

O-level

### ATOMIC MASS OR FORMULA MASS:

**Atomic** mass is the sum of protons and neutrons in an atom.

**Isotopes** are atoms of the same element with the same number of protons but different number of neutrons

**Relative atomic masses (RAM)** is average atomic masses of isotopes of an element in the ratios of their existence.

**Formula masses** are calculated by adding together the masses of the constituent atoms in a molecule.

#### Example 1; What is the formula mass of ozone (O<sub>3</sub>)?

**Solution:** the ozone molecule contains three oxygen atoms, each of which weights 16 grams. Therefore, the formula mass of ozone is: -  
 $3 \times 16 = 48 \text{ grams}$

#### Example 2: What is the formula mass of ammonia, NH<sub>3</sub>?

**Solution:** Nitrogen atoms weight 14 grams and hydrogen atoms weight 1 g. There are three hydrogen atoms in the molecule; Therefore, the formulae mass is  
 $14 + (3 \times 1) = 17 \text{ grams}$

#### Example 3: What is the formula mass of glucose C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>?

**Solution:** Carbon weights 12-gram, hydrogen 1 gram, oxygen 16 gram. The formula mass of glucose is:  $(6 \times 12) + (12 \times 1) + (6 \times 16)$   
 $72 + 12 + 96 = 180 \text{ grams.}$

### EXERCISE

Question 1; What is the formula mass of

- ammonium sulphate [(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>]?
- Ca(NO<sub>3</sub>)<sub>2</sub>
- Mg(OH)<sub>2</sub>
- BaSO<sub>4</sub>
- KClO<sub>3</sub>
- H<sub>3</sub>PO<sub>4</sub>
- NH<sub>4</sub>NO<sub>3</sub>

(Ca = 40, N = 14, O = 16, Mg = 24, H = 1, Ba = 137, S = 32, K = 39,  
Cl = 35.5, P = 31)

## Answers

Formula	Relative formula mass
i) $[(NH_4)_2SO_4]?$	$2(14 + 1 \times 4) + 32 + 16 \times 4 = 132$
ii) $Ca(NO_3)_2$	$40 + 2(14 + 16 \times 3) = 102$
iii) $Mg(OH)_2$	$24 + 2(16 + 1) = 58$
iv) $BaSO_4$	$137 + 32 + 16 \times 4 = 233$
v) $KClO_3$	$39 + 35.5 + 16 \times 3 = 122.5$
vi) $H_3PO_4$	$1 \times 3 + 31 + 16 \times 4 = 98$
vii) $NH_4NO_3$	$14 + 1 \times 4 + 14 + 16 \times 3 = 80$

