

# Day ①: At equilibrium

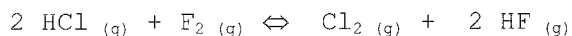
39

Period 19

- Quiz on Le Chatelier's Principle
- Go over equilibrium expressions worksheet
- Mathematical examples

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Example #1:



At a certain temperature, the equilibrium concentrations were found to be as follows:  $[\text{HCl}] = 0.50 \text{ M}$   $[\text{F}_2] = 0.40 \text{ M}$   $[\text{Cl}_2] = 2.0 \text{ M}$   $[\text{HF}] = 0.60 \text{ M}$ . From this data, calculate  $K_{\text{eq}}$ .

Answer #1:

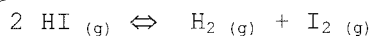
$$K_{\text{eq}} = \frac{[\text{Cl}_2][\text{HF}]^2}{[\text{HCl}]^2[\text{F}_2]} = \frac{(2.0)(0.60)^2}{(0.50)^2(0.40)} = 7.2$$

note: it is acceptable to leave out units for  $K_{\text{eq}}$  because they don't really mean anything and there is no standard unit for this constant.

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Example #2:



At a certain temperature,  $[\text{H}_2] = 2.5 \times 10^{-2} \text{ M}$  and  $[\text{I}_2] = 3.1 \times 10^{-2} \text{ M}$ . If  $K_{\text{eq}}$  is  $8.6 \times 10^{-2}$ , calculate the equilibrium  $[\text{HI}]$ .

Answer #2:

$$K_{\text{eq}} = \frac{[\text{H}_2][\text{I}_2]}{[\text{HI}]^2} \quad [\text{HI}]^2 = \frac{[\text{H}_2][\text{I}_2]}{K_{\text{eq}}}$$
$$[\text{HI}]^2 = \frac{(2.5 \times 10^{-2})(3.1 \times 10^{-2})}{(8.6 \times 10^{-2})}$$

$$[\text{HI}]^2 = 9.0 \times 10^{-3}$$

$$[\text{HI}] = 9.5 \times 10^{-2} \text{ M}$$

note: even though no unit was given for  $K_{\text{eq}}$  it is understood that there is a unit for concentration - moles per litre or M for short.

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