# → STOICHIOMETRY ←
## PROBLEMS

1. Methane burns in air by the following reaction:

$$CH_4\,(g) + 2\,O_2\,(g) \rightarrow CO_2\,(g) + 2\,H_2O\,(g)$$

What mass of water is produced by burning 500 g of methane?

2. Propene burns in excess oxygen according to the following reaction.

$$C_3H_8 + 5\,O_2 \rightarrow 3\,CO_2 + 4\,H_2O$$

a. How many moles of each $CO_2$ and $H_2O$ are formed from 3.85 mol of propane?

b. If 0.647 mol of oxygen is used to burn propane, how many moles of each $CO_2$ and $H_2O$ are produced? How many moles of $C_3H_8$ are consumed?

3. Chlorine gas can be produced in the laboratory by adding concentrated hydrochloric acid to manganese (IV) oxide in the following reaction:

$$MnO_2\,(s) + 4\,HCl\,(aq) \rightarrow MnCl_2\,(aq) + 2\,H_2O\,(l) + Cl_2\,(g)$$

a. Calculate the mass of $MnO_2$ needed to produce 25 g of $Cl_2$.

b. What mass of $MnCl_2$ is produced when 0.091 g of $Cl_2$ is generated?

# → STOICHIOMETRY ← PROBLEMS

Answers

1. Methane burns in air by the following reaction:

$$CH_4\,(g) + 2\,O_2\,(g) \rightarrow CO_2\,(g) + 2\,H_2O\,(g)$$

What mass of water is produced by burning 500 g of methane?

500 g $CH_4$ x (1 mol $CH_4$/16.01 g $CH_4$) x (2 mol $H_2O$/1 mol $H_2O$) x (18.02 g $H_2O$/1 mol $H_2O$) = 1126 g $H_2O$

2. Propene burns in excess oxygen according to the following reaction.

$$C_3H_8 + 5\,O_2 \rightarrow 3\,CO_2 + 4\,H_2O$$

a. How many moles of each $CO_2$ and $H_2O$ are formed from 3.85 mol of propane?

3.85 mol $C_3H_8$ x (3 mol $CO_2$/ 1 mol $C_3H_8$) = 11.55 mol $CO_2$

3.85 mol $C_3H_8$ x (4 mol $H_2O$/ 1 mol $C_3H_8$) = 15.4 mol $H_2O$

b. If 0.647 mol of oxygen is used to burn propane, how many moles of each $CO_2$ and $H_2O$ are produced? How many moles of $C_3H_8$ are consumed?

0.647 mol $O_2$x (3 mol $CO_2$/5 mol $O_2$) = 0.388 mol $CO_2$

0.647 mol $O_2$x (4 mol $H_2O$/5 mol $O_2$) = 0.518 mol $H_2O$

0.647 mol $O_2$x (1 mol $C_3H_8$/5 mol $O_2$) = 0.129 mol$C_3H_8$

3. Chlorine gas can be produced in the laboratory by adding concentrated hydrochloric acid to manganese (IV) oxide in the following reaction:

$$MnO_2\,(s) + 4\,HCl\,(aq) \rightarrow MnCl_2\,(aq) + 2\,H_2O\,(l) + Cl_2\,(g)$$

a. Calculate the mass of $MnO_2$ needed to produce 25 g of $Cl_2$.

25 g $Cl_2$ x (1 mol $Cl_2$/71 g $Cl_2$) x (1 mol $MnO_2$/ 1 mol $Cl_2$) x (87 g $MnO_2$/ 1 mol $MnO_2$) = 30.6 g $MnO_2$

b. What mass of $MnCl_2$ is produced when 0.091 g of $Cl_2$ is generated?

0.091 g $Cl_2$ x (1 mol $Cl_2$/71 g $Cl_2$) x (1 mol $MnO_2$/ 1 mol $Cl_2$) x (125.84 g $MnCl_2$/ 1 mol $MnO_2$) = 0.161 g $MnCl_2$