

AS TRANSITION COURSE
SUMMER
PART 1: MEASURING AMOUNT OF
SUBSTANCE

MASS

VOLUME

MOLAR MASS

AVOGADRO



CONCENTRATION

ATOM

ION

MOLECULE

MEASUREMENTS IN CHEMISTRY

Mass

Convert the following into grams:

- a) 0.25 kg
- b) 15 kg
- c) 100 tonnes
- d) 2 tonnes

Volume

Convert the following into dm^3 :

- a) 100 cm^3
- b) 25 cm^3
- c) 50 m^3
- d) 50000 cm^3

Tip – always use standard form for very large and very small numbers!

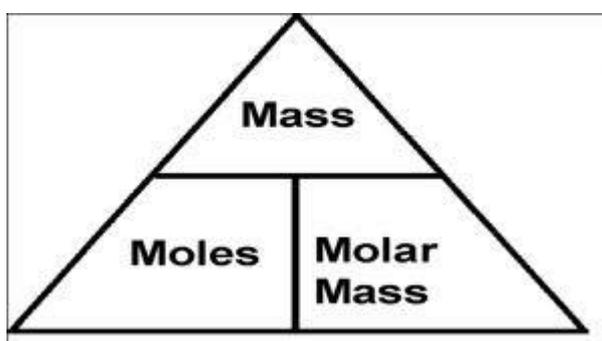
How can you work out how many moles you have?

a) From a measurement of **MASS**:

You can find the number of moles of a substance if you are given its **mass** and you know its **molar mass**:

$$\text{number of moles} = \text{mass/molar mass}$$

$$n = m/m_r$$



Mass MUST be measured in grams!

Molar mass has units of gmol^{-1}

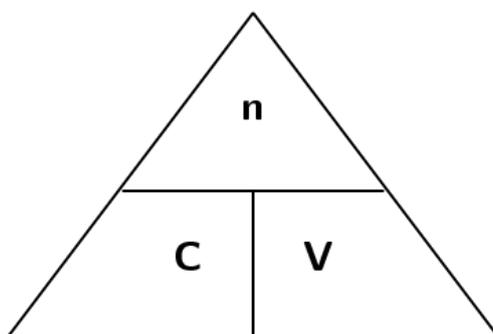
1. Calculate the number of moles present in:	2. Calculate the mass of:	3. Calculate the molar mass of the following substances:
a) 2.3 g of Na	a) 0.05 moles of Cl_2	a) 0.015 moles, 0.42 g
b) 2.5 g of O_2	b) 0.125 moles of KBr	b) 0.0125 moles, 0.50 g
c) 240 kg of CO_2	c) 0.075 moles of Ca(OH)_2	c) 0.55 moles, 88 g
d) 12.5 g of Al(OH)_3	d) 250 moles of Fe_2O_3	d) 2.25 moles, 63 g
e) 5.2 g of PbO_2	e) 0.02 moles of $\text{Al}_2(\text{SO}_4)_3$	e) 0.00125 moles, 0.312 g

b) From a measurement of AQUEOUS VOLUME:

You can find the number of moles of a substance dissolved in water (aqueous) if you are given the **volume** of solution and you know its **molar concentration**:

$$\text{number of moles} = \text{aqueous volume} \times \text{molar concentration}$$

$$n = V \times C$$



Aqueous volume MUST be measured in dm³!

concentration has units of mol dm⁻³

If you know the molar mass of the substance, you can convert the molar concentration into a mass concentration:

$$\text{Molar concentration (mol dm}^{-3}\text{)} \times m_r = \text{mass concentration (g dm}^{-3}\text{)}$$

1. Calculate the number of moles of substance present in each of the following solutions:	2. Calculate the molar concentration and the mass concentration of the following solutions:	3. Calculate the molar concentration and the mass concentration of the following solutions:
a) 25 cm ³ of 0.1 mol dm ⁻³ HCl	a) 0.05 moles of HCl in 20 cm ³	a) 35 g of NaCl in 100 cm ³
b) 40 cm ³ of 0.2 mol dm ⁻³ HNO ₃	b) 0.01 moles of NaOH in 25 cm ³	b) 20 g of CuSO ₄ in 200 cm ³
c) 10 cm ³ of 1.5 mol dm ⁻³ NaCl	c) 0.002 moles of H ₂ SO ₄ in 16.5 cm ³	c) 5 g of HCl in 50 cm ³

d) 5 cm ³ of 0.5 moldm ⁻³ AgNO ₃	d) 0.02 moles of CuSO ₄ in 200 cm ³	d) 8 g of NaOH in 250 cm ³
e) 50 cm ³ of 0.1 moldm ⁻³ H ₂ SO ₄	e) 0.1 moles of NH ₃ in 50 cm ³	e) 2.5 g of NH ₃ in 50 cm ³

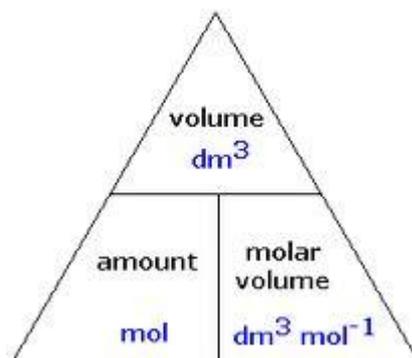
c) From a measurement of GASEOUS VOLUME:

You can find the number of moles of a gas if you are given the **volume** of the gas:

$$\text{number of moles} = \text{volume} / 24$$

$$n = V / 24$$

24 dm³ is the volume occupied by 1 mole of any gas at room temperature and pressure



Volume MUST be measured in dm³!

1. Calculate the number of moles present in:	2. Calculate the volume of gas occupied by:	3. Calculate the mass of the following gas samples:
a) 48 dm ³ of O ₂	a) 0.05 moles of Cl ₂	a) 48 dm ³ of O ₂
b) 1.2 dm ³ of CO ₂	b) 0.25 moles of CO ₂	b) 1.2 dm ³ of CO ₂
d) 200 cm ³ of N ₂	c) 28 g of N ₂	c) 200 cm ³ of N ₂
c) 100 dm ³ of Cl ₂	d) 3.2 g of O ₂	d) 100 dm ³ of Cl ₂
e) 60 cm ³ of NO ₂	e) 20 g of NO ₂	e) 60 cm ³ of NO ₂