Name: _____

Homework was checked against the key with wrong answers corrected.

Parent Signature: _____

Chapter 9.1-9.2: Stoichiometry

Each numbered question is worth 1 point except as noted. Total possible = 22 points.

Section 9.1

3. Interpret the equation for the formation of water from its elements in terms of (a) numbers of molecules, (b) numbers of moles, and (c) volumes of gases at STP. (1.5)

$2\ H_2(g) + O_2(g) \rightarrow 2\ H_2O(g)$

a.

b.

c.

4. Balance the equation for the combustion of acetylene:
___$C_2H_2(g)$ + ___$O_2(g)$ → ___$CO_2(g)$ + ___$H_2O(g)$

Then, interpret the equation in terms of (a) relative numbers of moles, (b) volumes of gases at STP, and (c) masses of reactants and products. (0.5 pts each for (a) and (b), 1 pt for (c))

a.

b.

c.

6. Balance this equation: ___$C_2H_5OH(l)$ + ___$O_2(g)$ → ___$CO_2(g)$ + ___$H_2O(g)$.

a. Interpret the equation in terms of numbers of molecules and numbers of moles. (1)

b. Show that the balanced equation obeys the law of conservation of mass. (2)

8. Interpret the following equation in terms of (a) relative numbers of representative particles (atoms, molecules, or formula units), (b) numbers of moles, and (c) masses of reactants and products. (0.5 pts each for (a) and (b), 1 pt for (c))

$2\ K(s) + 2\ H_2O(l) \rightarrow 2\ KOH(aq) + H_2(g)$

a.

b.

c.

Section 9.2

9. This equation shows the formation of aluminum oxide: $4\ Al(s) + 3\ O_2(g) \rightarrow 2\ Al_2O_3(s)$

a. write out the six mole ratios that can be derived from this equation. (1)

_____ _____ _____ _____ _____ _____

b. How many moles of aluminum are needed to form 3.7 mol Al_2O_3? (0.5)

10. According to the equation in Problem 9:

a. How many moles of oxygen are required to react completely with 14.8 mol Al?

b. How many moles of Al_2O_3 are formed when 0.78 mol O_2 reacts with aluminum?

11. Acetylene gas (C_2H_2) is produced by adding water to calcium carbide (CaC_2).

$CaC_2(s) + 2\ H_2O(l) \rightarrow C_2H_2(g) + Ca(OH)_2(aq)$

How many grams of acetylene are produced by adding water to 5.00 g of CaC_2?

12. Using the same equation from Problem #11, determine how many moles of CaC_2 are needed to react completely with 49.0 g H_2O.

13. How many molecules of oxygen are produced by the decomposition of 6.54 g of potassium chlorate ($KClO_3$)?

$2\ KClO_3(s) \rightarrow 2\ KCl(s) + 3\ O_2(g)$

14. The last step in the production of nitric acid is the reaction of nitrogen dioxide with water:

$3\ NO_2(g) + H_2O(l) \rightarrow 2\ HNO_3(aq) + NO(g)$

How many grams of nitrogen dioxide must react with water to produce 5.00×10^{22} molecules of nitrogen monoxide?

15. The equation for the combustion of carbon monoxide is:

$2\ CO(g) + O_2(g) \rightarrow 2\ CO_2(g)$

How many liters of oxygen are required to burn 3.86 L of carbon monoxide?

16. Phosphorus and hydrogen can be combined to form phosphine (PH_3):

$P_4(s) + 6\ H_2(g) \rightarrow 4\ PH_3(g)$

How many liters of phosphine are formed when 0.42 L of hydrogen reacts with phosphorus?

17. Consider this equation:

$CS_2(l) + 3\ O_2(g) \rightarrow CO_2(g) + 2\ SO_2(g)$

Calculate the volume of sulfur dioxide produced when 27.9 mL O_2 reacts with carbon disulfide.

18. From the equation in Problem 17, calculate the number of deciliters of carbon dioxide produced when 0.38 L SO_2 is formed.

19. Isopropyl alcohol (C_3H_7OH) burns in air according to this equation:

$2\ C_3H_7OH(l) + 9\ O_2(g\ ) \rightarrow 6\ CO_2(g) + 8\ H_2O(g)$

a. Calculate the moles of oxygen needed to react with 3.40 mol C_3H_7OH. (0.5)

b. Find the moles of each product formed when 3.40 mol C_3H_7OH reacts with oxygen. (1)

22. Tin(II) fluoride, formerly found in many kinds of toothpaste, is formed in this reaction:

$Sn(s) + 2\ HF(g) \rightarrow SnF_2(s) + H_2(g)$ (1.5 pts)

a. How many liters of HF are needed to produce 9.40 L of H_2 at STP?

b. How many molecules of H_2 are produced by reaction of tin with 20.0 L HF at STP?

c. How many grams of SnF_2 can be made by reacting 7.42×10^{24} molecules of HF with tin?