

An increase in pressure (by decreasing volume) results in increase in partial pressure \_\_\_\_\_

⇒ If rxn involves only solid & liq  
 $\text{Fe(s)} \rightarrow \text{Fe(l)} \quad P \uparrow \text{ backward}$



density ↓ Pressure ↑  
 less dense → more pressure  
more dense → less pressure

An increase in pressure favours more dense substance

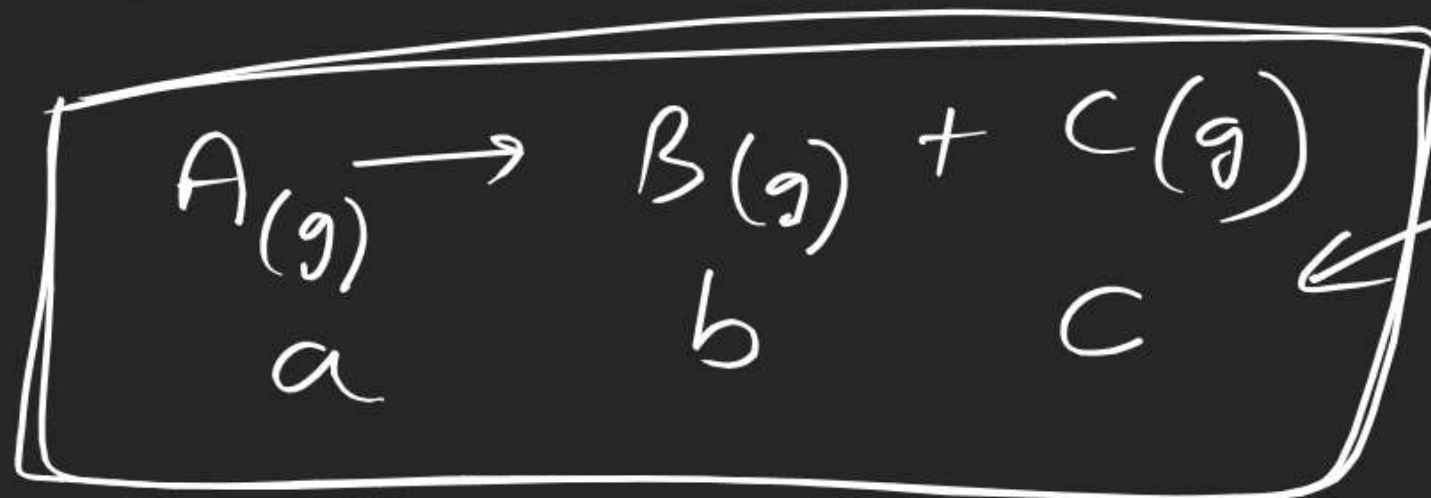
graphite → diamond  
 $P \uparrow$  forward



$P \uparrow$  forward

### ③ Effect of addition of inert gas

① At constant volume



← inert gas

$$K_c = \frac{b \times c}{a} \times \left( \frac{1}{V} \right)$$

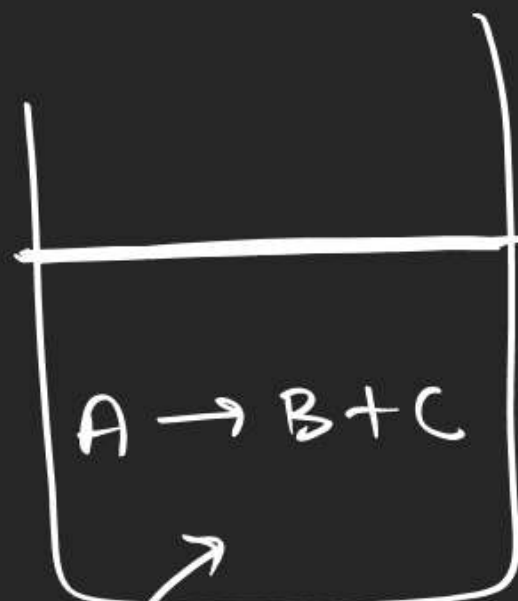
$$K_p = \frac{P_B \times P_C}{P_A}$$

$$P_c = \frac{n_c R T}{V}$$

Add<sup>n</sup> of inert gas at constant <sup>volume</sup> has no effect on eq<sup>l</sup> b<sup>m</sup> state because partial pressures remain unchanged

⑤ At constant pressure: →

Volume will increase

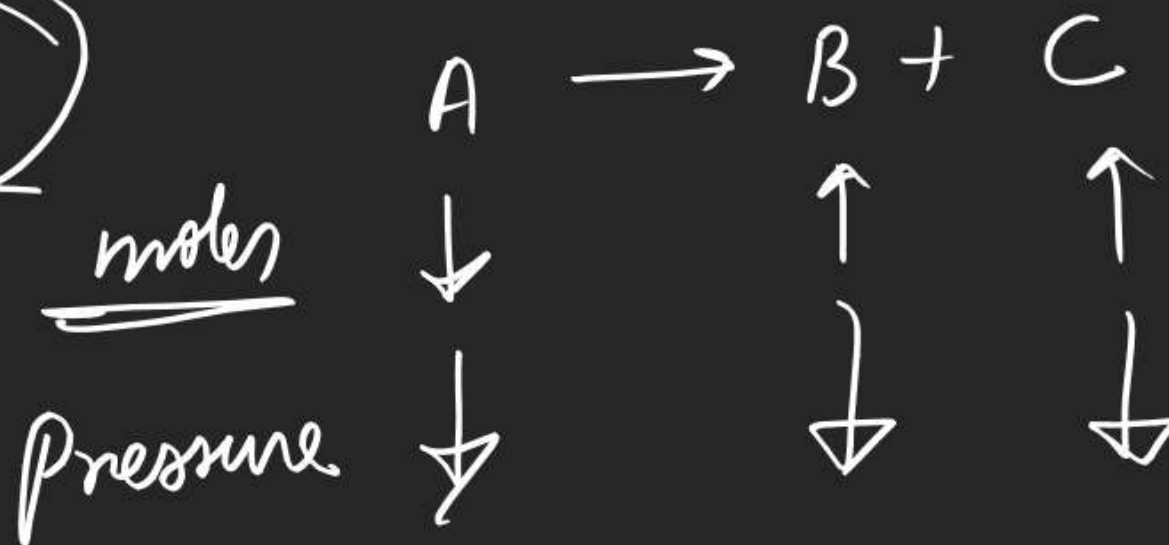


inert gas

forward dir<sup>n</sup>

$$K_c = \frac{b \times c}{a} \times \frac{1}{V} \uparrow$$

Rxn moves in the direction  
which more no of moles of gases





④ Effect of temperature: →



$$\underline{K_c} = \frac{b \times c}{a} \times \frac{1}{v}$$

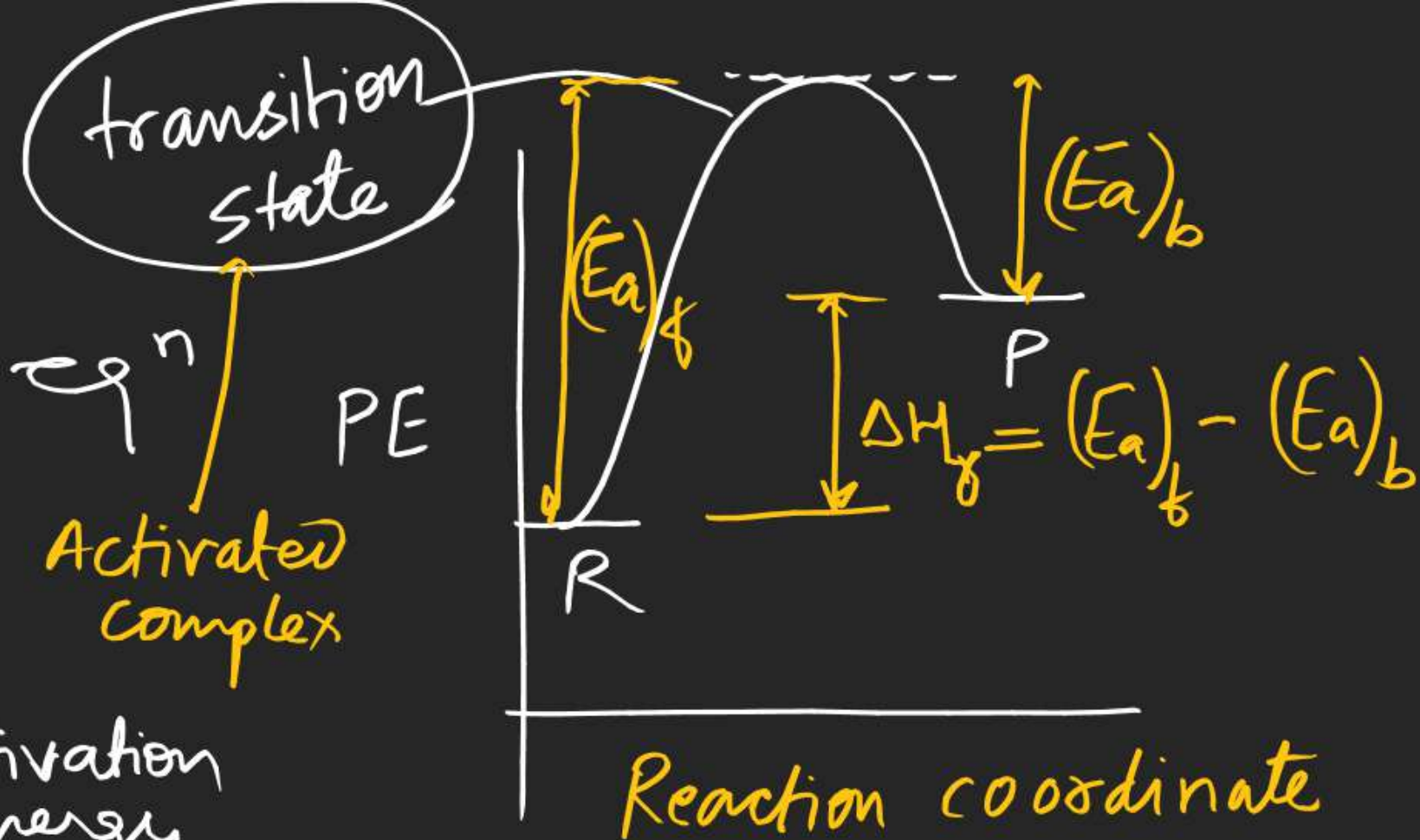
$$K_{eq} = \frac{k_f}{k_b} = \frac{\text{forward rate}}{\text{backward "}}$$

According to Arrhenius eq<sup>n</sup>

$$k = A e^{-E_a/RT}$$

rate const  $\uparrow$   $A$   $\uparrow$  Arrhenius constant  $\uparrow$  Activation energy

$A$  &  $E_a$  are temperature independent



$$\Delta H_r = (E_a)_f - (E_a)_b$$

$$k = A e^{-E_a/RT}$$

$$k_f = A_f e^{-(E_a)_f/RT}$$

$$k_b = A_b e^{-(E_a)_b/RT}$$

$$\frac{k_f}{k_b} = \frac{A_f}{A_b} e^{-[(E_a)_f - (E_a)_b]/RT}$$

$$K_{eq} = \frac{A_f}{A_b} e^{-\Delta H_r/RT}$$

$$\ln K_{eq} = \ln \frac{A_f}{A_b} - \frac{\Delta H_r}{R} \left( \frac{1}{T} \right)$$

$$\ln K_{T_1} = \ln \frac{A_f}{A_b} - \frac{\Delta H_r}{R} \left( \frac{1}{T_1} \right)$$

$$\ln K_{T_2} = \ln \frac{A_f}{A_b} - \frac{\Delta H_r}{R} \left( \frac{1}{T_2} \right)$$

$$\ln \frac{K_{T_2}}{K_{T_1}} = \frac{\Delta H_r}{R} \left( \frac{1}{T_1} - \frac{1}{T_2} \right)$$

Van't Hoff eq<sup>n</sup>

endo  $\Delta H > 0$   $T \uparrow$   $\ln \frac{K_{T_2}}{K_{T_1}} > 0$   $K_{T_2} > K_{T_1}$   $K_{eq} \uparrow$

exo  $\Delta H < 0$   $T \uparrow$   $\ln \frac{K_{T_2}}{K_{T_1}} < 0$   $K_{T_2} < K_{T_1}$   $K_{eq} \downarrow$



Haber process  
 $\Delta H_r < 0$  exo

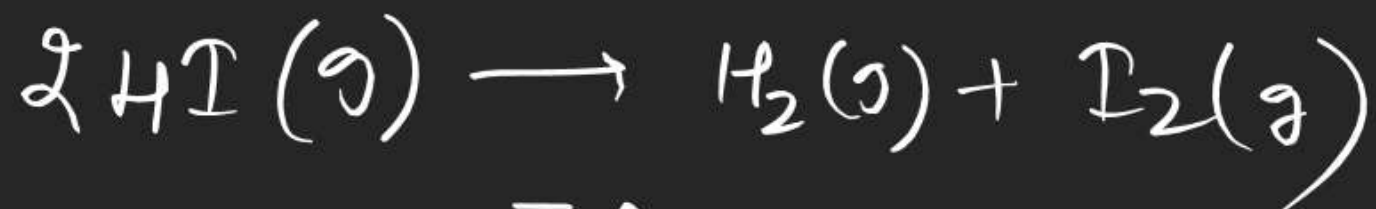
$T \uparrow$

$K_{eq} \downarrow$

backward



endo  $\Delta H > 0$   
 $T \uparrow$   $K_{eq} \uparrow$  forward



endo  $T \uparrow$  forward

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0-1      63 — 77

5-1      32 — 40



**JEE MAIN PAPER CLASS 11<sup>th</sup>**

1. Two solid compounds X and Y dissociates at a certain temperature as follows



The total pressure of gases over a mixture of X and Y is:

- (A) 4.5 atm      (B) 0.45 atm      (C) 0.6 atm      (D) 0.2 atm

2. The temperature of an ideal gas is increased from  $27^{\circ}\text{C}$  to  $327^{\circ}\text{C}$ . Calculate ratio of de-broglie wavelength of ideal at  $27^{\circ}\text{C}$  to  $327^{\circ}\text{C}$ .

(A)  $\frac{2}{1}$

(B)  $\frac{1}{2}$

(C)  $\frac{\sqrt{2}}{1}$

(D)  $\frac{1}{1}$

$$\lambda = \frac{h}{m \sqrt{\frac{3RT}{M}}}$$

3. <sup>39</sup>10.1 g of <sup>14</sup>KNO<sub>3</sub> is dissolved in 500 mL of H<sub>2</sub>O. <sup>0.05/2</sup>Mass of Ba(NO<sub>3</sub>)<sub>2</sub> that should be added to this solution to get molality (m) of 0.3 to NO<sub>3</sub><sup>-</sup> ion is:  
 (A) ≈ 1.3g      (B) ≈ 13g      (C) ≈ 6.5g      (D) ≈ 65g

$$\frac{10.1}{101} = \underline{0.1 \text{ NO}_3^-}$$

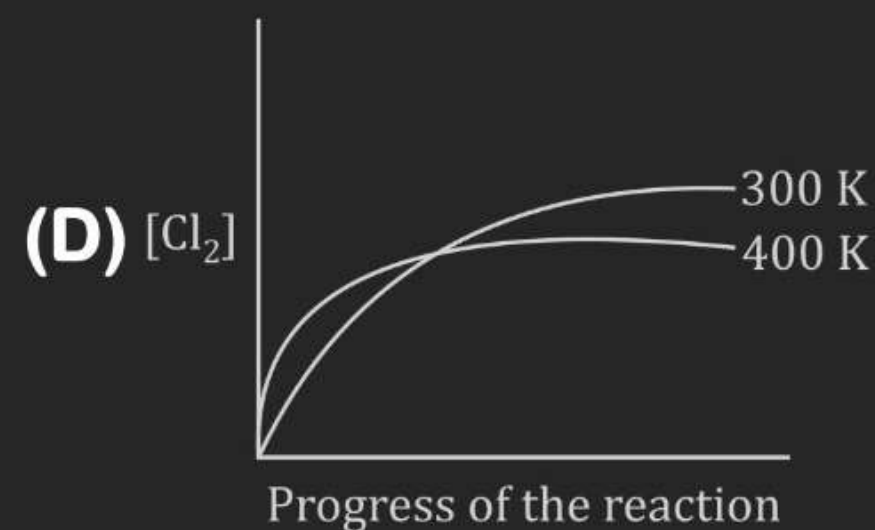
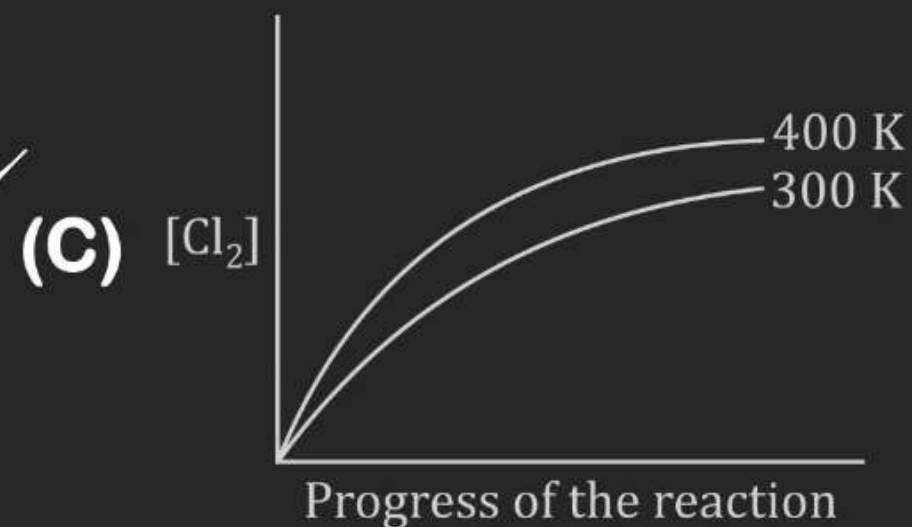
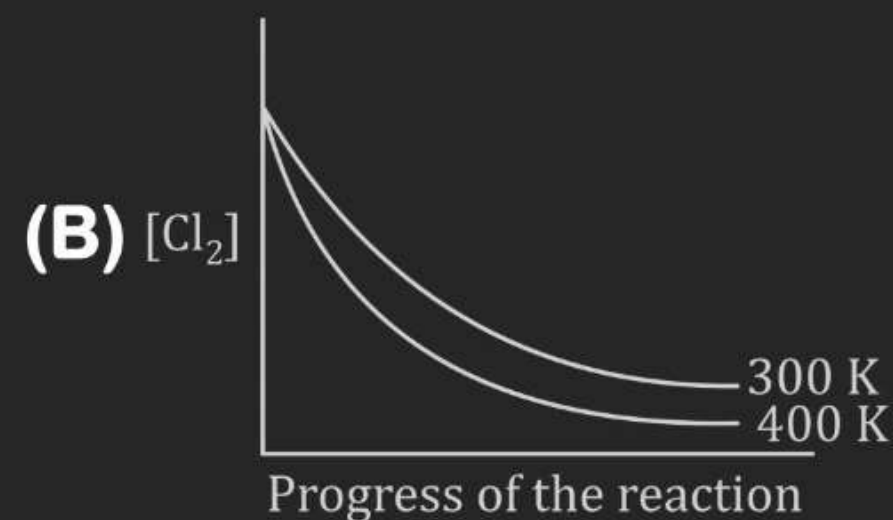
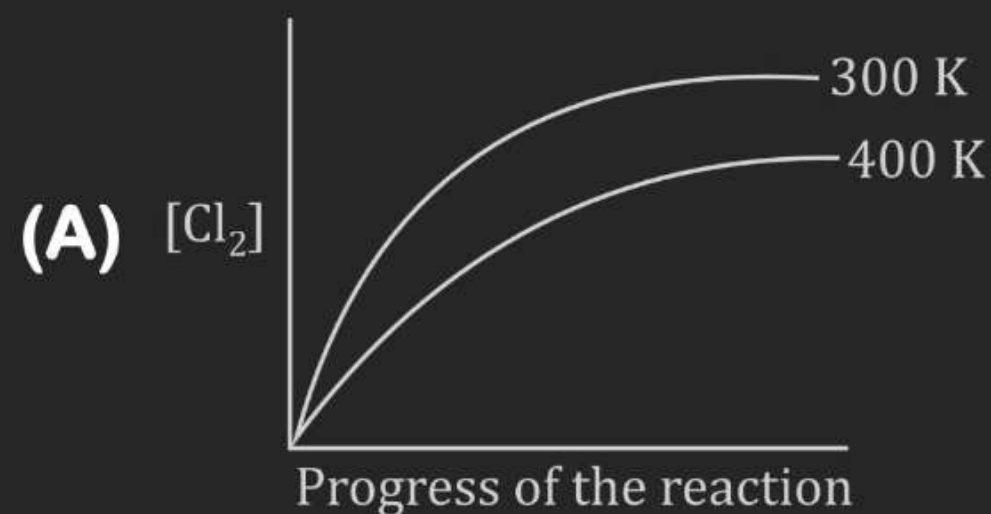
$$\frac{\eta}{500} \times 1000 = 0.3$$

$$\eta = \frac{0.3}{2} = 0.15$$

4. Which of the following graphical representation is correct for the chemical reaction?



endo





$$\frac{5 \times 5}{25} = 1 \text{ mol}$$

5.  $\text{Cl}_2$  was introduced in a container made up of aluminium of 5L capacity at 5 atm pressure at 300K. When temperature was raised to 600K then a reaction will start between the  $\text{Cl}_2(\text{g})$  and  $\text{Al}(\text{s})$  as follows:



$$x = 0.15$$

If after some time the reaction stops and mass of  $\text{AlCl}_3(\text{s})$  formed is 13.35 grams then  $K_p$  of the above reaction assuming no change in volume is :

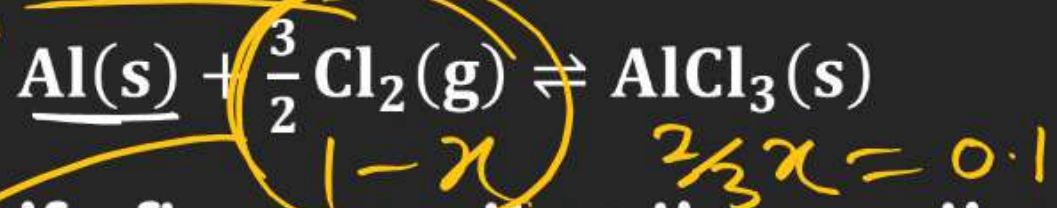
$$[\text{Al} = 27 \frac{\text{g}}{\text{mol}}, \text{Cl} = 35.5 \text{ g/mole}]$$

$$[\text{RT} = 25 \text{ L} \cdot \text{atm/mole at 300K}]$$

- (A) (5.5)      (B)  $(8.5)^{-\frac{3}{2}}$       (C)  $(6.5)^{-\frac{3}{2}}$       (D)  $(4.5)^{-\frac{3}{2}}$

$$K_p = \frac{1}{p^{3/2} a_2}$$

$$0.85$$



$$\frac{3}{2}x = 0.1$$

$$0.1 \text{ mol}$$

6.  $Z_2$  undergo disproportion in an alkaline medium into a mixture of  $Z^-$  and  $ZO_3^-$ .

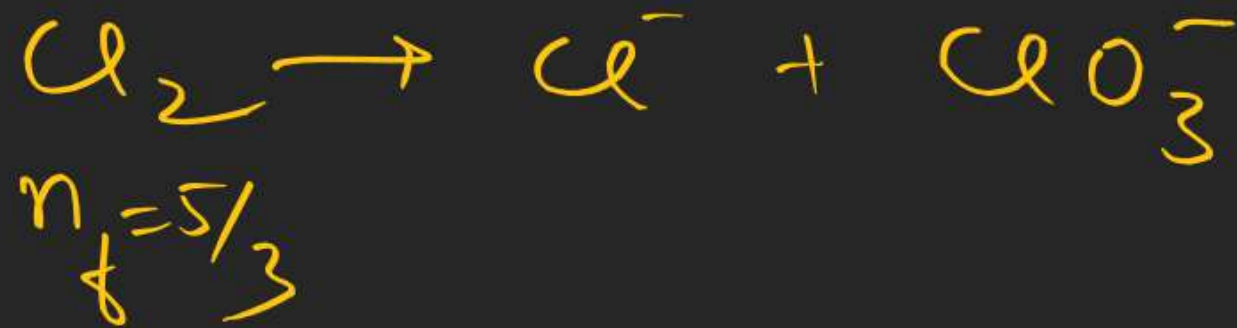
Equivalent mass of  $Z_2$  in the reaction is: [given that atomic mass of Z is 80gm/mol]

(A) 96

(B) 48

(C) 64

(D) 32



$$\frac{160}{5} \times 3$$

7. For the reaction  $2\text{NOCl(g)} \rightleftharpoons 2\text{NO(g)} + \text{Cl}_2\text{(g)}$ ,  $K_p = 3.5 \times 10^{-3}$  atm at  $27^\circ\text{C}$ . Value of  $K_c$  at this temperature will be : [R = 0.0821 L – atm/mole – Kelvin]

- (A)  $1.42 \times 10^{-4}$       (B)  $1.42 \times 10^{-3}$       (C)  $1.42 \times 10^{-5}$       (D)  $1.42 \times 10^{-6}$

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

$$\Delta n_g = 1$$

8. At equilibrium, a solution contains 1.0 mol each of  $\text{Cd}^{2+}(\text{aq})$ ,  $\text{SCN}^{-}(\text{aq})$ , and  $\text{Cd}(\text{SCN})_4^{2-}$ . What is the solution's volume?



$$K_c = \frac{1}{1 \times 1^4} \times \left(\frac{1}{V}\right)^{-4}$$



10. First and second ionization energies of magnesium atom are 7.646 and 15.035 eV respectively. The amount of energy in kJ needed to convert all the atoms of magnesium into  $\text{Mg}^{2+}$  ions present in 12 mg of magnesium vapours is: [Given : 1 eV = 100 kJ mol<sup>-1</sup>] (Report your answer to the nearest whole number) [Molar mass of Mg = 24/mol]

$$\frac{12 \times 10^{-3}}{24} = \frac{1}{2} \times 10^{-3} \text{ mol}$$

$$\left( \frac{1}{2} \times 10^{-3} \right) \times (15.035 + 7.646) \times 100 \text{ kJ/mol}$$