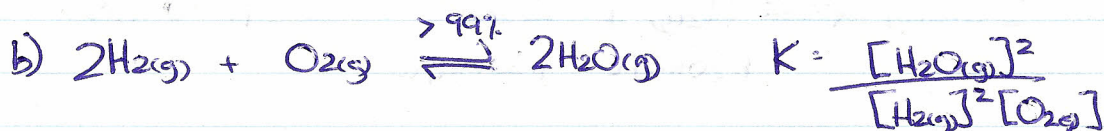
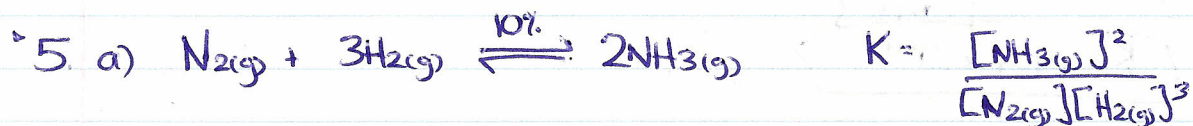
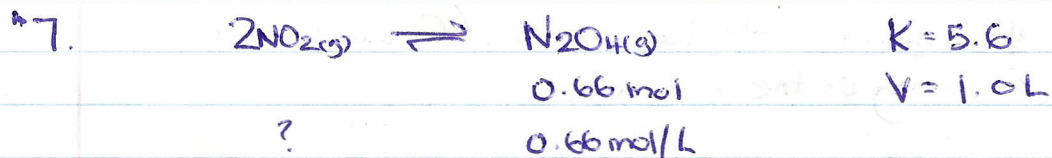


WORKSHEET: CHEMICAL EQUILIBRIUM REVIEW

- *1. Chemical equilibrium \rightarrow two processes (forward and reverse) occurring at the same rate.
- *2. Reaction rates can be increased by:
- 1) Adding a catalyst
 - 2) Increasing the temperature
 - 3) Decreasing the particle size
- *3. Le Chatelier's Principle \rightarrow when a stress is placed on a system, the system will act to relieve the stress and re-achieve equilibrium.
- *4. Changing the volume of a system will result in the opposite change of pressure.
i.e. Decrease volume, increase pressure.
Increase volume, decrease pressure



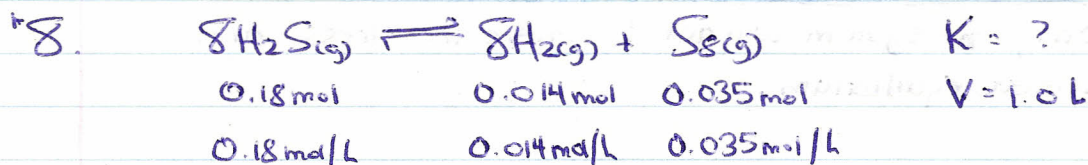
- | | |
|--------------------------------------|-------------|
| a) increase temperature | SHIFT LEFT |
| b) decrease pressure | SHIFT LEFT |
| c) increase $[\text{O}_2(\text{g})]$ | SHIFT RIGHT |
| d) add a catalyst | NO CHANGE |



$$K = \frac{[\text{N}_2\text{O}_4(\text{g})]}{[\text{NO}_2(\text{g})]^2}$$

$$[\text{NO}_2(\text{g})] = \sqrt{5.6 [0.66]}$$

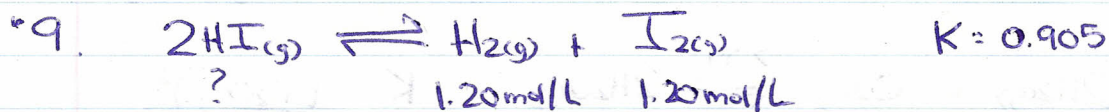
$$[\text{NO}_2(\text{g})] = 1.9 \text{ mol/L}$$



$$K = \frac{[\text{H}_2(\text{g})]^8 [\text{S}_8(\text{g})]}{[\text{H}_2\text{S}(\text{g})]^8}$$

$$K = \frac{[0.014]^8 [0.035]}{[0.18]^8}$$

$$K = 4.7 \times 10^{-11}$$

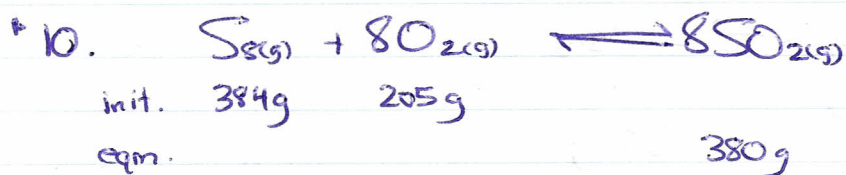


$$K = \frac{[\text{H}_2(\text{g})][\text{I}_2(\text{g})]}{[\text{HI}(\text{g})]^2}$$

$$[\text{HI}(\text{g})]^2 = \frac{[\text{H}_2(\text{g})][\text{I}_2(\text{g})]}{K}$$

$$[\text{HI}(\text{g})] = \sqrt{\frac{[1.20][1.20]}{0.905}}$$

$$[\text{HI}(\text{g})] = 1.26 \text{ mol/L}$$



Final max. product

If S_s is L.R.:

$$384g S_s \times \frac{1 \text{ mol } S_s}{256.48g S_s} \times \frac{8 \text{ mol } SO_2}{1 \text{ mol } S_s} \times \frac{64.06g SO_2}{1 \text{ mol } SO_2} = 767.28g SO_2$$

If O_2 is L.R.

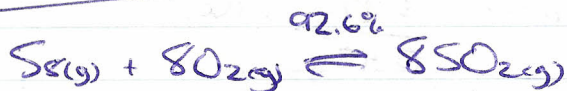
$$205g O_2 \times \frac{1 \text{ mol } O_2}{32.00g O_2} \times \frac{8 \text{ mol } SO_2}{8 \text{ mol } O_2} \times \frac{64.06g SO_2}{1 \text{ mol } SO_2} = 410.38g SO_2$$

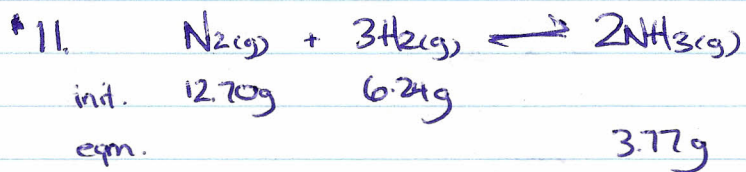
$\therefore O_2$ is L.R.

$$\% \text{ rxn} = \frac{\text{exp}}{\text{theor.}} \times 100\%$$

$$\% \text{ rxn} = \frac{380g}{410.38g} \times 100\%$$

$$\% \text{ rxn} = 92.6\%$$





Find max. product.

If N_2 is L.R.:

$$12.70\text{g N}_2 \times \frac{1\text{ mol N}_2}{28.02\text{g N}_2} \times \frac{2\text{ mol NH}_3}{1\text{ mol N}_2} \times \frac{17.04\text{g NH}_3}{1\text{ mol NH}_3} = \boxed{15.45\text{g NH}_3}$$

If H_2 is L.R.:

$$6.24\text{g H}_2 \times \frac{1\text{ mol H}_2}{2.02\text{g H}_2} \times \frac{2\text{ mol NH}_3}{3\text{ mol H}_2} \times \frac{17.04\text{g NH}_3}{1\text{ mol NH}_3} = 35.09\text{g NH}_3$$

$\therefore \text{N}_2$ is L.R.

$$\% \text{ rxn} = \frac{\text{exp.}}{\text{theor.}} \times 100\%$$

$$\% \text{ rxn} = \frac{3.77\text{g}}{15.45\text{g}} \times 100\%$$

$$\% \text{ rxn} = 24.4\%$$

