

9th Science Lesson 13 Questions in English

13] Chemical Bonding

1. Which of the following alone exists in independent state?

- a) Chalcogen
- b) **Nobel gas**
- c) Halogen
- d) All the above

Explanation

We already know that atoms are the building blocks of matter. **Under normal conditions no atom exists as an independent (single) entity in nature, except noble gases.**

2. Which of the following statement is correct?

- 1) A group of atoms is found to exist together as one species called molecule
 - 2) There should be a force to keep the constituent atoms together as the thread holds the flowers together in a garland
 - 3) This attractive force which holds the atoms together is called a bond
- a) 1, 2
 - b) 1, 3
 - c) 2, 3
 - d) **All the above**

Explanation

A group of atoms is found to exist together as one species. Such a group of atoms is called molecule. Obviously, there should be a force to keep the constituent atoms together as the thread holds the flowers together in a garland. This **attractive force which holds the atoms together is called a bond**. A chemical bond may be defined as the force of attraction between the atoms that binds them together as a unit called molecule.

3. Who explained about why atoms combine to form molecules based on Noble gases?

- 1) Kossel
 - 2) Karol
 - 3) Lewis
- a) 1, 2
 - b) **1, 3**
 - c) 2, 3
 - d) All the above

Explanation

Kossel and Lewis gave successful explained the concept of electronic configuration of noble gases about why atoms combine to form molecules. **Atoms of noble gases have little or no tendency to combine with each other or with atoms of other elements.** This means that these atoms must be having stable electronic configurations.

4. Match the following:

- | | |
|-------------|----------------|
| I. Krypton | 1. 2 |
| II. Neon | 2. 2,8,18,18,8 |
| III. Helium | 3. 2, 8 |
| IV. Xenon | 4. 2,8,18,8 |
- a) 3, 1, 4, 2
b) **4, 3, 1, 2**
c) 4, 3, 2, 1
d) 3, 4, 1, 2

Explanation

Name of the element	Atomic number	Shell electronic configuration
Helium (He)	2	2
Neon (Ne)	10	2,8
Argon (Ar)	18	2,8,8
Krypton (Kr)	36	2,8,18,8
Xenon (Xe)	54	2,8,18,18,8
Radon (Rn)	86	2,8,18,32,18,8

5. Which Noble gas doesn't have eight electrons in their valence shell?

- a) **Helium**
b) Neon
c) Krypton
d) Radon

Explanation

Except Helium, all other **noble gases have eight electrons in their valence shell**. Even helium has its valence shell completely filled and hence no more electrons can be added. The number of electrons lost from a metal atom is the valency of the metal and the number of electrons gained by a nonmetal is the valency of the non-metal.

6. Assertion(A): Noble gases do not form diatomic molecules and exist as monoatomic gaseous atoms

Reason(R): Because of their stable valence shell electronic configuration, the noble gas atoms neither have any tendency to gain nor to lose electrons

- a) Both (A) and (R) are correct, but (R) does not explain (A)
- b) Both (A) and (R) are wrong
- c) **Both (A) and (R) are correct and (R) explains (A)**
- d) (A) is Correct and (R) is wrong

Explanation

Because of having stable valence shell electronic configuration, the noble gas atoms neither have any tendency to gain nor to lose electrons and hence their valency is zero. They are so inert that they even do not form diatomic molecules and exist as monoatomic gaseous atoms.

7. When did Kossel and Lewis proposed 'Electronic theory of valence' or Octet rule?

- a) 1920
- b) **1916**
- c) 1909
- d) 1954

Explanation

Based on the **noble gas electronic configuration, Kossel and Lewis proposed a theory in 1916** to explain chemical combination between atoms and this theory is known as 'Electronic theory of valence' or Octet rule.

8. Which of the following statement about Octet rule is correct?

- 1) Atoms of all elements, other than inert gases, combine to form molecules because they have incomplete valence shell
 - 2) They tend to attain a stable electronic configuration similar to noble gases
 - 3) The tendency of atoms to have eight electrons in the valence shell is known as the 'Octet rule' or the 'Rule of eight'
- a) 1, 2
 - b) 1, 3
 - c) 2, 3
 - d) **All the above**

Explanation

According to 'Electronic theory of valence' or Octet rule, atoms of all elements, other than inert gases, combine to form molecules because they have incomplete valence shell and tend to attain a stable electronic configuration similar to noble gases. Atoms can combine either by transfer of valence electrons from one atom to another or by sharing of valence electrons in order to achieve the stable outer shell of eight electrons. The tendency of atoms to have eight electrons in the valence shell is known as the 'Octet rule' or the 'Rule of eight'.

9. What is the electronic configuration of Chlorine?

- a) 2,8,7
- b) 2,8
- c) 2,8,9
- d) 2,8,18

Explanation

Sodium with atomic number 11 will readily lose one electron to attain neon's stable electronic configuration. Similarly, **chlorine has electronic configuration 2,8,7**. To get the nearest noble gas (i.e. argon) configuration, it needs one more electron. So, chlorine readily gains one electron from other atoms and obtains stable electronic configuration. Thus, elements tend to have stable valence shell (eight electrons) either by losing or gaining electrons.

10. Match the following atoms with their Valency:

- | | |
|--------------|------|
| I. Boron | 1. 1 |
| II. Nitrogen | 2. 3 |
| III. Oxygen | 3. 5 |
| IV. Sodium | 4. 6 |
- a) 1, 4, 2, 3
 - b) 2, 1, 4, 3
 - c) 2, 3, 4, 1
 - d) 1, 3, 2, 4

Explanation

Element	Atomic number	Electron distribution	Valence electrons
Boron	5	2, 3	3
Nitrogen	7	2, 5	5
Oxygen	8	2, 6	6
Sodium	11	2, 8, 1	1

11. Which of the following statement is correct?

- 1) When atoms combine to form compounds, their valence electrons involve in bonding
- 2) The Lewis dot structure or electron dot symbol for an atom consists of the symbol of the element surrounded by dots representing the electrons of the valence shell of the atom
- 3) The unpaired electron in the valence shell is represented by double dot
 - a) 1, 2
 - b) 1, 3
 - c) 2, 3
 - d) All the above

Explanation

When atoms combine to form compounds, their valence electrons involve in bonding. Therefore, it is helpful to have a method to depict the valence electrons in the atoms. This can be done using Lewis dot symbol method. The Lewis dot structure or electron dot symbol for an atom consists of the symbol of the element surrounded by dots representing the electrons of the valence shell of the atom. **The unpaired electron in the valence shell is represented by a single dot whereas the paired electrons are represented by a pair of dots.**

12. Which of the following are used to differentiate the electrons of the different atoms in molecule?

- 1) Circle
- 2) Dot
- 3) Crosses
 - a) 1, 2
 - b) 1, 3
 - c) 2, 3
 - d) All the above

Explanation

Symbols other than dots, like **crosses or circles** may be used to differentiate the electrons of the different atoms in the molecule.

13. Match the following:

- | | |
|--------------|---------|
| I. Hydrogen | 1. 2,6 |
| II. Nitrogen | 2. 2 |
| III. Helium | 3. 1 |
| IV. Oxygen | 4. 2, 5 |
- a) 3, 1, 4, 2
 - b) 2, 1, 4, 3
 - c) 3, 4, 2, 1
 - d) 4, 3, 1, 2

Explanation

Element	Atomic number	Electron distribution	Valence electrons	Lewis dot structure
Hydrogen	1	1	1	H•
Helium	2	2	2	He:
Beryllium	4	2, 2	2	•Be•
Carbon	6	2, 4	4	•C•
Nitrogen	7	2, 5	5	•N•
Oxygen	8	2, 6	6	•O•

14. Which of the following statement is correct?

- 1) All the elements have different valence shell electronic configuration
 - 2) Depending on the type of bond, they show different characteristics or properties
- a) 1 alone
b) 2 alone
c) 1, 2
d) None

Explanation

All the elements have different valence shell electronic configuration. So, the way in which they combine to form compounds also differs. Hence, there are different types of chemical bonding possible between atoms which make the molecules. Depending on the type of bond, they show different characteristics or properties. Such types of bonding, that are considered to exist in molecules.

15. An ionic bond is a chemical bond formed by_____

- a) Electrostatic repulsion
- b) **Electrostatic attraction**
- c) Magnetic pulling
- d) None

Explanation

An ionic bond is a chemical bond formed by the electrostatic attraction between positive and negative ions. The bond is formed between two atoms when one or more electrons are transferred from the valence shell of one atom to the valence shell of the other atom.

16. The atom that loses electrons will form_____

- a) Anion
- b) Cation**
- c) Anode
- d) Cathode

Explanation

The **atom that loses electrons will form a cation (positive ion)** and the atom that gains electrons will form an anion (negative ion). These oppositely charged ions come closer to each other due to electrostatic force of attraction and thus form an ionic bond.

17. When the bond is between the ions, then it is called as_____

- a) Covalent bond
- b) Electrovalent bond
- c) Electrostatic bond
- d) Ionic bond**

Explanation

As the bond is between the ions, it is called Ionic bond and the **attractive forces being electrostatic**, the bond is also called **Electrostatic bond**. Since the **valence concept** has been explained **in terms of electrons**, it is also called as **Electrovalent bond**.

18. Ionic bond is formed between_____

- 1) Metals
- 2) Non-metals
- 3) Noble gases
- a) 1, 2**
- b) 1, 3
- c) 2, 3
- d) All the above

Explanation

Let us consider two atoms A and B. Let atom A has one electron in excess and atom B has one electron lesser than the stable octet electronic configuration. If atom A transfer one electron to atom B, then both the atoms will acquire stable octet electronic configuration. As the result of this electron transfer, atom A will become positive ion (cation) and atom B will become negative ion (anion). These oppositely charged ions are held together by electrostatic force of attraction which is called Ionic bond or Electrovalent bond. **In general, ionic bond is formed between a metal and non-metal.**

19. Which group elements form ionic compounds when they react with non-metals?

- 1) Group 1
 - 2) Group 4
 - 3) Group 2
 - 4) Group 5
- a) 1, 3
 - b) 2, 3
 - c) 2, 4
 - d) 1, 3

Explanation

The compounds containing ionic bonds are called ionic compounds. Elements of Group 1 and 2 in periodic table, i.e. alkali and alkaline earth metals form ionic compounds when they react with non-metals. The number of electrons that an atom of an element loses or gains to form an electrovalent bond is called its Electro-valency.

20. What is the nearest stable electronic configuration (noble gas) of Sodium?

- a) Helium
- b) **Neon**
- c) Argon
- d) Krypton

Explanation

The atomic number of Sodium is 11 and its electronic configuration is 2, 8, 1. It has one electron excess to the **nearest stable electronic configuration of a noble gas - Neon**. So, sodium has a tendency to lose one electron from its outermost shell and acquire a stable electronic configuration forming sodium cation (Na^+).

21. What is the nearest stable electronic configuration (noble gas) of Chlorine?

- a) Radon
- b) Neon
- c) **Argon**
- d) Krypton

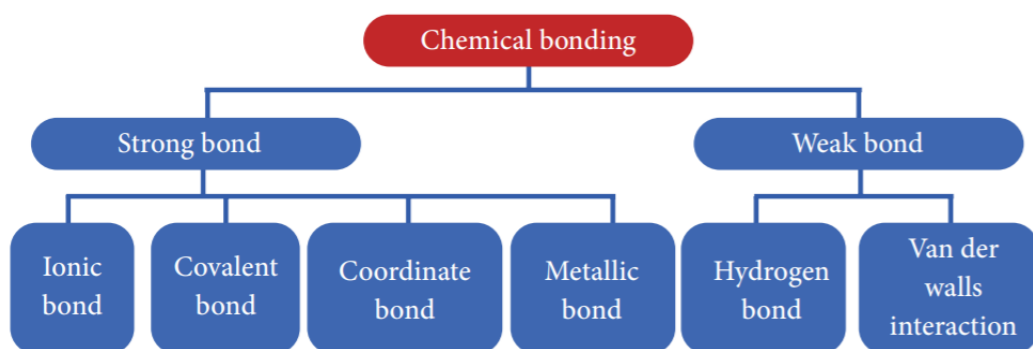
Explanation

The atomic number of Chlorine is 17 and its electronic configuration is 2, 8, 7. It has one electron less to the **nearest stable electronic configuration of a noble gas - Argon**. So, Chlorine has a tendency to gain one electron to acquire a stable electronic configuration forming chloride anion (Cl^-).

22. Which of the following are Weak Chemical bonding?

- 1) Hydrogen bond
 - 2) Covalent bond
 - 3) Van der walls interaction
- a) 1, 2
 - b) 1, 3**
 - c) 2, 3
 - d) All the above

Explanation



23. What is the atomic number of magnesium?

- a) 13
- b) 12**
- c) 16
- d) 21

Explanation

The **atomic number of magnesium is 12** and the electronic configuration is 2, 8, 2. It has two electron excess to the nearest stable electronic configuration of a noble gas - Neon. So, magnesium has a tendency to lose two electrons from its outermost shell and acquire a stable electronic configuration forming magnesium cation (Mg^{2+}).

24. Ionic compounds are_____ at room temperature.

- a) Crystalline solids**
- b) Liquid
- c) Gas
- d) None

Explanation

Ionic compounds are formed because of the strong electrostatic force between cations and anions which are arranged in a well-defined geometrical pattern. Thus, ionic compounds are **crystalline solids at room temperature**.

25. Which of the following statement about ionic compound is correct?

- 1) Ionic are tightly held together
- 2) In molten state their aqueous solutions conduct electricity
- 3) In solid state they cannot move freely, and they do not conduct electricity.
 - a) 1, 2
 - b) 1, 3
 - c) 2, 3
 - d) All the above

Explanation

Ionic compounds are crystalline solids and so their **ions are tightly held together**. The ions, therefore, cannot move freely, and **they do not conduct electricity in solid state**. However, in molten state **their aqueous solutions conduct electricity**.

26. Which of the following statement about ionic compound is correct?

- a) High melting and Low boiling points
- b) **High melting and boiling points**
- c) Low melting and boiling points
- d) Low melting and High boiling point

Explanation

The strong electrostatic force between the cations and anions hold the ions tightly together, so very high energy is required to separate them. Hence ionic compounds have high melting and boiling points.

27. In Which of the following ionic compounds are insoluble?

- 1) Benzene
- 2) Carbon tetra chloride
- 3) Water
 - a) 1, 2
 - b) **1, 3**
 - c) 2, 3
 - d) All the above

Explanation

Ionic compounds are soluble in polar solvents like water. **They are insoluble in non-polar solvents like benzene (C₆H₆), carbon tetra chloride (CCl₄).** Ionic compounds have high density and they are quite hard because of the strong electrostatic force between the ions. But they are highly brittle. Ionic compounds undergo ionic reactions which are practically rapid and instantaneous

28. Which of the following statement is correct?

- 1) Atoms can combine with each other by sharing the unpaired electrons in their outermost shell
- 2) Covalent bond is formed because of the sharing of electrons which become common to both the atoms
- 3) Covalent bond is also called as atomic bond.
 - a) 1, 2
 - b) 1, 3
 - c) 2, 3
 - d) All the above

Explanation

Atoms can combine with each other by sharing the unpaired electrons in their outermost shell. Each of the two combining atoms contributes one electron to the electron pair which is needed for the bond formation and has equal claim on the shared electron pair. According to Lewis concept, when two atoms form a covalent bond between them, each of the atoms attains the stable electronic configuration of the nearest noble gas. Since the **covalent bond is formed because of the sharing of electrons which become common to both the atoms, it is also called as atomic bond.**

29. How many types of Covalent bond exists?

- a) 3
- b) 1
- c) 4
- d) 2

Explanation

Formation of Covalent bond:

Let us consider two atoms A and B. Let atom A has one valence electron and atom B has seven valence electrons. As these atoms approach nearer to each other, each atom contributes one electron and the resulting electron pair fills the outer shell of both the atoms. Thus, both the atoms acquire a completely filled valence shell electronic configuration which leads to stability. **There are three types of Covalent bond.**

30. Match the following:

- | | |
|---------------------------|---------------------------|
| I. Double Covalent bond | 1. Between Nitrogen atoms |
| II. Single Covalent bond | 2. Between Oxygen atoms |
| III. Triple Covalent bond | 3. Between Hydrogen atoms |
- a) 2, 1, 3
b) 3, 2, 1
c) **2, 3, 1**
d) 1, 3, 2

Explanation**More to Know**

Covalent bonds are of three types:

1. Single covalent bond represented by a line (—) between the two atoms. Eg. H—H
2. Double covalent bond represented by a double line (=) between the two atoms. Eg. O=O
3. Triple covalent bond represented by a triple line (≡) between the two atoms. Eg. N≡N

31. How many valence electrons does Chlorine atom have?

- a) 1
b) 2
c) **7**
d) 3

Explanation

Chlorine molecule is formed by two chlorine atoms. **Each chlorine atom has seven valence electrons (2,8,7).** These two atoms achieve a stable completely filled electronic configuration (octet) by sharing a pair of electrons.

32. Methane molecule is formed by the combination of_____

- a) One Carbon and three Hydrogen
b) **One Carbon and four Hydrogen**
c) Two Carbon and five Hydrogen
d) One Carbon and one Hydrogen

Explanation

Methane molecule is formed by the combination of one carbon and four hydrogen atoms. The carbon atom has four valence electrons (2, 4). These four electrons are shared with four atoms of hydrogen to achieve a stable electronic configuration (octet) by sharing a pair of electrons.

33. How many valence electrons does Oxygen atom have?

- a) 3
- b) 1
- c) 6
- d) 5

Explanation

Oxygen molecule is formed by two oxygen atoms. **Each oxygen atom has six valence electrons (2, 6).** These two atoms achieve a stable electronic configuration (octet) by sharing two pair of electrons. **Hence a double bond is formed in between the two atoms.**

34. What is the electronic configuration of Nitrogen?

- a) 2, 7
- b) 2, 5
- c) 2, 1
- d) 2

Explanation

Nitrogen molecule is formed by two nitrogen atoms. **Each nitrogen atom has five valence electrons (2, 5).** These two atoms achieve a stable completely filled electronic configuration (octet) by sharing three pair of electrons. Hence a triple bond is formed in between the two atoms.

35. What are the Physical state of Covalent bond compound?

- 1) Gas
- 2) Solid
- 3) Liquid
- a) 1, 2
- b) 1, 3
- c) 2, 3
- d) All the above

Explanation

Depending on force of attraction between covalent molecule the bond may be weaker or stronger. Thus, **covalent compounds exist in gaseous, liquid and solid form.** Eg. Oxygen-gas; Water-liquid; Diamond-solid.

36. Assertion (A): Covalent compounds are Bad conductor of electricity

Reason (R): They do not contain charged particles

- a) Both (A) and (R) are correct, but (R) does not explain (A)
- b) Both (A) and (R) are wrong
- c) **Both (A) and (R) are correct and (R) explains (A)**
- d) (A) is Correct and (R) is wrong

Explanation

Covalent compounds do not contain charged particles (ions), so they are bad conductors of electricity. Covalent compounds are neither hard nor brittle. But they are soft and waxy.

37. In which of the following Covalent bond compounds are insoluble?

- a) Benzene
- b) Carbon tetra chloride
- c) **Water**
- d) All the above

Explanation

Covalent compounds are readily soluble in non-polar solvents like benzene (C_6H_6), carbon tetra chloride (CCl_4). **They are insoluble in polar solvents like water.** Covalent compounds undergo molecular reactions in solutions and these reactions are slow

38. Which of the following compounds are Polar solvents?

- 1) Water
 - 2) Acetone
 - 3) Acetic acid
 - 4) Ammonia
- a) 1, 2, 3
 - b) 2, 3, 4
 - c) **1, 3, 4**
 - d) All the above

Explanation

Polar solvents contain bonds between atoms with very different electronegativities, such as oxygen and hydrogen. Ionic compounds are soluble in polar solvents. Ex: **water, ethanol, acetic acid, ammonia.**

39. Non polar solvents contain bonds between atoms with similar electro negativities, such as___

- 1) Carbon
- 2) Oxygen
- 3) Hydrogen
 - a) 1, 2
 - b) 1, 3**
 - c) 2, 3
 - d) All the above

Explanation

Non polar solvents contain bonds between atoms with similar electro negativities, such as **carbon and hydrogen**. Covalent compounds are soluble in nonpolar solvents. Ex: acetone, benzene, toluene, turpentine.

40. Which of the following statement is correct?

- 1) A metal combines with a nonmetal through ionic bond.
- 2) A compound is said to be ionic when the charge of the cation and anion are completely separated.
- 3) In 1923, Robert Frost found, through his X-Ray crystallographic studies, that some of the ionic compounds show covalent character.
 - a) 1, 2
 - b) 1, 3
 - c) 2, 3
 - d) All the above

Explanation

As we know, a metal combines with a nonmetal through ionic bond. The compounds so formed are called ionic compounds. A compound is said to be ionic when the charge of the cation and anion are completely separated. But in 1923, **Kazimierz Fajans** found, through his X-Ray crystallographic studies, that **some of the ionic compounds show covalent character**.

41. According to Fajan's rule, when the size of the cation is small and that of anion is large, the bond is of more_____

- a) Ionic
- b) Covalent**
- c) Coordinate
- d) Hydrogen

Explanation

Fajan's rules are formulated by considering the charge of the cation and the relative size of the cation and anion.

- When the size of the cation is small and that of anion is large, the bond is of more covalent character
- Greater the charge of the cation, greater will be the covalent character

42. Which of the following are features of Ionic bond?

- 1) Low positive charge
 - 2) Large cation
 - 3) Small anion
- a) 1, 2
 - b) 1, 3
 - c) 2, 3
 - d) All the above

Explanation

Ionic	Covalent
Low positive charge	High positive charge
Large cation	Small cation
Small anion	Large anion

43. In aluminium triiodide, the bond is_____

- a) Ionic
- b) **Covalent**
- c) Coordinate
- d) Hydrogen

Explanation

In sodium chloride, low positive charge (+1), a fairly large cation and relatively small anion make the charges to separate completely. So, it is ionic. **In aluminium triiodide, higher is the positive charge (+3), larger is the anion and thus no complete charge separation. So, it is covalent.**

44. Coordinate covalent bond is also known as_____

- a) Atomic bond
- b) **Dative bond**
- c) Hydrogen bond
- d) Van der walls interaction

Explanation

In the formation of normal covalent bond each of the two bonded atoms contribute one electron to form the bond. However, in some compounds, the formation of a covalent bond between two atoms

takes place by the sharing of two electrons, both of which comes from only one of the combining atoms. **This bond is called Coordinate covalent bond or Dative bond.**

45. Which of the following statement is correct?

- 1) Mostly the lone pair of electrons from an atom in a molecule may be involved in the dative bonding
- 2) The atom which provides the electron pair is called donor atom while the other atom which accepts the electron pair is called acceptor atom.
- 3) The coordinate covalent bond is represented by an arrow ($\rightarrow$) which points from the donor to the acceptor atom.
 - a) 1, 2
 - b) 1, 3
 - c) 2, 3
 - d) All the above

Explanation

Mostly the lone pair of electrons from an atom in a molecule may be involved in the dative bonding. The atom which provides the electron pair is called donor atom while the other atom which accepts the electron pair is called acceptor atom. The coordinate covalent bond is represented by an arrow ($\rightarrow$) which points from the donor to the acceptor atom.

46. Which of the following statement about coordinate covalent compound is correct?

- 1) These compounds exist as gases, liquids or solids
- 2) Coordinate compounds also do not contain charged particles (ions), so they are bad conductors of electricity
- 3) They are soluble in polar solvents like water
 - a) 1, 2
 - b) 1, 3
 - c) 2, 3
 - d) All the above

Explanation

Characteristics of coordinate covalent compounds:

Physical state: These compounds exist as gases, liquids or solids.

Electrical conductivity: Like covalent compounds, coordinate compounds also do not contain charged particles (ions), so they are **bad conductors of electricity**.

Melting point: These compounds have melting and boiling points higher than those of purely covalent compounds but lower than those of purely ionic compounds.

Solubility: Insoluble in polar solvents like water but are soluble in non-polar solvents like benzene, CCl₄, and toluene.

Reactions: Coordinate covalent compounds undergo molecular reactions which are slow.

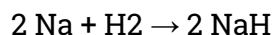
47. Which of the following results in Oxidation?

- 1) Addition of oxygen
 - 2) Addition of hydrogen
 - 3) Loss of electron
 - 4) Removal of hydrogen
- a) 1, 2, 4
 - b) 2, 3, 4
 - c) 1, 3, 4
 - d) All the above

Explanation

The chemical reaction which involves **addition of oxygen or removal of hydrogen or loss of electrons is called oxidation.**

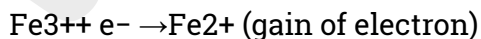
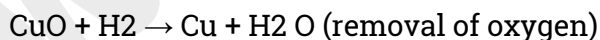
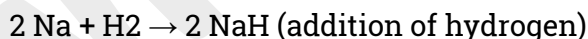
48. What is the below reaction?



- a) Oxidation
- b) **Reduction**
- c) Redox
- d) None

Explanation

The chemical reaction which involves addition of hydrogen or removal of oxygen or gain of electrons is called reduction.



49. $2 \text{PbO} + \text{C} \rightarrow 2 \text{Pb} + \text{CO}_2$

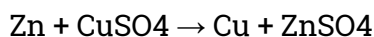
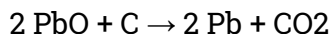
What is the above reaction?

- a) Oxidation
- b) **Reduction**

- c) Redox
- d) None

Explanation

Generally, the oxidation and reduction occur in the same reaction (simultaneously). If one reactant gets oxidised, the other gets reduced. Such reactions are called oxidation-reduction reactions or Redox reactions.



50. Which of the following statement is correct?

- 1) Substances which have the ability to oxidise other substances are called oxidising agents
- 2) These are also called as electron acceptors
- a) 1 alone
- b) 2 alone
- c) 1, 2
- d) None

Explanation

Substances which have the ability to oxidise other substances are called oxidising agents. These are also called as electron acceptors because they remove electrons from other substances. Example: H_2O_2 , MnO_4^- , CrO_3 , $\text{Cr}_2\text{O}_7^{2-}$

51. Which of the following are Reducing agents?

- 1) H_2O
- 2) NaBH_4
- 3) Platinum
- 4) Palladium
- a) 1, 3, 4
- b) 2, 3, 4
- c) 1, 2, 3
- d) All the above

Explanation

Substances which have the ability to reduce other substances are called Reducing agents. These are also called as electron donors because they donate electrons to other substances. Example: NaBH_4 , LiAlH_4 and metals like Palladium, Platinum.

52. Which of the following statement is correct?

- 1) The oxidation reaction in food materials is called Rancidity
- 2) The shining surface of metals tarnishes due to the formation of respective metal oxides on their surfaces. This is called corrosion.
- 3) The freshly cut surfaces of vegetables and fruits turn brown after some time because of the oxidation of compounds present in them.
 - a) 1, 3
 - b) 2, 3
 - c) 1, 2
 - d) All the above

Explanation

In nature, the oxygen present in atmospheric air oxidises many things, starting from metals to living tissues.

- The **shining surface of metals tarnishes** due to the formation of respective metal oxides on their surfaces. This is called **corrosion**
- The freshly cut surfaces of vegetables and fruits turn brown after some time because of the oxidation of compounds present in them
- The **oxidation reaction in food materials** that were left open for a long period is responsible for spoiling of food. This is called **Rancidity**

53. Which of the following statement is correct?

- 1) Oxidation number is also called oxidation state
- 2) The sum of oxidation numbers of all the atoms in the formula for a neutral compound is ZERO.
- 3) Negative oxidation number in a compound of two unlike atoms is assigned to the more electronegative atom
 - a) 1, 2
 - b) 1, 3
 - c) 2, 3
 - d) All the above

Explanation

Oxidation number of an element is defined as the total number of electrons that an atom either gains or loses in order to form a chemical bond with another atom. **Oxidation number is also called oxidation state.** If the oxidation number is positive then it means that the atom loses electron, and if it is negative it means that the atom gains electrons. **If it is zero then the atom neither gains nor loses electrons. The sum of oxidation numbers of all the atoms in the formula for a neutral compound is ZERO.** The sum of oxidation numbers of an ion is the same as the charge on that ion. **Negative oxidation number in a compound of two unlike atoms is assigned to the more electronegative atom.**

54. Match the following:

- | | |
|--|--------|
| I. Oxidation number of Br in KBr | 1. +1 |
| II. Oxidation number of Oxygen in most cases | 2. - 1 |
| III. Oxidation number of H | 3. - 2 |
- a) 3, 1, 2
b) 2, 3, 1
c) 2, 1, 3
d) 3, 2, 1

Explanation

- Oxidation number of K and Br in KBr molecule is +1 and -1 respectively.
- Oxidation number of N in NH₃ molecule is -3.
- Oxidation number of H is +1 (except hydrides).
- Oxidation number of Oxygen in most cases is -2.

55. What is the Oxidation Number of S in H₂SO₄?

- a) 4
b) 6
c) 1
d) 3

Explanation

Oxidation Number of S in H₂SO₄

Let ON of S be x and we know ON of H = +1
and O = -2

$$2 \times (+1) + x + 4 \times (-2) = 0$$

$$(+2) + x + (-8) = 0$$

$$x = +6 \quad \text{Therefore, ON of S is +6}$$

56. What is the Oxidation Number of H in H₂O?

- a) 2
b) 1
c) 3
d) -2

Explanation

Oxidation Number of H and O in H_2O

Let us take ON of H = +1 and ON of O = -2

$$2 \times (+1) + 1 \times (-2) = 0$$

$$(+2) + (-2) = 0$$

Thus, ON of H is +1 and ON of O is -2

57. What is the Oxidation Number of Cr in $\text{K}_2\text{Cr}_2\text{O}_7$?

- a) 7
- b) 12
- c) 6
- d) 3

Explanation**Oxidation Number of Cr in $\text{K}_2\text{Cr}_2\text{O}_7$**

Let ON of Cr be x and we know ON of K = +1
and O = -2

$$2 \times (+1) + 2 \times x + 7 \times (-2) = 0$$

$$(+2) + 2x + (-14) = 0$$

$$2x = +12$$

$x = +6$ Therefore, ON of Cr in $\text{K}_2\text{Cr}_2\text{O}_7$ is +6