Stoichiometry worksheet #3

1. $$24\text{ g NaCl} \left| \frac{1\text{ mol}}{58\text{ g}} \right| \frac{1\text{ Na}_2\text{O}}{2\text{ NaCl}} \left| \frac{62\text{ g}}{1\text{ mol}} \right| = 12.8\text{ g Na}_2\text{O}$$

2. $$53\text{ g MgO} \left| \frac{1\text{ mol}}{40\text{ g}} \right| \frac{1\text{ MgCl}_2}{1\text{ MgO}} \left| \frac{6.02\times10^{23}}{1\text{ mol}} \right| = 7.98\times10^{23}\text{ molecules}$$

3. Find mass first:

$$25\text{ mL MgO} \left| \frac{2.4\text{ g}}{1\text{ mL}} \right| \frac{1\text{ mol}}{40\text{ g}} \left| \frac{1\text{ Na}_2\text{O}}{1\text{ MgO}} \right| \frac{62\text{ g}}{1\text{ mol}} =$$

93 g Na_2O

4. Work out both amounts.

$$10\text{ g NaCl} \left| \frac{1\text{ mol}}{58\text{ g}} \right| \frac{1\text{ MgCl}_2}{2\text{ NaCl}} \left| \frac{94\text{ g}}{1\text{ mol}} \right| = 8.1\text{ g MgCl}_2$$

$$10\text{ g MgO} \left| \frac{1\text{ mol}}{40\text{ g}} \right| \frac{1\text{ MgCl}_2}{1\text{ MgO}} \left| \frac{94\text{ g}}{1\text{ mol}} \right| = 23.5\text{ g MgCl}_2$$

Lowest answer is amount produced: **8.1 g $MgCl_2$**

so **Limiting reactant is NaCl.**

To find excess, convert limiting reactant into the excess:

$$10\text{ g NaCl} \left| \frac{1\text{ mol}}{58\text{ g}} \right| \frac{1\text{ MgO}}{2\text{ NaCl}} \left| \frac{40\text{ g}}{1\text{ mol}} \right| = 3.4\text{ g}$$

↑ amount used.

$$10\text{ g} - 3.4\text{ g}$$

6.6 g MgO

5. $\frac{14 \text{ moles } K_2O \mid 2\ K_3N \mid 131\ g}{\mid 3\ K_2O \mid 1 \text{ mol}} = 1223\ g\ K_3N$

6. $\frac{25\ g\ Mg_3N_2 \mid 1 \text{ mol} \mid 3\ MgO \mid 40\ g}{\mid 100\ g \mid 1\ Mg_3N_2 \mid 1 \text{ mol}} = 30\ g\ MgO$

$\frac{50\ g\ K_2O \mid 1 \text{ mol} \mid 3\ MgO \mid 40\ g}{\mid 94\ g \mid 3\ K_2O \mid 1 \text{ mol}} = 21.3\ g\ MgO$

Lowest answer: **21.3 g MgO**

Limiting reactant: **50 g K_2O**

Now find excess:

$\frac{50\ g\ K_2O \mid 1 \text{ mol} \mid 1\ Mg_3N_2 \mid 100\ g}{\mid 94\ g \mid 3\ K_2O \mid 1 \text{ mol}} = 17.7\ g$

so its $25 - 17.7 =$ **7.3 g excess Mg_3N_2**

7.) Find theoretical yield:

$\frac{160\ g\ NaOH \mid 1 \text{ mol} \mid 3\ NaCl \mid 58\ g}{\mid 40\ g \mid 4\ NaOH \mid 1 \text{ mol}} = 174\ g$

so its: $\frac{160\ g\ NaCl}{174\ g\ NaCl} \times 100 =$ **92%**

8.) a) $2\,Na + 2\,H_2O \rightarrow 2\,NaOH + H_2$

b) $\dfrac{5 \text{ mole } NaOH \mid 2\,Na}{2\,NaOH} = 5 \text{ moles } Na$

c) $\dfrac{5\,g\,H_2O \mid 1 \text{ mol } H_2O \mid 2\,H_2}{18\,g\,H_2O \mid 2\,H_2O} = 0.14 \text{ mol } H_2$