

Chapter 3 - Synthetic Fibres and Plastics

Topics to be covered.....

- Synthetic fibres
- Polymers and Polymerisation
- Types of Synthetic fibres
- Characteristics of Synthetic fibres
- Plastics and Types of Plastics
- Plastics as materials of choice
- Biodegradable and Non-biodegradable substances
- Plastics and the environment





Objectives...

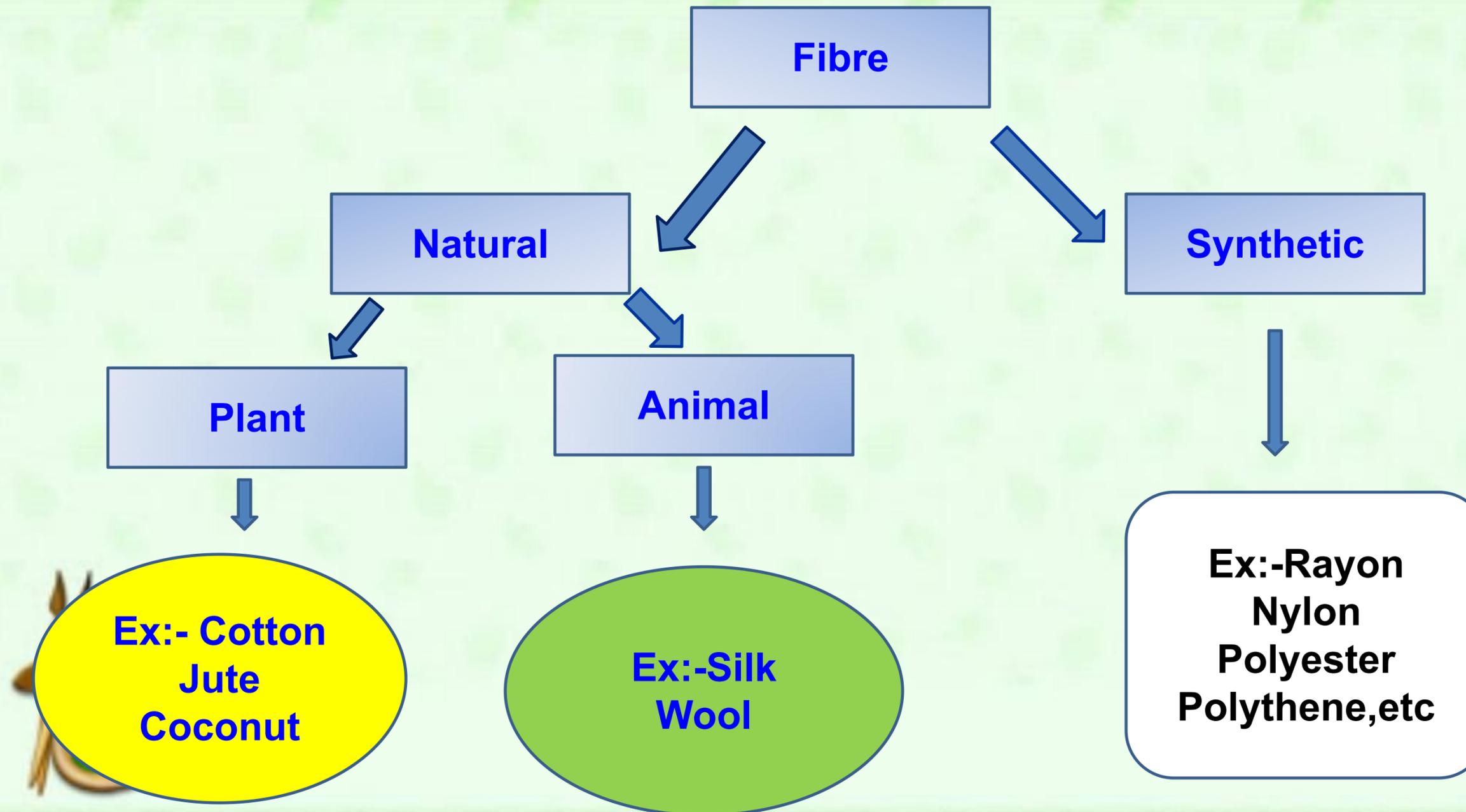


Students will be able to

- **Know about different kinds of synthetic fibres**
- **Know about monomers, polymeres and polymerisation reactions**
- **Explain the characteristics and uses of synthetic fibres.**
- **Understand the types of plastics to be used**
- **Distinguish biodegradable substances from non-biodegradable substances.**
- **Understand the effects of plastics on environment.**

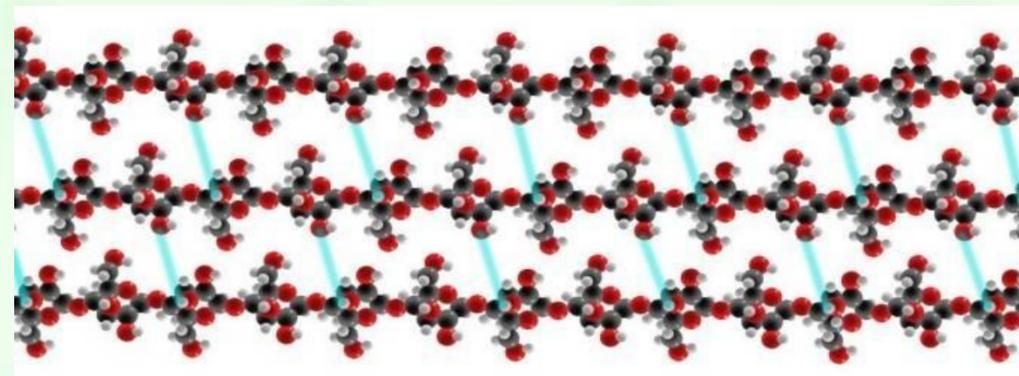


Previous Knowledge



Synthetic fibres.....

- Synthetic fibres are man made fibres
- They are normally made from the bye-products of petroleum known as **petrochemicals**.
- Synthetic fibres are polymers made by the combinations of large number of smaller units.

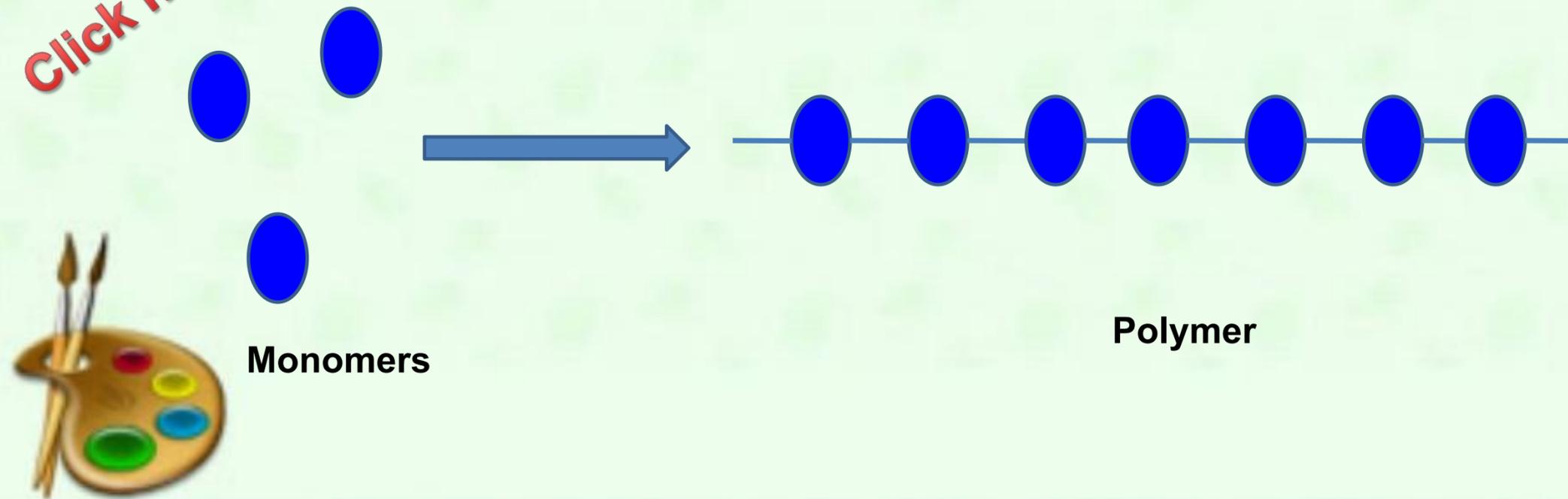


Polymers

Poly = Many
Meres = Units

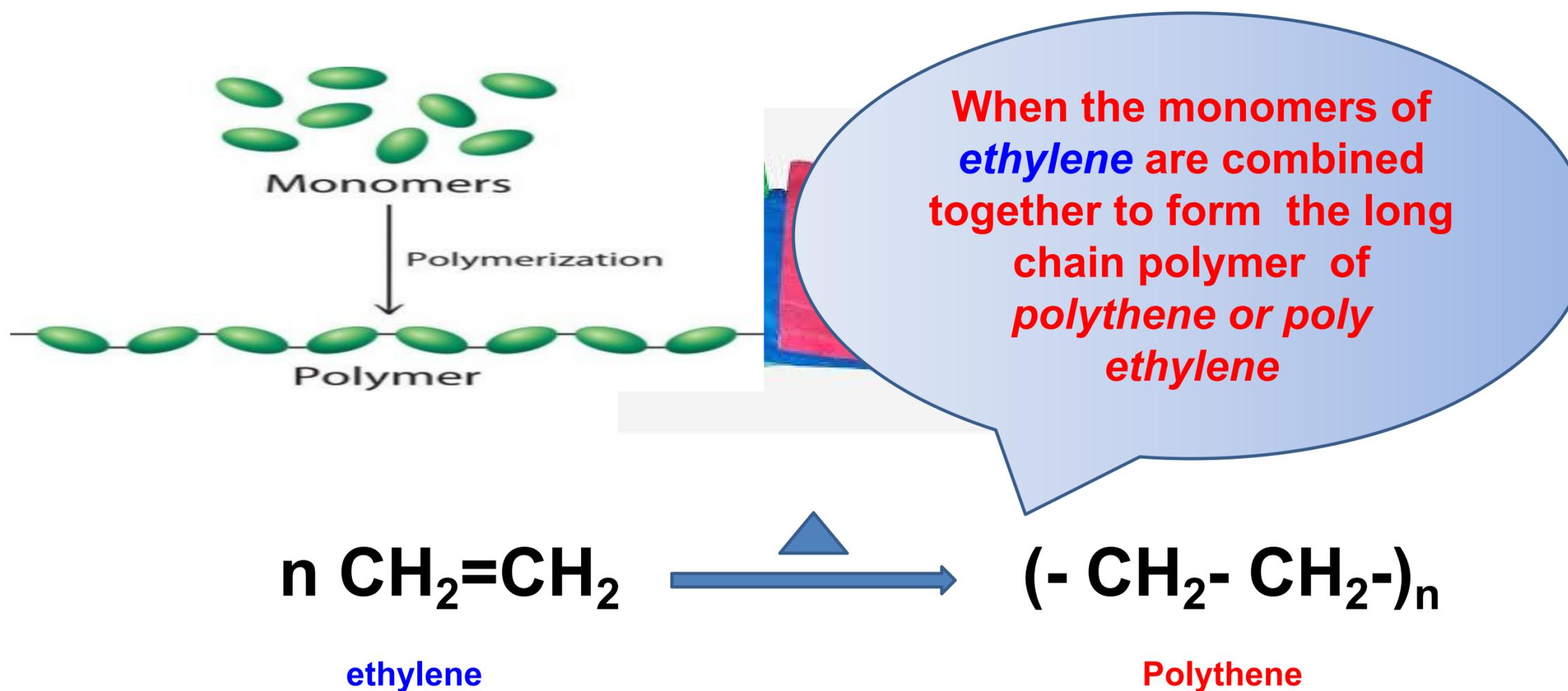
Polymers are long chain molecules formed by the combination of many smaller units known as monomers (mono=single, mere=units)

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Polymerisation Reaction....

The process of formation of long chain compounds polymers by the combination of monomers is called polymerisation reaction.



Types of Synthetic Fibres

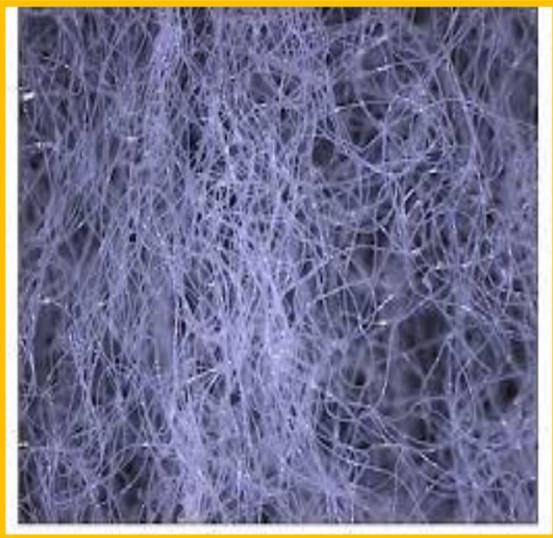
1. Rayon



2. Nylon



3. Polyester



4. Acrylic



Rayon, Nylon, Polyester and Acrylic are the four major types of synthetic fibres

RAYON...

- ❖ Rayon is a man made fibre obtained from wood pulp(cellulose) on chemical treatment with NaOH, Carbon disulphide and Sulphuric acid .
- ❖ The properties of rayon is similar to silk and it shrink like silk. So it is commonly called Artificial Silk.



**Note:-
Cellulose is a
natural
polymer**



Rayon – Properties & Uses

Properties:-

- Rayon is soft, durable and strong fibre.
- It can be dyed into various colours.

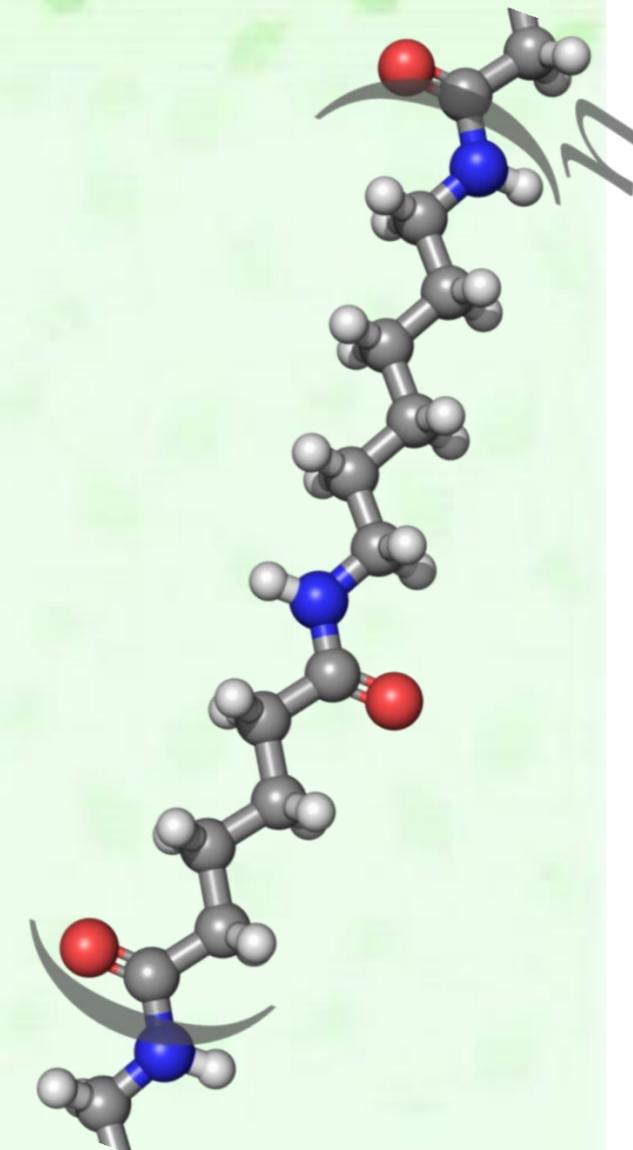
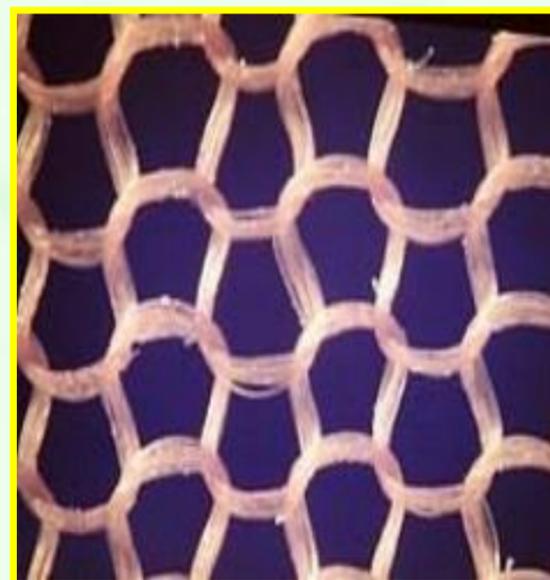
Uses:-

- Used for making **fabrics**
- For making **bed sheets and carpets**
- Used to make surgical products like **bandages.**



NYLON.....

- ❑ Nylon is the first fully synthetic fibre made in 1931.
- ❑ It was prepared from coal, water and air.
- ❑ Nylon is made by the polymerisation of a dicarboxylic acid with a diamine.



NYLON:- Properties & Uses



Properties:-

- ❖ Nylon is very strong.
- ❖ It is elastic
- ❖ It is light and lustrous
- ❖ Easy to dye and wash

Uses:-

- ❖ Used for making fishing nets.
- ❖ Various fabrics are made from nylon.
- ❖ Ropes are made from nylon
- ❖ Tooth brush, tents, car seats etc are made.
- ❖ Parachutes are made using nylon.
- ❖ Curtains, bags, socks, etc are made.



NYLON:- Properties & Uses



Properties:-

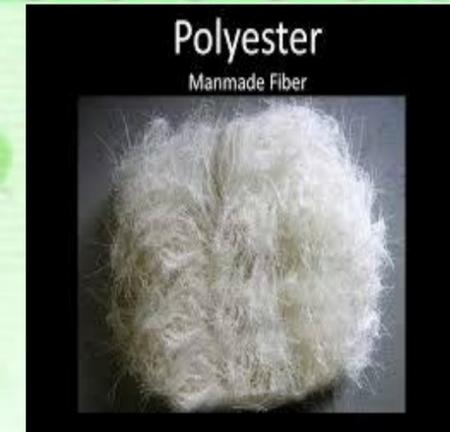
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POLYESTER



- ❑ Polyesters are polymers of **alcohols and carboxylic acids**.
- ❑ **Terylene** is popular polyester formed from terephthalic acid and glycol.
- ❑ **PET - Poly Ethylene Terephthalate** is familiar form of polyester used for making bottles, films, wires, vessels, etc.



Polyester clothes



PET Wires

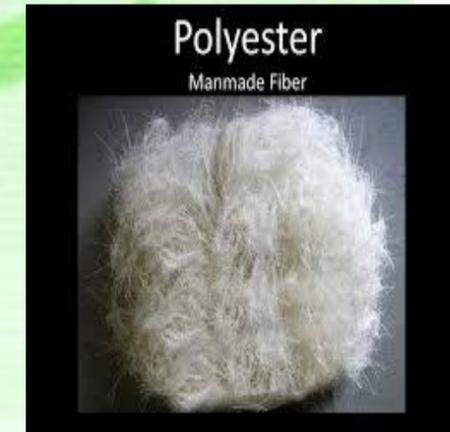


PET Films



PET Bottles

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Polyester clothes



PET Wires



PET Films



PET Bottles



ACRYLIC



Acrylic are polymers of petrochemicals *resembles wool* in their properties.

Properties:-

1. Acrylic are very cheap or affordable.
2. They are available in different colours.
3. Less weight, soft and warm



- Uses:-**
1. Acrylic Fabrics
 2. Paints
 3. Utensils



Characteristics of Synthetic Fibres

- ❖ Synthetic fibres are less expensive or affordable to all.
- ❖ They are durable.
- ❖ Readily available.
- ❖ Easy to maintain.
- ❖ Synthetic clothes dry quickly.
- ❖ Light weight.
- ❖ Chemically inert.



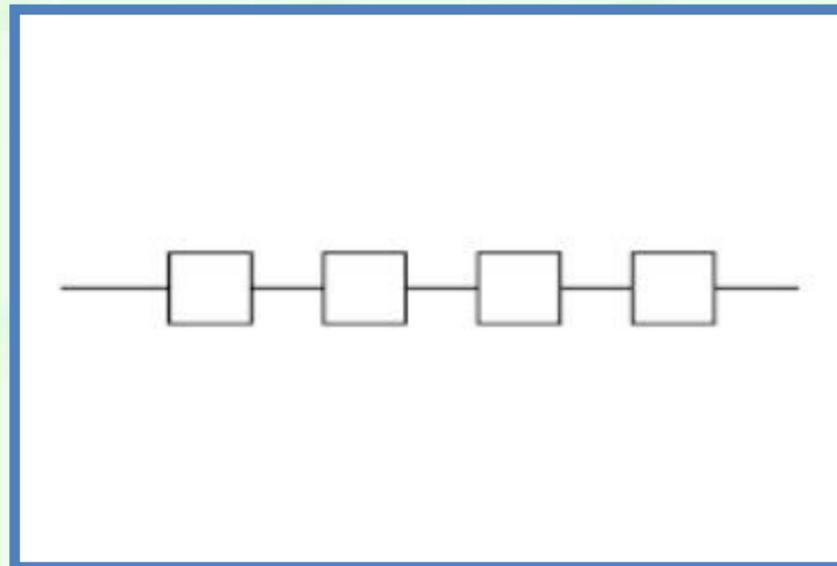
PLASTICS

- A plastic is a synthetic material which can be molded or set into any shape when soft, and then hardened to produce a durable article.
- Plastics are *synthetic polymers* formed by the combination of large number of monomers.

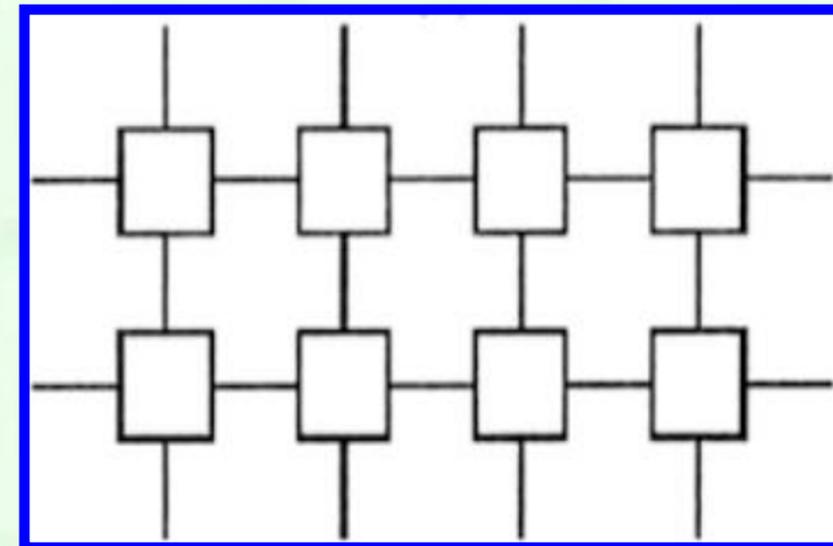


PLASTICS

Based on the arrangements of the units the plastics are classified into two types such as Linear and Cross-linked Plastics.



Linear



Cross-linked



Types of Plastics

THERMOPLASTICS



(Can be melted repeatedly)

THERMOSETS



(Once shaped, cannot be melted)



Thermoplastics

Plastics which is deformed on heating and can be bent easily are called Thermoplastics. Ex:- PVC (Poly Vinyl Chloride), Polythene



PVC Items



Polythene Items

Thermosetting Plastics

The plastics which when moulded once cannot be softened by heating and which cannot be remoulded are called Thermosetting Plastics.

Ex:- **Bakelite and Melamine**



Melamine



Bakelite





Bakelite:-

Bakelite is *a poor conductor of heat and electricity.*

So it is used for making switches,



Melamine:-

Melamine *resist fire and can tolerate heat better than plastics.* So it is used for making Fire proof dresses, Tiles, Kitch enwares, etc



Plastics are materials of choice.....



- Plastics have light weight
- They are strong and durable
- Cheap and affordable to all
- Non-reactive
- Non-corrosive
- Poor conductors of heat and electricity



Biodegradable and Non-biodegradable materials

Biodegradable Materials

- Are decomposed by microorganisms.
- Organic
- Does not cause environmental pollution
- Of animal and plant origin



Non-biodegradable Materials

- Are not decomposed by microorganisms.
- Inorganic
- Causes environmental pollution
- Manmade materials like plastic, ceramic, glass, synthetic fibers



Biodegradable and Non-biodegradable materials

Type of waste	Approximate time taken to degenerate	Nature of material
Peels of vegetable and fruits, leftover foodstuff, etc.	1 to 2 weeks.	Biodegradable
Paper	10-30 days	Biodegradable
Cotton cloth	2 to 5 months	Biodegradable
Wood	10 to 15 years	Biodegradable
Woollen clothes	About a year	Biodegradable
Tin, aluminium, and other metal cans	100 to 500 years	Non-biodegradable
Plastic bags	Several years	Non-biodegradable

Plastics and the Environment

- Plastics are non-biodegradable materials.
- It will cause pollution on land, water and on air.
- Burning of plastics releases harmful gases to the air which are carcinogenic (cancer causing)
- Animals swallows the plastic materials which chokes their respiratory system and leads to death.
- Carelessly thrown plastics block the drains.
- Plastics reaches the water bodies and kill the organisms like fishes

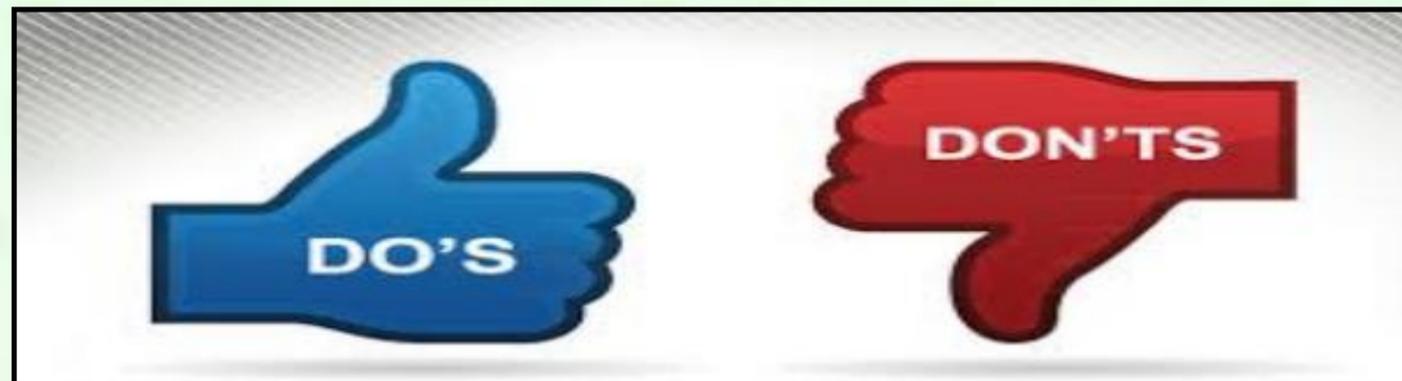


Steps to Control Plastics



Follow this....

Follow 4R Principle



- Follow 4R Principle.
- Take a cotton/jute bag for shopping.
- Minimise the use of plastics.

- Don't throw plastics.
- Don't burn plastics.
- Don't put food wastes in plastics and dump in wastes yards.

DID YOU KNOW?

Teflon is special plastic which is used in non-stick cook wares

Special plastic is used in microwave ovens for cooking

Melamine is a plastic which is fire-proof

Almost every piece of plastic ever made still exists today!!

160,000 plastic bags are used globally every second!

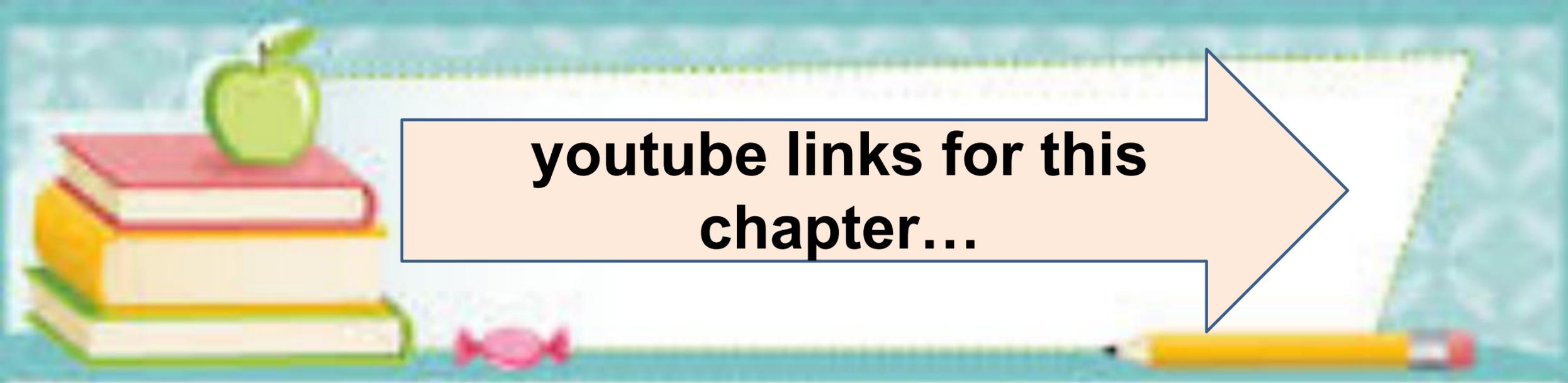
Only 1 to 3% of plastic bags are recycled worldwide.

Recapitulation

- ✓ Synthetic fibres are **polymers**.
- ✓ Polymers are long chain compounds formed from large number of monomers.
- ✓ **Rayon, Nylon, Polyester, and acrylic** are synthetic fibres.
- ✓ **Nylon** is one of the **strongest** synthetic fibres.
- ✓ Terylene is a very common type of polyester.
- ✓ PETs are used to make bottles, films etc.
- ✓ Plastics are of two types such as **thermoplastics and thermosetting plastics**.
- ✓ **PVC and Ethylene** are thermoplastics.
- ✓ **Bakelite and Melamine** are thermosetting plastics.
- ✓ The materials may be **biodegradable or non-biodegradable**.
- ✓ Plastics are non-biodegradable materials which cause pollution.
- ✓ we must follow **4R Principles** to prevent plastic pollution.



**Reduce, Reuse, Recycle and Recover
Plastics.....!**



**youtube links for this
chapter...**



<https://youtu.be/PVcUxecTgZ4>

<https://youtu.be/gqCECJ-HrHs>

<https://youtu.be/SUC4-Bm7t64>

<https://youtu.be/K5kJZ-SfGBg>

<https://youtu.be/BqFKxPdnZ1U>