Non-metallic materials

1. Define plastic with example. What are the types of plastics?

Ans→ Plastics are the basic synthetic materials of a high molecular weight which can be moulded into any shape by the application of temperature, pressures in the presence of catalyst.
E.g:- Polystrene, Teflene, PVC, bakelite etc.

The following are the two types of plastics are as follows:-

i). Thermoplastics :- Thermoplastics are formed by addition polymerisation of long chain of linear polymes with little or no cross-linking.
Eg:- Polythelene, Polystrene, polypropelene, cellulose acetate, cellulose nitrate, PVC etc

ii). Thermosetting plastics :- Thermosetting plastics are formed by condensation polymerisation and consists of a 3D network structure joined by strong covalent bonds.
Eg:- Bakelite, Urea formaldehyde, Nylon etc.

2. Difference between thermoplastics and thermosetting plastics

Thermoplastics	Thermosetting
i). These plastics are formed by addition polymerisation.	i). These plastics are formed by condensation polymerisation.
ii). It consists of long chain of linear polymer with little or no cross linking.	ii). It consists of 3D network structure and joined by strong covalent bonds.
iii). It have a ~~high~~ low molecular weight.	iii). It have a ~~low~~ high molecular weight.
iv). It ~~s~~ shape and size can be change by the application of heat.	iv). It ~~shape~~ and size can't be change by the application of heat
v). It has weaker force of attraction btw molecules	v). It has strong molecule bonding between its molecule.
vi). They are soluble in organic solvents as their bonds are weaker.	vi). They are insoluble in organic solvents as their bonds are stronger
vii). They are softer, weaker and less brittle in nature.	vii). They are harder, stronger and more brittle.

Explain different types of polymerisation with example?

The polymerisation is the process in which the large number of small molecules (monomers) are linked together to form a large ~~polymers~~ molecules (~~non~~ polymer) under specific conditions of temperature, pressure and catalyst. The higher polymer is known as plastics. A higher polymer is one in which the no. of repeating units is excess of 100. This termed as degree of polymerisation.

Types of Polymerisation

Addition Polymerisation :- It is the process in which the monomers undergo repeated addition, resulting in the formation of long chain of polymer without the ~~mole~~ elimination of simple molecules like H_2O, HCl, NH_3

Polymerisation of ethylene to form polyethelene

The polymerization of ethylene (ethyene) to form polyethylene (polythene) is a chain-reaction of addition polymerisation where many ethylene molecules combine to form a long chain.

$$n(CH_2=CH_2) \longrightarrow (-CH_2-CH_2-)_n$$
(ethylene)

or

$$n(C_2H_4) \xrightarrow{\text{Polymerisation}} (C_2H_4)_n$$
(ethene)

2. Condensation Polymerisation:- It is the process in which the monomers of different types are joined together to form a large polymer by the condensation with the elimination of simple molecules like H_2O, HCl, CH_3OH.

E.g:- Formation of Bakelite (phenol formaldehyde)
It is prepared by condensing phenol (C_6H_5OH) and formaldehyde ($HCHO$) in the presence of acidic/alkaline catalysts.

$$n\,C_6H_5OH + n\,HCHO \longrightarrow (C_6H_6O-CH_2OH)_n$$
(Phenol) (Formaldehyde) (Bakelite)

What are the ingredients of plastics and explain its functions?

The plastics are compounded with other substances which impart the definite properties to the final finish products.

The following are the ingredients of plastics and its functions are:-

1. Resins:-

- Resins are the basic binding materials which covers major part of a plastics.
- Thermosetting plastics are supplied as linear polymers comparatively low molecular weight because at this stage it is fusible and easily mouldable. The fusible form gets converted into cross-linked infusible form during moulding in the presence of catalysts.

2. Fillers:-

- Fillers are the substances added to the plastics provide better hardness, tensile strength, opacity, workability which impart the special properties to the final finished products.

- It also reduce cost, shrinkage on setting and brittleness of plastics.

E.g.-

- Quartz, Mica, Carborundum are the substances added to provide extra hardness to the plastics.
- The addition of ~~plastics~~ abestos provide heat and corrosion resistance to the plastics.
- The percentage of fillers as high as 50% of the total moulding mixture.
- Those fillers are added which increase the mechanical strength are called as reinforcing fillers.

3. Plasticizers :- Plasticizers are the substances added to the plastics to increase plasticity and flexibility of the plastics.
There also reduce tensile strength and chemical ~~res~~ resistance.
Some commonly used plastics are as :-

- Camphore :- it increases the surface hardness of the plastics.
- Tributyl and Triphenyl Phosphates :- It is used for flame-proofing.
- Triactein :- It ~~the~~ increases the toughness property of the plastics.

4. Accelerator or Catalysts :-
- These are the substances only used in thermosetting plastics.
- Accelerators are the substances which accelerate the polymerisation of fusible plastic into cross-linke infusible plastic during the moulding operation.
- Eg:- Some catalysts are as H_2O_2, Benoyl phosphate, some metals such as Pb, Ag, Au and some metallic compounds such as ZnO, Ammonia and its salt.

5. Coloured pigments :-
- The colouring matter used in plastics should be resistant to the action of sunlight.
- The various coloured pigment are used in plastics which impart desired colours to the plastic articles.
- Eg :- Organic dystuffs and inorganic pigments

5. What are the application of plastics in engineering with respective to their property?

Ans: Plastics are many applications in engineering with respective to their properties are as :-

i). Plastics are used in aircrafts, automobiles and structural industries due to being property of low specific ~~graf~~ gravity and high tensile strength.

ii). Plastics are used for making steering wheels and plastic dashboard by combining plastic with metals.

iii). Plastics are used in machinery to reduce noise and vibrations in machines due to being property of hard and shock-absorption.

iv). Plastics are used in making handles of electric irons, kettles, soldering iron, pressure cooker etc. due to bad conductor of heat.

v). Plastics are used in chemical industries for manufacturing pipes, tubes, underground installation, tank etc. due to high resistance towards chemical and corrosive agents.

vi). They are cheaply and easily mouldable with accurate dimensions due to low cost fabrications.

vii). It is also suitable for making wind screens of automobiles, aircrafts due to optical clarity.

Q. What is rubber and write the difference between Natural and Synthetic rubber?

Ans: Rubber or elastomers are high polymer which can sustain or undergo very large elongations relatively at very low stresses.

Natural rubber	Synthetic Rubber
i). Natural rubber is a high molecular weight of linear hydrocarbon polymer exhibits elasticity and other rubber like properties.	i). Synthetic rubber is a vulcanisable artifically prepared rubber like products which can stretched up to 300% or more of it original length.
ii). It is an elastic material obtained from the white milky emulsion (latex) of rubber trees.	ii). It is artifically obtained by some chemical reaction.
iii). It is a polymer of isoprene (C_5H_8) molecule.	iii). it is a polymer of substances having unsaturated nature.
iv). It is non-resistant to oxidation	iv). It is highly resistant to oxidation.
v). It becomes soft and sticky by the application of heat.	v). It do not becomes soft and sticky by the application of heat.
vi). It's tack property is high	vi). It's tack property is low.
vii). It is soluble in organic solvents.	vii). It is insoluble in organic solvents.

What is the drawbacks of rubber and vulcanisation with sulphur?

The following are the drawbacks of rubber:-

The rubber or crude rubber becomes soft and sticky in summer, while ~~rubber~~ in cold becomes hard and brittle in cold.

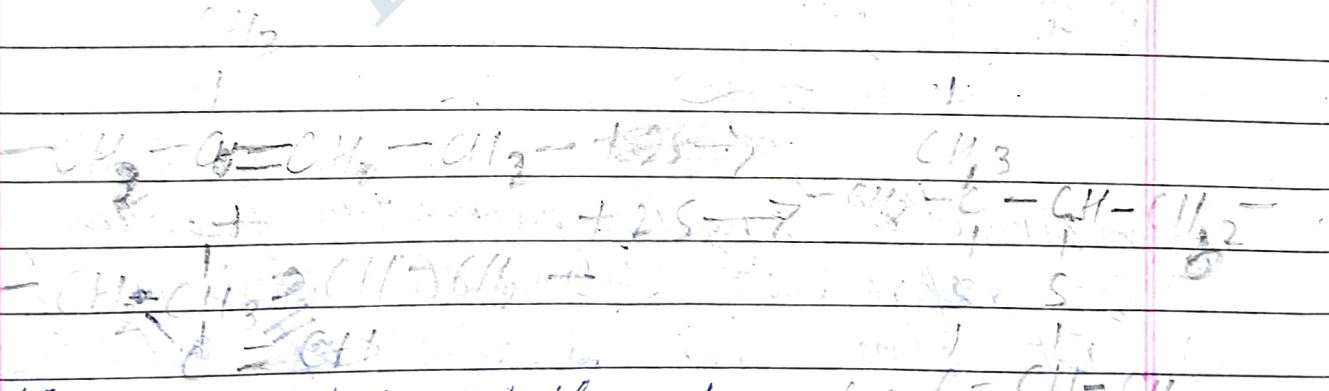
It has low tensile strength.

On stretching, it undergoes permanent deformation.

It is too weak ~~to~~ to be used in heavy duty operation.

It also has also low water absorbing capacity.

In vulcanisation of rubber, the rubber is heated with sulphur at a very high temperature then the sulphur combined with the double bond of rubber molecules.



Vulcanisation bring stiffness to the plastics and consequently prevent intermolecular movent.

The more stiffness or loss of elasticity in rubber depends upon the amount of sulphur added.

Quantum No.

~~It is position place where~~
Quantum no. gives the position of an electrons.

Orbitals:- It is the 3D space where the probability of finding e^- is max.

1. Principal quantum no. (n) :-
→ It represents the shell / orbits around the nucleus
→ It also states about the size of orbitals and energy of the orbitals.

Energy and size increases ↓

$n = 1$	K
$n = 2$	L
$n = 3$	M
$n = 4$	N
⋮	
$n = \infty$	

. Azimuthal / Angular momentum quantum of no. (l)
) It represent sub-shell ~~in~~ in a shell
It also give shape of orbitals

$$0 \leq l \leq n-1$$

l	Sub-shell name	shape
0	s	spherical
1	p	Dumb-bell
2	d	Double Dumbell
3	f	complicate shape & fold structure

n	l	
1	0	1s
2	0, 1	2s 2p
3	0, 1, 2	3s 3p 3d
4	0, 1, 2, 3	4s 4p 4d 4f