

## HW11, chemistry 2

Factors affecting reaction rate:

Concentrations

Pressure (for reactions involving gases)

Surface area of solid reactants

Temperature

Catalysis

Temperature: as the temperature increases, the rate of reaction increases following this equation (every increase by 10 degrees in temperature will increase reaction rate (or rate constant) by 2 to 4 times):

$$k_{t+10} / k_t = \gamma$$

$$\gamma = 2-4$$

$t$  – temperature in C (or K)

Catalysis:

A catalyst is a substance that increases the rate of chemical reaction without being used up, a catalyst acts by allowing the reaction to proceed by alternative pathway with lower activation energy. Metals, oxides, acids can be catalysts, as well as enzymes in biochemical processes.

### Questions:

1. By how much will the rate constant increase if we raise the temperature by 30 degrees, given that  $\gamma$  is equal to 4?
2.  $Mg(s) + 2HCl(aq) \rightarrow MgCl_2 + H_2$

Which of the following will not increase the rate of the reaction:

- a. Increasing the temperature
- b. Increasing the surface area of Mg
- c. Increasing the volume of HCl
- d. Increasing the concentration of HCl

3. The destruction of ozone in the upper atmosphere can be described with this reaction:



The activation energy for uncatalyzed reaction is 14.0 kJ/mol

If we consider the following mechanism:



**NO** is catalyst for the reaction, the activation energy for this reaction 11.9 kJ/mol.

We know that Freons (CCl<sub>2</sub>F<sub>2</sub>) can destroy ozone:



Cl is catalyst for this reaction, E<sub>a</sub> = 2.1 kJ/mol.

Which is the more effective catalyst for the destruction of ozone, NO or Cl?