SELECTING PLASTICS

There are two main classes of plastic.

Thermoplastics - can be reshaped by heating. They will try and return to their original shape if re-heated.

Thermosetting Plastics - cannot be reshaped by heating and can withstand higher temperatures than thermoplastics.

All modern plastics are made mainly from oil, coal and extracts from plants. They are **synthetic** (not natural - man-made) and come in hundreds of types, each with their own set of properties. Many have been made to order by materials scientists, e.g. The drinks industry wanted a lightweight plastic that would not crack when dropped or when under pressure, to make bottles for fizzy drinks. Scientists produced Polyethylene teraphthalate (PET). (Can you pronounce this?) Most property changes are made by adding additives to the basic plastic.

The following are common additives:

Plasticisers - make the plastic less brittle.

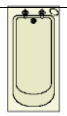
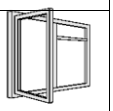
Pigments - colour the plastic

Fillers - powdered additives, e.g. mica reduces electrical conductivity, asbestos allows higher temperature use, etc.

Stabilisers - protect plastic from ultra violet light that can make it become brittle.

Flame retardants - make the plastic less likely to catch fire.

Thermoplastics

	PLASTIC	PROPERTIES	USES
USED IN SCHOOL	Polymethyl-methacrylate (Acrylic or PMMA)	Rigid, hard, can be clear, very durable outside, polishes to a high shine.	Illuminated signs, windows, baths, 
	Polyvinyl chloride (PVC)	Rigid, quite hard, good chemical resistance, tough.	Pipes, guttering, window, frames, 
	Polyethylene (polythene)	Flexible, soft, good chemical resistance, feels waxy	Food bags, buckets, bowls, bottles. 
	Polyamide (nylon)	Tough, self lubricating, resists wear, good chemical resistance	Gear wheels, bearings tights, combs 
	Polystyrene	Lightweight, hard, rigid, can be clear, good water resistance	Model kits, utensils, containers, packaging 
	Expanded Polystyrene	Very lightweight, floats, good heat insulator	Insulation, packaging 

	PLASTIC	PROPERTIES	USES
USED IN INDUSTRY	Polyethylene teraphthalate (PET)	Tough, clear, lightweight,	Fizzy drinks bottles 
	Polypropylene	Lightweight, flexible, resists cracking and tearing	Climbing ropes, crisp packets 
	Acrylonitrile butadiene styrene (ABS)	Very tough, scratch resistant, good chemical resistance	Casings for cameras, kettles, vacuum cleaners 

Thermosetting plastics

	PLASTIC	PROPERTIES	USES
USED IN SCHOOL	Polyester resin (mixed with glass fibre - GRP)	Hard, rigid, brittle, tough when mixed with glass or carbon fibres	Boat and car bodies, paper weights
	Epoxy resin (Araldite)	Strong, good chemical and heat resistance, sticks to other materials well	Adhesive encapsulating electronic components
USED IN INDUSTRY	Melamine Formaldehyde	Rigid, hard scratch resistant, water and stain resistant	Table ware, laminate top coating
	Urea formaldehyde	Rigid, hard, strong, heat resistant, does not bend when heated, good electrical insulator	Electrical plugs and sockets, door knobs

1. What are the two classes of plastic and what is the difference between them?
2. Why are there many types of plastic?
3. Give an example of how a materials chemist can change the properties of a plastic.
4. Why would you add a stabiliser to a plastic?
5. Which thermoplastic would you choose for making a window frame and why?
6. Which thermoplastic would you choose to protect a china ornament sent by post?
7. Which thermoplastic would you use for making a house number sign and why?
8. Why is nylon a good plastic for making combs?
9. Which thermoplastic would be best for making the casing of a cool-wall toaster?
10. Which thermosetting plastic has the properties required for making a saucepan handle?
A List **five** items in your home that are made of plastic, suggest which plastic you think they are made from, and what the properties of the plastic would need to be.