

The Mole in Unit 1

1 gram of Hydrogen contains 6.02×10^{23} Hydrogen atoms

We call this number 'the mole'. We say that '1 gram of Hydrogen contains 1 mole of Hydrogen atoms'.

1 mole of Hydrogen atoms weighs 1 gram.

=> 2 moles of Hydrogen atoms weigh 2 grams etc

Since the mass of a Hydrogen atom is 1 amu and the mass of an Oxygen atom is 16 amu, Oxygen atoms are 16 times heavier than Hydrogen atoms.

1 mole of Oxygen atoms therefore weighs 16g - the relative atomic mass in grams.

The mass of 1 mole of a substance is known as 'the gram formula mass' and is obtained by adding the relative atomic masses of all the atoms present in the formula.

1 mole of H_2O molecules weighs $(2 \times 1) + (1 \times 16) = 18\text{g}$

i.e. the gram formula mass of H_2O is 18g

Here are some other gram formula masses. See if you can work them out:

Substance	Formula Mass/g
N_2	28
HBr	81
SO_2	64
$\text{C}_6\text{H}_{12}\text{O}_6$	180

Problem 1

Calculate the number of moles of SO_2 in 320g of SO_2 .

Answer

$$\begin{aligned} \text{Number of moles of } \text{SO}_2 \text{ in } 64\text{g} &= 1 \\ \Rightarrow \text{Number of moles of } \text{SO}_2 \text{ in } 320\text{g} &= \frac{320}{64} \\ &= \underline{5 \text{ moles}} \end{aligned}$$

Problem 2

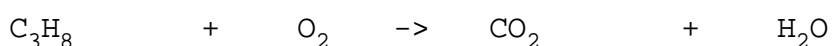
Calculate the mass of 0.5 moles of Ethane, C₂H₆.

Answer

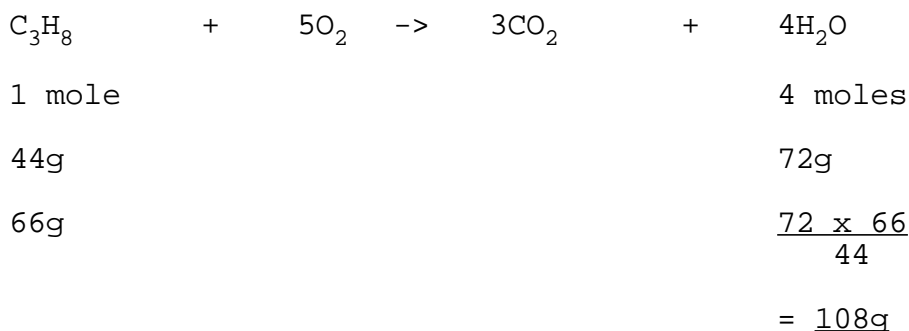
$$\begin{aligned} \text{Mass of 1 mole of Ethane} &= 30\text{g} \\ \Rightarrow \text{Mass of 0.5 moles of Ethane} &= 30 \times 0.5 \\ &= \underline{15\text{g}} \end{aligned}$$

Problem 3

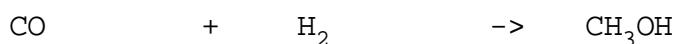
Calculate the mass of Water formed on burning 88g of Propane, C₃H₈, given the equation:

**Answer**

First balance the equation:

**Problem 4**

Calculate the mass of Hydrogen required to produce 64g of Methanol, CH₃OH, given the equation:

**Answer**

First balance the equation:

