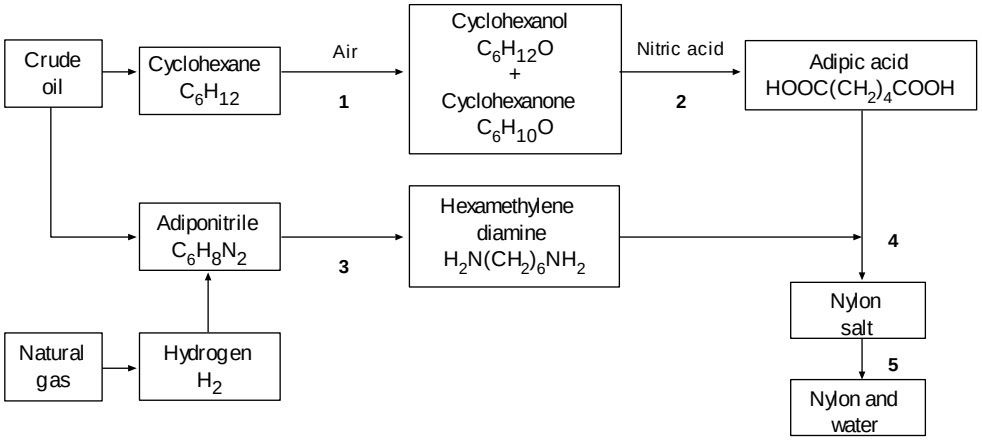
Nylon: Questions



1. The flow diagram summarises the process used to make Nylon

(a) The molecular formula of hexamethylene diamine is $C_6H_{16}N_2$.

What is the molecular formula of adipic acid? _____[1]

(b) Choose the best words from the list to describe the five processes labelled in the flow diagram. You may choose each answer once, more than once or not at all.

Acid-base **Combustion** **Dehydration** **Oxidation** **Reduction**

1 _____; 2 _____;

3 _____; 4 _____;

5_____ [5]

(c) (i) Finish the equation for the reaction of adiponitrile with hydrogen to produce hexamethylene diamine.

$$C_6H_8N_2 + \_\_\_H_2 \rightarrow C_6H_{16}N_2$$ [1]

(ii) Calculate the mass of hydrogen needed to produce 116 tonnes of hexamethylene diamine.

_____tonnes [2]

Nylon salt is formed from $NH_2(CH_2)_6NH_2$ and $HOOC(CH_2)_4COOH$. In aqueous solution it forms two ions $^+NH_3(CH_2)_6NH_3^+$ and $^-OOC(CH_2)_4COO^-$.

(a) What changes take place to the hexamethylene diamine and adipic acid molecules when the Nylon salt is formed?

_____

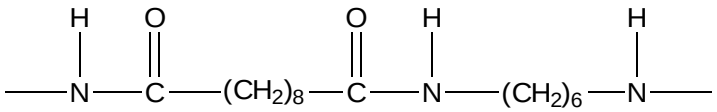
_____[2]

(b) Why is the Nylon salt soluble in water?

_____

_____[2]

(c) Nylon produced from adipic acid and hexamethylene diamine is called Nylon 6:6. The structure of another type of Nylon, called Nylon 6:10, is



(i) Draw the structures of the monomers used to make it.

[2]

(ii) Explain the naming system used for these Nylons.

_____

_____

_____[2]

(d) Another type of Nylon – Nylon 6 – is produced by the polymerisation of a single monomer. The monomer contains two reactive groups. One is an acid group and one is a basic group. The structure of the monomer is:

$H_2N(CH_2)\ nCOOH$

(i) What is the value of *n*?_____[1]

(ii) Draw the structure of the polymer.

[2]