Exercise :4 A

1. What is the contribution of the following in Atomic structure.
a) Maharshi Kanada (b) Democritus?

Solution:

a) Maharshi Kanada given the idea of the smallest units of matter. According to him, matter consisted of indestructible minute particles called paramanus, which are now called as atoms. He also gave the concept of the molecule.

b) Democritus called the paramanu as atom which is derived from Greek word atomos meaning indivisible.

2. State Dalton's atomic theory.

Solution:

Dalton atomic theory states that atoms are indivisible particles which are the fundamental building blocks of matter. He states that the existence of different types of matter are due to different types of atoms.

- Main postulates of Dalton's atomic theory:
- Matter consists of very small and indivisible particles called atoms.
- Atoms can neither be created nor be destroyed.
- The atoms of an element are alike in all respects, but they differ from the atoms of other elements.
- Atoms of an element combine in small numbers to form molecules.
- Atoms of one element combine with atoms of another element in a simple ratio to form molecules of compounds.
- Atoms are the smallest units of matter which can take part in a chemical reaction.

3. What is an α (alpha) particle?

Solution:

A doubly charged helium ion (He^{2+}) containing two protons and two neutrons is called an α-particle. α (alpha) particle is formed by removing two electrons from the helium atom.

4. What are cathode rays? How are these rays formed?

Solution:

Rays that originate from the negative plate(Cathode) and travels towards anode are called cathode rays.

Formation of cathode rays

When a high voltage charge from an induction coil is applied to tubes filled with gases at very low pressure (0.01 mm of mercury), the gases become good conductors of electricity and begin to flow in the form of rays which are cathode rays.

5. What is the nature of charge on (i) cathode rays (ii) anode rays

Solution:

Cathode rays are negatively charged as they are made of negatively charged particles.

Anode rays are positively charged as they are made of positively charged particles.

6. How are X-rays produced?

Solution:

X- rays are produced when a beam of cathode rays is made to fall upon hard metallic targets like tungsten.

7. Why -were.anode rays also called as 'canal rays'?

Solution:

In discharge tube experiment set of rays travelling in a direction opposite to that of the cathode rays were found. These were called canal rays because they passed through the holes or canals in the cathode.

8. How do cathode rays differ from anode rays?

Solution:

Cathode rays	**Anode rays**
They travel from the cathode to the anode.	They travel from the anode to the cathode.
They are made of negatively charged particles.	They are made of positively charged particles.
They produce a greenish-yellow fluorescence on a soda-glass screen.	They produce fluorescence on a zinc sulphide screen.
They are inflected towards a positive field and deflected towards a negative field.	They are deflected by electric and magnetic fields towards positive fields.

9. State one observation which shows that atom is not indivisible.

Solution:

Chadwick discovered neutral particles present in an atom by bombarding light nuclei like beryllium with alpha particles. This observation shows that the atom is divisible.

10. a) Name an element which does not contain neutron.
b) If an atom contains one electron and one proton, will it carry any charge or not?

Solution:

a) Hydrogen does not contain neutron.
b) If an atom contains one electron and one proton, it will be neutral in charge.

11. On the basis of Thomson's model of an atom, explain how an atom as a whole is neutral.

Solution:

According to Thomson's atomic model, an atom is made of positively charged substances in the form of a sphere. Electrons are embedded into this sphere, and the total positive charge of the sphere is equal to the total negative charge of electrons, and hence, the atom remained electrically neutral.

12. Which sub-atomic particle was discovered by

(a) Thomson (b) Goldstein (c) Chadwick.

Solution:

a. Thomson discovered electrons.
b. Goldstein discovered protons.
c. Chadwick discovered neutrons.

13, Name the sub-atomic particle whose charge is
(a) +1 (b) —1 (c) 0. 14.

Solution:

a. Proton
b. Electron
c. Neutron

14. (a) Which metal did Rutherford select for his a particle scattering experiment and why ?
(b) What do you think would be the observation of a-particle scattering experiment is carried out on
(i) heavy nucleus like platinum (ii) light nuclei like lithium.

Solution:

a) Rutherford used gold for his scattering experiment because gold is the most malleable metal and he wanted the thinnest layer as possible.

b) i) If metal with a heavy nucleus is used for a-particle scattering experiment observation would be same as the original experiment.

ii) If light metal like lithium is used for a-particle scattering experiment, then massive alpha particles will push the nucleus and may not be deflected back.

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

Solution:

Based on Rutherford's model of an atom, which subatomic particle is present in the nucleus is **proton.**

16. Which part of atom was discovered by Rutherford.

Solution:

Rutherford discovered the **nucleus.**

17. How was it shown that atom has empty space ?

Solution:

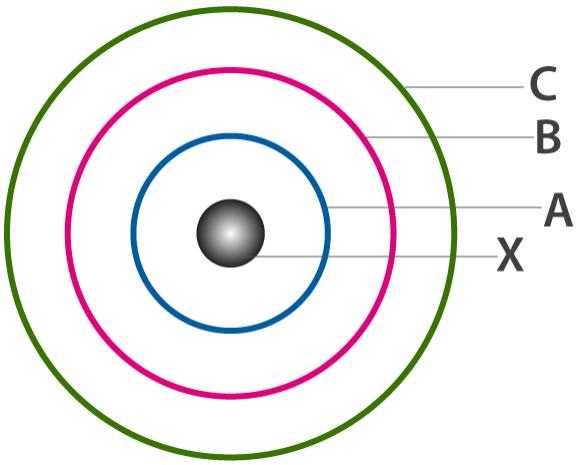
Rutherford performed an experiment by allowing a stream of alpha particles to pass through a very thin gold foil. He observed that alpha particles pass through the metal foil without deviating from their path. This shows that an atom contains a large empty space called nuclear space.

18. State one major drawback of Rutherford's model.

Solution:

The comparison of electrons with planets in the solar system is the main drawback of Rutherford's model. Thus Rutherford's model failed to explain the stability of an atom.

19. In the figure given alongside :
(a) Name the shells denoted by A, B and C. Which A shell has least energy ?
(b) Name X and state the charge on it.
(c) The above sketch is of model of an atom.



Solution:

a) A is for K shell or I shell.
B is for L shell or II shell.
C is for M shell or III shell.
Shell K has a minimum amount of energy.

b) X is a nucleus, it is positively charged.

c) The above figure is of Bohr model of an atom

20. Give the postulates of Bohr's atomic model.

Solution:

Postulates of Bohr's atomic model are as follows

i) The electrons revolving around the nucleus are confined to certain fixed orbits called shells or energy levels, each of which is associated with a fixed amount of energy.

ii) Electron neither loses nor gain electron while moving around the nucleus.

iii) An electron revolving in a particular orbit, on gaining a certain amount of energy, jumps to the next orbit and

iv) vice verse.