

Chemistry Worksheets Class 9 on Chapter 3 Atoms and Molecules Worksheet with Answers - Set 2

Q1. A negatively charged ion is known as:

- a.) cation
- b.) anion
- c.) polyatomic ion
- d.) None of the above

Correct Answer– (b.) anion

Q2. An atom is similar to its ion in:

- a.) nuclear charge
- b.) mass number
- c.) number of electrons
- d.) number of neutrons

Correct Answer– (d.) number of neutrons

Q3. The chemical formula of water is:

- a.) HO
- b.) H₂O
- c.) O₂H
- d.) H₃O

Correct Answer– (b.) H₂O

Q4. Who proposed the statement that the atom is indivisible?

- a.) Rutherford
- b.) Dalton
- c.) Bohr
- d.) Lavoisier

Correct Answer– (b.) Dalton

Q5. The smallest unit of a chemical compound is:

- a.) Atom
- b.) Ion
- c.) Electron
- d.) Molecule

Correct Answer– (d.) Molecule

Q6. Name the law of chemical combination which was given by:

- a.) Lavoisier
- b.) Proust

Answer.

- a.) The law of chemical combination which was given by Lavoisier is the Law of conservation of mass.
- b.) The law of chemical combination which was given by Proust is the Law of constant proportions.

Q7. An element X has a valency of 1 and the other element Y has a valency of 2. What will the formula of its compound be?

Answer. An element X has a valency of 1 and the other element Y has a valency of 2. Therefore the formula of its compound will be X_2Y .

Q8. How does an atom exist?

Answer. An atom usually exists in two forms:

- i.) Molecules
- ii.) Ions

A molecule is an electrically neutral group of two or more atoms chemically bonded together. An ion is a charged particle of an atom.

Q9. What is meant by the symbol of an element? Explain with examples.

Answer. The symbol of an element is the first letter or the first letter and another letter of the English name or Latin name of the element.

For example: The symbol of oxygen is O which is the first letter of its name and the symbol of iron is Fe which is the first two letters of its Latin name Ferrum.

Q10. What do you mean by the Law of constant proportions?

Answer. The law of constant proportions states that chemical compounds are made up of elements that are present in a fixed ratio by mass. This means that any pure sample of a compound, no matter the source, will always consist of the same elements that are present in the same ratio by mass. For

example, pure water will always contain hydrogen and oxygen in a fixed mass ratio (a gram of water consists of approximately 0.11 grams of hydrogen and 0.88 grams of oxygen, the ratio is 1:8).

Q11. Hydrogen and oxygen combine in the ratio of 1:8 by mass to form water. What mass of oxygen gas would be required to react completely with 3g of hydrogen gas?

Answer. Given ratio of masses is 1:8 in water molecule
1 g of H combines to form 8g of O
 $\therefore$ 3 g of H will combine to form 3×8 g of O = 24 g.
Therefore, the mass of oxygen gas required will be 32 grams.

Q12. Define polyatomic ions.

Answer. The ions which are formed from groups of joined atoms are called polyatomic ions or compound ions. Some of the examples of polyatomic ions are: PO_4^{3-} , SO_4^{2-} , CO_3^{2-} , etc.

Q13. What is the chemical formula? Explain by giving examples.

Answer. A chemical formula represents the composition of a molecule of the substance in terms of the symbols of the elements present in the molecule. A chemical formula is also known as the molecular formula.

Characteristics:

- Chemical formulae provide insight into the chemical composition of a substance.
- They also represent the ratios in which the constituent elements combine to form the compound.
- The chemical formula of a compound is crucial while representing it in a chemical equation.
- Chemical formulae can also be employed to represent ions, free radicals and other chemical species

The chemical formula of water is H_2O , through this, we come to know that two hydrogen and one oxygen atoms are chemically bonded together.

Some examples of the chemical formula are: CO_2 , MgCO_3 , HCl , NaOH , etc.

Q14. Define 1 mole. Illustrate its relationship with the Avogadro constant.

Answer. A mole of any species (atoms, molecules, ions, or particles) is the quantity in number that has the same mass as its atomic or molecular mass (in grams). The number of particles (atoms, molecules, or ions) in one mole of any substance is fixed at 6.022×10^{23} . This is known as the Avogadro constant or Avogadro number.

Q15. Fill in the blanks.

- Mole is the link between the ____ atoms and the ____ atoms.
- A compound made up of only two elements is called a ____.
- Ionic compounds are formed by the combination between ____ and ____.

- d.) If an atom has less electrons than normal, then it gets ____ charge.
e.) ____ represents the name of the substance.

Answer.

- a.) Mole is the link between the mass of atoms and the number of atoms.
b.) A compound made up of only two elements is called a binary compound.
c.) Ionic compounds are formed by the combination between metals and non-metals.
d.) If an atom has less electrons than normal, then it gets a positive charge.
e.) Formula represents the name of the substance.

Q16. Differentiate between:

- a.) Atoms and molecules
b.) Cations and anions
c.) Molecular mass and molar mass

Answer.

a.)

Atoms	Molecules
Most fundamental and smallest part that can exist of an element.	Two or more atoms are chemically bonded together.
Examples: Oxygen – O Phosphorus – P Sulphur – S Hydrogen – H	Examples: Oxygen – O ₂ Phosphorus – P ₄ Sulphur – S ₈ Water – H ₂ O
An atom may not always be stable in nature due to the presence of electrons in the outer shells.	Molecules are formed to attain stability.
Atoms are made of Protons, Electrons & Neutrons	It is made up of two or more atoms of the same or different elements.
Except for the noble elements, atoms of all elements showcase a certain level of reactivity.	Compared to an atom, the level of reactivity is less because some valence points are filled by electrons of combined elements.

b.)

Basis	Anions	Cations
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Definition	An anion may be defined as an atom or molecule that is negatively charged.	A cation may be defined as an atom or molecule that is positively charged.
Charge Type	Negative	Positive
Type of Element	Non-Metal	Metal
Examples	Sulfide, Oxide, Fluoride, Chloride	Iron, Lead, Sodium

c.)

MOLAR MASS	MOLECULAR MASS
Refers to mass of one mole of a substance	Refers to the mass of sum of the atomic masses of all the atoms present in a molecule
Also known as molecular weight	It determines the mass of a single molecule
SI unit is g/mol to use in higher calculations	Measured in amu
It is defined as the mass of Avogadro number of atoms/molecules or compounds	Defined as the sum of the atomic masses of all the atoms present in a molecule of a substance.
Measurement given to compounds, atoms or molecules	Determined only in molecules
Less accurate than molecular mass	Accurate to use in higher calculations
Example: Mass of 1 mole of oxygen is 15.9994 grams. Therefore, the molar mass = 15.9994 g/mol	Example: Molecular mass of $\text{Ca}(\text{OH})_2 = 74$ atomic mass units

Q17. a.) In which one of the following cases is the number of hydrogen atoms is more?
Two moles of HCl or one mole of NH_3 .

- b.) Calculate the mass of 1 mole of CaCO_3 .
c.) Give two examples of triatomic molecules.

Answer.

a.) Two moles of HCl can be written as 2HCl . It contains 2 moles of H atoms. One mole of NH_3 contains 3 moles of H atoms. Therefore, NH_3 contains more number of hydrogen atoms.

b.) 1 mole of CaCO_3 = Formula mass of CaCO_3 in grams
= Mass of Ca + Mass of C + 3 × Mass of O
= $40 + 12 + (3 \times 16)$
= $40 + 12 + 48$
= 100 g.

Thus, the mass of 1 mole of CaCO_3 is 100 grams.

c.) Triatomic molecules are Carbon dioxide (CO_2) and water H_2O .

Q18. a.) When 3.0 g of carbon is burnt in 8.00 g oxygen, 11.00 g of carbon dioxide is produced. What mass of carbon dioxide will be formed when 3.00 g of carbon is burnt in 50.00 g of oxygen? Which law of chemical combination will govern your answer?

b.) If one mole of carbon atoms weighs 12 grams, what is the mass (in grams) of 1 atom of carbon?

Answer.

a.) 3 g of carbon produces carbon dioxide = 11 g.

The remaining oxygen $50 \text{ g} - 8 \text{ g} = 42 \text{ g}$ does not take part in the reaction.

The law of definite proportion is governed by the above data.

b.) One mole of carbon atoms weighs 12 g (given) i.e., the mass of 1 mole of carbon atoms = 12 g.
Then, the mass of 6.022×10^{23} number of carbon atoms = 12 g

$$\begin{array}{r} 12 \\ \hline 6.022 \times 10^{23} \end{array}$$

Therefore, the mass of 1 atom of carbon = $\frac{12}{6.022 \times 10^{23}}$
= $1.9926 \times 10^{-23} \text{ g}$.

Q19. a.) Calculate the mole ratio of 240 g of calcium and 240 g of magnesium.

b.) If sulphur exists as S_8 molecules, calculate the number of moles in 100 g of sulphur.

Answer.

a.) The number of moles in 240 g of calcium will be $\frac{240}{40} = 6$.

The number of moles in 240 g of magnesium will be $\frac{240}{24} = 10$.

Therefore, the ratio of moles of calcium to that of magnesium will be 6:10 which will be 3:5.

b.) Given mass of sulphur = 100g.

The atomic mass of sulphur S_8 is $32 \times 8g = 256g$

$$\text{Number of moles} = \frac{\text{Given mass of element}}{\text{Atomic mass of the element}}$$

$$\text{Number of moles} = \frac{100}{256} = 0.39 \text{ moles}$$

Q20. The mass of a single atom of an element X is $2.65 \times 10^{-23} g$. What is its atomic mass? What could this element be?

Answer. The mass of one atom of an element A = $2.65 \times 10^{-23} g$

We know that 1 mole of an atom = 6.023×10^{23} atoms

1 mole of an atom = its atomic weight

Mass of one atom of an element = $2.65 \times 10^{-23} g$

Mass of 6.023×10^{23} atoms of an element A = $2.65 \times 10^{-23} \times 6.023 \times 10^{23} g = 15.69 g$

Thus the element is oxygen.