Section A

1. The mass number of an atom is equal to the sum of the number of _____.

A) Protons, neutrons, and electrons
B) Protons and neutrons
C) Protons and electrons
D) Electrons and neutrons

2. What is the maximum number of electrons that the third shell of an atom can hold?

A) 8 B) 18 C) 32 D) 10

3. Which of the following particles is responsible for the chemical behaviour of an atom?

A) Neutron B) Proton C) Electron D) Nucleus

4. Which of the following best describes an anion?

A) A positively charged ion formed by gaining electrons.
B) A negatively charged ion formed by losing electrons.
C) A positively charged ion formed by losing electrons.
D) A neutral atom.

5. The atomic mass of an atom is approximately equal to the sum of the masses of its _____.

A) Protons and electrons
B) Neutrons and electrons
C) Protons and neutrons
D) Protons, neutrons, and electrons

6. Which of the following best describes an ion?

A) A neutral atom with equal protons and electrons.
B) An atom with an unequal number of protons and electrons, giving it a charge.
C) An atom that has no protons.
D) An atom with the same number of neutrons and protons.

7. What is the number of protons, neutrons, and electrons in an atom of carbon-14 (atomic number 6, mass number 14)?

A) 6 protons, 6 neutrons, 6 electrons
B) 6 protons, 8 neutrons, 6 electrons
C) 6 protons, 8 neutrons, 14 electrons
D) 6 protons, 14 neutrons, 6 electrons

8. Which of the following is true about the atomic number of an element?

A) It is the total number of protons and neutrons.
B) It is the number of neutrons in an atom.
C) It determines the chemical properties of the element.
D) It is the total number of electrons in an atom.

9. Which of the following elements has its outermost shell completely filled with electrons?

A) Neon B) Oxygen C) Nitrogen D) Sodium

10. The atomic mass of an atom is the sum of the number of _____ and _____.

A) Electrons, protons
B) Protons, neutrons
C) Neutrons, electrons
D) Protons, electrons

11. The number of protons in an atom determines the _____.

A) Mass number
B) Atomic number
C) Neutron number
D) Electron number

12. Which of the following statements about isotopes is correct?

A) Isotopes have the same number of protons and neutrons.
B) Isotopes have the same number of neutrons but different numbers of protons.
C) Isotopes have the same number of protons but different numbers of neutrons.
D) Isotopes have different numbers of electrons.

13. What is the charge on an atom of chlorine (Cl) after it gains one electron?

A) +1 B) -1 C) +2 D) 0

14. Which of the following elements has a full outer electron shell and is chemically inert?

A) Nitrogen B) Oxygen C) Argon D) Fluorine

15. Which of the following represents the Bohr model of an atom?

A) Electrons are distributed in fixed orbits around the nucleus.
B) Electrons are scattered throughout the atom.
C) Electrons move randomly in the electron cloud.
D) Electrons are fixed at the center of the atom.

16. The number of neutrons in an atom can be calculated by subtracting the atomic number from the:

A) Atomic mass
B) Mass number
C) Number of protons
D) Number of electrons

17. Which of the following is the correct symbol for a neutron?

A) n B) p C) e D) γ

18. The number of electrons in an element X is 15 and the number of neutrons is 16. Which of the following is the correct representation of the element?

A) ${}^{31}_{15}X$ B) ${}^{31}_{16}X$ C) ${}^{16}_{15}X$ D) ${}^{15}_{16}X$

19. Which of the following statements about Rutherford's model of atom are correct?

(i) considered the nucleus was positively charged.

(ii) established that the α–particles are four times as heavy as a hydrogen atom.

(iii) can be compared to the solar system.

(iv) was in agreement with Thomson's model.

(a) (i) and (iii)

(b) (ii) and (iii)

(c) (i) and (iv)

(d) only (i)

20. In Thomson's model of atoms, which of the following statements are correct?

(i) The mass of the atom is assumed to be uniformly distributed over the atom.

(ii) the positive charge is assumed to be uniformly distributed over the atom.

(iii) the electrons are uniformly distributed in the positively charged sphere.

(iv) The electrons attract each other to stabilize the atom.

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

(b) (i) and (iii)

(c) (i) and (iv)

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

21. Rutherford's α- particle scattering experiment showed that:

(i) Electrons have a negative charge.

(ii) the mass and positive charge of the atom is concentrated in the nucleus.

(iii) neutrons exist in the nucleus.

(iv) Most of the space inside an atom is empty.

Which of the above statements is correct?

(a) (i) and (iii)

(b) (ii) and (iv)

(c) (i) and (iv)

(d) (iii) and (iv)

22. The ion of an element has 3 positive charges. The mass number of the atom is 27 and the number of neutrons is 14. What is the number of electrons in the ion?

(a) 13 (b) 10 (c) 14 (d) 16

23. In a sample of ethyl ethanoate (CH3COOC2H5CH3COOC2H5), the two oxygen atoms have the same number of electrons but different numbers of neutrons. Which of the following is the correct reason for it?

(a) One of the oxygen atoms has gained electrons.

(b) One of the oxygen atoms has gained two neutrons.

(c) The two oxygen atoms are isotopes.

(d) The two oxygen atoms are isobars.

24. Elements with valency 1 are:

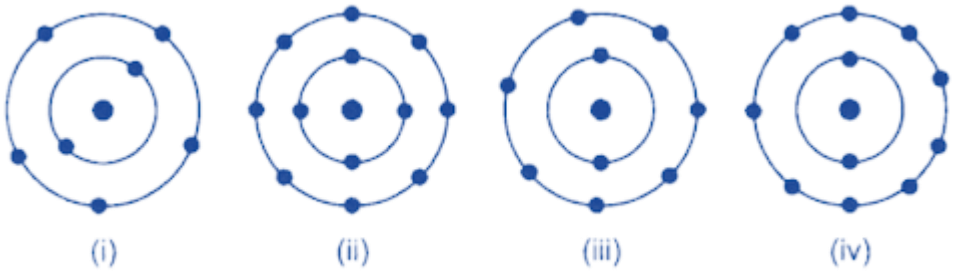
(a) always metals. (b) always metalloids.

(c) either metals or non-metals. (d) always non-metals.

25. An atom with 3 protons and 4 neutrons will have a valency of:

(a) 3 (b) 7 (c) 1 (d) 4

26. Which of the following in Fig. 4.2 does not represent Bohr's model of an atom correctly?



(a) (i) and (ii)

(b) (ii) and (iii)

(c) (ii) and (iv)

(d) (i) and (iv)

27. Atomic models have been improved over the years. Arrange the following atomic models in the order of their chronological order:

(i) Rutherford's atomic model

(ii) Thomson's atomic model

(iii) Bohr's atomic model

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

(b) (ii), (iii) and (i)

(c) (ii), (i) and (iii)

(d) (iii), (ii) and (i)

Section B

Short Answer Questions:

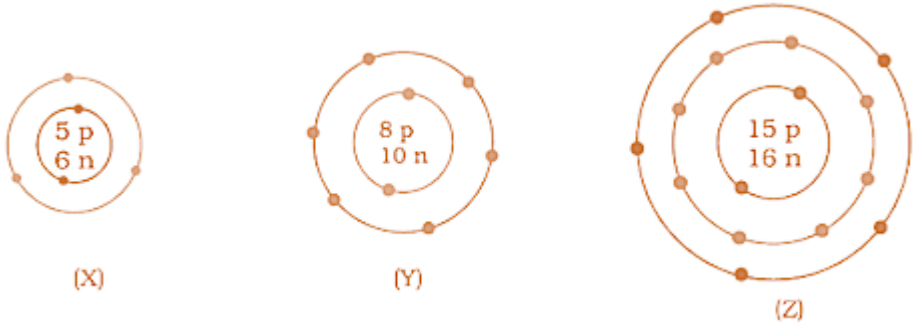
Q1. Is it possible for the atom of an element to have one electron, one proton and no neutron? If so, name the element.

Q2. Write any two observations which support the fact that atoms are divisible.

Q3. Will ^{35}Cl and ^{37}Cl have different valencies. Justify your answer.

Q4. In the atom of an element X, 6 electrons are present in the outermost shell. If it acquires a noble gas configuration by accepting a requisite number of electrons, then what would be the charge on the ion so formed?

Q5. What information do you get from the given figure about the atomic number, mass number, and valency of atoms X, Y, and Z? Give your answer in a tabular form.



Q6. Calculate the number of neutrons present in the nucleus of an element X which is represented as $^{31}_{15}X$.

Q7. Complete Table 4.1 based on information available in the symbols given below:

(a) $^{35}_{17}Cl$

(b) $^{12}_{6}C$

(b) $^{81}_{35}Br$

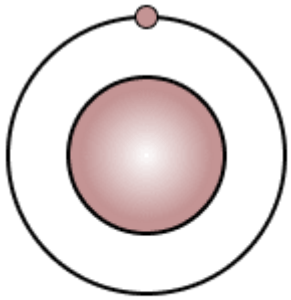
Element	n_p	n_n

Q8. Helium atom has 2 electrons in its valence shell but its valency is not 2. Explain.

Q9. An element X has a mass number of 4 and an atomic number of 2. Write the valency of this element.

Q10. 'Valency' is also the number of electrons - donated or accepted by an atom so as to achieve stable electronic configuration of the nearest noble gas'. With reference to this definition -

Q11. The diagram represents an isotope of hydrogen [H]. Answer the following:



1. Are isotope atoms of the same element or different elements.
2. Do isotopes have the same atomic number or the same mass number.
3. If an isotope of 'H' has mass no. = 2, how many electrons does it have?
4. If an isotope of 'H' has mass no. = 3, how many neutrons does it have?
5. Which sub-atomic particles in the 3 isotopes of 'H' are the same?

Q12. (a) What are the two main features of Rutherford's atomic model?

(b) State its one drawback.

Q13. What is variable valency? Name two elements having variable valency and state their valencies.

Q14. The atomic number and the mass number of sodium are 11 and 23 respectively. What information is conveyed by this statement?

Q15. The atom of an element is made up of 4 protons, 5 neutrons and 4 electrons. What is its atomic number and mass number?

Q16. Complete the table below by identifying A, B, C, D, E, and F.

Element	Symbol	Number of protons	Number of neutrons	Number of electrons
Fluorine	$_{9}F^{19}$	9	**A**	**B**
Aluminium	**C**	**D**	14	13
Potassium	$_{19}K^{39}$	**E**	**F**	19

Q17. Compare the properties of electrons, protons, and neutrons.

Q18. State the mass number, the atomic number of neutrons and the electronic configuration of the following atoms.

Name of elements	Atomic number	Atomic mass	No. of proton	No. of electrons	No. of neutrons	Electronic configuration
${}^{12}_{6}C$						
${}^{16}_{8}O$						
${}^{19}_{9}F$						
${}^{20}_{10}Ne$						
${}^{27}_{13}Al$						
${}^{35}_{17}Cl$						

Section C

Q1. What were the drawbacks of Rutherford's model of an atom?

Q2. Show diagrammatically the electron distributions in a sodium atom and a sodium ion and also give their atomic number.

Sodium atom

Sodium ion

Q3. Why are atoms electrically neutral?

Q4. Why is the number of neutrons in an atom important?

Q5. Why do electrons in an atom occupy discrete energy levels or shells?

Q6. What is the role of electrons in chemical bonding?

Q7. Why do atoms of noble gases not form bonds easily?

Q8. Why do atoms of different elements have different atomic numbers?

Q9. Why is the mass number of an element a whole number but its atomic mass is usually a decimal?

Q10. Why is the atomic model of Bohr more accurate than Rutherford's model?

Q11. Why do atoms of metals tend to lose electrons and form positive ions?

Q12. Why do non-metals tend to gain electrons in chemical reactions?

Q13. Why does an atom of sodium form a positively charged ion, while an atom of chlorine forms a negatively charged ion?

Q14. Why is the electron configuration of an atom important in determining its chemical behaviour?

Q15. Why do atoms form ions during chemical reactions?

Q16. State how electrons are distributed in an atom. Explain in brief the rules that govern their distribution.

Q17. Concerning the formation of compounds from atoms by electron transfer - electro valency, state the basic steps in the conversion of sodium & chlorine atoms to sodium & chloride ions leading to the formation of the compound - sodium chloride.

Q18. What are isotopes? How does the existence of isotopes contradict Dalton's atomic theory?