CHEMISTRY ONLINE
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CHEMISTRY

INORGANIC CHEMISTRY II

Level & Board	AQA (A-LEVEL)
TOPIC:	POLYMERS
PAPER TYPE:	QUESTION PAPER - 3
TOTAL QUESTIONS	10
TOTAL MARKS	32

Polymers - 3

1. Synthetic polyamides have structures similar to those found in proteins.

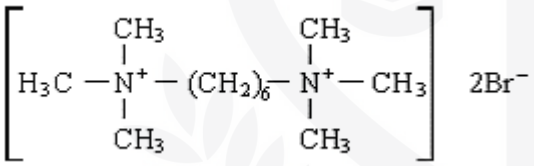
(a) Draw the structure of 2-aminopropanoic acid.

(1)

(b) Draw the organic product formed by the condensation of two molecules of 2-aminopropanoic acid.

(1)

2. Compounds like $H_2N(CH_2)_6NH_2$ are also used to make ionic compounds such as X, shown below.



(a) X belongs to the same type of compound as $(CH_3)_4N^+Br^-$
Name this type of compound.

(1)

(b) State a reagent which could produce X from $H_2N(CH_2)_6NH_2$ and give a necessary condition to ensure that X is the major product.

(2)

(c) Name the mechanism involved in this reaction to form X.

(1)

3. Synthetic polyamides are produced by the reaction of dicarboxylic acids with compounds such as $H_2N(CH_2)_6NH_2$

(a) Name the compound $H_2N(CH_2)_6NH_2$

(1)

(b) Give the repeating unit in the polyamide nylon 6,6.

(1)

4. The compound $H_2C=CHCN$ is used in the formation of acrylic polymers.

(a) Draw the repeating unit of the polymer formed from this compound.

(1)

(b) Name the type of polymerisation involved in the formation of this polymer.

(1)

5. This question is about isomers of $C_6H_{10}O_2$

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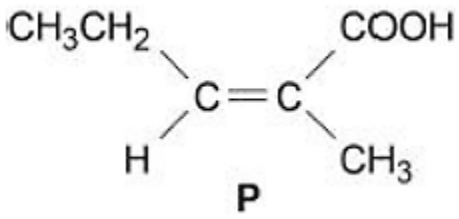
(a) Give the full IUPAC name of isomer P.



P

(1)

(b) A sample of P was mixed with an excess of oxygen and the mixture ignited.

After cooling to the original temperature, the total volume of gas remaining was 335 cm^3

When this gas mixture was passed through aqueous sodium hydroxide, the carbon dioxide reacted and the volume of gas decreased to 155 cm^3 Both gas volumes were measured at 25 °C and 105 kPa

Write an equation for the combustion of P in an excess of oxygen and calculate the mass, in mg, of P used.
The gas constant R = 8.31 J K^{-1} mol^{-1}

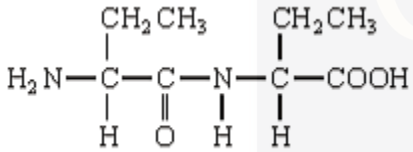
I am Sorry !!!!!

(5)

6. Explain why polyamides are degraded by sodium hydroxide whereas polymers such as poly(ethene) are not.

(3)

7. When the dipeptide shown below is heated under acidic conditions, a single amino acid is produced.



(a) Name this amino acid.

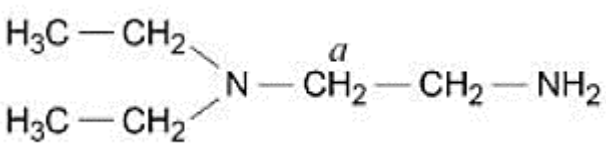
(1)

(b) Draw the structure of the amino acid species present in the acidic solution.

(1)

8. There are several isomers with the molecular formula $C_6H_{16}N_2$

(a) One isomer is shown.



Give the number of peaks in the ^{13}C NMR spectrum of this isomer.

State and explain the splitting pattern of the peak for the hydrogens labelled a in its ^{1}H NMR spectrum.

(3)

(b) Draw the structure of the isomer of $C_6H_{16}N_2$ used to make nylon 6,6.

(1)

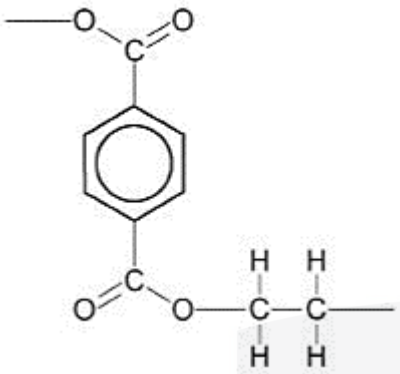
(c) Draw the structure of the isomer of $C_6H_{16}N_2$ that contains two primary amine groups and has only two peaks in its ^{13}C NMR spectrum.

(1)

(d) Draw the structure of the isomer of $C_6H_{16}N_2$ that contains two tertiary amine groups and has only two peaks in its ^{13}C NMR spectrum.

(1)

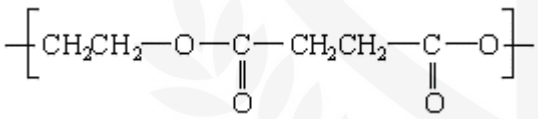
9. The structure of part of a polyester chain is shown. Which statement correctly explains why plastics made from this polyester only soften at high temperatures?



A. Hydrogen bonds and van der Waals' forces exist between polyester chains.
B. Permanent dipole-dipole forces and van der Waals' forces exist between polyester chains.
C. The carbon-carbon bonds in the chain are strong.
D. The carbon-oxygen bonds in the chain are strong.

(1)

10. The repeating unit of a polyester is shown below.



(a) Deduce the empirical formula of the repeating unit of this polyester.

(1)

(b) Draw the structure of the acid which could be used in the preparation of this polyester and give the name of this acid.

(2)

(c) Give one reason why the polyester is biodegradable.

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