**AS TRANSITION COURSE**

**SUMMER 2016**

**PART 1: MEASURING AMOUNT OF SUBSTANCE**

**MASS VOLUME MOLAR MASS AVOGADRO**



**CONCENTRATION ATOM ION MOLECULE**

**MEASUREMENTS IN CHEMISTRY**

**Mass**

Convert the following into grams:

1. 0.25 kg
2. 15 kg
3. 100 tonnes
4. 2 tonnes

**Volume**

Convert the following into dm3:

1. 100 cm3
2. 25 cm3
3. 50 m3
4. 50000 cm3

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

What is a mole?

Atoms and molecules are very small – far too small to count individually!

It is important to know how much of something we have, but we count particles in MOLES because you get simpler numbers

1 mole = 6.02 x 1023 particles

(6.02 x 1023 is known as Avogadro’s number)

1. If you have 2.5 x 1021 atoms of magnesium, how many moles do you have?
2. If you have 0.25 moles of carbon dioxide, how many molecules do you have?

How can you work out how many moles you have?

1. 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**:

 **number of moles = mass/molar mass**

 **n = m/mr**



**Mass MUST be measured in grams!**

**Molar mass has units of gmol-1**

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| 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 Cl2 | a) 0.015 moles, 0.42 g |
| b) 2.5 g of O2 | b) 0.125 moles of KBr | b) 0.0125 moles, 0.50 g |
| c) 240 kg of CO2  | 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 Fe2O3 | d) 2.25 moles, 63 g |
| e) 5.2 g of PbO2 | e) 0.02 moles of Al2(SO4)3 | e) 0.00125 moles, 0.312 g |

1. 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**:

**number of moles = aqueous volume x molar concentration**

 **n = V x C**



**Aqueous volume MUST be measured in dm3!**

**concentration has units of moldm-3**

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

**Molar concentration (moldm-3) x mr = mass concentration (gdm-3)**

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| 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 cm3 of 0.1 moldm-3 HCl | a) 0.05 moles of HCl in 20 cm3 | a) 35 g of NaCl in 100 cm3 |
| b) 40 cm3 of 0.2 moldm-3 HNO3 | b) 0.01 moles of NaOH in 25 cm3 | b) 20 g of CuSO4 in 200 cm3 |
| c) 10 cm3 of 1.5 moldm-3 NaCl | c) 0.002 moles of H2SO4 in 16.5 cm3 | c) 5 g of HCl in 50 cm3 |
| d) 5 cm3 of 0.5 moldm-3 AgNO3 | d) 0.02 moles of CuSO4 in 200 cm3 | d) 8 g of NaOH in 250 cm3 |
| e) 50 cm3 of 0.1 moldm-3 H2SO4 | e) 0.1 moles of NH3 in 50 cm3 | e) 2.5 g of NH3 in 50 cm3 |

1. 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 and its **pressure** (in kPa) and **absolute temperature (in K)**:

**number of moles = pressure x volume = PV/RT**

**R x temperature**

**Volume of gas must be in m3**

**Pressure must be in Pa**

**Temperature must be in K**

**R is the molar gas constant (8.31 Jmol-1K-1)**

|  |  |  |
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| 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 dm3 of O2 at 298 K and 100 kPa | a) 0.05 moles of Cl2 at 298 K and 100 kPa | a) 48 dm3 of O2 at 298 K and 100 kPa |
| b) 1.2 dm3 of CO2 at 298 K and 100 kPa | b) 0.25 moles of CO2 at 298 K and 100 kPa | b) 1.2 dm3 of CO2 at 298 K and 100 kPa |
| c) 200 cm3 of N2 at 273 K and 250 kPa | c) 28 g of N2 at 273 K and 250 kPa | c) 200 cm3 of N2 at 273 K and 250 kPa |
| d) 100 dm3 of Cl2 at 30 oC at 100 kPa | d) 3.2 g of O2 at 30 oC at 100 kPa | d) 100 dm3 of Cl2 at 30 oC at 100 kPa |
| e) 60 cm3 of NO2 at 25 oC and 100 kPa | e) 20 g of NO2 at 25 oC and 100 kPa | e) 60 cm3 of NO2 at 25 oC and 100 kPa |

**TRANSITION COURSE – END OF PART 1!**