Stoichiometry (Mass → Mass Conversions) Key

1a) $80.0\text{ g } BaCl_2 \left|\frac{1\text{ mol } BaCl_2}{208.3\text{ g } BaCl_2}\right|\frac{2\text{ mol NaCl}}{1\text{ mol } BaCl_2}\left|\frac{58.5\text{ g NaCl}}{1\text{ mol NaCl}}\right. = \boxed{44.9\text{ g NaCl}}$

b) $65.5\text{ g NaCl} \left|\frac{1\text{ mol NaCl}}{58.5\text{ g NaCl}}\right|\frac{1\text{ mol } BaCl_2}{2\text{ mol NaCl}}\left|\frac{208.3\text{ g } BaCl_2}{1\text{ mol } BaCl_2}\right. = \boxed{117\text{ g } BaCl_2}$

2.a) $120\text{ g } CuO \left|\frac{1\text{ mol } CuO}{79.5\text{ g } CuO}\right|\frac{2\text{ mol Al}}{3\text{ mol } CuO}\left|\frac{27.0\text{ g Al}}{1\text{ mol Al}}\right. = \boxed{27\text{ g Al}}$

b) $15.5\text{ g Al} \left|\frac{1\text{ mol Al}}{27.0\text{ g Al}}\right|\frac{3\text{ mol Cu}}{2\text{ mol Al}}\left|\frac{63.5\text{ g Cu}}{1\text{ mol Cu}}\right. = \boxed{54.7\text{ g Cu}}$

3. $52.0\text{ g } KClO_3 \left|\frac{1\text{ mol } KClO_3}{122.6\text{ g } KClO_3}\right|\frac{2\text{ mol KCl}}{2\text{ mol } KClO_3}\left|\frac{74.6\text{ g KCl}}{1\text{ mol KCl}}\right. = \boxed{31.6\text{ g KCl}}$

4. $32.0\text{ g } N_2 \left|\frac{1\text{ mol } N_2}{28.0\text{ g } N_2}\right|\frac{3\text{ mol } H_2}{1\text{ mol } N_2}\left|\frac{2.0\text{ g } H_2}{1\text{ mol } H_2}\right. = \boxed{6.9\text{ g } H_2}$

5. $Cu + 2AgNO_3 \longrightarrow 2Ag + Cu(NO_3)_2$

$100.0\text{ g Cu} \left|\frac{1\text{ mol Cu}}{63.5\text{ g Cu}}\right|\frac{2\text{ mol Ag}}{1\text{ mol Cu}}\left|\frac{107.9\text{ g Ag}}{1\text{ mol Ag}}\right. = \boxed{3.40\times10^2\text{ g Ag}}$

6. $4Al + 3O_2 \longrightarrow 2Al_2O_3$

$408\text{ g } Al_2O_3 \left|\frac{1\text{ mol } Al_2O_3}{102.0\text{ g } Al_2O_3}\right|\frac{4\text{ mol Al}}{2\text{ mol } Al_2O_3}\left|\frac{27.0\text{ g Al}}{1\text{ mol Al}}\right. = \boxed{216\text{ g Al}}$

7. $CaCO_3 \longrightarrow CaO + CO_2$

$$25.0\ g\ CaCO_3 \left|\frac{1\ mol\ CaCO_3}{100.1\ g\ CaCO_3}\right|\frac{1\ mol\ CO_2}{1\ mol\ CaCO_3}\left|\frac{44.0\ g\ CO_2}{1\ mol\ CO_2}\right| = \boxed{11.0\ g\ CO_2}$$

8. a) $$0.150\ g\ C_{14}H_{10}O_3S \left|\frac{1\ mol\ C_{14}H_{10}O_3S}{258.1\ g\ C_{14}H_{10}O_3S}\right|\frac{5\ mol\ H_2O}{1\ mol\ C_{14}H_{10}O_3S}\left|\frac{18.0\ g\ H_2O}{1\ mol\ H_2O}\right| = \boxed{0.0523\ g\ H_2O}$$

b) $$0.150\ g\ C_{14}H_{10}O_3S \left|\frac{1\ mol\ C_{14}H_{10}O_3S}{258.1\ g\ C_{14}H_{10}O_3S}\right|\frac{16\ mol\ O_2}{1\ mol\ C_{14}H_{10}O_3S}\left|\frac{32.0\ g\ O_2}{1\ mol\ O_2}\right| = \boxed{0.298\ g\ O_2}$$

9. $$1.00\ kg\ Al \left|\frac{1000\ g}{1\ kg}\right|\frac{1\ mol\ Al}{27.0\ g\ Al}\left|\frac{3\ mol\ NH_4ClO_4}{3\ mol\ Al}\right|\frac{117.5\ g\ NH_4ClO_4}{1\ mol\ NH_4ClO_4} = \boxed{4.35 \times 10^3\ g\ NH_4ClO_4}$$

10. $2NaCl + 2H_2O \longrightarrow Cl_2 + H_2 + 2NaOH$

$$1.4 \times 10^6\ kg\ Cl_2 \left|\frac{1000\ g}{1\ kg}\right|\frac{1\ mol\ Cl_2}{71.0\ g\ Cl_2}\left|\frac{1\ mol\ H_2}{1\ mol\ Cl_2}\right|\frac{2.0\ g\ H_2}{1\ mol\ H_2}\left|\frac{1\ kg}{1000\ g}\right| = \boxed{3.9 \times 10^4\ kg\ H_2}$$

11. a) $Al(OH)_3 + 3HCl \longrightarrow AlCl_3 + 3H_2O$

b) $$2.50\ g\ Al(OH)_3 \left|\frac{1\ mol\ Al(OH)_3}{78.0\ g\ Al(OH)_3}\right|\frac{3\ mol\ HCl}{1\ mol\ Al(OH)_3}\left|\frac{36.5\ g\ HCl}{1\ mol\ HCl}\right| = \boxed{3.51\ g\ HCl}$$