Unit 3: Chemical Reactions Review

This review is intended to help you study for the test. It does not replace your notes, nor does it completely replicate everything you have covered in this section.

Topic	Learning Outcomes	Reading Assignment
Chemical Reactions and Equations	It is expected that students will: • define reactants and products • observe and record changes that occur during a chemical reaction • describe chemical reactions in terms of the rearrangement of the atoms as bonds are broken and new bonds are formed • gather experimental data that lead to the law of conservation of mass • apply the law of conservation of mass to a formula equation of a reaction to demonstrate that atoms are conserved in the reaction • balance formula equations of several chemical reactions • use subscripts to represent solids, liquids, gases, and aqueous solutions • classify, predict products, and write balanced equations for the following types of chemical reactions: synthesis decomposition single replacement double replacement combustion acid-base neutralization • define exothermic and endothermic reactions • classify reactions as exothermic or endothermic based on observations • relate energy changes to bond breaking and formation • write equations for chemical reactions including the energy term	Ch. 9-1 to 9-3 Ch. 12-1 and 12-2

1. Describe what happens to bonds during a chemical reaction. Be specific about the energy requirements of each step.
2. What is the name for $(NH_4)_2SO_4$? What is the name for C_4O_6?
3. What are the formulas for trinitrogen pentoxide and copper (I) sulphate.
4. What are the formulas for the 5 acids you need to memorize?
5. Which elements form diatomic molecules when they are by themselves?
6. How do we **show** that a chemical reactant or product is dissolved in water in a chemical equation?
7. Write and Balance a bunch of reactions. You have lots to try.
8. What are the 5 types of reactions you must know? How do you recognize each?
9. What is the difference between a cationic and anionic single replacement (SR) reaction?
10. How can you tell if an element and a compound will actually react in a SR rxn?
11. Predict the products of a bunch of reactions. You have lots to try.

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12. Describe how you could tell if a compound will dissolve in water. Will PbI_2 dissolve in water or form a precipitate? What about CuI_2?
13. Draw a potential energy diagram for a rxn with $\Delta H = -145$ kJ. Label the ΔH. Is it exo or endothermic? Would your hand feel hot or cold if you were holding the beaker this rxn took place in?
14. A reaction causes your hand to feel very cold. Is the reaction exo or endothermic? Draw the PE diagram. What is happening to the energy of the chemicals as the reaction proceeds from reactants to products?
15. For each of the following, identify the type of reaction, predict the products and write a complete chemical reaction. You must write the phases, and write the energy term on the correct side of the equation.
    a) Solid aluminum sulphate and dissolved barium nitrate react, giving off heat to the surroundings.
    b) Dissolved potassium hydroxide is mixed with phosphoric acid, causing an exothermic reaction.
    c) Magnesium is placed in a solution of dissolved nickel (III) nitrate. This reaction absorbs energy (not really- but it's good practice).

Chemical Reaction Review Answers

Reactions

1. Describe what happens to bonds during a chemical reaction.
   Energy is absorbed to break the reactant bonds and energy is released when the product bonds form.

2. What is the name for $(NH_4)_2SO_4$? Ammonium sulphate
   What is the name for C_4O_6? Tetracarbon hexoxide

3. What are the formulas for trinitrogen pentoxide and copper (I) sulphate? N_3O_5 and Cu_2SO_4

4. What are the formulas for the 5 acids you need to memorize?
   HCl, H_3PO_4, HNO_3, H_2SO_4, and CH_3COOH Know their names as well!

5. Which elements form diatomic molecules when they are by themselves?
   H,O,F,Br,I,N,Cl

6. How do we <u>show</u> that a chemical reactant or product is dissolved in water in a chemical equation? **Use the symbol (aq) = aqueous**

7. Write and Balance a bunch of reactions. You have lots to try. **This is a big one!**

8. What are the 5 types of reactions you must know? How do you recognize each?
   See the chart provided in the notes and the WS in the workbook

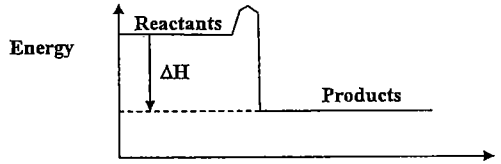
9. What is the difference between a cationic and anionic single replacement (SR) reaction?
   In a CSR, a metal replaces the cation in a compound. In an ASR, a non-metal relaces the anion in the compound.

10. How can you tell if an element and a compound will <u>actually react</u> in a SR rxn?
    Check the reactivity table in the data booklet. If the element is more reactive then the cation or anion in the compound, then the SR reaction will occur.

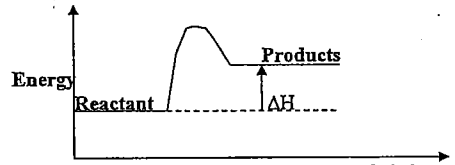
11. Predict the products of a bunch of reactions. You have lots to try.

12. Describe how you could tell if a compound will dissolve in water. Will PbI_2 dissolve in water or form a precipitate?
    Use the Solubility of Common Compounds in Water chart from the Data booklet. Low solubility compounds do not dissolve in water. PbI_2 will form a precipitate. Copper (II) in the CuI_2 is soluble however- it is Copper (I) which isn't.

13. Draw a potential energy diagram for a rxn with $\Delta H = -145$ kJ. Is it exo or endothermic? Would your hand feel hot or cold if you were holding the beaker this rxn took place in?
    If is exothermic, and your hand would feel hot.



14. A reaction causes your hand to feel very cold. Is the reaction exo or endothermic? Draw the PE diagram. What is happening to the energy of the chemicals as the reaction proceeds from reactants to products?
    Endothermic



The energy of the chemicals is increasing as you move from reactants to products.

15. For each of the following, identify the type of reaction, predict the products and write a complete chemical reaction. You must write the phases, and write the energy term on the correct side of the equation.
    a. Solid aluminum sulphate and dissolved barium nitrate react, giving off heat to the surroundings. **Double replacement**
    $Al_2(SO_4)_3$ (s) + 3 $Ba(NO_3)_2$ (aq) → 2 $Al(NO_3)_3$ (aq) + 3 $BaSO_4$ (s) + heat

    b. Dissolved potassium hydroxide is mixed with phosphoric acid, causing an exothermic reaction. **Neutralization**
    3 KOH (aq) + H_3PO_4 (aq) → 3 H_2O (l) + K_3PO_4 (aq) + heat

    c. Magnesium is placed in a solution of dissolved nickel (III) nitrate. This reaction absorbs energy (not really- but it's good practice)
    Cationic single replacement.
    3 Mg (s) + 2 $Ni(NO_3)_3$ (aq) + heat → 2 Ni (s) + 3 $Mg(NO_3)_2$ (aq)