# 5. Inside the Atom

## Practice Questions-

### Q 1) Write the answers of the following questions.

**1. Explain the Niels Bohr's composition of atom.**

**1. The Nobel Prize winner Niels Bohr has shown important changes in atomic theoryof Rutherford. 2. There are positively charged protons in the nucleus of atom, the negatively charged electrons are revolving in the concentric circular orbits. 3. The electron can travel from one shell to another shell but they cannot move between the space of two shells spirally. 4. The electron must absorb or emit some specific energy for moving from one cell to another. 5. Niels Bohr gave '$2n^2$' formula to obtain the maximum number of electrons a shell can contain. The K, L, M, N… corresponding names are given to the shell numbers (n. 1, 2, 3, 4.**

**∴ The maximum number of electrons in shell = $2n^2$**

**n = shell number**

**K (1) = 2, L (2) = 8, M (3) = 18, N (4) = 32**

**These shells are divided into subshells.**

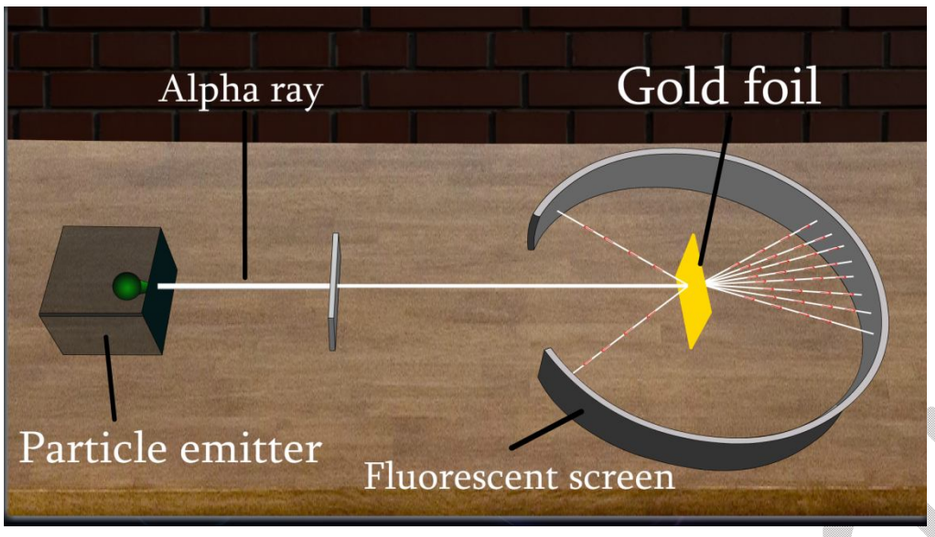
**2. Explain the Rutherford's nuclear model of atom with the help of experiment.**

**Ans: 1. Rutherford obtained the nuclear information with the help of gold foil in the year 1911.**

**2. Rutherford used a very thin gold foil (0.00004 cm. and bombarded it** with positively charged α **- particles emitted by a radioactive element.**

**3.** The α **– particles means the nucleus of helium. He fitted the** fluorescent screen around the gold foil and made the fixed path of α **- particles.**

**4. To stop the spread of radiation taking place from radioactive element, it was placed in lead box.**




## Diagram

## Experimental observation:

**1. A large number of the α – particles went straight through the gold foil.**

**2. Some α – particles path was changed in small amount.**

**3. Some α – particles path was changed in large amount.**

**4. Very few α – particles bounced back in the opposite direction.**

## Experiment result:

**1. All positive charge of atom and entire mass of the atom is concentrated in the nucleus. He named this centre as a nucleus.**

**2. The electrons revolve around the nucleus in the circular shells. The atom structure is similar to solar system.**

**3. There are also neutral particles in the atom other than proton and neutron.**

**3. Write the uses of radioactive isotopes in industrial field.**

**Ans: 1. Radiography – The cracks or gaps in iron fitting work can be found or detected using gamma rays. For this, cobalt – 60, iridium – 192 isotopes are used in radiography camera. In addition, these techniques are used to find fault in metalwork.**

**2. To measure thickness, density, level of metals –**

**1. It is necessary to maintain required thickness of the substances like aluminium, plastic, iron with less or more thickness while producing them. 2. In production, there is radioactive liquid on one side and radioactive measurement device on another side. With the help of this technique, the items in packing can also be checked.**

**3. The brightest colour and radioactive bright colour –**

**1. Earlier, the mixture of radioactive substances such as radium, promethium, and tritium were used to appear the clock brace, special objects in the dark. 2. Krypton – 85 in HID (High Intensity Discharge. lamp and promethium – 147 isotope in X-ray unit as a source of beta rays are used.4. Use in ceramic items – bright colours are used in tiles, utensils, plates, utensils in kitchen made of ceramic.**

**4. Write the importance of radioactive elements in agriculture field.**

**Ans: 1. For the rapid growth of plants and for business purpose, changes can be made in the genes and chromosomes which provide properties to seeds using radiation. 2. The radioactive isotope cobalt – 60 is used in the study of food. 3. The gamma rays radiated from cobalt – 60 are bombarded on the onions and potatoes so that they should not germinate.4. Strontium – 90 is used as tracer in the research of various crops.**

**5. What are uses of radioactive elements in medicine field?**

**Ans: 1. Polycythaemia – In this disease the amount of red blood cells in blood increases. On this, Phosphorous – 32 is used for its treatment.**

**2. Bone cancer – strontium – 89, strontium – 90 and radium – 223 are used for treatment.**

**3. Hyperthyroidism – Iodine – 123 is used for the treatment of this disease.**

**4. To identify tumour – Boron – 10, Iodine – 131, Cobalt – 60 are used for treatment of brain tumour and Arsenic – 74 is used to identify the small tumour in body.**

**5. Chromium – 51 is used to measure the protein decay in intestine and to guide the red cells.**

**6. Rhenium – 188 is used for the generation of beta rays in balloon which is used for angioplasty.**

**7. Selenium – 75 is used to study digestive disorders, Iron – 59 is used to diagnose the anaemia disease.**

**6. State types of Electronic Configuration.**

**Ans: 1. Stable Electronic Configuration**

**The elements whose outermost shell has two or eight electrons, the electronic configuration of that elements is called as Stable Electronic Configuration.**

**Ex.**

| Element | Electronic Configuration | |
|---|---|---|
| 1. Helium | 2 | Duplet |
| 2. Neon | 2, 8 | |
| 3. Argon | 2, 8, 8 | |
| 4. Krypton | 2, 8, 18, 8 | Octet |
| 5. Xenon | 2, 8, 18, 18, 8 | |

**1. The state of having two electrons in outermost shell is called as duplet state. 2. The state of having eight electrons in outermost shell is called as octet state.**

**2. Unstable Electronic Configuration – The elements whose outermost shell has electrons from 1 to 7, the electronic configuration of that elements is called as Unstable Electronic Configuration.**

**Ex.**

| Element | Electronic configuration |
|---|---|
| 1. Sodium | 2, 8, 1 |
| 2. Aluminium | 2, 8, 3 |

**7. What is valency, valence shell and valence electron? Write their types.**

**Ans: Valency – "The number of electrons given or taken to complete the octet state in the outermost shell of element is called as valency of that element." Valency is basic chemical property of an atom.**

**Valence shell – The electrons from last means outermost shellof atom takes part in chemical reaction. Therefore, the outermost shell is called valence shell.**

**Valence electrons – The electrons in the outermost shell of an atom is called as valence electrons. The valency of an element is decided by the number of valence electrons.**

**Ex.**

| Element | Electronic configuration | Valency |
|---|---|---|
| 1. Hydrogen | 1 | 1 |
| 2. Helium | 2 | 0 |
| 3. Sodium | 2, 8, 1 | 1 |
| 4. Magnesium | 2, 8, 2 | 2, 8, 2 |

**8. Write notes.**

**1. Features of Dalton's theory.**

**Ans: 1. Matter is made of atoms.2. Atoms are indivisible and indestructible. 3. Atom is the indivisible particle of matter/ substance.4. The atom cannot be prepared, cannot be partitioned or cannot be destroyed. 5. All atoms of an element are alike.6. Different element have different atom with different mass.**

**9. Write the features of Rutherford's nuclear model of atom.**

**Ans; 1. There is a positively charged nucleus at centre of an atom.2. Almost the entire mass of the atom is concentrated in the nucleus. 3. The electrons revolve around the nucleus. 4. The total negative charge on all the electron is equal to the positive charge on the nucleus. As the opposite charges are balanced the atom is electrically neutral.**

**5. There is an empty space between the revolving electron and the atomic nucleus.**

**10. Write the reasons.**

**1. The valency of inert element is zero.**

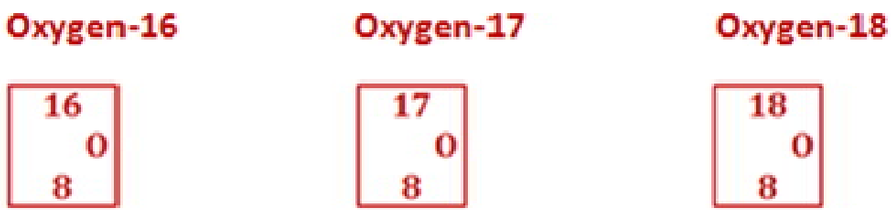
**Ans: 1. The duplet and octet state of inert element is completely filed. 2. These elements do not combine with the atoms of any other element. Therefore, the valency of inert element is zero.**

**2. The valency of hydrogen is one.**

**Ans: 1. There is one electron in hydrogen. 2. This one electron is present in the outermost shell of hydrogen. 3. Hydrogen needs one electron to complete the duplet state. Therefore, the valency of hydrogen is one.**

**11. Write the use of isotopes of oxygen.**

**Ans: Diagram**




**Uses: 1. Oxygen – 16 isotopes are most widely found in the nature and are used by all living organisms for respiration and combustion process. 2. Oxygen – 16, 17 and 18 isotopes are stable while isotopes in between 12 to 24 are radioactive and unstable. 3. Oxygen – 17 isotopes are formed from the combustion of hydrogen and helium. 4. Oxygen – 18 isotope is formed by the combination of the nucleus of nitrogen and helium. 5. 99.8% of Oxygen – 16, 0.04% of Oxygen – 17 and 0.2% of Oxygen – 18 is found in the atmosphere of the earth.**

**12. Write the information on Heavy water.**

**Ans: Hydrogen has three isotopes. They have separate names hydrogen, deuterium and tritium. The molecule formed by the combination of deuterium and oxygen is called as Heavy water.**

**Deuterium means there is neutron with a proton at the centre of the hydrogen. Therefore, its weight is more than normal hydrogen. Its symbol becomes $D_2O$ means deuterium oxide after combination with oxygen.**

**Property: 1. The properties of heavy water are different than the normal water $H_2O$. 2. The density of this water is more than normal water and the solubility of heavy water is less than normal water by 15%.**

**Uses: 1. The neutrons from uranium metal in nuclear reactor has high speed/ faster. The heavy water is used to decrease their speed. 2. Used as moderator and coolant in nuclear reactor. Heavy water is used in neutrino detector machine. 3. Heavy water is used to check metabolic**

rate in anatomy and biology and for the production of tritium and deuterium.

**Q 2) Identify the correlation.**

1. _____: Plum pudding model: : Rutherford: Nuclear model

Ans: Thomson

2. Proton: _____: : Electron: Negatively charged

Ans: Positively charged

3. A: Atomic mass number: : _____: Atomic number

Ans: Z

4. Proton: Nucleus: : _____: Shell

Ans: Electron

**Q 3) Write whether true or false.**

1. The number of protons and number of electrons in atom is not same.

Ans: False (The number of protons and number of electrons in atom is same)

2. The nucleus gets positive charge due to the proton.

Ans: True

3. The mass of neutron is more than the mass of proton.

Ans: False (The mass of neutron is same as the mass of proton)

4. Almost entire mass of the atom is concentrated in the nucleus.

Ans: True

**Q 4) State names of the following.**

1. Which elements are used as a controller?

Ans: Boron, Cadmium, Beryllium

2. Which are the subatomic particles in the elements?

Ans: Proton, Neutron, Electron

## Q 5) Answer the following in one sentence.

**1. What is a nuclear reactor?**

**Ans: Nuclear reactor is a machine that generates electricity on large scale by using atomic energy.**

**2. What are the basic properties of the atom?**

**Ans: Every atom has size and mass, are the basic properties of the atom.**

**3. What is the radius of atom?**

**Ans: The distance from centre point of the nucleus to outermost shell is called as the radius of atom.**

**4. What are nucleons?**

**Ans: The atomic nucleus includes positively charged protons and charged neutrons. These collectively are called as nucleons.**

**5. What is duplet state?**

**Ans: The state of having two electrons in outermost shell is called as a duplet state.**

**6. What is an octet state?**

**Ans: The state of having eight electrons in outermost shell is called as an octet state.**

**7. What are isotopes?**

**Ans: The atom of the same element having different mass number are called isotopes.**

**8. Why Thomson is called as atom obstructer scientist?**

**Ans: Thomson was first scientist to tell that atoms are still microscopic/ minute particles so he is called as atom obstructer.**

**9. How many and which shells are present in an atom?**

**Ans: There are mainly four shells of atom, which are K, L, M and N.**

**10. Who invented the neutron?**

**Ans: James Chadwick invented neutron.**