Ch- Atoms and molecules

SECTION A: MULTIPLE CHOICE QUESTIONS (1 MARK EACH)

1. The smallest unit of an element is:
   a) Atom
   b) Molecule
   c) Ion
   d) Compound
2. Which of the following is a triatomic molecule?
   a) O_2 b) H_2O c) N_2 d) He

Assertion Reason type Questions

Directions: In each of the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option:
Options: a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

3. **Assertion (A):** Atoms of most elements cannot exist independently.
   Reason (R): Atoms are highly reactive.
4. **Assertion (A):** The formula of carbon dioxide is CO.
   Reason (R): Carbon forms a double bond with oxygen.

SECTION B: SHORT ANSWER QUESTIONS (2 MARKS EACH)

5. Write the chemical formula of the following compounds: (i) Ammonia (ii) Calcium chloride.
6. What is a molecular mass? Calculate the molar mass of water (H_2O).

SECTION C: COMPETENCY BASED QUESTIONS (3 MARKS EACH)

7. Differentiate between molecules of an element and molecules of a compound with one example of each.
8. Calculate the number of molecules in 18g of water. (H = 1 u, O = 16 u, Avogadro number = 6.022×10^{23})
9. Explain why atoms form chemical bonds. What kind of bond is present in NaCl?

MULTIPLE CHOICE QUESTIONS (1 MARK EACH)

1 . The number of atoms in a molecule of sulphur (S8) is:

a) 1
b) 4
c) 6
d) 8

2. The chemical formula of quick lime is:

a) $CaCO_3$
b) $Ca(OH)_2$
c) CaO
d) $CaCl_2$

3. Which of the following is a correct chemical formula?

a) $NaCl_2$ b) H_2SO_4 c) C_2O d) Mg_2Cl

SHORT ANSWER QUESTIONS (2 MARKS EACH)

4. Write the valency of the following elements and their formulae with chlorine: (i) Magnesium (ii) Aluminium

5. Name the elements present in the following compounds: (i) H_2SO_4, (ii) NaHCO3

COMPETENCY BASED LONG QUESTION (5 MARKS)

6. A compound is formed when 6 g of carbon combines with 16 g of oxygen.

(a) Calculate the molecular formula of the compound if the compound contains only carbon and oxygen.

(b) Calculate the number of moles and molecules in 22 g of this compound.

(Atomic masses: C = 12 u, O = 16 u, Avogadro number = 6.022×10^{23})

CASE BASED QUESTION (5 MARKS)

7. A student was asked to write the formula of compounds formed between sodium and Sulphur, and calcium and chlorine. Answer the following:

a) What is the valency of sodium and Sulphur?

b) Write the formula of the compound formed between sodium and Sulphur.

c) Write the formula of the compound formed between calcium and chlorine.

d) Which rule helps you write chemical formulae? Or

d) What is the significance of valency in writing chemical formulae?

MULTIPLE CHOICE QUESTIONS (1 MARK EACH)

1. Dalton proposed that all atoms of a given element are identical. Which modern discovery most directly challenges this idea?

A) Law of conservation of mass B) Discovery of isotopes

C) Law of multiple proportions D) Discovery of chemical bonds

2. The formula unit mass of NaCl is: (Na = 23, Cl = 35.5)

A. 23 B. 35.5 C. 58.5 D. 59

Assertion Reason type Questions (1 MARK EACH)

Direction: In each of the following questions Q No. 5 and 6, a statement of Assertion is given followed by a corresponding statement of Reason. Of the statements, mark the correct answer as

(a) Both assertion and reason are true, and reason is the correct explanation of assertion.

(b) Both assertion and reason are true, but reason is not the correct explanation of assertion.

(c) Assertion is true but reason is false.

(d) Assertion is false but reason is true

3. Assertion (A): The molecular mass of a compound is the sum of atomic masses of all atoms in a molecule.

Reason (R): A molecule is formed by the chemical combination of atoms in fixed proportion.

4. Assertion: Atoms always combine to form molecule and ions.

Reason: Atoms of most element are not able to exist independently

5. Which of the following represents a correct chemical formula? Name it. **(0.5 X 4)**

(a) CaCl (b) CaO (c) $NaSO_4$ (d) NaS

6. State the number of atoms present in each of the following chemical species **(0.5 X 4)**

(A) CO_3^{2-} (B) PO_4^{3-} (C) P_2O_5 (D) CO

7. Write the molecular formulae for the following compounds **(0.5 X 6)**

(a) Copper (II) bromide (b) Aluminium (III) nitrate

(c) Calcium (II) phosphate (d) Iron (III) sulphide

(e) Mercury (II) chloride (f) Magnesium (II) acetate.

8. Write the cations and anions present (if any) in the following compounds **(0.5 X 4)**

(a) CH_3COONa (b) NaCl (c) H_2 (d) NH_4NO_3

Multiple Choice Questions (1 mark each)

1. The maximum number of electrons that can be accommodated in the L-shell is:
   A. 2 B. 8 C. 18 D. 32
2. The number of neutrons in Carbon-14 is:
   A. 6 B. 8 C. 14 D. 12
3. Which of the following is not a postulate of Dalton's atomic theory?
   A. Atoms can be created or destroyed in a chemical reaction.
   B. Atoms are indivisible.
   C. Atoms of the same element have identical mass.
   D. Atoms consist of electrons, protons and neutrons.
4. The valency of phosphorus (atomic number 15) is:
   A. 3 B. 5
   C. 2 D. Both A and B depending on the compound

Assertion and Reasoning (1 mark each)

Choose the correct option:

A. Both Assertion and Reason are true, and Reason is the correct explanation.
B. Both Assertion and Reason are true, but Reason is not the correct explanation.
C. Assertion is true, Reason is false.
D. Assertion is false, Reason is true.

5. **Assertion (A):** The nucleus of an atom is positively charged.
   Reason (R): The nucleus contains protons and neutrons.
6. **Assertion (A):** Electrons revolve in fixed orbits around the nucleus.
   Reason (R): Bohr's model explains the stability of atom due to quantized orbits.

Short Answer Type Questions (2 marks each)

7. Draw the atomic structure of magnesium (atomic number =12). Mention the number of electrons in each shell.
8. Differentiate between isotopes and isobars with examples.
9. Write the electronic configuration and valency of chlorine (atomic number = 17). Explain how valency is determined.

MULTIPLE CHOICE QUESTIONS (1x3)

1. Which of the following organelles is primarily involved in the production of ATP through oxidative phosphorylation in eukaryotic cells?

A) Ribosome B) Mitochondrion C) Endoplasmic reticulum D) Golgi apparatus

2. 2: Which phase of the cell cycle is characterized by the replication of DNA?

A) G1 phase B) S phase C) G2 phase D) M phase

3. 3: The breakdown of glucose into two molecules of pyruvate occurs in which part of the cell?

A) Nucleus B) Mitochondrion C) Cytoplasm D) Endoplasmic reticulum

Assertion – Reason Type Questions (1x2)

A) Both A and R are true, and R is the correct explanation of A.
B) Both A and R are true, but R is not the correct explanation of A.
C) A is true, but R is false.
D) A is false, but R is true.

4. Assertion (A): Photosynthesis is a process by which plants convert light energy into chemical energy.
Reason (R): Chlorophyll absorbs light energy, which is used to convert carbon dioxide and water into glucose and oxygen.

5. Assertion (A): DNA replication occurs during the S-phase of the cell cycle.
Reason (R): During the S-phase, the cell grows and prepares for division.

Short Answer Type Questions (2x2)

6. Explain how the structure of the leaf is adapted for photosynthesis.

7. Why are xylem vessels more efficient than tracheids in conducting water in plants?

Short Answer Type Question (3 marks)

8. Explain the difference between prokaryotic and eukaryotic cells with any three points.

9.

5 Marks question

10. A student observes a cell under a microscope and notes the absence of a nucleus. What type of cell is it? Justify your answer. Draw the diagram of the type of cell.

Multiple Choice Questions (1 Mark each)

1. Which structure is present in plant cells but not in animal cells?
   a) Nucleus
   b) Mitochondria
   c) Cell wall
   d) Ribosome
2. What is the main function of the plasma membrane?
   a) Photosynthesis
   b) Control movement of substances
   c) Store wastes
   d) Synthesize proteins
3. Which organelle contains genetic material and controls cell activities?
   a) Mitochondria
   b) Nucleus
   c) Vacuole
   d) Lysosome
4. What is the process by which substances move from high concentration to low concentration?
   a) Osmosis
   b) Endocytosis
   c) Diffusion
   d) Exocytosis
5. Which of the following is a function of vacuoles in plant cells?
   a) Cellular respiration
   b) Storing substances and maintaining turgidity
   c) Protein synthesis
   d) Carrying genetic information
6.

Short Answer Type Questions (2 Marks Each)

7. Explain in your own words why osmosis is important for plant cells.
8. Describe what would happen to an animal cell placed in a very concentrated salt solution and explain why.

Assertion-Reason Type Questions (1 Mark Each)

For each question, state whether both the assertion and the reason are true, and whether the reason correctly explains the assertion.

9. **Assertion**: Mitochondria are called the powerhouses of the cell.
   Reason: Mitochondria release energy in the form of ATP during cellular respiration.
10. **Assertion**: Plant cells do not burst when placed in hypotonic solutions.
    Reason: The cell wall in plant cells provides structural support and prevents bursting.
11.

Long Answer Question (5 marks)

12. Explain the differences between plant cells and animal cells, focusing on at least three major structural features. Also, discuss the importance of these differences in the life of the organism.