Chemistry 12
Some General Reminders and Hints for Unit 1 – Reaction Kinetics

1. Units for rate is always $\frac{amount}{time}$
2. When calculating rates with a balanced equation:
   - Make sure units cancel properly
   - When going from one substance to another **use mole bridge!**
   - If an amount per time of a substance is given use rate = amount/time
   - If they ask for an amount of substance in a given time use amount = rate x time
   - Round answer to correct # of **SD's** and include **units.**

3. For methods of measuring (or monitoring) rates:
   - You **can't** use colour unless you **know** there is a colour change!
   - The **concentrations** of **solids cannot change!**
   - All equations should be in ionic form, so you can find **spectator ions**. Their concentrations do NOT change.
   - Look for moles of gas on **both** sides.
   - If there are **no gases on the left** and **there is gas on the right**, you can measure total pressure in a **closed system**, or volume of the gas produced by collecting in a gas measuring tube. You can also measure change in mass of container and contents in an **open system**.
   - If there are more mog on the right, you can measure increase in total pressure.(closed)
   - If there are more mog on the left, you can measure decrease in total pressure. (closed)
   - You can measure change in concentration of **aqueous ions**. **Be specific! Which ion** are you measuring the concentration of!
   - You **can't** measure the mass of **aqueous** substances.
   - You **can** measure the change in mass of specific **solids**.

4. For factors which **affect** reaction rates. (or ways to change the rate)
   - **ONLY** look at **REACTANTS** !!! (unless asked about **reverse** reaction rate!)
   - If **no gases in reactants**, **pressure** or **volume** will have **NO EFFECT**!
   - When using increase or decrease in concentration, **specify which substance or ion!**
   - When using **surface area**, grind or powder a **specific solid! (say which one!)**
   - If gases in reactants, **increase in pressure** will always **increase** the rate.
   - If gases in reactants, **decrease in volume** will always **increase** the rate.
   - If gases in reactants, **increase in volume** will always **decrease** the rate.
   - If gases in reactants and products **increase in volume** will always **decrease** the rate of both **forward** and **reverse** reactions!
   - Increase in temperature always increases rate (unless denaturing enzyme-rare)
   - Changing **concentration** only works for **aq** or **gases**. **Specify which** substance or ion!!
   - You can usually say "Add a suitable catalyst" to increase rates.

5. Get all the graphs in this unit straight in your mind:
    - Graphs of concentration vs. time for reactants and products
    - Graphs of rate vs. time for reactants and products
    - Kinetic energy distributions (where is KE, # of molecules, Ea, Area under curve)
    - Potential energy diagrams (uncatalyzed and catalyzed rx., forward, reverse rx)
    - Use slope of Amount vs. Time graphs to calculate rate (intervals)
    - Graph of rate vs. Time

6. For PE diagrams:
    - Read the question, are they asking for forward or reverse rx???
    - Are they asking for catalyzed or uncatalyzed or both???
    - Are they asking for Ea or Energy of the Activated Complex (different!)
    - ΔH is just **net difference** in energy between reactants and products. Are they asking for forward or reverse?
    - Ea is always positive
    - Higher PE means more unstable and lower KE
    - Lower PE means more stable and higher KE
    - Lower PE species have stronger bonds

7. For Nature of Reactants affecting rates
    - Look for covalent bonds that need to be broken (CH compounds, diatomic gases)
    - ONLY look at reactants
    - Aqueous reactants with no bonds to break are always fastest
    - Heterogeneous reactions are usually slower (especially with solids)

8. For Reaction Mechanisms:
    - CIA (X-files)
    - Slowest step if RDS
    - Only speeding up slowest step (RDS) will affect overall rate.
    - Don't get overall reaction mixed up with steps
    - Recognize intermediates and catalysts
    - Make sure **atoms** and **charges** are balanced!
    - Formula for Activated Complex in a step-Take all the atoms and charges in reactants and group them all into ONE species! (Use subscripts and charges!)
    - Increasing concentration of a reactant in a step will increase the rate of that step.
    - To find **reactants** and **products**, you must figure out the **overall** reaction!

9.