

1 Triglycerides, amylose and glycogen are used to store energy in many living organisms.

(a) Triglycerides contain fatty acids. Fatty acids are classified as saturated or unsaturated.

The formula for a saturated fatty acid is $C_nH_{2n}O_2$

The formula for an unsaturated fatty acid, with one double bond, is $C_nH_{(2n-2)}O_2$

The table below shows the melting points of some common fatty acids.

Fatty acid	Formula of fatty acid	Melting point / °C
P	$C_{16}H_{30}O_2$	-11.0
Q	$C_{18}H_{34}O_2$	13.4
R	$C_{20}H_{40}O_2$	76.5
S	$C_{24}H_{48}O_2$	86.0

For each of the statements below, put a cross in the box that corresponds to the correct statement.

(i) The saturated fatty acid(s) in the table

(1)

- A are P and Q
- B are R and S
- C is P only
- D is Q only

(ii) The fatty acid(s) liquid at 5 °C

(1)

- A are P and R
- B are Q and S
- C is P only
- D is Q only

(b) Use a labelled diagram to show how a triglyceride is formed.

(3)

(c) Amylose and glycogen are polysaccharides.

(i) Name the type of chemical reaction that joins monosaccharides together to form an amylose molecule.

(1)

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(ii) Name the chemical bond that is formed between the monosaccharides in an amylose molecule.

(1)

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(iii) Describe **one** structural difference between amylose and glycogen.

(1)

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(iv) Explain **two** ways in which the structures of amylose and glycogen make them suitable for energy storage.

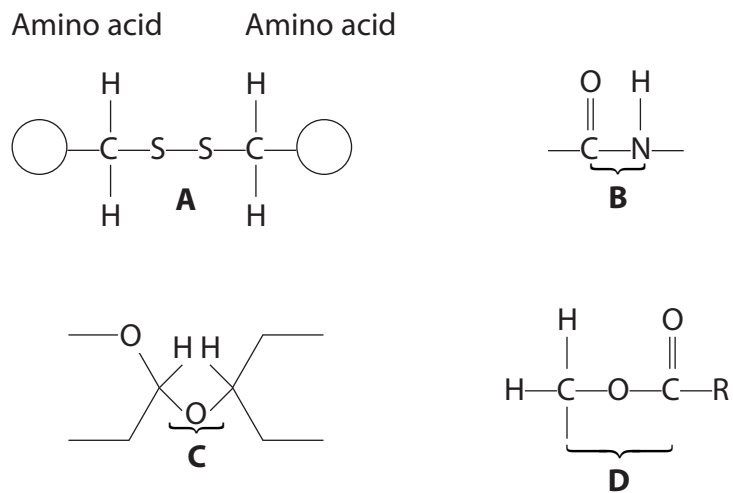
(2)

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(Total for Question 1 = 10 marks)

- 2 (a) The diagrams below show four different bonds, A, B, C, and D, found in biological molecules.



Place a cross ☒ in the box to complete each of the following statements.

- (i) The bond which occurs in a triglyceride molecule is

(1)

- A**
- B**
- C**
- D**

- (ii) The bond which may occur in the tertiary, but not the primary, structure of a protein is

(1)

- A**
- B**
- C**
- D**

(iii) The peptide bond is

(1)

A

B

C

D

(iv) The ester bond is

(1)

A

B

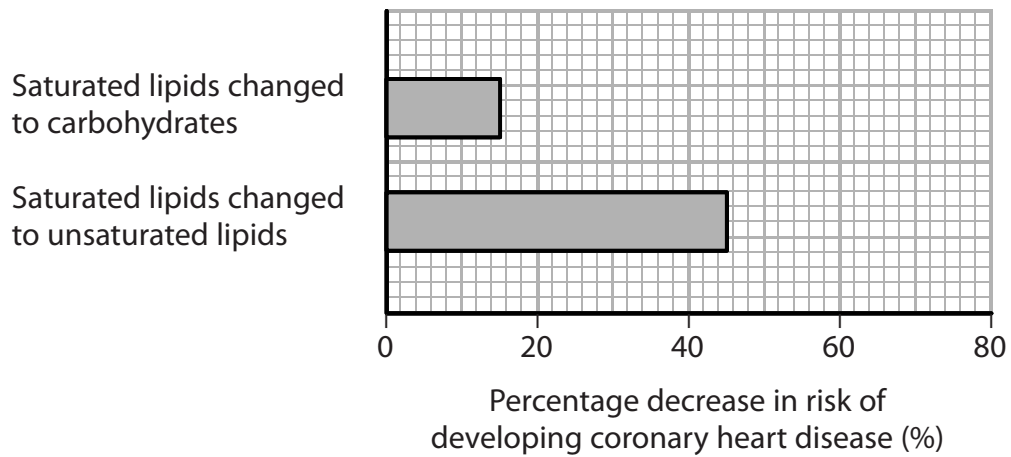
C

D

(b) Adult volunteers took part in an investigation to find out the effect of dietary changes on their risk of developing coronary heart disease.

In this investigation, 5% of the volunteers' energy intake was changed from one food source to another. The volunteers' total energy intake remained constant.

The graph below shows the results of this investigation.



(i) Suggest why it was necessary to ensure that their total energy intake remained constant.

(2)

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(ii) Using the information in the graph and your own knowledge, suggest an explanation for the results of this investigation.

(3)

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(Total for Question 2 = 9 marks)

3 Lipoprotein lipase is a biological catalyst and is involved in the hydrolysis of triglycerides.

(a) For each of the statements below, put a cross ☒ in the box that corresponds to the correct statement.

(i) A catalyst

(1)

- A** decreases the rate of reaction by increasing the activation energy
- B** decreases the rate of reaction by reducing the activation energy
- C** increases the rate of reaction by increasing the activation energy
- D** increases the rate of reaction by reducing the activation energy

(ii) Hydrolysis results in bonds between glycerol and a fatty acid

(1)

- A** being broken and water being formed
- B** being broken and water being used
- C** being formed and water being formed
- D** being formed and water being used

(iii) A triglyceride is made from

(1)

- A** one glycerol and one fatty acid
- B** one glycerol and three fatty acids
- C** three glycerols and one fatty acid
- D** three glycerols and three fatty acids

(iv) A type of bond found in a triglyceride is

(1)

- A** an ester bond
- B** a glycosidic bond
- C** a hydrogen bond
- D** a phosphodiester bond

(b) Some people have a mutation in the gene coding for lipoprotein lipase.

The table below shows the mean concentration of some types of lipid in the blood of people without the mutation and in the blood of people with the mutation.

Type of lipid	Mean concentration of lipid in blood / mg dm ⁻³	
	People without the mutation	People with the mutation
Triglyceride	102	93
LDL cholesterol	121	111
HDL cholesterol	48	49
Total cholesterol	186	179

It has been suggested that people with this mutation may be more at risk of developing cardiovascular disease (CVD).

(i) Give **two** reasons why the information in the table does **not** support this suggestion.

(2)

1

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2

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(ii) Name the type of drug that could be given to people with this mutation, to reduce the risk of developing CVD.

(1)

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(iii) State **one** health risk associated with using this type of drug.

(1)

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(Total for Question 3 = 8 marks)