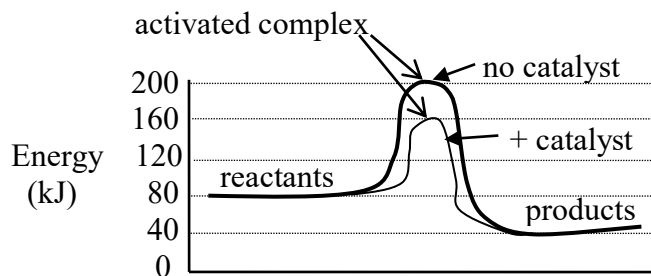


Answers to Chapter 17 Study Questions



2. 1) **concentration of reactants:** Reaction rate increases as concentration of reactants increases because number of collisions increases, making reaction more likely to occur.
 2) **surface area of reactants:** Rate increases as surface area of reactants increases because the greater the area of reactant exposed, the more likely are collisions that will result in product formation.
 3) **temperature:** As temperature increases, rate increases because at higher temperature, a greater proportion of reactant molecules have a kinetic energy greater than the activation energy so a greater proportion of collisions result in product formation.
 4) **catalyst:** Catalysts increase reaction rate by lowering the activation energy.
 5) **inhibitors:** Inhibitors decrease reaction rate by destroying a catalyst, reducing effective surface area or by using up reactant.

3. a) $2 \text{N}_2\text{O}(\text{g}) \rightarrow 2 \text{N}_2(\text{g}) + \text{O}_2(\text{g})$
 b) $\text{N}_2\text{O}(\text{g}) \rightarrow \text{N}_2 + \text{O}$; $\text{N}_2\text{O}(\text{g}) + \text{O} \rightarrow \text{N}_2 + \text{O}_2$
 c) O

4. True: b), c) and d)

5.a) $K = \frac{[\text{N}_2][\text{H}_2\text{O}]^2}{[\text{NO}]^2[\text{H}_2]^2}$; $K = \frac{(0.015)(0.130)^2}{(0.070)^2(0.020)^2} = \frac{(0.015)(0.0169)}{(0.0049)(0.00040)} = \frac{2.5 \times 10^{-4}}{2.0 \times 10^{-6}} = 1.3 \times 10^2 = 130$

b) Since K is greater than 1, the concentration of products is greater than the concentration of reactants; however since K is not extremely large, some reactants will remain at equilibrium.

6. a) $K = \frac{[\text{N}_2\text{O}_4]}{[\text{NO}_2]^2}$ b) $5.0 = \frac{[\text{N}_2\text{O}_4]}{[0.30]^2}$; $[\text{N}_2\text{O}_4] = 5.0 \times (0.30)^2 = 5.0 \times 0.090 = 0.45 \text{ mol/L}$

7. a) more reactant made (since more product added)
 b) more product made (since some product is removed)
 c) more product made (the concentration decreases so counteract by increasing concentration)
 d) more reactant made (to decrease pressure, decrease concentration)
 e) more product made (endothermic reactions use up heat)
 Increase yield: b, c and e (increase product)
 K will increase since increasing the temperature makes more product.

8. a) $K = \frac{[H_2S]}{[H_2]}$; no effect

b) $K = \frac{[NH_3]^2}{[N_2][H_2]^3}$; more product made. Increasing the pressure increases the concentration; counteract this by shifting to the side with fewer moles

c) $K = \frac{[NO]^2}{[N_2][O_2]}$; no effect

d) $K = \frac{[HBr]^2}{[H_2]}$; more reactant made