

JEE-Main-28-07-2022-Shift-2 (Memory Based)

Chemistry

Question: Conc. HNO_3 reacts with I_2 to give

Options:

- (a) HI
- (b) HOI
- (c) HIO_3
- (d) HIO_2

Answer: (c)

Solution: Iodine reacts with concentrated nitric acid according to the following equation



Question: White phosphorus reacts with thionyl chloride to give

Options:

- (a) POCl_3
- (b) PCl_3
- (c) SO_2Cl_2
- (d) SCl_3

Answer: (c)



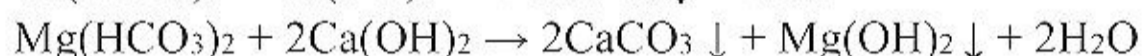
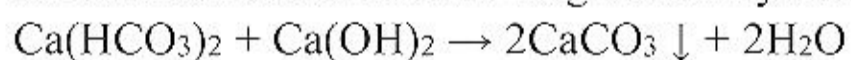
Question: Products obtained during treatment of hard water using Clark's method are

Options:

- (a) CaCO_3 , $\text{Mg}(\text{OH})_2$
- (b) $\text{Ca}(\text{OH})_2$, MgCO_3
- (c) CaCO_3 , MgCO_3
- (d) $\text{Ca}(\text{OH})_2$, $\text{Mg}(\text{OH})_2$

Answer: (a)

Solution: In Clark's method calculated amount of lime is added to hard water. It precipitates out calcium carbonate and magnesium hydroxide which can be filtered off.



Question: Decreasing order of metallic character

Na, Mg, Be, Si, P

Options:

- (a) $\text{Na} > \text{Mg} > \text{Be} > \text{P} > \text{Si}$
- (b) $\text{Mg} > \text{Na} > \text{Si} > \text{Be} > \text{P}$
- (c) $\text{Na} > \text{Mg} > \text{Be} > \text{Si} > \text{P}$
- (d) $\text{P} > \text{Si} > \text{Be} > \text{Mg} > \text{Na}$

Answer: (c)

Solution: Metallic character increases down the group and decreases along the period as we move left to right.

Hence, order of decreasing metallic character is $\text{Na} > \text{Mg} > \text{Be} > \text{Si} > \text{P}$

Question: Assertion: Permanganate titrations are not performed in presence of HCl

Reason: Chlorine is formed as a consequence of oxidation of HCl

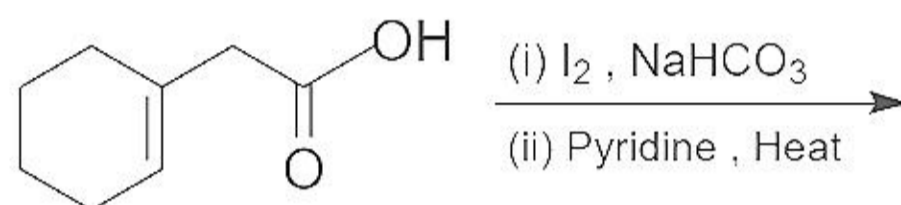
Options:

- (a) Both assertion and reason are true, reason is correct explanation of assertion.
- (b) Both assertion and reason are true, but reason is not a correct explanation of the assertion.
- (c) Assertion is true, but reason is false
- (d) Assertion is false, but reason is true

Answer: (a)

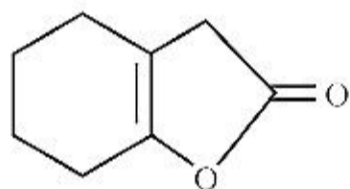
Solution: Permanganate titrations are not performed in presence of HCl because HCl oxidises to form chlorine.

Question:

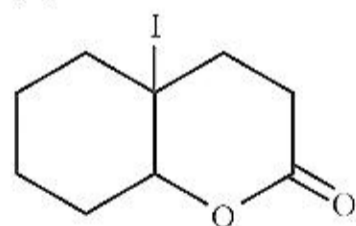


Options:

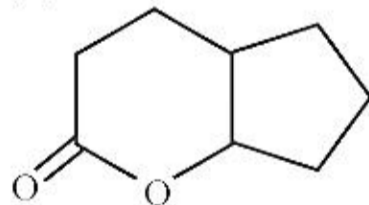
(a)



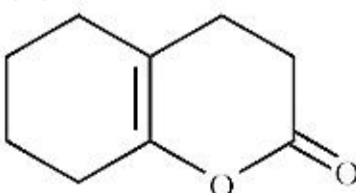
(b)



(c)

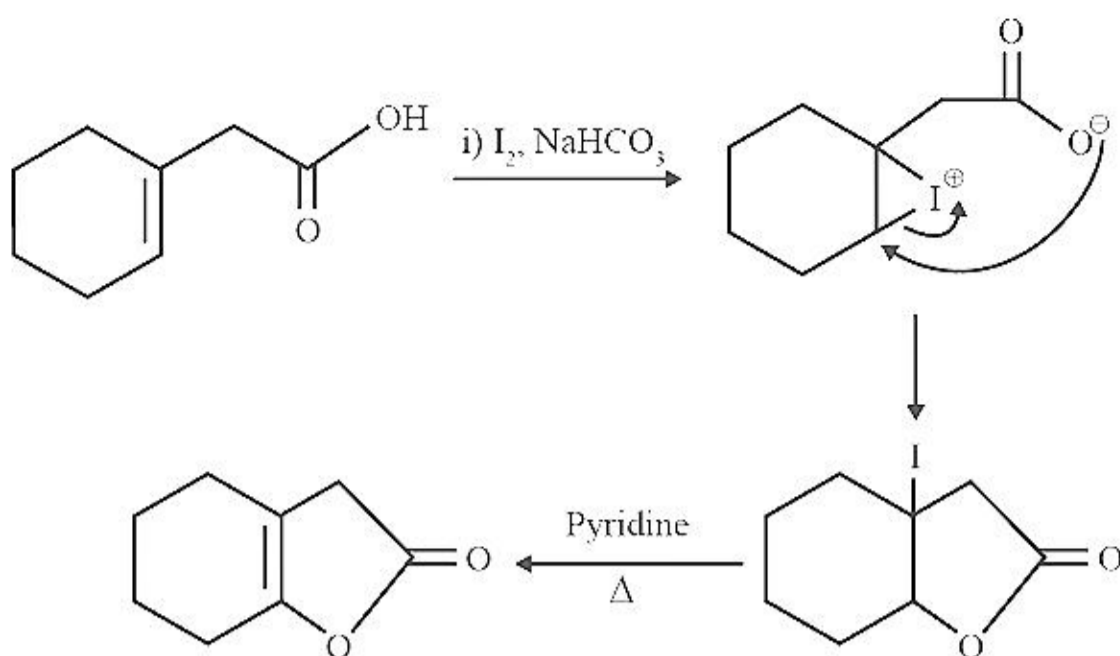


(d)



Answer: (a)

Solution:



Question: Match the following.

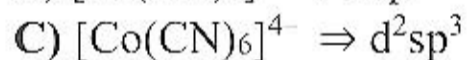
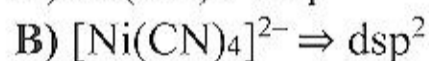
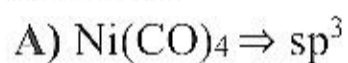
(Column I) Compounds	(Column II) Hybridizations
(A) $Ni(CO)_4$	(i) d^2sp^3
(B) $[Ni(CN)_4]^{2-}$	(ii) sp^3
(C) $[Co(CN)_6]^{4-}$	(iii) dsp^2

Options:

- (a) A \rightarrow (ii); B \rightarrow (iii); C \rightarrow (i)
 (b) A \rightarrow (iii); B \rightarrow (i); C \rightarrow (ii)
 (c) A \rightarrow (iii); B \rightarrow (ii); C \rightarrow (i)
 (d) A \rightarrow (i); B \rightarrow (iii); C \rightarrow (ii)

Answer: (a)

Solution:



Question: Assertion: Aniline on nitration gives o, p, m products

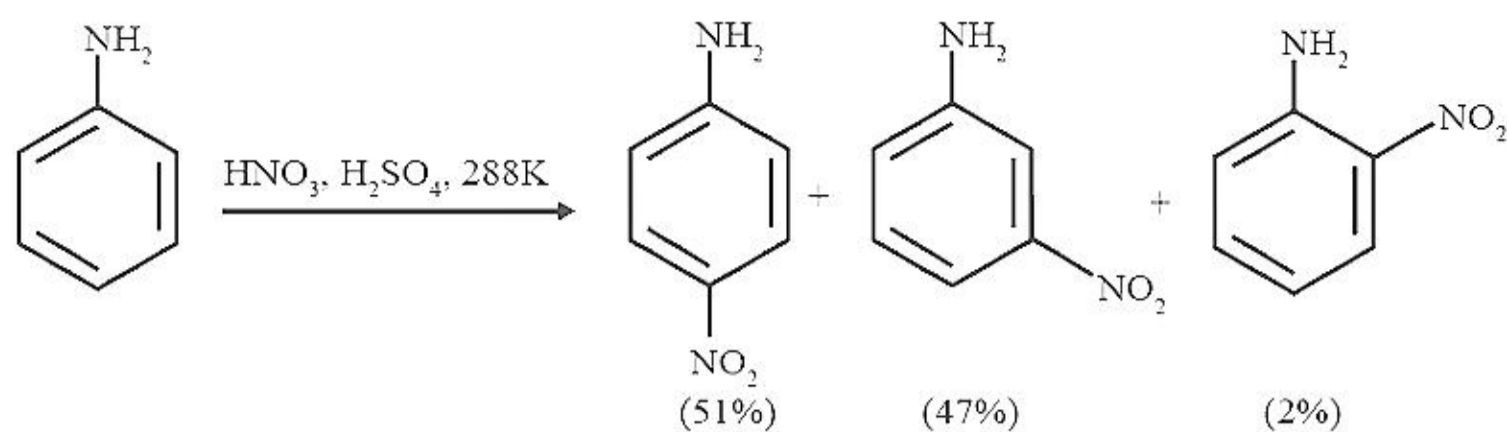
Reason: Mixture used in nitration is acidic

Options:

- (a) Both assertion and reason are true, reason is correct explanation of assertion.
 (b) Both assertion and reason are true, but reason is not a correct explanation of the assertion.
 (c) Assertion is true, but reason is false
 (d) Assertion is false, but reason is true

Answer: (a)

Solution: Direct nitration of aniline yields tarry oxidation products in addition to the nitro derivatives. Moreover, in the strongly acidic medium, aniline is protonated to form the anilinium ion which is meta directing. That is why besides the ortho and para derivatives, significant amount of meta derivative is also formed.



Question: Assertion: Zero orbital overlap is an out of phase overlap

Reason: It results due to different orientation / direction of approach of orbitals

Options:

- (a) Both assertion and reason are true, reason is correct explanation of assertion.
- (b) Both assertion and reason are true, but reason is not a correct explanation of the assertion.
- (c) Assertion is true, but reason is false
- (d) Assertion is false, but reason is true

Answer: (a)

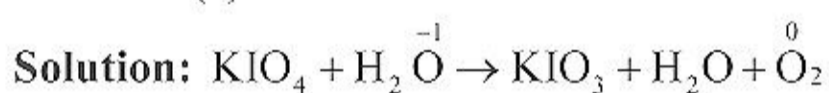
Solution: Zero overlap is out of phase due to different orientation direction of approach

Question: Find the change in oxidation state of oxygen when KIO_4 reacts with H_2O_2 ?

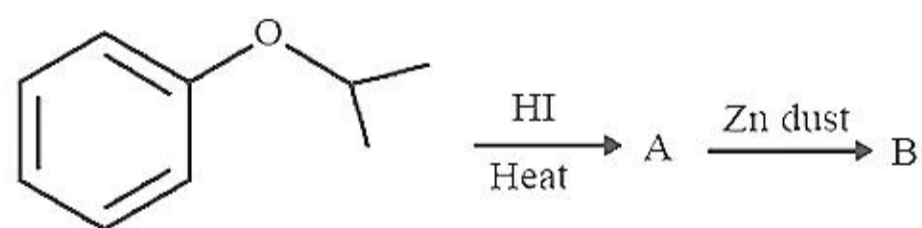
Options:

- (a) 4
- (b) 2
- (c) 1
- (d) 3

Answer: (c)

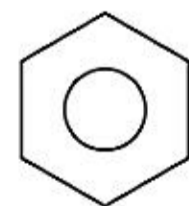


Question:

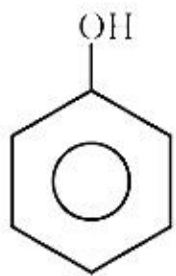


Options:

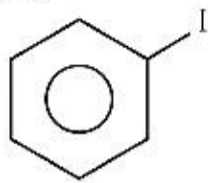
(a)



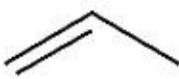
(b)



(c)

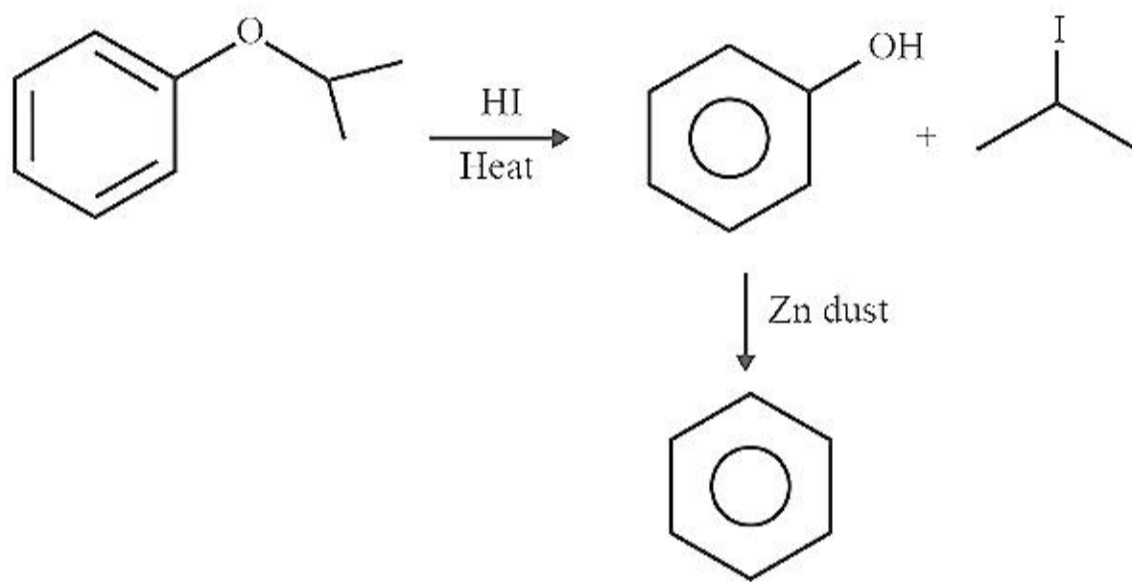


(d)



Answer: (a)

Solution:



Question: Matching of polymers:

(Column I)	(Column II)
(A) Nylon	(i) Thermosetting
(B) Bakelite	(ii) Thermoplastic
(C) Polythene	(iii) Elastomer
(D) Natural rubber	(iv) Fibers

Options:

(a) A → (i); B → (iii); C → (ii); D → (iv)

(b) A → (iv); B → (i); C → (ii); D → (iii)

(c) A → (iii); B → (ii); C → (iv); D → (i)

(d) A → (ii); B → (i); C → (iv); D → (iii)

Answer: (b)

Solution:

Nylon ⇒ Fibers

Bakelite ⇒ Thermosetting

Polythene ⇒ Thermoplastic

Natural rubber ⇒ Elastomer

Question: Arrange the following according to the rate of nitration:

1) p - xylene

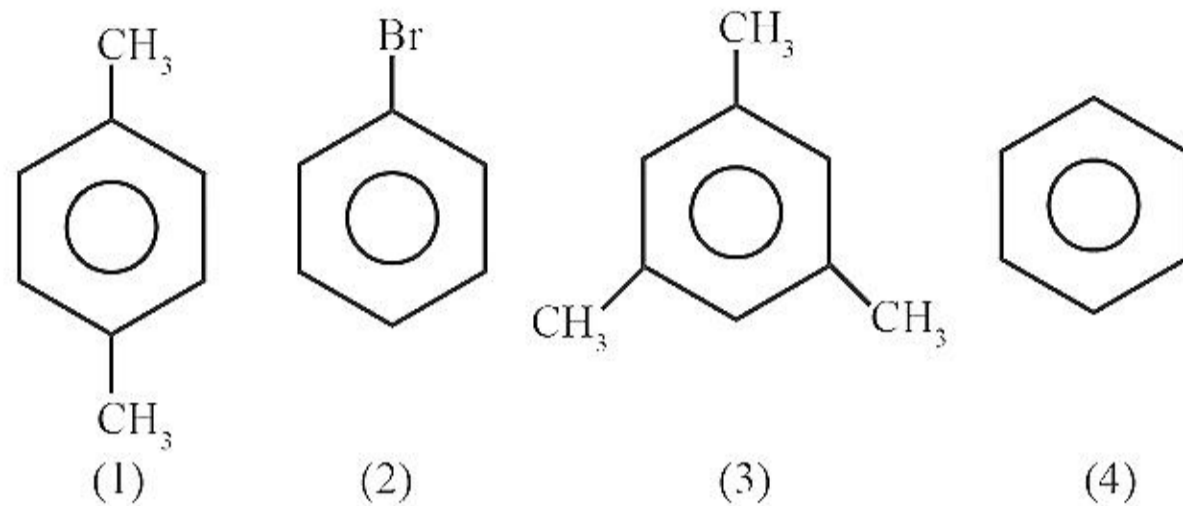
- 2) bromobenzene
 3) mesitylene
 4) benzene

Options:

- (a) $3 > 1 > 4 > 2$
 (b) $2 > 1 > 4 > 3$
 (c) $1 > 3 > 2 > 4$
 (d) $4 > 2 > 3 > 1$

Answer: (a)

Solution:



More is the electron density groups attached, higher is the rate of nitration.

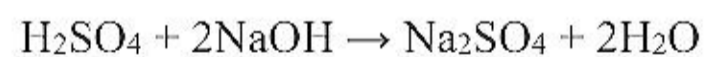
Question: Find the molarity of Na_2SO_4 formed upon mixing of 0.2 M, 2 L H_2SO_4 and 0.1 M, 2 L NaOH.

Options:

- (a) 0.05 M
 (b) 0.03 M
 (c) 0.04 M
 (d) 0.025 M

Answer: (d)

Solution:



Initial moles 0.4 0.2 - -

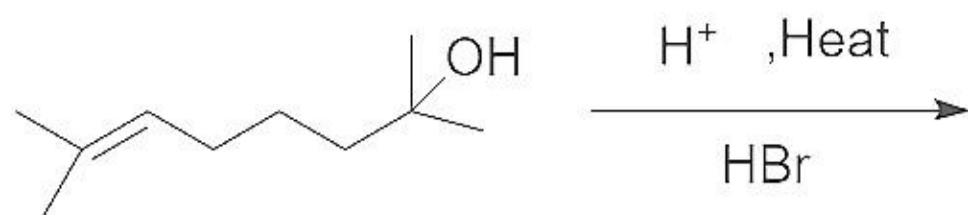
NaOH is the limiting reagent

\therefore 2 moles of NaOH \rightarrow 1 mole of Na_2SO_4

\therefore 0.2 moles of NaOH $\rightarrow \frac{0.2}{2} = 0.1$ moles of Na_2SO_4

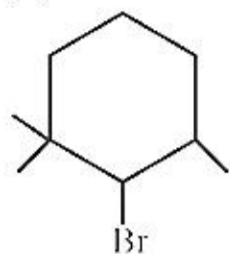
$$M_{\text{Na}_2\text{SO}_4} = \frac{0.1}{4} = 0.025 \text{ M}$$

Question:

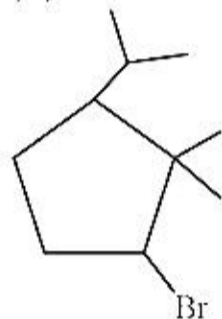


Options:

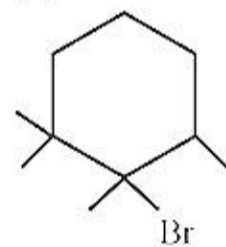
(a)



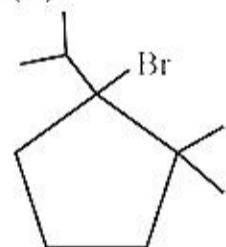
(b)



(c)

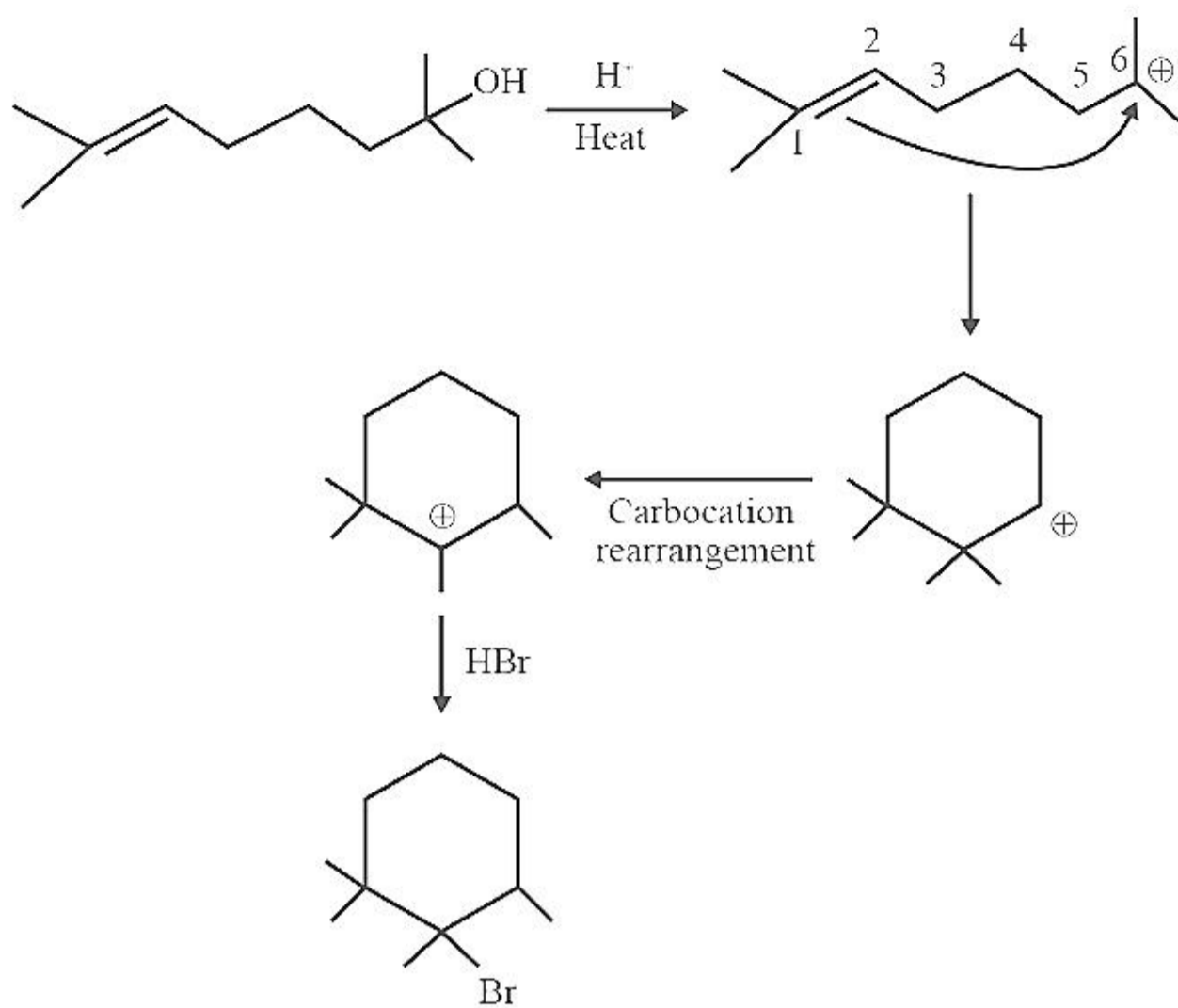


(d)



Answer: (c)

Solution:



Question: The temperature at which rms speed of gas molecules becomes double of its value at 0°C is

Options:

- (a) 819°C
- (b) 760°C
- (c) 273°C
- (d) 224°C

Answer: (a)

Solution:

$$V_{\text{rms}} = \sqrt{\frac{3RT}{M}}$$

$$V_{\text{rms}} \propto \sqrt{T}$$

$$\frac{(V_{\text{rms}})_1}{(V_{\text{rms}})_2} = \sqrt{\frac{T_1}{T_2}}$$

$$(V_{\text{rms}})_2 = 2(V_{\text{rms}})_1$$

$$\frac{1}{2} = \sqrt{\frac{273}{T_2}}$$

$$\Rightarrow T_2 = 273 \times 4 = 1092 \text{ K}$$

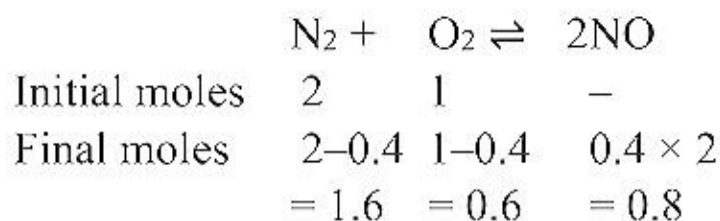
$$= 819^\circ\text{C}$$

Question: In the reaction, $\text{N}_2 + \text{O}_2 \rightleftharpoons 2\text{NO}$

If initial moles of N_2 and O_2 are 2 mol and 1 mol, then find the value of K_c . The moles of O_2 at equilibrium is 0.6 mol.

Answer: 0.67

Solution:



$$K_c = \frac{[\text{NO}]^2}{[\text{N}_2][\text{O}_2]} = \frac{\left(\frac{0.8}{V}\right)^2}{\left(\frac{1.6}{V}\right)\left(\frac{0.6}{V}\right)} = 0.67$$

Question: In a FCC lattice a molecule, density = 9.03 g/cm³, a = 4 × 10⁻⁸ cm. Find molecular weight

Answer: 87.00

Solution: Z = 4, density = 9.03 cm⁻³, a = 4 × 10⁻⁸ cm

$$d = \frac{ZM}{a^3 N_a}$$

$$M = \frac{da^3 N_a}{Z} = \frac{9.03 \times (4 \times 10^{-8})^3 \times 6.02 \times 10^{23}}{4} = 869.7 \times 10^{-1}$$

$$= 86.97 \text{ g/mol}$$

$$M \approx 87 \text{ g/mol}$$

Question: How many of the following are not isoelectronic species?

A) Yb⁺³

B) Tb⁺⁴

C) Eu⁺³

D) Tb⁺²

Answer: 4.00

Solution:

Yb⁺³ – 4f¹³ (67 electrons)

Tb⁺⁴ – 4f⁷ (61 electrons)

Eu⁺³ – 4f⁶ (60 electrons)

Tb⁺² – 4f⁹ (63 electrons)

None of them is isoelectronic species