Exercise :4 E

1. a) Define covalent(molecular bond).

b) Give an example of covalend bond formed by
i) similar atoms b) dissimilar atoms

Solution:

a) The bond formed between two atoms by mutual sharing of one or more pair of electrons os called as covalent bonding.

b) i) Bond formed between two Cl atoms; Cl–Cl
ii) Bond formed between a hydrogen atom and chlorine atom; H–Cl

2. Covalent bonds can be single, double or triple covalent bond. How many electrons are shared in each? Give an example of each type.

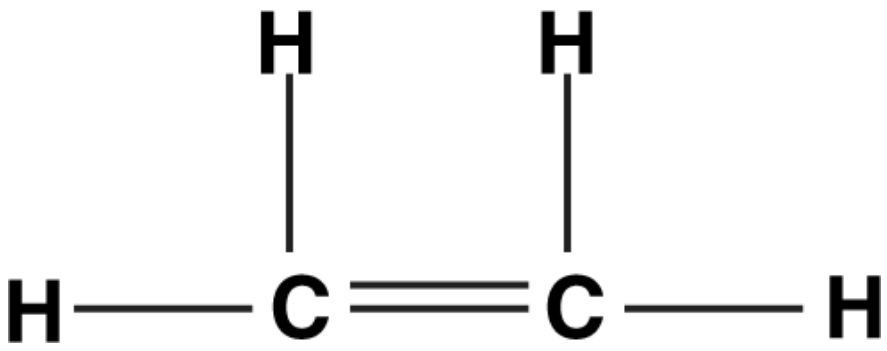
Solution:

A single covalent bond is formed by sharing of one pair of electrons between atoms; each atom contributes one electron. Ex: Formation of Hydrogen molecules
A double bond is formed by sharing two pairs of electrons between two atoms. Ex: Formation of Oxygen molecule
A triple bond is formed by sharing of three pairs of electrons between two atoms. Ex: Formation of N2 molecules

3. Show number of bonds in
(i) ethene molecule (ii) ethyne molecule

Solution:

i) Ethene molecule has one double covalent bond and four single covalent bonds.



ii) Ethyne molecule has one triple covalent bond and two single covalent bonds.

4. An element A has 1 electron in its first shell. It combines with clement B having 7 electrons in its third shell. What type of bond is formed ?

Solution:

Element A with 1 electron in its first shell is hydrogen, and element B with 7 electrons in its third shell is chlorine. So, a single covalent bond is formed between hydrogen and chlorine by sharing one pair of electrons.

5. Match the atomic numbers 4, 8, 10, 15 and 19 with each of the following
(a) Element which can form trivalent ion.
(b) An element with 4 shells.
(c) Element with 6 valence electrons.
(d) Element which does not form ion.

Solution:

Atomic number 15
Electronic configuration (15): 2,8,5
Atomic number 19
Electronic configuration (19): 2,8,8,1
Atomic number 8
Electronic configuration (8): 2,6
Atomic number 10
Electronic configuration (10): 2,8

6. If electrons are getting added to an element Y; then

(a) is Y getting oxidized or reduced ?
(b) what charge will Y migrate to during the process of electrolysis ?

Solution:

a) Electrons are getting added to element Y, so, it is getting reduced.
b) Y will migrate towards the positive charge.

7. (a) Elements X, Y and Z have atomic numbers 6, 9 and 12 respectively. Which one

i) forms an anion , (ii) forms a cation,

b) State the type of bond between Y and Z and give, its molecular formula.

Solution:

i. Y = 9
ii. Z = 12
Ionic bond with molecular formula ZY_2.

8. Taking MgCl, as an example of electrovalent bond, CCl_4 as a covalent bond. Give a difference between electrovalent and covalent bonds.

Solution:

$MgCl_2$ - Electrovalent compound	**CCl_4 - Covalent compound**
They are hard crystalline solids consisting of ions.	These are gases or liquids or soft solids.
They have high melting and boiling points.	They have low melting and boiling points.
They conduct electricity in the fused or aqueous state.	They do not conduct electricity in the solid, molten or aqueous state.
These are soluble in inorganic solvents but insoluble in organic solvents.	These are insoluble in water but dissolve in organic solvents.

9. Potassium Chloride is an electrovalent compound, while hydrogen chloride is a covalent compound. But, both conduct electricity in their aqueous solutions. Explain.

Ans. : Both have free mobile ions in their aqueous state

Solution:

In potassium chloride electrostatic forces of attraction weaken in the fused state or in aqueous solution which make them conduct electricity.

Hydrogen chloride is a polar compound which ionise in their solution which act like electrolyte. This will make Hydorgen chloride to conduct electricity.

10. Name two compounds that are covalent when taken pure but produce ions when dissolved in water.

Ans. • Ammonia and HO

Solution:

HCl and NH_3

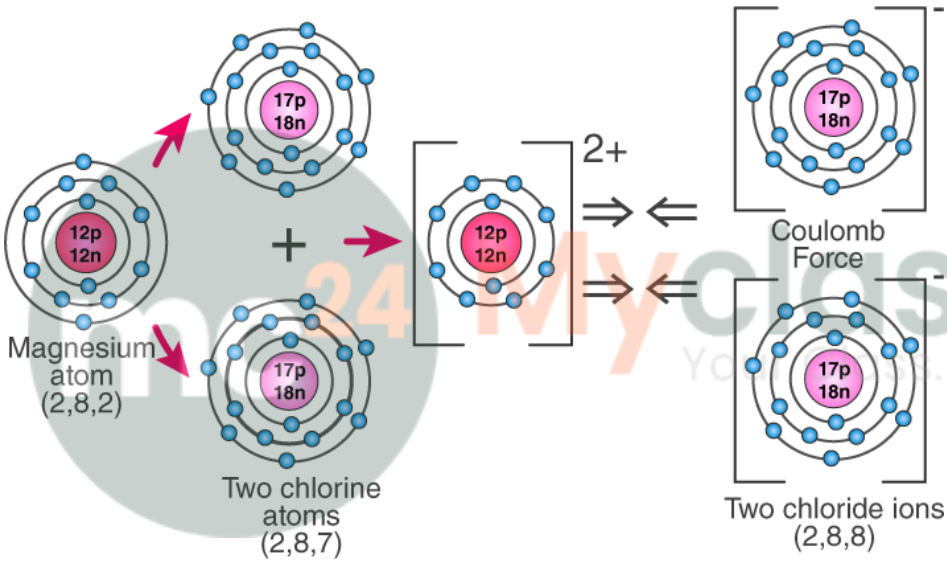
11. An element M burns in oxygen to form an ionic compound MO. Write the formula of the compounds formed if this element is made to combine with chlorine and sulphur separately.

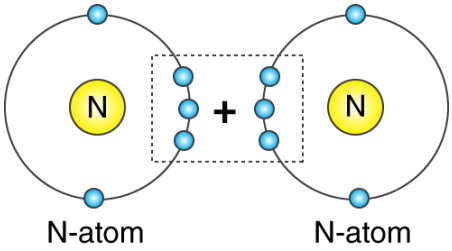
Solution:

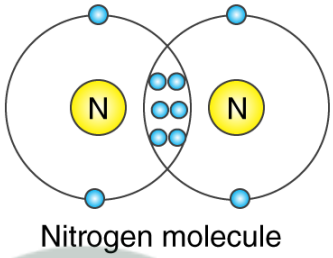
MCl_2
MS

12. Give orbital diagram of the following :
(a) magnesium chloride, (b) nitrogen,
(c) methane (d) hydrogen chloride

Solution:

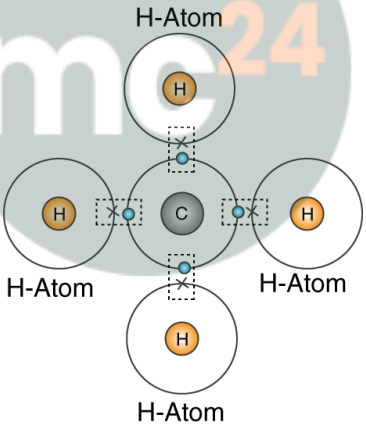


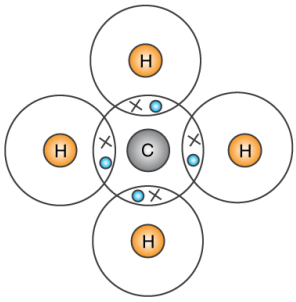




Nitrogen molecule

c) Methane





13. State the type of bonding in the following molecules.
(a) water, (b) calcium oxide, (c) hydrogen chloride

Solution:

a) Polar covalent bond
b) Ionic bond
c) Polar covalent bond

14. Metal M forms a chloride with the formula $MC1_2$. What type of bond in MC12. Write the formula of the compound when M combines with sulphur, oxygen and nitrogen.

Solution:

The bond formed between metal and nonmetal is ionic bond.

Bond formed between metal M and chlorine is ionic bond.

When metal M combines with sulphur – MgS

When metal M combines with oxygen – MgO
When metal M combines with nitrogen – Mg_3N_2.

15. Explain the following :
(a) Mass of an atom is concentrated inside the nucleus of the atom.
(b) Atoms combine by transfer and sharing of electron(s).
(c) An element has atoms with different mass number,
(d) Carbon-12 and carbon-14 both show chemical properties

Solution:

a) Mass of an atom is contributed by proton and neutron. An electron has a negligible mass which does not contribute much for the mass of an atom. As protons and neutron lie inside the nucleus mass of an atom is majorly present in the nucleus.

b) Atoms tend to attain a stable electronic configuration. To achieve a stable configuration, they share the electrons present in their valence electrons.

16. Choose the correct answer from the choices A, B, C and D:

(i) The characteristic of an covalent compound is that:
A. they are farmed by sharing of electrons.
B. they are formed between metals and non-metals.
C. they are formed between two non-metals.
D. they often exist as a liquid.

(ii) When a metal atom becomes an ion
A. it loses electrons and is oxidized,
B. it gains electrons and is reduced,
C. it gains electrons and is oxidized,
D. it loses electrons and is reduced

Solution:

(i) B. They are formed between metals and non-metals.
(ii) A. It loses electrons and is oxidised.

17. Identify the following reactions as either oxidation or reduction:

i) $O + 2e^- \longrightarrow O^{-2}$ **ii)** $K \xrightarrow{-e^-} K^+$ **iii)** $Fe^{+3} + e^- \rightarrow Fe^{+2}$ **iv)** $Zn \longrightarrow Zn^{+2} + 2e^-$

Solution:
i) Reduction
ii) Oxidation
iii) Reduction
iv) Oxidation

18. a) Name the charged particles which attract one another to form electrovalent comopounds.
(b) In the formation of electrovalent compounds; electrons are transferred from one element to another. How are electrons involved in the formation of a covalent compound ?
(c) The electronic confi.wration of nitrogen is (2, 5) How many electrons in the outer shell of a nitrogen atom are not involved in the formation of a nitrogen molecule ?
(d) In the formation of magnesium chloride (by direct combination between magnesium and chlorine). Name the substance that is oxidized and the substance that is reduced.

Solution:

a) Cation and anion
b) By mutual sharing of electrons
c) Two
d) Magnesium is oxidised and chlorine is reduced.

19. What is the term defined below ?
(a) A bond formed by a shared pair of electrons, each bonding atom contributing one electron to the pair.
(b) A bond formed by transfer of electron(s).

Solution:

a) Single covalent bond
b) Electrovalent bond

20. Name or state the following
(a) An element having valency zero.
(b) Metal with valency one.
(c) Atoms of the same element differing in mass numbers.
(d) Elements having same mass number but different atomic number.
(e) Bond formed by transfer of electrons (s)
(f) Ion formed by gain of electron(s)

Solution:

(a) Helium
(b) Lithium
(c) Hydrogen
(d) $^{40}_{18}Ar$ and ^{40}Ca
(e) Ionic bond
(f) Anion

21. An element X has 2 electrons in its M shell, it forms bond with an element Y which has 7 electrons in its third orbit.

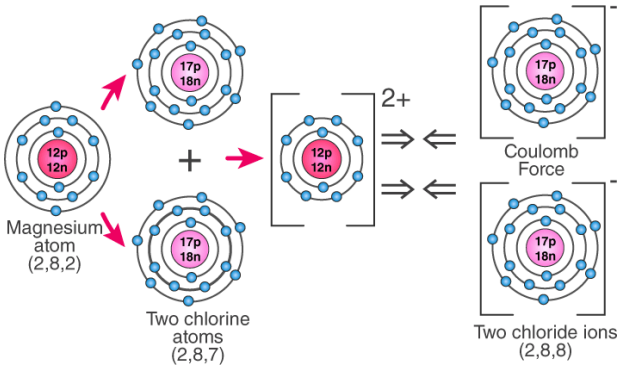
a) Write the formula of the compound formed.
b) Which nearest inert gas electronic configuration will element X and Y acquire
c) Show by orbital diagram the formation of compound between X and Y.

Solution:

a) Element X is Mg (12) and element Y is Cl (17) hence the compound formed will is $MgCl_2$.

b) The nearest inert gas electronic configuration for element X is 2,8, while that for element Y is 2,8,8.

c)



22. In the formation of i) Oxygen molecule ii) Carbon tetra chloride molecule, state the following.

a) **Electronic configuration of nearest inert gas attained.**
b) **How many electrons are sahred/transferred in bond formation?**
c) **Which type of bonds these compounds form?**
d) **Draw the orbital diagrams?**

Solution:
In the formation of i) Oxygen molecule
a) Neon (10) 2,8
b) Two pairs of electrons are shared.
c) Covalent bond
d) Orbital Diagram:

In the formation of ii) Carbon tetra chloride molecule

a) Neon (10) 2,8
b) Four pair of electrons are shared.
c) Covalent bond
d) Orbital Diagram: