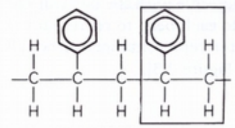
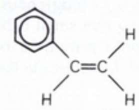
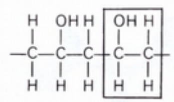
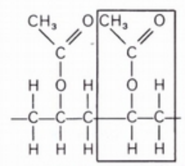
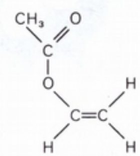
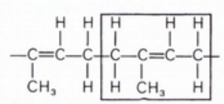
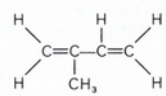
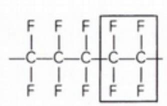
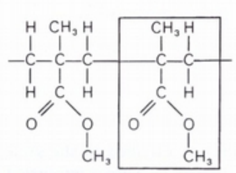
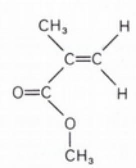
Structural formula	Monomer	Other names
 polystyrene (PS)	 styrene	Lustrex Styrofoam
 poly(vinyl alcohol) (PVAL)	vinyl alcohol does not exist as a monomer. PVAL is made from PVAC	PVA, PVOH
 poly(vinyl acetate) (PVAC)	 vinyl acetate	often called PVA and confused with poly(vinyl alcohol)
 Polyisoprene (natural rubber)	 isoprene (2-methyl 1.3 butadiene)	latex
	 tetrafluorethylene	Teflon Fluon
 poly(methyl methacrylate) (PMMA)	 methyl methacrylate	Perspex Plexiglas acrylic

You may be perplexed by the names of some of the polymers listed in Figure 2.5. Some of the difficulty arises from the variety and complexity of the materials themselves and is made worse by the lack of a universally agreed system for naming them. Thus, some are named after part, or all, of their chemical constituents (as are all of those in Figure 2.5), others have uninformative and inaccurate chemical names (for example, acrylic) others are proprietary names that have entered our vocabulary (for example, celluloid and nylon). A systematic method of naming is needed, and in recent years a step has been made in the right direction with the adoption of standard abbreviations. Those given in Figure 2.5 and others you will meet later in the text are used, for instance, by the British Standards Institution (BSI), the American Society for Testing and Materials (ASTM), and the International Union of Pure and Applied Chemistry (IUPAC). You should get into the habit of using these standard abbreviations; it will help, for example, to clear up the confusion about the ambiguous initials PVA, which can refer to a product based on **poly(vinyl acetate)** (PVAC) or **poly(vinyl alcohol)** (PVAL).

poly(vinyl acetate)
poly(vinyl alcohol)

There are many reasons for the commercial development of so many types of synthetic polymeric materials, but one of the most important is that different types of molecule produce different properties in the bulk material. One of the technological aims of their development is to produce polymers that carry out particular functions, or that do them better than alternative materials.

Imagine, for example, a mass of polymer made up of polyethylene (PE) molecules and another made of polymethylmethacrylate (PMMA) molecules. Both materials will contain large numbers of long-chain molecules, but the types of molecule are very different. PE molecules have only hydrogen side-groups attached to the carbon backbone, and, as you know, these are non-polar groups and only very weak secondary forces are set up between neighbouring molecules. As a direct consequence the molecules can be drawn apart quite readily, which means that PE has a low melting point, and is relatively soft and flexible (see Book 2 Section 4B). On the other hand, PMMA has some large polar side-groups which means that the molecules are irregular in shape and more strongly bound to one another. Thus, PMMA has higher melting point than PE and is harder and more rigid. This is the polymer from which Perspex (Plexiglas) is made.

So far only long-chain polymers that have a backbone composed solely of carbon atoms have been considered. However, the possibility of substituting other atoms for carbon in the backbone provides many other variations. The requirements are that the substitute atoms form at least two covalent bonds with neighbouring atoms so that the chain is maintained. Examples are oxygen, nitrogen, sulphur and silicon. The molecular structures can be quite complex: Figure 2.6 shows three relatively simple examples.

Figure 2.5 *Examples of the long chain polymers which are in common commercial use as plastics and adhesives.*