# Important Question for Class 11

# Chemistry

# Chapter 1 – Some Basic Concepts of Chemistry

**Very Short Answer Questions** **1 Mark**

**1. What is chemistry?**
**Ans:** Chemistry is the scientific study of the composition, characteristics, and interactions of matter.

**2. How has chemistry contributed to the nation's development?**
**Ans:** Weather patterns, brain function, computer operation, chemical industries, manufacturing, fertilizers, alkalis, acids, salts, dyes, polymers, medicines, soaps, detergents, metals, alloys, and other fields of chemistry have all contributed to the national economy.

**3. Differentiate solids, liquids & gases in terms of volume & shapes.**
**Ans:** These are tabulated below:

| Property | 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. Name the different methods that can be used for separation of components of a mixture.**
**Ans:** Physical procedures such as handpicking, filtrations, crystallization, distillation, and others can be used to separate the components of a mixture.

**5. Classify following as pure substances and mixtures – Air, glucose, gold, sodium and milk.**
**Ans:** From the substances given in the question Glucose, Gold, and Sodium are the pure substances while air milk are the mixtures.

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

**of each.**

**Ans:** The difference is tabulated below:

| Molecules | Compound |
|---|---|
| Molecules are made up of either distinct atoms or the same atoms. | When two or more distinct atoms join in a simple proportion, a compound is created. |
| For example, a hydrogen molecule has two hydrogen atoms, but a water molecule has two hydrogen atoms and one oxygen atom. | For example, water ($H_2O$), Carbon dioxide ($CO_2$), etc. |

**7. How can we separate the components of a compound?**

**Ans:** The constituents of a compound cannot be separated by physical methods. They can only be separated by chemical methods.

**8. How are physical properties different from chemical properties?**

**Ans:** Color, odor, and other physical properties can be measured or observed without changing the substance's identity or composition, whereas chemical properties require a chemical change to be measured.

**9. What are the two different systems of measurement?**

**Ans:** The different systems of measurement are the English system and the metric system.

**10. What is the SI unit of density?**

**Ans:** $Kg\ m^{-3}$ or $Kg/m^3$ is the SI unit of density.

**11. What are the reference points in a thermometer with Celsius scale?**

**Ans:** The thermometers with Celsius scale are calibrated form $0^oC$ to $100^oC$ where there two temperatures are the freezing and boiling of water.

**12. What is the SI unit of volume? What is the other common unit which is not an SI unit of volume?**

**Ans:** The SI unit of volume is $m^3$ while liter (L) is the common unit which is not an SI unit.

**13. What is the difference between precision and accuracy?**

**Ans:** This is tabulated below:

| Precision | Accuracy |
|---|---|
| Precision refers to how near different measurements for the same amount are to each other. | When comparing the observed value to the real value of the outcome, accuracy informs us how close they are. |

**14. What do you understand about significant figures?**

**Ans:** Significant figures are used to define those numbers which have some uncertainty in the form of digits. Considering the following example, if we have 5.756 value, then it has 4 significant figures.

**15. State law of definite proportions.**

**Ans:** Law of definite proportions also known by the name of law of constant proportions which states that a given element always contains exactly the same proportion of elements by weight.

**16. State Avogadro's law.**

**Ans:** Avogadro's law states that at same temperature and pressure, gases which have equal volume will contain equal number of molecules.

**17. Define one atomic mass unit (amu).**

**Ans:** One atomic mass unit is defined as the mass that is exactly equivalent to $1/12^{th}$ of the mass of a carbon atom, whereas the mass of a carbon atom is 12.0107 u.

**18. What is formula mass?**

**Ans:** When a material has a three-dimensional structure and does not include discrete molecules as component particles, the molecular mass is calculated by summing the atomic masses of all the individual atoms present in that composition.

**19. What is the value of one mole?**

**Ans:** A mole of a material or particle is defined as having exactly $6.022 \times 10^{23}$ particles, which can be atoms, molecules, or ions, with $6.022 \times 10^{23}$ being Avogadro's number.

**20. At NTP, what will be the volume of molecules of $6.022 \times 10^{23}$ $H_2$?**

**Ans:** Under NTP circumstances, $6.022 \times 10^{23}$ hydrogen molecules will contain precisely 22.4 litres of hydrogen.

**21. Calculate the number of molecules present in 0.5 moles of $CO_2$?**

**Ans:** 1 mole of $CO_2$ contains exactly $6.022 \times 10^{23}$ molecules, then 0.5 moles will contain: $6.022 \times 10^{23} \times 0.5 = 3.011 \times 10^{23}$

So, 0.5 moles of $CO_2$ contains $3.011 \times 10^{23}$ molecules.

**22. 1L of a gas at STP weighs 1.97g. What is molecular mass?**

**Ans:** Molecular mass can be calculated by multiplying the weight by 22.4, so the 22.4 L of gas will weigh:

$1.97 \times 22.4 = 44.1$ g

Hence, the molecular mass is 44.1 g.

**23. What is stoichiometry?**

**Ans:** Stoichiometry is formed by combining two Greek words: stoikhein, which means element, and metron, which means measurement. As a result, we may say that stoichiometry is concerned with calculating the masses of reactants and products in chemical processes.

**24. The substance which gets used up in any reaction is called _____ .**

**Ans:** Limiting reagent

**25. What is 1 molal solution?**

**Ans:** One molal solution is defined as a solution containing one mole of a solute per kilogram or 1000 g of solvent.

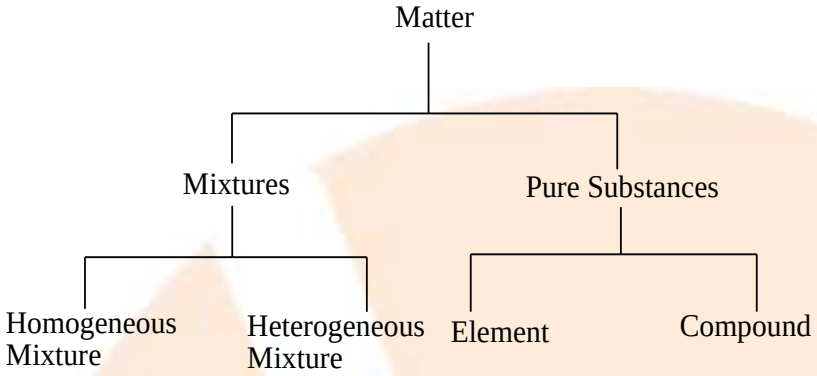
**Short Answer Questions** **2 Marks**

**1. How can we say that sugar is solid and water is liquid?**

**Ans:** Sugar's constituent particles are densely packed, and it also has its own volume and form, making it a solid, whereas water's constituent particles are not as densely packed. It has a definite volume but no defined form, therefore it is classified as a liquid.

**2. How is matter classified at macroscopic level?**

**Ans:** Macroscopic classification of matter is given as follows:




**3. Classify following substances as elements, compounds and mixtures – water, tea, silver, steel, carbon dioxide and platinum.**

**Ans:** From the substances given in the question water and carbon dioxide are compounds, silver and platinum are elements while tea and steel are mixtures.

**4. Write seven fundamental quantities and their units.**

**Ans:** The seven fundamental quantities and their SI units are listed as follows:

| Physical Quantity | SI unit |
|---|---|
| 1. Length (l) | Metre (m) |
| 2. Mass (m) | Kilogram (kg) |
| 3. Time (t) | Second (s) |
| 4. Electric Current (I) | Ampere (A) |
| 5. Thermodynamic Temperature (T) | Kelvin (K) |
| 6. Amount of substance (n) | Mole (mol) |
| 7. Luminous Intensity (I) | Candela (cd) |

**5. What is the difference between mass & weight? How is mass measured in the laboratory?**

**Ans:** The difference is tabulated below:

| Mass | Weight |
|---|---|
| The quantity of matter in a material is its mass. | The force of gravity exerted by the earth on an item or a body is its weight. |

| | |
|---|---|
| Mass is a scalar quantity as it only has a magnitude. | Weight is a vector quantity as it has magnitude and is directed towards the center of the Earth. |

The mass of a material is generally determined in the laboratory using an analytical balance.

**6. How is volume measured in the laboratory? Convert 0.5L into mL and 30 $cm^3$ to $dm^3$ .**

**Ans:** In laboratories, volume of a liquid is generally measured by using burette, graduated cylinder, pipette etc.

As, 1 L = 1000 mL

so, 0.5 L will be equal to:-

0.5 L = 0.5 × 1000 mL

0.5 L = 500 mL

Now, 1000 $cm^3$ = 1 $dm^3$

So, 30 $cm^3$ will be equal to:-

$$30\ cm^3 = \frac{1}{1000} \times 30 dm^3$$

$$30\ cm^3 = 0.03\ dm^3$$

**7. Convert 35°C to °F and K.**

**Ans:** To convert 35°C to °F

We will use the following formula,

$$^{o}F = \frac{9}{5}(^{o}C) + 32$$

Putting the value of 35 in °C, we get,

$$^{o}F = \frac{9}{5}(35) + 32$$

$$63 + 32 = 95^{o}F$$

Now, to convert 35°C to K,

We will use the following relationship,

$$K = {}^{o}C + 273.15$$

Putting the values, we get:

K = 35 + 273.15

K = 308.15

**8. What does the following prefixes stand for:**

**(a) Pico**

**Ans:** Pico = $10^{-12}$

**(b) Nano**

**Ans:** Nano = $10^{-9}$

**(c) Centi**

**Ans:** Centi = $10^{-2}$

**(d) Deci**

**Ans:** Deci = $10^{-1}$

**9. Explain law of multiple proportions with an example.**

**Ans:** The law of multiple proportions states that if two elements can combine to form more than one compound, the masses of one element which combine with a fixed mass of another element are in a ratio of small whole numbers.

For example:

Hydrogen and oxygen can combine to form water (whose chemical formula is $H_2O$ ) as well as hydrogen peroxide (whose chemical formula is $H_2O_2$ ).

Here, the masses of oxygen (16g and 32 g) combines with a fixed mass of hydrogen (2g) element bear a simple ratio which is 16:32 = 1:2

**10. Write Postulates of Dalton's atomic theory.**

**Ans:** Postulates of Dalton's atomic theory are as follows–

1. Matter consists of indivisible atoms.
2. All atoms of an element have a similar atomic mass. But atoms of different elements have different atomic masses.
3. Compounds are formed when atoms of different elements combine in a fixed ratio.
4. Chemical reaction involves the reorganization of atoms. These are neither created nor destroyed.

**11. Calculate the molecular mass of-**

**$C_2H_6$, $C_{12}H_{22}O_{11}$, $H_2SO_4$, $H_3PO_4$**

**Ans:** The molecular mass is the sum of the atomic masses of the individual elements present in a molecule. The molecular masses of the given compounds are calculated as follows with the help of the molar masses of the elements.
The molar mass of C= 12
The molar mass of H= 1
The molar mass of O= 16
The molar mass of S= 32
The molar mass of P= 31
$C_2H_6$ = (2×12) + (6×1) = 30 g/ mol
$C_{12}H_{22}O_{11}$ = (12×12) + (22×1) + (11×16) = 342 g/ mol
$H_2SO_4$ = (2×1) + (32) + (16×4) = 98 g/ mol
$H_3PO_4$ = (3×1) + (31) + (16×4) = 98 g/ mol

**12. Give one example each of molecule in which empirical formula and molecular formula are**

**(i) Same**

**Ans:** Molecule having same molecular formula and the empirical formula is Carbon dioxide, that is $CO_2$.

**(ii) Different**

**Ans:** When molecular formula and empirical formula are different, the example of such molecule is,
Hydrogen peroxide: the molecular formula is $H_2O_2$ and the empirical formula is HO.

**13. Calculate the number of moles in the following masses:**

**(i) 7.85g of Fe**

**Ans:** Given 7.85g of Fe
56g of Fe contains $6.022 \times 10^{23}$ atoms = 1 mole
56g of Fe = 1 mole
So, 7.85 g of Fe = $\frac{1}{56} \times 7.85 = 0.14$ moles

**(ii) 7.9 mg of Ca**

**Ans:** As, 40g of Ca = $40 \times 10^3$ mg of Ca

40g of Ca contain 1 mole of Ca

Or we can write $4 \times 10^4$ mg Ca = 1 mole

Therefore, 7.9 mg of Ca = $\frac{7.9}{4 \times 10^4}$

$= 1.97 \times 10^{-4}$ moles

**14. How much potassium chlorate should be heated to produce 2.24 L of oxygen at NTP?**

**Ans:** The reaction for heating of potassium chlorate is:

$2\ KClO_3 \xrightarrow{\Delta} 2\ KCl + 3O_2$

From the reaction, it is evident that 2 moles of potassium chlorate liberate 3 moles of oxygen.

Therefore, we have:

67.2 L of oxygen is produced from 245g of $KClO_3$

Then, 2.24L of oxygen will be produced from = $\frac{245}{67.2} \times 2.24$

=8.17 g of $KClO_3$

**15. Write an expression for molarity and molality of a solution.**

**Ans:** Molarity is the number of moles of solute per litre of a solution, that is,

$$\text{Molarity} = \frac{\text{number of moles of solutes}}{\text{Volume of solution in Litres}}$$

While molality is the number of moles of solute per kilogram of a solvent, that is,

$$\text{Molality} = \frac{\text{number of moles of solutes}}{\text{Mass of solvent in kg}}$$

**16. Calculate the weight of lime CaO obtained by heating 200kg of 95% pure limestone $CaCO_3$ .**

**Ans:** 100 kg impure sample has pure $CaCO_3$ = 95% = 95 kg

Therefore, 200kg impure sample has pure $CaCO_3$ = $\frac{95 \times 200}{100}$ = 190 kg

From the below reaction:

$CaCO_3 \xrightarrow{\Delta} CaO + CO_2$

We can observe that 100kg $CaCO_3$ will give CaO = 56 kg

Therefore, 190 kg $CaCO_3$ will give CaO = $\frac{56 \times 190}{100}$ = 106.4 kg

**17. 4 litres of water added to 2L of 6 molar HCl solution. What is the molarity of the resulting solution?**

**Ans:** Let the initial volume $V_1$ = 2 L

The final volume, $V_2$ = 4 L + 2 L = 6 L

Given, Initial Molarity, $M_1$ = 6 M

Let, Final molarity = $M_2$

Using the following relationship, $M_1V_1 = M_2V_2$

$6\ M \times 2\ L = M_2 \times 6\ L$

We have, $M_2 = \frac{6\ M \times 2\ L}{6\ L}$ = 2 M

**18. What volume of 10M HCl and 3M HCl should be mixed to obtain 1L of 6M HCl solution?**

**Ans:** Let the required volume of 10M HCl be V liters.

The required volume of 3M HCl be (1 – V) liters.

Using the resultant Molarity formula,

$M_1V_1 + M_2V_2 = M_3V_3$ .

Putting the values, we get:

$10 \times V + 3 \times (1\text{-}V) = 6 \times 1$

$10V + 3 – 3V = 6$

$7\ V = 3$

$V = \frac{3}{7}$ = 0.428 L = 428 ml

Then the volume of 10M HCl required = 428 ml and volume of 3M HCl required will be:

1000ml – 428ml = 572ml

**Long Answer Questions** **3 Marks**

**1. How many significant figures are present in**

**(a) $4.01 \times 10^2$**

**Ans:** There are rules that must be followed for counting the number of significant figures in a given number.
If a number terminates in zeros, but these zeros do not reach the right side of the decimal point, these zeros might be significant or not important.
So, the given number is $4.01 \times 10^2$, therefore, there are three significant figures in this.

**(b) 8.256**
**Ans:** All the non-zero digits and the zeros are important between the non-zero digits.
So, the given number is 8.256, therefore, there are four significant figures in this.

**(c) 100**
**Ans:** If a number terminates in zeros, but these zeros do not reach the right side of the decimal point, these zeros might be significant or not important.
So, the given number is 100, therefore, there is only one significant figure in this.

**2. Vitamin C is essential for the prevention of scurvy. Combustion of 0.2000g of vitamin C gives 0.2998g of $CO_2$ and 0.819g of $H_2O$ . What is the empirical formula of Vitamin C?**
**Ans:** The empirical formula is the simplest form of any molecular formula, and it can be also the same as the molecular formula.
First, we have to find the percentage of carbon, hydrogen, and oxygen in the given amount of compounds. These are given below:

Percentage of carbon = $\frac{2}{18} \times 0.2998 \times \frac{100}{0.2} = 40.88$

Percentage of Hydrogen = $\frac{2}{18} \times 0.819 \times \frac{100}{0.2} = 4.55$

Percentage of Oxygen = 100 - (40.88 + 4.55) = 54.57

So, we have the percentage of all the elements, now we can find the empirical formula as in the table given below:

| Element | % | Atomic Mass | Relative no. of atoms | Simplest Molar Ratio | Simplest Whole Number |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| C | 40.88 | 12 | $\frac{40.88}{12}=3.40$ | $\frac{3.40}{3.40}=1$ | $1 \times 3 = 3$ |
| H | 4.55 | 1 | $\frac{4.55}{1}=4.55$ | $\frac{4.55}{3.40}=1.33$ | $1.33 \times 3 = 4$ |
| O | 54.57 | 16 | $\frac{54.57}{16}=3.41$ | $\frac{3.41}{3.40}=1$ | $1 \times 3 = 3$ |

So, the empirical formula of Vitamin C = $C_3H_4O_3$.