CHAPTER1: SOME BASIC CONCEPTS OF CHEMISTRY

NCERT EXERCISES

1.1 Calculate the molecular mass of the following :

(i) H_2O (ii) CO_2 (iii) CH_4

1.2 Calculate the mass per cent of different elements present in sodium sulphate (Na_2SO_4).

1.3 Determine the empirical formula of an oxide of iron which has 69.9% iron and 30.1% dioxygen by mass.

1.4 Calculate the amount of carbon dioxide that could be produced when

(i) 1 mole of carbon is burnt in air.

(ii) 1 mole of carbon is burnt in 16 g of dioxygen.

(iii) 2 moles of carbon are burnt in 16 g of dioxygen.

1.5 Calculate the mass of sodium acetate (CH_3COONa) required to make 500 mL of 0.375 molar aqueous solution. Molar mass of sodium acetate is 82.0245 g mol^{-1}.

1.6 Calculate the concentration of nitric acid in moles per litre in a sample which has a density, 1.41 g mL^{-1} and the mass per cent of nitric acid in it being 69%.

1.7 How much copper can be obtained from 100 g of copper sulphate ($CuSO_4$) ?

1.8 Determine the molecular formula of an oxide of iron in which the mass per cent of iron and oxygen are 69.9 and 30.1 respectively.

1.9 Calculate the atomic mass (average) of chlorine using the following data :

	% Natural Abundance	Molar Mass
^{35}Cl	75.77	34.9689
^{37}Cl	24.23	36.9659

1.10 In three moles of ethane (C_2H_6), calculate the following :

(i) Number of moles of carbon atoms.

(ii) Number of moles of hydrogen atoms.

(iii) Number of molecules of ethane.

1.11 What is the concentration of sugar ($C_{12}H_{22}O_{11}$) in mol L^{-1} if its 20 g are dissolved in enough water to make a final volume up to 2L?

1.12 If the density of methanol is 0.793 kg L^{-1}, what is its volume needed for making 2.5 L of its 0.25 M solution?

1.13 Pressure is determined as force per unit area of the surface. The SI unit of pressure, pascal is as shown below :

$1Pa = 1N\ m^{-2}$

If mass of air at sea level is 1034 g cm^{-2}, calculate the pressure in pascal.

1.14 What is the SI unit of mass? How is it defined?

1.15 Match the following prefixes with their multiples:

	Prefixes	Multiples
(i)	micro	10^6
(ii)	deca	10^9
(iii)	mega	10^{-6}
(iv)	giga	10^{-15}
(v)	femto	10

1.16 What do you mean ' .gnificant figures ?

1.17   A sample of drinking water was found to be severely contaminated with chloroform, $CHCl_3$, supposed to be carcinogenic in nature. The level of contamination was 15 ppm (by mass).

     (i)   Express this in percent by mass.

     (ii)   Determine the molality of chloroform in the water sample.

1.18   Express the following in the scientific notation:

     (i)   0.0048

     (ii)   234,000

     (iii) 8008

     (iv) 500.0

     (v)   6.0012

1.19   How many significant figures are present in the following?

     (i)   0.0025

     (ii)   208

     (iii) 5005

     (iv) 126,000

     (v)   500.0

     (vi) 2.0034

1.20   Round up the following upto three significant figures:

     (i)   34.216

     (ii)   10.4107

     (iii) 0.04597

     (iv) 2808

1.21   The following data are obtained when dinitrogen and dioxygen react together to form different compounds :

|	**Mass of dinitrogen**	**Mass of dioxygen**
(i)	14 g	16 g
(ii)	14 g	32 g
(iii)	28 g	32 g
(iv)	28 g	80 g

(a)   Which law of chemical combination is obeyed by the above experimental data? Give its statement.

(b)   Fill in the blanks in the following conversions:

     (i)   1 km = ... mm = ... pm

     (ii)   1 mg = ... kg = ... ng

     (iii) 1 mL = ... L = ... dm^3

1.22   If the speed of light is 3.0×10^8 m s^{-1}, calculate the distance covered by light in 2.00 ns.

1.23   In a reaction

     $A + B_2 \rightarrow AB_2$
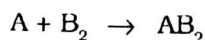
     Identify the limiting reagent, if any, in the following reaction mixtures.

     (i)   300 atoms of A + 200 molecules of B

     (ii)   2 mol A + 3 mol B

     (iii) 100 atoms of A + 100 molecules of B

     (iv) 5 mol A + 2.5 mol B

     (v)   2.5 mol A + 5 mol B

1.24 Dinitrogen and dihydrogen react with each other to produce ammonia according to the following chemical equation:

$$N_2 (g) + H_2 (g) \rightarrow 2NH_3 (g)$$

(i) Calculate the mass of ammonia produced if 2.00×10^3 g dinitrogen reacts with 1.00×10^3 g of dihydrogen.

(ii) Will any of the two reactants remain unreacted?

(iii) If yes, which one and what would be its mass?

1.25 How are 0.50 mol Na_2CO_3 and 0.50 M Na_2CO_3 different?

1.26 If ten volumes of dihydrogen gas reacts with five volumes of dioxygen gas, how many volumes of water vapour would be produced?

1.27 Convert the following into basic units:

(i) 28.7 pm

(ii) 15.15 pm

(iii) 25365 mg

1.28 Which one of the following will have largest number of atoms?

(i) 1 g Au (s)

(ii) 1 g Na (s)

(iii) 1 g Li (s)

(iv) 1 g of Cl_2(g)

1.29 Calculate the molarity of a solution of ethanol in water in which the mole fraction of ethanol is 0.040.

1.30 What will be the mass of one ^{12}C atom in g ?

1.31 How many significant figures should be present in the answer of the following calculations?

(i) $\dfrac{0.02856 \times 29}{0.5}$ (ii) 5×5.364

(iii) $0.0125 + 0.7864 + 0.0215$

1.32 Use the data given in the following table to calculate the molar mass of naturally occuring *argon* isotopes:

Isotope	Isotopic molar mass	Abundance
^{36}Ar	35.96755 g mol^{-1}	0.337%
^{38}Ar	37.96272 g mol^{-1}	0.063%
^{40}Ar	39.9624 g mol^{-1}	99.600%

1.33 Calculate the number of atoms in each of the following (i) 52 moles of Ar (ii) 52 u of He (iii) 52 g of He.

1.34 A welding fuel gas contains carbon and hydrogen only. Burning a small sample of it in oxygen gives 3.38 g carbon dioxide , 0.690 g of water and no other products. A volume of 10.0 L (measured at STP) of this welding gas is found to weigh 11.6 g. Calculate (i) empirical formula, (ii) molar mass of the gas, and (iii) molecular formula.

1.35 Calcium carbonate reacts with aqueous HCl to give $CaCl_2$ and CO_2 according to the reaction, $CaCO_3$ (s) + 2 HCl (aq) $\rightarrow$ $CaCl_2$ (aq) + CO_2(g) + H_2O(l)
What mass of $CaCO_3$ is required to react completely with 25 mL of 0.75 M HCl?

1.36 Chlorine is prepared in the laboratory by treating manganese dioxide (MnO_2) with aqueous hydrochloric acid according to the reaction
4 HCl (aq) + MnO_2(s) $\rightarrow$ 2H_2O (l) + $MnCl_2$(aq) + Cl_2 (g)
How many grams of HCl react with 5.0 g of manganese dioxide?