Stoichiometry

Symbols of Elements ?   A letter or two letters which stand for one atom of the element ?   Element symbols are sometimes taken from latin Compound Formulas ?   For every compound, there is a formula containing the symbols of the elements present and the ratio in which they are present. ?   The compound Carbon Dioxide consists of molecules, each molecule having one atom of carbon and 2 atoms of oxygen. (CO2) ? [Where 2 multiplies the O infront of it]. ?   Therefore three molecules of carbon dioxide is 3CO?2 Determining the formula of a compound/solution: Name of compound Symbols for elements and radicals in compound Write down their valencies Adjust the number of atoms of each element or radical until the valencies are the same on both the left and right side   ?   When dealing with diagram, each outer shell represents one atom of a certain element also provided. Therefore, write down the element symbol and the total number of atoms that are visible. ?   Compounds can have simpler, reduced formula E.g. Na3Cl3 can be reduced, the three cancelled, to give NaCl ?   When the charges of ions are presented, you must make negative charge balance positive charge by increasing the atoms of the element(s) present accordingly. E.g. Mg2+ and Cl- , Cl atoms are increased by one to give MgCl2. Chemical Equations ?   In reactions, reactants are converted into products ?   In word equations, the name of the elements used are shown with + sign indicating 'and' and an arrow indicating "yields". ?   Chemical equations give the symbols, formulas and state symbols of reactions. ?   Note in equations, the two sides, the atoms on the left hand side and the atoms on the right hand side are the same in kind and in number. Calcium carbonate ? calcium oxide + carbon dioxide CaCO3 (s) ? Ca0 (s) + CO2 (g) ?   Balancing chemical equations: make sure the no. of atoms of each element on the LHS equals the no of atoms of each element on the RHS. Relative Atomic Mass ?   Carbon was chosen as standard atom for comparison ?   Masses of atoms can be measured using the mass spectrometer ?   RAM or Ar = the average mass of an atom of the element divided by 1/12th of the mass of one atom of C-12 isotope. ?   Not always a whole # RAM = (% Abundance of Isotope 1 x Mass of Isotope 1) + ((% Abundance of Isotope 2 x mass iso 2) 100   100 Example: 24Mg = 80%,   25Mg = 9%, 26Mg = 11% RAM of Mg = (80 x 24) + (9 x 25) +   (11 x 26)   100   100   100   2.25 + 19.2 + 2.86 Ar (Mg) = 24.31 Relative Molecular Mass ?   the sum of the relative atomic masses ?   it is used in the calculation of mass of compounds/ionic compounds. ?   The mass of an element or compound in the form it exists in nature. ?   Mr or RMM RMM (O2) = 16 + 16 = 32 Note: Mr and A?r have no units % Composition Calculated by: Mr of element/compound   x 100   Mr of entire compound Purity ?   A substance is 100% pure when it consists of only 1 material ?   A substance is 98% pure when 2% is impurities The Mole/Avogadro's Constant ?   The mole is amount of substance that contains as many particles as there are in exactly 12 grams of Carbon 12 isotope. ?   12g of C-12 isotope contains 6.023 x 1023 particles (ions, atoms, molecules, electrons) Avogadro's Constant ?   the number of particles (molecules, ions, atoms) found in one mole of any substance and has the value of 6.023 x 1023 particles. Example: 1 mole of H atoms = 6.023 x 1023 1 mole of H2 atoms = 6.023 x 1023 1 mole of H atoms in H2 molecule = 2(6.023 x 1023) ?   Mole = mass provided   Molar mass of substance ?   The molar mass of a substance is the mass found in 1 mole of that substance ?   Molar mass, M = in units g/mol Molar Volume ?

         Space occupied by 1 mole of a gas (of any substance) ?   Measured in dm3 ?   R.t.p = Conditions of Room Temperature and Pressure ?   At r.t.p the volume of 1 mole of any gas is 24dm3. Note: 1000cm3 = 1 dm3 ?   For problems involving the above properties and values, use simple proportion to solve it. Find equation for reaction, take balanced equation and then use mole ratios to find answer. The Empirical Formula ?   The simplest whole # ratio of the number of atoms of each element in a compound ?   The ratio is the same as the moles in the compound ?   Mass composition or % composition of each element should be available ?   The aim of the empirical formula is to deduce the atoms present per element ?   Most importantly, the mole ratio (moles per element) needs to be determined Molecular Formula ?   The formula of a compound showing the actual # of atoms of each element in a compound ?   The molecular formula of a compound may differ from Empirical formula since the RMM of the compound is different ?   When the RMM of the compound is stated, it is possible to calculate the molecular formula, using the empirical formula. Molecular Formula = (Empirical Formula)x Where x represent subscript of compound, that will be multiplied to obtain actual atoms. Molecular Mass of CH2Br = 188 188 = (12 + 2 +80) x 188 = x 94 x = 2, THERFORCE, Molecular Formula = [CH2Br]2, C2H4Br *Molecular formula is especially required with organic substances NOTE: CONCENTRATIONS OF FORMULA (QUANTITATIVE ANALYSIS AND TITRATION) HAS NOT BEEN MADE INTO NOTES

About the Author