

**1. June/2022/Paper\_41/No.5**

- (a) Compare the relative acidities of benzoic acid ( $C_6H_5COOH$ ), phenylmethanol ( $C_6H_5CH_2OH$ ), and phenol ( $C_6H_5OH$ ).  
Explain your reasoning.

..... > ..... > .....

most acidic  least acidic

.....

.....

.....

.....

.....

[3]

- (b) A series of nine separate experiments is carried out as shown in Table 5.1.

Complete the table by placing a tick (✓) in the relevant box if a reaction occurs. Place a cross (X) in the box if no reaction occurs.

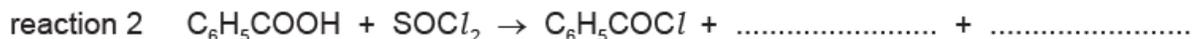
Table 5.1

	benzoic acid	phenylmethanol	phenol
Na(s)			
NaOH(aq)			
Na <sub>2</sub> CO <sub>3</sub> (aq)			

[3]

- (c) (i) Benzoyl chloride,  $C_6H_5COCl$ , can be synthesised by the reaction of benzoic acid with either  $PCl_5$  or  $SOCl_2$ .

Complete the equations for these reactions.



[1]

- (ii) Use your answer to (c)(i) to suggest why it is easier to isolate, in a pure form, the  $C_6H_5COCl$  from reaction 2 compared to reaction 1.

.....

..... [1]

- (d) Benzoyl chloride is hydrolysed by water at room temperature to form benzoic acid.

- (i) Complete the diagram to show the mechanism for the reaction between  $C_6H_5COCl$  and  $H_2O$ .

Include charges, dipoles, lone pairs of electrons and curly arrows as appropriate.



[4]

- (ii) Name the type of mechanism you showed in (d)(i).

..... [1]

(e) Acyl chlorides react with sodium carboxylates to form acid anhydrides as shown in Fig. 5.1.

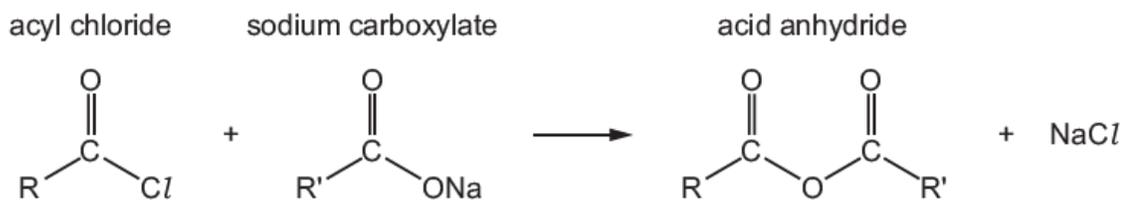


Fig. 5.1

The condensation polymers, polyanhydride and polyester, are formed by similar methods.

The repeat unit for a polyanhydride is shown in Fig. 5.2.

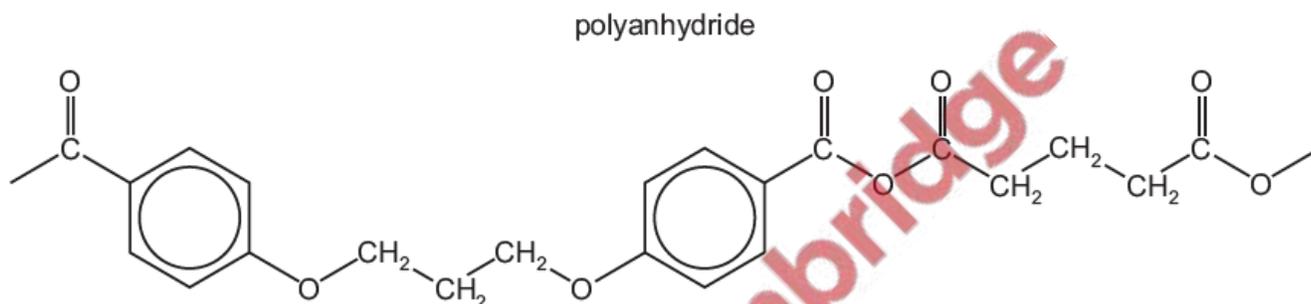
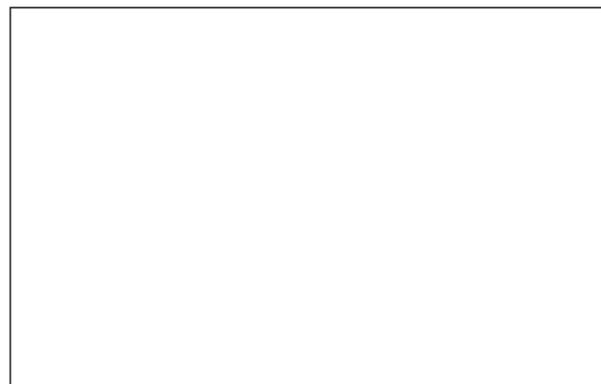
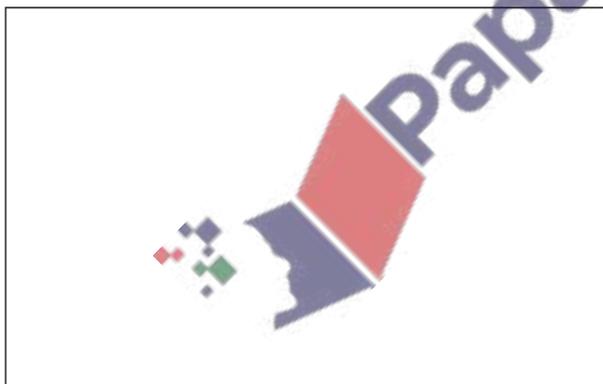


Fig. 5.2

(i) Use Fig. 5.1 and Fig. 5.2 to suggest the structures of the two monomers used to make this polyanhydride.



[2]

(ii) Polyanhydrides are biodegradable polymers.

Suggest how this polyanhydride can be degraded.

.....

..... [1]

[Total: 16]

2. June/2022/Paper\_42No.8

(a) Compare the relative acidities of ethanol, ethanoic acid, chloroethanoic acid and phenol. Explain your reasoning.

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most acidic least acidic

.....

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.....

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.....

.....

[4]

(b) An excess of ethanedioic acid, HOCCOOH(aq), is reacted with warm acidified KMnO<sub>4</sub>(aq).

State the type of reaction undergone by ethanedioic acid.  
Describe what you would observe.  
Write an equation for this reaction.

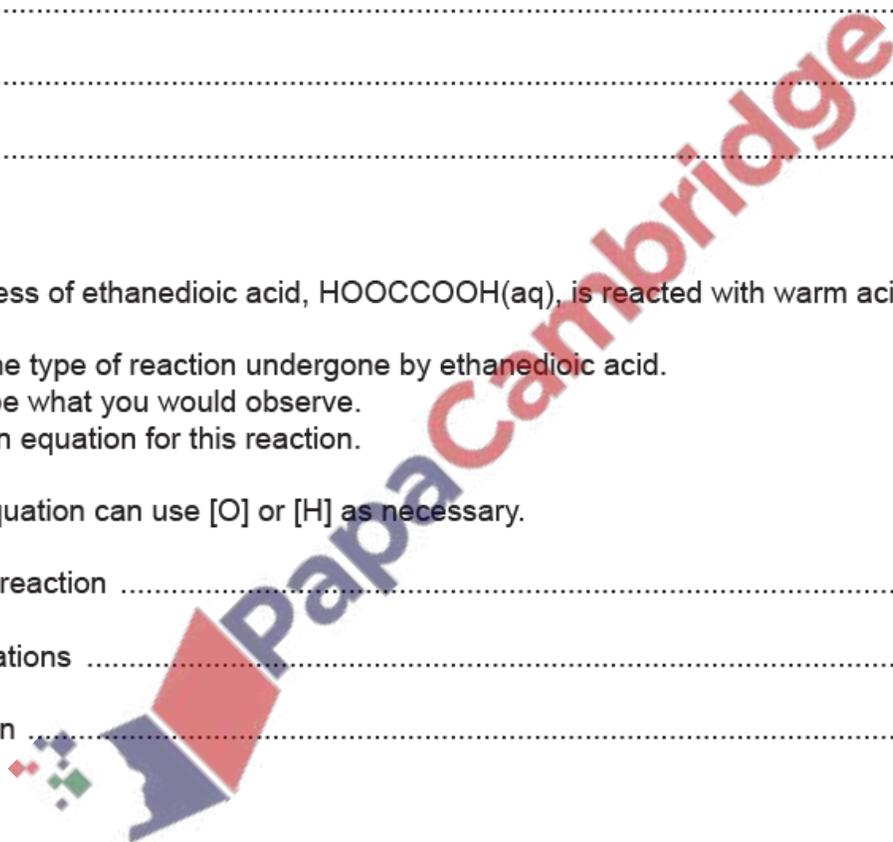
Your equation can use [O] or [H] as necessary.

type of reaction .....

observations .....

equation .....

[2]



(c) A section of a polyester is shown.

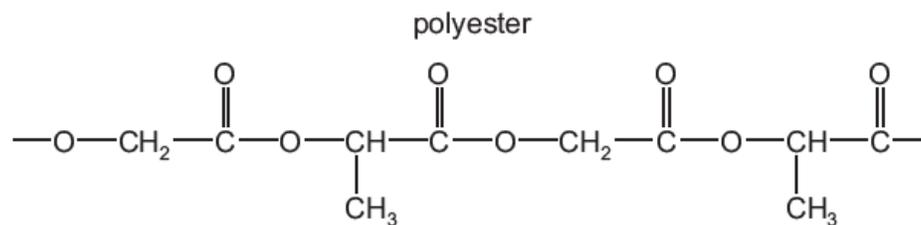


Fig. 8.1

Draw the structures of the two monomers that form this polyester.

[2]

(d) Serine can polymerise to form two different types of condensation polymer; a polyester and a polypeptide.

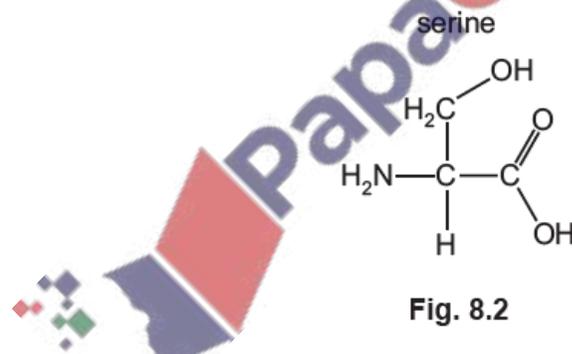


Fig. 8.2

Draw the structure of the polypeptide showing **two** repeat units. The peptide linkage should be shown displayed.

[2]

(e) Explain why condensation polymers normally biodegrade more readily than addition polymers.

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..... [1]

[Total: 11]