THE VILLAGE
INTERNATIONAL SCHOOL
"We Nurture Dreams"

ATOMS AND MOLECULES

OBJECTIVE TYPE QUESTIONS

MULTIPLE CHOICE QUESTIONS

1. One mole does not signify
   (a) Atomic mass unit (b) 6.023×10^{23} ions
   (c) 22.4 litres of a gas at STP (d) gram molecular mass
2. Choose the correct statement
   (a) Two atoms of hydrogen combine with one atom of oxygen to give water molecule.
   (b) One atom of hydrogen combines with one atom of chlorine to form hydrogen chloride.
   (c) One atom of nitrogen combines with 3 atoms of hydrogen to form 1 molecule of ammonia.
   (d) One atom of carbon combines with one molecule of oxygen to form one molecule of carbon dioxide.
3. Choose the odd molecule
   (a) Argon molecule (b) Chlorine molecule
   (c) Oxygen molecule (d) Fluorine molecule

4. How many atoms are present in 1mole of carbon?
   (a)12 (b)6.022 (c)6.022×10^{23} (d)6.022×10
5. In water, the proportion of oxygen and hydrogen by mass is:
   (a) 1:4 (b) 1:8 (c) 4:1 (d) 8:1
6. Identify the correct symbol of Sodium:
   a) S b) Na c)So d)N

ASSERTION-REASONING QUESTIONS

For the following questions, two statements are given-one labelled Assertion (A) and the other labelled Reason(R). Select the correct answer to these questions from the options

(i) , (ii), (iii) and (iv)as given below:

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

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

(iii)A is true but R is false.

(iv)A is false but R is true.

7. Assertion: Isotopes are atoms of the same element with same atomic number but different mass numbers.
   Reason: Isotopes differ in their number of protons.
8. Assertion: Ozone is triatomic molecule.
   Reason: Ozone has three molecules of oxygen in it.
9. Assertion: The atomic mass of an element is same as mass of the ion of the element.
   Reason: Atomic mass does not depend on number of electrons in an atom.
10. Assertion: Ions are charged particles.
    Reason: Ions are formed by loss of electrons.

ONE MARK QUESTIONS

11. What is meant by atomicity?
12. Give two examples for cations.
13. Name the elements present in the following:
    (a) Water (b) ammonia (c) sulphur dioxide
14. Define molecular mass of a substance.
15. Explain the difference between 2N and N_2

TWO MARK QUESTIONS

16. Write the differences between an atom and molecule

17. Write the formulae of:
    (a) Magnesium hydroxide (b) Hydrogen sulphide (c) Potassium chloride
    (d) Calcium oxide (e) Barium chloride (f) Sodium carbonate
18. (a) How do you differentiate between a molecule of an element and a molecule of a compound? Write one example of each.
    (b) Write the chemical formula of baking soda.
19. (a) What are polyatomic ions?
    (b) Write the formulae and names of the compounds formed by combination of
    (i) Fe^{3+} and SO_4^{2-} (ii) NH_4+ and CO_3^{2-}

THREE MARK QUESTIONS

20. (a) Define atomic mass unit.
    (b) Distinguish between molecular mass and molar mass.
    (c) Give an example of diatomic and triatomic molecule of compounds.
21. Calculate the number of moles present in (a) 60 g of Calcium (b) 3.011×10^{23} number of oxygen atoms.[Given that Ca=40u, Avogadro no-6.022×10^{23}]
22. (a) What is an ion? Write the symbol for calcium ion and aluminium ion
    (b)Give the difference between an anion and a cation.
    (c)How many atoms are present in one molecule of ozone?
23. (i) Calculate the number of moles in 34g of NH_3. [Given atomic mass of N=14u, H=1u]
    (ii) Write the chemical formulae of: (a) Sodium carbonate (b) Ammonium chloride.

PREVIUOS YEAR BOARD QUESTIONS

24. Calculate the formula unit mass of $CuSO_4.5H_2O$
    [Atomic mass of Cu=63.5u, S=32u, O=16u, H=1u]
25. (a) Calculate the mass of 0.5 mole of sulphuric acid. [Atomic mass H=1u, S=32u, O=16u]
    (b)Find the number of atoms in 12g of carbon.
    (c) How many atoms are present in (i) H_2S molecule (ii) PO_4^{3-} ions?
    (d) Write the names of elements present in (i) quick lime (ii) hydrogen bromide.
26. Calculate the molar mass of the following:
    (i) HNO_3 (ii) CH_3COOH
27. Calculate the formula unit masses of ZnO, Na_2O, K_2CO_3 [Zn=65u, Na=23u, K=39u, C=12u,O=16u]
28. Define the term gram atom. What is Avogadro number constant?

EXEMPLAR QUESTIONS

29. Write the molecular formulae of all the compounds that can be formed by the combination of following ions.
    Cu^{2+}, Na^+, Fe^{3+}, Cl^-, SO_4^{2-}, PO_4^{3-}
30. Give the chemical formulae for the following compounds and compute the ratio by mass of the combining elements in each one of them.
    (a) Ammonia
    (b) Carbon monoxide
    (c) Hydrogen chloride
    (d) Aluminium fluoride
    (e) Magnesium sulphide.

CASE STUDY BASED QUESTIONS

31. Atoms of most elements are not able to exist independently. Atoms of same elements or different elements combine to form molecules and ions. (atoms exist as molecules or ions) Atoms of the same element or of different elements can join together to form molecules. The molecules of an element are constituted by the same type of atoms. Atoms of different elements join together in definite proportions to form molecules of compounds.

(i) What is the ratio between masses of carbon and oxygen in CO_2?
   (a) 12:32
   (b) 12:16
   (c) 24:16
   (d) 24:32

(ii) Which of the following statements is not true about an atom.
   (a) Atoms are not able to exist independently.
   (b) Atoms are the basic unit from which molecules and ions are formed.
   (c) Atoms are always neutral in nature.
   (d) Atoms aggregate in large numbers to form the matter that we can we see , feel or touch.

(iii) 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 3 gram of hydrogen gas?
   (a) 23g
   (b) 12g
   (c) 24g
   (d) 16g

(iv) Select the atom which forms triatomic molecule.
   (a) Hydrogen
   (b) Oxygen
   (c) Chlorine
   (d) Bromine

ANSWERS

OBJECTIVE TYPE QUESTIONS

MULTIPLE CHOICE QUESTIONS

Qn.No.	Answers
1	(a) Atomic mass unit
2	(d)One atom of carbon combines with one molecule of oxygen to form one molecule of carbon dioxide.
3	(b)Valency
4	(c)6.022×10^{23}
5	(d) 8:1
6	(b)Na

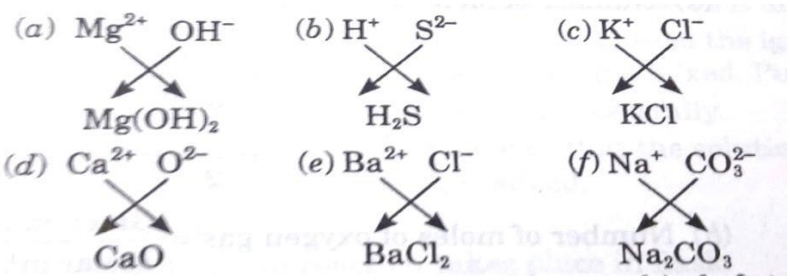
ASSERTION-REASONING QUESTIONS

7	(iii)A is true but R is false.
8	(iii)A is true but R is false.
9	(i)Both A and R are true and R is the correct explanation of the Assertion.
10	(iii)A is true but R is false.

ONE MARK QUESTIONS

11	The number of atoms present in one molecule of an element.
12	Na^+, Mg^{2+}
13	(a)Water-Hydrogen and oxygen (b) ammonia-Nitrogen and hydrogen (c) sulphur dioxide- sulphur and oxygen
14	Molecular mass is the sum of atomic masses of all atoms present in a molecule.
15	2N- two atoms of nitrogen, N_2- one molecule of nitrogen.

TWO MARK QUESTIONS

16	An atom is the smallest particle of an element which may or may not have independent existence. For example, Helium is an atom which exists as such. On the other hand, molecule is the smallest particle of an element or compound capable of independent existence. For example, hydrogen atom exists as H2, which is a molecule.
17	
18	(a) Molecule of an element contains same kind of atoms. Eg:-P_4 is a molecule of element which contains four atoms of phosphorus. Molecule of a compound contains different kinds of atoms. Eg:-H_2O- is a molecule of compound which contains 2 atoms of hydrogen and one atom of oxygen. (b) $NaHCO_3$ is the chemical formula of baking soda.
19	(a) Those ions which contain more than two atoms are called polyatomic ions. (b) (i) $Fe_2(SO_4)_3$ (ii) $(NH_4)_2CO_3$

THREE MARK QUESTIONS

20	(a) It is defined as 1/12 th of the mass of 1 atom of carbon-12. (b) Molecular mass is the mass of one molecule. molar mass is the mass of 6.022×10^{23} molecules(1 mole) (c) (i) HCl is a diatomic molecule of compound. (ii) H_2O is a triatomic molecule of compound.

21	(a) Number of moles of Ca = $\frac{\text{Given mass of Calcium}}{\text{Molar mass of Calcium}}$ = $\frac{60}{40}$ = 1.5 moles (b) Number of moles = $\frac{\text{Given No. of molecules}}{6.022\times10^{23}}$ = $\frac{3.011\times10^{23}}{6.022\times10^{23}}$ = 0.5 mol
22	(a) Charged atom is called an ion. Calcium ion is Ca^{2+} and Aluminium ion is Al^{3+} (b) Anion-positively charged ion. Cation-Negatively charged ion. (c) 3 Oxygen atoms.
23	1. Molar mass of $NH_3 = 14 + 3 \times 1 = 17\ g\ mol^{-1}$ Number of moles of NH_3 = $\frac{\text{Given mass}}{\text{Molar mass of } NH_3}$ = $\frac{34}{17}$ = 2 moles 2. (a) $Na^+\ CO_3^{2-}$ → Na_2CO_3 (b) $NH_4^+\ Cl^-$ → NH_4Cl

PREVIUOS YEAR BOARD QUESTIONS

24	Formula unit mass of $CuSO_4.5H_2O$= 1x63.5+1x32+4x16+5[2x1+1x16] =63.5+32+64+90 =249.5u
25	(a) 1 mole of sulphuric acid = 1 × 2 + 32 × 1 + 16 × 4 = 98 g 0.5 mole of sulphuric acid = $\frac{98}{2}$ = 49 g (b) 1 mole of carbon = 12 g = 6.022×10^{23} atoms (c) (i) H_2S molecule has three atoms. (ii) PO_4^{3-} ions have 4 atoms each. d) (i) Quicklime is $Ca(OH)_2$. Atoms present are calcium, oxygen and hydrogen. (ii) Hydrogen bromide is HBr. Atoms present are hydrogen and bromine.
26	(i) HNO_3 1x1+1x14+3x16= 63g (ii) CH_3COOH 1x12+3x1+1x12+1x16+1x16+1x1=60g
27	ZnO

	65+16=81u Na_2O 23x2+16=62u K_2CO_3 39x2+12x1+16x3=138u
28	The atomic mas of an element expressed in grams is called gram atomic mass or gram atom. Avogadro constant-$6.022x10^{23}$

EXEMPLAR QUESTIONS

29	$CuCl_2$, $CuSO_4$, $Cu_3(PO_4)_2$, NaCl, Na_2SO_4, Na_3PO_4, $FeCl_3$, $Fe_2(SO_4)_3$, $FePO_4$
30	

Compound	Chemical formulae	Ratio by mass
Ammonia	NH_3	14:3
Carbon monoxide	CO	3:4
Hydrogen chloride	HCl	1:35.5(2:71)
Aluminium fluoride	AlF_3	9:19
Magnesium sulphide	MgS	3:4

CASE STUDY BASED QUESTIONS

31	(i) (a) 12:32 (ii) (a) Atoms are not able to exist independently. (iii) (c) 24g (iv) (b) Oxygen