Introduction - Level I

1 Match the following physical quantities with units.

Physical quantity	**Unit**
A. Molarity	1. mol kg^{-1}
B. Molality	2. mol L^{-1}
C. Pressure	3. Candela
D. Luminous intensity	4. Pascal

Codes

	A	B	C	D
1.	1	4	2	3
2.	2	1	4	3
3.	1	4	3	2
4.	4	1	3	2

2 0.50 mol Na_2CO_3 and 0.50 M Na_2CO_3 are different because:

1.	Both have different amounts of Na_2CO_3.
2.	0.50 mol is the number of moles and 0.50 M is the molarity.
3.	0.50 mol Na 2 CO 3 will generate more ions.
4.	None of the above.

3 The SI unit of mass is:
1. Kilogram (kg)
2. Gram (g)
3. Pascal (Pa)
4. Kilometres (km)

4 If the speed of light is 3.0×10^8 m s^{-1}, then the distance covered by light in 2.00 nanoseconds will be -
1. 0.500 m
2. 0.600 m
3. 0.700 m
4. 0.800 m

5 The correct match is:

List I	**List II**
a. Micro	i. 10^{-15} m
b. Mega	ii. 10^{-6} m
c. Giga	iii. 10^6 m
d. Femto	iv. 10^9 m

	a	b	c	d
1.	i	iv	iii	ii
2.	iii	iv	ii	i
3.	ii	iii	iv	i
4.	i	iii	iv	ii

6 Which of the following reactions is not correct according to the law of conservation of mass?
1. $2\,Mg(s) + O_2(g) \rightarrow 2\,MgO(s)$
2. $C_3H_8(g) + O_2(g) \rightarrow CO_2(g) + H_2O(g)$
3. $P_4(s) + 5O_2(g) \rightarrow P_4O_{10}(s)$
4. $CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$

7 The numbers 234,000 and 6.0012 can be represented in scientific notation as -
1. 2.34×10^{-9} and 6×10^3
2. 0.234×10^{-6} and 60012×10^{-9}
3. 2.34×10^{-9} and 6.0012×10^{-9}
4. 2.34×10^5 and 6.0012×10^0

8 If the density of the solution is 3.12 g ml^{-1}, then what will be the mass of the 1.5 ml solution in two significant figures?
1. 4.4 g
2. 4680×10^3 g
3. 4.7 g
4. 46.80 g

9 The following data was 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

The law of chemical combination applicable to the above experimental data is:
1. Law of reciprocal proportions
2. Law of multiple proportions
3. Law of constant composition
4. None of these.

10 Which of the following statement indicates that the law of multiple proportions is being followed?

1.	A sample of carbon dioxide taken from any source will always have carbon and oxygen in the ratio of 1:2.
2.	Carbon forms two oxides namely, CO_2 and CO, where masses of oxygen that combine with a fixed mass of carbon are in the simple ratio of 2:1.
3.	When magnesium burns in oxygen, the amount of magnesium used for the reaction is equal to the amount of magnesium formed in magnesium oxide.
4.	At constant temperature and pressure, 200 mL of hydrogen will combine with 100 mL of oxygen to produce 200 mL of water vapour.

11 In sodium sulphate (Na_2SO_4), the mass percent of sodium, sulfur and oxygen is:

1. 32.4%, 45.05%, 22.6%
2. 22.6%, 45.05%, 32.4%
3. 32.4%, 22.6%, 45.05%
4. 45.05%, 32.4%, 22.6%

12 15.15 pm in the basic unit will be

1. 1.515×10^{-12} m
2. 2.57×10^{-11} m
3. 2.87×10^{-11} m
4. 1.515×10^{-11} m

13 If the mass of air at sea level is 1034 g cm^{-2}, pressure in pascal will be:

1. 1.01332×10^5 Pa
2. 1.01332×10^6 Pa
3. 1.01332×10^7 Pa
4. 1.01332×10^8 Pa

14 Two students performed the same experiment separately, and each of them recorded two readings of mass, which are given below. The correct reading of mass is 3.0 g. On the basis of the given data, mark the correct option out of the following statements.

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

1.	The results of both the students' are neither accurate nor precise.
2.	The results of student A are both precise and accurate.
3.	Student B's results are neither precise nor accurate.
4.	The results of student B are both precise and accurate.

15 A reading on Fahrenheit scale is 200˚F. The same reading on celsius scale will be :

1.	40°C	2.	94°C
3.	93°C	4.	30°C

16 Round up the following number into three significant figures:
i. 10.4107 ii. 0.04597 respectively are

1.	10.4, 0.0460	2.	10.41, 0.046
3.	10.0, 0.04	4.	10.4, 0.0467

INTRODUCTION - LEVEL II

17 The number of significant figures present in the answer of the following calculations [(i), (ii), (iii)] are respectively -

1.	$0.02856 \times 298.15 \times 0.112 / 5785$
2.	5×5.364
3.	$0.0125 + 0.7864 + 0.0215$

1.	4, 4, 3	2.	3, 3, 4
3.	4, 3, 4	4.	3, 4, 4

18 The incorrect statement among the following is-

1.	A molecule of a compound has atoms of different elements.
2.	A compound can not be separated into its constituent elements by the physical method of separation.
3.	A compound retains the physical properties of its constituent elements.
4.	The ratio of atoms of different elements in a compound is fixed.

19 In the final answer of the expression $\frac{(29.2-20.2)\times(1.79\times10^5)}{1.37}$ the number of significant figures after solving the expression is:

1.	2	2.	4
3.	6	4.	7

20

Assertion (A):	The significant figure for 0.200 is 3, whereas the significant figure for 200 is 1.
Reason (R):	Zero at the end or right of a number is significant, provided it is not on the right side of the decimal point.

1.	Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is true but **(R)** is false.
4.	**(A)** is false but **(R)** is true.

21 The number of significant figures in the numbers 5005, 500.0, and 126,000 are, respectively:
1. 2, 4, and 3
2. 4, 1, and 3
3. 4, 4, and 6
4. 4, 4, and 3

22 Which of the following combinations illustrates the law of reciprocal proportions?
1. $N_2O_3,\ N_2O_4,\ N_2O_5$
2. $NaCl,\ NaBr,\ NaI$
3. $CS_2,\ CO_2,\ SO_2$
4. $PH_3,\ P_2O_3,\ P_2O_5$

23 A significant figure is defined as :

1.	The total number of digits in a number, including the last digit that represents the uncertainty of the result.
2.	The total number of digits in a number, excluding the last digit, which represents the uncertainty of the result.
3.	The total number of digits in a number including the last digit that represents the certainty of the result.
4.	The total number of last digits that represents the uncertainty of the result.

Moles, Atoms & Electrons - Level I

24 Match the following:

COLUMN I	COLUMN II
A. 88 g of CO_2	1. 0.25 mol
B. 6.022×10^{23} molecules of H_2O	2. 2 mol
C. 5.6 L of O_2 at STP	3. 3 mol
D. 96 g of O_2	4. 1 mol

Codes

	A	B	C	D
1.	2	4	1	3
2.	1	2	3	4
3.	1	4	3	2
4.	4	1	3	2

25 4.4 *g* of an unknown gas occupies 2.24 litres of volume at NTP. The gas may be
1. Carbon dioxide
2. Carbon monoxide
3. Oxygen
4. Sulphur dioxide

26 The number of moles present in 2.5 litres of 0.2 M H_2SO_4 are:
1. 0.25
2. 0.5
3. 0.75
4. 0.2

27 The highest number of atoms is present in:
1. 4 g He
2. 46 g Na
3. 0.40 g Ca
4. 12 g He

28 The weight of 1×10^{23} molecules of $CuSO_4.5H_2O$ is
1. 34.42 g
2. 41.42 g
3. 54.44 g
4. 68.94 g

29

Assertion (A):	The number of molecules in 2 moles of NH_3 is equal to the number of molecules in 4 moles of CH_4.
Reason (R):	Both are chemically similar species.

1.	Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is true but **(R)** is false.
4.	Both **(A)** and **(R)** are false.

30 The mass of carbon present in 0.5 mole of $K_4[Fe(CN)_6]$ is

1.	1.8 g	2.	18 g
3.	3.6 g	4.	36 g

31 The formula of an acid is HXO_2. The mass of 0.0242 moles of the acid is 1.657 g. The atomic weight of X is -

1.	35.5	2.	28.1
3.	128	4.	19.0

32 The amount of copper (in grams) that can be obtained from 100 g of copper sulphate ($CuSO_4$) is-

1.	54.00	2.	39.81
3.	63.50	4.	159.50

33 The haemoglobin from the red blood corpuscles contains approximately 0.33% iron by mass. The molar mass of haemoglobin is 67,200. The number of iron atoms in each molecule of haemoglobin is -
(atomic mass of iron=56):

1.	2	2.	3
3.	4	4.	5

34 A mixture of gases contains H_2 and O_2 gases in the ratio of 1 : 4 (w/w). The molar ratio of the two gases in the mixture will be:

1.	1:4	2.	4:1
3.	16:1	4.	2:1

35 6.02×10^{20} molecules of urea are present in 100mL of its solution. The concentration of the solution is:

1.	0.02M	2.	0.01M
3.	0.001M	4.	0.1M

36 1cc N_2O at STP contains:
1. $\frac{1.32}{224} \times 10^{23}$ electrons
2. $\frac{6.02}{22400} \times 10^{23}$ molecules
3. $\frac{1.8}{224} \times 10^{22}$ atoms
4. All of the above

37 The maximum number of molecules is present in which of the following?
1. 15 L of H_2 gas at STP
2. 5 L of N_2 gas at STP
3. 0.5 g of H_2 gas
4. 10 g of O_2 gas

38 If the Avogadro number N_A, is changed from 6.022×10^{23} mol^{-1} to 6.022×10^{20} mol^{-1} this would change:
1. The definition of mass in units of grams.
2. The mass of one mole of carbon.
3. The ratio of chemical species to each other in a balanced equation.
4. The ratio of elements to each other in a compound.

39 The number of atoms in 0.1 mole of a triatomic gas is:
($N_A = 6.02 \times 10^{23} mol^{-1}$)
1. 6.026×10^{22}
2. 1.806×10^{23}
3. 3.600×10^{23}
4. 1.800×10^{22}

40 An organic substance containing C, H, and O gave the following percentage composition :
C = 40.687%, H = 5.085% and O = 54.228%. The vapour density of this organic substance is 59.
The molecular formula of the compound will be:
1. $C_4H_6O_4$
2. $C_4H_6O_2$
3. $C_4H_4O_2$
4. None of the above

41 At 100 ºC and 1 atm, if the density of liquid water is 1.0 g cm^{-3} and that of water vapor is 0.0006 g cm^{-3}, then the volume occupied by water molecules in 1 litre of steam at that temperature will be:

1.	6 cm^3	2.	60 cm^3
3.	0.6 cm^3	4.	0.06 cm^3

42 If N_A is Avogadro's number, then the number of valence electrons in 4.2 g of nitride ions (N^{3-}) will be:

1.	3.2 N_A	2.	1.6 N_A
3.	2.4 N_A	4.	1.2 N_A

43 Calculate the number of ions present in 2L of a solution of 1.6 M $K_4[Fe(CN)_6]$:

1.	4.8 x 10^{22}	2.	4.8 x 10^{23}
3.	9.6 x 10^{24}	4.	9.6 x 10^{22}

44 The number of valence electrons present in 0.53 grams of Na_2CO_3 is:

1. 3.01×10^{23}
2. 7.22×10^{22}
3. 12.046×10^{23}
4. 6.023×10^{23}

45 An element X has the following isotopic composition:
^{200}X : 90%, ^{199}X : 8.0%, ^{202}X : 2.0%
The weighted average atomic mass of the naturally occurring element X is closest to

1.	201 u	2.	202 u
3.	199 u	4.	200 u

46

Assertion (A):	The combustion of 16 g of methane gives 18 g of water.
Reason (R):	In the combustion of methane, water is one of the products.

1.	Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is true but **(R)** is false.
4.	**(A)** is false but **(R)** is true.

47 100 mL of H_2SO_4 solution having molarity of 1M and density 1.5 g/mL is mixed with 400 mL of water. The molarity of the H_2SO_4 solution will be: (final density is 1.25 g/mL)

1.	4.4 M	2.	0.145 M
3.	0.52 M	4.	0.227 M

MOLES, ATOMS & ELECTRONS - LEVEL II

48 The number of water molecules are maximum in which of the following?
1. 18 mL of water
2. 0.18 g of water
3. 0.00224 L water vapours at 1 atm and 273 K
4. 10^{-3} mol of water

49 What is the ratio of the number of atoms in 2.2 g of CO_2 and in 1.7 g of NH_3?

1.	1/2	2.	1/8
3.	3/8	4.	3/2

50 The average molar mass of the mixture of CH_4 and C_2H_4 present in the mole ratio of a:b is 20 g mol^{-1}. When the mole ratio is reversed, the molar mass of the mixture will be:

1.	24 gram	2.	42 gram
3.	20 gram	4.	15 gram

51 Which of the following statements is correct?
1. 1 mole of electrons weights 5.4 mg
2. 1 mole of electrons weights 5.4 kg
3. 1 mole of electrons weights 0.54 mg
4. 1 mole of electrons has 1.6×10^{-19} C of charge

52

Assertion (A):	1 g O_2 and 1 g O_3 have an equal number of oxygen atoms.
Reason (R):	O_2 and O_3 have different molar masses.

1.	Both **A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is true but **(R)** is false.
4.	**(A)** is false but **(R)** is true.

53

Assertion (A):	1 a.m.u = 1 .66 × 10^{-24} gram .
Reason (R):	The actual mass of one atom of C-12 is equal to 1.99 × 10^{-23} g .

1.	Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is true but **(R)** is false.
4.	**(A)** is false but **(R)** is true.

54 Calculate the number of moles of oxygen (O) atoms in 126 amu of HNO_3.
1. 2
2. $\frac{2}{N_A}$
3. 6
4. $\frac{6}{N_A}$

55
Given below are two statements:

Assertion (A):	One atomic mass unit is defined as one-twelfth of the mass of one carbon-12 atom.
Reason (R):	The carbon-12 isotope is the most abundant isotope of carbon and has been chosen as the standard.

1.	Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is true but **(R)** is false.
4.	**(A)** is false but **(R)** is true.

56 The number of gram molecules of oxygen in 6.02 × 10^{24} CO molecules are:
1. 10 *g* molecules
2. 5 *g* molecules
3. 1 *g* molecules
4. 0.5 *g* molecules

57

Assertion (A):	Moist air is heavier than dry air.
Reason (R):	The molecular mass of H_2O is more than that of the air.

1.	Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is true but **(R)** is false.
4.	Both **(A)** and **(R)** are false.

58 The mole fraction of the solute in a 1.00 molal aqueous solution is:

1.	0.00177	2.	0.0344
3.	0.0177	4.	0.1770

Empirical & Molecular Formula - Level I

59 The empirical formula and molecular mass of a compound are CH_2O and 180 g, respectively. The molecular formula of the compound is -

1. $C_9H_{18}O_9$	2. CH_2O
3. $C_6H_{12}O_6$	4. $C_2H_4O_2$

60 The molar mass of naturally occurring Argon isotopes is

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.	49.99947 g mol^{-1}	2.	39.99947 g mol^{-1}
3.	35.59947 g mol^{-1}	4.	45.59947 g mol^{-1}

61 On complete combustion, 44 g of a sample of a compound gives 88 g CO_2 and 36 g of H_2O. The molecular formula of the compound may be:
1. C_4H_6
2. C_2H_6O
3. C_2H_4O
3. C_3H_6O

62 An organic compound contains carbon, hydrogen, and oxygen. Its elemental analysis gave C, 38.71%, and H, 9.67%. The empirical formula of the compound would be:

1.	CH_3O	2.	CH_2O
3.	CHO	4.	CH_4O

63

Assertion (A):	The empirical mass of ethene is half of its molecular mass.
Reason (R):	The empirical formula represents the simplest whole-number ratio of the various atoms present in a compound.

1.	Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is true but **(R)** is false.
4.	**(A)** is false but **(R)** is true.

64 In an iron oxide, the mass percent of iron and oxygen are 69.9 and 30.1, respectively. The empirical formula of the oxide of iron will be:
1. Fe_3O_2
2. Fe_2O_2
3. Fe_2O_3
4. Fe_3O_4

Empirical & Molecular Formula - Level II

65 If 2.74 g of the metal oxide contains 1.53 g of metal, then the empirical formula of vanadium oxide is:
(Atomic Mass of V = 52)
1. V_2O_3
2. VO
3. V_2O_5
4. V_2O_7

66 The hydrated salt, $Na_2SO_4.nH_2O$, undergoes a 55% loss in mass on heating and becomes anhydrous. The value of n will be:
1. 5
2. 3
3. 7
4. 10

Limiting Reagent - Level I

67 The amount of Zinc (atomic weight=65) necessary to produce 224 mL of H_2 (at STP) by the reaction with dilute sulphuric acid will be:
1. 0.65 g
2. 7.6 g
3. 6.5 g
4. 8.5 g

68 On complete decomposition, the volume of CO_2 released at STP on heating 9.85 g of $BaCO_3$ (atomic mass, Ba=137) will be:
1. 1.12 L
2. 4.84 L
3. 2.12 L
4. 2.06 L

69

Assertion (A):	In Haber's process, starting with 5 moles of N_2 and 2.5 mol of H_2, on complete reaction only 1.66 moles of NH_3 were produced.
Reason (R):	H_2 acts as a limiting reagent in this reaction.

1.	Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is true but **(R)** is false.
4.	Both **(A)** and **(R)** are false.

70 When 22.4 L of H_2 (g) is mixed with 11.2 L of Cl_2 (g), each at STP, the moles of HCl(g) formed is equal to -
1. 1 mole of HCl (g)
2. 2 moles of HCl (g)
3. 0.5 mole of HCl (g)
4. 1.5 mole of HCl (g)

71 ln, a closed vessel, 50 ml of A_2B_3 completely reacts with 200 ml of C_2 according to the following equation:
$2A_2B_3(g)\ +\ 5C_2(g) \rightarrow\ 3C_3B_2(g) + CA_4(g)$
The composition of the gaseous mixture in the system will be:
1. 100 ml $C_2,\ 50\ ml\ C_3B_2, 50\ ml\ CA_4$
2. 25 ml $C_2,\ 75\ ml\ \ C_3B_{2,}\ 25\ ml\ CA_4$
3. 75 ml $C_2,\ 75\ ml\ C_3B_{2,}\ 25\ ml\ CA_4$
4. 10 ml $C_2,\ 25\ ml\ C_3B_{2,}\ 100\ ml\ CA_4$

72 The mass of ammonia produced when 2.00×10^3 g dinitrogen reacts with 1.00×10^3 g of dihydrogen is:
1. 2338.11 g
2. 2428.57 g
3. 2712.24 g
4. 2180.56 g

73 If 0.5 moles of $BaCl_2$ is reacted with 0.2 moles of Na_3PO_4 then the maximum moles of $Ba_3(PO_4)_2$ formed is:
1. 0.33
2. 0.25
3. 0.10
4. 0.52

74 In a reaction $A + B_2 \rightarrow AB_2$,
A will act as a limiting reagent if :

i.	300 atoms of A reacts with 200 molecules of B
ii.	2 moles A reacts with 3 moles B_2
iii.	100 atoms of A reacts with 100 molecules of B
iv.	5 moles A reacts with 2.5 moles B
v.	2.5 moles A reacts with 5 moles B_2

Choose the correct option
1. (i), (ii)
2. (i), (ii), (v)
3. (ii), (v)
4. All

Limiting Reagent - Level II

75 20.0 g of a magnesium carbonate sample decomposes on heating to give carbon dioxide and 8.0 g magnesium oxide. The percentage purity of magnesium carbonate in the sample will be:
(Atomic weight of Mg=24)
1. 75
2. 96
3. 60
4. 84

76 The moles of lead (II) chloride that will be formed from a reaction between 6.5 g of PbO and 3.2 g of HCl are:
1. 0.044
2. 0.333
3. 0.011
4. 0.029

77 In the Haber process, 30 L of dihydrogen and 30 L of dinitrogen were taken for the reaction, which yielded only 50% of the expected product. The composition of the gaseous mixture under the said conditions in the end is:
1. 20 L ammonia, 10 L nitrogen, 30 L hydrogen
2. 20 L ammonia, 25 L nitrogen, 15 L hydrogen
3. 20 L ammonia, 20 L nitrogen, 20 L hydrogen
4. 10 L ammonia, 25 L nitrogen, 15 L hydrogen

Equation Based Problem - Level I

78 If 10 volumes of H_2 gas react with 5 volumes of O_2 gas, the volumes of water vapor produced would be:
1. 9
2. 8
3. 10
4. 11

79 The number of moles of hydrogen molecules required to produce 20 moles of ammonia through Haber's process is -
1. 40 mol
2. 10 mol
3. 20 mol
4. 30 mol

80 Suppose the elements X and Y combine to form two compounds XY_2 and X_3Y_2. If 0.1 mole of XY_2 weighs 10 g and 0.05 mole of X_3Y_2 weighs 9 g, the atomic weight of X and Y respectively, will be?
1. 40, 30
2. 60, 40
3. 20, 30
4. 30, 20

81 The volume of oxygen gas (O_2) needed to completely burn 1 L of propane gas (C_3H_8) (both O_2 & propane measured at 0°C and 1 atm) will be:
1. 7 L
2. 6 L
3. 5 L
4. 10 L

82 25.4 g of I_2 and 14.2 g of Cl_2 are made to react completely to yield a mixture of ICI and ICI_3. The mole of ICI and ICI_3 formed, is respectively -
1. 0.5, 0.2
2. 0.1, 0.1
3. 0.1, 0.3
4. 0.3, 0.4

83 10 g of a silver coin, when dissolved completely in excess of conc. HNO_3 gives 8.5 g of silver nitrate.
The percentage purity of the coin is-
1. 25%
2. 54%
3. 67%
4. 100%

84 In the reaction, $4NH_3(g) + 5O_2(g) \rightarrow 4NO(g) + 6H_2O(l)$
When 1 mole of ammonia and 1 mole of O_2 reacts to completion, then:

1.	1.0 mole of H_2O is produced.
2.	1.0 mole of NO will be produced.
3.	All the oxygen will be consumed.
4.	All the ammonia will be consumed.

85 Consider the given reaction, $2SO_2 + O_2 \rightarrow 2SO_3$
6.4 g SO_2 and 3.2 g O_2 to form SO_3 . The mass of SO_3 formed is:
1. 32 g
2. 16 g
3. 8 g
4. 4 g

86 10 g of hydrogen and 64 g of oxygen were filled in a steel vessel and exploded. The amount of water produced in this reaction will be:
1. 2 mol
2. 3 mol
3. 4 mol
4. 1 mol

87 A mixture of 2.3 g formic acid and 4.5 g oxalic acid is treated with conc. H_2SO_4. The evolved gaseous mixture is passed through KOH pellets.
Weight (in g) of the remaining product at STP will be:
1. 1.4
2. 3.0
3. 2.8
4. 4.4

88 Amount of HCl that would react with 5.0 g of manganese dioxide, as per the given reaction will be
$4HCl_{(aq)} + MnO_{2(s)} \rightarrow 2H_2O_{(l)} + MnCl_{2(aq)} + Cl_{2(2)}$
1. 4.8 g
2. 6.4 g
3. 2.8 g
4. 8.4 g

89 On reduction with CO, 200 kg of iron ore (Fe_2O_3) containing 20% impurities gives iron. The amount of iron produced will be-
1. 84 kg
2. 200 kg
3. 56 kg
4. 112 kg

90 When 100 mL of PH_3 is decomposed, it produces phosphorus and hydrogen. The change in volume is:
1. 50 mL increase.
2. 500 mL decrease.
3. 900 mL decrease.
4. None of the above.

91

Assertion (A):	When 4 moles of H_2 reacts with 2 moles of O_2, then 4 moles of water are formed.
Reason (R):	O_2 will act as a limiting reagent.

1.	Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is true but **(R)** is false.
4.	Both **(A)** and **(R)** are false.

92 The sulphate of the metal M contains 9.87% of M. This sulphate is isomorphous with $ZnSO_4.7H_2O$. The atomic weight of M is:
1. 40.3
2. 36.3
3. 24.3
4. 11.3

Equation Based Problem - Level II

93 Sulphur burns according to the reaction
$\frac{1}{8}S_8(s)+O_2(g) \rightarrow SO_2(g)$
What volume of air, at 1 atm and 273 K, containing 21% oxygen by volume is required to completely burn sulphur (S_8) present in 200 g of sample? (This sample contains 20% inert material which does not burn)
1. 23.52 litre
2. 320 litre
3. 112 litre
4. 533.33 litre

94 One mole of a mixture of CO and CO_2 requires exactly 20g of NaOH in solution for the complete conversion of all the CO_2 into Na_2CO_3. How much NaOH would it require for conversion into Na_2CO_3, if the mixture (one mole) is completely oxidised to CO_2?
1. 60g
2. 80g
3. 40g
4. 20g

95 1 g of magnesium is burnt with 0.56g of oxygen in a closed vessel. The left-out reactant and its quantity are
(At. weight of Mg = 24, O=16)
1. Mg, 0.16g
2. O_2, 0.16g
3. Mg, 0.44g
4. O_2, 0.28g

96 When 50 mL of a 16.9 % (w/v) solution of $AgNO_3$ is mixed with 50 mL of 5.8% (w/v) NaCl solution, then the mass of precipitate formed is:
(Ag = 107.8, N = 14, O = 16, Na= 23,Cl=35.5)
1. 28 g
2. 3.5 g
3. 7 g
4. 14 g

97 The vapour density of a mixture containing NO_2 and N_2O_4 is 38.3. The mole of NO_2 in a 100 g mixture is -
[Vapour density = (Molar mass / 2)]
1. 0.437
2. 0.347
3. 0.557
4. 0.663

98 A sample of $CaCO_3$ is 50% pure. On heating 1.12 litres of CO_2 (at STP) is obtained. The weight of residues left (assuming non-volatile impurity) is -
(Ca = 40, C= 12, O=16)

1.	7.8 g	2.	5 g
3.	3.8 g	4.	2.8 g

Concentration Based Problem - Level I

99 If 500 mL of a 5 M solution is diluted to 1500 mL, the molarity of the resultant solution is:
1. 1.5 M
2. 1.66 M
3. 0.017 M
4. 1.59 M

100 At STP, the density of CCl_4 vapour in g/L will be closest to:
1. 8.67
2. 6.87
3. 3.67
4. 4.26

101 The parameter which is temperature dependent is:
1. Molarity
2. Mole fraction
3. Weight percentage
4. Molality

102 The molality of pure water is:
1. 1 m
2. 18 m
3. 55.5 m
4. None of the above

103 20 g of sugar is dissolved in enough water to make a final volume of 2L. The concentration of sugar ($C_{12}H_{22}O_{11}$) in mol L^{-1} will be:
1. 0.29 mol/L
2. 0.029 mol/L
3. 0.35 mol/L
4. 0.032 mol/L

104 The number of molecules of H_2SO_4 present in 100 mL of 0.02 M H_2SO_4 solution is:
1. 12.044×10^{20} molecules
2. 6.022×10^{23} molecules
3. 1×10^{23} molecules
4. 12.044×10^{23} molecules

105 25.3 g of sodium carbonate, Na_2CO_3, is dissolved in enough water to make 250 mL of a solution. If sodium carbonate completely dissociates, the molar concentrations of sodium ion, Na^+ and carbonate ion, CO_3^{2-} are respectively:
(molar mass of Na_2CO_3 = 106g mol^{-1})
1. 0.955 M and 1.910 M
2. 1.910 M and 0.955 M
3. 1.90 M and 1.910 M
4. 0.477 M and 0.477 M

106 If 4 g of NaOH dissolves in 36 g of H_2O, the molarity of the solution is: (specific gravity of solution is 1 g mL^{-1}) :
1. 3 M
2. 3.5 M
3. 2.5 M
4. 2 M

107 The volume occupied by one water molecule (density = 1 g cm^{-3}) is:
1. 9.0×10^{-23} cm^3
2. 6.023×10^{-23} cm^3
3. 3.0×10^{-23} cm^3
4. 5.5×10^{-23} cm^3

108 The density of a 2 M aqueous solution of NaOH is 1.28 g/cm^3. The molality of the solution is:
[molecular mass of NaOH = 40 $gmol^{-1}$]
1. 1.20 m
2. 1.56 m
3. 1.67 m
4. 1.32 m

109 The molality of a 20% (by mass) $CaCO_3$ solution is :
(Given: Density of solution is 1.2 gm/ml)
1. 1.25 m
2. 2.5 m
3. 2.08 m
4. 1.5 m

110 Concentrated aqueous sulphuric acid is 98% H_2SO_4 by mass and has a density of 1.80 g mL^{-1}. The volume of acid required to make one litre of 0.1 M H_2SO_4 solution is:
1. 11.10 mL
2. 16.65 mL
3. 22.20 mL
4. 5.55 mL

111 The total molarity of all the ions present in 0.1 M of $CuSO_4$ and 0.1 M of $Al_2(SO_4)_3$ solution is:
1. 0.2M
2. 0.7M
3. 0.8M
4. 1.2M

112 If the density of methanol is 0.793 kg L^{-1}, the volume needed for making 2.5 L of its 0.25 M solution would be:
1. 22.25 mL
2. 24.78 mL
3. 25.22 mL
4. 22.52 mL

Concentration Based Problem - Level II

113 The mass of $CaCO_3$ required to react completely with 25 mL of 0.75 M HCl according to the given reaction would be:

$CaCO_{3(s)} + HCl_{(aq)} \rightarrow CaCl_{2(aq)} + CO_{2(g)} + H_2O_{(l)}$

1. 0.36 g
2. 0.09 g
3. 0.96 g
4. 0.66 g

114 Concentrated nitric acid is 70% HNO_3. The amount of concentrated nitric acid solution that should be used to prepare 250 mL of 2.0 M HNO_3 would be:

1. 45.0 g conc. HNO_3
2. 90.0 g conc. HNO_3
3. 70.0 g conc. HNO_3
4. 54.0 g conc. HNO_3

115 The molality of a 15% (w/vol.) solution of H_2SO_4 of density 1.1g/cm^3 is-

1. 1.2
2. 1.4
3. 1.8
4. 1.6

116 The chloroform contamination level in water is 15 ppm (by mass of chloroform). The molality of chloroform in the water sample would be:

1. 3.25×10^{-4}
2. 1.5×10^{-3}
3. 7.5×10^{-3}
4. 1.25×10^{-4}

117 Equal volumes of 0.1 M $AgNO_3$ and 0.2 M NaCl are mixed. The concentration of NO_3^- ions in the mixture will be:

1. 0.1M
2. 0.05M
3. 0.2M
4. 0.15M

118 A partially dried clay mineral contains 8% water. The original sample contained 12% water and 45% silica. The percentage of silica in the partially dried sample is nearly:

1. 50%
2. 49%
3. 55%
4. 47%