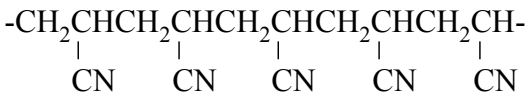
ALKENES: POLYMERISATION

I am not asking for the conditions for the various polymerisation processes mentioned on the Chemguide page because these don't involve any understanding – just last minute learning of whatever is likely to come up in your exam.

1. a) Draw the structure of the monomer you would use to make this polymer:



b) Draw the structure of the polymer you would get by polymerising the monomer $C_6H_5CH=CH_2$, showing at least three repeating units.

2. Poly(ethene) comes in two types – low density poly(ethene) (LDPE) and high density poly(ethene) (HDPE). The difference lies in the amount of branching in the polymer chains.

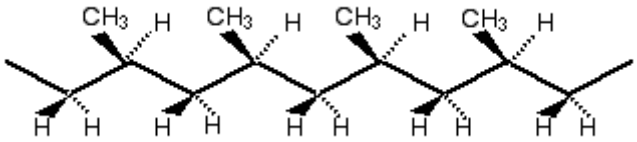
When LDPE is made, lots of branches form along the chains, whereas HDPE has very little branching. Explain how the amount of branching affects

a) the melting points of the two types;

b) the strength of the two types, and hence their uses;

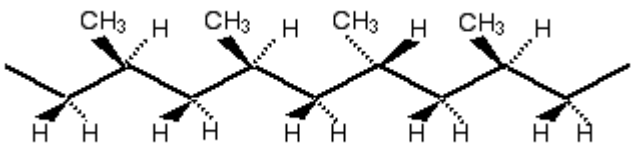
c) the density of the two types.

3. a) Poly(propene) comes in a number of different forms, but the commonest one is isotactic poly(propene). It has the structure (taken from the Chemguide page):



Explain what this diagram shows about the arrangement of the CH_3 groups along the chain.

b) Another form is atactic poly(propene) in which the arrangement of the CH_3 groups is random. For example:



Explain why isotactic poly(propene) is a more useful polymer than atactic poly(propene).

Chemguide – questions

4. This question is about PVC - poly(chloroethene). The following is taken from the Chemguide page:

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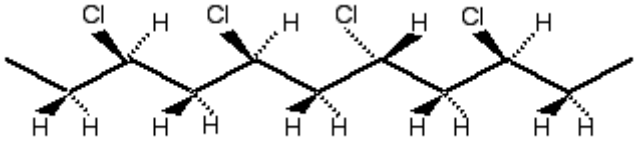

Because of the way the chlorine atoms stick out from the chain at random, and because of their large size, it is difficult for the chains to lie close together. Poly(chloroethene) is mainly amorphous with only small areas of crystallinity."

a) What do you understand by the last sentence "Poly(chloroethene) is mainly amorphous with only small areas of crystallinity." ?

b) Despite the lack of crystallinity, PVC is quite hard and rigid. Explain the reason for that.

c) Varying amounts of plasticisers are added to PVC. Briefly, how do they work, and what effect do they have on the properties of the PVC?

5. a) Write a simple equation to show the formation of poly(tetrafluoroethene) (PTFE) from its monomer.

b) Describe the properties of PTFE which make it such a useful polymer. (No explanations are needed.)

(I am not asking for explanations, because what – if anything – you will be expected to say may well differ depending on your examiners. If PTFE is on your syllabus, it is essential that you look at past papers and mark schemes to find out exactly what your examiners want.)