CHAPTER 8 REVIEW

Chemical Equations and Reactions

Teacher Notes and Answers

Chapter 8
SECTION 1

SHORT ANSWER
1. a. d
   b. a
   c. b
   d. f
   e. e
   f. c
2. 8, 4, 9
3. a. 12 atoms
   b. 16 atoms
   c. 51 atoms
   d. $3 \times 10^{24}$ atoms
4. $2\text{Al(s)} + 3\text{CuF}_2(\text{aq}) \rightarrow 2\text{AlF}_3(\text{aq}) + 3\text{Cu(s)}$
5. $\text{NaCl(}\text{aq}) + \text{AgNO}_3(\text{aq}) \rightarrow \text{AgCl(}\text{s}) + \text{NaNO}_3(\text{aq})$
6. 2\text{NaHCO}_3(\text{s})$\rightarrow\Delta\rightarrow \text{Na}_2\text{CO}_3(\text{s}) + \text{H}_2\text{O(}\text{g}) + \text{CO}_2(\text{g})$
   b. When solid sodium hydrogen carbonate (bicarbonate) is heated, it decomposes into solid sodium carbonate while releasing carbon dioxide gas and water vapor.
7. It is balanced but incorrect. In two of the formulas the subscripts were changed, which changed the compounds involved.
   Water is not H$_3$O, and sodium hydroxide is not Na$_2$OH. The correct balanced equation is $2\text{NaOH(}\text{l}) + \text{H}_2\text{S(}\text{}\text{l}) \rightarrow \text{Na}_2\text{S(}\text{s}) + 2\text{H}_2\text{O(}\text{l})$.
8. a. 30 mol
   b. 40 mol

SECTION 2

SHORT ANSWER
1. a. c
   b. d
   c. b
   d. a
2. c
3. a
4. b
5. a. its separate elements
   b. metal oxide + water
   c. metal oxide + carbon dioxide
   d. water + sulfur dioxide
6. CO$_2$, H$_2$O
7. a. single-displacement; Cl$_2$(aq) + 2NaI(aq) $\rightarrow$ I$_2$(aq) + 2NaCl(aq)
   b. synthesis; 3Mg(s) + N$_2$(g) $\rightarrow$ Mg$_3$N$_2$(s)
   c. double-displacement; Co(NO$_3$)$_2$(aq) + H$_2$S(aq) + CoS(s) + 2HNO$_3$(aq)
   d. combustion; C$_2$H$_5$OH(aq) + 3O$_2$(g) $\rightarrow$ 2CO$_2$(g) + 3H$_2$O(l)
8. a. 2C$2$H$_2$(g) + 5O$_2$(g) $\rightarrow$ 4CO$_2$(g) + 2H$_2$O(l)
   b. 2.0 mol
   c. 2.5 mol
9. a. BaCl$_2$(aq) + Na$_2$CO$_3$(aq) $\rightarrow$ BaCO$_3$(s) + 2NaCl(aq)
   b. double-displacement
10. 2Al$_2$O$_3$(l) $\rightarrow$ 4Al(s) + 3O$_2$(g)

SECTION 3

SHORT ANSWER
1. Choose from Cu, Ag, Au, Pt, Sb, Bi, and Hg.
2. Fe forms an oxide in nature, and Ag does not, because it is much less active.
3. a. F$_2$
   b. K
   c. H
4. a. $2\text{Al(s)} + 6\text{CH}_3\text{COOH(aq)} \rightarrow 50^\circ\text{C} \rightarrow \text{Al(CH}_3\text{COO)}_3(\text{aq}) + 3\text{H}_2(\text{g})$
   b. no reaction
   c. $2\text{Cr(s)} + 3\text{CdCl}_2(\text{aq}) \rightarrow 2\text{CrCl}_3(\text{aq}) + 3\text{Cd}\text(s)$
   d. no reaction
5. a. Ca(s) + 2H$_2$O(\text{l}) $\rightarrow$ Ca(OH)$_2$(aq) + H$_2$(g)
   b. Both are alkali metals and readily form a stable 1+ ion by ejecting an s$^1$ electron.
   Rb has a larger radius than Na and holds its electron less tightly, making it more reactive.
6. Gold has a low reactivity and therefore does not corrode over time.

7. In single-displacement reactions, if the activity of the free element is greater than that of the element in the compound, the reaction will take place.

8. Yes; because aluminum is above copper in the activity series, aluminum metal will replace copper in copper(II) nitrate.
   \[2\text{Al}(s) + 3\text{Cu(NO}_3\text{)}_2(aq) \rightarrow 2\text{Al(NO}_3\text{)}_3(aq) + 3\text{Cu}(s)\]