



Class 9 Science Chapter 8 – Important Questions

Journey Inside the Atom



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Chapter 8 is **Journey Inside the Atom**. It covers the development of atomic theory, **Thomson, Rutherford and Bohr models, protons, neutrons, electrons, atomic number, mass number, electronic configuration, valency, isotopes, isobars and average atomic mass.**



SECTION A – VERY SHORT ANSWER QUESTIONS

1. What is an atom?
2. Why was Dalton's atomic theory proposed?
3. What is an electron?
4. What is a proton?
5. What is a neutron?
6. Who discovered the electron?
7. Who proposed the plum-pudding model of the atom?
8. Who performed the alpha-particle scattering experiment?
9. What did Rutherford's experiment reveal about the atom?
10. What is the nucleus?

11. Where are electrons present in an atom?

12. What is atomic number?

13. What is mass number?

14. What is electronic configuration?

15. What is valency?

16. What are isotopes?

17. What are isobars?

18. What is average atomic mass?

19. What is a neutral atom?

20. What is an ion?

SECTION B – DEVELOPMENT OF ATOMIC THEORY

21. State the main ideas of Dalton's atomic theory.

22. What were the limitations of Dalton's atomic theory?

23. Why did scientists conclude that atoms were divisible?

24. What discovery led to the idea that atoms contain smaller particles?

25. Describe Thomson's model of the atom.

26. What was the main feature of Thomson's atomic model?

27. Why was Thomson's model later rejected?

28. Describe Rutherford's alpha-particle scattering experiment.
 29. What observations were made in Rutherford's experiment?
 30. What conclusions did Rutherford draw from the experiment?
 31. Why did most alpha particles pass straight through the gold foil?
 32. Why were a few alpha particles deflected?
 33. Why did a very small number of alpha particles bounce back?
 34. What did Rutherford's model explain about the nucleus?
 35. What was the major problem with Rutherford's model?
 36. Describe Bohr's model of the atom.
 37. What are shells or energy levels?
 38. Why are electrons not allowed to occupy arbitrary energy levels according to Bohr's model?
 39. How did Bohr's model improve upon Rutherford's model?
 40. Compare Thomson's, Rutherford's and Bohr's atomic models.
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SECTION C – SUBATOMIC PARTICLES

41. Name the three fundamental subatomic particles discussed in the chapter.
42. Compare the charge of an electron, proton and neutron.
43. Compare the approximate masses of proton, neutron and electron.
44. Where is the mass of an atom mainly concentrated?

- 45. Where are protons and neutrons located?
 - 46. Where are electrons located?
 - 47. Why is an atom electrically neutral?
 - 48. What happens when an atom loses electrons?
 - 49. What happens when an atom gains electrons?
 - 50. Why do protons determine the identity of an element?
 - 51. Why do isotopes of the same element have the same atomic number?
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SECTION D – ATOMIC NUMBER & MASS NUMBER

- 52. Define atomic number.
- 53. Write the relationship between atomic number and number of protons.
- 54. In a neutral atom, what is the relationship between protons and electrons?
- 55. Define mass number.
- 56. Write the formula for mass number.
- 57. How can the number of neutrons be calculated?
- 58. Why does changing the number of neutrons not change the identity of an element?
- 59. An atom has 11 protons and 12 neutrons. Find its atomic number and mass number.

60. An atom has atomic number 17 and mass number 35. Find the number of protons, neutrons and electrons.

61. An atom contains 8 protons and 8 neutrons. Find its atomic number and mass number.

62. An atom has 12 protons and 13 neutrons. Find its mass number.

63. An atom has atomic number 20 and mass number 40. Calculate the number of neutrons.



SECTION E – NUMERICAL / DATA-BASED QUESTIONS

64. An atom has 15 protons and 16 neutrons. Find:

- a) Atomic number
- b) Mass number
- c) Number of electrons in a neutral atom

65. An element has atomic number 13 and mass number 27. Find:

- a) Number of protons
- b) Number of electrons
- c) Number of neutrons

66. An atom has 17 protons, 18 neutrons and 17 electrons. Identify:

- a) Atomic number
- b) Mass number
- c) Whether the atom is neutral or charged

67. A species contains 11 protons, 12 neutrons and 10 electrons. Determine:

- a) Atomic number
- b) Mass number
- c) Whether it is neutral, a cation or an anion
- d) Electronic configuration

This type of multi-part question appears directly in the chapter-end material.

SECTION F – ELECTRONIC CONFIGURATION

- 68. What is electronic configuration?**
- 69. What are K, L, M and N shells?**
- 70. How are electrons distributed among shells in the first eighteen elements?**
- 71. What is the maximum number of electrons that can be accommodated in the K shell?**
- 72. What is the maximum number of electrons that can be accommodated in the L shell?**
- 73. What is the maximum number of electrons that can be accommodated in the M shell according to the simple shell model used here?**
- 74. Write the electronic configuration of hydrogen.**
- 75. Write the electronic configuration of helium.**
- 76. Write the electronic configuration of carbon.**
- 77. Write the electronic configuration of oxygen.**
- 78. Write the electronic configuration of sodium.**
- 79. Write the electronic configuration of magnesium.**
- 80. Write the electronic configuration of chlorine.**
- 81. Write the electronic configuration of argon.**

82. Why is the outermost shell important in determining the chemical behaviour of an element?

83. What are valence electrons?

SECTION G – VALENCY

84. What is valency?

85. What are valence electrons?

86. How is valency related to the number of electrons in the outermost shell?

87. What is the usual valency of elements with one valence electron?

88. What is the usual valency of elements with two valence electrons?

89. What is the usual valency of elements with seven valence electrons?

90. What is the usual valency of noble gases?

91. Find the valency of an element having electronic configuration 2,1.

92. Find the valency of an element having electronic configuration 2,8,1.

93. Find the valency of an element having electronic configuration 2,8,7.

94. Find the valency of an element having electronic configuration 2,8,8.

95. Explain why elements tend to achieve a stable outer shell.

SECTION H – ISOTOPES

96. What are isotopes?

- 97. Why do isotopes have the same atomic number?
 - 98. Why do isotopes have different mass numbers?
 - 99. Give an example of isotopes of hydrogen.
 - 100. Give an example of isotopes of carbon.
 - 101. Do isotopes have the same number of protons?
 - 102. Do isotopes have the same number of electrons in neutral atoms?
 - 103. Do isotopes have the same number of neutrons?
 - 104. Why do isotopes generally have similar chemical properties?
 - 105. What is the difference between isotopes and ordinary atoms of an element?
 - 106. Differentiate between isotopes and isobars.
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SECTION I – ISOBARS

- 107. What are isobars?
 - 108. Do isobars have the same atomic number?
 - 109. Do isobars have the same mass number?
 - 110. Give an example of isobars.
 - 111. Why do isobars belong to different elements?
 - 112. Differentiate between isotopes and isobars.
 - 113. Two atoms have the same mass number but different atomic numbers. What are they called?
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SECTION J – AVERAGE ATOMIC MASS

114. What is average atomic mass?
115. Why is the atomic mass of some elements not a whole number?
116. How does the abundance of isotopes affect average atomic mass?
117. Why is chlorine's atomic mass approximately 35.5 rather than exactly 35 or 37?
118. How is average atomic mass calculated from isotopic abundances?
119. An element has two isotopes of masses 10 and 11 with abundances 20% and 80%. Calculate its average atomic mass.
120. An element has isotopes of masses 35 and 37 occurring in the ratio 3:1. Calculate its average atomic mass.
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SECTION K – APPLICATION-BASED QUESTIONS

121. An atom has 6 protons and 6 neutrons.
- a) Identify its atomic number.
 - b) Find its mass number.
 - c) How many electrons does a neutral atom have?
 - d) Write its electronic configuration.
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122. An atom has the electronic configuration 2,8,1.
- a) How many electrons does it have?
 - b) What is its valency?
 - c) Is it likely to lose or gain an electron?
 - d) What kind of ion is likely to form?

123. An element has electronic configuration 2,8,7.

- a) How many valence electrons does it have?
 - b) What is its valency?
 - c) Is it likely to gain or lose electrons?
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124. Two atoms have atomic numbers 17 and 18.

- a) Write their electronic configurations.
 - b) Which one is likely to be chemically more stable?
 - c) Why?
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125. Two atoms have the same atomic number but different mass numbers.

- a) What are they called?
 - b) What is the reason for the difference in mass number?
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126. Two atoms have the same mass number but different atomic numbers.

- a) What are they called?
 - b) Are they atoms of the same element? Explain.
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SECTION L – COMPETENCY-BASED QUESTIONS

127.  Case Study – Rutherford's Experiment

In Rutherford's experiment, most alpha particles passed straight through the gold foil, some were deflected and a very small number returned towards the source.

Answer:

- a) What did the straight passage of most particles indicate?
 - b) What did the deflections indicate?
 - c) What did the backward scattering indicate?
 - d) What model of the atom was proposed based on these observations?
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128. Case Study – Atomic Structure

An atom contains 13 protons, 14 neutrons and 13 electrons.

- a) Find its atomic number.
 - b) Find its mass number.
 - c) Write its electronic configuration.
 - d) Find its valency.
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129. Case Study – Electronic Configuration

Three elements have configurations:

A = 2,8,1

B = 2,8,7

C = 2,8,8

Answer:

- a) Which element is likely to lose an electron?
 - b) Which is likely to gain an electron?
 - c) Which is chemically stable?
 - d) State the likely valency of A and B.
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130. Case Study – Isotopes

Two atoms of an element have mass numbers 35 and 37 but the same atomic number.

- a) What are these atoms called?
- b) What remains the same?

- c) What is different?
 - d) Why do they have similar chemical properties?
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SECTION M – HIGHER-ORDER THINKING QUESTIONS

- 131. Why was Dalton's model modified after the discovery of subatomic particles?**
- 132. Why did Rutherford conclude that most of the atom is empty space?**
- 133. Why is the nucleus positively charged?**
- 134. Why do electrons not contribute significantly to the mass number?**
- 135. Why does the atomic number uniquely identify an element?**
- 136. Why does changing the number of neutrons produce an isotope rather than a new element?**
- 137. Why do isotopes have similar chemical properties but different masses?**
- 138. Why can two isobars not be considered isotopes?**
- 139. Why is an atom electrically neutral even though it contains charged particles?**
- 140. Why do atoms form ions?**
- 141. Why is electronic configuration important for understanding chemical behaviour?**
- 142. Why are noble gases generally unreactive?**
- 143. Why can the average atomic mass of an element be fractional?**

144. Why was Bohr's model an improvement over Rutherford's model?

SECTION N – LONG ANSWER QUESTIONS

145. Explain the development of atomic models from Dalton to Bohr.

146. Describe Thomson's atomic model and explain its limitations.

147. Describe Rutherford's alpha-particle scattering experiment and explain its conclusions.

148. Explain Rutherford's atomic model and its limitations.

149. Explain Bohr's model of the atom.

150. Describe the structure of an atom in terms of protons, neutrons and electrons.

151. Explain atomic number and mass number with suitable examples.

152. Explain electronic configuration and its relationship with valency.

153. Explain isotopes with suitable examples.

154. Explain isobars with suitable examples.

155. Differentiate between isotopes and isobars.

156. Explain average atomic mass and why it may have a fractional value.

157. Explain how the number of protons, neutrons and electrons can be determined from atomic information.

MOST IMPORTANT QUESTIONS FOR EXAM

If students have limited time, prepare these **first**:

- ★ 1. Explain Dalton's atomic theory and its limitations.
 - ★ 2. Explain Thomson's model of the atom.
 - ★ 3. Describe Rutherford's alpha-particle scattering experiment and its conclusions.
 - ★ 4. Explain the limitations of Rutherford's model.
 - ★ 5. Explain Bohr's model of the atom.
 - ★ 6. Compare Thomson, Rutherford and Bohr models.
 - ★ 7. Define atomic number and mass number.
 - ★ 8. Find protons, neutrons and electrons from atomic number and mass number.
 - ★ 9. Write electronic configurations of the first 18 elements.
 - ★ 10. Explain valency using electronic configuration.
 - ★ 11. Differentiate between isotopes and isobars.
 - ★ 12. Explain isotopes with examples.
 - ★ 13. Calculate average atomic mass from isotopic abundance.
 - ★ 14. Solve questions involving atomic number, mass number and electronic configuration.
 - ★ 15. Explain why an atom is electrically neutral.
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IMPORTANT FORMULAS / RELATIONSHIPS

 Atomic Number

Atomic number = Number of protons

For a **neutral atom**:

Number of protons = Number of electrons



Mass Number

Mass number = Number of protons + Number of neutrons



Number of Neutrons

Number of neutrons = Mass number – Atomic number



Average Atomic Mass

Average atomic mass = Σ (Isotopic mass $\times$ Fractional abundance)



Electronic Configuration

For the first 18 elements, electrons are distributed among shells according to the shell model used in the chapter.

The textbook's table explicitly lists the first eighteen elements along with their atomic numbers, protons, neutrons, electrons and shell distributions.



QUICK REVISION BOX



Atom → Basic unit of an element



Electron → Negatively charged



Proton → Positively charged



Neutron → No electric charge



Nucleus → Contains protons and neutrons



Atomic number → Number of protons



Mass number → Protons + neutrons



Electronic configuration → Distribution of electrons in shells

 **Valency** → Combining capacity of an atom

 **Isotopes** → Same atomic number, different mass numbers

 **Isobars** → Same mass number, different atomic numbers

 **Average atomic mass** → Weighted average of isotopic masses

TOP DIAGRAMS / REPRESENTATIONS TO PRACTISE

1.  **Thomson's atomic model**
2.  **Rutherford's alpha-particle scattering experiment**
3.  **Rutherford's atomic model**
4.  **Bohr's atomic model**
5.  **Structure of an atom**
6.  **Isotopic representation**
7.  **Electronic shell configuration**
8.  **Comparison of atomic models**

Exam Tip

For atomic-structure numericals, always use this sequence:

Atomic number → Protons → Electrons (for neutral atom) → Mass number → Neutrons → Electronic configuration → Valency

This prevents most calculation mistakes and matches the chapter's emphasis on connecting atomic number, mass number, particle counts and electronic distribution.