Stoichiometry problems.

1. $CaCO_{3(s)} \longrightarrow CaO_{(s)} + CO_{2(g)}$

2. Moles of sodium used up when reacted with HCl.

$2Na + 2HCl \longrightarrow 2NaCl_{(aq)} + H_{2(g)}$

mole ratio of $Na : H_2 = 2 : 1$

3.65

moles of sodium used up $= (3.65 \text{ moles} \times 2) = 7.3 \text{ moles}$

3. $2Li_{(s)} + H_2SO_{4(aq)} \longrightarrow Li_2SO_4 + H_{2(g)}$

Mole ratio of:

$Li : Li_2SO_4$

$2 : 1$

moles of $Li = \frac{34.8\text{g}}{6.941\text{g/mol}} = 5.014 \text{ moles}$

$= 5.014$ moles

moles of $Li_2SO_4 = \left(\frac{5.014 \text{ moles}}{2}\right) = 2.507 \text{ moles}$

4. Grams of water produced when it explodes

$2H_{2(g)} + O_{2(g)} \longrightarrow 2H_2O_{(l)}$

moles of $H_2 = 36.1 \text{ moles}$

mole ratio $H_2 : H_2O$

$2 : 2$

moles of water $= 36.1 \text{ moles}$

mass of water $= (36.1 \text{ moles} \times 18\text{g/mol})$.

$= 649.8\text{g}$ of water

5. Grams of Sulphur trioxide produced.

$2S + 3O_2 \longrightarrow 2SO_3$

moles of sulphur $= \frac{43.5\,g}{32.06\,S} = 1.357$ moles.

moles of $SO_3 = \left(\frac{3 \times 1.357}{2}\right) = 2.036$ moles.

mass of $SO_3 = (2.036 \text{ moles} \times 80.06\,g/mol)$

$= 162.96\,g$ of SO_3

6. Grams of barium sulphate produced.

$K_2SO_{4(s)} + BaCl_{2(aq)} \longrightarrow BaSO_{4(s)} + 2KCl_{(aq)}$

moles of $K_2SO_4 = \left(\frac{50.0\,g}{174.25\,g/mol}\right) = 0.287$ moles

mole ratio $K_2SO_4 : BaSO_4 = 1:1$

moles of $BaSO_4$.

mass of $BaSO_4$ produced. $= (0.287 \times 233.38\,g/mol)$

$= 66.96\,g$ of $BaSO_4$.

7. Litres of hydrogen produced.

$2Na_{(s)} + H_2O_{(l)} \longrightarrow Na_2O_{(s)} + H_{2(g)}$

moles of Na = 7.89 moles.

mole ratio of $Na : H_2 = 2:1$

moles of $H_2 = \left(\frac{7.89 \text{ moles}}{2}\right) = 3.945$ moles of H_2.

1 mole = 24L

3.945 moles $\left(\frac{3.945 \times 24\,L}{1}\right) = 94.68$ Litres of H_2