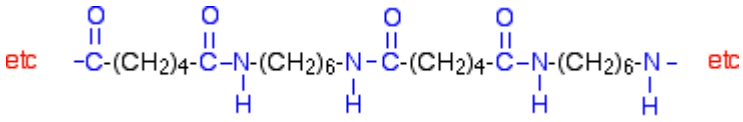
AMIDES: POLYAMIDES

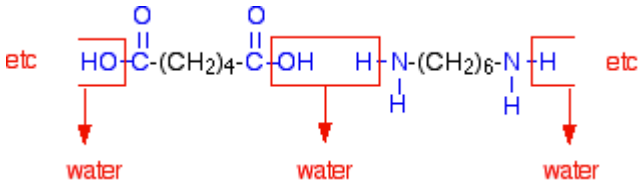
1. a) $HOOCCH_2CH_2CH_2CH_2COOH$ and $H_2NCH_2CH_2CH_2CH_2CH_2CH_2NH_2$

b) Taking the diagrams for this and the rest of the polymer structures from the Chemguide page to save time:



(This shows two of each monomer. The absolute minimum you could draw would be one of each. Don't forget the continuation bonds on each end.)

c) Polymerisation is the joining up of lots of small molecules to make a big one. A condensation reaction is one in which a small molecule is lost when two other molecules combine together. In this particular case, every time an amide link is formed to make the polyamide a molecule of water is lost.

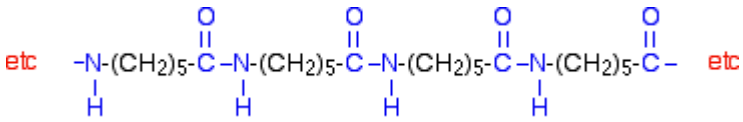


(The diagram isn't essential, but your answer should show or say which water molecules are lost when the chain is formed.)

d) The only essential difference is that the molecule being lost when the the chain forms is HCl rather than water.

e) The acid hydrolyses the amide links – adding water back to reform the original acid and amine groups. The polymer chains therefore break down into small individual molecules, and their structure is destroyed.

2.



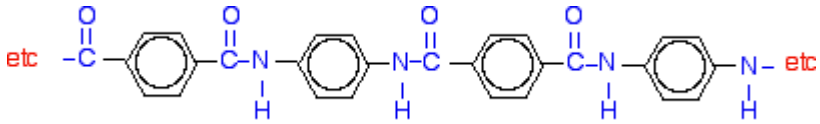
(If you need to know about nylon-6, make sure that you can see how you get this structure from the monomer. Don't waste time learning it – make sure that you can work it out using the structure for caprolactam. The bond between the carbon and nitrogen in the original molecule gets broken. Draw that structure in a straight line, and then reform C-N bonds with other similar structures. You may find when you do this that you have drawn the polymer the other way around (reading it from right to left) – that's OK! It just depends which way you have straightened out the structure from breaking the original ring. It would make sense to practise doing this so that you get the structure above though, because it contains more obvious-looking amide links.)

3. a)

benzene-1,4-dicarboxylic acid

1,4-diaminobenzene

b)



c) It is very strong – about 5 times the strength of steel weight-for-weight.