

## Chemistry 12

### Some General Reminders and Hints for Unit 1 – Reaction Kinetics

1. Units for rate is always  $\frac{\text{amount}}{\text{time}}$
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 mol on the right, you can measure increase in total pressure.(closed)
  - ✓ If there are more mol 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,  $E_a$ , 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  $E_a$  or Energy of the Activated Complex (different!)
  - ✓  $\Delta H$  is just **net difference** in energy between reactants and products. Are they asking for forward or reverse?
  - ✓  $E_a$  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.