

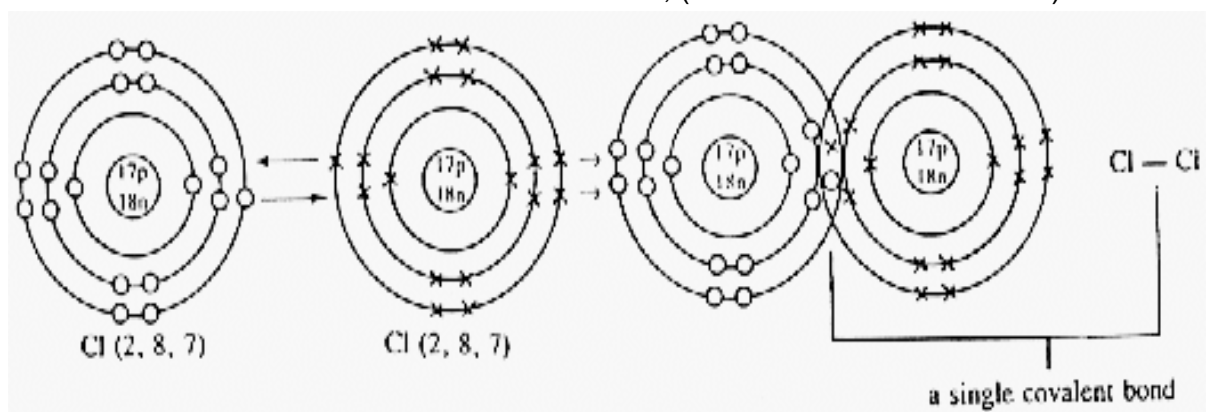
Science(Chemistry)

Covalent Bonding I

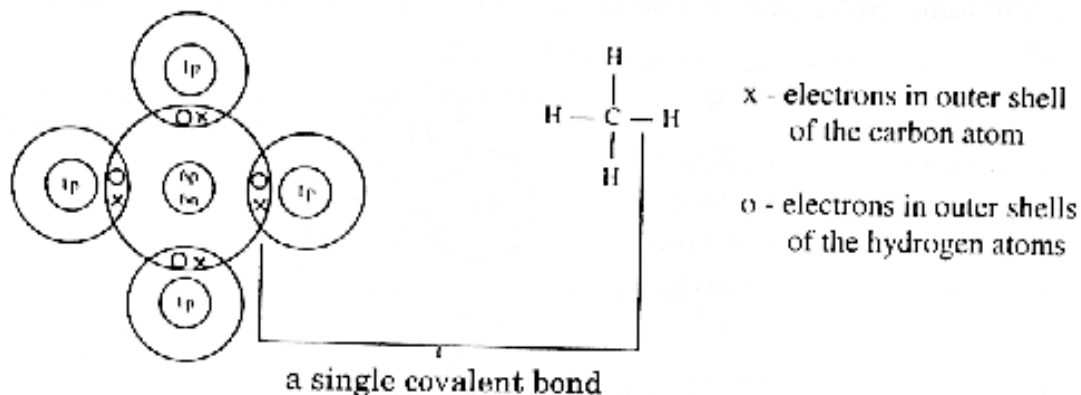
Name: _____() Class: _____ Date: _____

Notes

1. Bonds are formed because the atoms that combine want to achieve the more stable **duplet or octet electronic structure (noble gas structure)**. The electronic structures of the noble gases are as follows:
 - a) Helium, He(2) – this is called the duplet structure. (has completely filled up the first and only outershell)
 - b) The octet structures of neon, Ne (2,8) of 10 electrons and argon, Ar (2,8,8) of 18 electrons.
2. Covalent bonds are formed between:
 - a) **atoms of the same non-metallic element**,
example: chlorine gas where chlorine atom with electronic structure (2, 8, 7) shares its one electron with another chlorine atom, (to form a chlorine molecule) as follows:



- b) **atoms of different non-metallic elements**
example: between carbon and hydrogen where carbon (2, 4) shares its 4 outermost electrons with 4 hydrogen atoms.



3. Each atom contributes an equal amount of electrons for sharing.
4. Each shared pair of electrons formed is called a covalent bond.

Characterisitcs of Covalent Compounds

1. Consist of molecules.

The atoms are held strongly by covalent bond **within** a molecule but the attractive forces **between** molecules are weak.

(Covalent bond within molecules are strong but in a compound ,made up of many molecules joined together, the attractive force between these molecules are weak.

This is the reason why covalent compounds have low melting and boiling point.

Breaking the bond(covalent bond) in a molecule (made up of two or more atoms) requires much more energy compared to breaking a bond between 2 or more molecules.)

2. Relatively low melting and boiling points. Mostly liquids or gases at room temperatures. The molecules are held together by very weak van der waals force of attraction. Very little energy is required to overcome these weak intermolecular forces.
3. Volatile because they have low boiling point.
4. Usually insoluble in water but dissolve in organic solvents like ethanol.
5. They do not conduct electricity whether in solid or liquid state. They are usually non-electrolytes. They do not exist as ions.

Exercises

For Q1 to Q4: Fill in the blanks with the helping words.

molecule	non-metals	noble gas structure	covalent	share
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1. **Covalent bonding** takes place between when atoms of _____ combine among themselves.
2. The combining atoms (i)_____ electrons to achieve the (ii)_____ (e.g. a duplet or an octet structure) and become stable.

3. Each **shared pair of electrons** formed is called a _____ bond.
4. The atoms are held strongly by covalent bond in a _____.

For Q5 to Q9: Fill in the blanks with the helping words.

Characteristics of Covalent Compounds

low gas	not soluble liquid	molecules	do not	non-electrolytes
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5. Covalent compounds/elements consist entirely of small _____.
6. They usually exist as _____ or as volatile _____ at room temperature and pressure.
7. They have _____ melting and boiling points.
8. They are usually _____. They usually _____ conduct electricity.
9. They are usually _____ in water but soluble in organic solvents.
10. During the formation of a covalent bond, the atoms taking part
 - A lose electrons.
 - B gain protons.
 - C share electrons.
 - D gain electrons.
11. A compound which is covalent is probably
 - A soluble in water.
 - B a conductor when in aqueous solution.
 - C of a high boiling point.
 - D formed from two non-metals.
12. Which of the substances in the following table has the typical properties of a covalent compound?

	Melting Point/ °C	Boiling Point/ °C	Electrical conductivity at room temperature
A	-39	205	Conductor
B	-21	115	Non conductor
C	636	1320	Non conductor
D	3727	4670	Conductor