

220
FEBRUARY

Inorganic Chemistry

B.Sc Part-1, Group-B, '3'

CHEMICAL BONDING

Metallic Bond

038-3281

WK-06

FRIDAY

१३ माघ शुक्ल, शुक्रवार, सं २०७५

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Lecture Notes Series -

07

Metallic Bond

* Metals generally Possess the following Properties

- High thermal and electrical conductivity
- High ductility and malleability
- High Melting and boiling Points
- Metallic lustre
- Opaque to light and have refracting power.
- Low Ionisation energy
- They are made of the positive ions packed together in any of the following three forms
 - ① Face centred cubic
 - ② Body centred cubic
 - ③ Hexagonal Close Packed
- Allow formation

These above mentioned properties of metals can not be explained on the basis of normal ionic or covalent bonding. Such properties may be explained on the basis of a new type of bond called as metallic bond. It may be defined as:

"The force of attraction which binds a metal ion"

Notes

SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT
							1	2	3	4	5	6	7
							8	9	10	11	12	13	14

electrons within its sphere of influence is known as metallic bond"

* Theories of Metallic Bond *

The following theories have been proposed to explain the different properties of metals

1. Drude-Lorentz theory or electron sea theory
2. Resonance or valence bond theory.
3. Molecular orbital theory or Band theory

1. Drude-Lorentz theory or electron Sea theory

This theory was proposed by Drude in 1900 and later on developed by Lorentz in 1916.

According to this theory, metals have low ionisation energies. It indicates that valence electron of each atom are loosely bound to the core in metals. Thus each atom in a atom crystal loses all its valence electrons which move freely from one core to another.

The electron thus obtained from an electron pool and the positively charged metal ions are held together by this electron pool. The positively charged metal ions do not float in the sea of electrons but have definite position in the crystal lattice. Thus, according to this theory, metallic solids may be regarded as a collection of positively charged atomic cores immersed in a sea

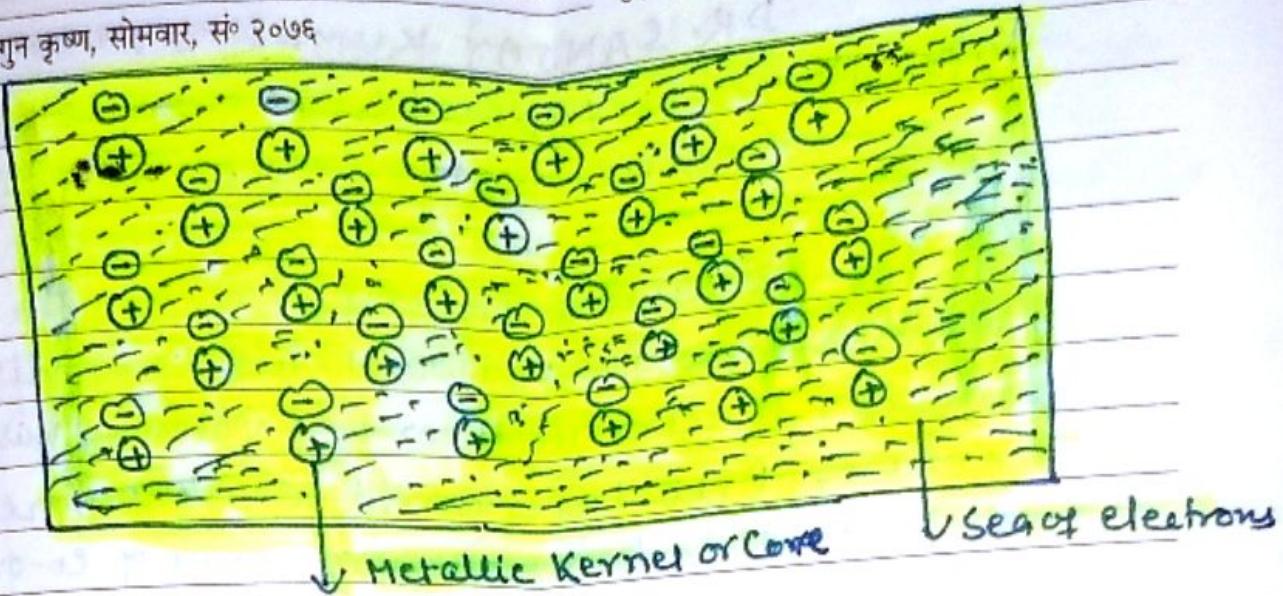
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[The electron sea model for metals]

The electron sea theory explains different metallic properties viz. metallic lustre, electrical conductivity, thermal conductivity, malleability, ductility and elasticity.

Limitation :-

Electron Sea theory does not explain the properties of certain metals, for example

- (a) Mercury melts at -39°C while tungsten melts at 3300°C
- (b) Electrical conductivity of metals varies largely e.g. copper is more than 50 times better conductor than bismuth.
- (c) Metals like Na and K are so soft that they can be cut with a knife while osmium is so hard that it can scratch the glass.

Notes

S	M	T	W	T	F	S	S	M	T	W	F	S
-	-	-	-	-	-	1	2	3	4	5	6	7
16	17	18	19	20	21	22	23	24	25	26	27	28