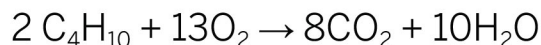# STOICHIOMETRY
PROBLEMS

Answers

1.The combustion of a sample of butane, C_4H_{10} (lighter fluid), produced 2.46 grams of water.

$$2\,C_4H_{10} + 13O_2 \rightarrow 8CO_2 + 10H_2O$$

(a) How many moles of water formed?

2.46 g H_2O x (1 mol H_2O/18 g H_2O) = 0.137 mol H_2O

(b) How many moles of butane burned?

0.137 mol H_2O x (2 mol C_4H_{10}/10 mol H_2O) = 0.027 mol C_4H_{10}

(c) How many grams of butane burned?

0.027 mol C_4H_{10} x (58.12 g C_4H_{10}/1 mol C_4H_{10}) = 7.94 g C_4H_{10}

(d) How much oxygen was used up in moles?

0.137 mol H_2O x (13 mol O_2/10 mol H_2O) = 0.1781 mol O_2

(e) How much oxygen was used up in grams?

0.1781 mol O_2 x (16 g O_2/ 1 mol O_2) = 2.85 g O_2

2. Sodium metal burns in air according to the balanced reaction below.

$$4\,Na\,(s) + O_2\,(g) \rightarrow 2\,Na_2O\,(g)$$
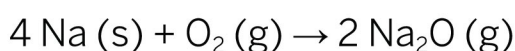
(a) How many moles of oxygen are needed to react with 9.5 g of sodium completely?

9.5 g Na x (1 mol Na/23 g Na) x (1 mol O_2/ 4 mol Na) = 0.103 mol O_2

(b) How many grams of sodium are needed to produce 12.5 g of sodium oxide?

12.5 g Na_2O x (1 mol Na_2O/62 g Na_2O) x (4 mol Na/2 mol Na_2O) x (23 g Na/1 mol Na) = 9.27 g Na

3. In the combustion of 54.5 g of butane (C_4H_6), how many grams of CO_2 are produced? Write and balance the equation before solving.

$$2\,C_4H_6 + 11\,O_2 \rightarrow 8\,CO_2 + 6\,H_2O$$

54.5 g C_4H_6 x (1 molC_4H_6/ 54 g C_4H_6) x(8 mol CO_2/2 mol C_4H_6) x (44 g CO_2/1 mol CO_2) = 178 g CO_2