Module 6



This exam-style question uses knowledge and skills you have already revised. Look at pages 133 and 134 for a reminder of optical isomers and the formation and hydrolysis of condensation polymers.

## Worked example

Lactic acid can be used to make a biodegradable polymer called poly(lactic acid) or PLA.

(a) Mark the chiral carbon in lactic acid using an asterisk (\*).



A chiral carbon is a carbon atom attached to four different atoms or groups of atoms. An exam question may ask you to identify several of these within a molecule.

(1 mark)

(b) Molecules with a chiral carbon show a particular type of isomerism.

(i) Name the type of isomerism shown by lactic acid and show, using 3D diagrams, the two isomeric forms of lactic acid. (3 marks)

## This type of stereoisomerism is called optical isomerism and this would also be an acceptable answer. The two forms are called enantiomers.

There is no way of telling,

isomer will rotate the plane

clockwise or anti-clockwise.

of plane-polarised light

Chemically the two enantiomers

only one form will react in a particular way. Such reactions

will be almost identical. However, in some biochemical reactions

from looking at their structure, whether an

The type of isomerism shown by lactic acid is stereoisomerism.



The two isomers are mirror images of each other. If you

(ii) Describe the key difference in the properties of the two isomers of lactic acid.

## (2 marks)

The two isomers will both rotate the plane of plane-polarised light. However one isomer will rotate the light clockwise, the other anti-clockwise.

(c) PLA is a condensation polymer.









are called stereospecific. The '2n' used in the question indicated that two repeat units are needed to balance the equation. Only 'n' is used after the repeat unit, as for every 2 monomers, I repeat

unit of the polymer forms.

Hydrolysis of PLA in the laboratory would be much quicker as you could use acidic or basic conditions to speed up the process.

(ii) PLA can be used to support bones as they mend after a fracture, gradually biodegrading once the bone has healed. Suggest how PLA biodegrades over (2 marks) time.

The PLA undergoes a hydrolysis reaction to form lactic acid. The lactic acid then breaks down further to form carbon dioxide and water.