Rates/Equilibrium : Review-30
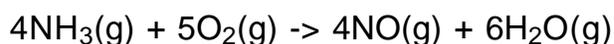
1) Explain in your own words how you would find the reaction rate for a specific reaction.

2) What is the basic premise of collision theory?

3) At high temperatures, ammonia reacts with oxygen to produce nitrogen monoxide and steam :

$$4NH_3(g) + 5O_2(g) \rightarrow 4NO(g) + 6H_2O(g)$$

If the rate of decomposition of $NH_3(g)$ is 1.6×10^{-4} mol/l/s, what is the rate at which oxygen is consumed ?

4) In a given collision, a reaction may or may not occur. Give two reasons why the reaction may not occur.

5) Give three ways to speed up a reaction.

6)   a) Draw a picture of a two step endothermic reaction where the second step is the rate determining step. Label ΔH and the activation energy.

     b) How many activated complexes are there?

     c) What does the Y-axis represent in the diagram?

7) Give three characteristics of a system at equilibrium.

8) State **Le Chatelier's Principle** in your own words.

9) What is the **Haber** process?

10) For the following reaction, state whether the given change will cause the equilibrium to shift; left, right or not at all.

$$BaCO_3(s) + heat \longleftrightarrow BaO(s) + CO_2(g)$$

a) add $BaCO_3(s)$ b) increase T   c) increase P

d) increase volume   e) add BaO(s)

f) add $CO_2(g)$ (constant volume)

11) For the reaction : $H_2(g) + I_2(g) \longleftrightarrow 2HI(g)$

Find the equilibrium concentrations of all species if the initial concentrations are; $[H_2] = 0.20$ M, $[I_2] = 0.20$ M, and [HI]= 0.0. M. K_{eq} = 49.

Answers : 1) Find the rate of change of the mass or volume or pressure of one of the reactants or products., 2) A reaction cannot occur unless the reacting particles collide., 3) 2.0×10^{-4} mol/l/s, 4) insufficient kinetic energy, incorrect collision geometry, 5) increase temperature, increase concentration of reactants, increase the surface area of the reactants, add a catalyst, 6)a)
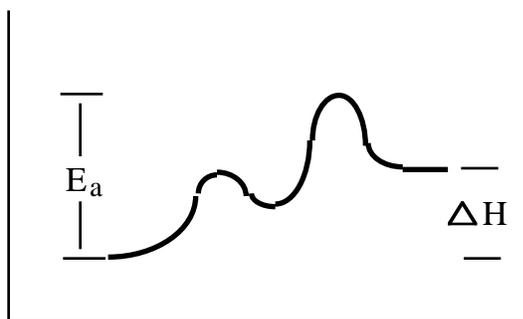
 b) 2, c) potential energy, 7) closed system, forward and reverse reactions occur at the same rate, constant macroscopic conditions (T, P, n), equilibrium can be reached from either direction, 8) If an equilibrium system is subjected to a change, processes occur that will counteract the imposed change as the system reaches a new state of equilibrium., 9) It is a process used to manufacture ammonia using a catalyst, 10)a) n, b) r, c) l, d) r, e) n, f) l, 11) $[H_2] = 0.044$ M, $[I_2]$ = 0.044 M, [HI] = 0.31 M.