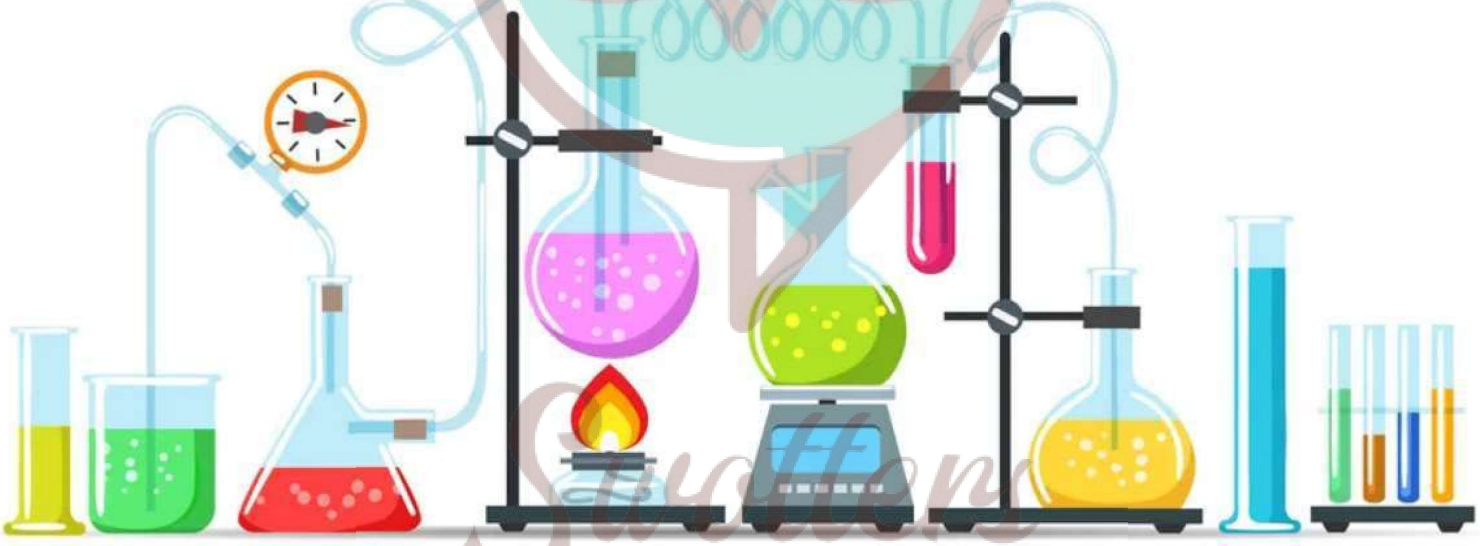
# CHEMISTRY



www.swottersacademy.com

# Important Questions

## Multiple Choice questions-

Question 1. Formula of Ferric Sulphate is:

(a) $FeSo_4$

(b) $Fe\ (So_4)_3$

(c) $Fe_2\ (So_4)_3$

(d) $Fe_2So_4$

Question 2. Approximate atomic weight of an element is 26.89. If its equivalent weight is 8.9, the exact atomic weight of element would be

(a) 26.89

(b) 8.9

(c) 17.8

(d) 26.7

Question 3. The total number of atoms represented by the compound CuSO4. 5H2O is

(a) 27

(b) 21

(c) 5

(d) 8

Question 4. An atom is 10 times heavier than 1/12th of mass of a carbon atom (C – 12). The mass of the atom in a.m.u. is

(a) 10

(b) 120

(c) 1.2

(d) 12

Question 5. 81.4 g sample of ethyl alcohol contains 0.002 g of water. The amount of pure ethyl alcohol to the proper number of significant figures is

(a) 81.398 g

(b) 71.40 g

(c) 91.4 g

(d) 81 g

Question 6. Which of the following halogen can be purified by sublimation?

(a) $F_2$

(b) $Cl_2$

(c) $Br_2$

(d) $I_2$

Question 7. 1 mol of $CH_4$ contains

(a) $6.02 \times 10^{23}$ atoms of H

(b) 4 g atom of Hydrogen

(c) $1.81 \times 10^{23}$ molecules of $CH_4$

(d) 3.0 g of carbon

Question 8. The prefix zepto stands for

(a) $10_9$

(b) $10^{-12}$

(c) $10^{-15}$

(d) $10^{-21}$

Question 9. Which has maximum number of atoms?

(a) 24 g of C (12)

(b) 56 g of Fe (56)

(c) 27 gof Al (27)

(d) 108 g of Ag (108)

Question 10: Irrespective of the source, pure sample, of water always yields 88.89% mass of oxygen and 11.11% mass of hydrogen. This is explained by the law of

(a) Conservation of Mass

(b) Multiple Proportions

(c) Constant Composition

(d) Constant Volume

Question 11. Hemoglobin contains 0.33% of iron by weight. The molecular weight of hemoglobin is approximately 67200. The number of iron atoms (At. wt. of Fe = 56) present in one molecule of hemoglobin is

(a) 6

(b) 1

(c) 4

(d) 2

Question 12. The -ve charged particles is called:

(a) Anion

(b) Cation

(c) Radical

(d) Atom

Question 13. Which of the following contains same number of carbon atoms as are in 6.0 g of carbon (C – 12)?

(a) 6.0 g Ethane

(b) 8.0 g Methane

(c) 21.0 g Propane

(d) 28.0 g CO

Question 14. The density of a gas is 1.78 $gL^{-1}$ at STP. The weight of one mole of gas is

(a) 39.9 g

(b) 22.4 g

(c) 3.56 g

(d) 29 g

Question 15. Molarity of 0.2 N $H_2SO_4$ is

(a) 0.2

(b) 0.4

(c) 0.6

(d) 0.1

## Very Short:

1.What is chemistry?

2. How has chemistry contributed towards nation's development?

3. Differentiate solids, liquids & gases in terms of volume & shapes.

4. Name the different methods that can be used for separation of components of a mixture.

5. Classify following as pure substances and mixtures – Air, glucose, gold, odium and milk

6. What is the difference between molecules and compounds? Give examples of each.?

7. How can we separate the components of a compound?
8. How are physical properties different from chemical properties?
9. What are the two different system of measurement?
10. What is the SI unit of density?

## Short Questions:

1. Define Mole. What is its numerical value?
2. Define molarity. Is it affected by a change in temperature?
3. What do you mean by Precision and accuracy?
4. Distinguish between fundamental and the derived units.
5. Define molality and write its temperature dependence.
6. Distinguish between an atom and a molecule.
7. Derive the SI unit of Joule (J) in terms of fundamental units.

## Long Questions:

1. State the law of Multiple Proportions. Explain with two examples.
2. State the law of Constant Composition. Illustrate with two examples.
3. Define empirical formula and molecular formula. How will you establish a relationship between the two? Give examples.
4. In the commercial manufacture of nitric acid, how many moles of NO2 produce 7.33 mol HN03 in the reaction

   $3\ NO_2(g) + H_2O(1) \rightarrow 2HNO_3(aq) + NO(g)$
5. A sample of $NaNO_3$ weighing 0.83 g is placed in a 50,0 mL volumetric flask. The flask is then filled with water upon the etched mark. What is the molarity of the solution?

## Assertion Reason Questions:

1. In the following questions, a statement of Assertion (A) followed by a statement of Reason (R) is given. Choose the correct option out of the choices given below each question.

   **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 various atoms present in a compound.

   (i) Both A and R are true and R is the correct explanation of A.

(ii) A is true but R is false.

(iii) A is false but R is true.

(iv) Both A and R are false.

2. In the following questions, a statement of Assertion (A) followed by a statement of Reason (R) is given. Choose the correct option out of the choices given below each question.

**Assertion (A) :** One atomic mass unit is defined as one twelfth of the mass of one carbon-12 atom.

**Reason (R) :** Carbon-12 isotope is the most abundant isotope of carbon and has been chosen as standard.

(i) Both A and R are true and R is the correct explanation of A.

(ii) Both A and R are true but R is not the correct explanation of A.

(iii) A is true but R is false.

(iv) Both A and R are false.

## Case Study Based Question:

1. Chemistry is the science of molecules and their transformations. It is the science not so much of the one hundred elements but of the infinite variety of molecules that may be built from them. Chemistry plays a central role in science and is often intertwined with other branches ofscience.to understand the basic concepts of chemistry, which begin with the concept of matter. Let us start with the nature of matter. matter can exist in three physical states viz. solid, liquid and gas. Particles are held very close to each other in solids in an orderly fashion and there is not much freedom of movement. In liquids, the particles are close to each other but they can move around. However, in gases, the particles are far apart as compared to those present in solid or liquid states and their movement is easy and fast. different states of matter exhibit the following characteristics:

   I. Solids have definite volume and definite shape.

   II. Liquids have definite volume but do not have definite shape. They take the shape of the container in which they are placed.

   III. Gases have neither definite volume nor definite shape. They completely occupy the space 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, reactivity 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 occurrence of a chemical change.

(1) Which of the following state of matter have definite volume but do not have definite shape ?

(a) Solid

(b) Liquid

(c) Gas

(d) Plasma

(2) 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

(3) Particles of …. consist of only one type of atom.

(a) Compound

(b) Mixture

(c) Element

(d) All the above

(4) Water molecule comprises …hydrogen atoms and … oxygen atom.

(a) One , two

(b) Three , one

(c) One , three

(d) Two , one

(5) Which of the following is not an example of Physical Properties of substance.?

(a) Odour

(b) Melting point

(c) Density

(d) Composition

2. 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:

- All non-zero digits are significant. For Example in 285 cm, 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 value to 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 Lavoisier in 1789. He performed careful experimental studies for combustion reactions and reached to the conclusion that in all physical and chemical changes, there is no net change in mass during the process. Hence, he reached to the conclusion that matter can neither be created nor destroyed. This is called 'Law of Conservation 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 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 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 Loussac's Law of Gaseous Volumes-** This law was given by Gay Loussac in 1808. He observed that when gases combine or are produced in a chemical reaction they do so in a simple ratio by volume, provided all 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 reorganisation of atoms. These are neither created nor destroyed in a chemical reaction.

1) …… refers to the closeness of various measurements for the same quantity.

a) Accuracy

b) Reliability

c) Precision

d) Uncertainty

2) Law of Conservation of mass was put forth by ……. in 1789.

a) Joseph Proust

b) Antoine Lavoisier

c) Joseph Louis

d) Gay Loussac

3) Which of the following number has two significant figures.

a) 00052

b) 052

c) 52

d) 0.0052

4) ..... is the agreement of a particular value to the true value of the result.

a) Accuracy

b) Reliability

c) Precision

d) Uncertainty

5) Law of Multiple Proportions proposed by ..

a) Joseph Proust

b) Antoine Lavoisier

c) Joseph Louis

d) John Dalton

## Answer Key:

### MCQ

1. (c) $Fe_2 (So_4)_3$
2. (a) 26.89
3. (b) 21
4. (a) 10
5. (a) 81.398 g
6. (d) $I_2$

7. (c) 4 g atom of Hydrogen

8. (d) $10^{-21}$

9. (a) 24 g of C (12)

10.(c) Constant Composition

11.(c) 4

12.(a) Anion

13.(b) 8.0 g Methane

14.(a) 39.9 g

15.(d) 0.1

## Very Short Answer:

1. Chemistry is the branch of science that studies the composition, properties and interaction of matter.

2. chemical principles are important in diverse areas such as weather patterns, functioning of brain, operation of a computer, chemical industries, manufacturing , fertilizers, alkalis, acids, salts, dyes, polymers, drugs, soaps, detergents, metals, alloys, contribute in a big way to national economy.

3.

| roperty | Solids | Liquids | Gases |
|---|---|---|---|
| 1. Volume | Definite | Definite | Not definite |
| 2. Shape | Fixed | Not fixed, take the shape of container, | Not fixed, takes the shape of the container |

4. The components of a mixture can be separated by physical methods like handpicking, filtrations, crystallization, distillation etc.

5.

| Pure Substances | Mixtures |
|---|---|
| Glucose | Air |
| Gold | Milk |
| Sodium | |

6. Molecules consist of different atoms or same atoms. e.g. molecule of hydrogen contains two atoms of hydrogen whereas molecule of water contain two atoms of hydrogen and one of oxygen.

Compound is formed when two or more than two different atoms combine in fire propo e.g. water –ration carbon dioxide, sugar etc.

7. The constituents of a compound cannot be separated by physical methods. They can only be separate by chemical methods.

8. Physical properties are those properties which can be measured or observed without changing the identity or the composition of the substance whereas the measurement of chemical properties require a chemical change to occur e.g. color, odour etc. are physical properties and combustion, basicity etc. are chemical properties.

9. The different system of measurement are English system and the metric system.

10. The SI Unit of density is Kg $m^{-3}$ or $kg/m^3$

## Short Answer:

**Ans: 1.** A mole is the amount of a substance that contains as many entities (atoms, molecules, or other particles) as there are atoms in exactly 0.012 kg or 12 g of the carbon-12 isotope.

**Ans: 2.** The molarity of a solution is defined as the number of moles of the solute present per liter of the solution. It is represented by the symbol M. Its value changes with the change in temperature.

**Ans: 3.** Precision and accuracy: The term precision refers to the closeness of the set of values obtained from identical measurements of a quantity.
Accuracy refers to the closeness of a single measurement to its true value.

**Ans: 4.** Fundamental units: Fundamental units are those units by which other physical units

can be derived. These are mass (M), Length (L), time (T), temperature (°).

Derived units: The units which are obtained by the combination of the fundamental units are called derived units.

**Ans: 5.** Molality (m) = $\frac{\text{Mole of solute}}{\text{Mass of the solvent in kg}}$

The molality of the solution does not depend upon the temperature.

**Ans: 6.** Atom: An atom is the smallest particle of an element that takes part in a chemical reaction. It may or may not be capable of independent existence.

Molecule: It is the smallest particle of a substance (element or compound) that is capable of independent existence

**Ans: 7.** Joule is the SI unit of work or energy

$$\begin{aligned}\text{As work} &= \text{force} \times \text{distance}\\ &= (\text{mass} \times \text{acceleration}) \times \text{distance}\\ &= \text{Mass} \times \frac{\text{distance}}{\text{time}^2} \times \text{distance}\\ &= \frac{\text{mass} \times (\text{distance})^2}{\text{time}^2}\end{aligned}$$

$$\text{Hence} \qquad J = \frac{kg \times m^2}{s^2} = kg\ m^2 s^{-2}.$$

## Long Answer:

**Ans: 1.** The Law of Multiple Proportions states:

"When two elements combine to form two or more than two chemical compounds than the weights of one of elements which combine with a fixed weight of the other, bear a simple ratio to one another.

**Examples:**

**1.** Compound of Carbon and Oxygen: C and O combine to form two compounds CO and $CO_2$.

In $CO_2$ 12 parts of wt. of C combined with 16 parts by wt. O.

In $CO_2$ 12 parts of wt. of C combined with 32 parts by wt. of O.

If the weight of C is fixed at 12 parts by wt., then the ratio in the weights of oxygen which

combine with the fixed wt. of C (= 12) is 16: 32 or 1: 2.

Thus, the weight of oxygen bears a simple ratio of 1: 2 to each other.

**2.** Compounds of Sulphate (S) and Oxygen (O):

S forms two oxides with O, viz., $SO_2$ and $SO_3$

In $SO_2$, 32 parts of wt. of S combine with 32 parts by wt. of O.

In $SO_3$, 32 parts of wt. of S combine with 48 parts by wt. of O.

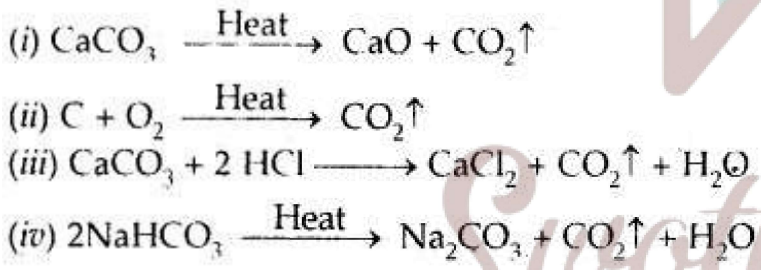
If the wt. of S is fixed at 32 parts, then' the ratio in the weights of oxygen which combine with the fixed wt. of S is 32: 48 or 2: 3.

Thus, the weights of oxygen bear a simple ratio of 2: 3 to each other.

**Ans: 2.** Law of Constant Composition of Definite Proportions states: "A chemical compound is always found, to be made up of the same elements combined together in the same fixed proportion by weight".

**Examples:**

1. $CO_2$ may be prepared in the laboratory as follows:



(*i*) $CaCO_3 \xrightarrow{\text{Heat}} CaO + CO_2\uparrow$

(*ii*) $C + O_2 \xrightarrow{\text{Heat}} CO_2\uparrow$

(*iii*) $CaCO_3 + 2\,HCl \longrightarrow CaCl_2 + CO_2\uparrow + H_2O$

(*iv*) $2NaHCO_3 \xrightarrow{\text{Heat}} Na_2CO_3 + CO_2\uparrow + H_2O$

In all the above examples, CO2 is made up of the same elements i. e., Carbon (C) and Oxygen (O) combined together in the same fixed proportion by weight of 12: 32 or 3: 8 by weight.

**Ans: 3**. The empirical formula of a compound expresses the simplest whole-number ratio of the atoms of the various elements present in one molecule of the compound.

For example, the empirical formula of benzene is CH and that of glucose is CH2O. This suggests that in the molecule of benzene one atom of Carbon (C) is present for every atom of Hydrogen (H). Similarly in the molecule of glucose (CH2O), for every one atom of C, there are two atoms of H and one atom of O present in its molecule. Thus, the empirical formula of a compound represents only the atomic ratio of various elements

present in its molecule.

The molecular formula of a compound represents the true formula of its molecule. It expresses the actual number of atoms of various elements present in one molecule of a compound. For example, the molecular formula of benzene is $C_6H_6$ and that of glucose is $C_6H_{12}O_6$. This suggests that in one molecule of benzene, six atoms of C and 6 atoms of H are present. Similarly, one molecule of glucose ($C_6H_{12}O_6$) actually contains 6 atoms of C, 12 atoms of H, and 6 atoms of O.

Relation between the empirical and molecular formula

Molecular formula = n × Empirical formula where n is an integer such as 1, 2, 3…

When n = 1; Molecular formula = Empirical formula

When n = 2; Molecular formula = 2 × Empirical formula.

The value of n can be obtained from the relation.

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

The molecular mass of a volatile substance can be determined by Victor Meyer's method or by employing the relation.

Molecular mass = 2 × vapour density.

Empirical formula mass can however be obtained from its empirical formula simply by adding the atomic masses of the various atoms present in it.

Thus, the empirical formula mass of glucose $CH_2O$

= 1 × 12 + 2 × 1 + 1 × 16 = 30.0 u.

**Ans: 4.** 2 mols of $HNO_3$ are produced by 3 mols of $NO_2$

7.33 mol $HNO_3$ are produced by $\frac{3 \times 7.33}{2}$ mol of $NO_2$

= 10.995 mols.

**Ans: 5.** Molar mass of $NaNO_3$ = 23 + 14 + 3 × 16 = 85 g $mol^{-1}$

Molarity = Number of moles of solute Volume of solution in L

$= \frac{0.83 \times 1000}{85 \times 50}$

= 0.196 M.

## Assertion Reason Answer:

1. (i) Both A and R are true and R is the correct explanation of A.
2. (ii) Both A and R are true but R is not the correct explanation of A.

## Case Study Answer:

**1. Answer:**

(1) (b) Liquid

(2) (c) Solid

(3) (c) Element

(4) (d) Two , one.

(5) (d) Composition

**2. Answer:**

(1) (c) Precision

(2) (b) Antoine Lavoisier

(3) (d) 0.0052

(4) (a) Accuracy

(5) (d) John Dalton

Swotters