

# Engineering chemistry

## (2022)

Q1. Choose the correct answer from the four alternatives:

- (i) Full form of COD is  
(a) Chemistry of Dyes  
(b) Chemical Oxygen Demand  
(c) Chemistry of Deuterium  
(d) Carbon of Dust

Ans.(b)

- (ii) Degree of Ionization depends upon  
(a) Nature of Solvent (b) Temperature  
(c) Nature of solute (d) All of these

Ans.(d)

- (iii) Solder contains  
(a) Cu, Al (b) Cu, Zn  
(c) Sn, Pb (d) Cu, Fe

Ans.(c)

- (iv) e-waste means  
(a) Organic compounds  
(b) Inorganic compounds  
(c) electronic gadgets  
(d) Both (a) and (b)

Ans.(c)

- (v) Electroplating is related to  
(a) Periodic Table (b) Biochemistry  
(c) Nuclear Chemistry (d) Electron Chemistry

Ans.(d)

- (vi) Sc (21) has how many electron in d-orbital?  
(a) 1 (b) 2  
(c) 3 (d) 4

Ans.(a)

- (vii) Natural rubber is  
(a) Inorganic compound (b) Organic compound  
(c) Metallic alloy (d) Electrical conductor

Ans.(b)

- (viii) A mineral is called ore if  
(a) metal extraction is costly from it.  
(b) metal extraction is economical from it.  
(c) metal extraction is very difficult and costly.  
(d) metal cannot be extracted.

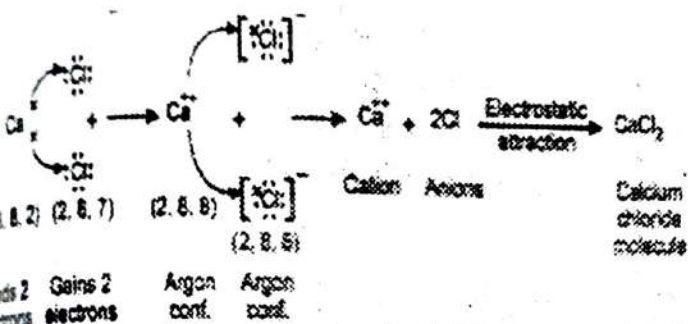
Ans.(d)

Q2. (a) Define and explain the types of valency with proper example.

Ans. Refers to Chapter 1

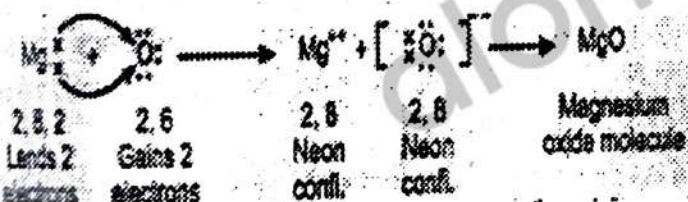
Q2.(b) Write electron dot structure of following compounds:

**Formation of Calcium Chloride Molecule ( $\text{CaCl}_2$ ):**  
A molecule of calcium chloride ( $\text{CaCl}_2$ ) consists of one atom of calcium and two atoms of chlorine. Calcium atom (At. No. 20) has the electronic configuration (2, 8, 2), while each chlorine atom (At. No. 17) has the configuration (2, 8, 7).



In the formation of calcium chloride molecule, 2 electrons are transferred from calcium atom to two chlorine atoms. By the loss of two electrons, the Ca atom acquires +2 charge and converts into  $\text{Ca}^{2+}$  ion and attains a stable configuration of nearest inert gas element argon. Similarly, two Cl atoms gain one electron each and acquire -1 charge and form 2  $\text{Cl}^-$  ions. These oppositely charged ions ( $\text{Ca}^{2+}$  and 2  $\text{Cl}^-$ ) combine together by the forces of electrostatic attraction to form apparently neutral molecule of  $\text{CaCl}_2$ .

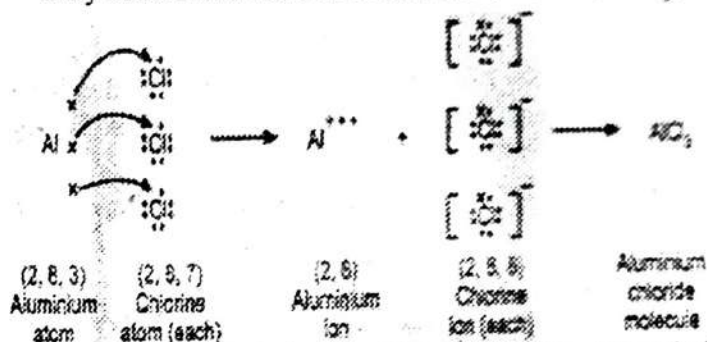
**Formation of Magnesium Oxide:** The formation of magnesium oxide can be diagrammatically represented as follows:



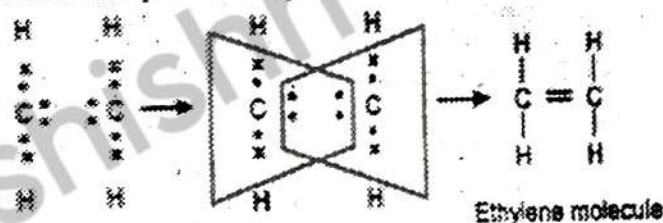
In the formation of magnesium oxide, 2 electrons are transferred from magnesium atom to oxygen atom. By the loss of 2 electrons, the magnesium atom acquires +2 charge and attains the stable configuration of neon gas. On the other hand, oxygen atom acquires -2 charge by the gain of 2 electrons from magnesium atom and attains the stable configuration of neon gas. These two equal and oppositely charged ions ( $\text{Mg}^{2+}$  and  $\text{O}^{2-}$ ) unite together by the forces of electrostatic attraction to form apparently neutral molecule of magnesium oxide. Thus,  $\text{MgO}$  is formed by electrovalency.

**Formation of Aluminium Chloride Molecule ( $\text{AlCl}_3$ ):**  
In the formation of aluminium chloride molecule, 3 electrons are transferred from aluminium atom to three chlorine atoms. By the loss of 3 electrons, the aluminium atom acquires +3 charge and attains the stable con-

figuration of the nearest inert gas element argon. On the other hand, each chlorine atom gains one electron from Al atom and acquires -1 charge and attains the stable configuration that of argon. These two equal and oppositely charged ions ( $\text{Al}^{3+}$  and 3  $\text{Cl}^-$ ) combine together by the force of electrostatic attraction to form apparently neutral molecule of aluminium chloride ( $\text{AlCl}_3$ ).



**Formation of ethylene molecule ( $\text{C}_2\text{H}_4$ ):** The ethylene molecule is formed by the combination of two atoms of carbon (2, 4) and four atoms of hydrogen (1). Each carbon atom is in short of 4 electrons to complete the octet and each hydrogen atom is in short of 1 electron to complete the duplet.



The ethylene molecule is formed by sharing two pairs of electrons between two carbon atoms and by sharing one electron with each of four hydrogen atoms. Thus, the two shared pairs form a double covalent bond between two carbon atoms in ethylene molecule.

**Q3.(a) What do you mean by Metallurgy? Write reaction involved in the extraction of Iron from their ore.**

Ans. Out of Syllabus

**Q3.(b) What is alloy? What is the purpose of making alloys?**

Ans. Out of Syllabus

**Q4.(a) Define pollution and pollutant. What are the causes of air pollution? What kind of pollution is more dangerous and why?**

Ans. Refers to Chapter 7

**Q4.(b) Write about Domestic waste and Industrial waste.**

Ans. Domestic waste:

- ♦ Most of the domestic waste contains biodegradable pol-



- ◆ Domestic wastes are produced in every home due to day to day activities.
  - ◆ Pollution monitoring and controlling bodies like MPCB do not keep a watch on the proportion of domestic wastes. It is the individual responsibility of every citizen to reduce the amount of domestic waste that they produce.
  - ◆ Garbage, domestic refuse, and discarded solid materials containing food waste, paper, cardboard, peels of fruits, vegetable matter, etc. form the domestic wastes.
- Industrial waste:**
- ◆ Most of the industrial waste contains nondegradable pollutants.
  - ◆ Industrial wastes are produced during industrial and manufacturing processes.
  - ◆ Pollution monitoring and controlling bodies like MPCB keep a watch on the proportion of industrial wastes.
  - ◆ Fly ash from thermal power plants, heavy metals, chemicals, etc. form the industrial wastes.

**Q5. Write short notes on the following (any four):**

- Plastics
- Thermal Insulating Materials
- Galvanic Cell
- Air Pollution
- Arrhenius Theory of Ionisation

**Ans. (a) Plastics:** Refers to Chapter 6

**(b) Thermal Insulating Materials:** Refers to Chapter 6

**(c) Galvanic Cell:** It converts chemical energy into electrical energy. It is used to produce electricity from spontaneous chemical reaction. Electrical energy is produced e.g., lead accumulators, dry cells. Dry cells and Daniel cell are electrochemical cells. Dry cells are used for torches, calculators, transistors, etc. Daniel cell is used for protection of metals from corrosion.

**(d) Air Pollution:** Refers to Chapter 5 Q.no 37

**(e) Arrhenius Theory of Ionisation:** Refers to Chapter 5

**Q6. Write short notes on:**

- E-waste
- Electrochemical Series
- Mechanical properties of Metal
- Greenhouse effects

**Ans. (a) E-waste:** Refers to Chapter 7

**(b) Electrochemical Series:** Refers to Chapter 5

**(c) Mechanical properties of Metal:** Out of Syllabus

**(d) Greenhouse effects:** Refers to Chapter 7