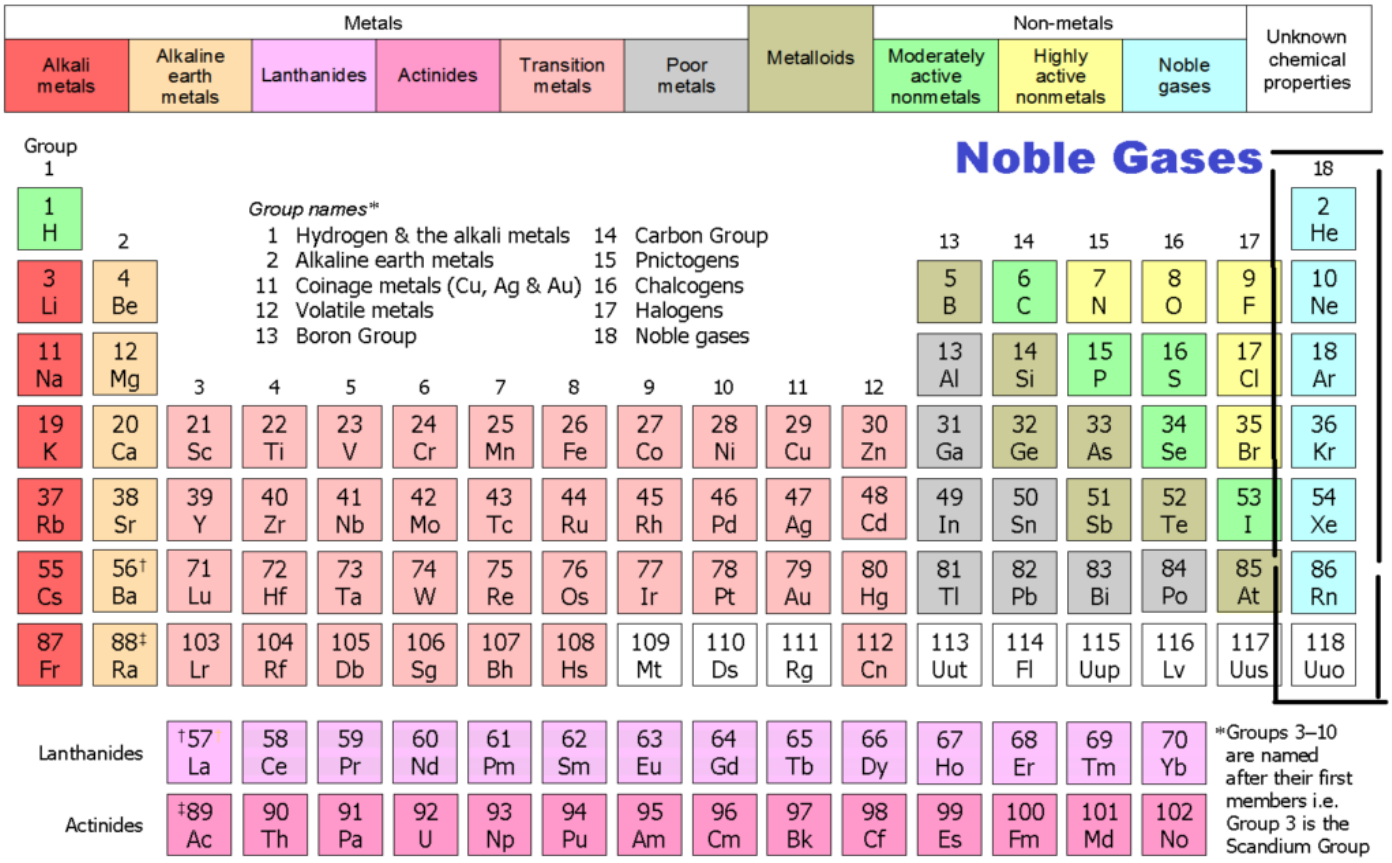
PART 1 : LESSON 4 : UNIT 1

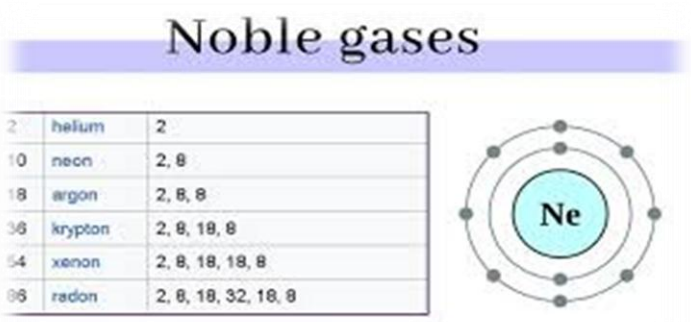
Noble gas:-

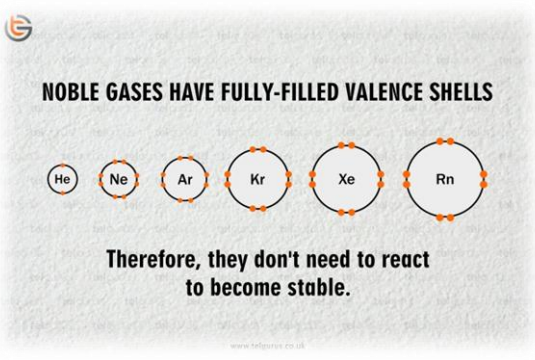
any of the seven chemical elements that make up Group 18 of the periodic table.

helium (He), neon (Ne), argon (Ar), krypton (Kr), xenon (Xe), radon (Rn)

Their atoms could not combine with those of other elements to form chemical compounds Because the last energy level is filled with electrons







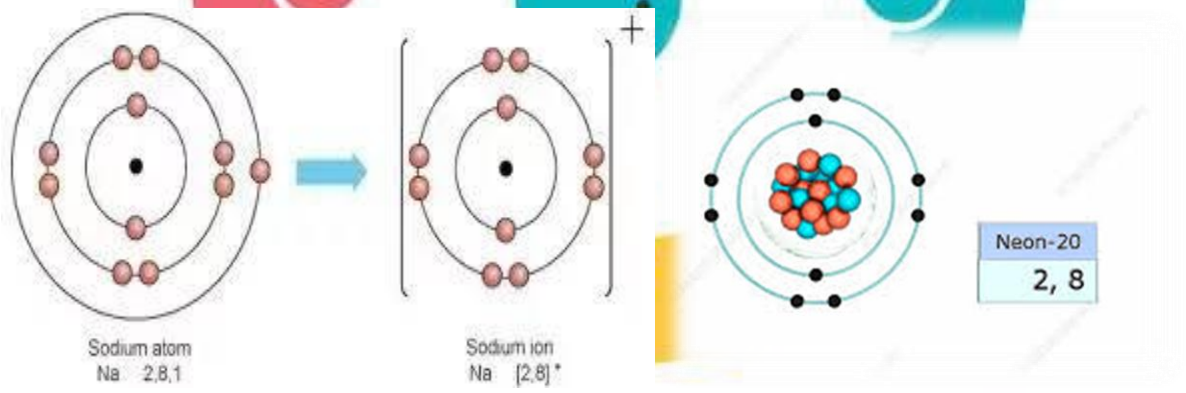
Metals:-

Metal atoms tend to lose electrons in the last energy level to reach the electron configuration of the inert gas that precedes them.

- When a metal atom loses electrons in the outer energy level and turns into a positive ion carrying a number of positive charges equal to the number of lost electrons.

Positive ion:-

An atom of a metal element that has lost one or more electrons



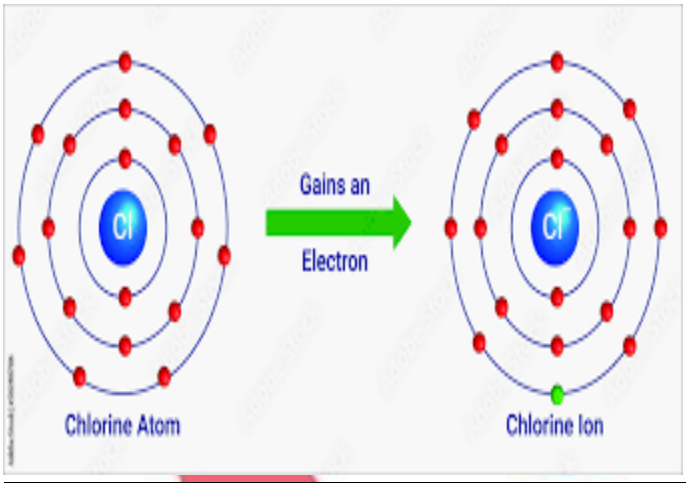
Nonmetals:-

Nonmetal atoms tend to gain one or more electrons depending on their valence, in order to reach the electron configuration of the next closest inert gas in the periodic table.

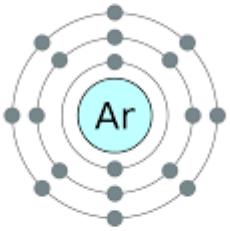
- When a nonmetal atom gains one or more electrons, it turns into a negative ion that carries a number of negative charges equal to the number of gained electrons.

Negative ion:-

An atom of a non-metallic element that has gained one or more electrons



18: Argon 2,8,8



Compare an atom and an ion:-

Atom	Ion
- Balanced electrical charge	- Positive or negative electrical charge
- The number of electrons equals the number of protons	- The number of electrons does not equal the number of protons
- The last energy level is incomplete with electrons except in noble gases	- Its outer energy level is complete with electrons

Compare the positive ion and the negative ion :-

The positive ion	The negative ion
- An atom of a metallic element that has lost one or more electrons	- An atom of a non-metallic element has gained one or more electrons
- The number of electrons is less than the number of protons	- The number of electrons is greater than the number of protons
- It carries a number of positive charges equal to the number of missing electrons	- The number of negative charges equals the number of electrons gained
- The number of energy levels in it is less than the number of energy levels in its atom	- The number of energy levels in it is equal to the number of energy levels in an atom of the same element
- The electron configuration is similar to the inert gas closest to it in the periodic table	- The electron configuration is similar to the next closest inert gas in the periodic table

Exercises: Put (✓) OR (×) In front of the following statements:-

1. The number of energy levels in the chlorine ion is less than the number in the argon atom.
2. It is necessary to convert fluorine into a negative ion to lose a proton.
3. When the atom turns into an ion, the number of nucleons changes, and the number of electrons remains unchanged.
4. When Formation of the magnesium oxide molecule: The oxygen atom loses 2 electrons, and here the magnesium atom gains
5. The ionic compound has a neutral electrical charge.
6. The molecular formula of the ionic compound resulting from the combination of the ground alkaloid element (A) with an element (B) from group (6A) is AB.

Give a reason:-

1. Stability of noble gas atoms in light of the electron distribution

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2. The argon element cannot form a positive ion or a negative ion under normal conditions

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3. Atoms of non-metallic elements tend to gain electrons

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4. Atoms of metallic elements tend to lose electrons

PART 2 : LESSON 4 : UNIT 1

Chemical bonding:-

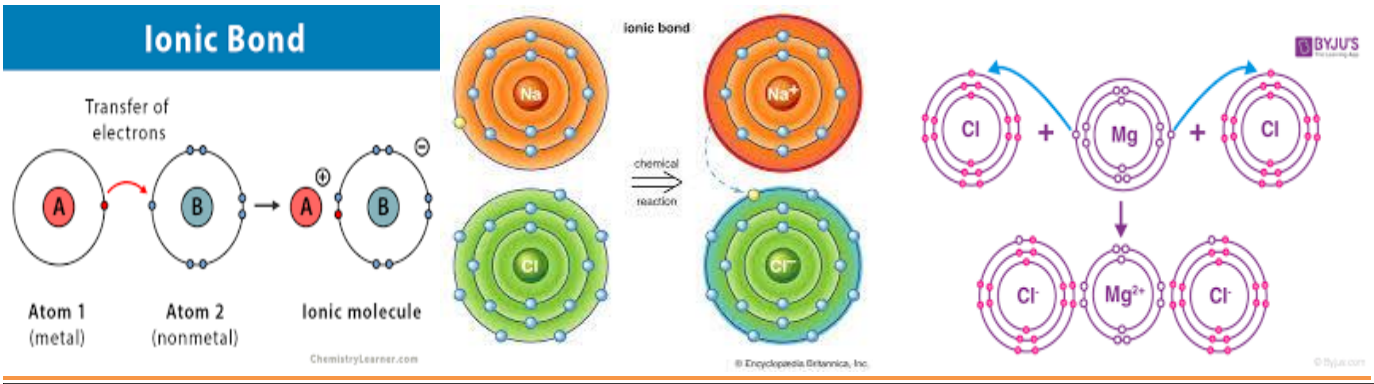
Atoms are chemically bonded to each other, forming element molecules or compound molecules.

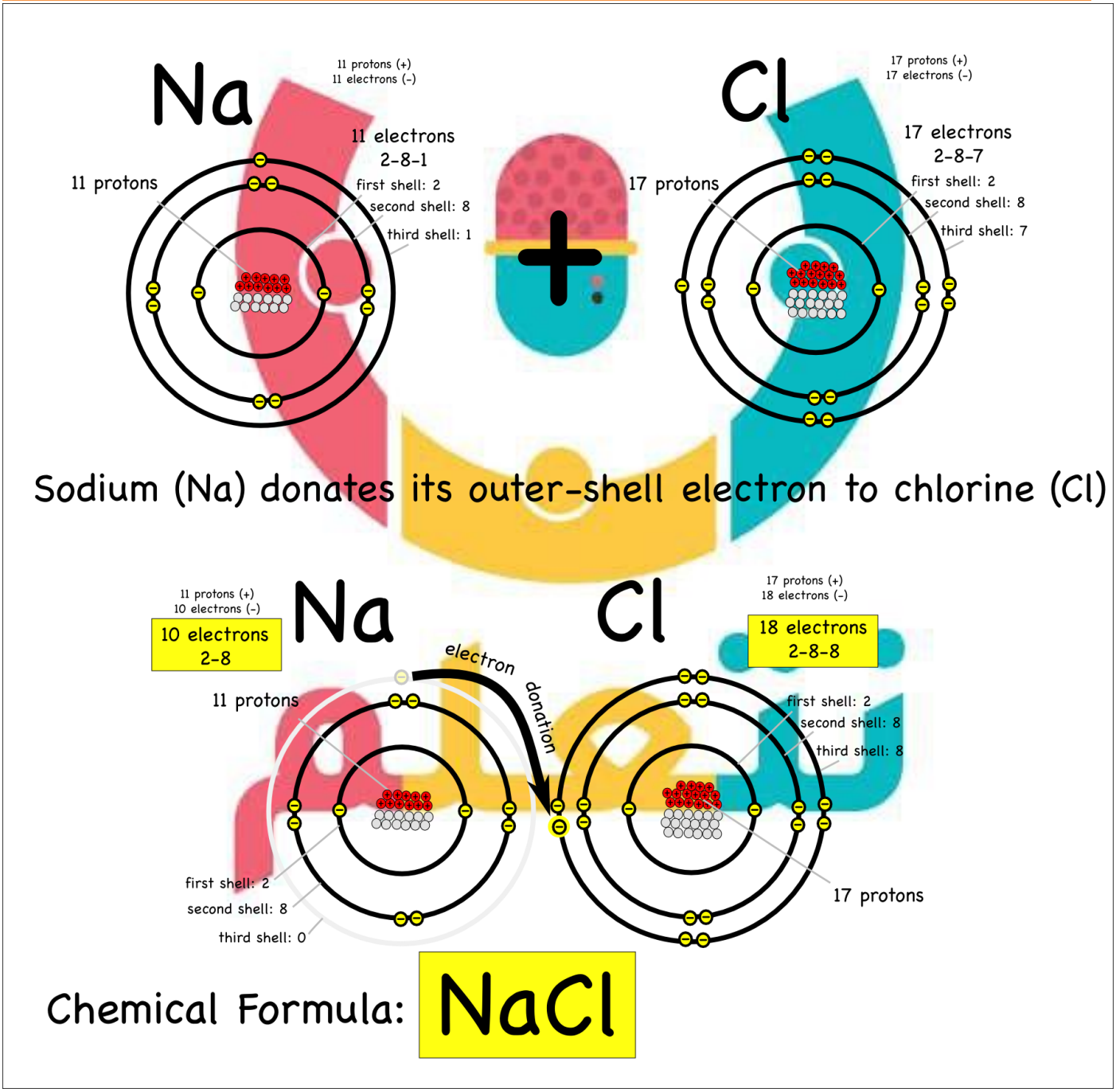
The difference in bonding of atoms to each other leads to differences in the physical and chemical properties of the resulting material molecules.

Types of chemical bonding include ionic bonding and covalent bonding:-

Ionic bonding:-

Ionic bonding occurs as a result of the electrical attraction of the ion of the metallic element and the ion of the non-metallic element to form an ionic compound molecule.


Ionic Bond
Transfer of electrons
A
B
A
B
Atom 1 (metal)
Atom 2 (nonmetal)
Ionic molecule
ChemistryLearner.com
Ionic bond
Na
Cl
chemical reaction
Na+
Cl−
© Encyclopaedia Britannica, Inc.
BYJU'S
Cl
+
Mg
+
Cl
Cl-
Mg2+
Cl-


Na
11 protons (+)
11 electrons (-)
11 electrons
2-8-1
11 protons
first shell: 2
second shell: 8
third shell: 1
Cl
17 protons (+)
17 electrons (-)
17 electrons
2-8-7
17 protons
first shell: 2
second shell: 8
third shell: 7
Sodium (Na) donates its outer-shell electron to chlorine (Cl)
11 protons (+)
10 electrons (-)
10 electrons
2-8
Na
Cl
17 protons (+)
18 electrons (-)
18 electrons
2-8-8
electron donation
11 protons
first shell: 2
second shell: 8
third shell: 8
first shell: 2
second shell: 8
third shell: 0
17 protons
Chemical Formula:
NaCl

(Ionic bonding is an electrical attraction between a positive ion (cation) and a negative ion (anion), forming an ionic compound molecule) .

Give a reason:-

1- An ionic compound has a neutral charge?

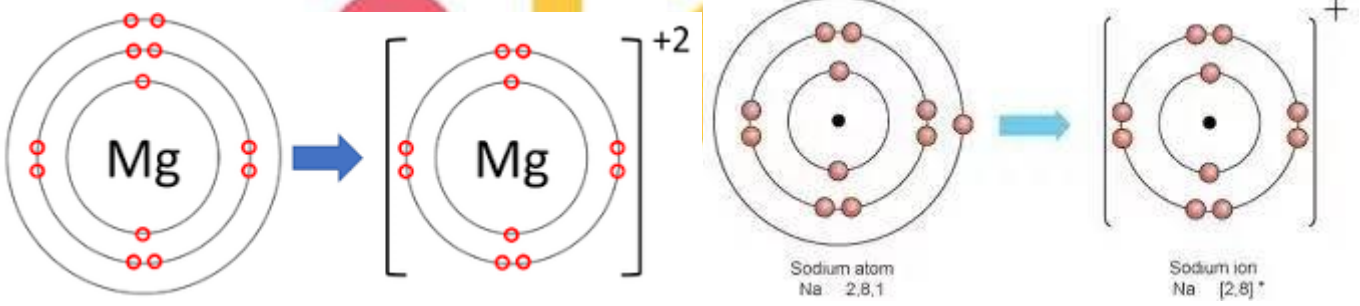
because the number of positive charges is equal to the number of negative charges in it

2- Ionic bonding results in molecules of compounds only and not molecules of elements?

because it arises between atoms of asymmetric elements as a result of the electrical attraction between the cation of an atom of a metallic element and the anion of an atom of a non-metallic element.

3-The elements sodium and magnesium cannot combine together to form a compound molecule?

because they are both metals whose atoms tend to lose their valence electrons and form a positive ion, so an electrical attraction does not occur between them.



Properties of ionic compounds:-

1. Most of them dissolve in water.

2. Their aqueous solutions conduct electric current.

3. Their melting and boiling points are high.

Covalent bonding:-

How does covalent bonding occur?

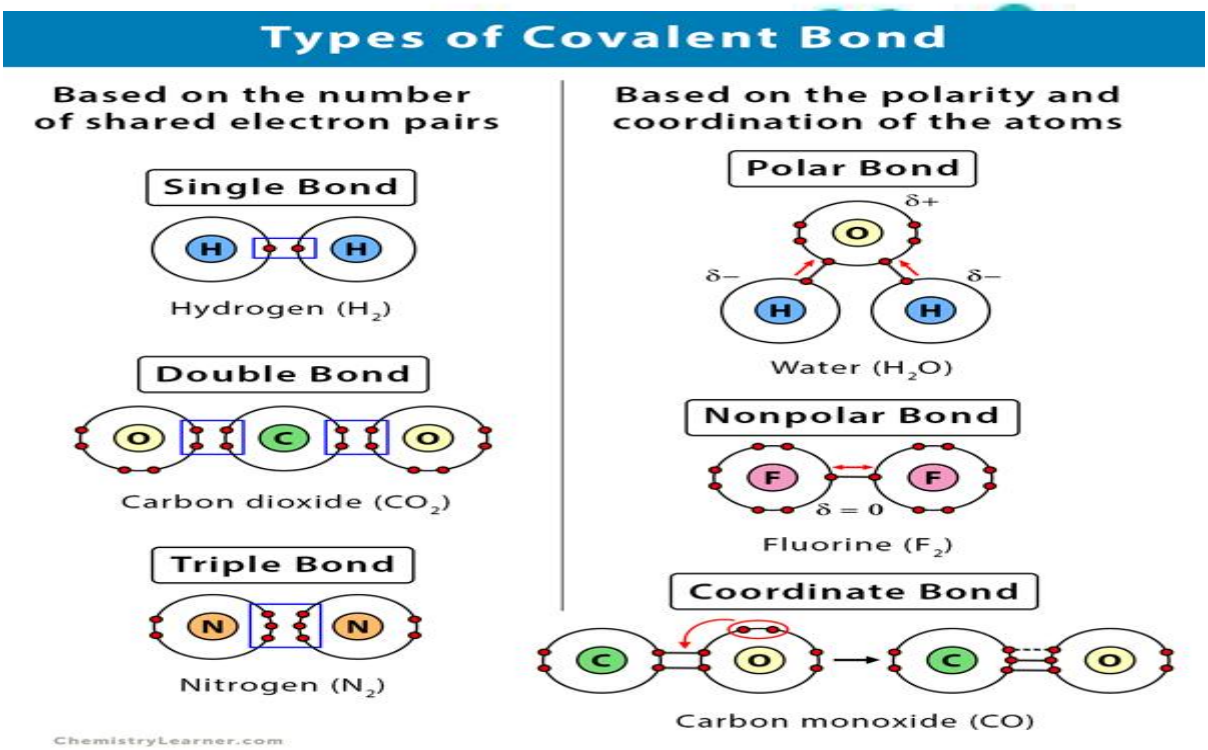
Covalent bonding is carried out by each atom sharing a number of electrons equal to the number of electrons needed to complete its external energy level without losing or gaining electrons.

The covalent bond that is formed is equal to the number of electrons shared by the atom.

If the atom shares one electron, the covalent bond becomes single.

If the atom shares two electrons, the covalent bond becomes double.

If the atom shares three electrons, the covalent bond becomes triple.



Covalent bonding:-

A bond that occurs between two atoms of the same non-metallic element or between two atoms of two different non-metallic elements by sharing electrons.

Give a reason:-

Covalent bonding may result in compound molecules?

because it can be created between two atoms of two different elements

Properties of covalent compounds:-

1-Most of them do not dissolve in water.

2-They do not conduct electric current.

3-They have a low melting point

Unique properties of the carbon atom:-

The last energy level in the carbon atom contains four single electrons.

Carbon atoms are distinguished from other element atoms by their ability to bond with each other in organic compounds.

It has three forms (connected chains - branched chains - ring form)

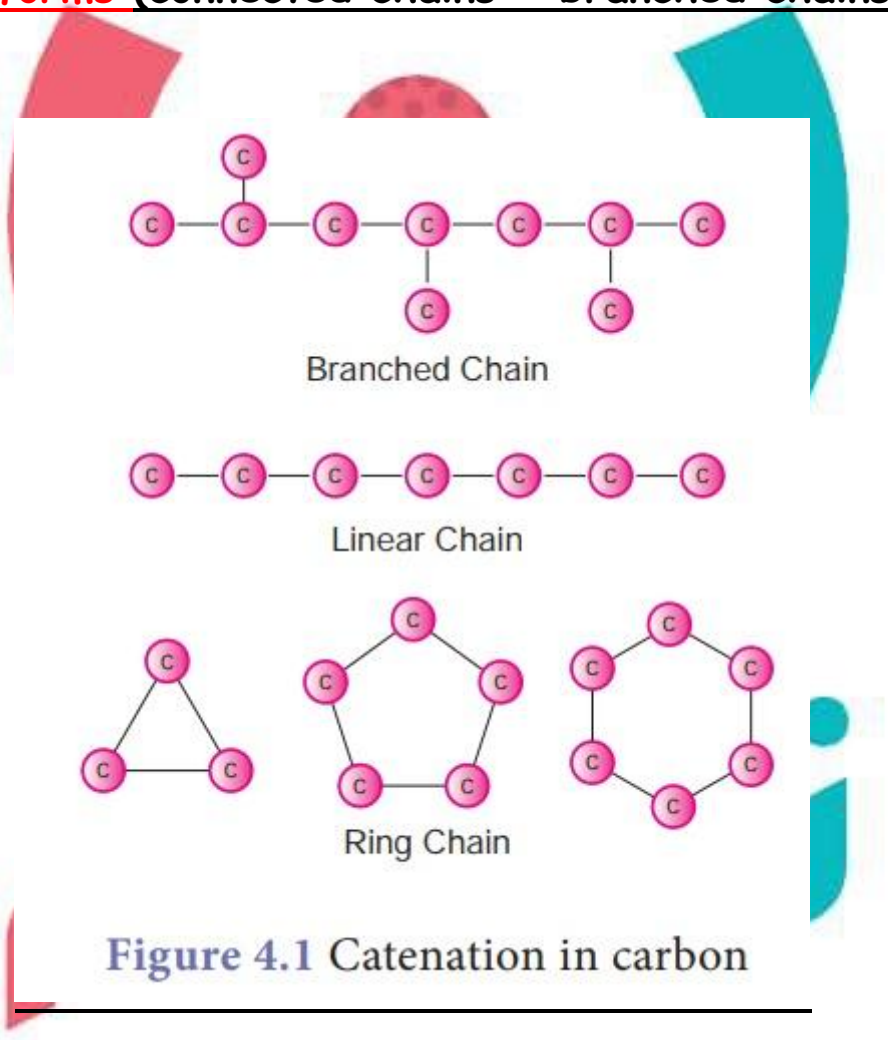


Figure 4.1 Catenation in carbon

Methane molecule (CH_4) is considered the simplest molecule of an organic compound in which the carbon atom is linked to four hydrogen atoms through four single covalent bonds.

Exercises: Put (✓) OR (✗) In front of the following statements:-

1. When two hydrogen atoms combine to form a molecule, each atom shares a pair of electrons
2. Bonding in the SO_2 molecule Ionic bonding
3. The bond in the oxygen molecule consists of three pairs of electrons
4. Sodium chloride (NaCl) is a covalent compound
5. Sulfur atoms are distinguished from other atoms Its ability to bond with each other in organic compounds in different forms.
6. In the methane molecule, the carbon atom is bonded to three hydrogen atoms.

Give a reason:-

1. sodium chloride is considered an ionic compound, while hydrogen chloride is a covalent compound.

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2. The bond in the water molecule is single-covalent.

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3. The bond in the nitrogen molecule is triple-covalent.

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4. The carbon atom has unique properties as the basic element in organic compounds.

