Relative Atomic Mass (Ar): Ratio of Weighted Average mass of an atom of an element to 1/12 of the mass of a ^{12}C atom

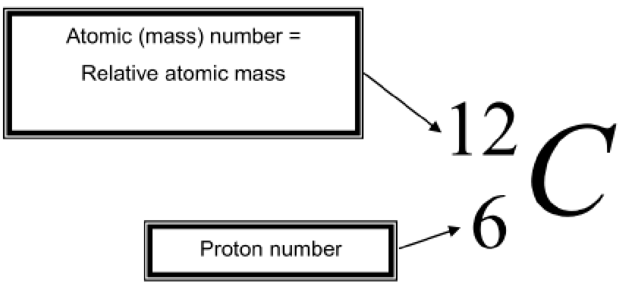
Relative Abundance Qns

$$\frac{\text{(relative abundance)}}{100} \times \text{mass} + \frac{\text{(relative abundance)}}{100} \times \text{mass} = Ar$$

Example from AISS Notes

Element	Isotopes	Relative Abundance	A_r of Element
(a) Carbon	C-12	98.89%	
	C-13	1.11%	
(b) Neon	Ne-20	90.5%	
	Ne-21	0.3%	
	Ne-22	9.2%	
(c) Potassium	K-39	93.38%	
	K-40	0.01%	
	K-41	6.61%	

From the Periodic Table,



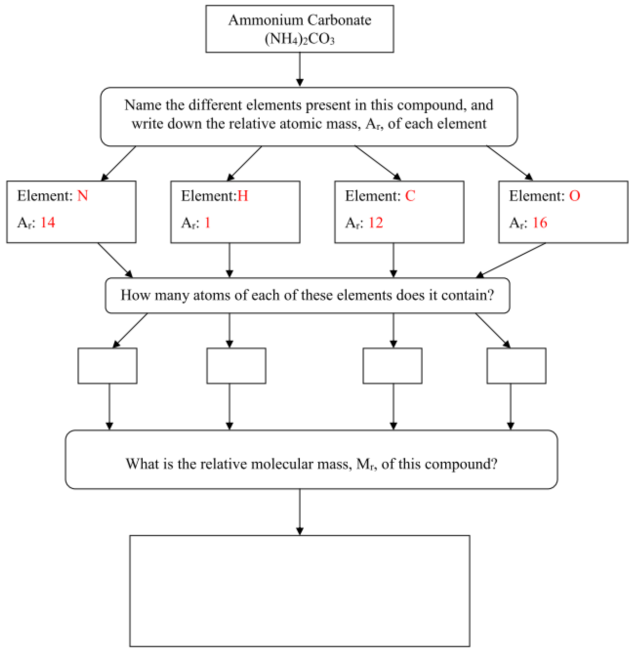
Example from AISS Notes

Write down the relative atomic mass for the following elements:

a. Sodium
b. Calcium
c. Oxygen
d. Copper

Relative Molecular Mass (Mr): Average Mass of one molecule of that element of compound compare to 1/12 of the mass of one carbon-12 atom.

Example from AISS Notes



Find the Relative molecular mass of each of the following compounds:

a. CO_2
b. Ammonium Chloride
c. Ammonium Phosphate
d. $MgSO_4.7H_2O$

Calculate the value of x in $CuSO_4.xH_2O$, given the Mr of $CuSO_4.xH_2O$ is 250.

Percentage Composition of Element in Compound

$$\text{\% composition of element in compound} = \frac{\text{No. of atoms of element} \times Ar}{\text{Mr of Compound}} \times 100\%$$

Example from AISS Notes

Find the percentage composition of copper in copeer(II) sulfate $CuSO_4$

Find the percentage composition of hydrogen in ethanoic acid, CH_3COOH

Hydrated copper(II) sulfate crystals ($CuSO_4 \cdot 5H_2O$) can be dehydrated by heating. Calculate the percentage composition by mass of water present in the molecule.

Mass of an element in given mass of compound

$$\text{Mass of an element in given mass of compound} = \frac{\text{No. of atoms of element} \times Ar}{Mr \text{ of Compound}} \times \text{Mass of Compound}$$

Example from AISS Notes

Calculate the mass of Cu in 32 g of $CuSO_4$

Calculate the mass of water in 12.3 g of $MgSO_4.7H_2O$

Mole

1 mole = 6×10^{23} particles (Avogrado's Constant)

e.g.

1 mole carbon dioxide gas = 6×10^{23} CO_2 molecules

0.5 mole carbon dioxide gas = 3×10^{23} CO_2 molecules

0.5 mole carbon dioxide gas = 6×10^{23} O atoms

Molar Mass: Mass of 1 mole of atoms of the element/molecule. It is equal to its relative atomic mass (Ar) /relative molecular mass (Mr)

$$\text{No. of moles} = \frac{\text{Mass (g)}}{\text{Molar Mass}}$$

Molar Mass: Ar or Mr from Periodic Table

Example from AISS Notes

Calculate the number of moles in 64 g of oxygen gas

Calculate the number of moles in 12.25 g of Barium Nitrate

Calculate the mass of 3 moles of Chlorine atoms

Calculate the mass of 0.2 moles of Bromine Gas

Calculate the mass of 0.6 moles of sulfuric acid

Empirical Formula: Simplest ratio of elements in the compound

Example from AISS Notes

A compound consists of 7.0 g of Nitrogen combined with 4.0 g of oxygen. Find the empirical formula of the compound.

12.0 g of anhydrous magnesium sulfate combines with 12.6 g of water to form hydrated magnesium sulfate. What is the formula of the hydrated magnesium sulfate? $MgSO_4 \cdot 7H_2O$

A compound has the composition by mass: 29.4% calcium, 23.5% sulfur and 47.1 % oxygen. Find the empirical formula.

Calculation of molecular Formula

Empirical Formula shows the simplest ratio between atoms in a compound.

Molecular formula shows the exact number of atoms of each element in a molecule.

If empirical formula is AxBy, Molecular formula is (AxBy)n where n = 1,2,3....

$$n = \frac{\text{relative molecular mass}}{\text{relative mass from empirical formula}}$$

Example from AISS Notes

The empirical formula of a compound is COH_3. Its relative molecular mass is 62. Find the molecular formula.

Caffeine is a compound found in coffee and tea. The percentage composition of caffeine is 49.5% carbon, 5.1% hydrogen, 15.6% oxygen and 28.9% nitrogen. The relative molecular mass of caffeine is 195. Determine

(a) the empirical formula and

(b) the molecular formula of caffeine.

Molar volume of Gases

1 mole of ANY gas at room temperature and pressure occupies 24 dm^3 in volume

$$\text{number of moles of ANY Gas at r.t.p} = \frac{\text{Volume of gas } (dm^3)}{24\ dm^3}$$

Example from AISS Notes

Find the number of moles in 12 dm^3 of Oxygen Gas

Find the Volume of 0.8 moles of Carbon Dioxide Gas

What is the volume (at r.t.p) that 0.75 moles of Hydrogen Gas occupy?

What is the volume (at r.t.p) that 1.5 mol of methane occupy?

How many moles does 3.6 dm^3 of nitrogen gas at r.t.p contain?

How many moles does 2400 cm^3 of Sulfur Dioxide gas at r.t.p contain?

Calculate the volume at r.t.p that is occupied by 34 g of ammonia gas.