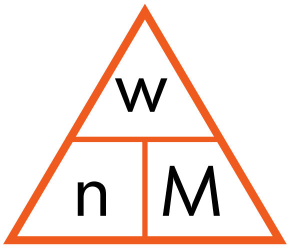
Tailored Tutors

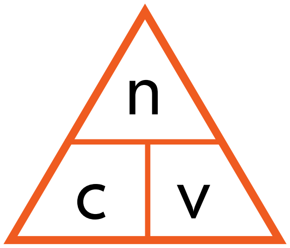
YEAR 1 CHEMISTRY EQUATIONS (OCR)

MOLE CALCULATIONS

number of moles = mass / molar mass
(g) $(g.mol^{-1})$

number of moles = concentration x volume
$(mol.dm^{-3})$ (dm^3)

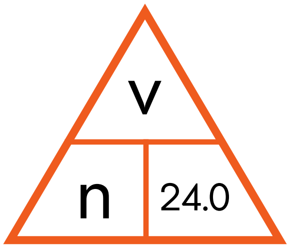




Avogadro's Constant = 6.02×10^{23} atoms or molecules = **1 mole**

MOLAR GAS CONSTANT

1 mole of ANY gas occupies 24.0 dm^3 at room temperature & pressure



IDEAL GAS EQUATION

P = Pressure (pa)

V = volume (m^3)

n = no. of moles

R = Gas Constant $(8.314\ J.K^{-1}.mol^{-1})$

T = Temperature (K)

$$PV = nRT$$

$$P = \frac{nRT}{V} \qquad V = \frac{nRT}{P} \qquad n = \frac{PV}{RT} \qquad T = \frac{PV}{nR}$$

For changes in conditions:

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$$

MASS SPECTROSCOPY

$$\text{Relative Atomic Mass (Ar)} = \frac{(\text{mass isotope 1 x abundance}) + (\text{mass isotope 2 x abundance}) + \ldots}{\sum \text{abundance}}$$

OTHER EQUATIONS

$$\text{\% by mass} = \frac{\text{mass of element in 1 mole}}{\text{Mr}}$$

$$\text{Empirical formula} = \frac{\text{M1}}{\text{Mr1}} : \frac{\text{M2}}{\text{Mr2}} : \frac{\text{M3}}{\text{Mr2}}$$

Where M1, M2 etc is the mass or % composition of element 1, 2 etc

then divide each by the smallest number to give empirical formula

$$\text{\% Atom Economy} = \frac{\text{mass of desired product}}{\text{total mass of all products}} \text{ x100}$$

You can use mass or number of moles here!

$$\text{\% Yield} = \frac{\text{actual yield}}{\text{theoretical yield}} \text{ x100}$$

You can replace masses with Mr values here too!

ENTHALPY

Q = energy transferred (J)

m = mass of **solution** (g)

c = specific heat capacity ($J.K^{-1}.mol^{-1}$)

$\triangle T$ = **change** in temperature (°C **or** K)

$$\mathbf{Q = m.c.\triangle T}$$

$$\underset{(J.mol^{-1})}{\triangle H} = \frac{Q}{n}$$

Don't forget to add a sign for $\triangle H$!

Divide by 1000 for $kJ.mol^{-1}$

$$\underset{(kJ.mol^{-1})}{\triangle H \text{ reaction}} = \underset{(kJ.mol^{-1})}{\sum \text{reactant mean bond enthalpies}} - \underset{(kJ.mol^{-1})}{\sum \text{product mean bond enthalpies}}$$

EQUILIBRIA

$$aA + bB \rightleftharpoons cC + dD$$

$$Kc = \frac{[C]^c\ [D]^d}{[A]^a\ [B]^b}$$

Where:
[A] = concentration ($mol.dm^{-3}$)
a = no. of moles from equation

COMMON IONS

POSITIVE

GROUP 1 = +
GROUP 2 = 2+
H^+
Ag^+
Zn^{2+}
Pb^{2+}
Al^{3+}
(Transition metals are variable)
e.g. Fe^{2+}, Fe^{3+}

NEGATIVE

GROUP 7 = -
GROUP 6 = 2-
GROUP 5 = 3-

MOLECULAR IONS

NH_4^+ ammonium	OH^- hydroxide	NO_3^- nitrate	CN^- cyanide
H_3O^+ hydronium	CO_3^{2-} carbonate	SO_4^{2-} sulfate	PO_4^{3-} phosphate

ACIDS & BASES

ACIDS

HCl	hydrochloric acid
HNO_3	nitric acid
H_2SO_4	sulphuric acid
H_3PO_4	phosphoric acid
CH_3COOH	ethanoic acid

BASES

$NaOH$	sodium hydroxide
KOH	potassium hydroxide
$Ca(OH)_2$	calcium hydroxide
CuO	copper (II) oxide

COMMON OXIDATION STATES

POSITIVE

GROUP 1 = +I
GROUP 2 = +II
H = +I
Ag = +I
Zn = +II
Pb = +II or +IV
Al = + III
(Transition metals are variable)
Fe = +II or +III
Cu = +II (sometimes +I)
C = +II or +IV

NEGATIVE

F = -I
O = -II
Cl = -I
Br = -I
I = -I
N = -III
S = -II
P = -III

Most common oxidation states, but may be positive when covalently bonded to more highly electronegative elements.
i.e. F or O

GROUP 1 SALTS: ALL SOLUBLE

NITRATE SALTS = ALL SOLUBLE

GROUP 2 SALTS:
HYDROXIDES INCREASE IN SOLUBILITY DOWN THE GROUP
SULFATES DECREASE IN SOLUBILITY DOWN THE GROUP
CARBONATES ARE NOT SOLUBLE

Ag SALTS: ALL INSOLUBLE EXCEPT $AgNO_3$

Pb SALTS ALL INSOLUBLE EXCEPT $Pb(NO_3)_2$

GROUP 7 SALTS: ALL SOLUBLE EXCEPT AgX and PbX_2

CO_3 SALTS: ALL INSOLUBLE EXEPT GROUP 1

YEAR 1 CHEMISTRY PRACTICALS (OCR)

No.	Practical	Detail	Done?
1	Moles Determination	Use apparatus to record the mass and volume of a gas	
2	Perform a simple acid-base titration	Use titration to: - Determine the concentration of an acid - Determine the molar mass of an acid - Identify and unknown carbonate	
3	Measure Enthalpy Change	Use a calorimeter to experimentally determine the energy released by: - A neutralisation reaction - A combustion reaction	
4	Identify Unknown Inorganic Ions in Solution	Use chemical tests to identify Group 2, Group 7, OH^-, CO_3^{2-} and SO_4^{2-} ions in solution	
5	Synthesis of an Organic Liquid	Synthesis of a haloalkane (Reflux & Distillation)	
7	Testing for organic functional groups	Use chemical tests to identify a carboxylic acid, an alcohol and an aldehyde.	
9	Rates of Reaction	Using the "continuous rate monitoring" method	