone is the chief glucocorticoid in our body.
- iii. Insulin promotes glycogenolysis and release of glucose from hepatocytes and adipocytes into blood.
- iv. Estrogen and testosterone are called gonadotropins.
- v. Pars nervosa stocks and releases hormones synthesized by hypothalamus.



$$Y = \overline{A \cdot (\overline{A} \cdot B)} \cdot \overline{B \cdot (A \cdot \overline{B})}$$

$$Y = A \cdot (\overline{A} \cdot B) + B \cdot (A \cdot \overline{B})$$

$$Y = A \cdot (\overline{A} + \overline{B}) + B \cdot (A + \overline{B})$$

$$Y = A\overline{B} + BA$$

	(i)	(ii)	(iii)	(iv)	(v)
(1)	F	T	F	F	T
(2)	F	T	F	T	F
(3)	F	F	F	F	T
(4)	F	F	T	F	T

XOR

Question no. 100

Which of the following is incorrect in relation to the catecholamines

- (1) These are called emergency hormones or hormones of fight or flight.
- (2) These hormones increase heart beat, strength of heart contraction and rate of respiration.
- (3) They inhibit lipolysis and proteolysis
- (4) They increases alertness, pupillary dilation, piloerection (raising of hairs) and sweating.

0.3V

9.7 V

$$I = \frac{9.7}{1000} = 9.7 \text{ mA}$$



Question no. 101

A old woman presents with increased thirst, frequent urination, and a decrease in blood sodium concentration. Her 24 -hour urine output is high, but her glucose levels are normal. Which of the following is the most likely diagnosis?

- (1) Diabetes mellitus (2) Diabetes insipidus
(3) Addison's disease (4) Grave's disease

1

Match the options given in List-I with List-II.

	List I		List-II
A.	Gastrin	I.	<u>Inhibits</u> gastric secretions
B.	Secretin	II.	Stimulates secretion of pancreatic enzymes
C.	Cholecystokinin	III.	Stimulates secretion of water and bicarbonate from pancreas
D.	Gastric inhibitory peptide	IV.	Stimulates release of HCl and pepsinogen

Choose the correct answer from options given below:

- (1) A-IV, B-III, C-II, D-I
- (2) A-I, B-II, C-III, D-IV
- (3) A-III, B-IV, C-I, D-II
- (4) A-IV, B-II, C-III, D-I

4

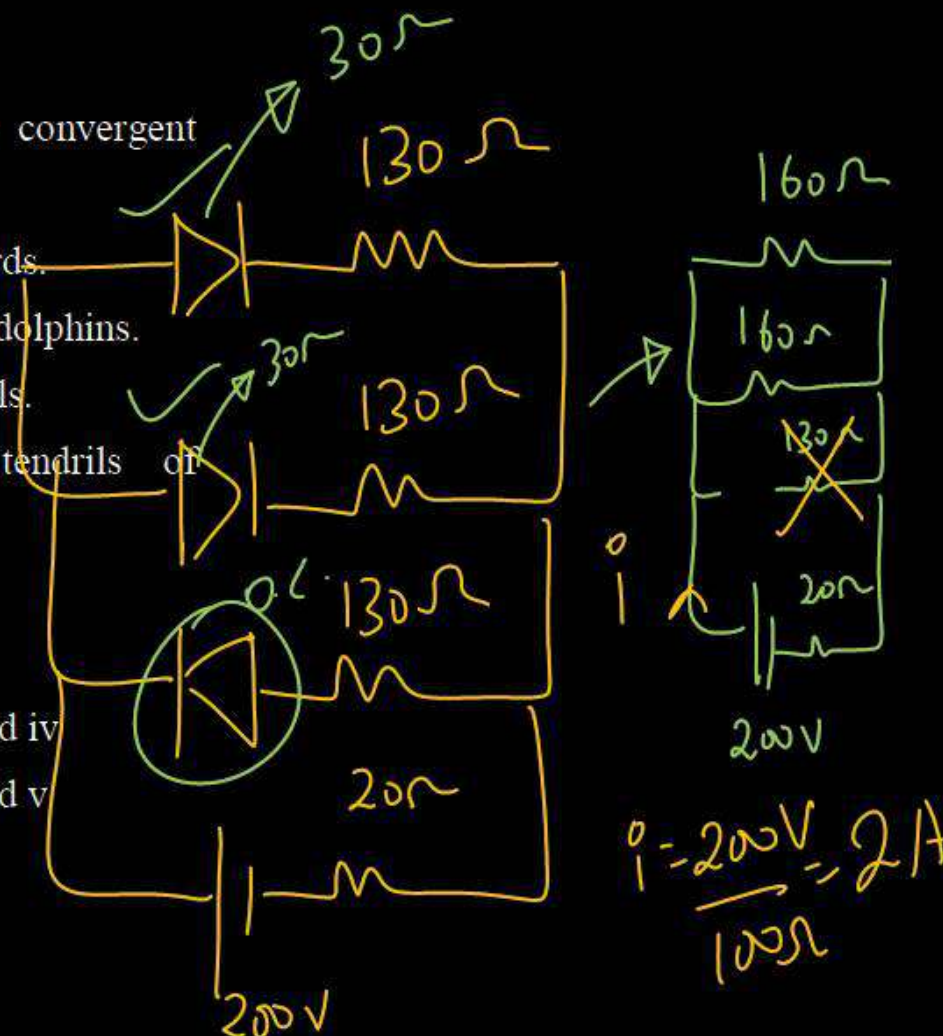
Immobilized +ve & -ve ions

Question no. 103

Choose the pairs of structure that show convergent evolution.

- i. Wings of butterflies and wings of birds.
- ii. Flippers of penguins and flippers of dolphins.
- iii. Eyes of octopus and eyes of mammals.
- iv. Thorns of Bougainvillea and tendrils of Cucurbita.
- v. Sweet potato and potato.
- vi. Heart of vertebrates

- (1) i, ii, v and vi
- (2) i, ii, iii and iv
- (3) i, ii and vi
- (4) i, ii, iii and v



Question no. 104

Identify the correct sequence of stages in the evolution of modern humans.

- I. Neanderthal man II. Cro-Magnon man
 III. Australopithecines IV. Homo habilis
 V. Homo erectus VI. Modern human

- (1) IV, III, V, II, I, VI (2) III, V, IV, II, I, VI
 (3) III, IV, V, I, II, VI (4) III, IV, V, II, I, VI

$$i = \frac{60}{4k\Omega} = 15mA$$

$$i_1 = \frac{30}{5k\Omega} = 6mA$$

$$i_2 = i - i_1$$

$$= 15 - 6$$

$$= 9mA$$



Question no. 105

A particular species of animals had three coat colours : white, yellow and black. A population of this species in Africa had more number of yellow animals and less number of white and black animals. After hundreds of years, the species evolved having very few yellow animals, and more white and black animals. The white and black animals were almost similar in quantity. The type of natural selection seen in this example is

- (1) Stabilising selection
- (2) Directional selection
- (3) Disruptive selection
- (4) It could be both stabilising and disruptive selection.

Zener

photo diode

3

Handwritten scribbles at the bottom of the page.

Which of the following is the correct sequence of events in the origin of life?

- I. Formation of protobionts
- II. Synthesis of organic monomers
- III. Synthesis of organic polymers
- IV. Formation of DNA based genetic systems

- (1) II, III, I, IV
- (3) III, II, I, IV

- (2) I, III, II, IV
- (4) III, I, II, IV

①

$$E_0 = B_0 C \quad \checkmark$$

$$\vec{E} = E_0 \sin(kx + \omega t) \hat{k}$$



$$E = (B_0 C) \sin(kx + \omega t) \hat{k}$$

$v = \frac{1}{\mu_0 \epsilon_0}$

The earliest organisms to appear on earth were

- (1) ~~Aerobic chemoautotrophs~~ $I \uparrow$, No of Photons \uparrow
- (2) ~~Anaerobic chemoheterotrophs~~ No change in f.l
- (3) ~~Anaerobic chemoautotrophs~~ $E = \phi + K$
- (4) Aerobic chemoheterotrophs $\frac{h\nu}{\lambda}$ \rightarrow No dry



According to Darwin, evolution is

(1) A slow and discontinuous process

(2) A slow, gradual and continuous process

(3) A sudden and discontinuous process

(4) A sudden and continuous process

SO

$$\frac{2hc}{\lambda} = \phi + k_2$$

$$\frac{2hc}{\lambda} - \phi = s\left(\frac{hc}{\lambda} - \phi\right)$$

$$\frac{2hc}{\lambda} - \phi = \frac{3hc}{\lambda} - 3\phi$$

$$2\phi = \frac{2hc}{\lambda} - \frac{2hc}{\lambda} = \frac{hc}{\lambda}$$

$$\phi = \frac{hc}{2\lambda}$$

$\phi = ?$

$$hc = \phi + k_1$$

Which of the following is the correct sequence of events depicting Darwin's theory of evolution?

- I. ~~Natural selection~~ $hf = hf_0 + K_{max}$ $\rightarrow K_{max} = hf - hf_0$
- II. Struggle for existence $hf = hf_0 + ev_0$ $\rightarrow 2hf - hf_0 = K_2$
- III. ~~Appearance of variations~~ $2(hf - hf_0)$
- IV. Overproduction

(1) I \rightarrow IV \rightarrow III \rightarrow II (2) IV \rightarrow II \rightarrow III \rightarrow I

(3) IV \rightarrow I \rightarrow III \rightarrow II (4) IV \rightarrow III \rightarrow II \rightarrow I

Question no. 110

The frequency of recessive allele in a population is 0.02. The number of heterozygotes in a population of 500 is

- (1) 150
(3) 160

- (2) 240
(4) 64

3 → 2

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

$$\frac{1}{10} = R \left(\frac{1}{4} - \frac{1}{5} \right)$$

$$\frac{1}{20} = R \left(\frac{5}{36} \right)$$

$$\frac{1}{\lambda_0} = \frac{5}{36 \cdot 9} = \frac{20}{27}$$

$$\frac{1}{\lambda_2} = \frac{3}{16 \cdot 4}$$

$$\frac{\lambda_2}{\lambda_0} = \frac{20}{27}$$

$$\lambda_2 = \frac{20 \lambda_0}{27}$$

4 → 2

$$\frac{1}{\lambda_2} = R \left(\frac{1}{4} - \frac{1}{16} \right)$$

$$\frac{1}{\lambda_2} = R \left(\frac{4-1}{16} \right) = \frac{1}{\lambda_2} = \frac{3}{16}$$

Sudden drop in population size due to natural calamity like flood, earthquake or any disease is called

(1) Gene migration

(2) Gene flow

(3) Bottle neck effect

(4) Hardy-Weinberg equilibrium

$$E = mc^2$$

$$E = 10^{-6} \times 10^{-3} \times 9 \times 10^{16} \text{ J}$$

$$E = 9 \times 10^7 \text{ J}$$

Sometimes the change in allelic frequency is so different that in the new sample of the population become a different species. The original drifted population create a different population. This is called

(1) Founder effect $\Delta E = 2 \times 1.115 \times \underline{\underline{mev}}$

(2) Bottleneck effect $\Delta E = \Delta m \times \underline{\underline{931 mev}}$

(3) Metapopulation effect

(4) ~~Gene migration~~ $\frac{\Delta E}{931 mev} = \frac{2 \times 1.115 mev}{931 mev} \Rightarrow \frac{2.220}{931}$

In natural selection :

- (1) New mutations are generated over time.
- (2) The genetic composition of the population changes at random over time. $H + H \rightarrow H_e$
- (3) All individuals in a population are likely to contribute offspring to the next generation equally. $D \rightarrow 4 \times 7 \rightarrow 28$
- (4) Individuals that possess particular heritable characteristics survive and reproduce at a higher rate than other individuals. $E = 28 - 4.4$

According to modern synthetic theory of evolution, the factor that does not contribute to evolution process is

$$X \rightarrow 200 \times 7.4 \Rightarrow 1480$$

(1) Reproductive isolation $A \rightarrow 110 \times 8.2 \Rightarrow 902$

(2) Natural selection

(3) Genetic variability in population $B \rightarrow 80 \times 8.1 \Rightarrow 648$

(4) Inheritance of acquired characters

1550

70 Mer

A population can't be present in Hardy-Weinberg equilibrium if -

(1) There is no migration

$$h = \frac{m}{M} = \frac{1}{200000}$$

(2) The population is small

$$N \rightarrow \frac{1000}{25}$$

(3) Individuals mate randomly

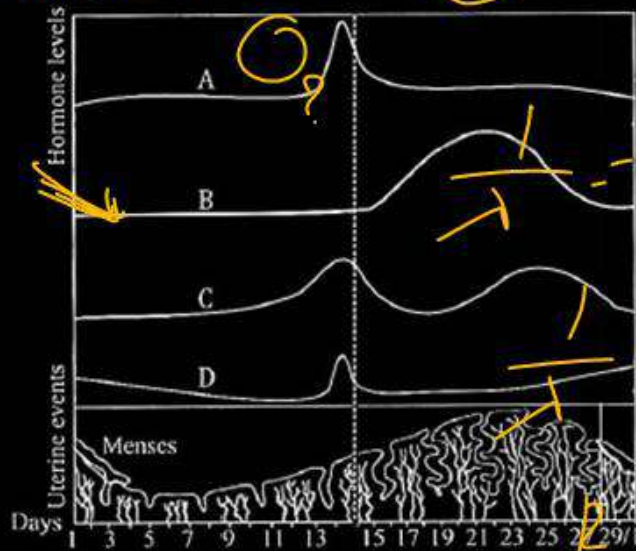
$$f_1 = \frac{1000}{25} \times \frac{1}{200000} = \frac{1}{500}$$

$$f_2 = \frac{1000}{25} \times \frac{1}{200000} = \frac{1}{500}$$

(4) There are no mutations

Question no. 116

In the following figure A, B, C and D are the hormones related with menstrual cycle of a woman. cyclical changes of these hormones during the menstrual periods are shown in the figure then identify this hormones -



- (1) A - Estrogen, B - FSH, C - Progesterone, D - LH
- (2) A - FSH, B - Estrogen, C - Progesterone, D - LH
- (3) A - LH, B - Progesterone, C - Estrogen, D - FSH
- (4) A - Estrogen, B - FSH, C - LH, D - Progesterone

○

$$\frac{1}{1} - R \left(\frac{1}{1} - \frac{1}{h^2} \right)$$

$$\frac{1}{h^2} = R - \frac{R}{h^2}$$

$$R = R - \frac{1}{h^2}$$

$$\frac{R}{h^2} = \frac{\lambda R - 1}{\lambda}$$

$$\frac{R^2}{R} = \frac{\lambda}{\lambda R - 1}$$

$$h = \sqrt{\frac{R \lambda}{\lambda R - 1}}$$

Question no. 117

Match List-I with List-II.

	List I		List-II
A.	350 mya	I.	Ichthyosaurs were formed
B.	200 mya	II.	Sea weeds and few plants existed
C.	320 mya	III.	Invertebrates were formed and active
D.	500 mya	IV.	Jawless fish evolved

Choose the correct answer from options given below:

- (1) A-IV, B-I, C-III, D-II
- (2) A-IV, B-I, C-II, D-III
- (3) A-I, B-IV, C-II, D-III
- (4) A-II, B-I, C-III, D-IV

Handwritten notes and corrections:

- Handwritten 'Q' with an arrow pointing to the question text.
- Handwritten 'E' with an arrow pointing to 'Invertebrates were formed' in List-II.
- Handwritten 'h' with an arrow pointing to 'and active' in List-II.
- Handwritten 'K = 1 mya' with an arrow pointing to 'Jawless fish evolved' in List-II.
- Handwritten formula: $E = \frac{12100 \times 8^4}{h^2}$

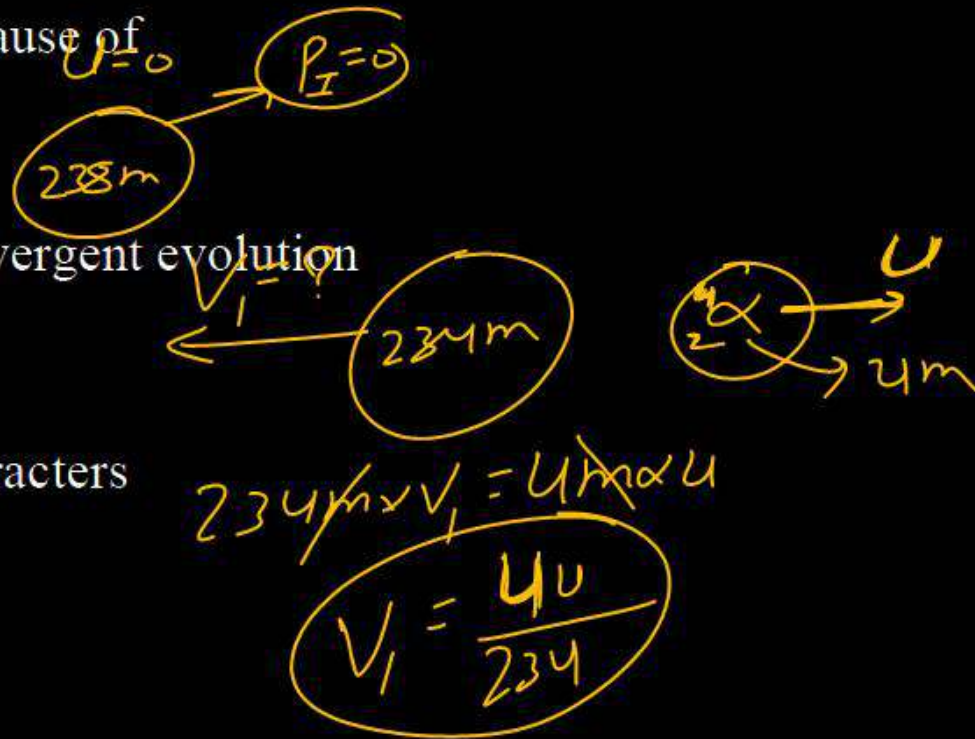
The tasmanian wolf is an Australian marsupial and appears similar to placental wolf. This is due to the fact that

- (1) They show divergent evolution
- (2) They underwent similar selection pressure
- (3) Both have evolved from reptiles
- (4) They both follow Lamarckism



The placental mammals in Australia evolved into several varieties each of which appears to be 'similar' to a corresponding marsupial because of

- (1) Anthropogenic action
- (2) Adaptive radiation and convergent evolution
- (3) Theory of germplasm
- (4) Inheritance of acquired characters



Statement I : A single mutation may produce a new species.

Statement II : Mutation may cause major variation in genetic material, and these are inheritable.

- (1) Both statement-I and statement-II are true.
- (2) Both statement-I and statement-II are false.
- (3) ~~Statement-I is true, Statement-II is false.~~
- (4) Statement-I is false, Statement-II is true.

Question no. 121

Assertion (A) : Natural selection is the outcome of difference in survival and reproduction among individuals that show variation in one or more traits.

Reason (R) : Adaptive forms of a given trait tend to become more common while less adaptive ones becomes less common or disappear.

- (1) Both assertion and reason are true and the reason is the correct explanation of the assertion.
- (2) If both assertion and reason are true, but reason is not the correct explanation of the assertion.
- (3) If assertion is true, but reason is false
- (4) If both assertion and reason are false

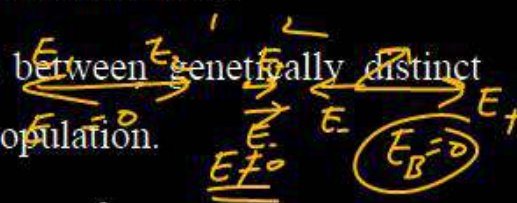
$$h = \frac{\sqrt{U\varepsilon}}{U_0\varepsilon_0}$$

$$\frac{1}{\sqrt{U_0\varepsilon_0}} + \sqrt{U\varepsilon}$$

Question no. 122

Gene flow refers to

- (1) Transfer of genes during crossing over
- (2) Non-disjunction of chromosomes
- (3) Transfer of genes between genetically distinct but interbreeding populations.
- (4) Random change in gene frequency



Question no. 123

Which of the following occur during the luteal phase of the menstrual cycle?

- A. Secretion of progesterone
- B. Maintenance of endometrium
- C. High level of FSH and LH
- D. Corpus luteum formation

- (1) A, B, C and D
- (2) A, B and D
- (3) A, B and C
- (4) B, C and D

Handwritten notes and diagrams:

$$B_1 = \frac{\mu_0 I \times 2}{4\pi \times 3a}$$

$$B_5 = \frac{\mu_0 I \times 2}{4\pi \times a}$$

$$B_2 = \frac{\mu_0 I \times 2}{4\pi \times 3a} \times \pi$$

$$B_4 = \frac{\mu_0 I \times 2}{4\pi \times a} \times \pi$$

A diagram shows a vertical line with a horizontal line crossing it. The vertical line has a '2' at the top and a '1' at the bottom. The horizontal line has a '5' in the middle. To the right of the vertical line is a '1'. To the right of the horizontal line is a '2'.

A bracket on the right side of the equations B_1 and B_5 points to B_{15} with a minus sign below it.

A bracket on the right side of the equations B_2 and B_4 points to B_{24} with a plus sign below it.

Question no. 124

What is the most direct trigger for parturition (childbirth)?

- (1) High estrogen levels
- (2) Decline in progesterone levels
- (3) Oxytocin release and uterine contractions
- (4) Rupture of the amniotic sac

$h \rightarrow$ Nu. of Photon Per sec

$$E = \frac{hc}{\lambda}$$

$$P = \frac{n \times hc}{\lambda} \frac{J}{s}$$

$$P_1 = P_2$$

$$\frac{1.2 \times 10^{20} \times hc}{600 \times 10^{-9}} = n_2 \times \frac{hc}{800 \times 10^{-9}}$$

$$n_2 = 1.2 \times 10^{20}$$

Question no. 125

Sequentially arrange the steps of spermatogenesis.

- A. Secondary spermatocyte
- B. Spermatid
- C. Spermatozoa
- D. Spermatogonia
- E. Primary Spermatocytes

- (1) E, A, D, B, C (2) E, A, D, C, B
- (3) E, A, C, D, B (4) D, E, A, B, C

$$\lambda = \frac{h}{p} \rightarrow \text{const.}$$

$$\lambda \propto \frac{1}{p}$$



Question no. 126

Choose the correct sequence of different processes which occur during spermatogenesis and transfer of sperm?

a. ✓ Spermiation

b. Ejaculation

c. Insemination

d. Spermiogenesis

(1) b → c → a → d

(2) c → a → b → d

(3) d → a → b → c

(4) d → b → a → c

$$P = \frac{V}{t} = \frac{V}{\frac{L}{v}} = \frac{Vv}{L}$$

$$P = \frac{Vv}{L} \rightarrow \text{const}$$

$$\frac{Vv}{L} = \frac{V_e v_e}{L_e} = \frac{V_p v_p}{L_p}$$

$$\frac{V_e}{L_e} = \frac{V_p}{L_p}$$

$$m_p > m_e$$

$$K = \frac{p^2}{2m} \rightarrow \text{const}$$

$$K \propto \frac{1}{m}$$

$$\underline{\underline{K_p < K_e}}$$

Which of the following is the correct sequence of hormone secretion in the menstrual cycle?

- (1) Progesterone, ~~FSH~~, estrogen, LH
- (2) Estrogen, LH, FSH, progesterone
- (3) FSH, estrogen, LH, progesterone
- (4) FSH, progesterone, LH, estrogen

$$1 = \frac{A^2 \omega^2}{L \omega^2}$$

$$\sqrt{E} = \text{const}$$

$$\sqrt{1} \cdot E_1 = \sqrt{16} \cdot E_2$$

$$\sqrt{1} \cdot E = \left(\frac{3}{4}\right)^2 \cdot E_2$$

$$\frac{16E}{9} = E_2$$

$$\text{extra energy} = E_2 - E_1$$

$$= \frac{16E}{9} - E$$

$$\frac{16E - 9E}{9}$$

$$\left(\frac{7E}{9}\right)$$

Question no. 128

In human female, the new menstrual cycle starts due to

- (1) Rise in levels of estrogen and progesterone at the end of previous cycle
- (2) ~~Decrease in levels of estrogen and progesterone at the end of previous cycle~~
- (3) Rise in level of FSH and LH at the end of previous cycle
- (4) Rise in levels of gonadotropin-releasing hormone (GnRH) at the end of previous cycle

$$\begin{aligned} E &= \phi + K \\ \phi &= \phi + K \\ \underline{\underline{K = 0}} \end{aligned}$$

Question no. 129

Match Column I with Column II and choose the correct combination from the options given.

	Column I (Time scale)		Column II (Fetal development)
a.	By end of first month of pregnancy	i.	First movement of foetus
b.	By the end of second month of pregnancy	ii.	Formation of limbs and digits
c.	By the end of fifth month of pregnancy	iii.	Body of covered with fine hair, eyelids separate
d.	By the end of second trimester	iv.	Formation of embryo's heart

$$E_2 = \phi + 3K$$

$$6.20 = \phi + 3(2.48 - \phi)$$

$$6.20 = \phi + 3 \times 2.48 - 3\phi$$

$$2\phi = 7.44 - 6.20$$

$$2\phi = 1.24$$

$$\phi = 0.62 \text{ (A)}$$

$$\phi = 0.61 \text{ (CV (Clg))}$$

$$\frac{7.44}{6.20}$$

$$\frac{1.24}{1.24}$$

- (1) a-(iii), b-(iv), c-(i), d-(i)
- (2) a-(iii), b-(ii), c-(i), d-(i)
- (3) a-(iv), b-(ii), c-(i), d-(ii)
- (4) a-(iv), b-(ii), c-(iii), d-(i)

$$E_1 = \phi + K$$

$$2.48 = \phi + K$$

$$2.48 - \phi = K$$

- ①

$$E_1 = 7c$$

$$E_2 = 1240$$

$$E_2 = 1240$$

$$E_1 = \frac{1240}{200}$$

$$E_2 = 6.20 \text{ (ev)}$$

$$E_1 = \phi + K$$

Hormones secreted by the placenta to maintain pregnancy are _____

- (1) hCG, hPL, progesterone, prolactin
- (2) hCG, hPL, estrogen, relaxin, oxytocin
- (3) hCG, hPL, progesterone, estrogens
- (4) hCG, progesterone, estrogens, glucocorticoids

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

$R = R_0 A^{1/3}$

$V = \frac{4}{3}\pi (R_0 A^{1/3})^3$

$V = \frac{4}{3}\pi R_0^3 A$

$V \propto A$

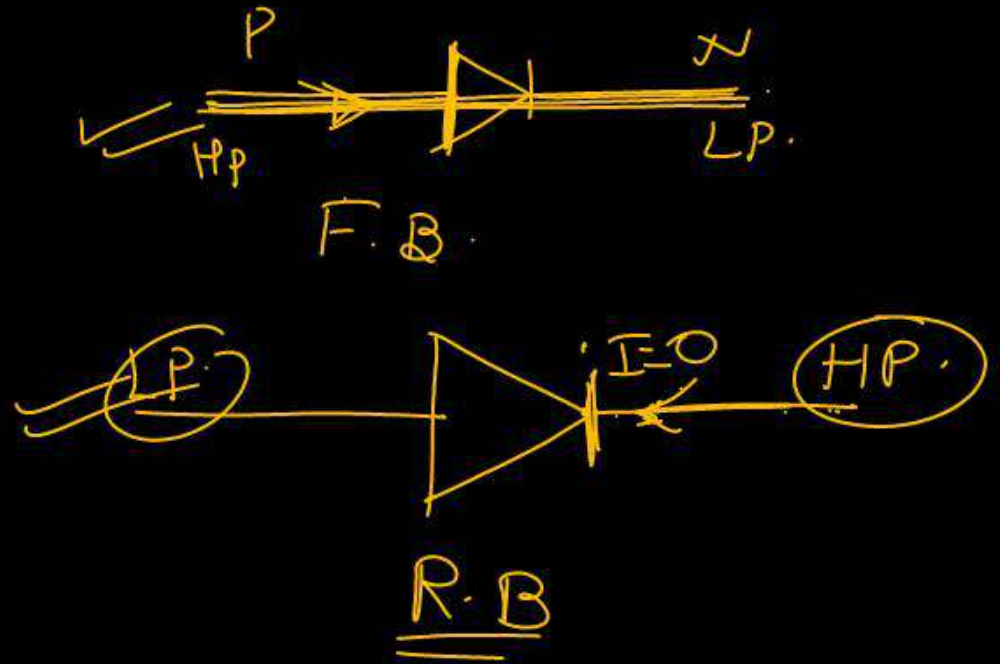
~~$\rho = \frac{m \cdot A}{\frac{4}{3}\pi R_0^3 A}$~~
 ~~$\rho = \frac{m}{\frac{4}{3}\pi R_0^3}$~~
 $\rho = \text{const}$



Question no. 131

Milk secreted from the cells of alveoli of mammary lobes reaches nipple through lactiferous duct(L), Mammary duct (M), Mammary tubule (T) and Mammary ampulla (A) in the following order

- (1) TMAL (2) MTLA
- (3) MTAL (4) ATML



Question no. 132

FSH in males

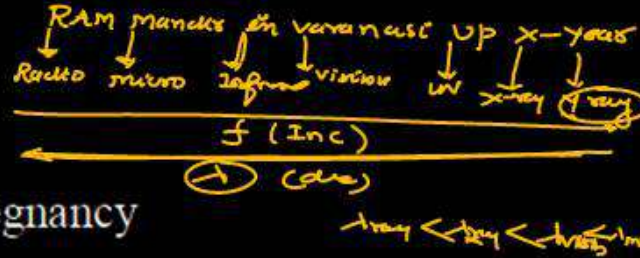
- (1) stimulates the Leyding cells for the secretion of testosterone
- (2) induces the appearance of secondary sexual characters
- (3) acts on sertoli cells that help in spermiogenesis
- (4) is also known as ICSH

	1	1	1
(1) stimulates the Leyding cells for the secretion of testosterone	1	1	1
(2) induces the appearance of secondary sexual characters	1	0	1
(3) acts on sertoli cells that help in spermiogenesis	0	0	1
(4) is also known as ICSH	0	0	0



Which of the following is a function of human chorionic gonadotropin (hCG)?

- (1) Initiates parturition
- (2) Inhibits LH and FSH during pregnancy
- (3) Maintains corpus luteum during pregnancy
- (4) Stimulates oxytocin release



Question no. 134

Which of the following are required for successful fertilization in humans?

- A. Ovum and sperm should reach ampulla simultaneously.
- B. Destruction of zona pellucida by secretions of acrosome.
- C. High progesterone levels in the oviduct.
- D. Cortical reaction in the ovum to prevent entry of second sperm.

(1) A, B, C and D

(2) A, B and D

(3) A, B and C

(4) B, C and D

$$\phi = \frac{\text{renewed}}{\infty}$$

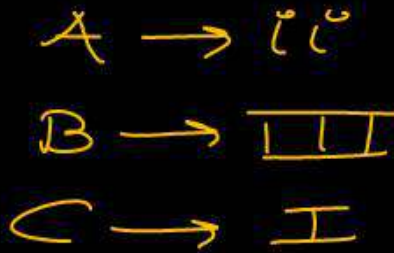
$$4\phi_{\text{ube}} = \frac{\phi}{\infty}$$

$$\phi_{\text{ube}} = \frac{\phi}{4\infty}$$

Question no. 135

Which of the following will have the same ploidy level?

- (1) Primary spermatocyte, primary oocyte, and second polar body
- (2) Oogonia, primary oocyte, and first polar body
- (3) Second polar body, spermatids, and primary spermatocyte
- (4) First polar body, secondary oocyte, and spermatozoa



The level of which group of hormones increased several fold into female during pregnancy

- (1) Thyroxin, Cortisol, Oestrogen and Thymosin
- (2) Prolactin, Progesterone, Oestrogen, Cortisol, Thyroxine
- (3) F.S.H. and LH, Thyroxin, Prolactin, Aldosterone
- (4) Gonadotropin, Thyroxine

2

Question no. 137

How many ova and sperms would be produced from 100 secondary oocytes and 100 secondary spermatocytes during gametogenesis in human?

- (1) 100 ova, 100 sperms
- (2) ✓ 100 ova, 200 sperms
- (3) 50 ova, 100 sperms
- (4) 200 ova, 200 sperms

oocyte \Rightarrow ovum.

2° spermatocyte $\times 2 =$ Sperm

2

Question no. 138

Column I contain different types of IUD's with their examples given in column II. Match the column and choose the correct option.

	Column-I		Column-II
A.	Non-Medicated IUDs	I.	Lippes loop
B.	Hormone releasing IUDs	II.	Multiload 375
C.	Copper releasing IUDs	III.	CuT
		IV.	Cu7
		V.	LNG - 20
		VI.	Progestasert

2

- (1) A-I; B-II; VI; C-III; IV; V
 (2) ✓ A-I; B-V; VI; C-II; III; IV
 (3) ✗ A-II; B-III; VI; C-I; V; IV
 (4) ✗ A-II; B-I; VI; C-III; IV; V

The Test-tube Baby Programme employs which one of the following techniques?

- (1) Intra Cytoplasmic Sperm Injection (ICSI)
- (2) Intra Uterine Insemination (IUI)
- (3) Gamete Intra Fallopian Transfer (GIFT)
- (4) Zygote Intra Fallopian Transfer (ZIFT)

Zygote Intra Fallopian Transfer (ZIFT)
→ Lab

In lab
4

What is wrong regarding Ideal contraceptive?

- (1) It should be user Friendly ✓
- (2) It should be effective and reversible with least side effects ✓
- (3) It should interfere with sexual act of the user. ✗
- (4) It should be easily available. ✓

3

Question no. 141

Highest failure rate is seen in which of the following contraceptive methods?

- (1) Oral contraceptive pills
- (2) Natural methods ✓
- (3) Hormonal implants
- (4) Barrier methods

2

Question no. 142

Read the following statements.

- A. Inhibits ovulation.
- B. Blocks the entry of sperms beyond cervix.
- C. Suppresses sperm motility.
- D. Promotes phagocytosis of sperms within uterus.
- E. Reduce the fertilizing capacity of sperms.

Which of the above are applicable for multiload-375?

- (1) A, B and C
- (2) B, C and D
- (3) C, D and E
- (4) A, B and E

C, D, E

Copper releasing
I.U.D.

3

✓

Question no. 143

A childless couple can be assisted to have a child through a technique called GIFT. The full form of this technique is _____

- (1) Gamete intra fallopian transfer
- (2) Gamete internal fertilization and transfer
- (3) Gamete cell internal fallopian transfer
- (4) Gamete inseminated fallopian transfer

1

Question no. 144

In case of a couple where the male is having a very low sperm count, which technique will be suitable for fertilization?

- (1) Intracytoplasmic sperm injection
- (2) Artificial insemination ✓
- (3) Intrauterine transfer
- (4) Gamete intra fallopian transfer

AI

Motility ↓ = ICSI

2

Which of the following contraceptive also provides protection from STIs and AIDS?

- (1) Diaphragms
- (2) Spermicidal foams
- (3) Condoms ✓
- (4) Lactational amenorrhoea

3

Question no. 146

Which of the following groups of contraceptives are included under barrier methods?

- (1) Condom, Vaults, IUDs, Cervical caps
- (2) IUDs, Diaphragm, Abstinence, Injections
- (3) Condom, Diaphragm, Cervical caps, Vaults ✓
- (4) Surgical methods, Oral contraceptives, Cervical caps, vaults

3

Question no. 147

Identify the correct function(s) of pills

- (i) Inhibit ovulation and implantation ✓
- (ii) Alter the quality of cervical mucus to prevent or retard the entry of sperms. ✓
- (iii) Prevent the ejaculated semen from entering the female vagina. ✗
- (iv) Inhibit spermatogenesis. ✗
- (v) Pills are very less effective with high risk of side effects. ✗

- (1) (i), (ii) and (iii) (2) ✓ (i) and (ii)
- (3) (ii), (iii), (iv) and (v) (4) (iii), (iv) and (v)

(i) (ii)

2

Question no. 148

Which of the following is an ideal contraceptive for the females who want to delay pregnancy and / or space children?

- (1) Barrier method
- (2) Intra Uterine Devices ✓
- (3) Oral Contraceptive pills
- (4) Surgical method

2

Question no. 149

Implants under the skin and injections are also used as contraceptive devices. These devices have

- (1) Progestogen alone ✓
- (2) Estrogen alone
- (3) Progestogen – estrogen combination ✓
- (4) Either A or C ✓

4

Question no. 150

Read the following statements and find out the incorrect statement.

- A. Surgical methods of contraception prevent gamete formation. ✗
- B. All sexually transmitted diseases are completely curable. ✗
- C. Oral pills are very popular contraceptives among the rural women. ✗
Urban
- D. In Embryo transfer techniques, embryos are always transferred into the uterus. ✗

- (1) A and C
- (2) B and D
- (3) B, C and D
- (4) A, B, C and D

4

Saheli, a new oral contraceptive for females developed by Indian scientists at CDRI Lucknow, contains -

- (1) Estrogen only ✗
- (2) Progesterone only ✗
- (3) Both Estrogen and Progesterone ✗
- (4) Neither Estrogen nor Progesterone ✓

Centchroman

4

Which of the following is used as an emergency contraceptive?

- (1) Administration of progestogen
- (2) Administration of progestogen - estrogen combinations
- (3) IUDs
- (4) All of the above ✓

4

Transplantation of tissues/organs fails often due to non-acceptance by the patient's body. Which type of immune response is responsible for such rejections?

- (1) Autoimmune response
- (2) ✓ Cell mediated immune response ✓
- (3) Hormonal immune response
- (4) Physiological immune response

→ T-cell
2

→ Infective stage

Sporozoites of the malarial parasite are found in

- (1) salivary glands of freshly moulted female Anopheles mosquito.
- (2) saliva of infected female Anopheles mosquito.
- (3) red blood corpuscles of humans suffering from malaria.
- (4) spleen of infected humans.

2

Question no. 155

Given below are 4-statements. Read the statements and mark the option that has both correct statements.

- A. Heroin, commonly called Smack, is obtained by acetylation of morphine ✓
- B. Cocaine is obtained from the latex of *Papaver somniferum* ✗
- C. Marijuana interferes with the transmission of dopamine ✗
- D. Morphine is an effective sedative and pain killer. ✓

- (1) A and B
- (2) A and D ✓
- (3) B and C
- (4) C and D

2

Question no. 156

Which one of the following statement is correct?

- (i) Benign tumors show the property of metastasis X
- (ii) Heroin accelerates body functions Slows - Down
- (iii) Malignant tumors exhibit metastasis ✓
- (iv) Patients who have undergone surgery are given cannabinoids to relieve pain. X opioids
- (v) Spleen is ^{2°} primary lymphoid organ.

- (1) Only (i) and (ii)
- (2) Only (iii), (iv) and (v)
- (3) ~~Only (iii)~~
- (4) Only (i) and (iv)

3

Question no. 157

Read the statements :

A. IgE antibodies are produced in an allergic reaction.

B. B-lymphocytes mediate cell mediated immunity. X

C. The yellowish fluid colostrum has abundant IgE antibodies. X

D. Spleen is a secondary lymphoid organ. ✓

IgA

4

Of the above statements:

(1) Only A is correct (2) A and B are correct

(3) B and C are correct (4) ✓ A and D are correct

Question no. 158

Arrange the following steps regarding HIV infection in correct sequence

A. Viral RNA produced by the infected cell (5)

B. Virus infects macrophages. (1)

C. Viral DNA is produced by reverse transcriptase (3)

D. Viral RNA is introduced into the cell. (2)

E. Viral DNA incorporates into the host genome. (4)

(3)

Choose the correct answer from the options given below:

(1) D, B, A, C, E

(2) B, C, D, A, E

(3) ✓ B, D, C, E, A

(4) D, C, B, E, A

Select the pathogen mismatched with the symptoms of disease caused by it from the list given below:

- (1) Entamoeba histolytica : Constipation, abdominal pain. ✓
- (2) Epidermophyton : Dry scaly lesions on nail. ✓
- (3) Wucheria bancrofti : Chronic inflammation of lymphatic vessels of lower limb. ✓
- (4) Haemophilus influenzae : Blockage of the intestinal passage.

→ Lungs

4

Question no. 160

The product of which has been commercialized for lowering blood cholesterol

HA:

Statin

- (1) Trichoderma polysporum
- (2) Monascus purpureus
- (3) Saccharomyces cerevisiae
- (4) Aspergillus niger

2

Question no. 161

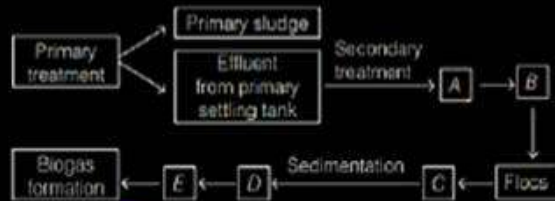
The free-living fungus *Trichoderma* can be used for

- (1) Killing insects ✗
- (2) Biological control of plant diseases
- (3) Controlling butterfly caterpillars
- (4) Producing antibiotics

→ Root ecosystem
②

Question no. 162

Given below is the flowchart of sewage treatment. Identify A, B, C, D and E and select the correct option.



- (1) A—small aeration tank, B—Microbial digestion, C—High BOD, D—Activated sludge, E—Aerobic sludge digesters
- (2) A—Large aeration tank, B—Mechanical agitation, C—Increased BOD, D—Activated sludge, E—Aerobic sludge digesters
- (3) A—small aeration tank, B—Microbial digestion, C—Low BOD, D—Activated sludge, E—Anaerobic sludge digesters
- (4) A—Large aeration tank, B—Mechanical agitation, C—Reduced BOD, D—Activated sludge, E—Anaerobic sludge digesters

4

Question no. 163

In molluscs of New York state, which of these expressions gives you a value between 0.1 to 0.2?

(S = log of species richness, A = log of area, C = log of y-intercept in the species richness area curve)

(1) $\frac{S-C}{A}$

(2) $\frac{S-A}{C}$

(3) $\frac{C-A}{S}$

(4) $\frac{A-S}{C}$



The variation in potency and concentration of reserpine of Rauwolfia is an example of

- (1) Genetic diversity
- (2) Species diversity
- (3) Ecological diversity
- (4) Population diversity

Genetic
Diversity

1

Question no. 165

A population of deer in a forest numbered 500 individuals at the beginning of a year. During that year 50 individuals died due to predation. Based on this data, evaluate the following statements:

- A. The death rate of the population = 0.1 per individual per year.
- B. The death rate expressed in percentage terms is 10%.
- C. If 100 births also occurred in the same year, the net population at the end of the year = 550.
- D. If no births occurred and no emigration / immigration took place, the population after one year would be 450.

Which of the above statements are true?

- (1) A, B and C only
- (2) A, B and D only
- (3) B, C and D only
- (4) A, B, C and D

$$\frac{\text{No of Death}}{\text{Total initial Po}} = \frac{50}{500} = 0.1 \text{ per}$$

$$= 0.1 \times 100\% = 10\%$$

$$= 500 + 100 - 50 = 550$$

$$= 450$$

4

Which of the following are true about the posterior pituitary?

- A. It synthesizes ADH and oxytocin X
- B. It stores and release neurohormones
- C. It is under direct neural control of the hypothalamus

- (1) A, B and C
- (2) A and B
- (3) B and C
- (4) A and C

3

Which of the following is not an autoimmune disease?

(1) Rheumatoid arthritis ✓ Joints →

(2) Myasthenia gravis ✓ NMJ

(3) Grave's disease ✓ Thyroid

(4) Rickets

→ Deficiency of Vit-D

4

Which of the following are modes of transmission for Hepatitis B?

A. Blood transfusion

B. Sexual contact

STD

C. ~~Mosquito bite~~

D. Shared needles

(1) A, B and C

(2) A, B and D

(3) A, B, C and D

(4) B, C and D

2

Statement I: AIDS is caused by a retrovirus.

Statement II: Retroviruses have RNA as genetic material and use reverse transcriptase.

- (1) Both I and II are correct, and II is the correct explanation of I
- (2) Both I and II are correct, but II is not the correct explanation of I
- (3) I is correct, II is incorrect.
- (4) I is incorrect, II is correct.

2

Which of the following characteristics apply to active immunity?

A. Long-lasting ✓

B. Immediate protection ✗ - Passive

C. Memory cell formation ✓

D. Antibodies are transferred from another organism - Passive

(1) A, B, C and D

✓ (2) A and C

(3) B, C and D

(4) A, B and D

→ Acquired

(2)

Which of the following disease are non-communicable?

A. Typhoid ✓

B. Diabetes mellitus ✗

C. Malaria ✓

D. Hypertension ✗

(1) A, B and C

(2) B, C and D

(3) B and D ✓

(4) A, C and D

3

Question no. 172

Assertion (A): Vaccination provides long-term immunity against diseases.

Reason (R): Vaccination is based on the property of immunological memory.

- (1) Both A and R are true, and R is the correct explanation of A.
- (2) Both A and R are true, and R is not the correct explanation of A.
- (3) A is true, but R is false.
- (4) A is false, but R is true.



Question no. 173

Match drugs with their classification.

	Column-I (Drug)		Column-II (Category)
A.	Morphine	i.	Analgesic / Pain killer
B.	Barbiturates	ii.	Sedative / tranquilizer
C.	Cocaine	iii.	Stimulant
D.	LSD	iv.	Hallucinogen



- (1) A – ii, B – iii, C – i, D – iv
- (2) ✓ A – i, B – ii, C – iii, D – iv
- (3) A – iv, B – iii, C – ii, D – i
- (4) A – i, B – iii, C – iv, D – ii

Question no. 174

Which of the following components are involved in allergic reaction?

- (1) IgE and mast cells
- (2) IgG and mast cells
- (3) IgA and mast cells
- (4) IgG and basophils

Basophils

1

Ringworm infections are caused by

(i) Microsporum ✓

(ii) Epidermophyton ✓

(iii) Trichophyton ✓

(iv) Trichomonas vaginalis

STD

1

(1) (i), (ii) and (iii) ✓

(2) (ii), (iii) and (iv)

(3) (i) and (iv)

(4) (ii) and (iv)

Question no. 176

Which of the following option does not contain secondary lymphoid organs.

- (1) Lymph nodes and appendix
- (2) Tonsils and Peyer's patches
- (3) Bone marrow and thymus
- (4) MALT and spleen

3

Which of the following are not the components of innate immunity?

- (1) Skin, macrophages, neutrophils ✓
- (2) Mucous coating of epithelium, natural killer cells ✓
- (3) B-lymphocytes, T-lymphocytes
- (4) Interferons, cytokines, neutrophils ✓

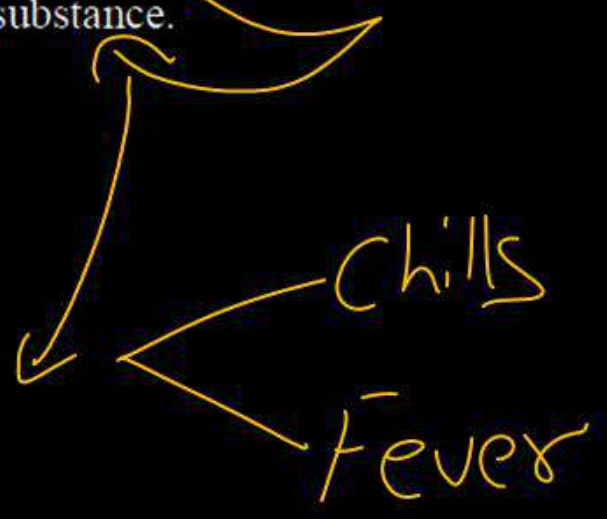
3

→ Acquired.

Question no. 178

The Plasmodium initially multiplies within the liver cells and then attacks the red blood cells, resulting in their rupture. The rupture of RBCs is associated with release of a toxic substance.

- (1) Hirudin
- (2) Heparin
- (3) Heptoin
- (4) Haemozoin



4

Question no. 179

During the gestation period fetus remain protected from many infections because it receives many antibodies from maternal blood through placenta this type of immunity is correctly described as -

- (1) Naturally acquired active immunity
- (2) Artificially acquired active immunity
- (3) Naturally acquired passive immunity
- (4) Artificially acquired passive immunity

3

Natural
Passive IgG

Macromolecule chitin is

- (1) Sulphur containing polysaccharide
- (2) Phosphorus containing polysaccharide
- (3) Nitrogen containing polysaccharide
- (4) Simple polysaccharide



3