

Class 9 CBSE Test paper Solved Chapter 3: Structure of atoms -3

1. Q. The description of atomic particles of two elements X and Y is given below

	Protons	neutrons	electrons
X	8	8	8
Y	8	9	8

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|---|---|
| (i) What is the atomic number of Y
(iii) What is the relation between X and Y
(v) Write the electronic configuration of X | (ii) What is the mass number of X
(iv) Which element/elements do they represent
(vi) Write the cation/anion formed by the element |
|---|---|

Ans:

- | | |
|----------------------------|---------------------------------------|
| (i) Atomic number of y = 8 | (ii) Mass number of x = 16 |
| (iii) x and y are isotopes | (iv) x and y represent - oxygen |
| (v) 2, 8, 6 | (vi) It will form an anion - O^{2-} |

2. Q. Which of the following are isotopes and which are isobars?

Argon, Protium, Calcium, Deuterium.

Explain why the isotopes have similar chemical properties but they differ in physical properties?

Ans: Isotopes - Protium, Diuterium

Isobars - Argon and calcium

Since isotopes have identical electronic configuration containing same number of valence electrons they have similar chemical properties.

Since the masses are slightly different the physical properties (density, melting pt, boiling pt, etc) are different

3. Q. (a) Explain Bohr and Bury rules for distribution of electrons into different shells.

(b) Draw the electronic structure of element X with atomic number 17 and element Y with atomic number 16 ?

Ans: (a) Bohr Bury Rules

(i) The maximum no. of electrons present in a shell is given by the formula $2n^2$ (where n is shell no.)

(ii) The maximum no. of electrons that can be accommodated in the outer most orbit is 8. (iii)

Electron are not accommodated in a given shell, unless the inner shells are filled :

(b) (i) X at No. 17 E.C.= 2 , 8, 7 (ii) Y At No. 16 E.C = 2, 8, 6

4. Q. The atomic number and mass number of an element are 16 and 32 respectively. Find the number of protons, electrons and neutrons in it. State its valency. Is this element a metal or a non – metal. Justify your answer.

Ans: (a) No. of protons = 16

No. of electrons = 16

No. of neutrons = 16

(b) Electronic configuration 2, 8, 6 So, Valency = $8-6 = 2$

(c) It is a non metal because it has 6 valence electrons

5. Q. (a) The composition of nuclei of two atomic species X and Y are given below

	X	Y
Protons	17	17
Neutrons	18	20

Find the mass number of X and Y. State the relationship between X and Y (b) The K and L shells of an atom are completely filled. Find the number of electrons present in it. State the name of this element.

Ans: (a) Mass number of X = 35 Mass number of Y = 37

Relationship between the two species since number of protons is same (same atomic number) they are isotopes of same element

(b) Numbers of electrons = 10 Name of the element = Neon [k L ----> 2 8]

6. Q. State the three rules proposed by Bohr and Bury regarding distribution of electrons indifferent orbits of atoms.

Ans. The Bohr-Bury rules regarding the distribution of electrons in different orbits of atoms are:

(i) The maximum number of electrons present in a shell is given by the formula $2n^2$, where 'n' is the orbit number or energy level index 1, 2, 3...

Hence maximum number of electrons in the first orbit or K-shell will be = $2 \times 1^2 = 2$, second orbit or L-shell will be = $2 \times 2^2 = 8$, and so on.

(ii) The maximum number of electrons that can be accommodated in the outermost orbit is 8.

(iii) Electrons are not accommodated in a given shell, unless the inner shells are filled up.

7. Q.(i) State the limitations of J.J. Thomson's model of an atom. (ii) Define valency by taking the examples of magnesium (At. no = 12) and oxygen (At. no=8) (iii) S^{-2} has completely filled K,L and M shells. Find its atomic number.

Ans: (i) The results of experiments carried out by other scientists could not be explained by J.J. Thomson's model of atom.

(ii) The combining capacity of an element is called its valency. Magnesium has atomic number 12 and electronic configuration is 2,8,2. It can lose 2 electrons to get octet configuration thus its valency is 2.

Oxygen has atomic number 8 and its electronic configuration is 2, 6. It can gain 2 electrons to get octet configuration thus its valency is $8-6=2$

(iii) The atomic number is equal to number of protons thus atomic number of S^{2-} ion is 16.

8. Q. State one use each of an isotope of (i) uranium , (ii) iodine.

Ans: Isotope of uranium is used in nuclear reactions and Isotope of iodine is used in treatment of goiter

9. Q. 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 ${}^1\text{H}_1$

10. Q. What is meant by valency? How will you find the valency of chlorine and magnesium?

Ans. Valency is the combining capacity of an element.

Chlorine ($Z = 17$) has the electronic configuration 2, 8, 7. Since the number of electrons in the outermost shell is close to full capacity, therefore it is easier for chlorine to gain one electron rather than lose seven electrons to achieve an octet. Therefore valency is determined by subtracting seven electrons from the octet. This gives a valency of one for chlorine.

Similarly for magnesium ($Z = 12$) with electronic configuration 2, 8, 2 valency is 2.

11. Q. (i) Why is an alpha particle called a helium nuclei? (ii) What is the charge on the above mentioned particle?

Ans. (i) An α -particle carries two units of positive charge and four units of mass just like a helium nuclei which contains two protons and two neutrons. (ii) The charge on an alpha particle is +2.

12. Q. Why is Thomson's model of an atom compared with a watermelon?

Ans. In the Thomson's model of an atom, the negative charges (or electrons) are spread in a sphere of positive charge just like the seeds are spread inside a watermelon