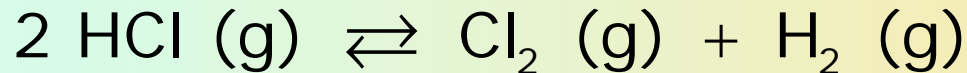


Equilibrium: conceptual questions

Consider this chemical equation:



Initially we have 2 mol of HCl. We can say that:

1. K_p and K_c are dimensionless (without units)



true



false

$$K_p = \frac{(\text{atm})^2}{(\text{atm})^2} \dots \text{dimensionless}$$

$$K_c = \frac{(\text{M})^2}{(\text{M})^2} \dots \text{dimensionless}$$

2. If we compare K_p and K_c



$K_p > K_c$



$K_p < K_c$

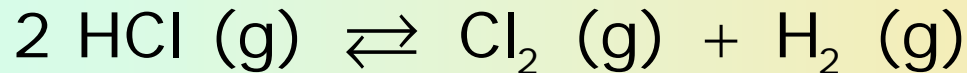


$K_p = K_c$

$$K_p = K_c * (\text{RT})^{\Delta n} \xrightarrow{\Delta n = 0} K_p = K_c$$

Equilibrium: conceptual questions

Consider this chemical equation:

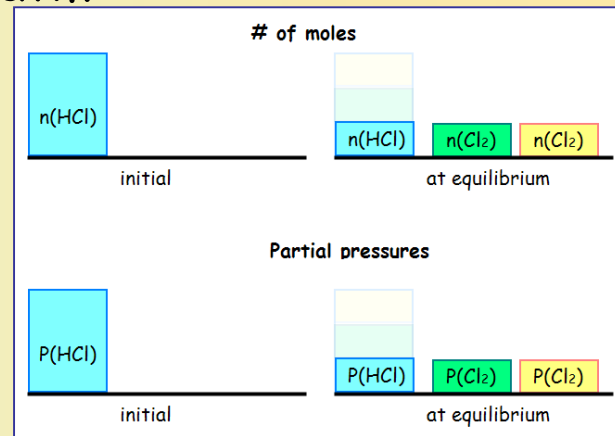


Initially we have 2 mol of HCl. We can say that:

3. If the initial pressure is 50 atm, the pressure at equilibrium will be

- 50 atm < 50 atm > 50 atm

When 2 moles of reactant are spent, 2 moles of product will be produced: the total number of moles doesn't change. Thus, the total pressure will remain unchanged

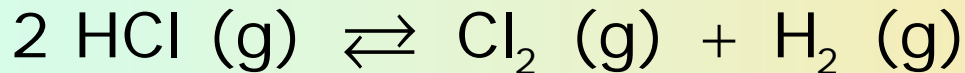


4. The total number of moles at equilibrium will be

- > 2 moles 2 moles < 2 moles

Equilibrium: conceptual questions

Consider this chemical equation:



Initially we have 2 mol of HCl. We can say that:

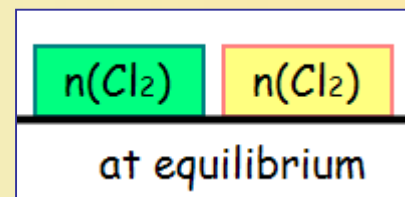
5. The partial pressures at equilibrium:

$P_{\text{Cl}_2} > P_{\text{H}_2}$

$P_{\text{Cl}_2} < P_{\text{H}_2}$

$P_{\text{Cl}_2} = P_{\text{H}_2}$

The number of moles of both products is equal; therefore, both partial pressures will be equal.



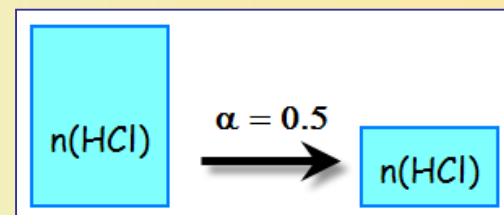
6. If $\alpha = 0.5$ (dissociation percentage = 50%) and the initial pressure is 50 atm, at equilibrium we will have:

$P_{\text{HCl}} = 25 \text{ atm}$

$P_{\text{HCl}} > 25 \text{ atm}$

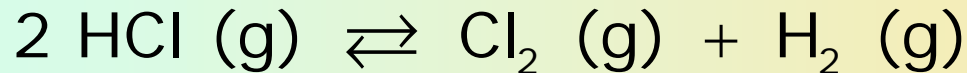
$P_{\text{HCl}} < 25 \text{ atm}$

At equilibrium only 1 mole of HCl will be present. Thus, its partial pressure will be halved.



Equilibrium: conceptual questions

Consider this chemical equation:



Initially we have 2 mol of HCl. We can say that:

7. If $\alpha = 0.5$ (dissociation percentage = 50%) and the initial pressure is 50 atm, at equilibrium we will have:

$n_{\text{HCl}} = 1 \text{ mol}$ $n_{\text{HCl}} > 1 \text{ mol}$ $n_{\text{HCl}} < 1 \text{ mol}$

If 50 % is spent \rightarrow 1 mole is spent \rightarrow 1 mole will remain at equilibrium

$n_{\text{H}_2} = 1 \text{ mol}$ $n_{\text{H}_2} > 1 \text{ mol}$ $n_{\text{H}_2} < 1 \text{ mol}$

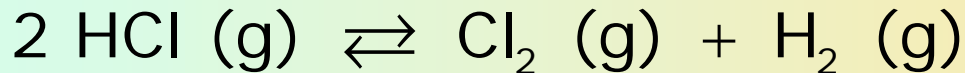
If 50 % is spent \rightarrow 1 mole is spent \rightarrow 0.5 mol of hydrogen will be produced

$n_{\text{total}} = 2 \text{ moles}$ $n_{\text{total}} > 2 \text{ moles}$ $n_{\text{total}} < 2 \text{ moles}$

In this reaction # of moles spent = # of moles produced

Equilibrium: conceptual questions

Consider this chemical equation:



Initially we have 2 mol of HCl. We can say that:

7. If $\alpha = 0.5$ (dissociation percentage = 50%) and the initial pressure is 50 atm, at equilibrium we will have:

$P_{\text{HCl}} > P_{\text{H}_2} + P_{\text{Cl}_2}$ $P_{\text{HCl}} = P_{\text{H}_2} + P_{\text{Cl}_2}$ $P_{\text{HCl}} < P_{\text{H}_2} + P_{\text{Cl}_2}$

There will be 1 mole of reactant and 1 mole of product

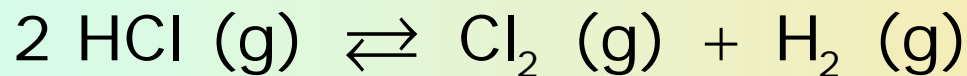
$$K_p = 0.25$$

$$K_c = K_p = 0.25$$

$$K_p = \frac{P_{\text{Cl}_2} * P_{\text{H}_2}}{P_{\text{HCl}}^2} = \frac{(P_{\text{tot}}/4) * (P_{\text{tot}}/4)}{(P_{\text{tot}}/2)^2} = 0.25$$

Equilibrium: conceptual questions

Consider this chemical equation:



Initially we have 2 mol of HCl. We can say that:

8. If the initial pressure is 50 atm, at equilibrium we will have:

If $\alpha = 0.5$:

$$P_{\text{HCl}} = 25 \text{ atm}$$

$$P_{\text{Cl}_2} = 12.5 \text{ atm}$$

If $\alpha = 0.20$:

$$P_{\text{HCl}} = 40 \text{ atm}$$

$$P_{\text{Cl}_2} = 5 \text{ atm}$$

If $\alpha = 0.80$:

$$P_{\text{HCl}} = 10 \text{ atm}$$

$$P_{\text{Cl}_2} = 20 \text{ atm}$$

If $\alpha = 0.24$

$$P_{\text{HCl}} = 38 \text{ atm}$$

$$P_{\text{Cl}_2} = 6 \text{ atm}$$

If $\alpha = 0.48$

$$P_{\text{HCl}} = 26 \text{ atm}$$

$$P_{\text{Cl}_2} = 12 \text{ atm}$$