ANSWER KEY

EXTRA PRACTICE: Limiting and Excess Reactants Practice #2 Name: _____

1. 50.0 grams of sodium metal reacts with 60.0 grams of chlorine to produce sodium chloride. What is the L.R. and E.R.?

$$2\ Na + 1\ Cl_2 \rightarrow 2\ NaCl$$

$$\frac{50.0\text{ g Na}}{1}\left|\frac{1\text{ mol Na}}{22.99\text{ g Na}}\right|\frac{2\text{ mol NaCl}}{2\text{ mol Na}}\left|\frac{58.44\text{ g NaCl}}{1\text{ mol NaCl}}\right| = 127\text{ g NaCl}$$

$$\frac{60.0\text{ g Cl}_2}{1}\left|\frac{1\text{ mol Cl}_2}{70.9\text{ g Cl}_2}\right|\frac{2\text{ mol NaCl}}{1\text{ mol Cl}_2}\left|\frac{58.44\text{ g NaCl}}{1\text{ mol NaCl}}\right| = 98.9\text{ g NaCl}$$

L.R. = Cl_2
E.R. = Na

2. In an S-R reaction, 50.0 grams of zinc reacts with 30.0 grams of hydrochloric acid (HCl) to produce zinc chloride. How many grams of zinc chloride are produced?

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

① $$\frac{50.0\text{ g Zn}}{1}\left|\frac{1\text{ mol Zn}}{65.39\text{ g Zn}}\right|\frac{1\text{ mol ZnCl}_2}{1\text{ mol Zn}}\left|\frac{136.29\text{ g ZnCl}_2}{1\text{ mol ZnCl}_2}\right| = 104\text{ g ZnCl}_2$$

$$\frac{30.0\text{ g HCl}}{1}\left|\frac{1\text{ mol HCl}}{36.458\text{ g HCl}}\right|\frac{1\text{ mol ZnCl}_2}{2\text{ mol HCl}}\left|\frac{136.29\text{ g ZnCl}_2}{1\text{ mol ZnCl}_2}\right| = 56.1\text{ g ZnCl}_2$$

L.R. = HCl
E.R. = Zn

② 56.1 g $ZnCl_2$ Produced → Theoretical Yield from L.R. = HCl

3. 40.0 grams of sodium iodide reacts with 50.0 grams of silver nitrate in a D-R reaction. How many grams of silver iodide is produced?

$$1\ NaI + 1\ AgNO_3 \rightarrow 1\ NaNO_3 + 1\ AgI_{(s)}$$

① $$\frac{40.0\text{ g NaI}}{1}\left|\frac{1\text{ mol NaI}}{149.89\text{ g NaI}}\right|\frac{1\text{ mol AgI}}{1\text{ mol NaI}}\left|\frac{234.77\text{ g AgI}}{1\text{ mol AgI}}\right| = 62.7\text{ g AgI}$$

$$\frac{50.0\text{ g AgNO}_3}{1}\left|\frac{1\text{ mol AgNO}_3}{169.91\text{ g AgNO}_3}\right|\frac{1\text{ mol AgI}}{1\text{ mol AgNO}_3}\left|\frac{234.77\text{ g AgI}}{1\text{ mol AgI}}\right| = 69.1\text{ g AgI}$$

L.R. = NaI
E.R. = $AgNO_3$

② 62.7 g AgI Produced → Theoretical Yield from L.R. = NaI

4. When 2.60 grams of hydrogen reacts with 10.2 grams of oxygen, water is produced. What is the L.R. and E.R.?

$$2\ H_2 + 1\ O_2 \rightarrow 2\ H_2O$$

$$\frac{2.60\text{ g H}_2}{1}\left|\frac{1\text{ mol H}_2}{2.016\text{ g H}_2}\right|\frac{2\text{ mol H}_2\text{O}}{2\text{ mol H}_2}\left|\frac{18.016\text{ g H}_2\text{O}}{1\text{ mol H}_2\text{O}}\right| = 23.2\text{ g H}_2\text{O}$$

$$\frac{10.2\text{ g O}_2}{1}\left|\frac{1\text{ mol O}_2}{32.00\text{ g O}_2}\right|\frac{2\text{ mol H}_2\text{O}}{1\text{ mol O}_2}\left|\frac{18.016\text{ g H}_2\text{O}}{1\text{ mol H}_2\text{O}}\right| = 11.5\text{ g H}_2\text{O}$$

L.R. = O_2
E.R. = H_2

5. How many grams of water are produced if 50.6 grams of magnesium hydroxide and 45.0 grams of hydrochloric acid react in this D-R reaction?

$$1\ Mg(OH)_2 + 2\ HCl \rightarrow 1\ MgCl_2 + 2\ H_2O$$

① $\frac{50.6\ g\ Mg(OH)_2}{1} \left| \frac{1\ mol\ Mg(OH)_2}{58.326\ g\ Mg(OH)_2} \right| \frac{2\ mol\ H_2O}{1\ mol\ Mg(OH)_2} \left| \frac{18.016\ g\ H_2O}{1\ mol\ H_2O} \right| = 31.3\ g\ H_2O$

$\frac{45.0\ g\ HCl}{1} \left| \frac{1\ mol\ HCl}{36.458\ g\ HCl} \right| \frac{2\ mol\ H_2O}{2\ mol\ HCl} \left| \frac{18.016\ g\ H_2O}{1\ mol\ H_2O} \right| = 22.2\ g\ H_2O$

L.R. = HCl
E.R. = $Mg(OH)_2$

② **22.2 g H_2O Produced** → Theoretical Yield from L.R. = HCl

6. In a D-R reaction of 30.0 grams of calcium nitrate and 50.0 grams of sodium phosphate, how many grams of calcium phosphate are produced from the limiting reactant?

$$3\ Ca(NO_3)_2 + 2\ Na_3PO_4 \rightarrow 1\ Ca_3(PO_4)_2 + 6\ NaNO_3$$

① $\frac{30.0\ g\ Ca(NO_3)_2}{1} \left| \frac{1\ mol\ Ca(NO_3)_2}{164.1\ g\ Ca(NO_3)_2} \right| \frac{1\ mol\ Ca_3(PO_4)_2}{3\ mol\ Ca(NO_3)_2} \left| \frac{310.18\ g\ Ca_3(PO_4)_2}{1\ mol\ Ca_3(PO_4)_2} \right| = 18.9\ g\ Ca_3(PO_4)_2$

$\frac{50.0\ g\ Na_3PO_4}{1} \left| \frac{1\ mol\ Na_3PO_4}{163.94\ g\ Na_3PO_4} \right| \frac{1\ mol\ Ca_3(PO_4)_2}{1\ mol\ Na_3PO_4} \left| \frac{310.18\ g\ Ca_3(PO_4)_2}{1\ mol\ Ca_3(PO_4)_2} \right| = 94.6\ g\ Ca_3(PO_4)_2$

L.R. = $Ca(NO_3)_2$
E.R. = Na_3PO_4

② **18.9 g $Ca_3(PO_4)_2$ Produced** → Theoretical Yield from L.R. = $Ca(NO_3)_2$

7. If 100.0 grams of lithium carbonate reacts with 45.0 grams of magnesium sulfide, how many grams of magnesium carbonate are produced from the limiting reactant in this D-R reaction?

$$1\ Li_2CO_3 + 1\ MgS \rightarrow 1\ MgCO_3 + 1\ Li_2S$$

① $\frac{100\ g\ Li_2CO_3}{1} \left| \frac{1\ mol\ Li_2CO_3}{73.892\ g\ Li_2CO_3} \right| \frac{1\ mol\ MgCO_3}{1\ mol\ Li_2CO_3} \left| \frac{84.32\ g\ MgCO_3}{1\ mol\ MgCO_3} \right| = 114\ g\ MgCO_3$

$\frac{45.0\ g\ MgS}{1} \left| \frac{1\ mol\ MgS}{56.37\ g\ MgS} \right| \frac{1\ mol\ MgCO_3}{1\ mol\ MgS} \left| \frac{84.32\ g\ MgCO_3}{1\ mol\ MgCO_3} \right| = 67.3\ g\ MgCO_3$

L.R. = MgS
E.R. = Li_2CO_3

② **67.3 g $MgCO_3$ Produced** → Theoretical Yield from L.R. = MgS

8. If 15.0 grams of copper (II) chloride react with 20.0 grams of lead (II) nitrate in this D-R reaction, what is the L.R. and E.R.?

$$1\ CuCl_2 + 1\ Pb(NO_3)_2 \rightarrow 1\ Cu(NO_3)_2 + 1\ PbCl_2(s)$$

$\frac{15.0\ g\ CuCl_2}{1} \left| \frac{1\ mol\ CuCl_2}{134.45\ g\ CuCl_2} \right| \frac{1\ mol\ PbCl_2}{1\ mol\ CuCl_2} \left| \frac{278.1\ g\ PbCl_2}{1\ mol\ PbCl_2} \right| = 31.0\ g\ PbCl_2$

$\frac{20.0\ g\ Pb(NO_3)_2}{1} \left| \frac{1\ mol\ Pb(NO_3)_2}{331.22\ g\ Pb(NO_3)_2} \right| \frac{1\ mol\ PbCl_2}{1\ mol\ Pb(NO_3)_2} \left| \frac{278.1\ g\ PbCl_2}{1\ mol\ PbCl_2} \right| = 16.8\ g\ PbCl_2$

L.R. = $Pb(NO_3)_2$
E.R. = $CuCl_2$