MODULE -I - ATOMIC STRUCTURE

1] Explain the concept of quantum numbers needed to specify an electron in an atom.

Quantum numbers are used to specify the main shell, subshell, and orbital of an electron in an atom.

There are Four types quantum numbers.

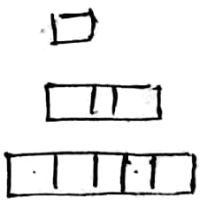
① Principal quantum number
- It is used to indicate the main shell.
- It is represented as n.
- Its value is $n = 1, 2, 3$, etc. That is the main shells are K, L, M, N, etc.

② Azimuthal quantum number
- It is used to indicate the subshell.
- It is represented as l.

$l = 0 \Rightarrow$'s' subshell
$l = 1 \Rightarrow$ 'p' subshell
$l = 2 \Rightarrow$ 'd' subshell.

③ Magnetic quantum number
- It is used to indicate the number of orbital in a subshell.
- It is represented as 'm'.
- The number of Orbitals = $2l+1$

's' subshell ⇒ 1 orbital
'p' subshell ⇒ '3' orbital
'd' subshell ⇒ '5' Orbital.



④ Spin quantum number

It is used to explain the direction of electrons in an orbital.

It is represented as s.

It's value = $+\frac{1}{2}$ or $-\frac{1}{2}$.

2] Debroglie's Dual nature of matter?

It states that All small particles like electron, proton, and neutron have both wave nature and particle nature.

$$\lambda = \frac{h}{mv}$$

3] What is de Broglie relation for a particle?

$$\lambda = \frac{h}{mv}$$

λ = wavelength
m = mass of particle
v = velocity of particle.
h = plank's constant

4] Calculate the de Broglie wavelength for an electron moving with a velocity of 10^3 m/s.
($h = 6.625 \times 10^{-34}$ kgm^{2}s^{-1}, $m = 9.1 \times 10^{-31}$ kg)

$$\lambda = \frac{h}{mv}$$

$$\lambda = \frac{6.625 \times 10^{-34}}{9.1 \times 10^{-31} \times 10^3}$$

$=$

$h = 6.625 \times 10^{-34}$
$m = 9.1 \times 10^{-31}$
$v = 10^3$ m/s

} Questions and answers.

5] An electron is associated with a wavelength of 10 nm. Calculate the velocity of the electron. ($h = 6.63 \times 10^{-34}$ Js, Mass of electron $= 9.1 \times 10^{-31}$ kg)

$$\lambda = \frac{h}{mv}$$

$$V = \frac{h}{m\lambda}$$

$$= \frac{6.63 \times 10^{-34}}{9.1 \times 10^{-31} \times 10 \times 10^{-9}}$$

$$=$$

$h = 6.63 \times 10^{-34}$ Js

$m = 9.1 \times 10^{-31}$ kg

$\lambda = 10\,nm = 10 \times 10^{-9}$ m.

6] State Heisenberg's uncertainity principle.

It states that it is impossible to measure simultaneously the position and velocity of a small particle like electron.

$$\Delta x \times \Delta p \geq \frac{h}{4\pi}$$

Δx = uncertainity in position

Δp = uncertainity in momentum.

7] State Aufbau principle. write the electronic configuration of Na (Z=11) and K (Z=19).

It states that the orbitals of an electron is filled in the increasing order of their energy.

That is

1s < 2s = 2p < 3s = 3p, etc.

The electronic configuration of Na is (Na = Sodium, K = potassium)

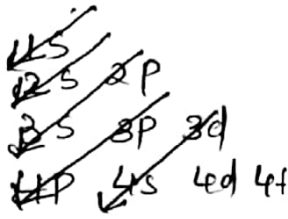
Na = Atomic no. = 11

$= 1s^2 2s^2 2p^6 3s^1$.

The electronic configuration of K is

K = Atomic no. = 19

$1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$

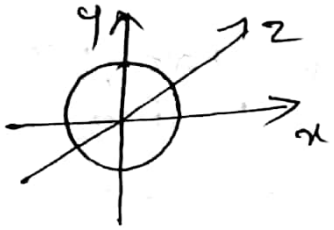


8] Define Orbital. Draw the shape of S, P_x, P_y and P_z orbital.

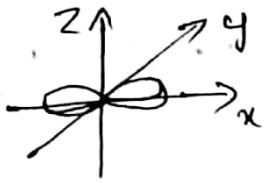
Orbital is a three dimensional space around the nucleous where the ~~probabi presence of~~ electron ~~is~~ chance to find electron is maximum.

Shape

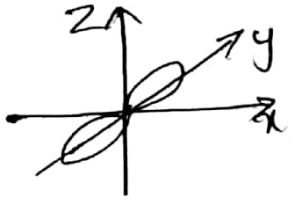
S - orbital



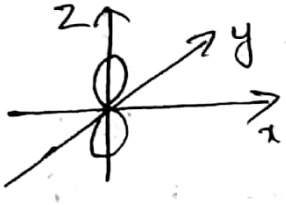
P_x - orbital



P_y - orbital



P_z - orbital

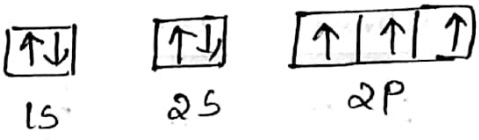


9] State Hund's rule of maximum multiplicity. illustrate it using two examples.

It states that pairing of electrons in the orbitals of same subshell do not take ~~place~~ place untill each orbital of that subshell got one electron each.

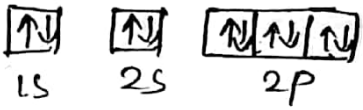
Eg : 1) Nitrogen = Atomic No. = 7

Subshell electronic configuration is

$= 1s^2 2s^2 2p^3$: 

2) Neon = Atomic No. = 10

Subshell electronic configuration is

~~$1s^2 2s^2 2p^3 3s^3$~~ $1s^2 2s^2 2p^6$ = 

10] Explain the formation of ionic bond, covalent bond and coordinate bond.

Ionic bond.

1) It is Formed by the transfer of one or more valence electrons from one atom to another.

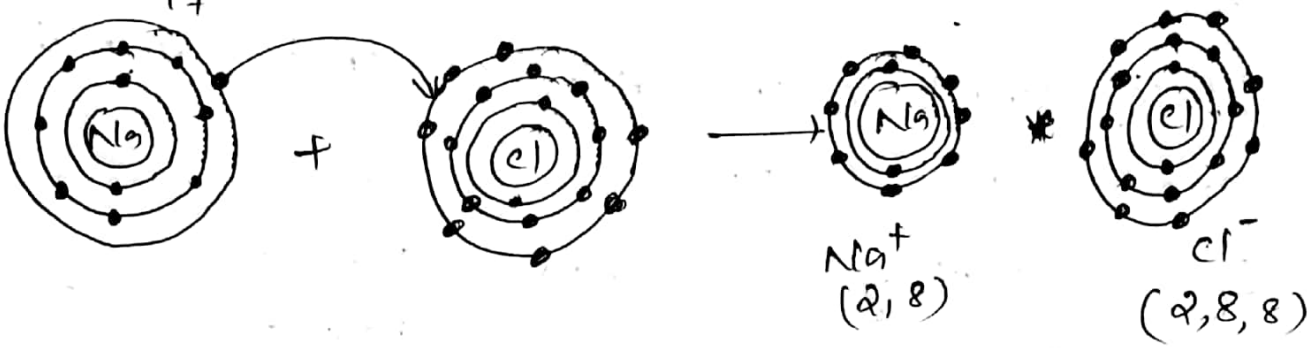
~~2) It is formed by a covalent~~

2) The atom which loses electron ~~loss~~ forms positive ion and the atom which gain electron forms negative ion.

Eg: Formation of NaCl.

$_{11}Na$ = 2, 8, 1

$_{17}Cl$ = 2, 8, 7



Covalent bond

It is formed by sharing of electrons between two atoms.

Eg: Formation of Hydrogen molecule.

$H\bullet + \bullet H \rightarrow H:H$

If one electron pair is shared = single bond

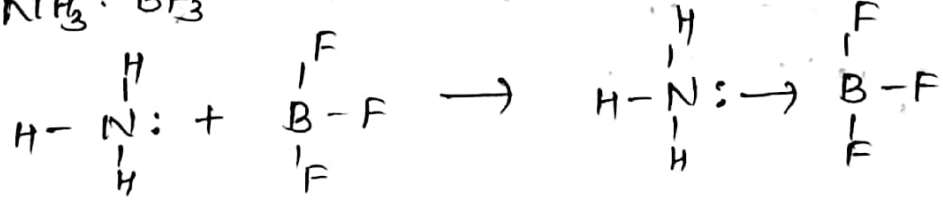
Two electron pair is shared = double bond.

Three electron pair is shared = Triple bond.

Coordinate bond or (Dative bond)

If the electron pair is donated by one of the atom but shared by both the atom. is called coordinate bond.

Eg $NH_3 \cdot BF_3$



11) Write the important postulates of Bohr model of an atom.

(See Text book Pg NO. 3)

12) Define Stationary State

(See point ⑤ - Text book Pg NO. 3)

13) Differentiate Orbit and Orbital. (See Note book)

14) Define the term electronegativity and which is the most electronegative element? which type of bond is usually formed between two elements of almost same electronegativity.

Electronegativity

Tendency of an atom to attract the shared pair of electrons.

Most electronegative element - Fluorine.

Covalent bond is the bond usually formed between two elements of almost same electronegativity.

MODULE - 2

ELECTROCHEMISTRY

1) Define Corrosion and explain electrochemical theory of corrosion and mechanism of Rusting.

Corrosion is defined as the process of slow conversion of metals into their undesirable compounds such as oxides by their chemical action with moisture and air.

According to electrochemical theory, corrosion is considered as an electrochemical process.

In rusting a galvanic cell is set up between two dissimilar parts of the same metal.

The portion of iron which is in contact with water is act as anode and other portion in contact with air act as cathode. moisture containing dissolved oxygen or CO_2 on the surface act as electrolyte.

Overall rusting involves following steps.

① Oxidation occurs at anode

At anode : $2Fe \longrightarrow 2Fe^{2+} + 4e^-$

The electrons released at the anode moves through the metal to the cathodic site.

② Reduction occurs at cathode.

At cathode : $O_2 + 4H^+ + 4e^- \longrightarrow 2H_2O$.

Overall reaction is

$$2Fe + O_2 + 4H^+ \longrightarrow 2Fe^{2+} + 2H_2O.$$

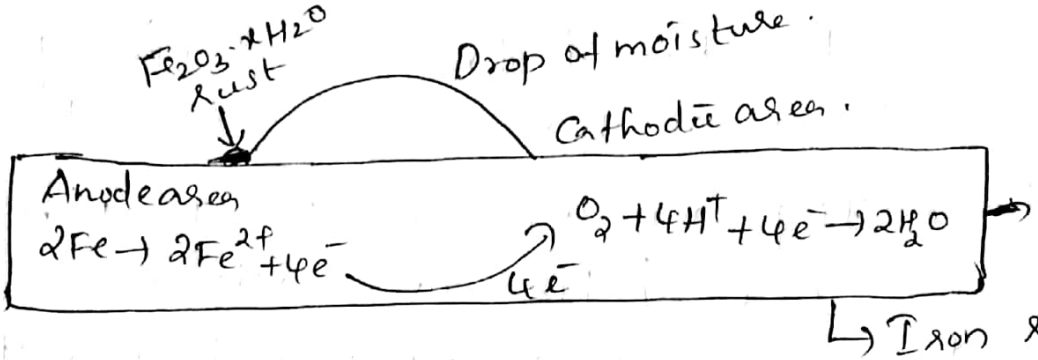
The Ferrous ions are further oxidised by atmospheric oxygen to form Rust.

That is

$$2Fe^{2+} + 2H_2O + \frac{1}{2}O_2 \longrightarrow Fe_2O_3 + 4H^+$$

$$Fe_2O_3 + xH_2O \longrightarrow Fe_2O_3 \cdot xH_2O$$

Hence the final product formed (Rust) after corrosion is Rust. ($Fe_2O_3 \cdot xH_2O$)



★ Study e.m.f related problems (See your Note book.)

1] Distinguish between chemical and Electrochemical Corrosion. (1)

Chemical Corrosion	Electrochemical Corrosion
1. It is Dry corrosion	It is wet Corrosion.
2. It occurs due to direct chemical action of atmospheric gases such as O_2, SO_2, etc.	It occurs ~~due to~~ when the metal surface is in contact with water or moisture.
3. Moisture is not required Eg: Ca, Mg, Al are coated with a thin layer of oxides.	Moisture is required eg: Rusting of iron.

2] Electrochemical Corrosion is also known as galvanic Corrosion. Why?

The metal surface behaves like galvanic cells having separate anodic and cathodic areas on surface. the metal loses electrons from the anodic areas in presence of moisture which act as the electrolyte

3] What is rust? and give its chemical formula? Write the conditions for Rusting?

Rust is Chemically hydrated ferric oxide, having general formula $Fe_2O_3 \cdot xH_2O$.

The conditions favouring Rusting are

1) Impurities in iron.
2) Presence of moisture or wet atmosphere.
3) Presence of Acidic environment
4) Presence of oxygen and gases such as Cl_2 or SO_2

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5] What are Anti rust solutions? Give examples? and how does it help to Reduce corrosion?

The Alkaline solutions of certain phosphate and chromate salts act as anti rust solutions. It is used to protect the metal from corrosion. To protect from corrosion the iron article is dipped in this solution, then a protective coating of iron phosphate is formed on the surface. Eg: Alkaline solution of chromate or phosphate of sodium or potassium.

6] Write the principle behind barrier protection and suggest any two methods for it.

Barrier protection is a method to prevent corrosion. In this method a physical barrier is created between the metal and the ~~surrounding~~ moist ~~air~~ environment. The barrier may be metallic or non metallic. by using a barrier, we can avoid the contact of metal surface with the environment.

Eg: Painting on metal surface.
Electroplating of iron with other metals such as Nickel, tin etc.

7) Coating of zinc

8] Define Galvanization?
Galvanization is the process of coating iron surface with zinc. galvanized iron resist corrosion here zinc act as a sacrificial anode and protects iron.

8] Coating of Zinc or Tin is preferred to control the corrosion of iron. Give reason.

Zinc is better than tin in protecting iron from corrosion. because zinc has more affinity to oxygen than tin. When it is coated on iron then it react with oxygen and forms a protective layer of zinc oxide on iron

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which prevent the further reaction of iron with oxygen and thus preventing the process of rusting. But in the case of tin it does not react with oxygen hence it is less effective in preventing rusting.

9] What is sacrificial protection? Cathodic protection is also called sacrificial protection why?

Sacrificial protection is a method used to prevent corrosion. In this method surface of iron is covered with a layer of more active metal like zinc. this ~~metal~~ active metal act as anodic region and react with oxygen and suffering damages to itself, Then undergoes oxidation ~~(Corrosion)~~ and ~~thus~~ prevents ~~the~~ Corrosion ~~rusting of iron~~. It is a method of protecting one metal by the more active metal. hence it is called sacrificial protection.

In cathodic protection, the iron surface is protected by connecting it to ~~some~~ more active metal such as ~~aluminium~~ Magnesium or zinc through a metal wire. The iron act as cathode and ~~a~~ active metal act as anode and is sacrificed to protect the iron from corrosion. hence cathodic protection is also called ~~sea~~ sacrifical protection.

10] Rate of corrosion is more near to sea shore area. ~~Explain your answer~~. why?

Near to ~~the~~ seashore area the presence of saline water is more. iron rust more rapidly in saline water in comparison to pure water. because it increases the conductivity of medium ~~and hence~~ hence the rate of corrosion increases.

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MODULE - 3 (Unit 1 - Introduction to Organic chemistry)

1. Distinguish between Organic and inorganic compounds.

Organic compounds	Inorganic compounds
• Obtained from plants and animals.	Obtained from minerals and non living matters.
• Covalent compounds	Ionic compounds.
• Volatile and Inflammable	Non volatile and non inflammable.
• Slow Reaction.	Fast Reaction.
• Low melting and boiling Point.	High melting and boiling point

2. Distinguish between saturated and unsaturated compounds with one example for each.

Saturated compounds	unsaturated compounds
• Only single bonds.	Double or Triple bonds
• Less Reactive	More Reactive
• Undergo substitution Reaction.	Undergo addition Reaction
• Cannot decolourise bromine water	Can decolourise bromine wate
• Cannot decolourise $KMnO_4$	Can decolourise $KMnO_4$
Eg: Ethane (CH_3-CH_3)	eg: Ethene ($CH_2=CH_2$)

These are the test to identify Saturated and unsaturated Compounds.

3. Describe the uniqueness of Carbon atom.

Carbon atom can form large no. of organic compounds due to some of its unique properties. They are,

① Tetracovalency of carbon — Carbon atom has four electrons in its valence shell and can form four covalent bonds. This is called tetracovalency.

② Catenation capacity — It is the self linking property of an element. Due to this catenation capacity carbon atom can form straight chain, branched chain and closed chain compounds.

③ Strength of C-C bond — Carbon - carbon bond is very strong and highly stable. Compared to other elements.

④ Isomerism — It is the phenomenon of existing compounds having the same molecular formula but different structures and properties.

In addition to these properties carbon atom can form multiple bonds and it has the capacity to form strong bond with oxygen, Nitrogen, sulfur, etc.

4). What is meant by a Functional group? Write the Functional group in aldehyde and amine.

Functional group is defined as an atom or group of atoms which determines the properties of an organic compound. On the basis of functional group organic compounds are classified as hydrocarbons, alcohols, ethers, aldehydes, ketones, acids, etc.

Functional group in a) Aldehyde — CHO

b) Amine — NH_2

5) Give two elements which show maximum catenation.

Carbon and Silicon.

6). Give two tests for unsaturation.

1) Unsaturated compounds decolourise bromine water.

2) Unsaturated compounds decolourise alkaline Potassium permanganate solution. It is also called Bayer's Test.

7) Different Functional groups and their names.

Functional gp	Name
OH	Alcohol
CHO	Aldehyde.
COOH	Carboxylic acid
CO	Ketone.
COO	Ester
NH_2	Amine
O	Ether
NO_2	Nitro

8) What are multiple covalent bonds? Give two examples.

Multiple covalent bond is a bond where two or more electron pairs are shared between two atoms.

Eg: Double bond $\overset{\diagup}{C}=C\overset{\diagdown}{}$, Triple bond $-C\equiv C-$

9) Define ~~Homolog~~ Homologous series.

It is a Family of compounds having a general formula and similar properties.

Eg: Alkanes, Alkenes, Alkynes.

Unit-2 Refractories

1. What are refractories ? How they are classified ? Give one example for each.

Refractories are heat resistant materials used for the linings of high temperature furnaces, reactors and other processing units. where high temperature is maintained.

Refractories are classified in five ways.

① Based on chemical nature, It is classified in to

a) Acidic refractories – They are stable to acids but attacked by alkalis.
Eg: Silica, Alumina.

b) Basic refractories – They are stable to alkalies but attacked by acids.
Eg: Magnesite bricks,

c) Neutral refractories – These are formed of ~~neutral~~ neutral materials.
Eg: Silicon Carbide.

② Based on physical nature, It is classified into

a) Shaped refractories – have a definite shape.
b) Unshaped refractories – Does not have a definite shape.

③ Based on Method of manufacture,
Dry Press process, Fused Cast, Hand moulded, etc.

④ On the basis of oxide content

a) Single oxide Refractories (eg: Alumina, Magnesia)

b) Mixed oxide Refractories (eg: Spinel)

c) Non oxide Refractories (eg: borides)

⑤ On the basis of Refractoriness.

a) Low or moderate heat duty Refractories (1580°c – 1630°c)
eg: Silica bricks.

b) Intermediate heat duty Refractories (1630°c — 1690°c)
eg: Fire clay bricks.

c) High heat duty Refractories (1690°c – 1730°c)
eg: chromite bricks.

d) Super heat duty Refractories (greater than 1730°c)
eg: Silicon Carbide

2) What are the characteristics of Refractories?

1) It do not peel, crack or bend at the operating temperature. (That is it possess high mechanical Strength)
2) It is chemically inert.
3) It should withstand thermal shock and heat.
4) It should resist size change.
5) It should have lower porosity.

What are the Functions of Refractories?

1) It act as a protective barrier against corrosion.
2) It gives physical protection.
3) It act as thermal insulation.
4) It act as a thermal barrier between hot medium and wall of the vessel.

Unit-3 Glasses

1) What are glasses ? Mention any four of its properties and four varieties.

Glass is a non crystalline, brittle and transparent solid. It is obtained by fusing a mixture of ~~Sodium~~ Sodium carbonate, calcium carbonate and silica.

Properties of glass

- It is amorphous (non-crystalline)
- It is transparent.
- It can absorb, reflect or transmit light.
- It can be moulded in to any desired shape.
- It is bad conductor of heat and electricity.
- It has no definite melting point.

There are different types of glasses. They are Soda glass or soft glass, Borosilicate glass (pyrex glass), Safety glass, insulating glass.

2) Write notes on. a) Soda glass b) Safety glass

a) Soda glass

It is also called ordinary glass or soft glass, window glass. It a mixed silicates of ~~Calcium~~ Calcium and Sodium or potassium obtained by fusing Sodium carbonate, calcium carbonate and silica. It softens at lower temperature and can be easily shaped in to different forms, hence it is called soft glass.

It is used in making window glass, Bottles, Bulbs, Jars, etc.

b) Safety glass

It is a type of glass when when breakes does not allow its broken pieces to fly apart. It is prepared by placing a layer of transpasent plastic between two layers of glass. Then plastic and glass sheets are pressed together under heat. It has high impact resistance hence it is used in making wind screens of automobiles, aeroplanes, trains, etc.

3) What is borosilicate glass? List its important properties and two uses.

It is a mixture of sodium aluminium borosilicate. It contains Silca (80%), Sodium oxide (4%) Calcium oxide (0.5%), Potassium oxide (0.5%), boric oxide (12%), Alumina (3%).

It is resistant to chemicals,
It can withstand sudden temperature changes.
It has low coefficient of expansion.

Due to these properties, it is used to make laboratory glass wares like flask, beaker, etc. and kitchen wares.

Unit-4 – Optical Fibers

1) What are optical Fibers ? Write its uses

Optical fibers is a flexible, transparent fiber made by of glass or plastic to a diameter slightly thicker than that of human hair. These are used to transmit signals or data in the form of light.

Uses of optical fibers

- It is used for long distance communication.
- This can be used as optic sensors to measure temperature, pressure, wavelength, etc.
- These are used as light guides in medical applications.
- It is used for illumination in decorative applications.
- used to direct the path of sunlight.

2) Write the Advantages of optical fibers.

- Optical fibers are immune to electromagnetic interference.
- It has higher band width than metal wire cables.
- Transmission loss is less.
- Light can be kept within the fiber by the phenomenon of total internal reflection.
- It do not conduct electricity.

Unit-5 (Polymers)

1). What is the Role of Sulphur in Vulcanization of rubber?

Vulcanization is the process of heating natural rubber with 3-5% sulphur and zinc oxide at a temperature range 110-140°c. here sulphur act as a crosslinking agent and introduce sulphur crosslinks between rubber chains.

After Vulcanization, the elasticity, tensile strength of rubber increases. and vulcanisation makes the rubber suitable for commercial purposes such as tyre manufacture.

2) Write the polymers of monomers of

PVC – Vinyl chloride

Nylon 6 – caprolactum

Nylon 6,6 – Hexamethylene diamine + Adipic acid

Buna S – Styrene + butadiene.

Buna N – ~~Acyclo~~ Acrylonitrile + butadiene.

Teflon – Tetrafluoro ethylene.

Bakellite – Phenol + formaldehyde.

Neoprene – chloroprene.

Natural rubber – isoprene.

All the above are Synthetic polymers except natural rubber.

Natural polymers – Glucose, amino acids.

3) How are plastics classified based on their method of molding and applications. differentiate between them with one example each.

See Text book Pg No: 108 (Table)

4) How are polymers classified based on their structure? Give one example for each.

Based on structure polymers are classified in to Linear, Branched and Cross linked polymers.

Linear polymers

- Monomer units are linked to form long straight chains.
- Due to close packing they have high density,
- high tensile strength and high melting point.

Eg: High density polyethylene (HDPE), nylon.

Branched chain polymers.

- Monomer units are linked to form long chains with side chains.
- These are irregularly packed and thus have low density, low tensile strength and low melting point

Eg: Low density poly ethylene (LDPE)

Cross linked polymers

- Monomer units are linked to form three dimensional network.
- Due to network structure, they are hard, rigid and brittle.

Eg: Bakellite, melamine.

5) Explain the classification of polymers based on mode of polymerisation and distinguish between them. — It is Addition polymers and Condensation polymers.

See Text book Pg No. 106 (Table)

6) Distinguish between natural and synthetic rubber.

(See Text book. Pg No. 112
Study ~~natural~~ — 5 points)

7) Name the process to modify Crude rubber and explain the process.

(See Question No. 1)
Crude rubber (Natural rubber).

8) Name Two Synthetic rubbers.

1) Buna S
2) Buna N

9) Distinguish between Homopolymers and Copolymers

~~See Textbook Pg no~~:

Homopolymers — Polymers made up of one kind of monomers.

Eg: Polyethylene, PVC

Copolymers — Polymers made up of more than one type of monomers.

Eg: Buna S, Buna N

MODULE-4

Fuels And Environmental Chemistry

1) Define Calorific value.

It is the quantity of heat liberated by the complete combustion of a unit mass of the fuel in air.

2) What are the characteristics of a good fuel.

- High Calorific value.
- Low moisture content.
- Minimum temperature required to burn.
- Easy to control and handle.
- Less pollution
- Low cost

3) What are primary fuels and secondary fuels? Give three examples for each.

Primary fuels – which occur in nature and can be used directly.

Eg: wood, charcoal, Petroleum and natural gas.

Secondary fuels – which are artificially manufactured from primary fuels.

Eg: Coke, ~~kerosene~~ Kerosene oil, Petrol.

4) What are fuels? How they are classified based upon their physical state. Give two examples for each category.

Fuels are any substance which on proper ignition in air produce heat energy, which can be used for domestic and industrial purposes.

Based on physical state, fuels are classified in to

- Solid fuels – wood, Peat
- Liquid fuels – Petrol, diesel
- Gaseous fuels – Natural gas, gobar gas.

5) How will you convert higher hydrocarbons to petrol?

Higher hydrocarbons can be converted to Petrol by cracking.

Cracking is the splitting of less volatile higher hydrocarbon molecules of petroleum fractions in to more volatile lower hydrocarbon molecules by applying heat and pressure.

6) Compare Thermal cracking and Catalytic cracking. which is more better?

Thermal Cracking

- It requires high temperature (470-530°c)
- High pressure.
- Does not need Catalyst.
- Difficult to control
- yield is low
- quality is low.

Catalytic Cracking

- Heat at high temperature (450 – 550°c)
- Low pressure
- Presence Catalysts such as Silica and alumina is used.
- High yield
- More quality.

Catalytic cracking is better than thermal cracking Because of high yield and more quality.

7) Distinguish between Solid, liquid and gaseous fuels.

Solid fuels	Liquid fuels	Gaseous fuel
•) Easily available and cheap.	More costly than solid fuels.	Except natural gas, all other gaseous fuels are costly.
•) Transport, storage and handling are easy without any risk of explosion.	Can be easily transpoted through pipes and stored in closed containers.	Stored in leak proof storage tanks and can be distributed through pipe lines.
•) Risk of fire hazard is least	Greater risk of fire hazards.	Due to highly inflammable, chances of fire hazards are high.
•) calorific value is least	Calorific value is higher.	Calorific value is highest.
•) Thermal efficiency is least	Thermal efficiency is higher.	Thermal efficiency is highest.

8) What are nuclear fuels? write three examples.

•) These are fuels, produce heat energy by nuclear fission.
•) The device used to produce heat energy is nuclear reactor.
•) Here nuclear energy is converted in to thermal energy.

Eg: Natural uranium, Enriched uranium, Plutonium -239.

9) Write the constituents of natural gas and gobar gas and mention any two uses of natural gas.

Natural gas — Formed by decomposition of organic matter under earth.

Major constituent — methane.

Uses

.) Excellent fuel for domestic and industrial purposes.

.) Used for the manufacture of carbon black and hydrogen.

Gobar gas — Produced from cow dung.

Major constituent — methane.

10) Define Pollution, and Pollutants.

Pollution

It is the undesirable change in physical, chemical or biological characteristics of air, soil or water by the activity of humans or other species.

Pollutant

It is chemical, physical or biological agents that produce undesirable changes in environment.

11) How Pollutants are classified ?

Pollutants are classified is to primary pollutants and secondary pollutants.

Primary pollutants.

Directly enter the air and cause pollution eg. CO_2 and CO, NO, SO_2;

Secondary Pollutants

Produced by the chemical interaction of primary pollutants with atmospheric air.

Eg: SO_3, NO_2.

12) What is green house effect and give any three consequences.

Green house effect is the process of heating up of earth's atmosphere due to the absorption of infrared radiations by green house gases.

Green house effect is also called Global warming.

Important Green house gases – CO_2, water vapour, methane.

Consequences of green house effect

- Atmospheric temperature increases.
- flooding of coastal planes
- change climate of the Planet – which affect rain fall, wind, etc.

13) Write a short note on Acid rain

Acid rain is the presence of harmful acids in rain water.

Cause of Acid Rain

Acid rain forms when the air is polluted with acidic oxides such as oxides of Sulphur, nitrogen, etc given out from automobiles and industry. These oxides react with water vapour and produce Sulphuric and nitric acids. Then the acid vapours may ~~Cook~~ Condense and fall down as rain.

Consequences of acid rain

- It leads to the damage of crops and forests.
- Acidic water effect lungs, skin and hair.
- leads to the corrosion of rails, vehicles and machinery.
- Cause damages to buildings.

Ways to reduce the production of acid rain

- Use low Sulphur containing fuels.
- Control automobile emissions
- Control the release of acidic gases.

14) what is Smog ? Explain different types of Smog.

Smog is a kind of air pollution that occurs in major cities. It is the mixture of smoke and Fog in air.

Classical Smog (London smog)

This type smog occurs in the regions where

- Emissions of the sulfur containing compounds is high.
- Air contains high liquid water contents.
- This Fog has reducing character.

Photochemical smog (Los angeles smog)

- It is caused by secondary pollutants like PAN, ozone and oxides of nitrogen.
- It is formed by photochemical reactions in the presence of solar radiations.
- This fog has oxidising character.

15) Mention three steps to prevent water pollution and write two examples of water pollutants.

Water pollution is defined as the undesirable change in the physical, chemical and biological properties of water due to the presence of undesirable and toxic substances.

Methods to prevent water pollution are

- Reduce the use of herbicides, Pesticides and fertilizers
- Proper Sewage treatment and management
- Avoid direct dumping in to water systems.
- Avoid the use of plastics.
- Use minimum amount of detergents and soaps.

16) Comment on the relevance of green chemistry in the present scenario.

Green chemistry is a new branch of chemistry which aims to prevent pollution at its source by the minimization of unwanted side products and wastes. ~~to avoid use~~

It also called Sustainable chemistry.

In recent years ~~there is~~ green chemistry has a greater importance. This gives information about solvents and solvent selection in various chemical reactions.

Nowadays the environmental pollution is increases by human activity, etc. hence it is essential to control the pollution by avoiding and minimizing the use of pollutants. hence we encourage green chemistry to become

more sustainable through the development of ecofriendly products and processes that both reduce waste and prevent toxic substances from entering the environment.

17) Write a short note on ozone depletion

Ozone layer in Stratosphere is act as a protective shield or umbrella for earth by absorbing ultraviolet radiations from the sun.

Ozone is formed in the stratosphere of atmosphere by a photochemical reaction

$$O_3 \xrightarrow{\text{U.V light}} O_2 + O$$
$$O_2 + O \xrightarrow{\text{U.V light}} O_3$$

} this is a continous process.

The depletion of ozone layer due to the effect of pollutants such as chlorofluoro carbons and oxides of nitrogen is called ozone depletion. The chlorine atom in CFC cause severe damage to the ozone layer. Similarly the oxides of nitrogen catalyse the decomposition of ozone.

when ozone layer get depleted more uv radiation will enter to earth and this will leads to global warming, sun burn, etc.

Control of ozone depletion

.) ozone depleting substances are to be replaced by other less harmfull substances.

★ Study Atleast 5 principles of green chemistry (Pg. No - 142)

★ Study Any two examples for green chemistry (Pg. No - 143)