CHEMISTRY ONLINE
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CHEMISTRY

ORGANIC CHEMISTRY II

Level & Board	AQA (A-LEVEL)
TOPIC:	POLYMERS
PAPER TYPE:	QUESTION PAPER - 1
TOTAL QUESTIONS	10
TOTAL MARKS	/27

Polymers - 1

1. Esters have many important commercial uses such as solvents and artificial flavourings in foods.

Esters can be prepared in several ways including the reactions of alcohols with carboxylic acids, acid anhydrides, acyl chlorides and other esters.

(a) Ethyl butanoate is used as a pineapple flavouring in sweets and cakes.

Write an equation for the preparation of ethyl butanoate from an acid and an alcohol.

Give a catalyst used for the reaction.

(4)

(b) Butyl ethanoate is used as a solvent in the pharmaceutical industry.

Write an equation for the preparation of butyl ethanoate from an acid anhydride and an alcohol.

(3)

2. Which polymer has hydrogen bonding between the polymer chains?

A. Kevlar
B. PVC
C. poly(phenylethene)
D. Terylene

(1)

3. Name and outline a mechanism for the reaction of CH_3COCl with CH_3OH to form an ester.

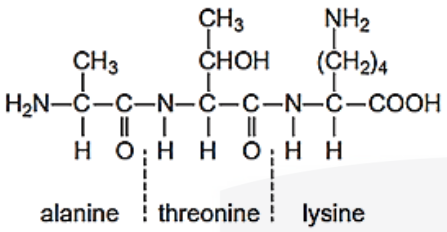
(5)

4. Which type of polymer is not hydrolysed by heating with concentrated aqueous sodium hydroxide?

A. poly(alkene)
B. poly(amide)
C. poly(ester)
D. protein

(1)

5. The tripeptide shown is formed from the amino acids alanine, threonine and lysine.



(a) Draw a separate circle around each of the asymmetric carbon atoms in the tripeptide.

(1)

(b) Draw the zwitterion of alanine.

(1)

(c) Give the IUPAC name of threonine.

(1)

(d) Draw the species formed by lysine at low pH.

(1)

6. Which forms a polymer with $ClOC(CH_2)_8COCl$?

A. $NH_2CH_2CH_2NH_2$
B. $(CH_3CO)_2O$
C. $CH_3CH_2CONH_2$
D. NH_2CH_2COOH

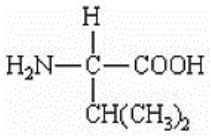
(1)

7. Fibres are made from natural and from synthetic polymers.

Both types of polymer have advantages and disadvantages.

Amino acids are the building blocks of naturally-occurring polymers called proteins.

Consider the following amino acid.



(a) Draw the structure of the amino acid species present in a solution at pH 12.

(1)

(b) Use your understanding of amino acid chemistry to deduce the structure of the dipeptide formed from two molecules of this amino acid and illustrate your answer with a sketch showing the structure of the dipeptide.

(1)

(c) Protein chains are often arranged in the shape of a helix.

Name the type of interaction that is responsible for holding the protein chain in this shape.

(1)

8. Which polymer has hydrogen bonding between its chains?

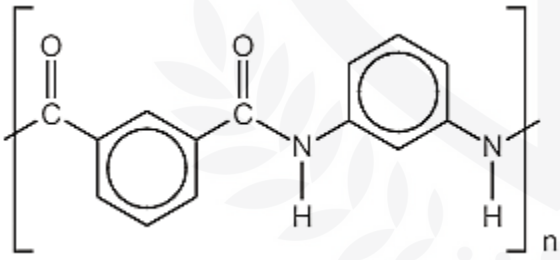
A. Kevlar
B. Polythene
C. PVC
D. Terylene

(1)

9. Nylon is sometimes used for electrical insulation.

However, if there is a risk of high temperatures then a polymer such as Nomex, with a higher melting point, is used.

The repeat unit of Nomex is shown below.



(a) Draw the structures of two monomers that could be used to form Nomex.

(2)

(b) Suggest a reason why the melting point of Nomex is higher than that of nylon.

(1)

10. Which polymer is least likely to be biodegraded after several years in a landfill site?

A. Kevlar
B. Nylon
C. Polythene
D. Terylene

(1)

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