CBSE Test Paper 03

Chapter 04 Structure of Atom

1. There are 14 protons and 13 neutrons in the nucleus of an element. What is its mass number? **(1)**
   a. 29
   b. 27
   c. 13
   d. 17
2. Out of electron, positron, alpha particle and proton, which particle is regarded as the universal particle? **(1)**
   a. Alpha particle
   b. Positron
   c. Proton
   d. Electron
3. Which of the following statements is incorrect? **(1)**
   a. ${}^{2}_{1}H$ is used to determine the age of old samples of water and wine.
   b. Co-60 is used in treatment of cancer.
   c. I-132 is used in thyroid scan and treatment of goiter.
   d. C-14 is used to determine the age of old samples of living organisms.
4. How many times is the radius of extra nuclear portion more than that of the nucleus of an atom? **(1)**
   a. Five times
   b. 3 times
   c. 2 times
   d. 10 times
5. Atomic number of an element during a chemical reaction**: (1)**
   a. Either increase or decrease
   b. Decreases
   c. Increases
   d. Remains constant
6. Does the atomic number of the element change when its atom gets converted into

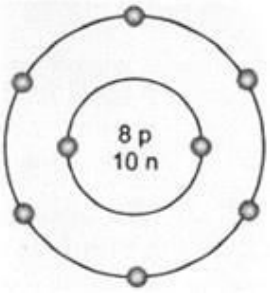
cation and anion? **(1)**

7. If an atom contains one electron and one proton, will it carry any charge or not? **(1)**
8. What is relative mass and charge of an electron? **(1)**
9. State Mendeleev's periodic law. **(1)**
10. How many times is radius of extra nuclear portion more than that of the nucleus of an atom? **(1)**
11. Do isobars have also identical chemical characteristics like isotopes? **(3)**
12. How will you find the valency of chlorine, sulphur and magnesium? **(3)**
13. List any three distinguishing features between the models of an atom proposed by J.J. Thomson and Ernest Rutherford. **(3)**
14.

Atomic number	Mass number	Number of neutrons	Number of protons	Number of electrons	Name of the atomic species
9	-	10	-	-	-
16	32	-	-	-	Sulphur
-	24	-	12	-	-
-	2	-	1	-	-
-	1	0	1	0	-

(5)

15. The given figure depicts the atomic structure of an atom of an element 'X'. Write the following information about the element 'X'. **(5)**



a. Atomic number of 'X'
b. Atomic mass of 'X'
c. Valence electrons
d. Valency of 'X'
e. 'X' should be metal or non-metal.

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Answers

1. b. 27

   Explanation: The mass number (A) of an atom is equal to the sum of the number of protons and neutrons present in the nucleus of the atom.
   So, the mass number (A) of the given element = number of protons + number of neutrons = 14 +13 = 27 u

2. d. Electron

   Explanation: Electron is considered as a universal particle as it is present in all atoms. It also provides the chemical properties to the atoms.

3. a. ${}_{1}^{2}H$ is used to determine the age of old samples of water and wine.

   Explanation: An isotope of iodine is used in treatment of goitre.
   Carbon – 14 is used in carbon dating.
   The age of wine can be determined by measuring the trace amount of radioactive tritium, 3H, present in a sample.
   So given statement is incorrect.

4. a. Five times

   Explanation: The nuclear region is a small portion of the atom as compared to the space inside an atom.

5. d. Remains constant

   Explanation: Atomic number (number of protons) of an element remains constant during a chemical reaction.

6. No, the atomic number of the element remains the same.
   The size of an anion is larger than the parent atom. The electrons decrease due to the addition of an electron. A cation is smaller than the parent atom. The electrons increase due to the removal of an electron.

7. An electron is a negatively charged particle, whereas a proton is a positively charged particle. The magnitude of their charges is equal. Therefore, an atom containing one

electron and one proton will not carry any charge. Thus, it will be a neutral atom.

8. The mass of electron is about $\frac{1}{1840}$ of the mass of hydrogen. The absolute mass of an electron is 9×10^{-28} gram. The absolute charge on an electron is coulomb of negative charge which is smallest, carried by any particle. Thus, it is taken as unit of negative charge.

9. According to **Mendeleev's periodic law**, the physical and chemical properties of elements are a periodic function of their atomic weight (atomic mass).

10. The nucleus of an atom has diameter of 10^{-14} to 10^{-15} meters(m). The extranuclear space where its electrons are found is a much larger volume with a diameter of approximately 10^{-10}m.
    So, Radius of extra nuclear portion is nearly five times more as compared to the nucleus.

11. No, these are not identical because the isobars have different atomic numbers as well as different electronic configurations. Isotope compound have same number of electrons. Isotopes have same chemical properties as the number of electrons present in them are same because only electrons participate in chemical reactions. While isobar compounds have same mass number but different atomic number and chemical properties depend upon number of electrons so isobars have different chemical properties.

12. The electrons present in the outermost shell of an atom are known as the valence electrons. Valence electrons determine the valency (combining capacity) of that atom.
    The atomic number of chlorine is 17. The electronic configuration is 2, 8, 7.
    So the number of valence electrons for chlorine is 7 and it needs 1 more electron to complete its octet (8 electrons in its outermost shell).
    Therefore, its valency is one (8 - 7).
    The atomic number of sulphur is 16. The electronic configuration is 2, 8, 6.
    So the number of valence electrons for sulphur is 6 and it needs 2 more electrons to complete its octet (8 electrons in its outermost shell).
    Therefore, its valency is two (8 - 6).
    The atomic number of magnesium is 12. The electronic configuration is 2, 8, 2.

It is easier for magnesium to give away its two valence electrons rather than try to acquire 6 more electrons to complete its octet.
Therefore its valency is two.

13.

J. J.Thomson Model of Atom	Rutherford's Model of Atom
1. Positive charge forms a kernel.	1. Nucleus (dense positive charge) is in the centre of the atom.
2. Electrons are present (embedded in positive charge) throughout the atom.	2. Electrons revolve around the nucleus in orbits.
3. No space inside the atom is empty. Thomson likened an atom to a pudding or a watermelon.	3. According to Rutherford, most of the space inside the atom is empty.

14.

Atomic number	Mass number	Number of neutrons	Number of protons	Number of electrons	Name of the atomic species
9	19	10	9	9	Fluorine
16	32	16	16	16	Sulphur
12	24	12	12	12	Magnesium
1	2	1	1	1	Deuterium (Isotope of Hydrogen)
1	1	0	1	0	Hydrogen ion

Mass number of atomic species (A) = Number of protons (Z) + Number of neutrons
Number of neutrons = Mass number (A) - Atomic number (Z)
Atomic number (Z) = Number of protons = Number of electrons
When the number of protons is equal to the number of electrons, the atomic species is a neutral atom.
When the number of protons is not equal to the number of electrons, the atomic species is an ion (either cation or anion).

15. a. Atomic number of 'X' = Number of protons in 'X' = 8

b. Atomic mass of 'X' = Number of protons in 'X' + Number of neutrons in 'X' = 8 + 10 = 18 u
c. Valence electrons = Electrons in outermost shell = 6
d. Valency = Number of valence electrons (for 4 or lesser valence electrons); Valency = 8 - Number of valence electrons (for more than 4 valence electrons)
   Therefore, valency of 'X' = 8 - 6 = 2
e. 'X' should be non-metal because there are six valence electrons, hence it will tend to gain two more electrons to complete its outermost shell in order to achieve a noble gas configuration.