

## Chemistry Worksheets Class 9 on Chapter 3 Atoms and Molecules Worksheet with Answers - Set 1

**Q1.** The atomic number of an element is 13. What will be the number of electrons in its ion?

- a.) 13
- b.) 12
- c.) 11
- d.) 10

**Correct Answer–** (d.) 10

**Q2.** The formula of a compound is  $A_3B_2$ . The valency of element B will be:

- a.) 2
- b.) 3
- c.) 1
- d.) Cannot be determined

**Correct Answer–** (b.) 3

**Q3.** Atoms of the same element combine to form:

- a.) molecules
- b.) ions
- c.) atoms
- d.) compounds

**Correct Answer–** (a.) molecules

**Q4.** The correct symbol of lead is-

- a.) L
- b.) Le
- c.) Pb
- d.) Pu

**Correct Answer–** (c.) Pb

**Q5.** The discovery of \_\_\_ proved that the atom is divisible.

- a.) protons
- b.) electrons
- c.) neutrons
- d.) All of the above

**Correct Answer–** (d.) All of the above

**Q6.** What is the Avogadro constant?

**Answer.** The number of particles present in one mole of any substance is fixed with a value of  $6.022 \times 10^{23}$ .

**Q7.** The relative atomic mass of the oxygen atom is 16. Explain its meaning.

**Answer.** The relative atomic mass of an atom is the average mass of the atom, as compared to the  $1/12$  mass of one carbon-12 atom.

The relative atomic mass of the oxygen atom is 16 means that an atom of oxygen is 16 times heavier than the mass of one carbon-12 atom.

**Q8.** What is the difference between 2N and  $N_2$ ?

**Answer.**

- 2N means two atoms of nitrogen.  $N_2$  means two atoms of nitrogen in one molecule.
- $N_2$  shows that two nitrogen are bonded with a covalent bond, and it becomes nitrogen gas whereas 2N does not show any bond, it just shows two number of nitrogen.
- $N_2$  is a stable molecule, while 2N is nascent nitrogen with no stability.

**Q9.** What were the drawbacks of Dalton's atomic theory?

**Answer.** The two major drawbacks of Dalton's atomic theory are as follows:

- Dalton's atomic theory states that atoms are indivisible. However, later it was proved that atoms can be further divided into electrons, protons and neutrons.
- It does not account for isotopes: As per Dalton's atomic theory, all atoms of an element have identical masses and densities. But, unfortunately, different isotopes of elements have different atomic masses.

**Q10.** Define the Law of conservation of mass.

**Answer.** The law of conservation of mass states that-

"The mass in an isolated system can neither be created nor be destroyed but can be transformed from one form to another".

According to the law of conservation of mass, the mass of the reactants must be equal to the mass of the products.

**Q11.** What is meant by a molecule? Give examples.

**Answer.** The smallest particle of any substance which can exist independently and retain the physical and chemical properties of the substance, made up of one or different elements is a molecule.

Molecules are divisible into atoms further.

For example, the oxygen atom is represented as O, the oxygen molecule is represented as O<sub>2</sub>.

**Q12.** Define atomic mass.

**Answer.** The atomic mass (or atomic weight) of an element is defined as the relative mass of the element's atom in relation to the mass of an atom of the C – 12 isotope.

One atomic mass unit is equal to the mass of one-twelfth of a part of C – 12.

**Q13.** Calculate the molecular mass of the following compounds:

(Atomic masses: C = 12 μ, H = 1 μ, Cl = 35.5 μ, S = 32 μ, O = 16 μ, Na = 23 μ)

- a.) Chloroform
- b.) Sulphuric acid
- c.) Sodium hydroxide

**Answer.**

a.) Chloroform = CHCl<sub>3</sub> = 12 + 1 + 3 × (35.5) = 119.5 μ

b.) Sulphuric acid = H<sub>2</sub>SO<sub>4</sub> = 2 × (1) + 32 + 4 × (16) = 98 μ

c.) Sodium hydroxide = NaOH = 23 + 16 + 1 = 40 μ

**Q14.** What are ions?

**Answer.** An ion is a positively or negatively charged atom. There are two types of ions: cations and anions.

Cation: A cation is a positively charged atom. It is formed when an atom loses one or more electrons.

For example, a sodium atom loses 1 electron to form a sodium ion Na<sup>+</sup>. A cation contains less electrons than a normal atom.

Anion: An anion is a negatively charged atom. It is formed when an atom accepts one or more electrons.

For example, a chlorine atom accepts one electron to form the chloride ion Cl<sup>-</sup>. An anion contains more electrons than a normal atom.

**Q15.** Fill in the blanks.

- a.) Clusters of atoms that act as an ion are called \_\_\_\_ ions
- b.) A chemical formula is also known as a \_\_\_\_.
- c.) The valency of an ion is \_\_\_\_ to the charge on the ion.
- d.) The mass of 1 mole of a substance is called its \_\_\_\_.

e.) The formula mass of  $\text{Na}_2\text{O}$  is \_\_\_\_.

**Answer.**

- a.) Clusters of atoms that act as an ion are called polyatomic ions
- b.) A chemical formula is also known as a molecular formula.
- c.) The valency of an ion is equal to the charge on the ion.
- d.) The mass of 1 mole of a substance is called its molar mass.
- e.) The formula mass of  $\text{Na}_2\text{O}$  is 62 amu.

**Q16.** How many grams of oxygen gas contain the same number of molecules as 16 grams of sulphur dioxide gas? (O = 16  $\mu$ , S = 32  $\mu$ )

**Answer.** 1 mole of sulphur dioxide  $\text{SO}_2$  = mass of S + 2  $\times$  mass of O  
= 32 + 2  $\times$  16  
= 64 grams  
64 g of  $\text{SO}_2$  = 1 mole

Therefore, 16 g of  $\text{SO}_2$  =  $\frac{1}{64} \times 16$

=  $\frac{1}{4}$  mole.

$\frac{1}{4}$  mole of sulphur dioxide will have the same number of molecules as  $\frac{1}{4}$  mole of oxygen.

Therefore,

1 mole of oxygen,  $\text{O}_2$  = 2  $\times$  mass of O atoms

= 2  $\times$  16 = 32 grams

1 mole of oxygen = 32 grams

Therefore,  $\frac{1}{4}$  mole of oxygen = 32  $\times$   $\frac{1}{4}$  grams = 8 grams.

Hence, 8 grams of oxygen will contain the same number of molecules as 16 grams of sulphur dioxide.

**Q17.** Write the symbols of the following:

- a.) Copper
- b.) mercury
- c.) iron
- d.) silver
- e.) gold
- f.) argon
- h.) zinc

**Answer.** The symbols are as follows:

- a.) Copper = Cu
- b.) mercury = Hg
- c.) iron = Fe
- d.) silver = Ag

- e.) gold = Au
- f.) argon = Ar
- h.) zinc = Zn

**Q18.** Write the chemical formula of the following compound:

- a.) Magnesium chloride
- b.) Calcium oxide
- c.) Copper nitrate
- d.) Aluminium chloride

**Answer.**

- a.) Magnesium chloride =  $\text{MgCl}_2$
- b.) Calcium oxide =  $\text{CaO}$
- c.) Copper nitrate =  $\text{Cu}(\text{NO}_3)_2$
- d.) Aluminium chloride =  $\text{AlCl}_3$

**Q19.** a.) The atomic number of three elements A, B and C are 9, 10 and 13 respectively. Which of them will form a cation?

b.) Give an example to show the law of conservation of mass applies to physical changes also.

**Answer.** a.) A cation is a positively charged atom. Whenever an atom loses electrons it becomes a cation. The electronic configurations of A, B and C are- (2, 7), (2, 8), (2, 8, 3).

Element C will donate electrons as it has three electrons in its outermost shell. Therefore, element C will form a cation.

b.) The law of conservation of mass states that in a chemical reaction, mass cannot be created or destroyed. This law, however, also applies to physical changes. For example, when ice melts into water, the mass of ice equals the mass of water, implying that mass is conserved. This proves the law of mass conservation.

**Q20.** a.) What is meant by the molar mass of a substance? State the unit in which molar mass is usually expressed.

b.) Calculate the molar masses of the following substances-

- i.) Ozone molecule  $\text{O}_3$
- ii.) Ethanoic acid  $\text{CH}_3\text{COOH}$
- c.) Calculate the number of molecules in 4g of oxygen.

**Answer.**

a.) The molar mass of a substance is the mass in grams. It is numerically equivalent to the sum of the atomic masses of individual atoms in the substance's molecular formula.

A substance's molar mass is typically expressed in grams per mole.

b.)

i.) The molar mass of ozone  $O_3 = 3 \times 16 = 48$  g/mol.

ii.) The molar mass of ethanoic acid  $CH_3COOH = (2 \times 12) + (4 \times 1) + (2 \times 16) = 60$  g/mol.

c.) To calculate the number of molecules in 4g of oxygen, we have,

Moles of oxygen =  $4/32 = 0.125$  mol,

Molecules of oxygen =  $0.125 \times 6.022 \times 10^{23} = 7.52 \times 10^{22}$ .

Oxygen's atomic weight is 16.00 amu where 1 mole of oxygen is

$6.02 \times 10^{23}$  atoms of oxygen  $1 \text{ amu} = 1.661 \times 10^{-24}$  g.

