PHYSICS WALLAH

PRAYAS JEE

- Some Basic Concepts of Chemistry
- Redox Reaction
- Solutions
- Thermodynamics
- Equilibrium

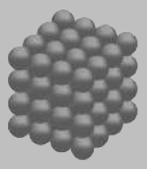
Chemistry

MODULE 1

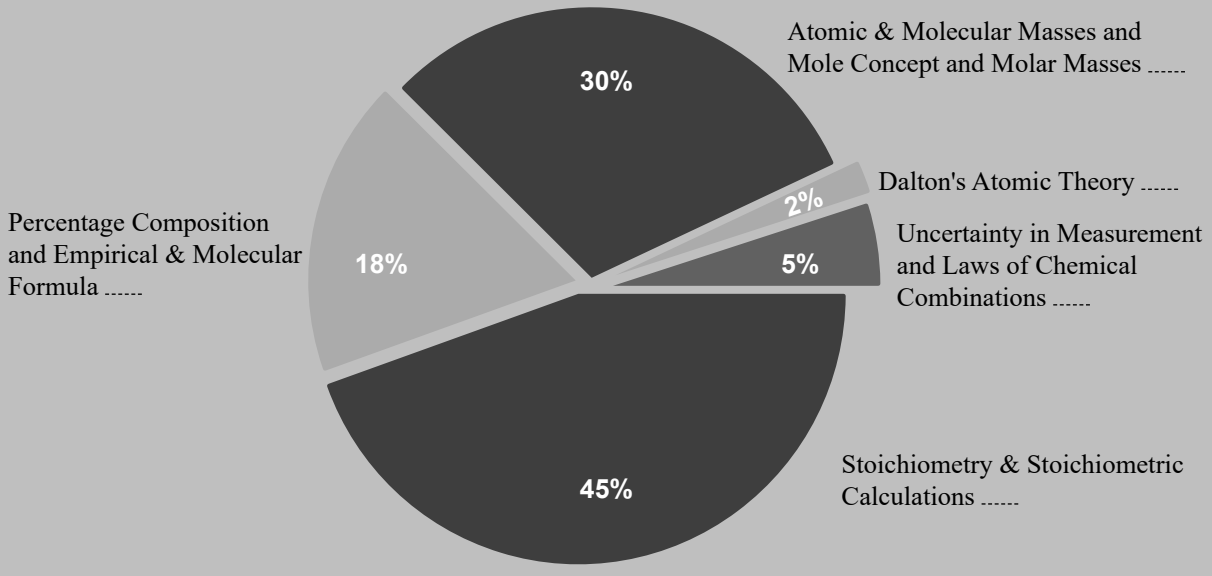
CHAPTER

1

Some Basic Concepts of Chemistry



Topicwise Weightage of JEE Main 6 Years Paper (124 Sets)



"How's the Josh?" for these Topics: *Mark your confidence level in the blank space around the topic (Low-L, Medium-M, High-H)*

MATTER

A substance which occupies space, possesses mass and can be felt by any one or more of the five senses is called matter.

Physical Classification of Matter

It is based on physical state under ordinary conditions of temperature and pressure.

(*a*) **Solid:** A substance is said to be solid if it possesses a definite volume and a definite shape, e.g. sugar, iron, gold, wood etc.

(*b*) **Liquid:** A substance is said to be liquid if it possesses a definite volume but not definite shape. They take up the shape of the container, e.g. water, milk, oil, mercury, alcohol etc.

(*c*) **Gas:** A substance is said to be gas if it neither possesses a definite volume nor a definite shape. This is because they fill up the whole container, e.g. Hydrogen (H_2), Oxygen (O_2), Carbon dioxide (CO_2) etc.

Chemical Classification of Matter

(*a*) **Pure Substance:** A material containing only one type of substance. Pure Substance can not be separated into simpler substance by physical method.

e.g.: Element = Na, Mg, Ca ..... etc.

Compound = HCl, H_2O, CO_2, HNO_3 .....etc.

Pure substance is classified into two types:

(I) Element (II) Compound

(I) **Element:** The pure substance containing only one kind of atoms. It is classified into 3 types

(i) Metal → Zn, Cu, Hg, Ac, Sn, Pb etc.

(ii) Non-metal → N_2, O_2, Cl_2, Br_2, F_2, P_4, S_8 etc.

(iii) Metalloids → B, Si, As, Te etc.

(II) **Compound:** It is defined as pure substance containing more than one kind of elements or atoms which are combined together in a fixed proportion by weight and which can be decomposed into simpler substance by the suitable chemical method. The properties of a compound are completely different from those of its constituent element, e.g. HCl, H_2O, H_2SO_4, $HClO_4$, HNO_3 etc.

(*b*) **Mixture:** A material which contain more than one type of substances and which are mixed in any ratio by weight is called as mixture. The property of the mixture is the property of its components. The mixture can be separated by simple physical method.

Classification of Mixture

(*i*) **Homogeneous mixture:** The mixture, in which all the components are present uniformly is called as

Concept Application

10. The number of electrons present in 1 mol of methane molecule are:
(*a*) 6.022×10^{25} (*b*) 6.022×10^{24}
(*c*) 6.022×10^{23} (*d*) 6.022×10^{22}

11. The mass of one molecule of water is approximately:
(*a*) 3×10^{-23} g (*b*) 18 g
(*c*) 1.5×10^{-23} g (*d*) 4.5×10^{-23} g

12. The molar mass of ferrous sulphate ($FeSO_4.7H_2O$) is:
(*a*) 152 gm (*b*) 278 gm
(*c*) 137 gm (*d*) None of these

13. The vapour density of carbon dioxide is:
(*a*) 44 (*b*) 32 (*c*) 22 (*d*) 12

14. The density of air is 0.001293 g/cm^3 at STP. Identify which of the following statement is correct?
(*a*) Vapour density is 12.72.
(*b*) Molecular weight is 28.96.
(*c*) Vapour density is 0.001293 g/cm^3.
(*d*) Vapour density and molecular weight cannot be determined.

ELEMENTAL ANALYSIS

For n mole of a compound ($C_3H_7O_2$);
Moles of C = 3n
Moles of H = 7n
Moles of O = 2n

PERCENTAGE FORMULAE COMPOSITION

% of element in a compound

$$= \frac{\text{Atomic weight of element} \times \text{Number of atom of that element in one molecule} \times 100}{\text{Total molecular weight of compound}}$$

Here we are going to find out the percentage of each element in the compound by knowing the molecular formula of compound.

EMPIRICAL AND MOLECULAR FORMULA

We have just seen that knowing the molecular formula of the compound, we can calculate percentage composition of the elements. Conversely, if we know the percentage composition of the elements initially, we can calculate the relative number of atoms of each element in the molecules of the compound. This gives us the empirical formula of the compound. Further if the molecular mass is known then the molecular formula can easily be determined.

An empirical formula represents the simplest whole number ratio of various atoms present in a compound.

The molecular formula gives the actual number of atoms of each element in a molecule. The molecular formula shows the exact number of different types of atoms present in a molecule of a compound.

The molecular formula is an integral multiple of the empirical formula.

i.e. Molecular formula = Empirical formula × n

where $n = \frac{\text{Molecular Formula Mass}}{\text{Empirical Formula Mass}}$

- If sum of mass percent of all elements is less than 100 then difference is due to oxygen.
- Mass % of $C = \frac{12}{44} \times \frac{m_{CO_2}}{m_{compound}} \times 100$
- Mass % of $H = \frac{2}{18} \times \frac{m_{H_2O}}{m_{compound}} \times 100$

Train Your Brain

Example 13: Every molecule of ammonia always has formula NH_3 irrespective of method of preparation or sources. i.e. 1 mole of ammonia always contains 1 mol of N and 3 mole of H. In other words 17 gm of NH_3 always contains 14 gm of N and 3 gm of H. Now find out % of each element in the compound.

Sol. Mass % of N in NH_3 =

$$\frac{\text{Mass of N in 1 mole } NH_3}{\text{Mass of 1 mole of } NH_3} \times 100 = \frac{14}{17} \times 100 = 82.35\%$$

Mass % of H in NH_3 =

$$\frac{3 \times \text{Mass of H in 1 mole } NH_3}{\text{Mass of 1 mole of } NH_3} \times 100$$

$$= \frac{3}{17} \times 100 = 17.65\ \%$$

Example 14: Acetylene and benzene both have the empirical formula CH. The molecular masses of acetylene and benzene are 26 and 78 respectively. Deduce their molecular formulae.

Sol. ∵ Empirical Formula is CH

Step-1: The empirical formula of the compound is CH
∴ Empirical formula mass = (1 × 12) + 1 = 13.
Molecular mass = 26

Step-2: To calculate the value of 'n'

$$n = \frac{\text{Molecular mass}}{\text{Empirical formula mass}} = \frac{26}{13} = 2$$

Step-3: To calculate the molecular formula of the Compound.

Molecular formula = n × (Empirical formula of the compound) = 2 × CH = C_2H_2

Thus the molecular formula is C_2H_2

Similarly for benzene

To calculate the value of 'n'

$$n = \frac{\text{Molecular mass}}{\text{Empirical formula mass}} = \frac{78}{13} = 6.$$

Thus the molecular formula is 6 × CH = C_6H_6

1. 1.80 g of a certain metal burnt in oxygen gave 3.0 g of its oxide. 1.50 g of the same metal heated in steam gave 2.50 g of its oxide. The law shown by above data is:

(*a*) Law of constant proportion

(*b*) Law of multiple proportion

(*c*) Law of reciprocal proportion

(*d*) All of the above

Sol. In the first sample of oxide,

Weight of metal = 1.80 g;

Weight of oxygen = (3.0 – 1.80) g = 1.2 g

$$\therefore \frac{\text{wt of metal}}{\text{wt of oxygen}} = \frac{1.80\text{g}}{1.2\text{g}} = 1.5$$

In the second sample of the oxide,

Weight of metal = 1.50 g;

Weight of oxygen = (2.50 – 1.50) g = 1 g

$$\frac{\text{wt of metal}}{\text{wt of oxygen}} = 1.5$$

Thus, in both samples of the oxide, the proportions of the weights of the metal and oxygen are fixed. Hence the results follow the law of constant proportion.

Therefore, option (*a*) is the correct answer.

2. Calculate the total charge present on 4.2 gm of N^{3-}.

(*a*) 8.67×10^4 C (*b*) 9.05×10^4 C

(*c*) 8.67×10^3 C (*d*) 7.67×10^4 C

Sol. $\text{Mole} = \frac{\text{wt. in gm}}{\text{Ionic wt.}} = \frac{4.2}{14} = 0.3$

Total no. of ions = $0.3 \times N_A$ ions.

Total charge = $0.3\ N_A \times 3 \times 1.6 \times 10^{-19}$ C

$= 0.3 \times 6.022 \times 10^{23} \times 3 \times 1.6 \times 10^{-19} = 8.67 \times 10^4$ C

Therefore, option (*a*) is the correct answer.

3. How many carbon atoms are present in 0.35 mol of $C_6H_{12}O_6$?

(*a*) 6.022×10^{23} carbon atoms.

(*b*) 1.26×10^{23} carbon atoms.

(*c*) 1.26×10^{24} carbon atoms.

(*d*) 6.022×10^{24} carbon atoms.

Sol. $\because$ 1 mol of $C_6H_{12}O_6$ has $6\ N_A$ atoms of C

$\therefore$ 0.35 mol of $C_6H_{12}O_6$ has $6 \times 0.35\ N_A$ atoms of C

$= 2.1\ N_A$ atoms $= 2.1 \times 6.022 \times 10^{23} = 1.26 \times 10^{24}$ carbon atoms.

Therefore, option (*c*) is the correct answer.

4. How many molecules are present in 5.23 gm of glucose ($C_6H_{12}O_6$)?

(*a*) 1.65×10^{22} (*b*) 1.75×10^{22}

(*c*) 1.75×10^{21} (*d*) None of these

Sol. $\because$ 180 gm glucose has = N_A molecules

$$\therefore \text{ 5.23 gm glucose has} = \frac{5.23 \times 6.022 \times 10^{23}}{180}$$

$= 1.75 \times 10^{22}$ molecules

Therefore, option (*b*) is the correct answer.

5. A sample of (C_2H_6) ethane has the same mass as 10^7 molecules of methane. How many C_2H_6 molecules does the sample contain?

(*a*) 5.34×10^6 (*b*) 1.26×10^8

(*c*) 4.26×10^6 (*d*) 6.022×10^6

Sol. Moles of $CH_4 = \frac{10^7}{N_A}$

Mass of $CH_4 = \frac{10^7}{N_A} \times 16 =$ mass of C_2H_6

So Moles of $C_2H_6 = \frac{10^7 \times 16}{N_A \times 30}$

So no. of molecules of $C_2H_6 = \frac{10^7 \times 16}{N_A \times 30} \times N_A = 5.34 \times 10^6$.

Therefore, option (*a*) is the correct answer.

6. From 160 g of SO_2 (g) sample, 1.2046×10^{24} molecules of SO_2 are removed then find out the volume of left over SO_2 (g) at STP.

(*a*) 11.2 L (*b*) 12.5 L

(*c*) 9.5 L (*d*) 10.8 L

Sol. Given moles = $\frac{160}{64} = 2.5$.

Removed moles = $\frac{1.2046 \times 10^{24}}{6.022 \times 10^{23}} = 2$.

So left moles = 0.5.

Volume left at STP = $0.5 \times 22.4 = 11.2$ L.

Therefore, option (*a*) is the correct answer.

7. 14 g of Nitrogen gas and 22 g of CO_2 gas are mixed together. Find the volume of gaseous mixture at STP.

(*a*) 10.2 L (*b*) 12.2 L

(*c*) 15.5 L (*d*) 22.4 L

Sol. Moles of $N_2 = \frac{14}{28} = 0.5$.

Moles of $CO_2 = \frac{22}{44} = 0.5$.

So total moles = 0.5 + 0.5 = 1.

So vol. at STP = $1 \times 22.4 = 22.4$ L.

Therefore, option (*d*) is the correct answer.

8. How many years it would take to spend Avogadro's number of rupees at the rate of 1 million rupees per second?

(*a*) 19.098×10^{19} years (*b*) 19.098 years

(*c*) 19.098×10^9 years (*d*) None of these

FUNDAMENTAL QUANTITIES, LAWS OF CHEMICAL COMBINATION

1. Express the result of (0.582 + 324.65) to the appropriate number of significant figures:
(*a*) 325.24 (*b*) 325.23
(*c*) 325.2 (*d*) 325.232

2. The correctly reported answer of the area of rectangle which is 12.34 cm long and 1.23 cm wide is :
(*a*) 15.2 m^2 (*b*) 15.2 cm^2
(*c*) 15.1 cm^2 (*d*) 15.17 cm^2

3. Two elements X and Y combine in gaseous state to form XY in the ratio 1:35.5 by mass. The mass of Y that will be required to react with 2 g of X is:
(*a*) 7.1 g (*b*) 3.55 g (*c*) 71 g (*d*) 35.5 g

4. 4.4 g of an oxide of nitrogen gives 2.24 L of nitrogen and 60 g of another oxide of nitrogen gives 22.4 L of nitrogen at S.T.P. The data illustrates:
(*a*) Law of conservation of mass
(*b*) Law of constant proportions
(*c*) Law of multiple proportions
(*d*) Law of reciprocal proportions

5. Two elements X and Y combine to form compounds A, B and C. The ratio of different masses of Y which combine with a fixed mass of X in A, B and C is 1 : 3 : 5. If 32 parts by mass of X combines with 84 parts by mass of Y in B, then in C, 16 parts by mass of X will combine with;
(*a*) 14 parts by mass of Y (*b*) 42 parts by mass of Y
(*c*) 70 parts by mass of Y (*d*) 84 parts by mass of Y

ATOMIC MASS & MOLECULAR MASS, MOLE CONCEPT AND APPLICATIONS

6. 1 mol of CH_4 contains:
(*a*) 6.02×10^{23} atoms of H
(*b*) 4 *g*-atom of Hydrogen
(*c*) 1.81×10^{23} molecules of CH_4
(*d*) 3.0 *g* of carbon

7. 7.5 grams of a gas occupy 5.6 litres of volume at STP, the gas is:
(*a*) NO (*b*) N_2O (*c*) CO (*d*) CO_2

8. The number of atoms in 4.25 *g* of NH_3 is approximately:
(*a*) 1×10^{23} (*b*) 2×10^{23}
(*c*) 4×10^{23} (*d*) 6×10^{23}

9. One litre of a gas at STP weighs 1.16 *g*. The possible gas is:
(*a*) C_2H_2 (*b*) CO
(*c*) O_2 (*d*) CH_4

10. If N_A is Avogadro's number, then number of valence electrons in 4.2 *g* of nitride ions (N^{3-}) is:
(*a*) 2.4 N_A (*b*) 4.2 N_A
(*c*) 1.6 N_A (*d*) 3.2 N_A

11. The number of molecules at STP in 1 ml of an ideal gas will be:
(*a*) 6×10^{23} (*b*) 2.69×10^{19}
(*c*) 2.69×10^{23} (*d*) None of these

12. Volume of a gas at STP is 1.12×10^{-7} cc. The number of molecules in it are:
(*a*) 3.01×10^{20} (*b*) 3.01×10^{12}
(*c*) 3.01×10^{23} (*d*) 3.01×10^{24}

13. 4.4 g of an unknown gas occupies 2.24 L of volume at standard temperature and pressure. The gas may be:
(*a*) Carbon dioxide (*b*) Carbon monoxide
(*c*) Oxygen (*d*) Sulphur dioxide

14. The number of oxygen atoms in 4.4 *g* of CO_2 is approx.:
(*a*) 1.2×10^{23} (*b*) 6×10^{22}
(*c*) 6×10^{23} (*d*) 12×10^{23}

15. The total number of protons in 10 *g* of calcium carbonate is: ($N_A = 6.022 \times 10^{23}$)
(*a*) 1.5057×10^{24} (*b*) 2.0478×10^{24}
(*c*) 3.0115×10^{24} (*d*) 4.0956×10^{24}

16. Number of molecules in 100 ml each of O_2,NH_3 and CO_2 at STP are:
(*a*) In the order: $CO_2 < O_2 < NH_3$
(*b*) In the order: $NH_3 < O_2 < CO_2$
(*c*) The same in all
(*d*) In the order: $NH_3 < CO_2 < O_2$

17. The number of water molecules in 1 litre of water is:
(*a*) 18 (*b*) 18×1000
(*c*) N_A (*d*) 55.55 N_A

18. 2 g of oxygen contains number of atoms equal to that in:
(*a*) 0.5 g of hydrogen (*b*) 4 g of sulphur
(*c*) 7 g of nitrogen (*d*) 2.3 g of sodium

PERCENTAGE COMPOSITION, EMPIRICAL FORMULA & MOLECULAR FORMULA

19. Caffeine has a molecular weight of 194. If it contains 28.9% by mass of nitrogen, number of atoms of nitrogen in one molecule of caffeine is:
(*a*) 4 (*b*) 6
(*c*) 2 (*d*) 3

20. A compound (60 *g*) on analysis gave C = 24 g, H = 4 *g*, O = 32 *g*. Its empirical formula is:
(*a*) $C_2H_2O_2$ (*b*) C_2H_2O
(*c*) CH_2O_2 (*d*) CH_2O

1. A sample of calcium phosphate $Ca_3(PO_4)_2$ contains 8 mol of O atoms. The number of mole of Ca atoms in the sample is:
(*a*) 4 (*b*) 1.5 (*c*) 3 (*d*) 8

2. Ratio of masses of H_2SO_4 and $Al_2(SO_4)_3$ each containing 32 grams of S is _____.
(*a*) 0.86 (*b*) 1.72 (*c*) 0.43 (*d*) 2.15

3. Which has maximum number of atoms of oxygen?
(*a*) 10 ml $H_2O(l)$
(*b*) 0.1 mole of V_2O_5
(*c*) 12 gm $O_3(g)$
(*d*) 12.044×10^{22} molecules of CO_2

4. Mass of one atom of the element A is 3.9854×10^{-23}g. How many atoms are contained in 1g of the element A?
(*a*) 2.509×10^{22} (*b*) 6.022×10^{23}
(*c*) 12.044×10^{23} (*d*) None of these

5. The number of atoms present in 0.5 g-atoms of nitrogen is same as the atoms in:
(*a*) 12 g of C (*b*) 32 g of S
(*c*) 8 g of oxygen (*d*) 24 g of Mg

6. How many moles of magnesium phosphate $Mg_3(PO_4)_2$ will contain 0.25 mole of oxygen atoms?
(*a*) 0.02 (*b*) 3.125×10^{-2}
(*c*) 1.25×10^{-2} (*d*) 2.5×10^{-2}

7. 64 g of an organic compound has 24 g carbon and 8 g hydrogen and the rest is oxygen. The empirical formula of the compound is:
(*a*) CH_4O (*b*) CH_2O
(*c*) C_2H_4O (*d*) None of these

8. Two elements X (atomic mass = 75) and Y (atomic mass = 16) combine to give a compound having 75.8% of X. The formula of the compound is:
(*a*) X_2Y_3 (*b*) X_2Y (*c*) X_2Y_2 (*d*) XY

9. A definite amount of gaseous hydrocarbon was burnt with just sufficient amount of O_2. The volume of all reactants was 600 ml, after the explosion the volume of the products [$CO_2(g)$ and $H_2O(g)$] was found to be 700 ml under the similar conditions. The possible molecular formula of the compound is:
(*a*) C_3H_8 (*b*) C_3H_6 (*c*) C_3H_4 (*d*) C_4H_{10}

10. Mole fraction of ethyl alcohol in aqueous ethyl alcohol (C_2H_5OH) solution is 0.25. Hence, percentage of ethyl alcohol by weight is:
(*a*) 54% (*b*) 25%
(*c*) 75% (*d*) 46%

11. Weight of oxygen in Fe_2O_3 and FeO in the simple ratio for the same amount of iron, is:
(*a*) 3 : 2 (*b*) 1 : 2
(*c*) 2 : 1 (*d*) 3 : 1

12. A person needs on average of 2.0 mg of riboflavin (vitamin B_2) per day. How many gm of butter should be taken by the person per day if it is the only source of riboflavin? (Butter contains 5.5 microgram riboflavin per gm.)
(*a*) 363.6 gm (*b*) 2.75 mg
(*c*) 11 gm (*d*) 19.8 gm

13. The oxide of a metal contains 30% oxygen by weight. If the atomic ratio of metal and oxygen is 2 : 3, determine the atomic weight of metal.
(*a*) 12 u (*b*) 56 u (*c*) 27 u (*d*) 52 u

14. When a mixture of 10 mole of SO_2 and 15 mole of O_2 was passed over catalyst, 8 mole of SO_3 was formed. How many mole of $SO_2$and O_2 did not enter into combination?
(*a*) 2 moles of SO_2, 11 moles of O_2
(*b*) 3 moles of SO_2, 11.5 moles of O_2
(*c*) 2 moles of SO_2, 4 moles of O_2
(*d*) 8 moles of SO_2, 4 moles of O_2

15. $C_6H_5OH(g) + O_2(g) \rightarrow CO_2(g) + H_2O(l)$
Magnitude of volume change if 30 ml of C_6H_5OH (g) is burnt with excess amount of oxygen, is:
(*a*) 30 ml (*b*) 60 ml (*c*) 20 ml (*d*) 10 ml

16. Mass of sucrose $C_{12}H_{22}O_{11}$ produced by mixing 84 gm of carbon, 12 gm of dihydrogen and 56 lit. O_2 at 1 atm & 273 K according to given reaction, is:
$C(s) + H_2(g) + O_2(g) \rightarrow C_{12}H_{22}O_{11}(s)$
(*a*) 138.5 (*b*) 155.5
(*c*) 172.5 (*d*) 199.5

17. What volume (in ml) of 0.2 M H_2SO_4 solution should be mixed with the 40 ml of 0.1 M NaOH solution such that the resulting solution has the concentration of H_2SO_4 as $\frac{6}{55}$ M.
(*a*) 70 (*b*) 45 (*c*) 30 (*d*) 58

18. For the reaction; $2x + 3y + 4z \rightarrow 5w$, initially 1 mol of x, 3 mol of y and 4 mol of z is taken. If 1.25 mol of w is obtained then % yield of this reaction is:
(*a*) 50% (*b*) 60% (*c*) 70% (*d*) 40%

19. If 10 g of Ag reacts with 1 g of sulphur , the amount of Ag_2S formed will be:
(*a*) 7.75 g (*b*) 0.775 g
(*c*) 11 g (*d*) 10 g

20. A solution of A (MM = 20) and B (MM = 10), [Mole fraction $X_B = 0.6$] has density 0.7 gm/ml then molarity and molality of B in this solution will be _____ and _____ respectively.
(*a*) 30 M, 75 m (*b*) 40 M, 75 m
(*c*) 30 M, 65 m (*d*) 50 M, 55 m

41. For sequential reaction :

$A \longrightarrow B + C$ ...(i)

$2B \longrightarrow C + 2D$ ...(ii)

If % yield of (i) and (ii) reactions are 90% and 80% respectively then the overall % yield is expected to be:

(*a*) 90% (*b*) 80% (*c*) 72% (*d*) 10%

42. If 32 g of O_2 contains 6.022×10^{23} molecules at STP then 32 g of S, under the same conditions, will contain,

(*a*) 6.022×10^{23} S atoms (*b*) 3.011×10^{23} S atoms

(*c*) 12.044×10^{23} S atoms (*d*) 1×10^{23} S atoms

INTEGER TYPE QUESTIONS

43. The specific gravity of a solution is 1.8, having 62% by weight of acid. It is to be diluted to specific gravity of 1.2. What volume of water (in mL) should be added to 100 ml of this solution?

44. Carbon disulphide, CS_2, can be made from by-product SO_2. The overall reaction is

$5C + 2SO_2 \longrightarrow CS_2 + 4CO$

How much CS_2 (in kg) can be produced from 440 kg of waste SO_2 with 60 kg of coke if the SO_2 conversion is 80%?

45. Pure iron pyrite, FeS_2, is burnt with 50% excess air than required for complete oxidation of FeS_2, in a closed vessel.

$4FeS_2(s) + 11O_2(g) \longrightarrow 2Fe_2O_3(s) + 8SO_2(g)$

Air contains 20% O_2 and 80% N_2, by volume. The mole percent of N_2 gas in the gaseous mixture, after complete reaction, is.

46. Mixture of 10 moles of Fe_2S_3, 20 moles of H_2O and 30 mole of O_2 react with 30% yield of given reaction:

$$Fe_2S_3 + H_2O + O_2 \rightarrow Fe(OH)_3 + S$$

Calculate moles of $Fe(OH)_3$ that can be produced in above reaction.

47. Sample of an element "X" consist of its three isotopes A_1, A_2 & A_3 and population of A_2 is three times the population of A_3. If the average molar mass of sample is 1.25, determine percentage population of A_1 (Molar masses of isotopes A_1, A_2 & A_3 are 1, 2 and 3 gm/mol respectively.)

48. A solution of A (MM=20) and B (MM= 10), [Mole fraction $X_B = 0.6$] has density 0.7 gm/ml then molarity and molality of B in this solution will be _____M and ____m respectively.

49. A piece of aluminium weighing 2.7 g is heated with 75.0 ml of H_2SO_4 (sp. gr. 1.2 containing 25% H_2SO_4 by mass). After the metal is completely dissolved, the solution is diluted to 400ml. What is the molarity of the free H_2SO_4 in the resulting solution (Multiply final answer by 10)?

50. The odour of skunk is caused by chemical compounds called thiols ($C_4H_{10}S$). These can be deodorized by reaction with household bleach (NaOCl) according to following unbalanced reaction:

$C_4H_{10}S + NaOCl(aq) \rightarrow C_8H_{18}S_2 + NaCl(aq) + H_2O(aq)$

How many gram of thiol can be deodorized by 74.5 gm of NaOCl?

Parikshit (JEE Advanced Level)

SINGLE CORRECT TYPE QUESTIONS

1. (i) $2Al + 6HCl \longrightarrow 2AlCl_3 + 3H_2$

(ii) $AlCl_3 + 3NaOH \longrightarrow Al(OH)_3 + 3NaCl$

(iii) $Al(OH)_3 + NaOH \longrightarrow NaAlO_2 + 2H_2O$

Above series of reactions are carried out starting with 18 g of Al and 109.5 g of HCl in first step and further 100 g of NaOH is added for step (ii) and (iii). Find out limiting reagent in each step and calculate the maximum amount of $NaAlO_2$ that can be produced in step (iii). (Assume reactions are taken in sequence and also that each reaction goes to 100% completion)

	L.R. in step (I)	L.R. in step (II)	L.R. in step (III)	Moles of $NaAlO_2$
(*a*)	Al	$AlCl_3$	$Al(OH)_3$	0.66
(*b*)	Al	Na(OH)	$Al(OH)_3$	0.5
(*c*)	Al	$AlCl_3$	NaOH	0.5
(*d*)	HCl	$AlCl_3$	NaOH	0.5

2. A mixture of CH_4 and C_2H_2 was completely burnt in an excess of oxygen yielding equal volumes of CO_2 and steam, measured at the same temperature and pressure. The mole percent of CH_4 in the original mixture is

(*a*) 25% (*b*) 30%

(*c*) 75% (*d*) 50%

3. 10 moles of X, 12 mole of Y and 20 moles of Z are mixed to produce a final product P, according to the given balanced reactions:

$$X + 2Y \longrightarrow I$$

$$I + Z \longrightarrow Y + P$$

then the maximum no. of moles of P, which can be produced assuming that the products formed can also be reused in the reaction?

(*a*) 6 mole (*b*) 9 mole

(*c*) 10 mole (*d*) 12 mole

4. 56 gm of N_2 and 9 gm of H_2 are made to react completely to produce a mixture of NH_3 and N_2H_4. The ratio of moles of NH_3 and N_2H_4 is:

(*a*) 1 : 1 (*b*) 3 : 2

(*c*) 2 : 3 (*d*) None of these

5. NX is produced by the following step of reactions:

$M + X_2 \rightarrow MX_2$,

$MX_2 + X_2 \rightarrow M_3X_8$,

$M_3X_8 + N_2CO_3 \rightarrow NX + CO_2 + M_3O_4$

How much M (metal) is consumed to produce 206 g of NX. (Take at wt. of M = 56, N = 23, X = 80)

(*a*) 42 g (*b*) 56 g

(*c*) $\frac{14}{3}$ (*d*) $\frac{7}{4}$

6. An ore of iron contains FeS and some non-volatile impurity. Roasting of this ore converts all FeS into Fe_2O_3 and 4% loss in weight was observed. Mass percentage of FeS in ore will be

$$2FeS + \frac{7}{2}O_2 \longrightarrow Fe_2O_3 + 2SO_2$$

(*a*) 60 % (*b*) 44 %

(*c*) 30 % (*d*) 66 %

7. Elements X and Y can combine to form two different compounds. If 1.6 g of X reacts with exactly 1.6 g of Y the compound produced has formula XY_2. However under different conditions, 2.4 g of X will react with 1.6 g of Y to form a second compound, whose empirical formula is ____.

(*a*) X_3Y_4 (*b*) XY

(*c*) XY_3 (*d*) X_2Y

8. For a sequential reaction, $NH_3 \longrightarrow N_2 + H_2$ .....(i)

$H_2 + O_2 \longrightarrow H_2O$ ...(ii)

What will be the amount of water obtained if 5 moles of NH_3 is mixed with 3 moles of O_2 & % yield of 1st & 2nd reaction is 50% & 80% respectively?

(*a*) 3 moles (*b*) 2.5 mole

(*c*) 2 moles (*d*) 2.4 moles

9. On heating $KClO_3$ at a certain temperature, it is observed that one mole of $KClO_3$ yields one mole of O_2. What is the mole fraction of $KClO_4$ in the final solid mixture containing only KCl and $KClO_4$, the latter being formed by parallel reaction?

(*a*) 0.75 (*b*) 0.33

(*c*) 0.25 (*d*) 0.67

10. A drug, marijuana, owes its activity to tetrahydrocannabinol, which contains 70 percent as many carbon atoms as hydrogen atoms and 15 times as many hydrogen atoms as oxygen atoms. The number of moles in a gram of terahydrocannabinol is 0.00318. Determine its molecular formula.

(*a*) CH_3O_2 (*b*) $C_{21}H_{30}O_2$

(*c*) $C_{15}H_{30}O_2$ (*d*) $C_{70}H_{15}O$

11. From the following reactions,

$2CoF_2 + F_2 \rightarrow 2CoF_3$

$(CH_2)_n + 4n\ CoF_3 \rightarrow (CF_2)_n + 2n\ HF + 4n\ CoF_2$

Calculate how much F_2 will be consumed to produce 1 kg of $(CF_2)_n$. (F = 19)?

(*a*) 1.52 kg (*b*) 2.04 kg (*c*) 0.76 kg (*d*) 4.56 kg

12. Hydrogen cyanide, HCN, can be made by a two step process. First, ammonia is reacted with O_2 to give nitric oxide, NO.

$4NH_3\ (g) + 5O_2(g) \rightarrow 4NO(g) + 6H_2O\ (g)$

Then nitric oxide is reacted with methane, CH_4.

$2NO(g) + 2CH_4(g) \rightarrow 2HCN(g) + 2H_2O(g) + H_2(g)$

When 25.5 g of ammonia and 32.0 g of methane are used, how much grams of hydrogen cyanide can be produced?

(*a*) 1.5 (*b*) 2.0 (*c*) 40.5 (*d*) 54.0

MULTIPLE CORRECT TYPE QUESTIONS

13. Which is/are correct statements about 1.7 g of NH_3?

(*a*) It contain 0.3 mol H – atoms.

(*b*) It contain 2.408×10^{23} atoms.

(*c*) Mass % of hydrogen is 17.65%.

(*d*) It contains 0.3 mol N-atoms.

14. If 27 g of carbon is mixed with 88 g of oxygen and is allowed to burn to produce CO_2, then:

(*a*) Oxygen is the limiting reagent.

(*b*) Volume of CO_2 gas produced at STP is 50.4 L.

(*c*) C and O combine in mass ratio of 3.8.

(*d*) Volume of unreacted O_2 at STP is 11.2 L.

15. A sample of a mixture of $CaCl_2$ and NaCl weighing 4.44 g was treated to precipitate all the Ca as $CaCO_3$, which was then heated and quantitatively converted to 1.12 g of CaO. (At . wt. Ca = 40, Na = 23, Cl = 35.5)

(*a*) Mixture contains 50% NaCl by mass

(*b*) Mixture contains 60% $CaCl_2$ by mass

(*c*) Mass of $CaCl_2$ is 2.22 g in the mixture

(*d*) Mass of $CaCl_2$ is 1.11 g in the mixture

16. $A + B \rightarrow A_3B_2$ (unbalanced)

$A_3B_2 + C \rightarrow A_3B_2C_2$ (unbalanced)

Above two reactions are carried out by taking 3 moles each of A and B and one mole of C. Then, which option is/are correct?

(*a*) 1 mole of $A_3B_2C_2$ is formed.

(*b*) 1/2 mole of $A_3B_2C_2$ is formed.

(*c*) 1/2 mole of A_3B_2 is formed.

(*d*) 1/2 mole of A_3B_2 is left finally.

17. The **incorrect** statement(s) regarding 2 M $MgCl_2$ aqueous solution is/are: ($d_{solution}$ = 1.09 gm/ml)

(*a*) Molality of Cl^- is 4.44 m.

(*b*) Mole fraction of $MgCl_2$ is approximately 0.035.

(*c*) The conc. of $MgCl_2$ is 19% w/v. (approx)

(*d*) The conc. of $MgCl_2$ is 19×10^4 ppm.

INTEGER TYPE QUESTIONS

40. A solution contain substances A and B in H_2O (solvent). The mole fraction of 'A' is 0.05 and molarity of 'B' is 7 M. The solution has density 1.14 gm/ml. Calculate "molarity of A". [Molecular weight of A = 10 gm/mol; molecular weight of B = 30 gm/mol]

41. A fluorine disposal plant was constructed to carryout the following reactions:

$$F_2 + 2NaOH \longrightarrow \frac{1}{2}O_2 + 2NaF + H_2O$$

$$2NaF + CaO + H_2O \longrightarrow CaF_2 + 2NaOH$$

Over a period of operation, 1900 kg of fluorine was fed into a plant and 10,000 kg of lime was required. What was the percentage utilisation of lime ? [Lime : CaO]

42. Based on the following information, determine sum of value of x and y:

$(CH_3)_xAlCl_y(0.643g) \longrightarrow xCH_4(g)(0.22\ g) + yCl^- + Al^{3+} \xrightarrow{AgNO_3}$ white ppt. (0.996g).

43. A mixture of $NH_3(g)$ & $N_2H_4(g)$ is placed in a sealed container at 300K. The total pressure is 0.5 atm. The container is heated to 1200 K at which time both substances decompose completely according to the equations

$2NH_3(g) \longrightarrow N_2(g) + 3H_2(g)$ and

$N_2H_4(g) \longrightarrow N_2(g) + 2H_2(g)$

After decomposition is complete, the total pressure at 1200 K is found to be 4.5 atm. Find the mole % of NH_3 in the original mixture.

44. In a container 6 litre N_2 and 30 litre H_2 is taken which react according to the following reactions and N_2H_2 reacts with H_2 to give N_2H_4.

$N_2(g) + H_2(g) \longrightarrow N_2H_2(g)$

$N_2H_2(g) + H_2(g) \longrightarrow N_2H_4(l)$

Find percentage of volume contracted.

45. Atoms of elements A, B and C combine to form a compound in the atomic ratio of 1 : 6 : 2. Atomic masses of A, B and C are 64, 4 and 16, respectively. Calculate the maximum mass (in mg) of the compound formed from1.28 gm of A, 3.0×10^{23} atoms of B and 0.04 mole atom of C. [Take: $N_A = 6 \times 10^{23}$]

46. $KClO_4$ can be prepared by Cl_2 and KOH by a series of reactions as given below:

$Cl_2 + 2KOH \longrightarrow KCl + KClO + H_2O$

$3KClO \longrightarrow 2KCl + KClO_3$

$4KClO_3 \longrightarrow 3KClO_4 + KCl$

If 10 moles of Cl_2 are mixed with 22 moles of KOH then calculate total moles of all the substances at the end of reaction. (Assuming 100% yield of all the reactions.)

PYQ's (Past Year Questions)

PROPERTIES OF MATTER AND THEIR MEASUREMENT

1. The candela is the luminous intensity, in a given direction, of a source that emits monochromatic radiation of frequency 'A' $\times 10^{12}$ hertz and that has a radiant intensity in that direction of $\frac{1}{\text{'B'}}$ watt per steradian. 'A' and 'B' are respectively. **[09 April, 2024 (Shift-II)]**

(*a*) 540 and $\frac{1}{683}$ (*b*) 540 and 683

(*c*) 450 and $\frac{1}{683}$ (*d*) 450 and 683

UNCERTAINTY IN MEASUREMENT AND LAWS OF CHEMICAL COMBINATIONS

2. Which of the following have same number of significant figures? **[8 April, 2023 (Shift-II)]**

A. 0.00253 B. 1.0003

C. 15.0 D. 163

Choose the correct answer from the options given below

(*a*) A, B and C only (*b*) C and D only

(*c*) A, C and D only (*d*) B and C only

3. Using the rules for significant figures, the correct answer for the expression $\frac{0.02858 \times 0.112}{0.5702}$ **[29 June, 2022 (Shift-II)]**

(*a*) 0.005613 (*b*) 0.00561

(*c*) 0.0056 (*d*) 0.006

4. The number of significant figures in 50000.020×10^{-3} is_____. **[26 Feb, 2021 (Shift-I)]**

5. To check the principle of multiple proportions, a series of pure binary compounds (P_mQ_n) were analyzed and their composition is tabulated below. The correct option(s) is(are) **[JEE Adv 2022]**

Compound	Weight % of P	Weight % of Q
1	50	50
2	44.4	55.6
3	40	60

(*a*) If empirical formula of compound 3 is P_3Q_4. then the empirical formula of compound 2 is P_3Q_5.

(*b*) If empirical formula of compound 3 is P_3Q_2 and atomic weight of clement P is 20, then the atomic weight of Q is 45.

(*c*) If empirical formula of compound 2 is PQ, then the empirical formula of the compound 1 is P_5Q_4.

(*d*) If atomic weight of P and Q are 70 and 35, respectively, then the empirical formula of compound 1 is P_2Q.

DALTON'S ATOMIC THEORY

6. Choose the Incorrect Statement about Dalton's Atomic Theory **[04 April, 2024 (Shift-II)]**

(*a*) Compounds are formed when atoms of different elements combine in any ratio

(*b*) All the atoms of a given element have identical properties including identical mass

(*c*) Matter consists of indivisible atoms

(*d*) Chemical reactions involve recorganization of atoms

7. The incorrect postulates of the Dalton's atomic theory are:

(A) Atoms of different elements differ in mass.

(B) Matter consists of divisible atoms.

(C) Compounds are formed when atoms of different element combine in a fixed ratio.

(D) All the atoms of given element have different properties including mass.

(E) Chemical reactions involve reorganisation of atoms.

Choose the correct answer from the options given below: **[05 April, 2024 (Shift-I)]**

(*a*) (B), (D), (E) only (*b*) (A), (B), (D) only

(*c*) (C), (D), (E) only (*d*) (B), (D) only

ATOMIC & MOLECULAR MASSES

8. The average molar mass of chlorine is 35.5 g mol^{-1}. The ratio of ^{35}Cl to ^{37}Cl in naturally occurring chlorine is close to: **[6 Sept, 2020 (Shift-II)]**

(*a*) 4 : 1 (*b*) 3 : 1 (*c*) 2 : 1 (*d*) 1 : 1

MOLE CONCEPT AND MOLAR MASSES

9. 0.05 cm thick coating of silver is deposited on a plate of 0.05 m^2 area. The number of silver atoms deposited on plate are _____ $\times 10^{23}$. (At mass Ag = 108, $d = 7.9\ g\ cm^{-3}$) **[30 Jan, 2024 (Shift-I)]**

10. Match List-I with List-II. **[10 April, 2023 (Shift-II)]**

	List-I		List-II
A.	16g of $CH_4(g)$	p.	Weighs 28 g
B.	1g of $H_2(g)$	q.	60.2×10^{23} electrons
C.	1 mole of $N_2(g)$	r.	Weighs 32g
D.	0.5 mol of $SO_2(g)$	s.	Occupies 11.4 L volume at STP

Choose the correct answer from the options given below:

(*a*) (A)-(p), (B)-(r), (C)-(q), (D)-(s)

(*b*) (A)-(q), (B)-(r), (C)-(r), (D)-(p)

(*c*) (A)-(q), (B)-(s), (C)-(r), (D)-(p)

(*d*) (A)-(q), (B)-(s), (C)-(p), (D)-(r)

11. When 0.01 mol of an organic compound containing 60% carbon was burnt completely, 4.4 g of CO_2 was produced. The molar mass of compound is _____ g mol^{-1} (Nearest integer) **[29 Jan, 2023 (Shift-II)]**

12. Production of iron in blast furnace follows the following equation $Fe_3O_4(s) + 4CO(g) \longrightarrow 3Fe(l) + 4CO_2(g)$

When 4.640 kg of Fe_3O_4 and 2.520 kg of CO are allowed to react then the amount of iron (in g) produced is:

[Given: Molar Atomic mass (g mol^{-1}); Fe = 56
Molar Atomic mass (g mol^{-1}); O = 16
Molar Atomic mass (g mol^{-1}); C = 12]
[29 June, 2022 (Shift-I)]

(*a*) 1400 (*b*) 2200 (*c*) 3360 (*d*) 4200

13. 4g equimolar mixture of NaOH and Na_2CO_3 contains x g of NaOH and y g of Na_2CO_3. The value of x is _____ g. (Nearest Integer) **[20 July, 2021 (Shift-II)]**

14. $NaClO_3$ is used, even in spacecraft, to produce O_2. The daily consumption of pure O_2 by a person is 492L at 1 atm, 300 K. How much amount of $NaClO_3$, in grams, is required to produce O_2 for the daily consumption of a person at 1 atm, 300 K?

$NaClO_3(s) + Fe(s) \rightarrow O_2(g) + NaCl(s) + FeO(s)$

$R = 0.082\ L\ atm\ mol^{-1}\ K^{-1}$. **[8 Jan, 2020 (Shift-II)]**

15. 5 moles of AB_2 weigh 125×10^{-3} kg and 10 moles of A_2B_2 weigh 300×10^{-3} kg. The molar mass of $A_{(M_A)}$ and molar mass of $B_{(M_B)}$ in kg mol^{-1} are: **[12 April, 2019 (Shift-I)]**

(*a*) $M_A = 50 \times 10^{-3}$ and $M_B = 25 \times 10^{-3}$

(*b*) $M_A = 25 \times 10^{-3}$ and $M_B = 50 \times 10^{-3}$

(*c*) $M_A = 5 \times 10^{-3}$ and $M_B = 10 \times 10^{-3}$

(*d*) $M_A = 10 \times 10^{-3}$ and $M_B = 5 \times 10^{-3}$

16. Aluminium reacts with sulfuric acid to form aluminium sulfate and hydrogen. What is the volume of hydrogen gas in liters (L) produced at 300 K and 1.0 atm pressure, when 5.4 g of aluminium and 50.0 mL of 5.0 M sulfuric acid are combined for the reaction?

(Use molar mass of aluminium as 27.0 g mol^{-1}, R = 0.082 atm L mol^{-1} K^{-1}) **[JEE Adv 2020]**

PERCENTAGE COMPOSITION AND EMPIRICAL & MOLECULAR FORMULA

17. A sample of $CaCO_3$ and $MgCO_3$ weighed 2.21 g is ignited to constant weight of 1.152 g. The composition of mixture is:

(Given molar mass in g mol^{-1} $CaCO_3$: 100, $MgCO_3$: 84) **[31 Jan, 2024 (Shift-II)]**

(*a*) 1.187 g $CaCO_3$ + 1.023 g $MgCO_3$

(*b*) 1.023 g $CaCO_3$ + 1.023 g $MgCO_3$

(*c*) 1.187 g $CaCO_3$ + 1.187 g $MgCO_3$

(*d*) 1.023 g $CaCO_3$ + 1.187 g $MgCO_3$

18. 10 mL of gaseous hydrocarbon on combustion gives 40 mL of $CO_2(g)$ and 50 mL of water vapour. Total number of carbon and hydrogen atoms in the hydrocarbon is _____. **[01 Feb, 2024 (Shift-II)]**

19. An organic compound has 42.1% carbon, 6.4% hydrogen and remainder is oxygen. If its molecular weight is 342, then its molecular formula is: **[05 April, 2024 (Shift-I)]**

(*a*) $C_{11}H_{18}O_{12}$ (*b*) $C_{12}H_{20}O_{12}$

(*c*) $C_{14}H_{20}O_{10}$ (*d*) $C_{12}H_{22}O_{11}$

NUMERICAL TYPE QUESTIONS (ANSWER UPTO TWO DECIMAL PLACE)

1. Excess of calcium orthophosphate is reacted with magnesium to from Ca_3P_2 along with MgO. Ca_3P_2 on reaction with water liberated PH_3 along with $Ca(OH)_2$. PH_3 is burnt in excess of oxygen to form P_2O_5 along with water. Oxides of magnesium and phosphorous react to give magnesium metaphosphate. Calculate grams of magnesium metaphosphate obtained if 1.92 gm of Mg is taken (Mg = 24, P = 31, O = 16)

2. In one process for waterproofing, a fabric is exposed to $(CH_3)_2SiCl_2$ vapour. The vapour reacts with hydroxyl groups on the surface of the fabric or with traces of water to form the waterproofing film $[(CH_3)_2SiO]_n$, by the reaction

$n[(CH_3)_2SiCl_2 + 2nOH^- \rightarrow 2nCl^- + nH_2O + [(CH_3)_2SiO]_n$

Where n stands for a large integer. The waterproofing film is deposited on the fabric layer upon layer. Each layer is 6.0 Å thick [the thickness of the $(CH_3)_2SiO$ group]. How much (in g) $(CH_3)_2$ $SiCl_2$ is needed to waterproof one side of a piece of fabric, 1.00 m by 3.70 m, with a film 300 layers thick ? The density of the film is 1.0 g/cm^3. (Si = 28)

Molar mass of $(CH_3)_2SiO$ = 74 g/mol

Molar mass of $(CH_3)_2SiCl_2$ = 129 g/mol

INTEGER TYPE QUESTIONS

3. Cis-platin $[Pt(NH_3)_2Cl_2]$, a compound used in cancer treatment is prepared by the reaction of ammonia with potassium tetrachloroplatinate.

$K_2PtCl_4 + 2NH_3 \rightarrow 2KCl + Pt(NH_3)_2Cl_2$

(i) How many grams of cis-platin are formed from 41.5 gm K_2PtCl_4 amd 34 gm NH_3, if the reaction takes place in 90% yield? (Ans. x)

(ii) What is the maximum mass (in gm) of KCl which can be produced if initially total 9 moles of reactant are taken. Assuming 100% reaction ? (Ans. y)

What is the value of (x + y)? [Pt = 195, K = 39, Cl = 35.5]

4. The number of Alkoxy groups in an organic compound $A(OR)_x$ may be determined by the sequential reaction.

$$A(OR)_x + xHI \rightarrow A(OH)_x + xRI$$

$$RI + Ag^+ + H_2O \rightarrow ROH + AgI(s) + H^+$$

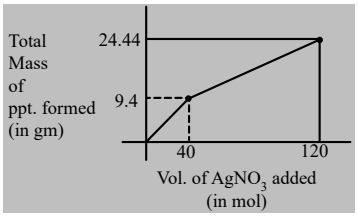
When 4.8 gm of organic compound $A(OR)_x$ (molar mass = 240 gm mol^{-1}) is treated as above, 9.4 gm AgI is precipitated. Then, calculate number of alkoxy groups in the compound $A(OR)_x$? (I = 127, Ag = 108)

5. A sample of ammonia contains only H^1 and H^2 isotopes of hydrogen in 4 : 1 ratio and N^{14} and N^{15} isotopes of nitrogen in 3 : 1 ratio. How many neutrons are present in 1.785 mg of ammonia? (Answer in the order of 10^{18})($N_A = 6 \times 10^{23}$)

6. In order to determine the composition of a mixture of halides containing MBr_2 & NaI, 14 gm mixture was dissolved in water. To this solution, $AgNO_3$ solution of certain molarity was added gradually. The mass of precipitate produced (in gm) were measured and it was plotted against volume of $AgNO_3$ solution added (in ml). If it is known that AgI is precipitated first and precipitation of Br^- does not start until the already precipitating I^- precipitates completely. Find out the value of AB × CD where:

AB = Atomic weight of metal 'M'

CD = Mole percent of NaI in original mixture.



(Molar mass of NaI = 149.89g/mol, Br = 79.9g/mol, AgI = 234.77g/mol)

7. A mixture of gases liberated upon decomposition of 33.1 gm $Pb(NO_3)_2$ is dissolved in 10ml of water. What is the mass (in g) of 0.1M KOH solution with density 1.05 g/ml required to neutralise this acid. The reactions involved are: (at. mass of Pb = 207)

$$2Pb(NO_3)_2 \xrightarrow{\Delta} 2PbO + 4NO_2 + O_2$$

$$4NO_2 + 2H_2O + O_2 \rightarrow 4HNO_3$$

$$KOH + HNO_3 \rightarrow KNO_3 + H_2O$$

8. Water is the working Fluid in a thermal plant for producing electricity. Coal is Combusted for Generating heat as per reaction, $C + O_2 \rightarrow CO_2$. 0.01% of the released CO_2 gas is absorbed in water and gets converted into weak acid, H_2CO_3 which dissociate to give H^+ as $H_2CO_3 \rightarrow 2H^+ + CO_3^{-2}$. The % dissociation of acid is 5%. Assume no ionisation of H_2O. If in a certain application $[H^+]$ concentration can maximum be 10^{-5} M, then

(a) Calculate maximum no. of moles of H^+(x) and CO_3^{-2} (y) in water if 10^9 litres of H_2O is used.

(b) Calculate maximum no. of mole of carbon (z) which can be burnt so that water remains fit to be used.

What is the value of xy^2/z?

9. A mother cell disintegrates into 60 identical cells and each daughter cell of mother disintegrates into 24 smaller cells, The smallest cell is uniform cylindrical in shape with diameter 120Å and each cell is 6000Å long. Determine molar mass of the mother cell, if density of the smallest cell is 1.12 gm/cm^3. Using scientific notation if your answer is $x \times 10^y$, their write the value of [x] + y, where [ ] is an integer function. Take avogadro number as 6×10^{23}.

ANSWER KEY

CONCEPT APPLICATION

1. (*a*) **2.** (*a*) **3.** (*d*) **4.** (*a*) **5.** (*a*) **6.** (*a*) **7.** (*a*) **8.** (*b*) **9.** (*b*) **10.** (*b*)
11. (*a*) **12.** (*b*) **13.** (*c*) **14.** (*b*) **15.** (*a*) **16.** (*b*) **17.** (*b*) **18.** (*a*) **19.** (*c*) **20.** (*d*)
21. (*d*) **22.** (*b*) **23.** (*a*) **24.** (*c*) **25.** (*b*) **26.** (*c*) **27.** (*c*) **28.** (*b*) **29.** (*c*) **30.** (*d*)
31. (*a*) **32.** (*b*)

PRARAMBH (TOPICWISE)

1. (*b*) **2.** (*b*) **3.** (*c*) **4.** (*c*) **5.** (*c*) **6.** (*b*) **7.** (*a*) **8.** (*d*) **9.** (*a*) **10.** (*a*)
11. (*b*) **12.** (*b*) **13.** (*a*) **14.** (*a*) **15.** (*c*) **16.** (*c*) **17.** (*d*) **18.** (*b*) **19.** (*a*) **20.** (*d*)
21. (*c*) **22.** (*b*) **23.** (*b*) **24.** (*c*) **25.** (*c*) **26.** (*c*) **27.** (*c*) **28.** (*a*) **29.** (*a*) **30.** (*a*)
31. (*d*) **32.** (*a*) **33.** (*c*) **34.** (*d*) **35.** (*b*) **36.** (*c*) **37.** (*a*) **38.** (*d*) **39.** (*d*) **40**. (*a*)

PRABAL (JEE MAIN LEVEL)

1. (*c*) **2.** (*a*) **3.** (*c*) **4.** (*a*) **5.** (*c*) **6.** (*b*) **7.** (*a*) **8.** (*a*) **9.** (*a*) **10.** (*d*)
11. (*a*) **12.** (*a*) **13.** (*b*) **14.** (*a*) **15.** (*b*) **16.** (*b*) **17.** (*a*) **18.** (*a*) **19.** (*a*) **20.** (*a*)
21. (*a*) **22.** (*d*) **23.** (*c*) **24.** (*b*) **25.** (*b*) **26.** (*c*) **27.** (*b*) **28.** (*b*) **29.** (*c*) **30.** (*b*)
31. (*c*) **32.** (*a*) **33.** (*c*) **34.** (*c*) **35.** (*c*) **36.** (*a*) **37.** (*b*) **38.** (*c*) **39.** (*a*) **40.** (*d*)
41. (*c*) **42.** (*a*) **43.** [300] **44.** [76] **45.** [83] **46.** [4] **47.** [80] **48.** [30M, 75m] **49.** [2]
50. [180]

PARIKSHIT (JEE ADVANCED LEVEL)

1. (*c*) **2.** (*d*) **3.** (*c*) **4.** (*c*) **5.** (*a*) **6.** (*b*) **7.** (*a*) **8.** (*a*) **9.** (*c*) **10.** (*b*)
11. (*a*) **12.** (*c*) **13.** (*a,b,c*) **14.** (*b,c,d*) **15.** (*a,c*) **16.** (*b,d*) **17.** (*b,d*) **18.** (*a,b*) **19.** (*a,b,d*) **20.** (*a,b,c*)
21. (*a,c*) **22.** (*a,c,d*) **23.** (*a,b,d*) **24.** (*a,b*) **25.** (*b,c,d*) **26.** (*a*) **27.** (*b*) **28.** (*b*) **29.** (*b*) **30.** (*c*)
31. (*b*) **32.** (*c*) **33.** (*b*) **34.** (*b*) **35.** (*b*) **36.** (*d*) **37.** [1811.5] **38.** [0.3] **39.** [73.6]
40. [3] **41.** [28] **42.** [3] **43.** [75] **44.** [50] **45.** [2400] **46.** [32]

PYQ's (PAST YEAR QUESTIONS)

1. (*b*) **2.** (*c*) **3.** (*b*) **4.** [8] **5.** (*b, c*) **6.** (*a*) **7.** (*d*) **8.** (*b*) **9.** [11] **10.** (*d*)
11. [200] **12.** (*c*) **13.** [1] **14.** [2130] **15.** (*c*) **16.** [6.15] **17.** (*a*) **18.** [14] **19.** (*d*) **20.** (*a*)
21. (*a*) **22.** [56] **23.** (*b*) **24.** [13] **25.** [3] **26.** (*d*) **27.** [8] **28.** [50] **29.** [24] **30.** (*b*)
31. (*b*) **32.** [100] **33.** (*c*) **34.** [63] **35.** [80] **36.** (*c*)

PW CHALLENGERS

1. [1.82] **2.** [1.16] **3.** [474] **4.** [2] **5.** [471] **6.** [4994] **7.** [2100] **8.** [250] **9.** [16] **10.** [5]
11. [2667] **12.** (*c*)

VIDYAPEETH
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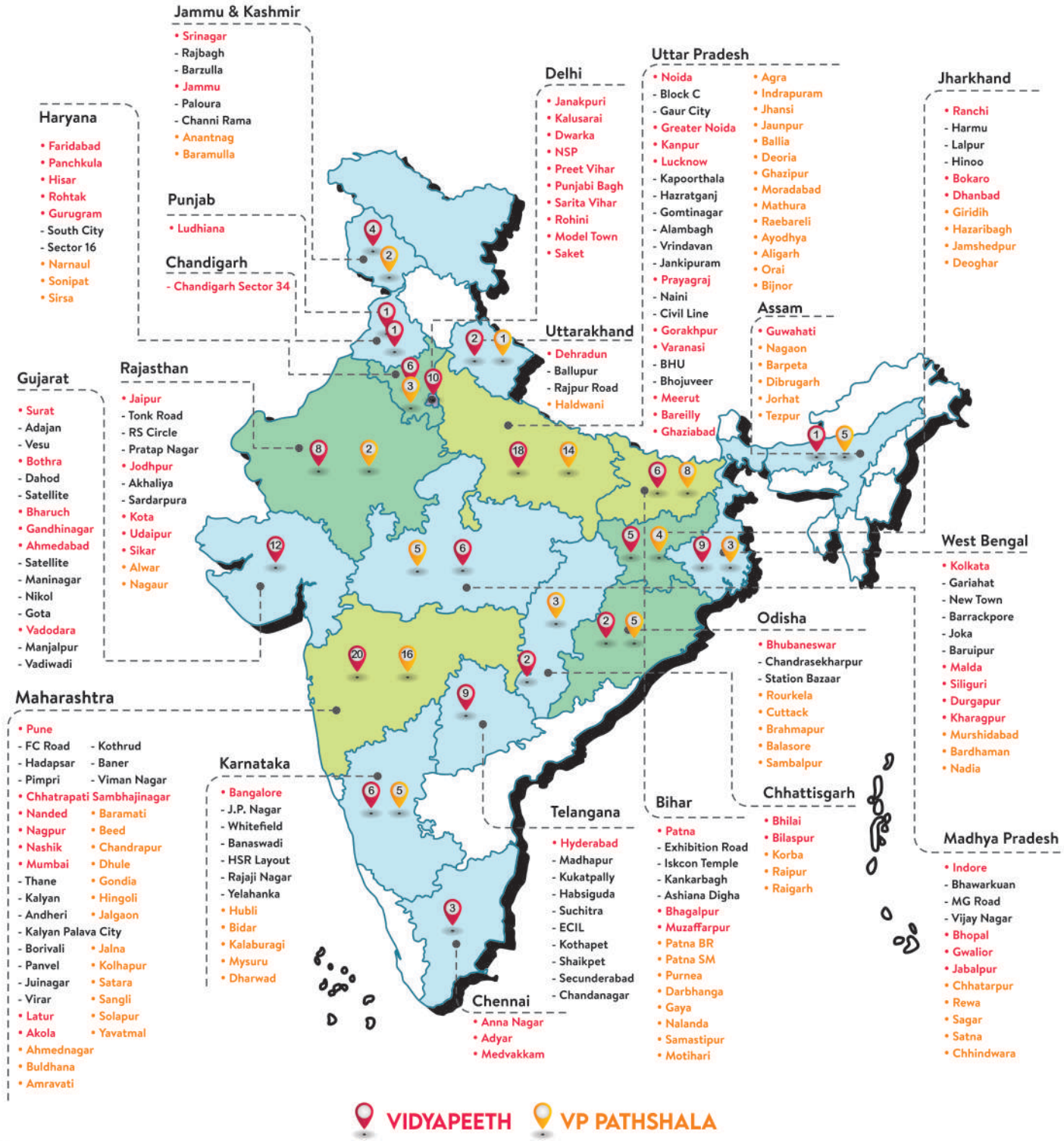

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