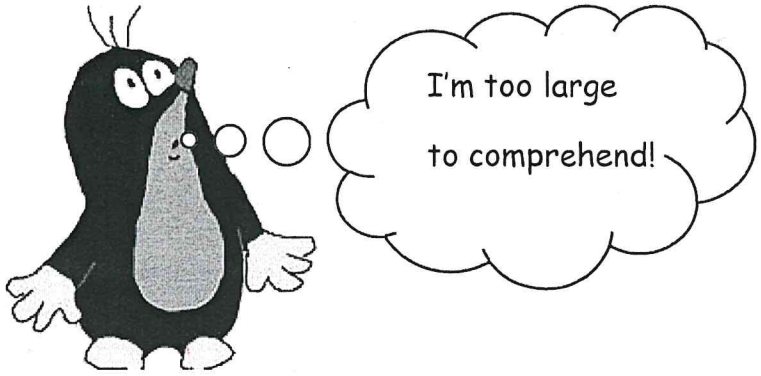
Date: _____



Quantities in Chemical Reactions

Avodagro's Number or the **Mole Number** =

This number represents the number of particles in a gram of a substance

The molar mass (the mass of one mole) for an element is the atomic mass of the element expressed in grams

Ex. 1 – 6.02×10^{23} atoms of neon weighs 20.18g grams or more easily stated 20.18g/mol. * round to 2 decimal places.

State the molar mass of; Aluminum 26.98g/mol Iron 55.85g/mol

Ex. 2 – Watch out for diatomic compounds (the seven gases that don't exist alone)

Sate the molar mass of; Oxygen = 16(2) O_2 = 32g/mol Hydrogen = 1.01(2) H_2 = 2.02g/mol Nitrogen = 14.01(2) N_2 = 28.02g/mol.

Ex. 3 – Molar Mass of Compounds – To get the molar mass of a compound you need to determine how many particles of each atom compose the compound and sum their individual masses

To determine the molar mass of Magnesium Chloride - $MgCl_2$

1	Mg	@	24.31	=	24.31
2	Cl	@	35.45	=	70.90
			total	=	95.21 g/mol.

Once again.....

Sodium Sulfate Na_2SO_4

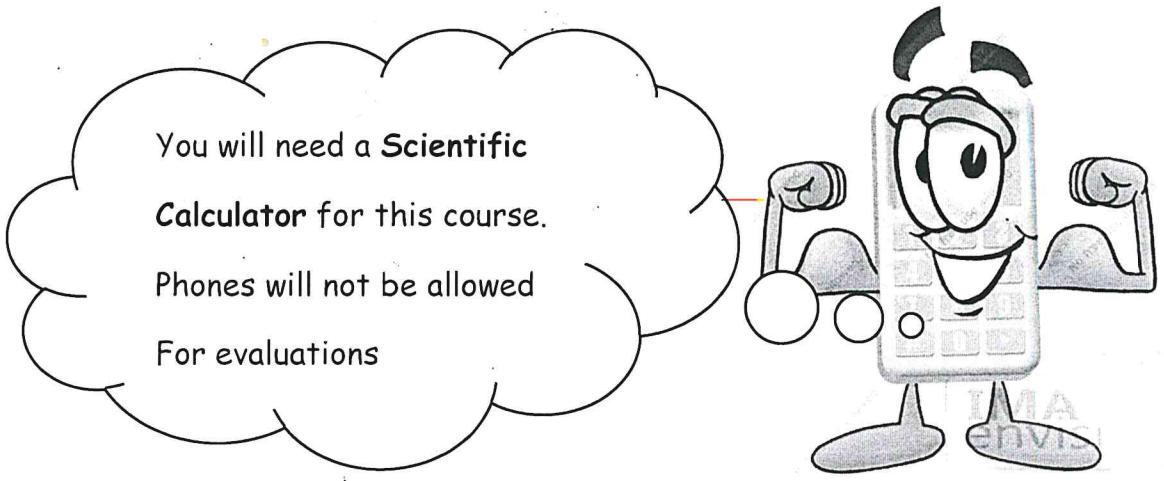
2	Na	@	22.99	=	45.98
1	S	@	32.07	=	32.07
4	O	@	16.00	=	64.00
			total	=	142.05 g/mol

Now it's your turn.....

Hydrogen phosphate H_3PO_4

3	H	@	1.01	=	3.03
1	P	@	30.97	=	30.97
4	O	@	16.00	=	64.00
			total	=	98 g/mol.

Molar Mass Calculations



1.25 moles of Sodium oxide contains

a) How many molecules?

$= 1.25(6.02\times10^{23})$

$= 7.525\times10^{23}$ molecules

b) How many atoms?

Na_2O $= 7.525\times10^{23}(3)$

3 atom in each molecule $= 2.26\times10^{24}$

Think about eggs or doughnuts. A mole of something is like a dozen….just much bigger!

1 dozen = 12 1 mole $= 6.02\times10^{23}$

5 dozen $= 5(12)$ 5 mole $= 5(6.02\times10^{23})$

$= 60$

Ex. 5 If a sample of carbon dioxide gas contains 5.83×10^{24} molecules. How many moles of carbon dioxide are present in the sample?

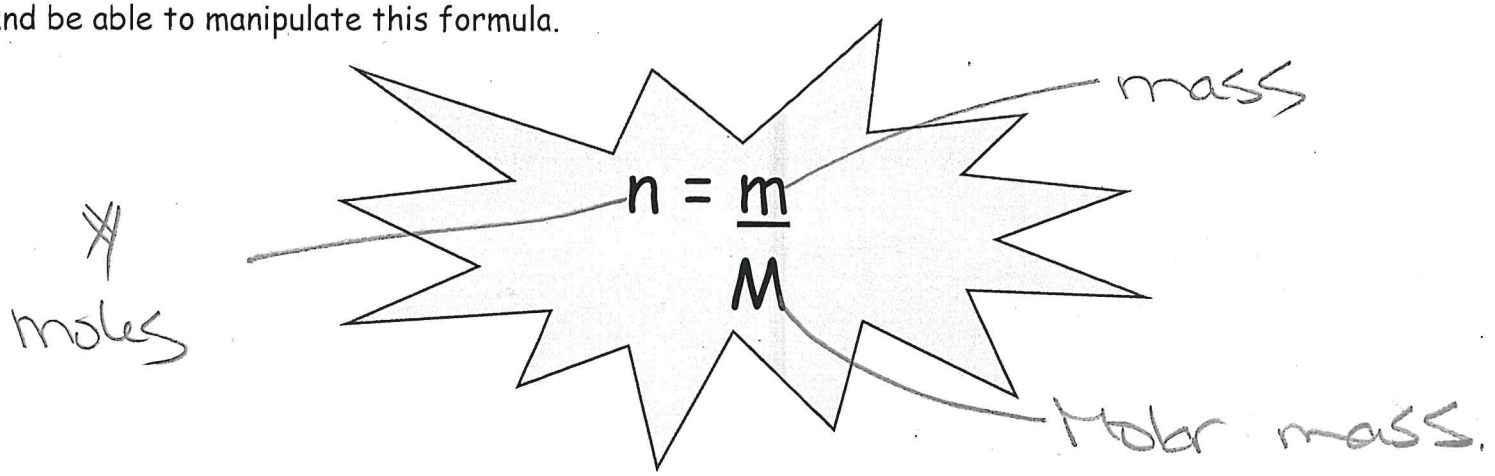
$$= \frac{5.83\times10^{24}}{6.02\times10^{23}}$$

$= 9.68$ moles

moles $\xrightarrow{\times}$ molecules

$\xleftarrow{\div}$

The mathematical relationship between moles (n), mass (m) and molar mass (M) of a substance is stated below. You will need to know and be able to manipulate this formula.



Ex. 6 – A chemist needs 4.0g of sodium hydroxide for an investigation, how many moles of the substance will she be using?

$n = ?$

$m = 4g$

$M = 40.01$

NaOH
23.99 16.00 1.01

$n = \frac{m}{M}$

$n = \frac{4}{40}$

$= 0.10$ moles

∴ 2

Ex. 7 – How much would 1.6 moles of iron (III) oxide weigh?

$n = 1.6$

$m = ?$

$M = 159.7$

55.85 16
Fe_2O_3

$n = \frac{m}{M}$

$m = n(M)$

$= 159.7(1.6)$

$= 255.52\ g$

∴ 2

Ex . 8 - According to a manufacturer, a typical can of cola contains 40.0g of sucrose ($C_{12}H_{22}O_{11}$). Calculate the amount (in moles) of sucrose in the 40.0g sample.

$n = ?$

$m = 40\,g$

$M = 342.34\,g/mol$

$C_{12}\ H_{22}\ O_{11}$

$12.01\ \ 1.01\ \ 16$

$x12\ \ y22\ \ x11$

$n = \frac{m}{M}$

$= \frac{40}{342.34}$

$= 0.117\,mol.$

Ex. 9 - A liter of human blood typically contains 4.0mmol of glucose ($C_6H_{12}O_6$). Calculate the mass of this amount of glucose.

$n = \frac{4\,mmol}{1000}$

$= 0.004\,mol$

$m = ?$

$M = 180.18$

72.06

12.12

96.00

$m = n(M)$

$= (0.004)(180.18)$

$= 0.72\,g$