Polymers

Polymer is a macromolecule consisting in a great number of equal or different molecular units often formed into a chain-like structure through the repetition of the same type of linkage (covalent). The word polymer (from Greek poly meros, many parts) was introduced for the first time by the Swedish chemist Jöns Jacob Berzelius (1779–1848) to indicate substances with different molecular mass but with the same chemical formula, referring to both natural polymers (starch, rubber, cellulose) and synthetic ones. However the earliest studies in synthetic polymers are owed to Henry Braconnot, who, in 1811, obtained derivative cellulose compounds. Only in 1920 the German Hermann Staudinger supposed macromolecular structures in plastic subjects. Although, strictly speaking, macromolecules typical of the living systems are polymers too; in industrial chemistry this term points out macromolecules of synthetic origin: plastic subjects, synthetic rubbers, textile fibers such as nylon and synthetic biocompatible polymers widely used in pharmaceutical, cosmetic and food industries.

Polymers are currently used more than any other material available to man: adhesives, coatings, foams, packaging materials to textile and industrial fibres, composites, electronic devices, biomedical devices, optical devices. So polymers have several fields of application:

Agriculture and Agribusiness

Polymeric films are used to improve aeration and boost plant growth reducing the use of water and pesticides. Besides, agriculturalist shouldn't worry about biodegradable polymers disposal.

Medicine

Biomaterials are employed to replace human tissues or organs when damaged by pathological or traumatic events but also in the form of disposables in surgery.

Consumer science

Containers made of polymers with the addition of nanoparticles are lighter and less expensive than traditional ones. Polymeric products are moreover easy to clean and scratch-resistant. In textile sector they are used to make wrinkle-resistant and stain-repellent clothing.

Industry

Polymers are used in electronic, car and aerospace industries. They are valuable substitutes for metals, because polymers are very light. In space vehicles, for example, polymeric equipment reduces fuel amounts necessary to transport them.

Sports

Many sports articles are made up of polymers. They contribute to produce ever more comfortable, safe, durable as well as aesthetically pleasing items: balls, protective velvets, surf and kite board coverings, sportswear etc.

Activities

True (T) or False (F)?

T F 1) There are no polymers in nature.

T F 2) Polymers can't be chemically synthesized.

T F 3) Optical devices may be made up of polymers.

T F 4) Some polymers are biodegradable.

T F 5) Polymers can't be used in medicine because of their chemical composition.

T F 6) Containers constituted by polymers are less expensive than traditional ones.

T F 7) Polymers will never replace metals.

T F 8) Polymers contribute to produce many sports article.

TICK THE CORRECT ANSWER

1) The first studies of synthetic polymers concerned:
a) nylon polymers.
b) cellulose compounds.
c) synthetic rubbers.

2) With addition of nanoparticles polymers:
a) are used to produce scratch-resistant cases.
b) increase their molecular weight.
c) can't be used to produce containers.

3) Producers of sports articles use polymers:
a) to make their products more comfortable.
b) to save money on production costs.
c) because they don't contain polluting agents.

COMPLETE THE SENTENCES WITH THE CORRECT WORD

1) Polymeric macromolecules are linked to each other forming a …….. structure.

2) Plastic subjects are macromolecules of …….. origin.

3) Polymeric films reduce the wastage of ……..

4) In medicine polymers are used to substitute damaged …….. .

5) Polymeric fibers make …….. clothing.

6) Polymers in car industries are very well suited to substitute …….. .

7) Space vehicles, lightened by using polymers, consume less …….. .

8) Kite board …….. are made up of polymers.

Keys

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~~T~~ F 3) Optical devices may be made up of polymers.
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T ~~F~~ 5) Polymers can't be used in medicine because of their chemical composition.
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COMPLETE THE SENTENCES WITH THE CORRECT WORD

1) Polymeric macromolecules are linked to each other forming a CHAIN-LIKE structure.
2) Plastic subjects are macromolecules of SYNTHETIC origin.
3) Polymeric films reduce the wastage of WATER
4) In medicine polymers are used to substitute damaged HUMAN TISSUES.
5) Polymeric fibers make WRINKLE-RESISTANT clothing.
6) Polymers in car industries are very well suited to substitute METALS.
7) Space vehicles, lightened by using polymers, consume less FUEL.
8) Kite board COVERINGS are made up of polymers.