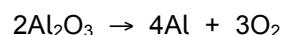




# REACTING MASS CALCULATIONS 1

- 1) Aluminium is extracted from aluminium oxide as shown. Calculate the mass of aluminium that can be formed from 1020 g of aluminium oxide.

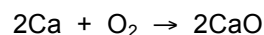


$$\text{moles Al}_2\text{O}_3 = \frac{1020}{102} = 10.0 \text{ mol}$$

$$\text{moles Al} = 2 \times 10.0 = 20.0 \text{ mol}$$

$$\text{mass Al} = 27 \times 20.0 = 540 \text{ g}$$

- 2) Calculate the mass of oxygen needed to react 10.0 g of calcium to form calcium oxide.

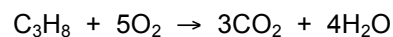


$$\text{moles Ca} = \frac{10.0}{40} = 0.250 \text{ mol}$$

$$\text{moles O}_2 = \frac{0.250}{2} = 0.125 \text{ mol}$$

$$\text{mass O}_2 = 32 \times 0.125 = 4.00 \text{ g}$$

- 3) What mass of propane could burn in 48.0 g of oxygen?

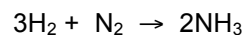


$$\text{moles O}_2 = \frac{48.0}{32} = 1.50 \text{ mol}$$

$$\text{moles C}_3\text{H}_8 = \frac{1.50}{5} = 0.300 \text{ mol}$$

$$\text{mass C}_3\text{H}_8 = 44 \times 0.300 = 13.2 \text{ g}$$

- 4) What mass of ammonia can be made from 20.0 g of hydrogen?

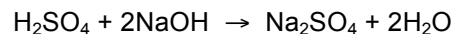


$$\text{moles H}_2 = \frac{20.0}{2} = 10.0 \text{ mol}$$

$$\text{moles NH}_3 = 10.0 \times \frac{2}{3} = 6.67 \text{ mol}$$

$$\text{mass NH}_3 = 17 \times 6.67 = 113 \text{ g}$$

- 5) What mass of sodium hydroxide is needed to neutralise 24.5 kg of sulfuric acid?

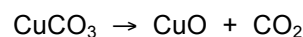


$$\text{moles H}_2\text{SO}_4 = \frac{24500}{98} = 250 \text{ mol}$$

$$\text{moles NaOH} = 2 \times 250 = 500 \text{ mol}$$

$$\text{mass NaOH} = 40 \times 500 = 20000 \text{ g}$$

- 6) What mass of carbon dioxide is formed when 7.41 g of copper(II) carbonate decomposes on heating?

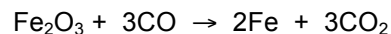


$$\text{moles CuCO}_3 = \frac{7.41}{123.5} = 0.0600 \text{ mol}$$

$$\text{moles CO}_2 = 0.060 \text{ mol}$$

$$\text{mass CO}_2 = 44 \times 0.060 = 2.64 \text{ g}$$

- 7) What mass of carbon monoxide is needed to react with 2.08 kg of iron oxide?

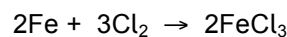


$$\text{moles Fe}_2\text{O}_3 = \frac{2080}{160} = 13.0 \text{ mol}$$

$$\text{moles CO} = 3 \times 13.0 = 39.0 \text{ mol}$$

$$\text{mass CO} = 28 \times 39.0 = 1092 \text{ g}$$

- 8) What mass of chlorine reacts with 20.0 g of iron to form iron(III) chloride?

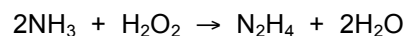


$$\text{moles Fe} = \frac{20.0}{56} = 0.357 \text{ mol}$$

$$\text{moles Cl}_2 = 0.357 \times \frac{3}{2} = 0.536 \text{ mol}$$

$$\text{mass Cl}_2 = 71 \times 0.536 = 38.0 \text{ g}$$

- 9) Hydrazine ( $\text{N}_2\text{H}_4$ ) is used as a rocket fuel. It can be made by reacting ammonia with hydrogen peroxide. What mass of ammonia is needed to make 148 g of hydrazine?

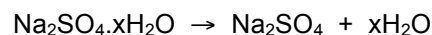


$$\text{moles N}_2\text{H}_4 = \frac{148}{32} = 4.625 \text{ mol}$$

$$\text{moles NH}_3 = 2 \times 4.625 = 9.25 \text{ mol}$$

$$\text{mass NH}_3 = 17 \times 9.25 = 157 \text{ g}$$

- 10) 10.00 g of hydrated sodium sulfate decompose to form 4.40 g of anhydrous sodium sulfate on heating. Calculate the formula mass of hydrated sodium sulfate and the value of x.



$$\text{moles Na}_2\text{SO}_4 = \frac{4.40}{142} = 0.03099 \text{ mol}$$

$$\text{mass H}_2\text{O} = 10.00 - 4.40 = 5.60 \text{ g}$$

$$\text{moles H}_2\text{O} = \frac{5.60}{18} = 0.3111 \text{ mol}$$

$$\text{Ratio of moles Na}_2\text{SO}_4 : \text{H}_2\text{O} = 0.03099 : 0.3111 = \frac{0.03099}{0.03099} : \frac{0.3111}{0.03099} = 1 : 10$$

$$\therefore x = 10 \text{ (nearest whole number)}$$

Area	Strength	To develop	Area	Strength	To develop	Area	Strength	To develop
Done with care and thoroughness			Can find moles from mass			Can convert units		
Shows suitable working			Can use reacting ratios in equations			Can find water of crystallisation		
Can work out $M_r$			Can find mass from moles			Gives units		