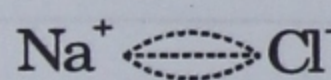
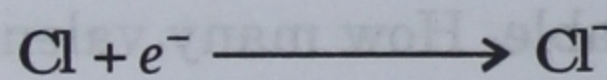
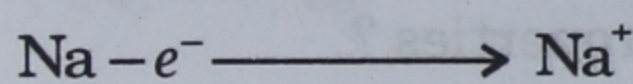
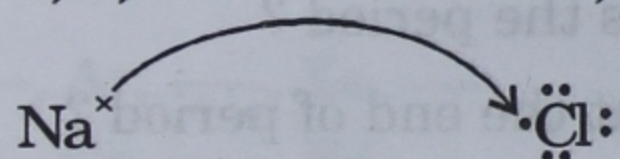
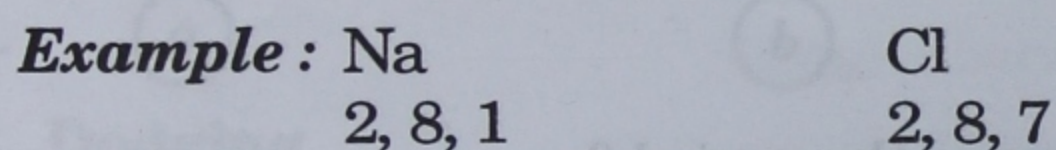


Chemical Bonding

IMPORTANT POINTS TO REMEMBER

1. An atom is **electrically neutral**. The number of positively charged particles (*i.e.*, protons) are equal to the number of negatively charged particles (*i.e.*, electrons).
2. Every atom tries to attain the **stable electronic configuration** of nearest inert gas, *i.e.*, eight electrons in the valence shell (**except Helium which is having 2 electrons in valence shell**).
3. Atom attains the **stable electronic configuration** by either **losing, gaining** or **sharing** electrons.
4. **Ion** : When an atom **loses** or **gains** electrons, it gets converted to electrically charged particle called an **ion**.
5. **Cation** : When an atom **loses** electron, it gets converted to positively charged particle called **cation**.
6. **Anion** : When an atom **gains** electron, it gets converted to negatively charged particle called **anion**.
7. **Electropositive elements** : The elements which easily **lose electrons** and acquire **positive charge** are called **electropositive elements**. **Metals** are electropositive elements.
Example — Na^+ , K^+ , Ca^{2+} , Mg^{2+} , Al^{3+} etc.
8. **Electronegative elements** : The elements which easily **gain electrons** and acquire **negative charge** are called **electronegative elements**. **Non-metals** are electronegative elements.
Example — Cl^- , Br^- , I^- , F^- , O^{2-} , S^{2-} , N^{3-} etc.
9. **Ionic bond** : The bond formed as a result of transference of electrons from the outermost shell of a metal to the outermost shell of a non-metal is called an **ionic bond** or **electrovalent bond**.
10. Ionic bonds are formed between **metals** and **non-metals**. Metals **lose** electrons and non-metals **gain** electrons.



↔ Electrostatic forces of attraction

11. As a result of transference of electrons, ions are formed which are held by strong electrostatic forces of attraction.
12. The metals participating in an ionic bond formation should have **low ionization potential**.
13. The non-metals participating in an ionic bond formation should have **high electron affinity**.
14. The chemical compounds formed as a result of the transfer of electrons from the outermost shell of a metal to the outermost shell of non-metal are called **ionic** or **electrovalent compounds**.

The compounds formed by the transference of electrons are called **Ionic** or **electrovalent compounds**.

15. The properties of the **ionic or electrovalent compounds** are :

- (i) Ionic compounds are hard **solids**. As their constituent particles are ions which are held by strong electrostatic forces of attraction and hence they cannot be separated easily.
- (ii) Ionic compounds have **high melting point** and **boiling point**. They are **non-volatile** solids. As in these compounds ions are held by strong electrostatic forces of attraction, so large amount of energy is required to overcome these forces of attraction between the ions.
- (iii) Ionic compounds **do not conduct electricity** in their **solid state**. However, they **can conduct electricity** in their **fused, molten** and in their **aqueous solution**. In solid state, they **do not conduct electricity** as the ions are not free they are held by **strong** electrostatic forces of attraction. However, in their molten state the **strong forces** of attraction gets **weakened** and thus, the ions become free to **conduct electricity**. In aqueous solution, the **high dielectric constant** overcomes **strong** electrostatic forces of attraction thus, the ions become **free** to carry the **electric current**.
- (iv) Ionic compounds on dissolving in water **allow** the passage of **electric current** through them as the ions become **free**. Thus, they act as **strong electrolyes**.
- (v) Ionic compounds are **soluble** in water but they are **insoluble** in organic solvents. As water has maximum **dielectric constant**, therefore it **decreases** the force of attraction between the ions and thus it forms free ions and hence they dissolve.
- (vi) On passing electric current through **molten, fused** and **aqueous solution** of ionic compounds, the ions **dissociate** and **migrate** towards **electrodes**.
- (vii) Ionic compounds undergo fast reactions in their aqueous solution.

16. **Covalent bond** : The bond formed as a result of mutual sharing of electrons is called **covalent bond**.

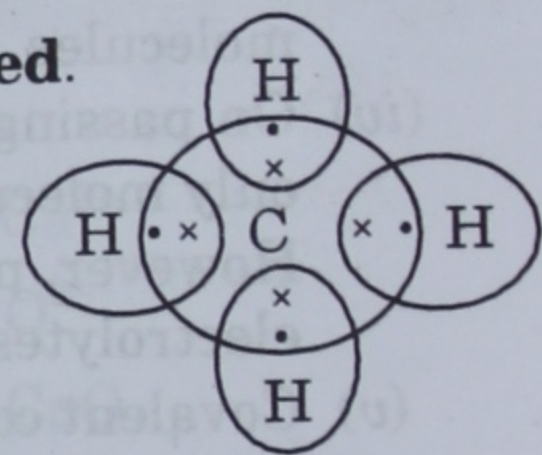
17. The covalent bond formation takes place between two **non-metallic elements**.

18. When the **same** or **different non-metallic atoms** present in **groups 14, 15, 16, 17** of periodic table combine together, **covalent bonds** are formed.

19. Both the atoms participating in covalent bond formation should have **high electronegativity, high ionisation energy** and **high electron affinity**.

20. During covalent bond formation, **ions** are **not formed, only molecules** are formed.

21. **Non-polar covalent compounds** : The covalent compounds in which the combining elements have no or very slight difference in their electronegativity are called **non-polar covalent compounds**.

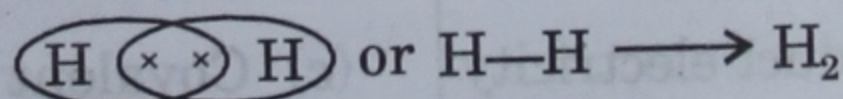


Example : H_2, Cl_2, N_2, O_2 .

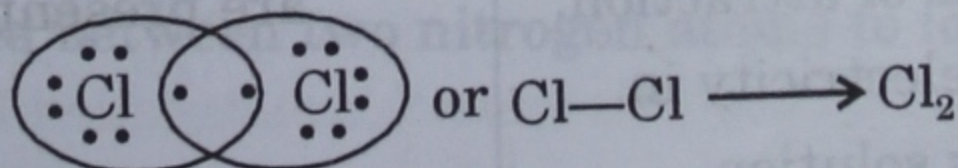
All hydrocarbons are non-polar covalent compounds, e.g., Methane, (CH_4), Ethane (C_2H_6), Ethene (C_2H_4), Ethyne (C_2H_2) and Carbon tetrachloride (CCl_4).

(i) A **single covalent bond** is formed by the sharing of one pair of electrons between the atoms, each atom is contributing only one electron. A single covalent bond is denoted by putting a single short line (—) between the two atoms.

(a) Formation of **hydrogen molecule** ($H = 1$)

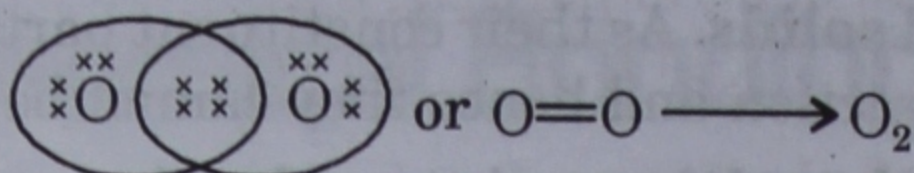


(b) Formation of **chlorine molecule** ($Cl = 2, 8, 7$)



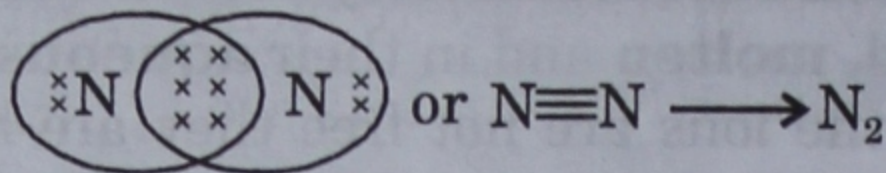
(ii) A **double covalent bond** is formed by the sharing of two pairs of electrons between the two atoms, to acquire stable electronic configuration. A double covalent bond is denoted by putting a double line (=) between the two atoms.

Formation of **oxygen molecule** (O = 2, 6)



- (iii) A **triple covalent bond** is formed by the sharing of three pairs of electrons between the two atoms. A triple covalent bond is denoted by putting three short lines (\equiv) between the two atoms.

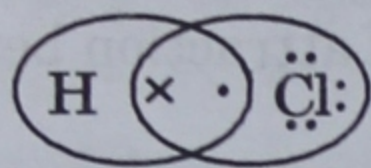
Formation of **nitrogen molecule** (N = 2, 5)



22. Polar covalent compounds : The covalent compounds in which the combining elements have large difference in their electronegativity are called **polar covalent compounds**.

Example : Hydrogen chloride gas (HCl), Water (H_2O) and Ammonia (NH_3).

23. In case of **hydrogen chloride gas**, chlorine is **more electronegative** than hydrogen, therefore chlorine **attracts the shared pair of electrons** towards its side. Hence, chlorine acquires a **partial negative charge** and hydrogen acquires a **partial positive charge**. Thus, the bond becomes **polar**.



Mutual sharing



Chlorine is more electronegative than hydrogen.

24. The compounds formed by the mutual sharing of electrons are called as **covalent compounds**.

The properties of covalent compounds are

- Covalent compounds are **liquids** or **gases**. Their constituent particles are molecules which are held by weak van der waals' forces.
- Covalent compounds are **volatile compounds** with **low melting point** and **boiling point**. As in these compounds the molecules are held by weak van der waals' forces, so less amount of energy is required to overcome these forces of attraction.
- Covalent compounds **do not conduct electricity** as they do not contain ions. They only contain molecules.
- On passing electric current through the covalent compounds they **do not ionize** as they contain only molecules and not ions.

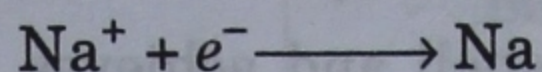
However, polar covalent compounds on dissolving in water produces ions and thus they can act as electrolytes.

- Covalent compounds are **insoluble in water** but **soluble in organic solvents**.
- Covalent compounds **only** contain **molecules** and their **dissociation to ions does not take place**.
- Covalent compounds undergo **slow** speed of reactions.

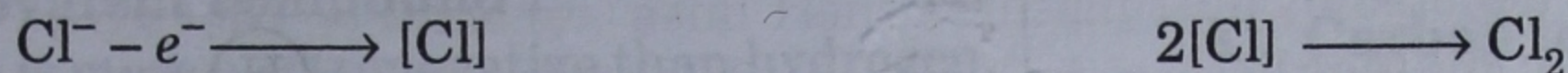
Differences between Ionic compounds and Covalent compounds :

<i>Ionic Compounds</i>	<i>Covalent Compounds</i>
(a) They are solid.	(a) They are liquids or very soft waxy solids.
(b) They have high melting point and boiling point.	(b) They have low melting point and boiling point.
(c) Ionic compounds do not conduct electricity in the solid state as the ions are held by strong electrostatic forces of attraction. But they easily conduct electricity in fused, molten or aqueous solution.	(c) Covalent compounds do not conduct electricity because the ions are absent only molecules are present.
(d) Ionic compounds are soluble in water.	(d) Covalent compounds are insoluble in water but soluble in organic solvents.
(e) Ionic compounds undergo fast reactions.	(e) Covalent compounds undergo slow reactions.

25. Reduction is the process of **gain of electrons**. It takes place at **cathode**. During reduction cation gains electrons and get converted to neutral particle, e.g.



26. Oxidation is the process of **loss of electrons**. It takes place at **anode**. During oxidation anion losses electrons and get converted to neutral particle, e.g.

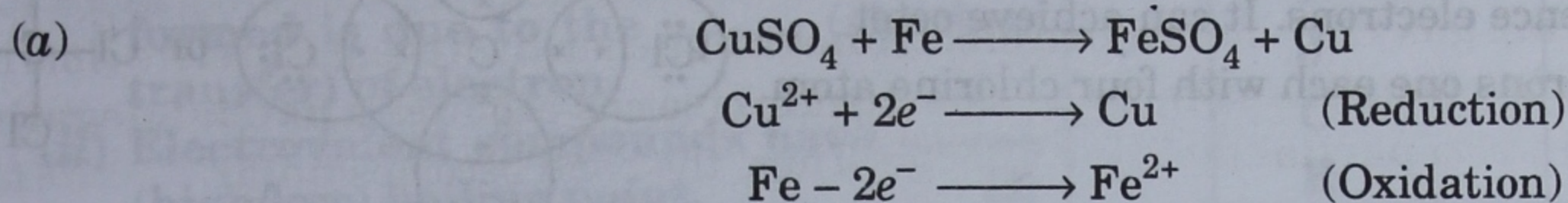


27. Reducing agents are electron donors. **Metals** are reducing agents.

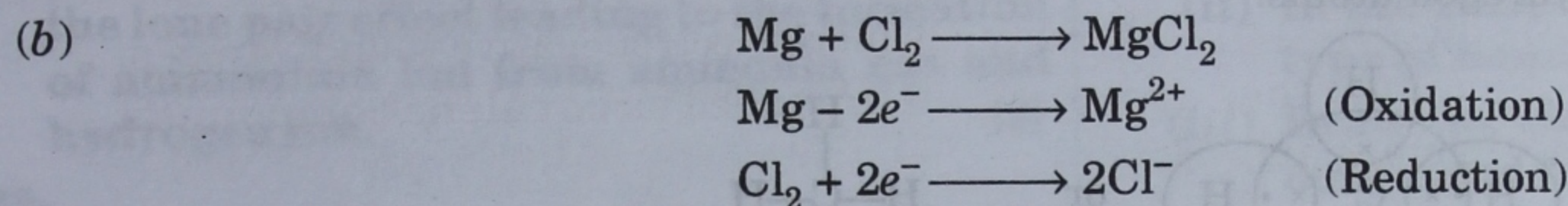
28. Oxidizing agents are electron acceptors. **Non-metals** are oxidizing agents.

29. Reducing agent during the reaction gets **oxidized** and **oxidizing agent** during the reaction gets **reduced**.

30. Consider the following reaction :



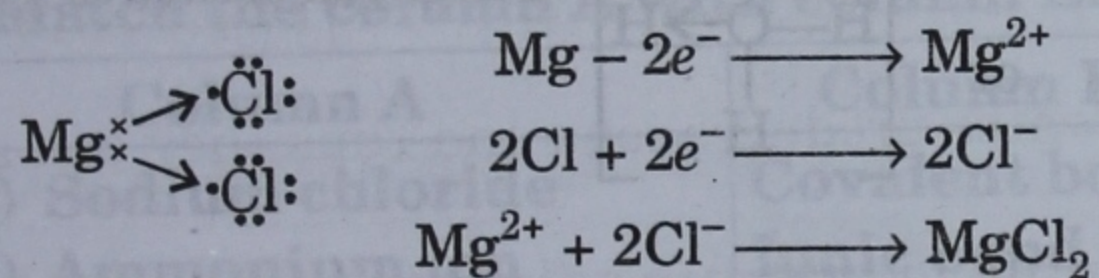
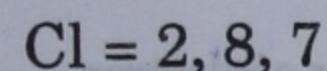
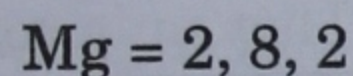
Copper ion gets **reduced** and iron metal gets **oxidized**, thus copper sulphate is an **oxidizing agent** and iron is a **reducing agent**.



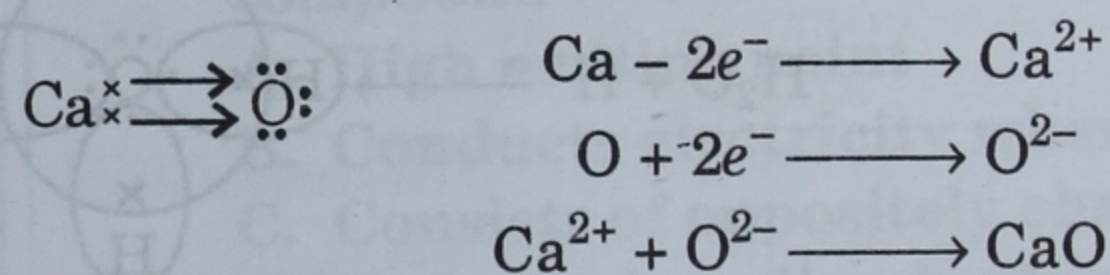
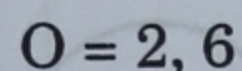
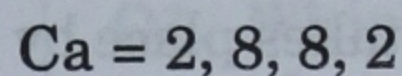
Magnesium is getting **oxidized** and chlorine is getting **reduced** thus, magnesium is the **reducing agent** and chlorine is the **oxidizing agent**.

31. The structures of few electrovalent compounds are given below :

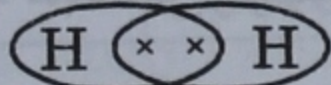
(i) Magnesium chloride



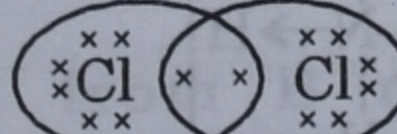
(ii) Calcium oxide



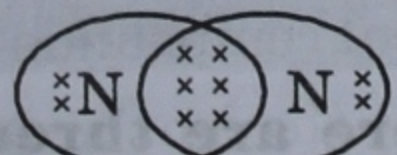
32. The structures of few **covalent molecules** are given below :

(i) Hydrogen (H₂)  or H—H


A single covalent bond is formed between two hydrogen atoms to form a molecule.

(ii) Chlorine (Cl₂)  or Cl—Cl

A single covalent bond is formed between two chlorine atoms to form a molecule.

(iii) Nitrogen (N₂)  or N≡N

A triple covalent bond is formed between two nitrogen atoms to form a molecule.

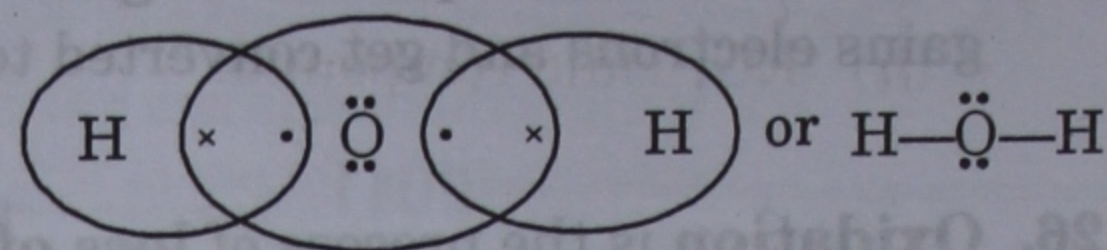
(iv) Oxygen (O₂)  or O=O

A double covalent bond is formed between two oxygen atoms to form a molecule.

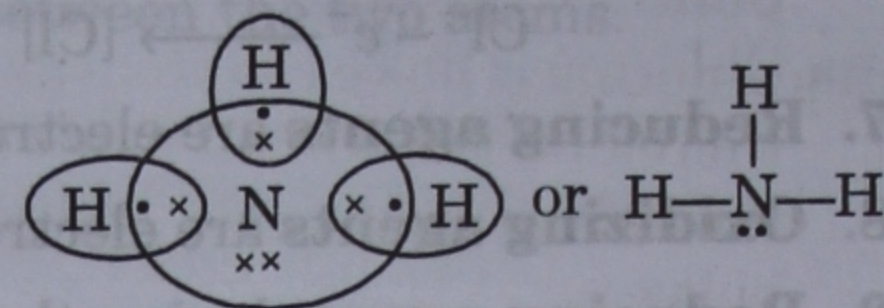
(v) Water (H₂O)

Oxygen atom has electronic configuration 2, 6.

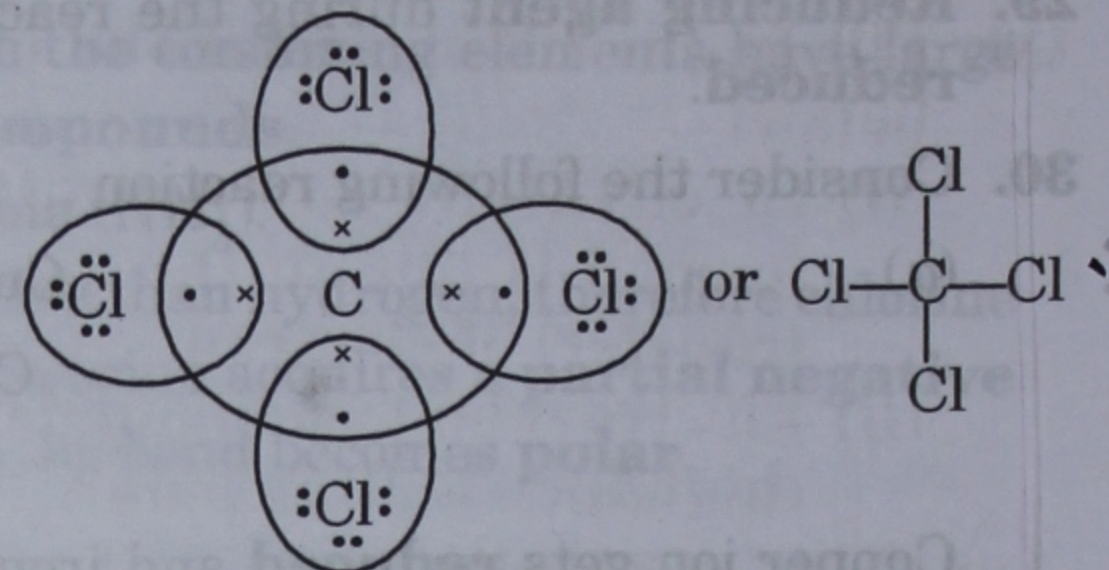
It has six electrons in its valence shell and achieves octet by sharing two electrons, one each with hydrogen atom.

**(vi) Ammonia (NH₃)**

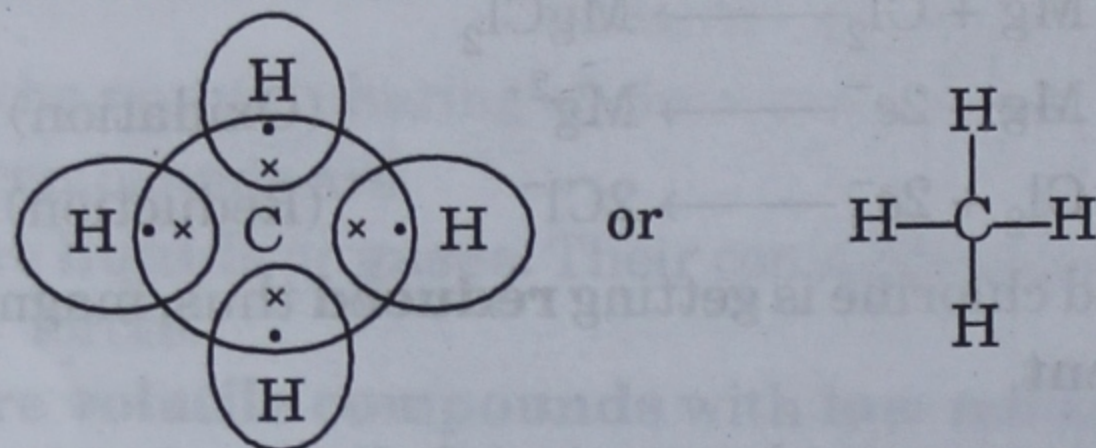
Nitrogen atom has five electrons in its valence shell and can achieve octet (stable configuration) by sharing three electrons, one each with three hydrogen atoms.

**(vii) Carbon tetrachloride (CCl₄)**

Carbon has four valence electrons. It can achieve octet by sharing four electrons one each with four chlorine atoms.

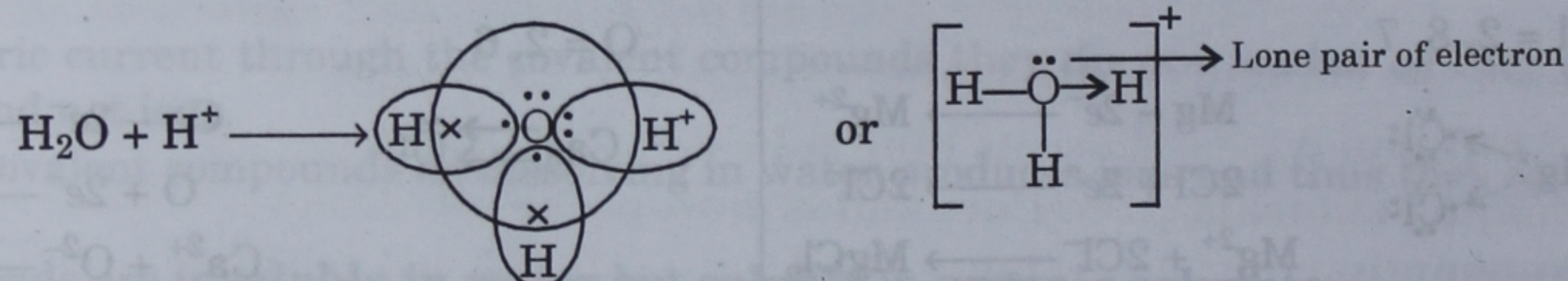
**(viii) Methane (CH₄)**

Carbon atom has four electrons in its valence shell. In order to complete octet it shares four electrons, one each with four hydrogen atoms.



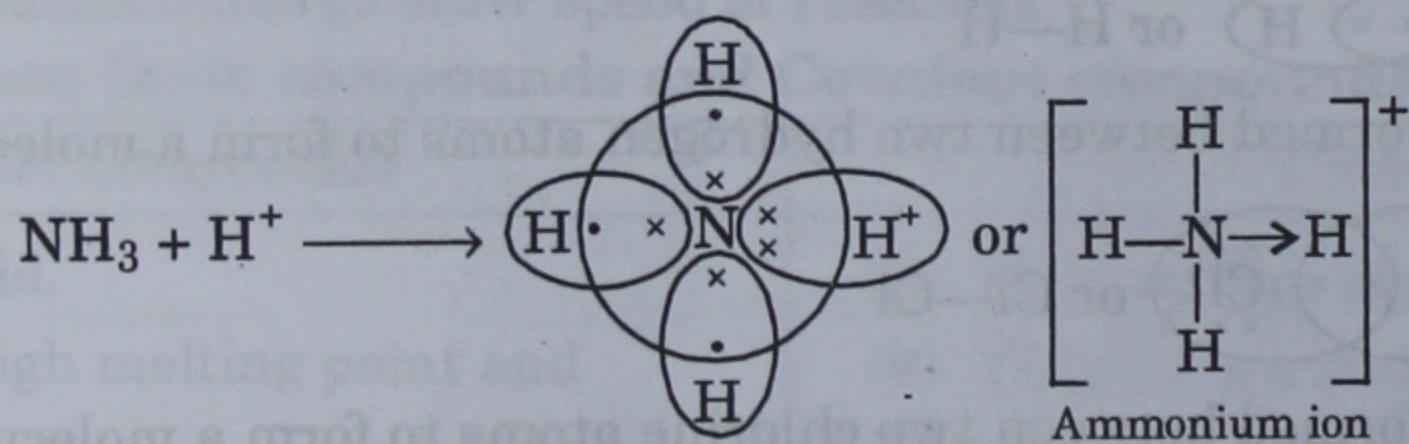
33. Coordinate bond : The bond in which the sharing of electrons takes place on the part of entirely one atom is called **coordinate bond**.

34. The formation of **hydronium ion** takes place by **coordinate bond** formation.

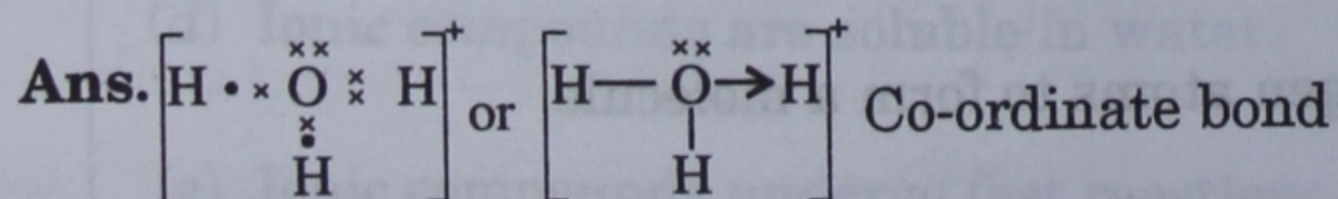


The pair of electron which does not take part in bond formation is called as lone pair of electron.

35. The formation of **ammonium ion** also takes place by **coordinate bond** formation.

**PREVIOUS YEARS' QUESTIONS****2012**

Q1. Draw an electron dot diagram to show the structure of hydronium ion. State the type of bonding present in it. [3]



Q2. There are three elements E, F, G with atomic numbers 19, 8 and 17 respectively.

(i) Classify the elements as metals and non-metals. [3]

(ii) Give the molecular formula of the compound formed between E and G and state the type of chemical bond in this compound. [1]

Ans. (i) Non-metal – F, G

Metal – E

(ii) EG, ionic compound.

2011

Q1. Why Hydrogen chloride can be termed as a polar covalent compound? [1]

Ans. Chlorine is more electronegative than hydrogen, therefore, the shared pair of electron lies closer towards chlorine and hence the bond becomes polar.

Q2. Fill in the blanks from the choices given below:

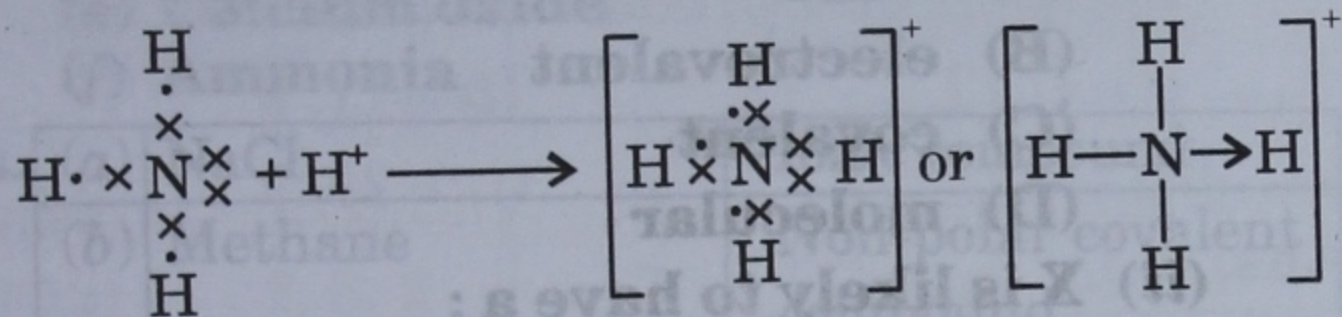
(i) In covalent compounds, the bond formed is due to the (sharing/transfer) of electron.

(ii) Electrovalent compounds have (high/low) boiling point. [2]

Ans. (i) Sharing (ii) High

Q3. By drawing an electron dot diagram, show the lone pair effect leading to the formation of ammonium ion from ammonia gas and hydrogen ion. [2]

Ans.



2010

Q1. Match the column A with column B.

Column A	Column B
(i) Sodium chloride	Covalent bond
(ii) Ammonium ion	Ionic bond
(iii) Carbon tetrachloride.	Covalent and Coordinate bond

Answer as follows:

(i) correct item from B matching sodium chloride.

(ii) correct item from B matching ammonium ion, and so on [2]

Ans. (i) Ionic bond (ii) Covalent and Coordinate bond (iii) Covalent bond

2009

Q1. A covalent compound which behaves like an ionic compound in aqueous solution. [1]

Ans. Hydrogen chloride.

Q2. Select the correct answer from the choices A, B, C and D which are given.

Among the following the one which is composed of all the three kinds of bond (ionic, covalent and coordinate bond) is

- A. Sodium chloride
B. Ammonia
C. Carbon tetrachloride
D. Ammonium chloride. [1]

Ans. D

Element	Group numbers
B	I A or 1
H	VI A or 16
F	IV A or 14
J	VII A or 17
C	II A or 2
K	VII A or 17

(i) Write the formula of the compound between B and H.

(ii) In the compound between F and J what type of bond will be formed.

(iii) Draw the electron dot structure for the compound formed between C and K. [3]

Ans. (i) B₂H (ii) Covalent bond (iii) $\text{C} \times \begin{array}{c} \cdot \\ \cdot \\ \cdot \\ \cdot \\ \cdot \\ \cdot \\ \cdot \\ \cdot \end{array} \text{K} \cdot$

2008

Q1. Which of the following is not a common characteristic of an electrovalent compound?

- A. High melting point
B. Conducts electricity when molten
C. Consists of oppositely charged ions
D. Ionizes when dissolved in water. [1]

Ans. D

Q2. What are the terms defined below?

(a) A bond formed by shared pair of electrons, each bonding atom contributing one electron to the pair.

(b) A bond formed by a shared pair of electrons with both electrons coming from the same atom. [2]

Ans. (a) Covalent bond (b) Coordinate bond

2007

Q1. (i) Name the charged particles which attract one another to form electrovalent compounds.

(ii) In the formation of electrovalent compounds, electrons are transferred from one element to another. How are electrons involved in the formation of a covalent compound?

(iii) The electronic configuration of nitrogen is 2, 5. How many electrons in the outer shell of a nitrogen atom are not involved in the formation of a nitrogen molecule?

(iv) In the formation of magnesium chloride (by direct combination between magnesium and chlorine), name the substance that is oxidized and the substance that is reduced. [5]

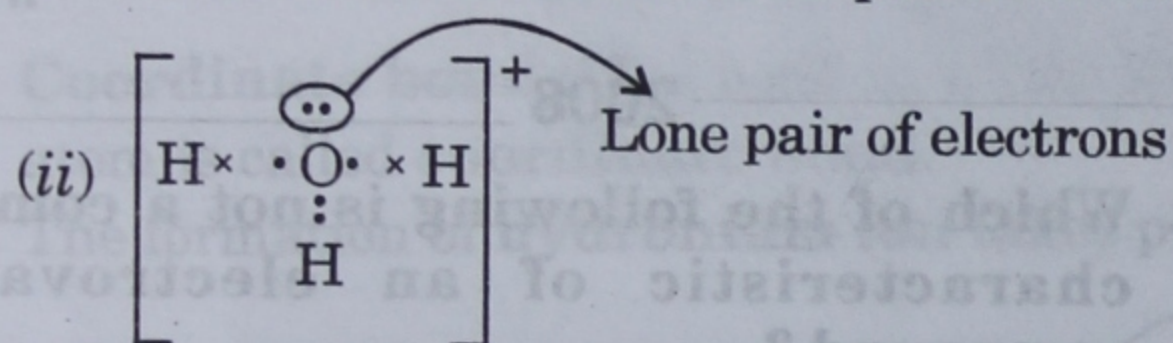
- Ans. (i) Cation and anion
 (ii) Electrons are mutually shared
 (iii) 2 electrons
 (iv) Magnesium is oxidized and chlorine is reduced.

2006

Q1. (i) What is a lone pair of electrons? [1]

(ii) Draw an electron dot diagram of a hydronium ion and label the lone pair of electrons. [2]

- Ans. (i) A pair of unshared electrons in a covalent molecule is called as a lone pair of electrons.



Q2. Choose the correct answer from the choices A, B, C and D.

(i) The property which is characteristic of an electrovalent compound.

- A. it is easily vaporised.
 B. it has high melting point.
 C. it is a weak electrolyte.
 D. it often exists as a liquid.

(ii) When a metal atom becomes an ion

- A. it loses electrons and is oxidised
 B. it gains electrons and is reduced
 C. it gains electrons and is oxidised
 D. it loses electrons and is reduced. [2]

- Ans. (i) B (ii) A

Q3. Identify the following reactions as either oxidation or reduction.

(i) $O + 2e^- \longrightarrow O^{2-}$ (ii) $K - e^- \longrightarrow K^+$

(iii) $Fe^{3+} + e^- \longrightarrow Fe^{2+}$ [3]

- Ans. (i) Reduction (ii) Oxidation (iii) Reduction

Q1. Fill in the blanks.

(i) As we descend the electrochemical series containing cations the tendency of the cations to get _____ (oxidised/reduced) at cathode increases.

(ii) The (higher/lower) _____ the concentration of an ion in a solution, the greater is the probability of its being discharged at the appropriate electrode. [2]

- Ans. (i) reduced, (ii) higher

Q2. Explain why solid sodium chloride does not allow electricity to pass through it. [1]

- Ans. Solid sodium chloride does not allow the electricity to pass through it as the ions are not free and they are held by strong electrostatic forces of attraction.

Q3. Compound X consists of molecules. Choose the letter corresponding to the correct answer from the choices A, B, C and D given below:

(i) The type of bonding in X will be

- (A) ionic
 (B) electrovalent
 (C) covalent
 (D) molecular

(ii) X is likely to have a:

- A. low melting point and high boiling point.
 B. high melting point and low boiling point.
 C. low melting point and low boiling point.
 D. high melting point and high boiling point.

(iii) In the liquid state, X will

- A. become ionic
 B. be an electrolyte
 C. conduct electricity
 D. not conduct electricity. [3]

- Ans. (i) C (ii) C (iii) D

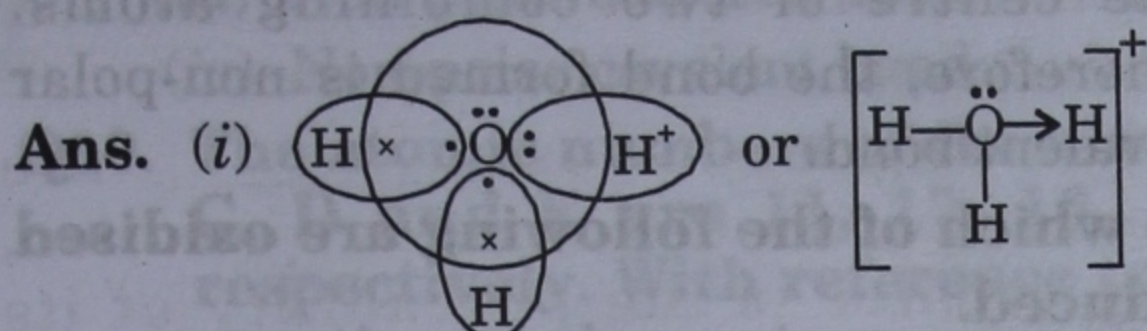
Q4. (i) Acids dissolve in water to produce positively charged ions. Draw the structure of these positive ions.

(ii) Explain why carbon tetrachloride does not dissolve in water.

(iii) Element Q and S react together to form an ionic compound under normal

conditions. Which physical state will the compound QS exist in ?

(iv) Can Q and S both be metals ? Justify your answer. [4]



(ii) Carbon tetrachloride does not dissolve in water as it is a covalent compound.

(iii) Under normal conditions QS exists in a solid state.

(iv) No, both Q and S cannot be metals as

between Q and S ionic bond formation takes place. This kind of bond formation takes place between metals and non-metals. Metals can form only cations but not anions.

Q5. Electrons are getting added to an element 'Y'.

(i) Is 'Y' getting oxidised or reduced ?

(ii) What charge will 'Y' have after the addition of electrons ?

(iii) Which electrode will 'Y' migrate during the process of electrolysis ? [3]

Ans. (i) Reduced

(ii) Negative charge

(iii) Anode

IMPORTANT QUESTIONS

Q1. Choose from the following ionic compounds, polar covalent compounds and non-polar covalent compounds :

- NaCl
- Methane
- Oxygen molecule
- Hydrogen chloride gas
- Calcium oxide
- Ammonia

Ans.	(a)	NaCl	Ionic compound
	(b)	Methane	Non-polar covalent compound
	(c)	Oxygen molecule	Non-polar covalent compound
	(d)	Hydrogen chloride gas	Polar covalent compound
	(e)	Calcium oxide	Ionic compound
	(f)	Ammonia	Polar covalent compound

Q2. Name the following :

- Polar covalent compound which, on dissolving in water, produces ions.
- The type of bonding present in metallic chlorides.
- The type of bonding present in non-metallic chlorides.
- The bond formed by the mutual sharing of electrons.
- The bond formed by the transference of electrons.
- An ion formed by the loss of electron from the neutral atom.

(g) An ion formed by the gain of electron by the neutral atom.

(h) Outermost shell of an atom.

(i) The electrons present in the outermost shell of an atom.

(j) Elements having eight electrons in the outermost shell.

Ans. (a) Hydrogen chloride gas

(b) Ionic or electrovalent bonding

(c) Covalent bonding (d) Covalent bond

(e) Ionic bond (f) Cation

(g) Anion (h) Valence shell

(i) Valence electrons

(j) Inert gases or noble gases

Q3. Element	A	B	C	D
Electronic configuration	2,8,1	2,8,7	2,5	1

(a) What type of bond is formed between

(i) A and B (ii) C and D

(iii) B and D (iv) Molecule of D

(v) Molecule of C (vi) Molecule of B

(b) What is the formula of the compound formed between

(i) A and B (ii) C and D

(iii) B and D

Ans. (a) (i) Ionic bond or Electrovalent bond

(ii) Covalent bond (iii) Covalent bond

(iv) Single covalent bond

(v) Triple covalent bond

(vi) Single covalent bond

(b) (i) AB (ii) CD₃ (iii) DB

Q4.

Element	Proton	Electron present in ion formed from element
P	9	10
Q	20	18
R	11	10
S	18	18

- (a) Identify the element which forms
(i) cation (ii) anion
- (b) Identify the element with complete octet.
- (c) What type of bond is formed between Q and P?
- (d) Give the formula of the compound formed between Q and P.

Ans. (a) (i) Q and R (ii) P

(b) S

(c) Ionic bond

(d) QP_2

Q5. Give reasons, why :

- (a) Solid Sodium Chloride does not conduct electricity.
- (b) Molten Sodium Chloride conducts electricity.
- (c) Sugar solution does not conduct electricity.
- (d) Ionic compounds have high melting point and boiling point.
- (e) Bond formed in Hydrogen molecule is non-polar covalent bond.

Ans. (a) Solid Sodium chloride does not conduct electricity because the oppositely charged ions in Sodium chloride are held by strong electrostatic force of attraction and hence, they are not free to carry electric current.

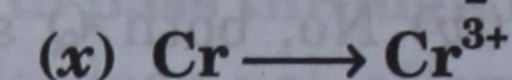
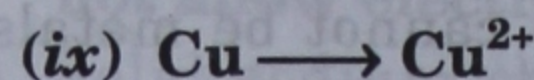
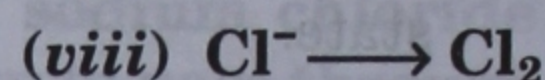
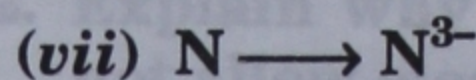
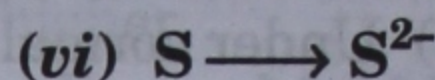
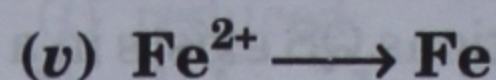
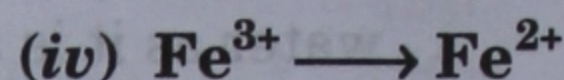
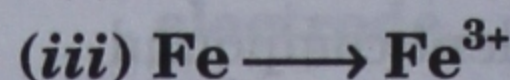
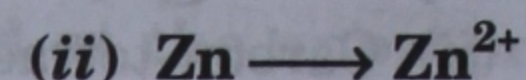
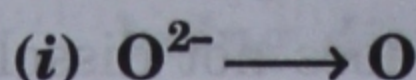
(b) Molten Sodium chloride conducts electricity because the electrostatic forces of attraction are overcome by heat energy. Therefore, the ions become free to carry electric current.

(c) Sugar solution, being a covalent compound, does not conduct electricity. As the ions are absent only molecules are present.

(d) The constituents of ionic compounds, i.e. oppositely charged particles are held by strong electrostatic forces of attraction therefore large amount of heat is supplied to separate the constituents from their lattice. So to melt, it requires high amount of energy.

(e) The combining elements in hydrogen molecule are identical, i.e. they have no difference in their electronegativity. Hence, the shared pair of electrons lies exactly in the centre of two combining atoms. Therefore, the bond formed is non-polar covalent bond.

Q6. State which of the following are oxidised or reduced.



Ans. (i) Oxidised

(ii) Oxidised

(iii) Oxidised

(iv) Reduced

(v) Reduced

(vi) Reduced

(vii) Reduced

(viii) Oxidised

(ix) Oxidised

(x) Oxidised

Q7. Identify the type of bond expected to form between the pair of elements with the following atomic number. Identify the element and predict their formula also.

(i) 1, 17

(ii) 11, 9

(iii) 6, 1

(iv) 20, 1

Ans.

Atomic Number	Name of element	Type of bond	Formula
(i) 1 17	Hydrogen Chlorine	Polar covalent bond	HCl
(ii) 11 9	Sodium Fluorine	Ionic bond	NaF
(iii) 6 1	Carbon Hydrogen	Non-polar covalent bond	CH_4
(iv) 20 1	Calcium Hydrogen	Ionic bond	CaH_2

Q8. How many covalent bonds and coordinate bonds are present in

(i) Hydronium ion (ii) Ammonium ion

Name of the ions	No. of Covalent bonds	No. of Coordinate bonds
(i) Hydronium ion	Two	One
(ii) Ammonium ion	Three	One

Q9. State the type of bond present in

(i) Non-metallic chloride

Let's Recall

Fill Your Answer in the Space Given for Each Question.

Q1. Match the following :

A. Column -I

- (i) Reduction
- (ii) Reducing agent
- (iii) Oxidation
- (iv) Oxidizing agent

Column-II

- (a) Loss of electrons
- (b) Non-metals
- (c) Metals
- (d) Gain of electrons

Ans. (i) (ii) (iii) (iv)

B. Column -I

- (i) Cation
- (ii) Anion
- (iii) Electrostatic force
- (iv) van der Waals' force

Column-II

- (a) Non-metals
- (b) Covalent bond
- (c) Metals
- (d) Ionic bond

Ans. (i) (ii) (iii) (iv)

Q2. Fill in the blanks.

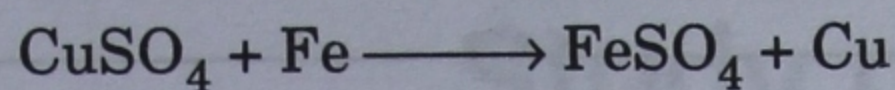
- (i) An atom is electrically _____.
- (ii) An ion is a _____ charged particle formed as a result of _____ or _____ of electrons from the neutral atom.
- (iii) The electron pair which do not take part in bond formation is called _____ pair of electrons.
- (iv) Oxidizing agents during the reaction gets _____ and reducing agents during the reaction gets _____.
- (v) Sodium chloride does not conduct electricity in _____ state.

Q3. State whether the following statements are True or False.

- (i) Covalent bond is formed by the transference of electrons.
- (ii) Hydrogen molecule is a non-polar molecule.
- (iii) In non-polar covalent bond the shared pair of electrons lies in the centre of the two combining atoms.
- (iv) All hydrocarbons are non-polar covalent compounds.
- (v) Ionic compounds are solid and possess low melting point.
- (vi) During reduction, the process of loss of electrons takes place.
- (vii) On losing electrons atom gets converted to anion.
- (viii) Ionic compounds are insoluble in water.
- (ix) Nitrogen molecule is triatomic.
- (x) Inert gases do not form ions.
- (xi) Helium is an inert gas having complete octet.
- (xii) Solid sodium chloride is a strong electrolyte.
- (xiii) Ionic compounds have high melting point and low boiling point.
- (xiv) Hydrochloric acid does not contain ions.
- (xv) Ammonium ion is formed by coordinate bond.

Q4. Each question has four options out of which only one option is correct. Dark the bubble for correct answer.

(i) Consider the reaction below and tick the correct option :



- (a) Both CuSO_4 and Fe are reducing agent.
 (b) Both CuSO_4 and Fe are oxidizing agents.
 (c) CuSO_4 is a reducing agent and Fe is an oxidizing agent.
 (d) CuSO_4 is an oxidizing agent and Fe is a reducing agent.

Ans.

(a)

(b)

(c)

(d)

(ii) Ammonia molecule contains

- (a) three covalent bonds and two lone pairs of electrons.
 (b) two covalent bonds and three lone pairs of electrons.
 (c) three covalent bonds and one lone pair of electrons.
 (d) None of the above

Ans.

(a)

(b)

(c)

(d)

(iii) Water is a polar covalent compound as

- (a) combining elements have no difference in electronegativity.
 (b) combining elements have large difference in electronegativity.
 (c) Both of the above
 (d) None of the above

Ans.

(a)

(b)

(c)

(d)

(iv) Which of the following is not a common characteristic of a covalent compound ?

- (a) Low melting point
 (b) Conducts electricity
 (c) Consists of molecules
 (d) Insoluble in water

Ans.

(a)

(b)

(c)

(d)

(v) Which pair of elements listed below will undergo ionic bond formation ?

- (a) Na and K
 (b) C and Cl
 (c) C and H
 (d) Na and Cl

Ans.

(a)

(b)

(c)

(d)

ANSWERS

1. A. (i) d (ii) c (iii) a (iv) b
 B. (i) c (ii) a (iii) d (iv) b
2. (i) neutral (ii) electrically, lose, gain (iii) lone (iv) reduced, oxidised
 (v) solid
3. (i) False (ii) True (iii) True (iv) True (v) False (vi) False (vii) False (viii) False
 (ix) False (x) True (xi) False (xii) False (xiii) False (xiv) False (xv) True
4. (i) d (ii) c (iii) b (iv) b (v) d

SELF EVALUATION Test

Time : 30 minutes

Marks : 25

- Q1.** Show the formation of
 (a) Hydronium ion (b) Ammonium ion 1
- Q2.** How many lone pairs of electrons are present in
 (a) Hydronium ion (b) Ammonium ion ? 2
- Q3.** Why ammonia and water undergo coordinate bond formation ? 2
- Q4.** Name two polar covalent compounds which on dissolving in water produces ions. 2
- Q5.** Compare the properties of electrovalent and covalent compounds on the basis of
 (i) Electrical conductivity
 (ii) Physical state
 (iii) Type of particle formed
 (iv) Solubility in water 2
- Q6.** Give reasons why 4
 (i) metals are always monoatomic.
 (ii) ionic compounds have high melting point.
 (iii) ionic compounds easily dissolve in water.
 (iv) inert gases do not form ions.
- Q7.** Copy and complete the table given below and answer the following questions :
 (Note : Do not identify the element)

Element	Mass No.	Atomic No.	Proton	Electronic Configuration	5
A	14	7	—	—	
B	35	17	—	—	
C	1	1	—	—	
D	12	6	—	—	
E	16	8	—	—	

- (i) How many valence electrons are present in A, B, C, D and E ? 2½
- (ii) Choose metal, non-metal or inert gas from the above elements. 2½
- (iii) What type of bond formation takes place between 2
 (a) B and C (b) Molecule of A (c) D and C (d) A and C ?