ANSWER KEY

EXTRA PRACTICE: Stoichiometry Practice (#11-20) Name:_____ Date:_____

For each problem, write the chemical equation first, balance, and then solve. Show ALL of your work for full credit.

11. How many molecules of nitrogen monoxide will react with 14.0 molecules of oxygen to produce nitrogen dioxide?

$2\,NO + 1\,O_2 \rightarrow 2\,NO_2$

$$\frac{14.0\text{ molecule } O_2}{1}\left|\frac{1\text{ mol } O_2}{6.02E23\text{ molecule } O_2}\right|\frac{2\text{ mol NO}}{1\text{ mol } O_2}\left|\frac{6.02E23\text{ molecule NO}}{1\text{ mol NO}}\right| = \boxed{28.0\text{ molecule NO}}$$

12. Magnesium chloride and hydrogen gas are produced in a single-replacement reaction. How many moles of magnesium are reacted with 2.80 moles of hydrochloric acid in this reaction?

$1\,Mg + 2\,HCl \rightarrow 1\,MgCl_2 + 1\,H_2$

$$\frac{2.80\text{ mol HCl}}{1}\left|\frac{1\text{ mol Mg}}{2\text{ mol HCl}}\right| = \boxed{1.40\text{ mol Mg}}$$

13. How many grams of sulfuric acid are required to react completely with 15.0 grams of zinc metal in a single replacement reaction that produces zinc sulfate and hydrogen gas?

$1\,H_2SO_4 + 1\,Zn \rightarrow 1\,ZnSO_4 + 1\,H_2$

$$\frac{15.0\text{ g Zn}}{1}\left|\frac{1\text{ mol Zn}}{65.39\text{ g Zn}}\right|\frac{1\text{ mol } H_2SO_4}{1\text{ mol Zn}}\left|\frac{98.076\text{ g } H_2SO_4}{1\text{ mol } H_2SO_4}\right| = \boxed{22.5\text{ g } H_2SO_4}$$

14. In a combustion reaction, how many moles of carbon dioxide are produced in the burning of 46.8 grams of butane, C_4H_{10}, in the presence of oxygen?

$2\,C_4H_{10} + 13\,O_2 \rightarrow 8\,CO_2 + 10\,H_2O$

$$\frac{46.8\text{ g } C_4H_{10}}{1}\left|\frac{1\text{ mol } C_4H_{10}}{58.12\text{ g } C_4H_{10}}\right|\frac{8\text{ mol } CO_2}{2\text{ mol } C_4H_{10}} = \boxed{3.22\text{ mol } CO_2}$$

15. How many molecules of oxygen are needed to react with 37.5 moles of sulfur dioxide in order to produce sulfur trioxide?

$1\,O_2 + 2\,SO_2 \rightarrow 2\,SO_3$

$$\frac{37.5\text{ mol } SO_2}{1}\left|\frac{1\text{ mol } O_2}{2\text{ mol } SO_2}\right|\frac{6.02E23\text{ molecule } O_2}{1\text{ mol } O_2} = \boxed{1.13E25\text{ molecule } O_2}$$

16. Sodium Chlorate decomposes into sodium chloride and oxygen gas. How many grams of sodium chloride are produced from 10.5 grams of sodium chlorate?

$$2\ NaClO_3 \rightarrow 2\ NaCl + 3\ O_2$$

$$\frac{10.5\text{ g } NaClO_3}{1} \left| \frac{1\text{ mol } NaClO_3}{106.44\text{ g } NaClO_3} \right| \frac{2\text{ mol } NaCl}{2\text{ mol } NaClO_3} \left| \frac{58.44\text{ g } NaCl}{1\text{ mol } NaCl} \right| = \boxed{5.76\text{ g } NaCl}$$

17. How many grams of potassium chloride are produced from a synthesis reaction of 2.50 grams of potassium metal and chlorine gas?

$$2\ K + 1\ Cl_2 \rightarrow 2\ KCl$$

$$\frac{2.50\text{ g } K}{1} \left| \frac{1\text{ mol } K}{39.10\text{ g } K} \right| \frac{2\text{ mol } KCl}{2\text{ mol } K} \left| \frac{74.55\text{ g } KCl}{1\text{ mol } KCl} \right| = \boxed{4.77\text{ g } KCl}$$

18. In the production of zinc chloride and hydrogen gas, how many moles of hydrogen gas are produced from the reaction of 3.00 grams of zinc metal and hydrochloric acid?

$$1\ Zn + 2\ HCl \rightarrow 1\ ZnCl_2 + 1\ H_2$$

$$\frac{3.00\text{ g } Zn}{1} \left| \frac{1\text{ mol } Zn}{65.39\text{ g } Zn} \right| \frac{1\text{ mol } H_2}{1\text{ mol } Zn} = \boxed{0.0459\text{ mol } H_2}$$

19. In a combustion reaction of propane, C_3H_8, how many grams of carbon dioxide are produced if 20.0 molecules of oxygen are consumed?

$$1\ C_3H_8 + 5\ O_2 \rightarrow 3\ CO_2 + 4\ H_2O$$

$$\frac{20.0\text{ molecule } O_2}{1} \left| \frac{1\text{ mol } O_2}{6.02E23\text{ molecule } O_2} \right| \frac{3\text{ mol } CO_2}{5\text{ mol } O_2} \left| \frac{44.01\text{ g } CO_2}{1\text{ mol } CO_2} \right| = \boxed{8.77E-22\text{ g } CO_2}$$

20. In a double replacement reaction of potassium phosphate and aluminum nitrate, potassium nitrate and aluminum phosphate are produced. How many formula mass units (f.m.u.) of potassium nitrate are produced when 2.56 grams of potassium phosphate reacts.

$$1\ K_3PO_4 + 1\ Al(NO_3)_3 \rightarrow 1\ AlPO_4 + 3\ KNO_3$$

$$\frac{2.56\text{ g } K_3PO_4}{1} \left| \frac{1\text{ mol } K_3PO_4}{212.27\text{ g } K_3PO_4} \right| \frac{3\text{ mol } KNO_3}{1\text{ mol } K_3PO_4} \left| \frac{6.02E23\text{ fmu } KNO_3}{1\text{ mol } KNO_3} \right| = \boxed{2.18E23\text{ fmu } KNO_3}$$