

ST ANDREWS SCOTS SR SEC SCHOOL

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ASSIGNMENT OF SOME BASIC CONCEPTS OF CHEMISTRY

Class 11 - Chemistry

Section A

- 20 °F can also be written in K as [1]
 - 169.5 K
 - 256.00 K
 - 266.5 K
 - 206.5 K
- What will be the volume of CO₂ at NTP obtained on heating 10 grams of (90% pure) limestone [1]
 - 20.16 litre
 - 2.24 litre
 - 22.4 litre
 - 2.016 litre
- Number of significant figure in π . [1]
 - infinite
 - 3
 - 1
 - 4
- Chemistry does not play a major role in: [1]
 - Large scale production of a variety of fertilizers.
 - Design and synthesis new materials having specific magnetic, electric and optical properties.
 - Explaining ozone depletion.
 - Explaining superconductivity
- — — — — Ba₃N₂ + — — — — — H₂O → — — — — — Ba (OH)₂ + — — — — — NH₃ . This [1]
equation can be balanced by inserting the following in blank spaces from left to right.
 - 1,6,3,2
 - 1,3,6,2
 - 2,6,1,2
 - 1,6,3,6
- For the reaction [1]
 $2C_4H_{10} (g) + 13O_2 (g) \rightarrow 8CO_2 (g) + 10H_2O(l)$ 300 g of C₄H₁₀ is burnt in 1000 g of O₂.
The yield of H₂O and the limiting reagent in the reaction are
 - 442 g and O₂
 - 480 g and C₄ H₁₀ (g)
 - 455 g and C₄ H₁₀ (g)
 - 432 g and O₂
- A measured temperature on Fahrenheit scale is 200° F. What will this reading be on Celsius scale? [1]
 - 40° C
 - 30° C
 - 94° C
 - 93.3° C
- The gram molar mass of ZnSO₄ is [1]

- a) maximum of atomic masses of the elements present in a molecule b) minimum of atomic masses of the elements present in a molecule
- c) average of atomic masses of the elements present in a molecule d) sum of atomic masses of the elements present in a molecule
18. What is the mass percent of carbon in carbon dioxide? [1]
- a) 0.034% b) 28.7%
- c) 27.27% d) 3.4%
19. When excess of CO is used for the reaction, [1]
- $$\text{Fe}_2\text{O}_3(\text{s}) + 3\text{CO}(\text{g}) \longrightarrow 2\text{Fe} + 3\text{CO}_2$$
- the limiting reagent is_____.
- a) CO₂ b) Fe₂O₃
- c) CO d) Fe
20. Molecular mass of glucose (C₆H₁₂O₆) in gm/mol is [1]
- a) 198.162 b) 192.162
- c) 186.162 d) 180.156

Section B

21. 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? [2]
22. Express the following in scientific notation: [2]
- i. 0.0048
- ii. 234,000
- iii. 8008
- iv. 500.0
- v. 6.0012
23. The cost of table salt (NaCl) and table sugar are Rs. 1 per kg and Rs. 6 per kg respectively calculate their cost per mole. [2]
24. A piece of metal is 3 inch (represented by in) long. What is its length in cm? [2]
25. A liquid has a volume of 49.0 cm³ and a mass of 57.642 g. Find out the density of this liquid in SI unit. [2]
26. Calculate: Number of gram atoms in 1.4 grams of nitrogen. (Atomic mass, N = 14) [2]
27. Two students performed the same experiment separately and each one of them recorded two readings of mass which are given below. Correct reading of mass is 3.0 g. On the basis of given data, what would you infer about the accuracy and precision in the readings of students A × B? [2]

Students	Readings	
	(i)	(ii)
A	3.01	2.99
B	3.05	2.95

28. How many grams of Na₂CO₃ should be dissolved to make 100 cm³ of 0.15 M Na₂CO₃ solution? [2]
29. Determine the empirical formula of an oxide of Iron which has 69.9° % iron and 30.1% dioxygen by mass. [2]

30. Calculate the molarity of a solution of ethanol in water, in which the mole fraction of ethanol is 0.040 (assume the density of water to be one). [2]
31. Give an example of a molecule in which the ratio of the molecular formula is six times the empirical formula. [2]
32. How many moles of methane are required to produce 22g CO₂ (g) after combustion? [2]
33. Calculate the atomic mass (average) of chlorine with following data: [2]

	% Natural Abundance	Molar mass
³⁵ Cl	75.77	34.9689
³⁷ Cl	24.23	36.9659

34. 1.375 g of cupric oxide was reduced by heating in a current of hydrogen and the weight of copper that remained was 1.098 g. In another experiment, 1.179 g of copper was dissolved in the nitric acid and the resulting copper nitrate was converted into cupric oxide by ignition. The weight of cupric oxide formed was 1.476 g. Show that these results illustrate the law of constant composition. [2]
35. Calculate molecular mass of glucose (C₆H₁₂O₆) molecule. [2]

Section C

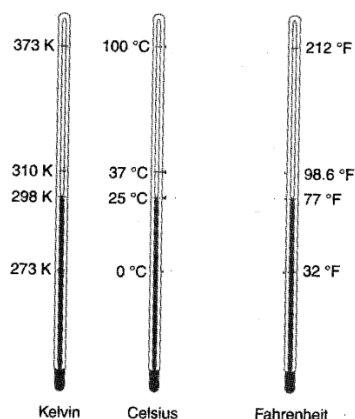
36. Perform the following calculations and express the results to a proper number of significant figures. [3]
- $144.3 \text{ m}^2 + (2.54 \text{ m} \times 8.4 \text{ mL})$
 - $(4.05 \times 10^2 \text{ mL}) - (0.0225 \times 10^2 \text{ mL})$
 - $(3.50 \times 10^2 \text{ cm}) (2.54 \text{ m} \times 10^6 \text{ cm})$
37. A box contains some identical red coloured balls, labelled as A, each weighing 2 grams. Another box contains identical blue coloured balls, labelled as B, each weighing 5 grams. Consider the combinations AB, AB₂, A₂B and A₂B₃ and show that law of multiple proportions is applicable. [3]
38. A flask P contains 0.5 mole of oxygen gas. Another flask Q contains 0.4 mole of ozone gas. Which of the two flasks contains greater number of oxygen atoms? [3]
39. 10 mL of H₂ combine with 5 mL of O₂ to form water. When 200 mL of H₂ at STP is passed over heated CuO, the CuO loses 0.144 g of its weight. Does the above data correspond to the law of constant composition? [3]
40. Calculate the number of moles in the following. [3]
- 7.85 g of iron
 - 4.68 mg of silicon
 - 65.6 ug of carbon
41.
 - Assuming the density of water to be 1g/cm³, calculate the volume occupied by one molecule of water. [3]
 - Assuming the water molecule to be spherical, calculate the diameter of the water molecule.
 - Assuming that oxygen atom occupies half of the volume occupied by the water molecule, calculate approximately the diameter of the oxygen atom.
42. 10 mL of a solution of NaCl containing KCl, gave an evaporation 0.93 g of the mixed salt. This salt - mixture gave 1.865 g of AgCl by reacting with Ag NO₃ solution. [3]
- Calculate the quantity of NaCl in 10 mL of the solution.
- Given: Atomic masses; Ag = 108, Cl = 35.5, K = 39.0, N = 14.0, O = 16.0
43. Three oxides of nitrogen contained 63.6%, 46.7% and 30.4% nitrogen respectively. Show that these figures illustrate the law of multiple proportions. [3]

44. The density of 3 M solution of NaCl is 1.25 g mL^{-1} . Calculate the molality of the solution. [3]
45. A solution contains 25 % water, 25 % ethanol and 50 % acetic by mass. Calculate the mole fraction of each component. [3]
46. An alloy of iron (53.6%), nickel (45.8 %) and manganese (0.6 %) has a density of 8.17 g cm^{-3} . Calculate the number of Ni atoms present in the alloy of dimensions $10.0 \text{ cm} \times 20.0 \text{ cm} \times 15.0 \text{ cm}$ [3]
47. Calculate the molecular mass of the following. [3]
- H_2O
 - CO_2
 - CH_4
48. The vapour density of a mixture of NO_2 and N_2O_4 is 38.3 at 27°C . Calculate the number of moles of NO_2 in 100 g of the mixture. [3]
49. What volume of oxygen at STP is required to effect complete combustion of 200 cm^3 of acetylene and what would be the volume of carbon dioxide formed? [3]
50. Copper oxide was prepared by the following methods. [3]
- In one case, 1.75 g of the metal was dissolved in nitric acid and igniting the residual copper nitrate yielded 2.19 g of copper oxide.
 - In the second case, 1.14 g of metal dissolved in nitric acid were precipitated as copper hydroxide by adding caustic alkali solution. The precipitated copper hydroxide after washing, drying and heating yielded 1.43 g of copper oxide.
 - In the third case, 1.46 g of copper when strongly heated in a current of air yielded 1.83 g of copper oxide.
- Show that the given data illustrate the law of definite composition.

Section D

Question No. 51 to 55 are based on the given text. Read the text carefully and answer the questions: [5]

Every experimental measurement has some amount of uncertainty associated with it because of the limitation of the measuring instrument and the skill of the person making the measurement. Significant figures are meaningful digits that are known with certainty plus one which is estimated or uncertain. The uncertainty is Density involved mass and volume. The density of a substance is its amount of mass per unit volume. The density of a substance tells us about how closely its particles are packed. If the density is more, it means particles are more closely packed. Temperature are three common scales to measure temperature — $^\circ\text{C}$ (degree celsius), Fahrenheit) and K (kelvin). Here, K is the SI unit. The thermometers are based on these scales indicate by writing the certain digits and the last uncertain digit. Precision refers to the closeness of various measurements for the same quantity. However, accuracy is the agreement of a particular value to the true value of the result.



51. The significant figures in 3400 are

- a) 6
b) 5
c) 2
d) 4

52. Which of the following is the incorrect match?

	Column A	Column B
a.	Density	g mol
b.	Mass	kg
c.	Pressure	pascal
d.	Luminous intensity	unitless

- a) Option (b)
b) Option (d)
c) Option (c)
d) Option (a)

53. If the density of a solution is 3.12 g mL^{-1} , the mass of 1.5 mL solution in significant figures is _____.

- a) 46.80 g
b) 4.680 g
c) 4.7 g
d) $4680 \times 10^{-3} \text{ g}$

54. Which of the following pairs have the same number of atoms?

- I. 16 g of $\text{O}_2(\text{g})$ and 4 g of $\text{H}_2(\text{g})$
II. 16 g of O_2 and 44 g of CO_2
III. 28 g of N_2 and 32 g of O_2
IV. 12 g of $\text{C}(\text{s})$ and 23 g of $\text{Na}(\text{s})$

- a) III and IV
b) I and II
c) II and IV
d) I and II

55. A measured temperature on the Fahrenheit scale is 200°F . What will this reading be on Celsius scale?

- a) 30°C
b) 94°C
c) 40°C
d) 93.3°C

Question No. 56 to 60 are based on the given text. Read the text carefully and answer the questions:

[5]

Chemistry developed mainly in the form of Alchemy and Iatrochemistry during 1300-1600 CE. Modern chemistry took shape in 18th century Europe. Chemistry contributes in a big way to the national economy. It also plays an important role in meeting human needs for food, healthcare products, and other material aimed at improving the quality of life anything which has mass and occupies space is called matter. Everything around us, for example, a book, pen, pencil, water, air, all living beings, etc., are composed of matter can exist in three physical states viz. solid, liquid and gas. Particles are held very close to each other in solids in an orderly fashion and there is not much freedom of movement. In liquids, the particles are close to each other but they can move around. However, in gases, the particles are far apart as compared to those present in solid or liquid states and their movement is easy and fast. Because of such arrangement

68. Calcium carbonate reacts with aqueous HCl to give CaCl_2 and CO_2 according to the reaction, [5]

$$\text{CaCO}_3 + 2\text{HCl}(aq) \rightarrow \text{CaCl}_2(aq) + \text{CO}_2(g) + \text{H}_2\text{O}(l)$$
 What mass of CaCO_3 is required to react completely with 25 mL of 0.75 M HCl?
69. A solution is prepared by adding 2 g of a substance A to 18 g of water. Calculate the mass percent of the solute. [5]
 Also define volume percentage and parts per million (ppm).
70. i. A sample of drinking water was found to be severely contaminated with chloroform, CHCl_3 , supposed to be [5]
 carcinogenic in nature. The level of contamination was 15 ppm (by mass).
 a. Express this in percent by mass.
 b. Determine the molarity of chloroform in the water sample.
 ii. Calculate the molarity of a solution of ethanol in water in which the mole fraction of ethanol is 0.040.
71. i. Give an example of a molecule in which [5]
 a. The ratio of the molecular formula and the empirical formula is 6: 1.
 b. Molecular weight is two times of the empirical formula weight.
 c. The empirical formula is CH_2O and the ratio of molecular formula weight and empirical formula weight is 6.
 ii. 1.615 g of anhydrous ZnSO_4 was left in moist air. After a few days its weight was found to be 2.875 g. What is the molecular formula of hydrated salt?
 (At. masses: Zn = 65.5, S = 32, O=16, H = 1)
72. Calculate the number of moles in each of the following: [5]
 i. 392 g of sulphuric acid
 ii. 44.8 litres of sulphur dioxide at N.T.P.
 iii. 6.022×10^{22} molecules of oxygen
 iv. 8g of calcium
73. Express the following in the scientific notation. [5]
 i. 0.000968
 ii. 15742
 iii. 90,00
 iv. $(5.7 \times 10^6) \times (4.2 \times 10^{-2})$
 v. $(6.8 \times 10^{-9}) + (1.4 \times 10^{-2})$
 vi. $(4.56 \times 10^{-3} + 2.62 \times 10^{-2})$
 vii. $(9.87 \times 10^{-3} - 2.26 \times 10^{-4})$
74. Commercially available concentrated hydrochloric acid contains 38% HCl by mass. [5]
 i. What is the molarity of the solution (density of solution = 1.19 g mL^{-1})?
 ii. What volume of concentrated HCl is required to make 1.0 L of an 0.10 M HCl?
75. 250 ml of 0.5 sodium sulphate (Na_2SO_4) solution are added to an aqueous solution containing 10.0 g of BaCl_2 , [5]
 resulting in the formation of white precipitate of BaSO_4 . How many moles and how many grams of barium sulphate will be obtained?