

'GSA'

Past Paper Questions

Q. (a) Why do atoms form bonds? Name three major types of chemical bonds. (5)

Ans: Atoms form bonds to achieve greater stability. This stability is often attained by reaching a full outer electron shell, which typically makes the atom more energetically favorable. The drive for atoms to bond can be understood through octet rule, which states that atom tends to form bonds to have eight electrons in their valence

shell, similar to the electron configuration of noble gases

Three Major Types of Chemical Bonds:

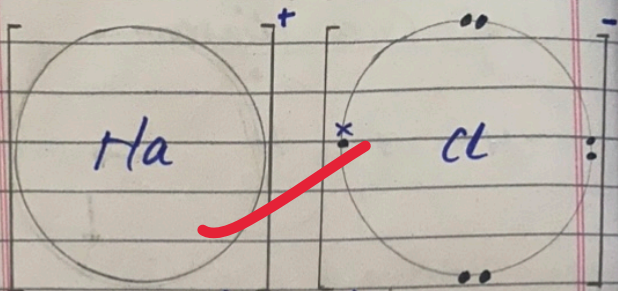
- (1) Ionic Bonds.
- (2) Covalent Bonds.
- (3) Metallic Bonds.

(1) Ionic Bonds:

Formed when one atom donates one or more electrons to another atom, resulting in positively charged cations and negatively charged anions.

Example:

NaCl.

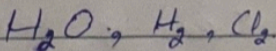


(HCl)
Dot-and-Cross
Diagram.

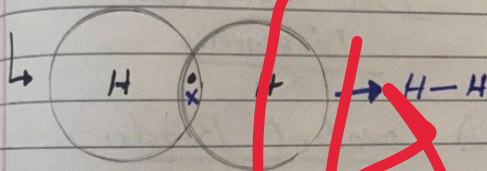
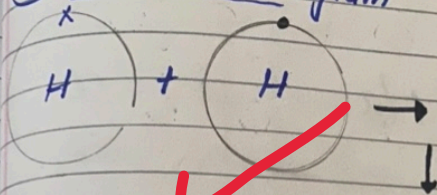
(2) Covalent Bonds:

Formed when
 two atoms share one
 or more pairs of
 electrons. In other words,
 mutual sharing of electrons
 is called covalent bond.

Example:



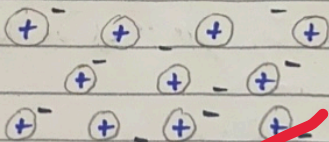
Dot-Cross diagram



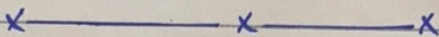
Hydrogen atoms sharing electrons

(3) Metallic Bonds:

Occur between metal atoms when electrons are shared in a "sea of electrons" that are free to move around.



'Sea' of delocalised
electrons



(b) What is difference
between the ionic
and covalent bonding?
Give examples. (5)

Ans:

Ionic bond

• Definition:

Ionic bonding
occurs when
one atom
donates an electron
to another,
resulting in
the formation

Covalent bond

• Definition:

Covalent bonding
occurs when
two atoms share
one or more
pairs of electrons,
allowing each
atom to achieve

of positively and negatively charged ions that attract each other due to electrostatic forces a full outer shell of electrons

• Formation:

Typically occurs between a metal and a non-metal

• Formation:

Typically occurs between two non-metals

• Electron Transfer:

Involves the complete transfer of electrons from one atom to another.

• Electron sharing:

Involves the mutual sharing of electrons between atoms

• Bond strength:

Generally strong due to the electrostatic attraction between oppositely charged ions

Bond strength:

Can be strong, but generally varies depending on the number of shared electron pairs (single, double or triple bonds).

• Physical properties:

Ionic compounds tend to have high melting and boiling points, are often soluble in water and can conduct electricity when dissolved or

• Physical properties:

Covalent compounds can have lower melting and boiling points, are often insoluble in water and do not conduct electricity

molten.

• Examples:

(1) Sodium Chloride
(NaCl)

Formation:

(Na) loses an electron to become Na^+ , and (Cl) gains that electron to become Cl^- . This results in the formation of NaCl

(2) Magnesium oxide
(MgO)

Formation:

(Mg) loses two electrons

• Examples:

(1) Water (H_2O)

Formation:

Each hydrogen atom shares one electron with the oxygen atom, resulting in two covalent bonds.

(2) Carbon dioxide
(CO_2)

Formation:

Each oxygen atom shares

to become
 Mg^{2+} , and (O)
gains two
electrons to
become O^{2-} .

Thus, they attract
each other to
form MgO .

two pairs
of electrons
with the
each atom,
resulting in
two double
bonds.

