Important Questions Class 9 Science Chapter 4: Chapter 4 of Class 9 Science, "Structure of the Atom," focuses on the discovery and development of atomic models. It begins with Dalton's atomic theory, followed by J.J. Thomson's plum pudding model and Rutherford's nuclear model, which proposed that atoms consist of a small, dense nucleus surrounded by electrons.

The chapter introduces Bohr's model, where electrons revolve in specific orbits, and discusses isotopes, isobars, and the composition of atoms, including protons, neutrons, and electrons. Key concepts include atomic number, mass number, and electronic configuration, which help explain the arrangement of electrons in an atom's different energy levels.

Important Questions Class 9 Science Chapter 4 Overview

Chapter 4, "Structure of the Atom," in Class 9 Science is crucial for building a strong foundation in atomic theory. Important questions often focus on topics like the discovery of subatomic particles (electrons, protons, neutrons), atomic models (Dalton's, Thomson's, Rutherford's, and Bohr's), and differences between isotopes and isobars. Questions related to atomic number, mass number, and electronic configuration are essential as they frequently appear in exams and form the basis for higher-level chemistry.

Understanding these topics helps students grasp complex concepts in future classes, making the questions from this chapter vital for academic success and competitive exams.

Important Questions Class 9 Science Chapter 4 Structure of the Atom

Below is the Important Questions Class 9 Science Chapter 4 Structure of the Atom -

Q1. Dalton's Atom Theory was successfully explained

(i) Law on conservation of mass

(ii) Law on constant composition

(iii) Law of radioactivity

(iv) Law on multiple proportions

Options

(a) (i),(ii), and (iii).

(b) (i),(iii), and (iv).

(c) (ii),(iii), and (iv).

(d) (i),(iii) or (iv).

Answer: (d) (i),(iii) or (iv).

Explanation:

The laws of mass conservation, laws of constant composition, and laws of numerous proportions are all described by Dalton's theory. Regarding the Law of Radioactivity, it offers no information.

Q2. Which of these statements are true about Rutherford's model of an atom?

(i) The nucleus is positively charged

(ii) It was found that a-particles were four times heavier than a hydrogen atom.

(iii) Can be compared with the solar system

(iv) Agreed to Thomson's model

Options:

(a) (iii), (iv)

(b) (ii), and (iii).

(c) (i), and (iv).

(d) Only (i)

Answer: (a) (iii), (iv)

Explanation:

Positively charged alpha particles could be deflected by the nucleus. This demonstrates the positive charge of the nucleus. Rutherford also proposed that, similar to how planets are organised around the sun, electrons in an atom are arranged around a nucleus.

Q3. Which statements are correct in Thomson's model for atoms?

(i) The mass of an atom is assumed uniformly distributed across the atom

(ii) The positive charge is assumed uniformly distributed throughout the atom

(iii) The electrons are evenly distributed in the positively charged space

(iv) The electrons attract one another to stabilise the atom

Options:

(a) (i),(ii), and (iii).

(b) (i), and (iii).

(c) (i), and (iv).

(d) (i),(iii), and (iv).

Answer: (a) (iii), (iv)

Explanation:

According to Thomson, negatively charged electrons in the nucleus are stabilised by positively charged protons. It is not accurate to assume that the positive charge is evenly distributed throughout the atom.

Q4. Rutherford's alpha particle scattering experiment resulted in the discovery of:

1. a) Electron
2. b) Proton
3. c) Nucleus in the atom
4. d) Atomic mass

Answer: c) Nucleus in the atom.

Explanation: The presence of a nucleus at the centre of an atom is demonstrated by the discovery that some alpha particles returned to their original route.

Q5. The ion of an element has three positive charges. The atom's mass is 27, and the number of neutrons is 14. Choose what the number of electrons in the ion is?

1. a) 13
2. b) 10
3. c) 14
4. d) 16

Answer: b) 10

Explanation: Mass number of the element = 27

Number of neutrons in the atom = 14

Hence, the number of electrons in an atom = 14

Hence, the number of electrons in atom = mass number – number of neutrons in atom

= 27 – 14 = 13

Since the ion of the elements has three positive charges, the number of electrons in the ion is 13 – 3. The ion has 10 electrons.

Q6. How do you find the valency of chlorine, sulphur, and magnesium?

Answer: In elements where the number of electrons in the outer layer shell is less than four, then the valency of an atom = number of the electron in the outermost shell of the atom.

1. In the case of magnesium,

Thus, the valency of magnesium = 2

2. If the number of electrons in the outermost shell is less than four then,

Valency of an atom = 8 – Number of electrons in the outermost shell.

3. In the case of sulphur, then the valency of sulphur = 8 – 6 = 2
4. In the case of chlorine, then the valency of chlorine = 8 – 7 = 1

Q7. Na+ has filled K and L shells. Give a reason.

Answer: The atomic number of Na = 11= Total number of electrons.

The electronic configuration of Na = 2, 8, 1.

The electronic configuration of Na+ ion = 2 (K-shell), 8 (l-shell).

Thereby Na+ion has wholly filled K and L shells.

Q8. An electron can be considered a universal particle. Explain.

Answer: The charge (e) and mass (m) of an electron are constant regardless of the source of emission. Either the cathode or the gas inside the tube might release the electrons from the discharge tube. Regardless of the gas in the discharge tube and the metal that makes up the cathode, these values stay the same. For this reason, the electron is considered a universal particle.

Q9. What observation would you make if the a-particle diffusion experiment was done using a foil made of other metal than gold?

Answer: If the metal, such as gold (or silver, platinum, etc.), is heavy If the metal is extremely light (such as sodium, magnesium, etc.), similar outcomes can be obtained. It is possible that

the heavy and quickly moving a-particles (4u Mass) will push the nucleus out of the way and let minute deviations flow through.

Q10. The rules for writing the distribution of electrons in different shells for the first eighteen elements are summarised.

Answer: An atom's total mass is equal to the sum of the protons and neutrons in its nucleus because electrons have very little mass. The mass of each proton and neutron is equivalent to four units. Protons and neutrons in an atom's nucleus must therefore add up to the atom's mass. This is known as an element's mass number. The letter "A" stands for this. It can be characterised as:

The sum of the protons and neutrons found in an atom’s nucleus.

Mass number (A) = No. number of protons + no. of neutrons

Q11. Why does Argon have zero valences?

Answer: The Element Argon has 8 electrons in its valence shells. Since it has the maximum number of electrons in its valence shells, it does not have any tendency to combine with other elements. So, its valency is equal to zero.

Q12. Explain the drawbacks of Rutherford’s model of an atom?

Answer: Rutherford concluded from the a-particle scattering experiment that-

- Since the majority of a-particles go through the gold foil without being deflected, the maximum space inside an atom is empty.
- The fact that so few particles were diverted from their course suggests that the positive charge of the atom takes up very little space.
- By 1800, a very small percentage of a-particles had been deflected, proving that the mass of the gold atom and its positive charges were concentrated in a small space inside the atom. He also determined from the data that the radius of the atom is approximately 105 times greater than the radius of the nucleus.

Q13. Write any two observations which support the fact that atoms are divisible.

Answer: The assumption that atoms can be divided is supported by the discovery of protons and electrons. The rearrangement can be caused by the sharing or transfer of electrons between various atoms during a chemical reaction. The variations in neutron size and number allow for the existence of isotopes of an element. This demonstrates that atoms can be divided.

Q14. Why did Rutherford select a gold foil in his a-ray scattering experiment?

Answer: Rutherford desired that the scattering experiment be conducted on a thin metal sheet. The most pliable metal known to man is gold. Making thin sheets from it is simple. In his alpha-ray scattering experiment, Rutherford utilised gold foil.

Rutherford experiment

- Rutherford carried out his gold foil experiment in 1911, and he could definitively establish the existence and position of protons in the atom.
- He suggested that electrons are in a particular position and behave accordingly.
- They used fast-moving particles of alpha to bombard fragile e-gold foil sheets.
- Alpha particles are positive particles with a mass four times greater than hydrogen. Alpha particles are a type of natural radioactive particle.
- Although the test did not reflect most alpha particles, about 1 in 8000 particles bounced off gold foil at extended angles.
- Some of the alpha particles were even redirected to the source.

Q15. What are ions? What are the two types of ions?

Answer: An ion can be described as a small, electrically charged particle. Ions can be either single charged atoms (simple or polyatomic ions) or small charged “molecules”.

- Simple ions are Na + and Ca 2+. Cl is -.
- Polyatomic ions are (NH4)+ and (CO3)2-.

Neutrons and electrons can be readily added to and deleted from an atom, in contrast to protons. Ions are created in this manner. Negative ions are created when an atom acquires electrons or anions. This shows that the number of protons and electrons in an atom is out of balance.

Benefits of Solving Important Questions Class 9 Science Chapter 4

Solving important questions from Chapter 4, "Structure of the Atom," in Class 9 Science offers several benefits:

Concept Clarity: It helps in thoroughly understanding key concepts like atomic models, subatomic particles, and electronic configuration, which are fundamental for higher-level chemistry.

Exam Preparation: Important Questions Class 9 Science Chapter 4 are often designed based on exam patterns, helping students become familiar with commonly asked topics, improving their confidence for exams.

Problem-Solving Skills: Practicing a variety of questions enhances analytical thinking and problem-solving abilities, preparing students for complex topics in future studies.

Foundation Building: Mastery of atomic structure forms the foundation for advanced topics in chemistry and physics, aiding academic progression.

Better Retention: Regular practice ensures better retention of key facts, formulas, and definitions, making revision easier.