# CHM 152 Group Work 1 Summer 2009 Crib

1. What is the rate law for this reaction? $H_3BO_3 + 3\ HCl \rightarrow BCl_3 + 3\ H_2O$ ___**rate = $k[H_3BO_3]^x\ [HCl]^y$**

2. If the concentration of a reactant is doubled and the corresponding rate quadruples, what is the order with respect to that reactant? ____**2**_

3. To graphically find the rate constant for a first order reaction you should plot __**ln $A_t$**___ versus time.

4. What is the half-life for a first order reaction if the initial concentration of reactant is 1.25M and after 69.2 seconds the concentration has dropped to 0.955M?

   **Ln (.955 / 1.25) = - $k$ (69.2s)  solve for $k = 3.89 \times 10^{-3}\ s^{-1}$  then $t_{1/2} = .693 / k = 178$ s**

5. What percentage of a sample remains after 5 half lives? __**3.125%**____

6. What is the rate law for a zero order overall reaction? ____**rate = $k$**___

7. If an elementary step has two reactants, what is its molecularity? ___**bimolecular**____

8. The slow step in a mechanism is also called the __**rate determining**__ step.

9. According to the following balanced equation, if the rate of appearance of oxygen gas is $4.00 \times 10^{-2}$ M/s, what is the rate of disappearance of $KClO_3$ (s)? $2\ KClO_3(s) \rightarrow 2\ KCl(s) + 3\ O_2(g)$

   a. **$2.67 \times 10^{-2}$ M/s** b. $6.00 \times 10^{-2}$ M/s c. $2.00 \times 10^{-2}$ M/s d. $3.00 \times 10^{-2}$ M/s e. $5.33 \times 10^{-2}$ M/s

   **$\Delta O_2 / 3\ \Delta t = - \Delta KClO_3 / 2\ \Delta t$  solve for $\Delta KClO_3 / \Delta t$ = choice a**

10. For this reaction: $2NO(g) + Cl_2(g) \rightarrow 2NOCl(g)$ the **real** rate law is rate = $k$ [NO] [$Cl_2$]
    If the following steps are the mechanism, which one must be the rate determining step? __**1**____
    What is the intermediate in this mechanism? __ **$NOCl_2(g)$** ___ What is the overall order? __**2**__

    $NO(g) + Cl_2(g) \rightarrow NOCl_2(g)$ elementary step one
    $NO(g) + NOCl_2(g) \rightarrow 2NOCl(g)$ elementary step two

11. Name one factor that can increase the success of reactant collisions. Explain **how** it increases the reaction rate.

    - **Temp: increase temp, molecules move faster, more collisions so rate increases**
    - **Concentration: increase [ ], more molecules, more collisions so rate increases**
    - **180° angle of impact: more energy, greater chance of surpassing $E_a$, rate increases**

12. What is the reactant concentration after 78.9 seconds for a second order reaction with a half-life of 3.l0 minutes if the initial concentration was 0.555M?

    **$k = 1 / (3.10\text{min})(.555\text{M}) = .581226\ \text{min}^{-1}\text{M}^{-1}$**
    **$1/ A_t = (.581226\ \text{min}^{-1}\text{M}^{-1})(78.9\ \text{s})(\ \text{min}/60\ \text{s}) + 1/.555\text{M}$**
    **$A_t = .390\text{M}$**