Question: 01

What are some common types of plastics? and what are their properties and uses?

Answer:

* Definition of plastic
* Derivation of word "plastic"
* Composition of plastic
* Types of plastic
* properties
* Uses of plastic

1: Definition:

"Plastic is polymers of long Chain"

OR

"A synthetic material made from a wide range of organic polymers that can be moulded into shape by heat. The molecule that compose plastics are long chains and these long chain molecules are called polymers".

2: Plastic derivation:-

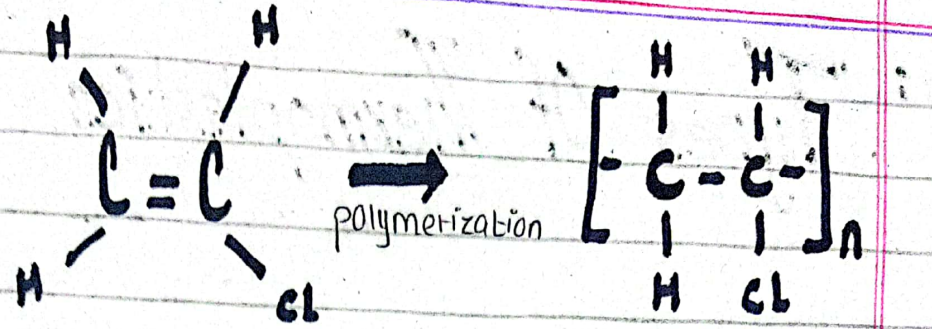
The word "Plastic" is derived from the Greek word "Plastikos" which means "capable of being shaped"

The term was coined in the 17th century by the English physician and naturalist Sir Thomas who used to describe substance that could be molded.

3: Composition of Plastic:

* Plastic is made up of polymers, which are large organic molecules composed of repeating carbon units or chains called monomers.

* Plastics are made from natural materials such as cellulose, coal, natural gas, salt and crude oil through a polymerisation or polycondensation process.



Vinyl chloride — Polyvinyl Chloride

4: Types Of Plastic

Plastic

Two types

Thermoplastic	Thermosetting Plastic
Can be repeatedly softened by heating and hardened by cooling.	Can be moulded once and cannot be remoulded again and again.

a: Thermoplastic

> "Thermoplastic can be repeatedly softened by heating and hardened by cooling"

b: # Types Of Thermoplastics

The following are the types of thermoplastics;

* Polyethylene
* Polyvinyl Chloride
* polypropylene
* Polystyrene
* Polyamide

➡ Polyethylene:

It is milky white resin, translucent substance derived from ethylene

Types:

polyethylene is further divided into two types.

Polyethylene

LDPE
Low density polyethylene

HDPE
High density polyethylene.

LDPE:

Low density polyethylene is

inexpensive, flexible and chemical resistant.

Properties:-

The following are the properties of polyethylene;

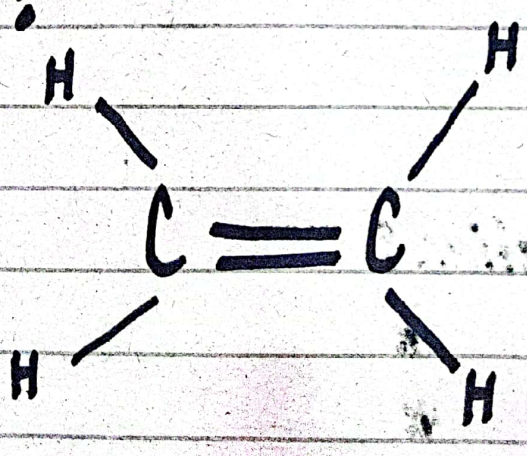
* Thermoplastic
* translucent
* permeable by hydrocarbons
* resistant to X-rays

Application:

It is uses in the following;

* Film * bags * Pipe
* bottles * plastic toys * lids
* plastic wrap

→ Formula:



→ Polyvinyl Chloxide:

(6)

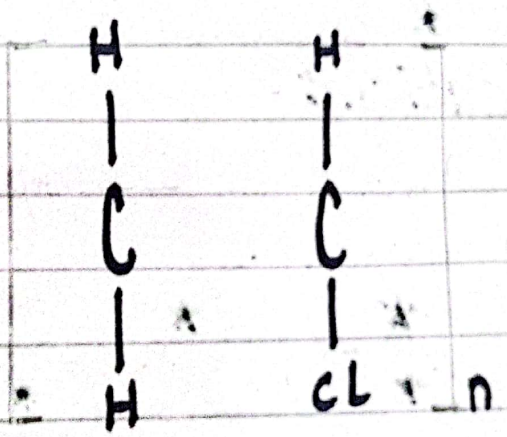
Pvc is a polymer in which more than half of the content by weight consist of chlorine.

Forms of PVC:

Pvc comes in two basic forms;

* Rigid (RPVC)
* Flexible

Structural Formula:



Chemical Formula:

Vinyl chloride C_2H_3Cl

Polyvinyl chloride $(C_2H_3Cl)_n$

Properties:

* Thermoplastic
* soft or rigid
* transparent
* opaque

* oils
* grease
* alcohol

Application:

* It is uses in household items
* Uses in water pipes
* floor coverings
* baggage
* sports
* camping gear etc

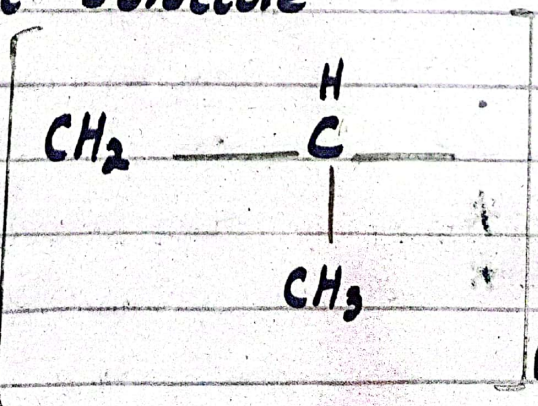
➡ Polypropylene:

It is polymerized from the organic compounds propylene.

Chemical Formula:

(CH_2CHCl).

Chemical Structure



Properties:

It is thermoplastic

* It has low density
* It is durable
* It is resistant to X-rays.
* It is permeable by water

Application:

* It is uses in household items.
* Uses in making of plastic wrapping
* bumpers
* It is uses in furniture
* Uses in making of bottles.

→ Polystyrene:

Polystyrene is produces from styrene.

Properties:

* It is widely used because of its rigid and superior installation properties.
* It is non-toxic
* It has optical and electrical properties
* It is easy to color
* It is resistant to X-rays

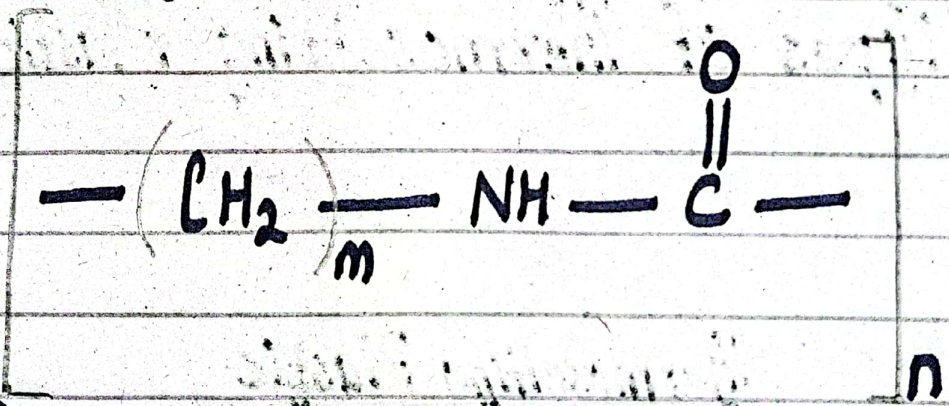
Application :-

* It is used to form toys, utensils, model aircrafts kits and ballpoints etc.
* It can also be expanded to form plastic as packaging material

➡ Polyamide :-

Polyamide known as by the name Nylon consist of highly ordered molecules which gives polyamides high tensils strength.

Structural Formula :



Properties :-

* They are highly abrasion resistance, and they are slippery.
* It is durable to temperatures upto 100°C
* It is resistant to X-rays and fuel.

* It is impermeable to odours and gases.

Application:-

The most common use of Nylon is used to form fibre, ropes, fishing lines, brushes and heavily used industries.

c: Thermosetting Plastic

These are those plastics which can be moulded once and cannot be remoulded again and again.

d: Types of Thermosetting Plastic

The following are the types of thermosetting plastic;

Thermosetting Plastic

- Melamine
- Phenolics
- Unsaturated polyesters
- Epoxy

Phenolics:

They are produced by the reaction of phenol and formaldehyde.

Properties :-

phenolic plastic is hard, strong and inexpensive to produce and they possess excellent electrical resistance.

Application :-

They are used to produce many things such as electrical circuit boards electrical switches, radio and television casings.

➡ Melamine :-

These plastic are made by condensation between Urea ($H_2NCOONH_2$) or melamine ($C_3H_6N_6$) and formaldehyde (CH_2O).

Properties :

The following are the properties of melamine;

* Melamine exists in a crystalline state.
* Melamine is a colourless compound.
* It is a nitrogen-rich compound.

* The melamine derivative possess flame retardant properties, due to the release of nitrogen when burned.

Application:

* Melamine is used to manufacture dishware, electrical components and laminated furniture.

→ Unsaturated Polyesters:

Unsaturated polyester belongs to the polyester group of plastics. It is composed of long carbon chains.

Application:

* They can be moulded into products such as shower floors, small boats hulls and roofing material.

* Bulk moulding components are also performed to be compression into car body panels and other automobiles components.

→ Epoxy:

Epoxy resins are a class

of thermosetting polymers made from monomers that contain at least two epoxide groups.

Properties:

The following are the properties of epoxy resins;

* Heat resistance
* Adhesion to a variety of substrates.
* Resistance to chemicals, particularly alkaline environments.
* High tensile, compression and bend strengths.

Application:

* It is uses in the aerospace industry.
* Epoxy is used to make the wing skins for the F-18 and F-22 fighters.
* Epoxy is used to make electrical appliances.