Exercise :4 D

1• How do atoms attain noble gas configuration ?

Solution:

Atoms attain noble gas configuration either by obtaining or donating and sharing of electrons present in their outermost shell.

2• Define electrovalent bond.

Solution:

The chemical bond formed due to the electrostatic force of attraction between cation and anion is called an electrovalent bond.

3. Elements are classified as metals, non-metals, metalloids and inert gases. Which of them form electrovalent bond?

Solution:

Metals tend to lose electron; hence, they combine with nonmetals to form electrovalent bond.

4.(a) An atom X has three electrons more than the noble gas configuration. What type of ion will it form ?
(b) Write the formula of its (X) (i) sulphate (ii) nitrate (iii) phosphate (iv) carbonate (v) hydroxide.

Solution:

a) An atom X which has three electrons more than the noble gas configuration loses 3 electrons to form cation.

b) i. $X(SO_4)_3$
ii. $X(NO_3)_3$
iii. XPO_4
iv. $X_2(CO_3)_3$
v. $X(OH)_3$

5. Mention the basic tendency of an atom which makes it to combine with other atoms.

Solution:

Atoms tend to become stable and for them attaining stability is nothing but obtaining an electronic configuration of inert gas. Helium has two atoms in its outermost orbitals whereas other inert gases like neon, argon, krypton, xenon and radon have eight electrons (octet) in the outermost shell.

6. What type of compounds are usually formed between metals and non-metals and why?

Solution:

Metals and nonmetals usually combine to form an electrovalent bond because metallic elements which have 1, 2 or 3 valence electrons tend to lose electrons and non-metallic elements which have 5, 6 or 7 valence electrons tend to receive electron.

7. (a) In the formation of the compound XY_2 , an atom X gives one electron to each Y atom. What is the nature of bond in XY_2?
(b) Draw the orbit structure of this compound (XY_2).

a) Nature of bond in XY_2 is an ionic bond.

b) Orbit structure of XY_2

Solution:

8. An atom X has electronic configuration 2,8,7. It combines with Y having 1 electron in its outermost shell.
(a) What type of bond will be formed between X and Y?
(b) Write the formula of the compound formed.

Solution:

a) Ionic bond
b) XY

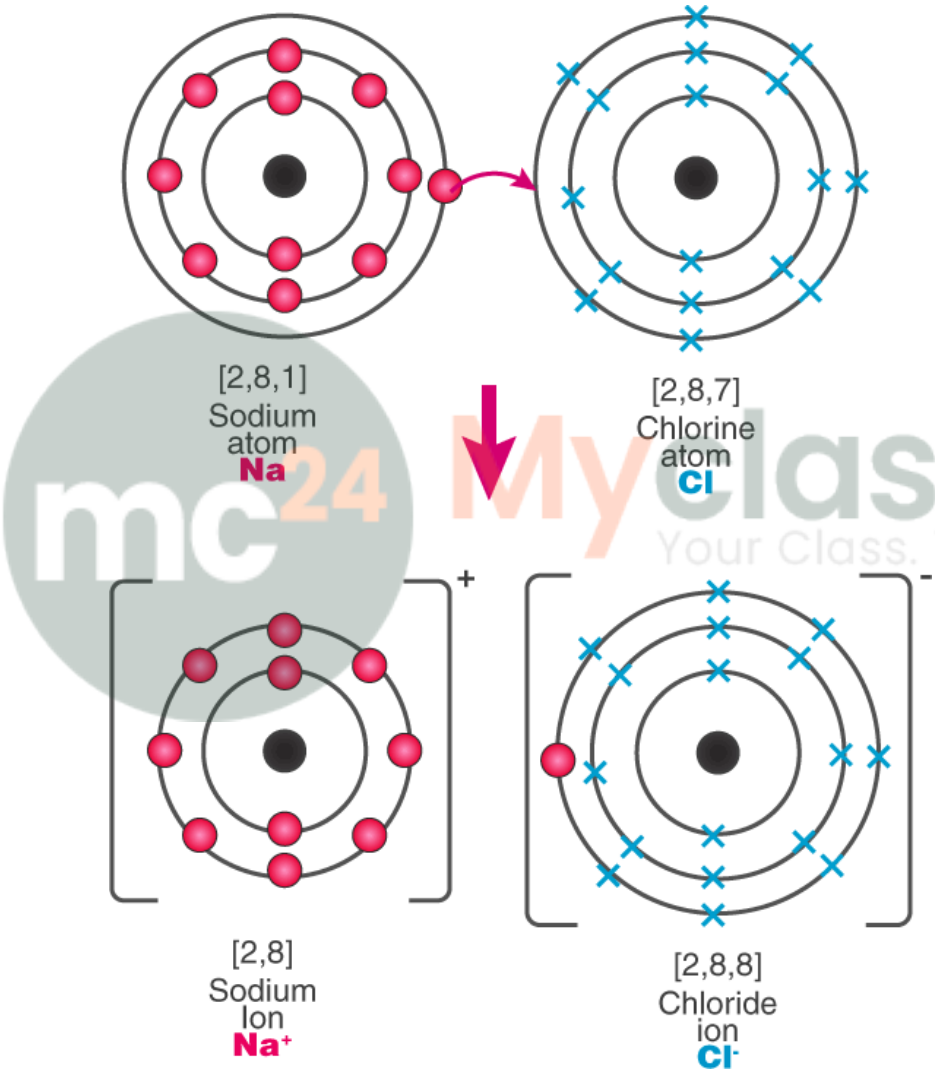
9. Draw orbit structure diagram of

a) Sodium chloride (NaCl) b) Calcium Oxide (CaO)

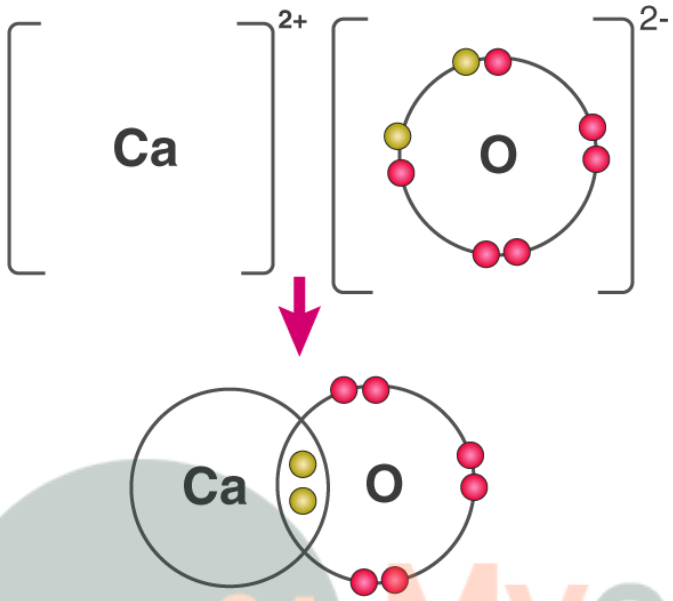
[Atomic numbers Na= 11, Ca=20, Cl= 17, O=8]

Solution:

a)



b)



10. Compare :
(a) sodium atom and sodium ion
(b) chlorine atom and chloride ion, with respect to
(i) atomic structure, (ii) electrical state

Solution:

Sodium atom	**Sodium ion**
Sodium atom is electrically neutral.	Sodium-ion is positively charged.
In sodium atom, there are 11 protons and 11 electrons, i.e. an equal number of protons and electrons.	In sodium-ion, there are 11 protons but 10 electrons, i.e. sodium ion contains a lesser number of electrons.
The sodium atom has only one electron in its valence shell.	Sodium-ion has 8 electrons in its valence shell.
Size of a sodium atom is larger than a sodium ion.	Size of a sodium ion is smaller than a sodium atom.

Chlorine atom	**Chloride ion**
In chlorine atom, there are 17 protons and 17 electrons	In chloride ion, there are 17 protons and 18 electrons
Chlorine atom is electrically neutral	Chloride atom is negatively charged
Chlorine atom is reactive.	Chloride ion is non-reactive
Chlorine is toxic, poisonous and used for bleaching and disinfectant.	Chloride is non-toxic and readily absorbed by plants

11. The electronic configuration of fluoride ion is the same as that of a neon atom. What is the difference between the two ?

Solution:

Fluoride ion is a negatively charged ion with 9 protons and 10 electrons whereas Neon atom is electrically neutral with 10 protons and 10 electrons.

12. (a) What do you understand by redox reactions?
(b) Explain oxidation and reduction in terms of loss or gain of electrons.

Solution:

a) In redox reaction, there is the transfer of electrons, which results in the bond formation. The electropositive atom undergoes oxidation, while the electronegative atom undergoes reduction.

b) Oxidation is a process in which an atom or ion looses electrons. The reduction is a process in which an atom or ion gains electrons.

13. Potassium (at No. 19) and chlorine (at No. 17) form a compound. Explain the formation of the compound on the basis of (a) oxidation (b) reduction (c) oxidising agent (d) reducing agent.

Solution:

$2K + Cl_2 \rightarrow 2KCl$

a) **Oxidation**: In the electronic concept, oxidation is a process in which an atom or ion loses an electron(s).
$K \rightarrow K^+ + e^-$

b) **Reduction:** In the electronic concept, reduction is a process in which an atom or ion accepts electron(s).
$Cl_2 + 2e^- \rightarrow 2Cl^-$

c) **Oxidising agent**
An oxidising agent oxidises other substances either by accepting electrons or by providing oxygen or an electronegative ion, or by removing hydrogen or an electropositive ion.
$Cl_2 + 2e^- \rightarrow 2Cl^-$

d) **Reducing agent**
A reducing agent reduces other substances either by providing electrons or by providing hydrogen or an electropositive ion, or by removing oxygen or an electronegative ion.
$K \rightarrow K^+ + e^-$