

Structure of the Atom

ONE MARK QUESTIONS

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

Ans :

Rutherford selected a gold foil in his a-ray scattering experiment because gold has high malleability and can be hammered into thin sheet.

2. Is C1-35 and C1-37 have different valencies?

Ans :

No, it is because these are isotopes of chlorine that have same atomic number but different mass number.

3. Find the number of neutrons in $^{31}\text{X}_{15}$.

Ans :

$^{31}\text{X}_{15}$ indicate that no. of proton

$$= 15 \text{ and mass number} = 31$$

$$\text{Mass number} = \text{No. of protons}$$

$$+ \text{No. of neutrons} = 31$$

$$\text{Number of neutrons} = 31 - \text{number of protons}$$

$$= 31 - 15 = 16$$

4. The atomic number of calcium and argon are 20 and 18 respectively, but the mass number of both these elements is 40. What is the name given to such a pair of elements?

Ans :

Isobars.

5. Name the isotope used for treatment of cancer.

Ans :

Isotope of cobalt : Co-60.

6. Where is the mass of an atom concentrated?

Ans :

Mass of an atom is concentrated in nucleus.

7. What is the charge and mass of α -particles?

Ans :

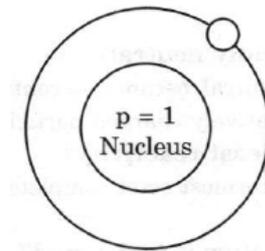
Charge is 2 and mass is 4 amu.

8. Draw an atomic structure of hydrogen atom.

(a) K = 1

(b) (no neutron)

Ans :



9. Who discovered proton?

Ans :

Goldstein discovered proton.

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10. What is the mass of a neutron?

Ans :

The mass of a neutron is 1.675×10^{-24} g.

11. Which is much closer to the nucleus of an atom out of K and L shells?

Ans :

K shell is much closer to the nucleus of an atom.

12. Which shell can accommodate a maximum of 32 electrons?

Ans :

Fourth shell can accommodate a maximum of 32 electrons.

13. Name the radioisotope used for examining the circulation of blood in the body.

Ans :

Na-24 is the radioisotope used for examining the circulation of blood in the body.

14. Can the addition of neutron to the nucleus of an atom determine the atomic mass or number?

Ans :

It will increase the atomic mass of the atom.

15. What is an orbit?

Ans :

Orbit is the path of electron around the nucleus.

16. What are valence electrons?

Ans :

The electrons present in the outermost shell of an atom are known as valence electrons.

17. What is an anion?

Ans :

When an atom gains one or more electrons, it becomes negatively charged and is known as anion.

18. How does an atom become a cation?

Ans :

When an atom acquires positive charge by losing one or more electrons, it is called cation.

19. What are nucleons?

Ans :

Protons and neutrons reside in the nucleus of an atom and are thus called nucleons.

20. Why helium have zero valency?

Ans :

Helium have zero valency because its outermost orbit is completely filled.

21. Give the derivative source of sodium.

Ans :

The symbol of Na for sodium is derived from its Latin name 'Natrium'.

22. Why isotopes of an element are chemically similar?

Ans :

Isotopes of an element are chemically similar because these have same electronic configuration.

23. Why an atom is electrically neutral?

Ans :

An atom is electrically neutral because it contains equal number of positively charged particles and negatively charged particles, i.e. protons and electrons.

24. Why noble gases show least reactivity?

Ans :

Noble gases have their outermost octet completely filled up, so these gases show least reactivity.

25. Define atomic number. How it is denoted?

Ans :

Number of protons of an atom determines its atomic number. It is denoted by 'Z'.

26. Which study led to the conclusion that atoms are not indivisible?

Ans :

Study of static electricity and the condition under which electricity is conducted by different substances

led to the conclusion that atoms are not indivisible.

27. Name the particles which determine the mass of an atom.

Ans :

Proton and neutron are the particles which determine the mass of an atom.

28. Electron attributes negative charge, protons attribute positive charge. An atom has both but why there is no charge?

Ans :

The negative and positive charges of electrons and protons respectively are equal in magnitude. So, the atom as a whole is electrically neutral.

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29. Write the charge and mass of an electron.

Ans :

Its mass is $\frac{1}{2000}$ times that of proton and it is negatively charged.

30. What type of charge is present on the nucleus of an atom?

Ans :

Positive charge.

31. Name one element, the nucleus of which does not have any neutron.

Ans :

Hydrogen.

32. Who discovered neutron?

Ans :

James Chadwick.

33. What is the charge and mass of alpha particle?

Ans :

Charge = + 2 units

Mass = 4 units

34. An uncharged particle is found in the nucleus of an atom. Identify this uncharged particle.

Ans :

Neutron.

35. Name the scientist who concluded that the size of nucleus is very small as compared to the size of atom.

Ans :

Rutherford.

36. Write the names of three elementary particles which constitute an atom.

Ans :

Electron, proton and neutron.

37. Helium atom has two electrons in its valence shell but its valency is not two. Why?

Ans :

Helium atom has two electrons in its valence shell but its valency is not two as its outermost shell is completely filled, its combining capacity or valency is zero.

38. Write the symbols of two isotopes of uranium.

Ans :

Uranium 238 (${}_{92}\text{U}^{238}$) and Uranium 235 (${}_{92}\text{U}^{235}$).

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

Ans :

Discovery of electrons and protons are two observations which support the fact that atoms are divisible.

40. If an atom contains one electron and one proton, will it carry any charge or not?

Ans :

It will not carry any charge because the positive charge on the proton neutralizes the negative charge on the electron.

41. On the basis of Rutherford's model of an atom, which subatomic particle is present in the nucleus of an atom?

Ans :

The positively charged particle in the nucleus of an atom is called 'proton'.

42. Name the scientist who discovered neutrons.

Ans :

J. Chadwick.

43. Where is neutron located in an atom?

Ans :

It is located in the nucleus of an atom.

44. Helium atom has an atomic mass of 4u and two protons in its nucleus. How many neutrons does it have?

Ans :

Two.

45. State the charge and mass of a neutron.

Ans :

Neutron has no charge and its mass is equal to that of a proton.

46. Give two uses of isotopes in the field of medicines.

Ans :

- (i) An isotope of cobalt is used in the treatment of cancer.
- (ii) An isotope of iodine is used in the treatment of goitre.

47. What is meant by electronic configuration of elements?

Ans :

The systematic distribution of electrons in various orbits of an atom is called electronic configuration of elements.

48. Why do noble gases show low reactivity?

Ans :

The outermost shell of the atoms of noble gases are complete. So, they show little chemical reactivity.

49. Is an atom electrically neutral?

Ans :

Yes, because number of protons (+ve charge) inside the nucleus are equal to the number of electrons (-ve charge) outside the nucleus.

50. Why do some elements possess fractional atomic mass?

Ans :

Some elements possess fractional atomic mass because they occur in nature in different isotopic forms. So, accordingly their average mass is calculated.

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51. Do isotopes of an element have similar chemical properties?

Ans :

Isotopes of an element have similar chemical properties because they have the same atomic number and valence electrons.

52. Are noble gases inert?

Ans :

The outermost shell of the atoms of noble gases are completely filled. So, they do not show affinity towards chemical reactions.

53. Name an element which has one electron, one proton and no neutron.

Ans :

Hydrogen atom (${}_{1}\text{H}^1$) has one electron, one proton and no neutron.

54. Why is the valency of Na is 1 and not 7?

Ans :

It is easy for Na atom to lose one electron instead of gaining seven electrons. So, valency of Na is one and not seven.

55. How can an atom become stable by losing or gaining electrons?

Ans :

For stability of an atom it must have either 2 or 8 electrons in the outermost orbit. So, by losing or gaining electrons it reaches to the electronic configuration of the nearest noble gas.

56. What kind of elements have a tendency to lose electrons? What are they commonly called?

Ans :

The elements having 1, 2 or 3 valence electrons have the tendency to lose electrons. They are commonly called metals.

57. What is the relation between physical and chemical properties of isobars?

Ans :

Isobars have different atomic numbers, so different electronic configuration and have different chemical properties. They are atoms of different elements, hence they have different physical properties.

58. What is the limitation of J.J. Thomson's model of an atom?

Ans :

The major limitation of J.J. Thomson's model is that it does not explain how positively charged particles are shielded from negatively charged particles, without getting neutralized.

59. Give the mass and charge of an electron.

Ans :

- (i) The mass of electron is about 9.0×10^{-31} kg.
- (ii) An electron is negatively charged particle and has a charge of 1.6×10^{-19} coulomb.

60. What kind of elements have a tendency to gain electrons? What are they commonly called?

Ans :

The elements having 5, 6 or 7 valence electrons have the tendency to gain electrons. They are commonly called non-metals.

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

Ans :

Yes, it is true for hydrogen atom which is represented as ${}^1_1\text{H}$.

62. Which particles were discovered by Chadwick, Thomson and Goldstein?

Ans :

- (i) Chadwick - Neutron
- (ii) Thomson - Electron
- (iii) Goldstein - Proton

63. If $Z = 3$, what would be the valency of the element? Also, name the element.

Ans :

Atomic number $Z = 3$

Electronic configuration = 2 (K), 1 (L)

Valence shell has 1 electron in the outermost shell, so valency of element is 1. The element is lithium.

64. Why do helium, neon and argon have a zero valency?

Ans :

Helium, neon and argon have 2, 8 and 8 electron in outermost shell, thus there is no need to gain or loose electrons. So, they have zero valency.

65. How are the canal rays different from electrons in terms of charge and mass?

Ans :

Electrons are negatively charged particles, mass of which is approximately $\frac{1}{2000}$ that of canal rays.

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THREE MARKS QUESTIONS

66. In what way the Rutherford proposed atomic model?

Ans :

Rutherford proposed a model in which electrons revolve around the nucleus in well-defined orbits. There is a positively charged centre in an atom called the nucleus. He also proposed that the size of the nucleus is very small as compared to the size of the atom and nearly all the mass of an atom is centered in the nucleus.

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

Ans :

The orbital revolution of the electron is not expected to be stable. Any particle in a circular orbit would undergo acceleration and the charged particles would radiate energy. Thus, the revolving electron would lose energy and finally fall into the nucleus. If this were so, the atom should be highly unstable and hence matter would not exist in the form that we know.

68. Is there any relationship between atomic number, mass number, isotopes, isobars and valency of an atom? Explain.

Ans :

Atomic number : It tells the number of protons (Z).

Atomic Mass : Total number of proton and neutron (A) is called atomic mass.

Isotopes : When atoms of same element have same number of protons but different number of neutrons is called isotopes.

Isobars : When atoms of different element have same atomic mass but different atomic number, such atoms are called isobars.

Valency : It is the combining capacity of an atom or it is defined as number of electrons lost or gained by an atom to acquire noble gas configuration.

69. What is discharge tube?

Ans :

A discharge tube is a glass tube about 70 cm long and 5 cm of diameter. Two metal electrodes are sealed at the two ends, one is connected to negative terminal

of battery and other to the positive terminal. A side tube is fused at the centre of the glass tube which serves to pump out air from it, using a suction pump.

70. Give important properties of cathode rays.

Ans :

- Cathode rays travel in straight line.
- Cathode rays can rotate a light wheel placed in their path.
- They ionise gas through which they pass.
- They are deflected by magnetic field.
- They can penetrate through thin metallic sheet.
- Mass of cathode ray particle is too small.

71. Answer the following question with the help of table :

Elements	Protons	Neutrons	Electrons
A	9	10	9
B	16	16	16
C	12	12	12
D	17	22	17

Give :

- The electronic distribution of element B.
- The valency of element A.
- The atomic number of element B.
- The atomic mass of element D.

Ans :

- The electronic distribution of element B = 2, 8, 6
- The valency of element A = +1
- The atomic number of element B = 16
- The atomic mass of element D = $17 + 22 = 39$

72. Describe the essential properties of the atomic nucleus. Compare these properties with the properties of electron.

Ans :

Nucleus is small positively charged centre located in a very small space. An electron is a very small negatively charged particle with well established charge to mass ratio. The charge on electron forms the smallest unit of charge on atomic particles.

73. How has atomic number improved the definition of an element?

Ans :

- Atomic number of an element = number of proton = number of electron
- Atomic number gives the position of the element in periodic table. An element can now be defined as a substance comprising of atoms all of which have same atomic number.

74. State the properties of isotopes.

Ans :

Isotopes have the following uses :

Treatment of disease : Radioactive isotopes are used for the treatment of dreadful diseases like cancer. Cobalt-60 is used to kill malignant cells in patients suffering from cancer.

- It is used in chemical analysis.
- It is used to detect disease in plants.
- Dating of plants/animals being obtained by using carbon-14 after excavation.
- Thyroid disorders can be treated by I-131.
- Leukaemia can be treated by using P-32.
- Uranium-235 can produce electricity.

75. What is the difference between Rutherford's atomic model and Thomson's atomic model?

Ans :

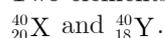
Rutherford proposed a model in which electrons revolve around the nucleus in well-defined orbits. There is a positively charged centre in an atom called the nucleus. He also proposed that the size of the nucleus is very small as compared to the size of the atom and nearly all the mass of an atom is centred in the nuclei. Thomson proposed the model of an atom to be similar to a christmas pudding. The electrons are studded like currants in a positively charged sphere like Christmas pudding and the mass of the atom was supposed to be uniformly distributed.

76. (i) An ion X^{2+} contains 10 electrons and 12 neutrons. What is the atomic number and mass number of the element X?
- (ii) Is it possible in an atom to have 12 protons and 13 electrons?
- (iii) Why helium gas is inert?

Ans :

- Atomic number = 12,
Mass number = 24.
- No, it is not possible. An atom is electrically neutral. The number of positively charged particles (protons) is always equal to the number of negatively charged particles (electrons).
- Helium atom has completely filled outermost shell. Thus, it is inert.

77. Two elements denoted as follows :



- Find the number of electrons present in X and Y.
- Find the number of nucleons present in X and Y.
- Explain the term used to represent X and Y.

Ans :

- The elements X and Y have 20 and 18 electrons respectively.
- Both have 40 nucleons.
- Isobars.

78. Write the conclusions drawn by Rutherford for the following observation during his scattering experiment :

- Most of the alpha-particles passed straight through the gold foil.
- Some alpha-particles getting deflected from their path.
- Very small fraction of alpha-particles getting deflected by 180° .

Ans :

- Most of the space inside the atom is empty.

- (ii) It indicates that the positive charge of the atom occupies a very little space.
- (iii) All the positive charge and mass of the gold atom were concentrated in a very small volume within the atom.

79. Define the following terms :

- (i) Electronic configuration
- (ii) Valence shell
- (iii) Valency

Ans :

- (i) The distribution of electrons amongst different orbits of an atom is known as electronic configuration.
- (ii) The outermost shell of an atom is called its valence shell.
- (iii) The combining capacity of an atom is called its valency or the number of electrons lost or gained by an atom to acquire noble gas configuration.

80. From the symbol ${}_{16}\text{S}^{32}$, give :

- (i) Atomic number of sulphur
- (ii) Mass number of sulphur
- (iii) Electronic configuration of sulphur
- (iv) Which of the two elements given would be chemically more reactive? S, Ar

Ans :

- (i) 16
- (ii) 32
- (iii) Electronic configuration : 2, 8, 6.
- (iv) Element S, having atomic number 16 is chemically more reactive than element Ar of atomic number 18. It is because the outermost shell of the atom of element S has six electrons only and has to complete its octet, whereas the outermost-shell of the atom of element Ar is completely filled up, i.e., its octet is complete and thus it shows little chemical activity.

81. Describe briefly Thomson's model of an atom.

Ans :

Thomson's model of an atom :

An atom consists of a positively charged sphere and the electrons are embedded in it.

The negative and positive charges are equal in magnitude. So, the atom as a whole is electrically neutral.

82. Give four characteristics of isotopes.

Ans :

All isotopes of an element consist of the same number of protons inside their nuclei. Hence, they have the same atomic number.

- (i) All isotopes of an element consist of different number of neutrons in their nuclei. Hence, they have different mass number.
- (ii) All isotopes of an element give identical chemical reactions.
- (iii) Isotopes of an element have same electronic configuration.

83. Write drawbacks of Thomson's model.

Ans :

Drawbacks of Thomson's Model : It could not explain about the stability of an atom, i.e., how both positive and negative charges could remain so close together. It could not explain the results of experiments (such as alpha ray scattering experiment) carried out by other scientists.

84. Draw a sketch of Bohr's model of an atom with three shells.

Ans :

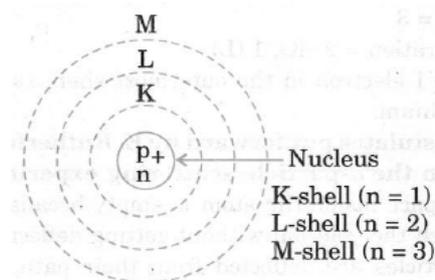


Figure: Bohr's model of an atom

85. What do you think would be the observation if the α -particle scattering experiment is carried out using a foil of a metal other than gold?

Ans :

If experiment is done by using a foil of some other metal, then results would not have been such as most of the particles will be deflected back. Gold can be beaten to an extremely thin sheet as it is extremely malleable metal. Rutherford could predict with the use of extremely thin gold foil that, "Most of the space inside the atom is empty and nucleus is positively charged occupying a small volume within the atom."

86. What are canal rays? Who discovered them? What is the charge and mass of canal ray?

Ans :

New radiations in a gas discharge tube which are positively charged are known as canal rays. They were discovered by E. Goldstein. Charge on canal rays is positive and its mass is one unit.

87. Helium atom has an atomic mass of $4u$ and two protons in its nucleus. How many neutrons it have?

Ans :

$$\begin{aligned} \text{Mass number} &= \text{Number of protons} \\ &+ \text{Number of neutrons} \\ 4 &= 2 + \text{No. of neutrons} \end{aligned}$$

$$\text{Number of neutrons} = 4 - 2 = 2$$

88. If K and L shells of an atom are full, then what would be the total number of electrons in the atom?

Ans :

$$\text{Number of electrons in full K-shell} = 2$$

Number of electrons in full L-shell = 8

Total number of electrons in an atom is $2 + 8 = 10$ electrons.

89. If number of electrons in an atom is 8 and number of protons is also 8, then (i) what is the atomic number of the atom? And (ii) what is the charge on the atom?

Ans :

- (i) Atomic number = Number of protons = 8
 (ii) The charge of the atom is zero, as total number of positive charge is equal to total number of negative charge.

Number of protons = Number of electrons

$$8 = 8$$

90. Explain the essential features of experiment that led to the discovery of isotopes.

Ans :

The $\frac{e}{m}$ values of the ionized atoms were determined by studying their deflections under the influence of electrical and magnetic fields. Ionised atoms of an element do not give a unique mass and chemical properties of these atoms are identical.

91. Define the term "Half life".

Ans :

Radioactive elements are unstable and disintegrate with time emitting alpha and beta particles along with gamma rays. The rate of disintegration depends on the amount of substance. As the amount of the substance decreases, disintegration becomes slower. But it takes a long time for whole of the substance to decay. Thus, the rate of radioactive decay is measured in terms of half time. The time taken by half of the atoms of radioactive element to disintegrate is called its half-time.

92. Write three main features of Rutherford's nucleus model of an atom.

Ans :

On the basis of α -particle scattering experiment, Rutherford proposed a model of atom. According to him :

There is positively charged centre in an atom called the nucleus which contains the whole mass of the atom.

The electrons revolve around the nucleus.

The size of the nucleus is very small as compared to the size of the atom.

93. Name the three subatomic particles of an atom.

Ans :

- (i) Electrons (negatively charged particles) which revolve around the nucleus.
 (ii) Protons (positively charged particles) which are present in the nucleus.
 (iii) Neutrons (having no charge) which are present in the nucleus.

94. Give drawbacks of Rutherford's model.

Ans :

Drawbacks of Rutherford's model :

- (i) Unable to explain the source of energy required for movement of electrons.
 (ii) Unable to explain as to why a moving charge does not lose energy and fall into the nucleus.
 (iii) It could not explain about the emission of radiations of different frequencies by different atoms when heated.
 (iv) It could not explain the stability of an atom when charged electrons are moving under the attractive force of positively charged nucleus.

95. Write the electronic configuration of any one pair of isotopes and isobars.

Ans :

Isotopes	Protons	Electrons	Neutrons	Electronic configuration
${}_{17}\text{Cl}^{35}$	17	17	18	2(K), 8(L), 7(M)
${}_{17}\text{Cl}^{37}$	17	17	20	2(K), 8(L), 7(M)

Isotopes	Protons	Electrons	Neutrons	Electronic configuration
${}_{20}^{40}\text{Cl}$	20	20	20	2(K), 8(L), 8(M), 2(N)
${}_{18}^{40}\text{Cl}$	18	18	22	2(K), 8(L), 8(M)

96. What was Chadwick's experiment?

Ans :

In Chadwick's experiment, he bombarded beryllium atoms with high speed particles.

- (i) The rays emitted from beryllium during bombardment had speeded about one-tenth the speed of light.
 (ii) Later Chadwick was able to show that these rays consisted of neutral particles called neutron.

97. State the major drawback in Rutherford's model of an atom. Mention two features of Bohr's model which helped compensate this drawback.

Ans :

The major drawback of Rutherford's model of an atom is that it does not explain the stability of an atom. Any particle in a circular orbit would undergo acceleration. During acceleration, charged particles would radiate energy. So, revolving electron would lose energy and finally fall into the nucleus.

Two features of Bohr's model which helped to resolve this drawback :

Only certain special orbits known as discrete orbits of electrons are allowed inside the atom.

While revolving in these discrete orbits, the electrons do not radiate energy.

98. Define isotopes. Why do isotopes have same atomic number but different mass number? Explain with the help of an example.

Ans :

Atoms of the same element, having the same atomic number but different mass numbers are called isotopes.

Isotopes have same atomic number but different mass number because they contain different number of neutrons.

For example : In nature chlorine occurs in two isotopic forms; ${}_{17}\text{Cl}^{35}$ and ${}_{17}\text{Cl}^{37}$.

Here atomic number of both the atoms is same but due to the difference in the number of neutrons, their mass number is different.

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99. If K and L shells of an atom are full, then what would be the total number of electrons in the atom? What is the valency of this element? Name the element.

Ans :

The maximum numbers of electrons that can occupy K and L shells of an atom are 2 and 8 respectively. Therefore, if K and L shells of an atom are full then the total number of electrons in the atom would be $2 + 8 = 10$ electrons. So, the valency of this element is zero. The element is neon (Ne).

100. Give the mass numbers of A and B, What is the relation between the two species?

Ans :

Mass number of A = No. of protons + No. of neutrons = $6 + 6 = 12u$

Mass number of B = No. of protons + No. of neutrons = $6 + 8 = 14u$

The species A and B are isotopes, as they have same atomic number but different mass number.

FIVE MARKS QUESTIONS

101. Number of electrons, protons and neutrons in chemical species A, B, C and D given below :

Elements	Electrons	Protons	Neutrons
A	2	3	4
B	10	9	8
C	8	8	8
D	8	8	10

Now, answer the following questions :

- What is the mass number of A and B?
- What is the atomic number of B?
- Which two elements represent a pair of isotopes and why?
- What is the valency of element C?

Also, justify your answers.

Ans :

- Mass number of A = $3 + 4 = 7$

Mass number of B = $9 + 8 = 17$

- Atomic number of B = Number of protons = 9
- Elements C and D represent a pair of isotopes because their atomic numbers are the same.
- Electronic configuration of C ($Z = 8$) = 2, 6. So, its valency is 2.

102. Describe in brief the Rutherford's alpha-particle scattering experiment with the help of labelled diagram. Write any three important conclusions drawn from the experiment.

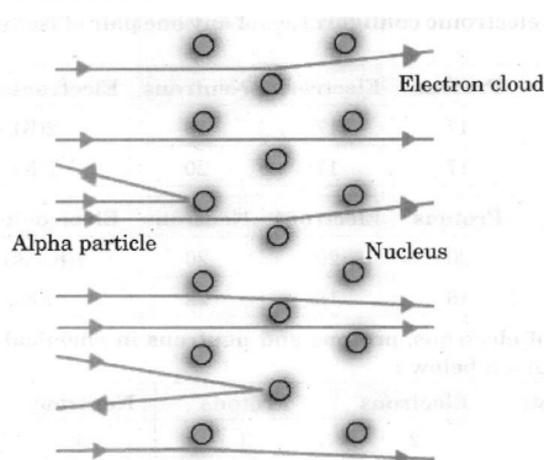
Ans :

Rutherford took a very thin gold foil and bombarded it with α -particles and he observed that :

- Most of the fast moving α -particles passed straight through the gold foil.
- Some of the alpha-particles were deflected by the foil by small angle.
- Out of every 12000 particles, one appeared to rebound.

From the above observations, he concluded :

- There is a positively charged centre in an atom called the nucleus. Nearly all mass of an atom resides in the nucleus.
- The electrons revolve around the nucleus in well defined orbits.



- The size of the nucleus is very small as compared with the size of the atom.

103. Explain Rutherford's atomic model.

Ans :

Rutherford proposed a model of an atom on the basis of α -particles scattering experiment. This is known as Rutherford's nuclear model of atom.

- An atom consists of a heavy positively charged core called nucleus.
- Nucleus is surrounded by electrons.
- Electrons and nucleus are held together by electrostatic force of attraction.
- Size of nucleus is very small as compared to the size of atom.
- Almost the entire mass of the atom is concentrated in the nucleus.

104. How was the neutron discovered?

Ans :

Atom was considered to have electrons and protons

only till 1920. But electrons have negligible mass. Then entire mass of the atom was considered to be only due to the protons present in it. In 1920, Rutherford found that atomic masses of all elements are higher than the mass of all protons and electrons in their atoms. Chadwick discovered the presence of an electrically neutral particle inside the atom in 1932.

105. Give the number of electron, proton and neutron in ${}_{59}\text{Co}^{27}$ and ${}_{108}\text{Ag}^{47}$.

Ans :

- (i) Number of protons in Co = 27
- (ii) Number of electrons in Co = 27
- (iii) Number of neutrons in Co = $59 - 27 = 32$
- (iv) Number of protons in Ag = 47
- (v) Number of electrons in Ag = 47
- (vi) Number of neutrons in Ag = $108 - 47 = 61$

106. Give difference between isotopes and isobars.

Ans :

	Isotopes	Isobars
1.	They are atoms of same element.	They are atoms of different elements.
2.	Have same atomic number.	Have different atomic number.
3.	Have different mass number.	Have same mass number.
4.	Have similar chemical properties.	Have different chemical properties.

107. Chlorine occurs in nature in two isotopic forms with masses 35u and 37u in the ratio of 3 : 1. What should be the mass of chlorine atom?

Ans :

$$35 \times \frac{75}{100} + 37 \times \frac{25}{100} = \frac{105}{4} + \frac{37}{4}$$

$$= \frac{142}{4} = 35.5\text{u}$$

108. An element ${}_{12}\text{X}^{24}$ loses two electrons to form a cation which combines with the anion of element ${}_{17}\text{Y}^{35}$ formed by gaining an electron.

- (i) Write the electronic configuration of element X.
- (ii) Write the electronic configuration of the anion of element Y.
- (iii) Write the formula for the compound formed by combination of X and Y.

Ans :

- (i) X = 2, 8, 2
- (ii) Y = 2, 8, 8
- (iii) XY_2

109. Elaborate the postulates put forward by E. Rutherford about the structure of atom based on the α -particle scattering experiment.

Ans :

- (i) Most of the space inside the atom is empty because most of the α -particles passed through

the gold foil without getting deflected.

- (ii) Very few particles are deflected from their path, indicating that positive charge of the atom occupies very little space.
- (iii) A very small fraction of particles was deflected by 180° , indicating that all the positive charge and mass of the gold atom were concentrated in a small volume within the atom.

110. Give reasons :

- (i) Mass number of an atom excludes the mass of an electron.
- (ii) Nucleus of an atom is charged.
- (iii) Alpha-particle scattering experiment was possible by using gold foil only and not by foil of any other metal.

Ans :

- (i) Mass number of an atom excludes the mass of an electron because electrons have negligible mass in comparison to protons and neutrons.
- (ii) Nucleus of an atom consists of protons and neutrons. Protons are positively charged particles. So, the nucleus of an atom is charged.
- (iii) Because an extremely thin film was required for the experiment and it was only possible by using gold, as gold is a highly malleable metal.

111. Give the postulates of Dalton's atomic theory.

Ans :

- (i) Every element is composed of extremely small particles called atoms.
- (ii) Atoms of a given element are identical, both in mass and properties. Different chemical elements have different kinds of atoms; in particular, their atoms have different masses.
- (iii) Atoms cannot be created, destroyed or transformed into atoms of other elements.
- (iv) Compounds are formed when atoms of different elements combine with each other in small whole number ratios.
- (v) The relative number and kinds of atoms in a given compound are constant.

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