WORKSHEET 2

CHAPTER 4 – ATOMIC STRUCTURE AND CHEMICAL BONDING

A. Tick (✓) the correct option.

1. The maximum number of electrons in an L-shell accommodate are
   a. 2. b. 18. c. 32. d. 8.
2. The outermost shell of an atom cannot have more than
   a. 2 electrons. b. 8 electrons. c. 18 electrons. d. 32 electrons.
3. An atom with electronic configuration 2, 8 will have
   a. 8 neutrons. b. 10 protons. c. 8 electrons. d. 2 protons.
4. The element having 20 protons is
   a. Argon. b. Potassium. c. Calcium. d. Fluorine.
5. The bond presents in an oxygen molecule is
   a. single covalent bond. b. double covalent bond.
   c. triple covalent bond. d. ionic bond.

B. Fill in the blanks from the choices given within the brackets.

1. _____ (Eugen Goldstein/JJ Thomson) discovered electron.
2. Number of valence electrons in chloride ion are _____ (7/8)
3. Atoms take part in chemical reactions because they want to _____ (share their electrons/complete their octet)
4. The extranuclear region consists of _____ (valence shell/electrons)
5. The number of electrons lost or gained by the atom is called its _____ (electrovalency/covalency)

C. State whether the given statements are correct or incorrect. If incorrect, rewrite those statements.

1. Atomic number is equal to the number of neutrons.
2. Helium is the only noble gas containing two electrons in its valence shell.
3. An atom always acquires stable electronic configuration of the nearest noble gas by losing electrons from the valence shell.
4. Non-metals form cations by accepting electrons in their valence shell.
5. A proton is 1/1837 times heavier than electron.

Name: ..... Teacher's signature: .....

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D. Give reasons for the following.

1. Argon is a noble gas.
2. Isotopes have different mass numbers but still they exhibit similar chemical properties.
3. The shells in which electrons revolve are also called energy levels.
4. The atomic number of an element accounts for the number of positive charges in the nucleus.
5. An ionic bond is formed between sodium and chlorine.

E. Answer the following.

1. What is the significance of the number of protons found in the atoms of each of the different elements?
2. a. What would be the reason for an element to have atoms with differing mass numbers?
   b. Differentiate between
      i. nucleus and nucleons
      ii. octet and duplet.
3. a. State why are noble gases unreactive while atoms of elements other than noble gases are chemically reactive?
   b. From the following atoms, select the isotopes and isobars: ${}^{238}_{92}A$, ${}^{234}_{90}B$, ${}^{234}_{92}C$, ${}^{224}_{91}D$, ${}^{228}_{93}E$
4. Complete the following table.

Element	Mass no.	Atomic no.	Neutrons	Protons	Electrons	Electronic configuration
Carbon	12	–	–	–	6	–
Aluminium	–	13	14	–	–	–
Fluorine	19	–	–	–	–	2, 7
Argon	–	–	22	18	–	–
Helium	4	–	–	–	2	–
Sodium	23	11	–	–	–	–

5. a. Draw a diagram to show the arrangement of electrons in sodium $\left({}^{23}_{11}Na\right)$ and fluorine $\left({}^{19}_{9}F\right)$ atom.
   b. What kind of bonding exists in the fluorine molecule?
   c. When sodium and fluorine combine, electron-transfer takes place and ions are formed. What kind of bonding exists between sodium and fluorine?
   d. Write down one similarity and one difference between sodium ion and fluoride ion.

ANSWERS

WORKSHEET 2

A. Tick (✓) the correct option.

1. d
2. b
3. b
4. c
5. b

B. Fill in the blanks from the choices given within the brackets.

1. JJ Thomson
2. 8
3. complete their octet
4. electrons
5. electrovalency

C. State whether the given are statements are correct or incorrect. If incorrect, rewrite those statements.

1. Incorrect

   Atomic number is equal to the number of protons.

2. Correct
3. Incorrect

   An atom always acquires stable electronic configuration of the nearest noble gas either by gaining, losing or sharing electrons from the valence shell.

4. Incorrect

   Non-metals form anions by accepting electrons in their valence shell.

5. Correct

D. Give reasons for the following:

1. Argon is a noble gas because its outermost shell contains octet of electrons.
2. Isotopes of an element have the same number of valence electrons and therefore, exhibit similar chemical properties.
3. Electrons revolve around the nucleus in fixed circular paths called orbits or shells. Each shell is associated with a certain amount of energy called energy level.
4. The atomic number of an element is equal to the number of protons present in the atom of an element. Since, protons are the only positively charged particles present in the nucleus of an atom, therefore, atomic number accounts for the number of positive charges in the nucleus.
5. Ionic bond is formed between a metal and a non-metal. Since, sodium is a metal and chlorine is a non-metal, therefore, the bond formed between them is ionic bond.

E. Answer the following.

1. The number of protons found in the nucleus of atoms of each of the different elements is called atomic number. This atomic number determines the positive charge of the nucleus in an atom.
2. a. The different mass numbers are due to the atoms having different number of neutrons in the nucleus as the number of protons remaining constant for atoms of a particular element.

   b. i.

Nucleus	Nucleons
Nucleus is the positively charged core consisting of protons and neutrons present at the centre of an atom.	Protons and neutrons present in the nucleus of an atom are collectively called nucleons.

ii.

Octet	Duplet
The arrangement of eight electrons in the valence shell of an atom is called octet.	When the atom has just one shell, i.e. *K*-shell, the arrangement of only two electrons in that *K*-shell or one shell is called **duplet.**

3. **a.** Noble gases are the elements which have eight electrons in their outermost shell and therefore, such elements are said to be stable. Hence, such elements do not take part in a chemical reaction. Thus, noble gases are unreactive. However, all other elements do not have arrangement like noble gases. They can donate/accept/share electrons from their valence shell and hence, are chemically active.

b. Isotopes (pair of elements with same atomic number but different mass numbers):

$$^{238}_{92}\mathrm{A} \text{ and } ^{234}_{92}\mathrm{C}$$

Isobars (pair of elements with same mass number):

$$^{234}_{90}\mathrm{B} \text{ and } ^{234}_{92}\mathrm{C}$$

4. Complete the following table.

Element	Mass No.	At No.	Neutrons	Protons	Electrons	Electronic configuration *K*, *L*, *M*
Carbon	12	6	6	6	6	2, 4
Aluminium	27	13	14	13	13	2, 8, 3
Fluorine	19	9	10	9	9	2, 7
Argon	40	18	22	18	18	2, 8, 8
Helium	4	2	2	2	2	2
Sodium	23	11	12	11	11	2, 8, 1

5. **a.**

Sodium atom

Fluorine atom

b. Covalent bonding

c. Ionic bonding

d. **Similarity:** Both have electronic configuration of 2, 8, same as neon gas.

Difference: Both have different number of protons and neutrons.