Chemical Reactions Practice Test

1. All the following are clues that a chemical reaction has taken place *except*
   A. a color change
   B. a solid forms
   C. the reactant is smaller
   D. a flame occurs
   E. bubbles form

2. How many of the following statements are true concerning chemical equations?
   I. Coefficients can be fractions.
   II. Subscripts can be fractions.
   III. Coefficients represent the relative masses of the reactants and/or products.
   IV. Changing the subscripts to balance an equation can only be done once.
   V. Atoms are conserved when balancing chemical equations.
   A. 3
   B. 5
   C. 1
   D. 4
   E. 2

3. Balance the following equation for the reaction where hydrogen sulfide gas burns in oxygen gas to form gaseous water and sulfur dioxide gas.
   $H_2S(g) + O_2(g) \rightarrow SO_2(g) + H_2O(g)$

When the following equations are balanced using the smallest possible integers, what is the number in front of the underlined substance in each case?

4. $Mg(s) + HCl(aq) \rightarrow MgCl_2(aq) + \underline{H_2(g)}$
   A. 2
   B. 4
   C. 1
   D. 3
   E. 5

5. $HCl(aq) + Mg(OH)_2(aq) \rightarrow \underline{MgCl_2(aq)} + H_2O(l)$
   A. 1
   B. 2
   C. 4
   D. 5
   E. 3

6. Determine the coefficient for O_2 when the following equation is balanced in standard form (smallest whole number integers).
   $C_4H_{10}(g) + O_2(g) \rightarrow CO_2(g) + H_2O(g)$
   A. 4
   B. 13
   C. 20
   D. 10
   E. 8

7. Balance the equation
   $MgCl_2 + K_3PO_4 \rightarrow Mg_3(PO_4)_2 + KCl$

8. Balance the equation
   $Ba(OH)_2(aq) + H_3PO_4(aq) \rightarrow Ba_3(PO_4)_2(aq) + H_2O(l)$

9. Balance the equation for the reaction of potassium metal with water to form potassium hydroxide and hydrogen gas.

10. Balance the equation for the reaction of calcium metal with oxygen gas to produce solid calcium oxide.

11. The most common factors that cause chemical reactions to occur are all the following *except*
    A. formation of a solid
    B. formation of a gas
    C. formation of water
    D. a decrease in temperature
    E. transfer of electrons

12. A substance that, when dissolved in water, produces a solution that conducts electric current very efficiently is called
    A. an electrical solute
    B. a strong ion
    C. a strong electrolyte
    D. a weak electrolyte
    E. None of the above

13. When a precipitation reaction occurs, the ions that do not form the precipitate
    A. form a second insoluble compound in the solution
    B. are left dissolved in the solution
    C. evaporate
    D. are cations only
    E. None of the above

Identify the solid product that forms when the following aqueous solutions are mixed:

14. $Na_2CrO_4(aq) + BaCl_2(aq) \rightarrow$
    A. $BaCrO_4$
    B. $Ba(CrO_4)_2$
    C. NaCl
    D. None forms.
    E. Na_2Cl

15. $Na_2S(aq) + AgNO_3(aq)$ -->
    A. Ag_2S
    B. $S(NO_3)_2$
    C. $NaNO_3$
    D. AgNa
    E. None forms.

16. Complete and write the balanced molecular equation for the following: An aqueous solution of magnesium chloride is added to an aqueous solution of silver nitrate.

17. When a metal and a nonmetal react, the metal _____ electrons and the nonmetal _____ electrons.

18. A reaction that involves a transfer of electrons is called a(n) _____ reaction.
    A. acid-base
    B. oxidation-reduction
    C. double-displacement
    D. precipitation
    E. None of the above

Use the following choices to classify each reaction given below (more than one choice may apply).

A. oxidation-reduction
B. acid-base
C. precipitation

19. $ZnBr_2(aq) + 2AgNO_3(aq) \rightarrow Zn(NO_3)_2(aq) + 2AgBr(s)$

20. $HNO_3(aq) + NaOH(aq) \rightarrow H_2O(l) + NaNO_3(aq)$

21. $Zr(s) + O_2(g) \rightarrow ZrO_2(s)$

Use the following choices to classify each of the following reactions (more than one choice may apply).

A. oxidation-reduction
B. combustion
C. synthesis
D. decomposition

22. $2Na(s) + H_2(g) \rightarrow 2NaH(s)$

23. $C_3H_8(g) + 5O_2(g) \rightarrow 3CO_2(g) + 4H_2O(g)$

24. $2H_2O(l) \rightarrow 2H_2(g) + O_2(g)$

25. $2Cs(s) + F_2(g) \rightarrow 2CsF(s)$

Answer Sheet

1. **C.** the reactant is smaller
2. **E.** 2
3. $2H_2S(g) + 3O_2(g) \rightarrow 2SO_2(g) + 2H_2O(g)$
4. **C.** 1
5. **A.** 1
6. **B.** 13
7. $3MgCl_2 + 2K_3PO_4 \rightarrow Mg_3(PO_4)_2 + 6\ KCl$
8. $3Ba(OH)_2(aq) + 2H_3PO_4(aq) \rightarrow Ba_3(PO_4)_2(aq) + 6H_2O(l)$
9. $2K(s) + H_2O(l) \rightarrow 2KOH(aq) + H_2(g)$
10. $2Ca(s) + O_2(g) \rightarrow 2CaO(s)$
11. **D.** a decrease in temperature
12. **C.** a strong electrolyte
13. **B.** are left dissolved in the solution
14. **A.** $BaCrO_4$
15. **A.** Ag_2S
16. $MgCl_2(aq) + 2AgNO_3(aq) \rightarrow 2AgCl(s) + Mg(NO_3)_2(aq)$
17. loses; gains
18. **B.** oxidation-reduction
19. **C.** precipitation
20. **B.** acid-base
21. **A.** oxidation-reduction
22. **A.** oxidation-reduction
    C. synthesis
23. **A.** oxidation-reduction
    B. combustion
24. **A.** oxidation-reduction
    D. decomposition
25. **A.** oxidation-reduction
    C. synthesis

Standards Summary

CA 2.a	Students know atoms combine to form molecules by sharing electrons to form covalent or metallic bonds or by exchanging electrons to form ionic bonds.
CA 3.a	Students know how to describe chemical reactions by writing balanced equations.
CA 3.g*	Students know how to identify reactions that involve oxidation and reduction and how to balance oxidation-reduction reactions.
CA 5.a	Students know the observable properties of acids, bases, and salt solutions.
NSES B.2.3	Bonds between atoms are created when electrons are paired up by being transferred or shared. A substance composed of a single kind of atom is called an element. The atoms may be bonded together into molecules or crystalline solids. A compound is formed when two or more kinds of atoms bind together chemically.
NSES B.2.4	The physical properties of compounds reflect the nature of the interactions among its molecules. These interactions are determined by the structure of the molecule, including the constituent atoms and the distances and angles between them.
NSES B.3.1	Chemical reactions occur all around us, for example in health care, cooking, cosmetics, and automobiles. Complex chemical reactions involving carbon-based molecules take place constantly in every cell in our bodies. [See Content Standard C (grades 9-12)]
NSES B.3.3	A large number of important reactions involve the transfer of either electrons (oxidation/reduction reactions) or hydrogen ions (acid/base reactions) between reacting ions, molecules, or atoms. In other reactions, chemical bonds are broken by heat or light to form very reactive radicals with electrons ready to form new bonds. Radical reactions control many processes such as the presence of ozone and greenhouse gases in the atmosphere, burning and processing of fossil fuels, the formation of polymers, and explosions.