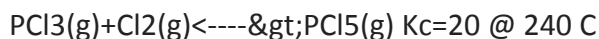


## Answer on Question#51004 – Chemistry – Other



If a 1.0 L container contains 0.25 mol of  $\text{PCl}_5$  at 240 C, how many moles of it dissociate to form  $\text{PCl}_3$  and  $\text{Cl}_2$ ?

### Solution:

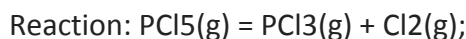
$$aA = bB + cC; K_c = \frac{[B]^b[C]^c}{[A]^a};$$

$K_c$  – the equilibrium constant (the concentration quotient);

[ ] – the molar concentration (mol/L);

$$C = n/V;$$

C – molar concentration (mol/L); n – mole (mol); V – volume (L);



According to the equilibrium:  $n(\text{PCl}_5):n(\text{PCl}_3):n(\text{Cl}_2) = 1:1:1$ ;

$$C(\text{PCl}_5) = n(\text{PCl}_5)/V; C(\text{PCl}_5) = 0.25 \text{ mol/L};$$

Initial concentration  $\text{PCl}_5 = 0.25 \text{ M}$ ;  $K_c = 20$ ;

x –  $n(\text{PCl}_5)$  – that dissociated;  $(0.25 - x)$  – n (equilibrium);

V – constant;  $n(\text{PCl}_3) = n(\text{Cl}_2) = n(\text{PCl}_5)_{\text{dis}} = x$ ;

$$K_c = \frac{C(\text{PCl}_3) * C(\text{Cl}_2)}{C(\text{PCl}_5)_{\text{eq}}} = \frac{(n(\text{PCl}_3) / V) * (n(\text{Cl}_2) / V)}{n(\text{PCl}_5)_{\text{eq}} / V} = \frac{n(\text{PCl}_3) * n(\text{Cl}_2)}{n(\text{PCl}_5)_{\text{eq}}};$$

$$K_c = x^2 / (0.25 - x);$$

$$x^2 / (0.25 - x) = 20;$$

$$x^2 + 20x - 5 = 0;$$

$$x = 0.25;$$

$$n(\text{PCl}_5)_{\text{dis}} = 0.25 \text{ mol}$$

**Answer:** 0.25 mol.