**A.P. Chemistry Outline Notes**

***Unit 3: Big Idea #3: Chemical Reactions, Energy Changes, and Redox Reactions***

*Corresponds to “Chapter 5: Electrons in Atoms” & “Chapter 6: The Periodic Table & Periodic Law” from textbook.*

### For the Unit:

1. Unit opening page
   1. Name of unit- Big Idea #3: Chemical Reactions, Energy Changes, and Redox Reactions
   2. Picture

### Each Week:

* Update your table of contents
* Number your pages
* Write neatly

1. I can identify chemical reactions v physical changes based on observations
   1. Write I can statement
   2. Describe evidence of a chemical reaction
   3. Draw an example of a chemical reaction
   4. Draw on the smallest scale possible an example of a physical change
   5. Describe evidence of a physical change
   6. Draw an example of a physical change
   7. Draw on the smallest scale possible an example of a chemical change
2. I can identify and classify chemical equations (synthesis, decomposition, precipitation, acid-base, oxidation-reduction (redox), and combustion)
   1. Write I can statement
   2. For a synthesis reaction
      1. Draw a picture
      2. Give the defining characteristics of a synthesis reaction
      3. Write a balanced synthesis reaction
      4. Use a particulate drawing to illustrate this reaction
   3. For a decomposition reaction
      1. Draw a picture
      2. Give the defining characteristics of a decomposition reaction
      3. Write a balanced decomposition reaction
      4. Use a particulate drawing to illustrate this reaction
   4. For an acid-base reaction
      1. Draw a picture
      2. Give the defining characteristics of an acid-base reaction
      3. Write a balanced acid-base reaction
      4. Use a particulate drawing to illustrate this reaction.
   5. For an oxidation-reduction reaction (redox)
      1. Draw a picture
      2. Give the defining characteristics of a redox reaction
      3. Write a balanced redox reaction
      4. Use a particulate drawing to illustrate this reaction
   6. For a combustion reaction
      1. Draw a picture
      2. Give the defining characteristics of a combustion reaction
      3. Write a balanced combustion reaction
      4. Use a particulate drawing to illustrate this reaction
   7. For a precipitation reaction
      1. Draw a picture
      2. Give the defining characteristics of a precipitation reaction
      3. Write a balanced precipitation reaction
      4. Use a particulate drawing to illustrate this reaction
3. I can write chemical reactions as molecular, ionic, or net ionic equation and as particulate drawings
   1. Write I can statement
   2. For a molecular equation:
      1. Define a molecular equation and describe instances when it is preferred
      2. Give an example of a molecular equation, including state functions
      3. Use a particulate drawing to illustrate a reaction happening in air, being sure to maintain conservation of mass
   3. For an ionic equation
      1. Define an ionic equation and describe instances when it is preferred
      2. Give an example of a molecular equation, including state functions
   4. For a net ionic equation
      1. Define net ionic equation and describe instances when it is preferred
      2. Define spectator ion
      3. Give an example of a net ionic equation, including state functions
   5. Use a particulate drawing to illustrate a reaction in solution, labeling the spectator ions and writing the balanced net ionic equation, being sure to maintain conservation of mass
4. I can apply basic solubility rules
   1. Write I can statement
   2. Draw an illustration
   3. Define soluble
   4. Write the names and formulas, and charges of ions that are always soluble
5. I can apply Coulomb’s Law to describe the interactions between ions and solvents to explain the solubility of ionic compounds.
   1. Write I can statement
   2. Write Coulomb’s Law
   3. Describe how charge of ions contributes to an ion’s solubility in water.
   4. Give an example of a soluble ion and insoluble solid that support your description in c.
   5. Draw a picture of the dissolving of a substance at the particulate level.
6. I can use stoichiometry to analyze reactant and product quantities
   1. Write I can statement
   2. Amount of product produced
      1. Draw an illustration
      2. Write a balanced reaction and do a moles to moles conversion for that reaction
      3. Write a balanced reaction and do a mass to mass conversion for that reaction
   3. Amount of reactant consumed
      1. Write the steps to determine how much reactant will be consumed
      2. Write a balanced reaction and determine how many grams of reactant will be consumed to make 10 grams of one of the products.
   4. Limiting and excess reactant
      1. Define limiting reactant
      2. Define excess reactant
      3. Draw an illustration
      4. Write the steps for determining a limiting reactant
      5. Do an example problem to solve for a limiting reactant
      6. Write the steps for determining how much excess reactant remains after a reaction
      7. Do an example problem to solve for how much excess reactant remains after a reaction
7. I can use gravimetric analysis to determine the concentration of an analyte in a solution or evaluate the purity of a substance.
   1. Write I can statement
   2. Explain what gravimetric analysis is.
   3. Describe the types of reactions that gravimetric analysis is used for
   4. Write the formula to determine the percent by mass of a compound in a particular substance
   5. Show your work and write out the steps used to solve “Purity Problem #1” (you may tape the question into your book)
   6. Show your work and write out the steps used to solve “Gravimetric Analysis Problem #1” (you may tape the question into your book)
8. I can relate energy change in a reaction to bond breaking and bond forming
   1. Write I can statement
   2. Define and explain the rules of enthalpy.
   3. Write the formula for calculating enthalpy based on bond energy
   4. Do an example problem, showing the Lewis structures for the molecules reacting/produced
9. I can illustrate energy changes using graphs and energy profiles
   1. Write I can statement
   2. Draw a chart showing the difference between endothermic and exothermic reaction in terms of
      1. Energy absorbed or released
      2. An energy profile for an endothermic reaction, labeling products, reactants, activated complex, activation energy, and enthalpy
      3. Heating/cooling surroundings
      4. Bond energy of reactants/products
      5. Enthalpy of formation for reactants/products
      6. Real world example
10. I can identify the purpose of a catalyst in a reaction
    1. Write I can statement
    2. Define catalyst ad describe its effect on a reaction mechanism.
    3. Write an example mechanism and identify a catalyst and its changes to the mechanism.
11. I can identify and balance the transfer of electrons in oxidation-reduction (redox) reactions
    1. Write I can statement
    2. Define reduction
    3. Define oxidation
    4. Define oxidation numbers
    5. List the rules for assigning oxidation numbers
    6. Balance a redox reaction in acidic solution, showing and labeling each step of the process.
    7. Balance a redox reaction in basic solution, showing and labeling each step of the process.
12. I can use standard electrode potential to calculate cell potential (cell voltage)
    1. Write I can statement
    2. Define standard electrode potential and give its units
    3. Relate standard electrode potential to electron affinity/ionization energy (relate to size and energy levels)
    4. State the conditions that standard electrode potentials are measured under
    5. Explain what is meant by a high v low electrode potential
    6. Define cell potential (voltage)
    7. Explain how to tell which substances are more likely to be reduced or oxidized
    8. Show how to calculate cell potential (voltage) for a balanced redox reaction
13. I can describe and identify a galvanic cell
    1. Write I can statement
    2. Explain how to identify an oxidation-reduction reaction
    3. Draw a diagram (picture) of the apparatus needed in an electrochemical cell
       1. Label the cathode and its solution
       2. Label the anode and its solution
       3. Write and label the oxidation reaction occurring, and its electrode potential
       4. Write and label the reduction reaction occurring, and its electrode potential
       5. Show the flow of electrons
       6. Label the salt bridge
    4. Explain the difference between the anode and the cathode, including mass changes, what is formed, the type of reaction, relative value of the reduction potentials, flow of electrons, and examples of reactions.
    5. Explain what a salt bridge is and its purpose
    6. Explain how to tell which reaction occurs at the anode and which reaction occurs at the cathode
14. I can describe and identify an electrolytic cell
    1. Write I can statement
    2. Define electrolysis
    3. Give three real world examples of electrolysis
    4. Draw a diagram (picture) of the apparatus commonly used in a galvanic cell
       1. Label the cathode
       2. Label the anode
15. I can compare and contrast the two different types of chemical cells: galvanic and electrolytic
    1. Write I can statement
    2. Explain the difference between a galvanic and electrolytic cell in terms of
       1. Energy/electricity use
       2. Set-up
       3. Cell potential
16. I can perform calculations related to electrolysis
    1. Write I can statement
    2. Define Faraday’s constant, its variable, its value, and its units
    3. Define current and give it’s units
    4. Do an example problem calculating mass based on a balanced redox reaction, current, and time
    5. Do an example problem calculating current based on a balanced redox reaction, current, and time

**Review:**

* “Cracking the AP Chemistry Exam”-Chapter 5
  + Multiple Choice Questions
  + Free Response Questions
* PowerPoint Notes
* Entry Slip Questions
* Science Notebooks