Q1. What will be the molarity of a solution. Which contains 5.58g of NaCl(s) per 500mL? **2 Marks**

Q2. If 10 volumes of dihydrogen gas reacts with five volumes of dioxygen gas, how many volumes of water vapour would be produced? **2 Marks**

Q3. Calculate the number of grams of oxygen in 0.10mol of Na_2CO_3. **2 Marks**

$10H_2O$.

Q4. What will be the mass of one atom of C-12 in grams?

Q5. Classify the following into elements, compounds and mixtures: water, tea, silver, steel, carbon dioxide and platinum.

Q6. Write the relationship between empirical formula and molecular formula.

Q7. Volume of a solution changes with change in temperature, then, will the molality of the solution be affected by temperature? Give reason for your answer.

Q8. How many atoms of calcium are there in 2g of Ca?
(At. mass of Ca = 40u)

Q9. Why are the atomic mass of most of the elements is fractional?

Q10. What do you mean by significant figures?

Q11. Define limiting reagent.

OR

What is limiting reactant in a reaction?

Q12. What is the symbol for SI unit of mole? How is the mole defined? **2 Marks**

Q13. How many electrons are present in 16g of CH_4? **2 Marks**

Q14. How many significant figures should be present in the answer of the following calculations? **2 Marks**

$$\frac{2.5 \times 1.25 \times 3.5}{2.01}$$

Q15. In a reaction **2 Marks**

$A + B_2 \rightarrow AB_2$

Identify the limiting reagent, if any, in the following reaction mixtures.
2 mol A + 3 mol B.

Q16. When 4.2g of $NaHCO_3$ is added to a solution of CH_3COOH weighing 10.0g, 1120cm^2 at of CO^2 at is released into atmosphere leaving behind 12.0g of residue. Prove that this observation is in accordance with law of conservation of mass. **2 Marks**

Q17. A measured temperature on Fahrenheit scale is 200° F. What will this reading be on Celsius scale? **2 Marks**

Q18. What is the mass percent of carbon in carbon dioxide? **2 Marks**

Q19. How many significant figures should be present in the answer of the following calculations? **2 Marks**
0.0125 + 0.7864 + 0.0215

Q20. If the density of a solution is 3.12g mL^{-1}, what is the mass of 1.5mL solution in significant figures. **2 Marks**

Q21. How many moles arc there in 0.08L of hydrogen at STP?

Q22. How is the term material different from matter?

Q23. Calculate the percentage by mass of water in sodium carbonate crystals. ($Na_2CO_3.10H_2O$).

Q24. How are 0.05m KOH and 0.05M different from each other?

Q25. Which is more informative? Empirical or molecular formula?

Q26. What mass of silver nitrate will react with 5.85g of sodium chloride to produce 14.35g of silver chloride and 8.5g of sodium nitrate, if the law of conservation of mass is true?

Q27. How many gram of Na_2CO_3 should be dissolved to make 100cm^3 of 0.15M Na_2CO_3 solution?

Q28. What is the difference between 5.0g and 5.00g?

Q29. What is the difference between molality and molarity?

Q30. How many atoms are present in 16g of ozone?

Q31. In a reaction A+ $B_2 \rightarrow AB_2$, identify the limiting reagent when 2 mole of A are mixed with 3 moles B_2. **2 Marks**

Q32. Calculate the number of gram molecules of water in a beaker containing 576g of water. **2 Marks**

Q33. How many moles of iron can be made from Fe_2O_3 by the use of 16 moles of carbon monoxide in the following reaction? **2 Marks**
$Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

Q34. It the concentration of glucose ($C_6H_{12}O_6$) in blood is 0.9g L^{-1}, what will be the molarity of glucose in blood? **2 Marks**

Q35. Calculate the number of moles of NaOH in $27cm^3$ of 0.15M NaOH solution. **2 Marks**

Q36. 1L of a gas at STP weighs 1.97g. What is molecular mass? **2 Marks**

Q37. Calculate the number of atoms of the following:
52 moles of Ar **2 Marks**

Q38. How many molecules of SO_2 are present in 11.2 L at STP? **2 Marks**

Q39. Use the data given in the following table to calculate the molar mass of naturally occuring argon isotopes: **2 Marks**

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

Q40. How many molecules are pre ent in one mole of oxygen gas at STP? Calculate its mass.

Q41. What do you understand by stoichiometric coefficients in a chemical equation?

Q42. In three moles of ethane (C_2H_6), calculate the following:
Number of molecules of ethane.

Q43. How many significant figures should be present in the answer of the following calculations?
5 × 5.364

Q44. How can you prove that red oxide of copper is not an element?

Q45. Calculate the molar mass of the following:
CO_2

Q46. How many atoms of magnesium are present in 96u of Mg? **2 Marks**

Q47. If 500mL of a 5M solution is diluted to 1500ml, what will be the molarity of the solution obtained? **2 Marks**

Q48. The empirical formula and molecular mass of a compound are CH_2O and 180g respectively. What will be the molecular formula of the compound? **2 Marks**

Q49. What is difference between molecules and compounds? Give examples of each. **2 Marks**

Q50. Calculate the molar mass of the following: **2 Marks**

CH_4

Q51. What does the following prefixes stand for: **2 Marks**

a. Pico.
b. Nano.
c. Micro.
d. Deci.

Q52. How many significant figures should be present in the answer of the following calculations? **2 Marks**

$$\frac{0.02856 \times 298.15 \times 0.112}{05785}$$

Q53. 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 15ppm (by mass). Express this in percent by mass. **2 Marks**

Q54. Why molality is preferred over molarity of a solution?

Q55. In an experiment, when hydrochloric acid was reacted with $CaCO_3$ at STP, $48cm^3$ of CO_2 was formed. Calculate the number of mole of CO_2 and number of molecules.

Q56. Calculate the average atomic mass of hydrogen using the following data:

Isotope	% Natural abundance	Molar mass
^1H	99.985	1
^2H	0.015	2

Q57. In a reaction
$A + B_2 \rightarrow AB_2$
Identify the limiting reagent, if any, in the following reaction mixtures.
100 atoms of A + 100 molecules of B.

Q58. Calculate the percentage of N in NH_3 molecule.

Q59. Calculate the mass percent of calcium, phosphorus and oxygen in calcium phosphate $Ca_3(PO_4)_2$. **2 Marks**

Q60. Why is the law of Gay Lussac's not obeyed if any reactant or product is not a gas? **2 Marks**

Q61. Calculate the number of atoms in the following:
52u of He. **2 Marks**

Q62. Calculate the molar mass of the following:
H_2O **2 Marks**

Q63. In a reaction **2 Marks**

$A + B_2 \rightarrow AB_2$

Identify the limiting reagent, if any, in the following reaction mixtures.

300 atoms of A + 200 molecules of B.

Q64. In three moles of ethane (C_2H_6), calculate the **2 Marks**

following:

Number of moles of hydrogen atoms.

Q65. Vitamin C is known to contain 1.29×10^{24} hydrogen atoms. Calculate the number of moles of **2 Marks**

hydrogen atoms.

Q66. In three moles of ethane (C_2H_6), calculate the **2 Marks**

following:

Number of moles of carbon atoms.

Q67. Calculate the volume of 34g of NH_3

at STP.

Q68. Calculate the number of molecules present in 22.0g of CO_2 [C = 12u,

H = 14u]

Q69. 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 15ppm (by mass).

Determine the molality of chloroform in the water sample.

Q70. Calculate the number of atoms in the

following:

52g of He.

Q71. In a reaction,

$A + B_2 \rightarrow AB_2$

Identify the limiting reagent, if any, in the following reaction mixtures.

2.5mol A + 5mol B.

Q72. What will be the mass of one ^{12}C

atom in g?

Q73. Calculate the percentage of nitrogen in NH_3· (Atomic mass of N = 14,H

= 1amu)

Q74. Calculate the volume of water that should be added to $25cm^3$ of 10M H_2SO_4 to obtain 0.5M **2 Marks**

$H2SO_4$ solution.

Q75. In a reaction **2 Marks**

$A + B_2 \rightarrow AB_2$

Identify the limiting reagent, if any, in the following reaction mixtures.

5mol A + 2.5mol B.

Q76. Empirical formula of a compound X (molar mass 78g mol^{-1}) is CH. Write its **2 Marks**

molecular formula.

Q77. What will be the molarity of a solution, which contains 5.85g of NaCl(s) per 500mL? **3 Marks**

A. 4mol L–1 B. 20mol L–1 C. 0.2mol L–1 D. 2mol L–1

Q78. How many atoms are present in 1ml of NH_3 at STP? **3 Marks**

Q79. Hydrogen gas is prepared in the laboratory by reacting dilute HCl with granulated zinc. Following reaction takes place. **3 Marks**

$Zn + 2HCl \rightarrow ZnCl_2 + H_2$

Calculate the volume of hydrogen gas liberated at STP when 32.65g of zinc reacts with HCl. 1mol of a gas occupies 22.7L volume at STP; atomic mass of Zn = 65.3u.

Q80. Dinitrogen and dihydrogen react with each other to produce ammonia according to the following chemical equation: **3 Marks**

$N_{2(g)} + H_{2(g)} \rightarrow 2NH_{3(g)}$

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

Q81. If 6.022×10^{23} molecules of N_2, react completely with H_2 according to the equation: **3 Marks**

$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$,

then calculate the number of molecules of NH_3 formed.

Q82. An organometallic compound on analysis was found to contain, C = 64.4%, H = 5.5% and Fe= 29.9%. Determine its empirical formula (At. mass of Fe = 56u).

Q83. The following data are obtained when dinitrogen and dioxygen react together to form different compounds:

Fill in the blanks in the following conversions:

i. 1km = ... mm = ... pm.

ii. 1mg = ... kg = ... ng.

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

Q84. Calcium carbonate reacts with aqueous HCl to give $CaCl_2$ and CO_2 according to the reaction given below

$CaCO_3$ (s) + 2HCl (aq) $\rightarrow$ $CaCl_2$(aq) + CO_2(g) + H_2O(l)

What mass of $CaCl_2$ will be formed when 250mL of 0.76M HCl reacts with 1000g of $CaCO_3$? Name the limiting reagent. Calculate the number of moles of $CaCl_2$ formed in the reaction.

Q85. How are 0.50mol Na_2CO_3 and 0.50M Na_2CO_3 different?

Q86. How much sugar ($C_{12}H_{22}O_{11}$) will be required if each person on the earth is given 10^{15} moles of sugar per day. Population of the earth is 3×10^{10}.

Q87. What is the molecular mass of a substance each molecule of which contains 9 atoms of carbon, 13 atoms of hydrogen and 2.33×10^{-23}g other component? **3 Marks**

Q88. Calculate the number of atoms present in 1.4g of N_2 molecule. **3 Marks**

Q89. Calculate the mass of sodium acetate (CH_3COONa) required to make 500mL of 0.375 molar aqueous solution. Molar mass of sodium acetate is 82.0245 g mol^{-1}. **3 Marks**

Q90. Compute the mass of one molecule and the molecular mass of C_6H_6 (benzene) (At. mass of C = 12, H = 1u). **3 Marks**

Q91. Calculate the percentage of copper in a sample of $CuCl_2$. **3 Marks**

(Atomic mass of Cu = 63.5u, Cl = 35.5u)

Q92. What is the concentration of sugar ($C_{12}H_{22}O_{11}$) i mol L^{-1} if its 20g are dissolved in enough water to make a final volume up to 2L? **3 Marks**

Q93. Calculate the concentration of nitric acid in mol per litre in a sample which has a density 1.41g mL^{-1} and the mass percent of nitric acid in it being 69%. **3 Marks**

Q94. 45.4L of dinitrogen reacted with 22.7L of dioxygen and 45.4L of nitrous oxide was formed. The reaction is given below: **3 Marks**

$2N_2(g) + O_2(g) \rightarrow 2N_2O(g)$

Which law is being obeyed in this experiment? Write the statement of the law?

Q95. The density of 3 molal solution of NaOH is 1.110g mL^{-1}. Calculate the molarity of the solution. **3 Marks**

Q96. Chlorophyll, the green colouring matter of plants contains 2.68% magnesium by weight. Calculate the number of magnesium atoms in 2.00g of chlorophyll (Atomic mass of Mg = 24).

Q97. A mixture of gases containing H_2 and O_2 in the ratio of 1 : 4 by mass. What is their molar ratio.

Q98. Calculate the mass of ferric oxide that will be obtained by complete oxidation of 2g of Fe. [Atomic weights of Fe = 56u, 0 = 16u]

Q99. Balance the following equations:

i. $H_3PO3 \rightarrow H_3PO_4 + PH_3$

ii. $Ca + H_2O \rightarrow Ca(OH)_2 + H_2$

iii. $Fe_2(SO_4)_3 + NH_3 + H_2O \rightarrow Fe(OH)_3 + (NH_4)_2SO_4$

iv. $Cl_2 + NaOH \rightarrow NaCl + NaClO_3 + H_2O$

Q100. 1M solution of $NaNO_3$ has density 1.25g cm^{-3}.Calculate its molality.

(Mol. weight of $NaNO_3$ = 85g mol^{-1})

Q101. A vessel contains 1.6g of dioxygen at STP (273.15K, 1 atm pressure). The gas is now transferred to another vessel at constant temperature, where pressure becomes half of the original pressure. Calculate

i. Volume of the new vessel.

ii. Number of molecules of dioxygen.

Q102. How many grams of $KClO_3$ must be decomposed to prepare 3.36 litres of oxygen at STP? (Atomic weight of K = 39, Cl= 35.5, 0 = 16u) **3 Marks**

Q103. The water level in a metric measuring cup is 0.75L before the addition of a pebble weighing 150g. The water level after submerging the pebble is 0.82L. Determine the density of the pebble. **3 Marks**

Q104. Calculate the volume of 02 at STP liberated by heating 12.25g of $KClO_3$ **3 Marks**

(At. wt. of K = 39, Cl = 35.5, 0 = 16u)

Q105. If 2 litres of N_2 is mixed with 2 litres of H_2 at a constant temperature and pressure, then what will be the volume of NH_3 formed? **3 Marks**

Q106. Express each of the following in SI units, **3 Marks**

i. 14 pound per square inch (atmospheric pressure).
ii. 100 mile per hour.
iii. 5 feet 2 inch.
iv. 150 pound.

Q107. 0.5 mole each of H_2S and SO_2 mixed together in a reaction Flask, react according to equation: **3 Marks**

$2H_2S + SO_2 \rightarrow 2H_2 + 3S$

Calculate the number of moles of 'S' formed.

Q108. Calculate the concentration of HBr solution in mol L^{-1} in a sample which has density $1.5ml^{-1}$ and mass percent of HBr being 48%. [Molar mass of HBr = 81g mol^{-1}] **3 Marks**

Q109. If the speed of light is 3.0×10^8 ms^{-1}, calculate the distance covered by light in 2.00ns. **3 Marks**

Q110. Calculate the total number of electrons present in 1.6g of methane.

Q111. 10mL of H, combine with 5mL of O_2 to form water. When 200mL of H, at STP is passed over heated CuO, the CuO loses 0.144g of its weight. Does the above data correspond to the law of constant composition?

Q112. If two elements can combine to form more than one compound, the masses of one element that combine with a fixed mass of the other element, are in whole number ratio.
a. Is this statement true?
b. If yes, according to which law?
c. Give one example related to this law.

Q113. The average molar mass of a mixture of methane (CH_4) and ethane (C_2H_4) present in the ratio of a : l is found to be 20.0g mol^{-1}. If the ratio were reversed, what would be the molar mass of the mixture?

Q114. Calculate the mass of $112cm^3$ of hydrogen gas at STP.
(Atomic mass of H = 1u)

Q115. If 4g of NaOH dissolves in 36g of H_2O, calculate the mole fraction of each component in the solution. Also, determine the molarity of solution (specific gravity of solution is 1g mL^{-1}).

Q116. 56kg of $N_2(g)$ and 10kg of $H_2(g)$ are mixed to produce NH_3 (g). Calculate the number of moles of ammonia gas formed.
(Atomic mass/ g mol^{-1} N = 14, H = 1)

Q117. One mole of any substance contains 6.022×10^{22} atoms/ molecules. Calculate the number of molecules of H_2SO_4 present in 100mL of 0.02M H_2SO_4 Solution. **3 Marks**

Q118. If 2L of N_2 is mixed with 2L of H at a constant temperature and pressure, then what will be the volume of NH_3 formed? **3 Marks**

Q119. i. How many gram atoms are there in 8.0g of S? **3 Marks**
ii. The molarity of Solution of sulphuric acid is 1.35M. Calculate its molality.
(The density of solution is 1.02g cm^{-3})

Q120. Calculate the weight of FeO formed from 2g of VO and 5.75g of Fe_2O_3. Also, report the limiting reagent. **3 Marks**

$2VO + 3Fe_2O3 \rightarrow 6FeO + V_2O_5$

(Atomic mass of V = 51.4, O = 16, Fe = 55.9g)

Q121. A black dot used as a full stop at the end of a sentence has a mass of about one attogram. Assuming that the dot is made up of carbon, calculate the approximate number of carbon atoms present in the dot? **3 Marks**

Q122. Commercially available concentrated hydrochloric acid contains 45% HCl by mass. **5 Marks**

a. What is the molarity of this solution? The density is 1.19g mL.

b. What volume of cone. HCl is required to make 1.00L of 0.24M HCl?

ii. Write the balanced chemical equations for the following:

a. $KMnO_4 + NH3 \rightarrow MnO_2 + KOH + H_2O + N_2$

b. $HNO_3 + P_4 \rightarrow NO_2 + H_3PO_4 + H_2O$

Q123. Read the passage given below and answer the following questions from (i) to (v).

The identity of a substance is defined not only by the types of atoms or ions it contains, but by the quantity of each type of atom or ion. The experimental approach required the introduction of a new unit for amount of substances, the mole, which remains indispensable in modern chemical science. The mole is an amount unit similar to familiar units like pair, dozen, gross, etc. It provides a specific measure of the number of atoms or molecules in a bulk sample of matter. A mole is defined as the amount of substance containing the same number of discrete entities (atoms, molecules, ions, etc.) as the number of atoms in a sample of pure 12C weighing exactly 12g. One Latin connotation for the word "mole" is "large mass" or "bulk," which is consistent with its use as the name for this unit. The mole provides a link between an easily measured macroscopic property, bulk mass, and an extremely important fundamental property, number of atoms, molecules and so forth. The number of entities composing a mole has been experimentally determined to b $6.02214179 \times 10^{23}$.

$6.02214179 \times 10^{23}$, a fundamental constant named Avogadro's number (NA) or the Avogadro constant in honor of Italian scientist Amedeo Avogadro. This constant is properly reported with an explicit unit of "per mole," a conveniently rounded version being 6.022×10^{23}/mol. Consistent with its definition as an amount unit, 1 mole of any element contains the same number of atoms as 1 mole of any other element. The masses of 1 mole of different elements, however, are different, since the masses of the individual atoms are drastically different. The molar mass of an element (or compound) is the mass in grams of 1 mole of that substance, a property expressed in units of grams per mole (g/mol).

The following questions are multiple choice questions. Choose the most appropriate answer:

i. A sample of copper sulphate pentahydrate contains 8.64g of oxygen. How many grams of Cu is present in the sample?

a. 0.952g

b. 3.816g

c. 3.782g

d. 8.64g

ii. A gas mixture contains 50% helium and 50% methane by volume. What is the percent by \ weight of methane in the mixture?

a. 19.97%

b. 20.05%

c. 50%

d. 80.03%

iii. The mass of oxygen gas which occupies 5.6 litres at STP could be:

a. Gram atomic mass of oxygen

b. One fourth of the gram atomic mass of oxygen
c. Double the gram atomic mass of oxygen
d. Half of the gram atomic mass of oxygen

iv. What is the mass of one molecule of yellow phosphorus? (Atomic mass of phosphorus = 30)

a. 1.993×10^{-22} mg
b. 1.993×10^{-19} mg
c. 4.983×10^{-20} mg
d. 4.983×10^{-23} mg

v. The number of moles of oxygen in 1L of air containing 21% oxygen by volume, in standard conditions is:

a. 0.186 mol
b. 0.21 mol
c. 2.10 mol
d. 0.0093 mol

Q124. Perform the following calculations and express the results to proper number of significant figures.

i. $144.3\ m^2 + (2.54\ m \times 8.4\ m)$.
ii. $(4.05 \times 10^2 mL) - (0.0225 \times 10^2 mL)$.
iii. $(3.50 \times 10^2 cm)\ (4.00 \times 10^6 cm)$.

Q125. A compound made up of two elements A and B has A = 70%, B = 30%. Their relative number of mole in the compound are 1.25 and 1.88. Calculate.

i. Atomic masses of the elements A and B.
ii. Molecular formula of the compound, if its molecular mass is found to be 160.

Q126. Match Column I with Column II.

S. No	Column I	S. No	Column II
	Physical quantity		Unit
1	Molarity	(i)	$g\ ml^{-1}$
2.	Mole fraction	(ii)	mol
3.	Mole	(iii)	Pascal
4.	Molality	(iv)	Unitless
5.	Presure	(v)	$mol\ L^{-1}$
6.	Luminous intensity	(vi)	Candela
7.	Density	(vii)	$mol\ kg^{-1}$
8.	Mass	(viii)	Nm^{-}
9.		(ix)	kg

Q127. The uncertainty in the experimental or the calculated values is indicated by mentioning the number of significant figures. Significant figures are meaningful digits which are known with certainty plus one which is estimated or uncertain. The uncertainty is indicated by writing the certain digits and the last uncertain digit. there are certain rules for determining the Number of significant figures. These are Stated below: **5 Marks**

- All non-zero digits are significant. For Example in 285cm, there are three Significant figures and in 0.25 mL, there are two significant figures.
- Zeros preceding to first non-zero digit are not significant. such zero indicates the position of decimal point. thus, 0.03 has one significant figure and 0.0052 has two significant figures.
- Zeros between two non-zero digits are significant. thus, 2.005 has four Significant figures.
- Zeros at the end or right of a number are significant, provided they are on the right side of the decimal point. For example, 0.200 g has three significant figures. But, if otherwise, the terminal zeros are not significant if there is no decimal point.

Precision refers to the closeness of various measurements for the same quantity. However, accuracy is the agreement of a particular valueto the true value of the result.

LAWS OF CHEMICALCOMBINATIONS- The combination of elements to form compounds is governed by the following five basic laws.

1. Law of Conservation of Mass-This law was put forth by Antoine Lavoisierin 1789. He performed careful experimental studies for combustion reactions and reached to the conclusion that in all physical andchemical changes, there is no net change inmassduring the process. Hence, he reachedto the conclusion that matter can neither becreated nor destroyed. This is called 'Law ofConservation of Mass'.
2. Law of Definite Proportions-This law was given by, a French chemist, Joseph Proust. He stated that a given compound always contains exactly the same proportion of elements by weight.
3. Law of Multiple Proportions-This law was proposed by John Dalton. According to this law, if two element can combine to form more than one compound, the masses of one element that combine with a fixed mass of the other element, are in the ratio of small whole numbers. For example, hydrogen combines with oxygen to form two compounds, namely, water and hydrogen peroxide.
   Hydrogen + Oxygen→ Water
   2g 16g 18g
   Hydrogen + Oxygen → Hydrogen Peroxide
   2g 32g 34g
   Here, the masses of oxygen (i.e., 16 g and 32 g), which combine with a fixed mass of hydrogen (2g) bear a simple ratio, i.e., 16:32 or 1:2.
4. Gay Lussac's Law of Gaseous Volumes-This law was given by Gay Lussac in 1808. Heobserved that whe gases combine or are produced in a chemicalreaction they do so in asimple ratio by volume,provided al gases are at the same temperature and pressure.
5. Avogadro's Law – In 1811, Avogadro proposed that equal volumes of all gases at the same temperature and pressure should contain equal number of molecules.

In 1808, Dalton published 'A New System of Chemical Philosophy', in which he proposed the following :

1. Matter consists of indivisible atoms.
2. All atoms of a given element have identical properties, including identical mass. Atoms of different elements differ in mass.
3. Compounds are formed when atoms of different elements combine in a fixed ratio.
4. Chemical reactions involve reorganisati on of atoms. These are neither created nor destroyed in a chemical reaction.

i. … refers to the closeness of variousmeasurements for the same quantity.
   a. Accuracy
   b. Reliability
   c. Precision
   d. Uncertainty

ii. Law of Conservation of mass was put forth by ….in 1789.
   a. Joseph Proust
   b. Antoine Lavoisier
   c. Joseph Louis

d. Gay Lussac

iii. Which of the following number has twosignificant figures.

a. 0.0052
b. 052
c. 52
d. 0052

iv. … is the agreement of a particular valueto the true value of the result.

a. Accuracy
b. Reliability
c. Precision
d. Uncertainty

v. Law of Multiple Proportions proposed by....

a. Joseph Proust
b. Antoine Lavoisier
c. Joseph Louis
d. John Dalton

Q128. Match the following physical quantities with units:

	Physical quantity		Unit
(i)	Molarity	(a)	g mL^{-1}
(ii)	Mole fraction	(b)	mol
(iii)	Mole	(c)	Pascal
(iv)	Molality	(d)	Unitless
(v)	Pressure	(e)	mol L^{-1}
(vi)	Luminous intensity	(f)	Candela
(vii)	Density	(g)	mol kg^{-1}
(viii)	Mass	(h)	Nm^{-1}
		(i)	kg

Q129. 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 25mL of 0.75M HCl?

Q130. Match the following:

(i)	88g of CO_2	(a)	0.25mol
(ii)	6.022×10^{23} molecules of H_2O	(b)	2mol
(iii)	5.6 litres of O_2 at STP	(c)	1mol
(iv)	96g of O_2	(d)	6.022 × 1023 molecules
(v)	1mol of any gas	(e)	3mol

Q131. A compound on analysis found to contain following percentage composition: Na = 43.4%, C = 11.4% and O = 45.3%. Determine the empirical and molecular formulae. **5 Marks**

Given: the relative molecular mass of the compound is 106.

Q132. Read the passage given below and answer the following questions from 1 to 5. **5 Marks**

Quantitative measurement of properties isreaquired for scientific investigation. Earlier, two different systems of measurement, i.e., the English System and the Metric System were being used indifferent parts of the world. The metric system, which originated in France in late eighteenth century. The SI system has seven base units. these are listed as follow.

	Base Physical Quantities	Unit
1	Length	Metre – m
2	Mass	Kilogram – kg
3	Time	Second – s
4	Electric current	Ampere- A
5	Thermodynamic Temperature	Kelvin – K
6	Amount of substance	Mole – mol
7	Luminous intensity	Candela- cd

Here , Mass of a substance is the amount of matter present in it, while weight is the force exerted by gravit on an object. Density of a substance is its amount of mass per unit volume. The mole, symbol mol, is the S unit of amount of substance. One mole contains exactly $6.02214076 \times 10^{23}$ elementary entities. This number is the fixed numerical value of the Avogadro constant, NA, when expressed in the unit per moland i called the Avogadro number. The amount of substance, symbol n, of a system is a measure of the number c specified elementary entities. An elementary entity may be an atom, a molecule, an ion, an electron, any other particle or specified group of particles.There are three common scales to measure temperature — °C (degree celsius), °F (degree fahrenheit) and K (kelvin). Here, K is the SIunit. Generally, the thermometer with celsius scale are calibrated from 0° to 100°, where these two temperatures are the freezing point and the boiling point of water, respectively. The fahrenheit scale is represented between 32° to 212°.

The temperatures on two scales are related to each other by the following relationship:

$°F = \frac{9}{5}(°C) + 32$

The kelvin scale is related to celsius scaleas follows:

$K = °C + 273.15$

i. The metric system,which originated in … in late eighteenthcentury.
   a. Ukraine
   b. German
   c. Russia
   d. France

ii. The SI system has …. base units.
   a. 7
   b. 3
   c. 9
   d. 1

iii. The symbol for SI unit of thermodynamic temperature is …
   a. Kelvin
   b. K
   c. Degree Celsius
   d. °C

iv. A prefix giga equivalents to:
   a. 10^9
   b. 10^{10}

c. 10^{11}

d. 10^{12}

v. The fahrenheit scale is represented between..

a. 0°F to 100°F

b. 32°F to 212°.F

c. 15° F to 373° F

Q133. i. 1.84g of mixture of $CaCO_3$ and $MgCO_3 \rightarrow$ is strongly heated till no further loss of mass takes place. The residue weighs 0.96g. Calculate the percentage composition of the mixture. **5 Marks**

ii. What will be the molality of the solution containing 18.25g of HCl gas in 500g of water?

Q134. Arrange the following in order of their increasing masses in gram (i) One atom of silver, (ii) one gram-atom of nitrogen, (iii) one mole of calcium, (iv) one mole of oxygen molecules, (v) 1023 atoms of carbon and (vi) one gram of iron. **5 Marks**

Q135. The reactant which is entirely consumed in reaction is known as limiting reagent. In the reaction 2A + 4B → 3C + 4D, when 5 moles of A react with 6 moles of B, then

i. Which is the limiting reagent?

ii. Calculate the amount of C formed?

Q136. Read the passage given below and answer the following questions from 1 to 5.

After having some idea about the terms atomsand molecules, it is appropriate here tounderstand what do w mean by atomic andmolecular masses.One atomicmass unit is defined as a mass exactly equal to one-twelfth of the mass of one carbon – 12 atom.Molecular mass is the sum of atomic masses of the elements present in a molecule. It is obtained by multiplying the atomic mass of each element by the number of its atoms and adding them together. Some substances, such as sodium chloride, do not contain discrete molecules as their constituent units. In such compounds, positive (sodium ion) and negative (chloride ion) entities are arranged in a three dimensional structure. The mole, symbol mol, is the SI unit of amount of substance. One mole contains exactly 6.02214076×10^{23} elementary entities. This number is the fixed numerical value of the Avogadro constant, N_A , when expressed in the unit mol–1 and is called the Avogadr number. The amount of substance, symbol n, of a system is a measure of the number of specified elementary entities. An elementary entity may be an atom, a molecule, an ion, an electron, any other particle or specified group of particles. It may be emphasised that the mole of a substance always contains the same number of entities, no matter what the substance may be. In order to determine this number precisely, the mass of a carbon–12 atom was determined by a mass spectrometer and found to be equal to 1.992648×10^{-23} g. Knowing that one mole of carbon weighs 12 g, the number of atoms in it is equal to:

$\frac{12 \text{ g /mol C-12}}{}$.

1.992648×10^{23} g / C- 12 atom. = 6.0221367×10^{23} atoms/mol.

The mass of one mole of a substance in grams is called its molar mass. the molar mass in grams is numerically equal to atomic molecular/formula mass in u.An empirical formula represents the simplestwhole number ratio of various atoms present ina compound, whereas, the molecular formulashows the exact number of different types ofatoms present in a molecule of a compound. If the mass per cent of variouselements present in a compound is known, its empiricalformula can be determined. Molecular formulacan further be obtained if the molar mass isknown.Many a time, reactions are carried out with the Amounts of reactants that are different than The amounts as required by a balanced chemical reaction. In such situations, one Reactant is in more amount than the amount required by balanced chemical reaction. The reactant which is present in the least amount Many a time, reactions are carried out with the amounts of reactants that are different than the amounts as required by a balanced chemical reaction. In such situations, one reactant is in more amount than the amount required by balanced chemical reaction. The reactant which is present in the least amount gets consumed after sometime and after that further

reaction does not take place whatever be the amount of the other reactant. Hence, the reactant, which gets consumed first, limits the amount of product formed and is, therefore, called the limiting reagent.

i. One atomic mass unit (amu) is defined as a mass exactly equal to one-twelfth of the mass of one … atom.
   a. Hydrogen – 1
   b. Carbon – 12
   c. Oxygen -12
   d. Chlorine – 35

ii. The mass of one mole of a substance in grams is called its..
   a. Atomic mass
   b. Molecular Weight
   c. Molecular mass
   d. Molar mass.

iii. … is the sum of atomic massesof the elements present in a molecule.
   a. Atomic mass
   b. Molecular Weight
   c. Molecular mass
   d. Molar mass.

iv. One mole contains exactly …elementary entities.
   a. 02214076×10^{21}
   b. 02214076×10^{22}
   c. $6.02214076 \times 10^{23}$
   d. 02214076×10^{24}

v. For which of the following compound , formula mass is preferred instead of molecular mass?
   a. NaCl
   b. C2H6
   c. N2
   d. H2O

Q137. Define the law of multiple proportions. Explain it with two examples. How does this law point to the existance of atoms?

Q138. Express the following in the scientific notation:

i. 0.0048
ii. 234, 000
iii. 8008
iv. 500.0
v. 6.0012

Q139. Match the following prefixes with their multiples: **5 Marks**

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

Q140. Read the passage given below and answer the following questions from 1 to 5. **5 Marks**

Chemistry is the science of molecules and theirtransformations. It is the science not so much of the one hundred elements but of the infinite variety of molecules thatmay be built from them. Chemistry plays a central role in science andis often intertwined with other branches ofscience.to understand thebasic concepts of chemistry, which begin withthe concept of matter. Let us start with thenature of matter. matter can exist in threephysical states viz. solid, liquid and gas.Particles are held very close to each otherin solids in an orderly fashion and there is notmuch freedom of movement. In liquids, theparticles are close to each other but they canmove around. However, in gases, the particlesare far apart as compared to those present insolid or liquid states and their movement iseasy and fast. different states of matter exhibitthe following characteristics:

1. Solids have definite volume and definiteshape.
2. Liquids have definite volume but do nothave definite shape. They take the shapeof the container in which they are placed.
3. Gases have neither definite volume nordefinite shape. They completely occupy thespace in the container in which they are placed.

Matter can be classified as mixture or pure substance. A mixture may be homogeneous or heterogeneous. Pure substances can further be classified into elements and compounds. Particles of an element consist of only one type of atoms. These particles may exist as atoms or molecules. When two or more atoms of different elements combine together in a definite ratio, the molecule of a compound is obtained.

Every substance has unique or characteristic properties. These properties can be classified into two categories — physical properties, such as colour, odour, melting point, boiling point, density, etc., and chemical properties, like composition, combustibility, ractivity with acids and bases, etc. Physical properties can be measured or observed without changing the identity or the composition of the substance. The measurement or observation of chemical properties requires a chemical change to occur. Measurement of physical properties does not require occurance of a chemical change.

i. Which of the following state of matter have definite volume but do not have definite shape?
   a. Solid
   b. Liquid
   c. Gas
   d. Plasma

ii. Particles are held very close to each other in … in an orderly fashion and there is not much freedom of movement.
   a. Liquid
   b. Gas
   c. Solid
   d. Plasma

iii. Particles of …. consist of only one type of atom.
   a. Compound
   b. Mixture
   c. Element
   d. All the above

iv. Water molecule comprises …hydrogen atoms and … oxygen atom.
   a. One, two
   b. Three, one
   c. One, three
   d. Two, one

v. Which of the following is not an example of Physical Properties of substance.?
   a. Odour
   b. Melting point
   c. Density

d. Composition

Q141. Determine the empirical formula of an oxide of iron, which has 69.9% iron and 30.1% dioxygen by mass. **5 Marks**

Q142. What volume of 0.1 M NaOH solution is required to neutralise 100ml of concentrated aqueous sulphuric acid which contains 98% H_2SO_4 by mass. The density of concentrated sulphuric acid solution is 1.84g ml^{-1} **5 Marks**

NaOH reacts with H_2SO_4 according to the following reaction:

$2NaOH + H_2SO4 \rightarrow Na_2SO_4 + 2H_2O$

(Atomic mass/ g mol^{-1} H = 1, S = 32, O = 16).

Q143. Sulphuric acid reacts with sodium hydroxide as follows: **5 Marks**

$H_2SO_4 + 2NaOH\ Na_2SO_4 + 2H_2O$

When 1 L of 0.1 M sulphuric acid solution is allowed to react with 1 L of 0.1 M sodium hydroxide solution. Calculate the amount of sodium sulphate formed and its molarity in the solution obtained.

Q144. Calculate the moles of NaOH required to neutralize the solution produced by dissolvingg 1.1gP_4O_6 in water. Use the following reactions:

$P_4O_6 + 6H_2O \rightarrow 4H_3PO_3$

$2NaOH + H_3PO3 \rightarrow Na_2HPO_3 + 2H_2O$

(Atomic mass/ g mol^{-1}; P = 31, O = 16)

Q145. i. A sample of salt has the following percentage composition
Fe = 36.76%, S = 21.11 % and O = 42.14%
Calculate the empirical formula of the compound

ii. What happens if the compound is heated? Write the balanced chemical equation.

Q146. A welding fuel gas contains carbon and hydrogen only. Burning a small sample of it in oxygen gives 3.38g carbon dioxide, 0.690 g of water and no other products. A volume of 10.0L (measured at STP) of this welding gas is found to weigh 11.6g. Calculate.

i. Empirical formula.
ii. Molar mass of the gas.
iii. Molecular formula.

Q147. i. The density of the water at room temperature is 0.1g/ mL. How many molecules are there in a drop of water if its volume is 0.05mL?

ii. An alloy of iron (53.6%), nickel (45.8%) and manganese (0.6%) has a density of 8.17g cm^{-3}
Calculate the number of Ni atoms present in the alloy of dimensions 10.0cm × 20.0cm × 15.0cm