

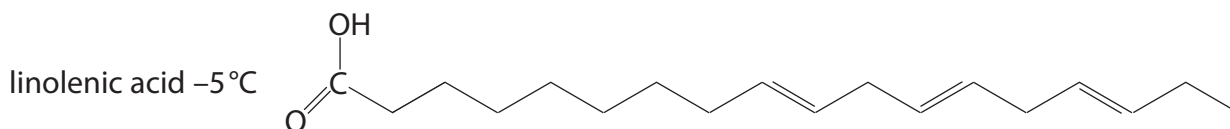
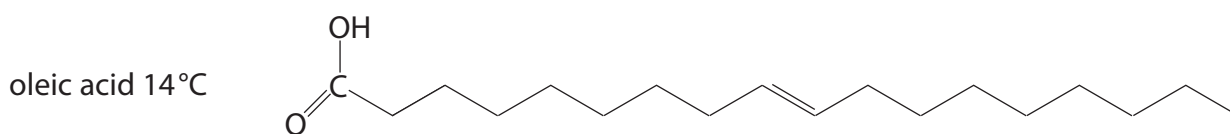
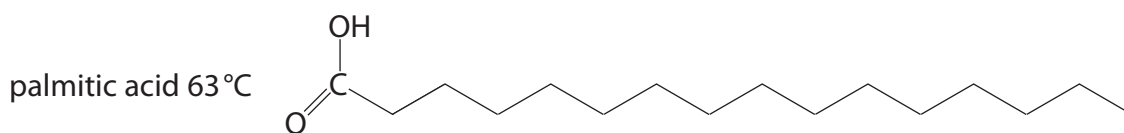


Answer ALL questions.

Some questions must be answered with a cross . If you change your mind about an answer, put a line through the box  and then mark your new answer with a cross .

1 Triglycerides are synthesised from glycerol and fatty acids.

(a) The diagrams below show the structures of three fatty acids and their melting temperatures.



(i) Using the diagrams above, describe the structure of oleic acid.

(2)

.....

.....

.....

.....

.....

(ii) Using the information in the diagrams, explain why these fatty acids have different melting temperatures.

(3)

.....

.....

.....

.....

.....

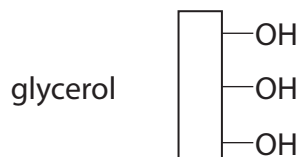
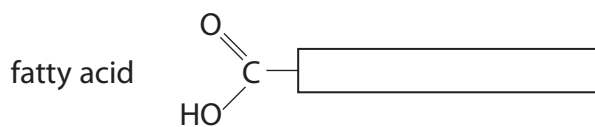
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



- (b) The diagrams below show the simplified structures of a fatty acid molecule and a glycerol molecule.



- (i) Use these diagrams to show the products formed from a reaction between **one** fatty acid molecule and the glycerol molecule.

(2)

- (ii) Name this type of reaction.

(1)

---

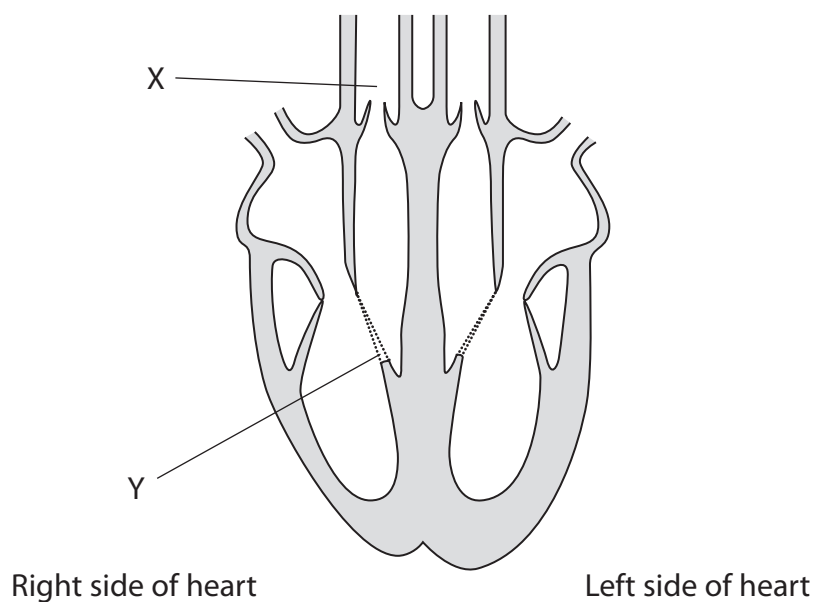
(Total for Question 1 = 8 marks)

---



2 The diagram below shows a section of a human heart and its blood vessels.

(a) On the diagram, draw arrows to show the flow of blood through the left side of the heart.



(1)

(b) Put a cross ☒ in the box that completes each of the following statements.

(i) The blood vessel labelled X carries

(1)

- A blood low in oxygen to the heart
- B blood low in oxygen from the heart
- C oxygen rich blood from the heart
- D oxygen rich blood to the heart

(ii) The structure labelled Y

(1)

- A pulls the semilunar valve open
- B pushes the atrioventricular valve closed
- C stops blood flowing from the ventricle to blood vessel X
- D stops the atrioventricular valve opening the wrong way



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(c) In mammals, blood passes through the heart twice for each circulation of the body.

Suggest how this type of circulation enables mammals to carry out effective gas exchange.

(3)

.....

.....

.....

.....

.....

.....

.....

.....

**(Total for Question 2 = 6 marks)**



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

3 Carbohydrates, such as starch and lactose, are important energy sources.

(a) Starch contains amylose and amylopectin.

(i) Compare the structures of amylose and amylopectin.

(3)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(ii) Explain how the structure of amylopectin affects its ability to provide energy.

(2)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(b) Milk contains between 2% and 8% lactose by weight.

State **one** difference between the structure of lactose and the structure of starch.

(1)

.....

.....

.....

(c) In one study, carried out in Sweden, the mass of milk in the diet and the relative risk of death were investigated.

Mass of milk in diet /grams per day	Relative risk of death	
	male	female
0	1.00	1.00
200	1.15	1.03
400	1.32	1.06
600	1.52	1.09
800	1.75	1.13
1000	2.01	1.16
1200	2.31	1.19

(i) State the relationship between the mass of milk in the diet and the relative risk of death.

(1)

.....

.....

.....



(ii) Suggest an explanation for this relationship.

(2)

.....

.....

.....

.....

.....

.....

.....

(iii) A newspaper report claimed this study proved that drinking large quantities of milk increased the risk of death.

Suggest why this claim may not be true.

(1)

.....

.....

.....

**(Total for Question 3 = 10 marks)**

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA





DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

4 Atherosclerosis is a major risk factor for cardiovascular disease (CVD).

(a) Put a cross  in the box that completes each of the following statements.

(i) Atherosclerosis develops in (1)

- A arteries
- B capillaries
- C chambers of the heart
- D veins

(ii) Atherosclerosis starts with (1)

- A an inflammatory response in blood vessels
- B damage to the endothelial layer of blood vessels
- C decreased blood pressure
- D plaque formation in blood vessels

(b) Atherosclerosis leads to an increased risk of blood clotting.

(i) Describe the blood clotting process. (4)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....



(ii) Name **two** treatments that can reduce the risk of blood clots forming.

(2)

1 .....

2 .....

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(c) High blood pressure is another risk factor for cardiovascular disease.

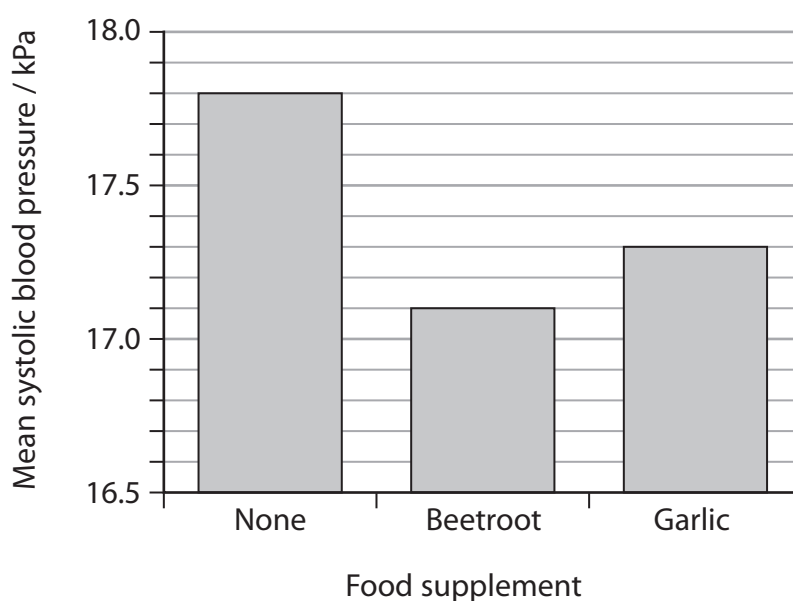
In one study, the effect of food supplements on blood pressure was investigated.

A group of 25 male volunteers with systolic blood pressures above 17 kPa were selected for this study.

For the first week, the volunteers consumed their normal diet but with the addition of beetroot. At the end of the week their blood pressure was measured.

For the second week, the volunteers consumed their normal diet but with the addition of garlic. At the end of the second week, their blood pressure was measured again.

The results of this study are shown in the graph below.



(i) Using the information in the graph, describe the effect of eating beetroot and garlic on blood pressure.

(2)

.....

.....

.....

.....

.....

(ii) Suggest **two** ways in which the design of this study could be improved.

(2)

1.....

.....

2.....

.....

**(Total for Question 4 = 12 marks)**

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



5 The genotype and phenotype of an individual can be affected by gene mutations.

(a) Explain what is meant by each of the following terms.

(i) Genotype

(1)

(ii) Phenotype

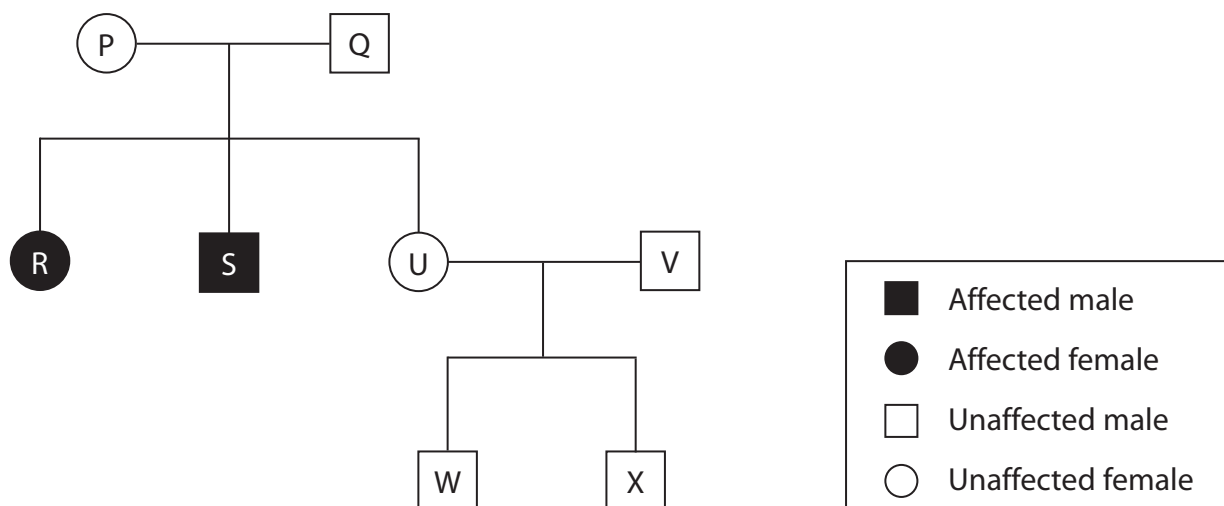
(2)

(b) Leber congenital amaurosis (LCA) is a form of inherited blindness.

LCA is a recessive condition caused by a gene mutation.

This mutation affects the production of a protein in the eyes.

The diagram below shows the inheritance of LCA in a family.



Put a cross  in the box that completes each of the following statements.

(i) The individuals that **must** be heterozygous for this condition are (1)

- A P and Q
- B R and S
- C U and V
- D W and X

(ii) The chance of individual U being heterozygous for this condition is (1)

- A 0%
- B 25%
- C 50%
- D 100%

(iii) Explain how gene therapy could be used to treat individuals with LCA. (3)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

**(Total for Question 5 = 8 marks)**

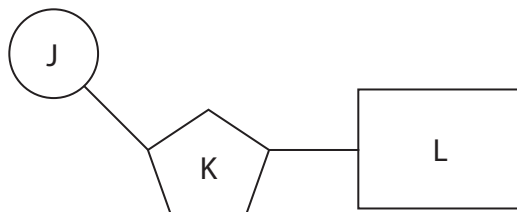


6 DNA contains the genetic information required for the development and functioning of living organisms.

(a) The diagram below shows the structure of a DNA mononucleotide.

Name the parts labelled J, K and L.

(2)



J .....

K .....

L .....

(b) Explain how mononucleotides combine to form a DNA molecule.

(2)

.....

.....

.....

.....





7 Molecules are transported through cell membranes in a number of different ways.

(a) Explain the role of phospholipids in the formation of a cell membrane.

(3)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(b) Put a cross  in the box that completes each of the following statements.

(i) Cells take up very large molecules or particles by

(1)

- A** endocytosis, which is an active process
- B** endocytosis, which is a passive process
- C** exocytosis, which is an active process
- D** exocytosis, which is a passive process

(ii) A partially permeable cell membrane

(1)

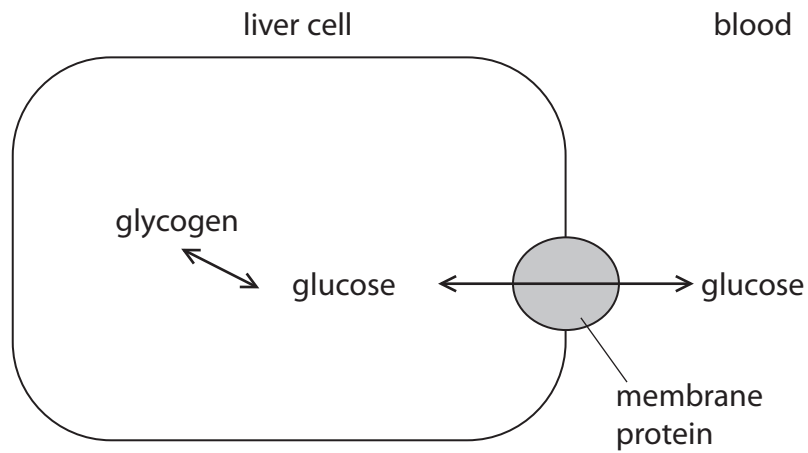
- A** allows the movement of all substances into the cell
- B** allows the movement of some substances into the cell
- C** blocks the movement of all substances into the cell
- D** blocks the movement of water into the cell





(c) The diagram below shows a liver cell.

Liver cells play an important role in maintaining blood glucose concentrations.



(i) The transport of glucose across the cell membranes of liver cells does **not** require energy.

Using information in the diagram, suggest how glucose is taken into liver cells from the blood.

(2)

.....

.....

.....

.....

(ii) The hormone insulin activates an enzyme that converts glucose to glycogen in liver cells.

Explain how insulin increases the rate at which glucose is taken into liver cells.

(2)

.....

.....

.....

.....



(d) Cystic fibrosis is caused by a mutation in the CFTR gene.

Suggest how mutations in the CFTR gene affect the movement of water through cell membranes.

(4)

Area with horizontal dotted lines for writing the answer.

(Total for Question 7 = 13 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



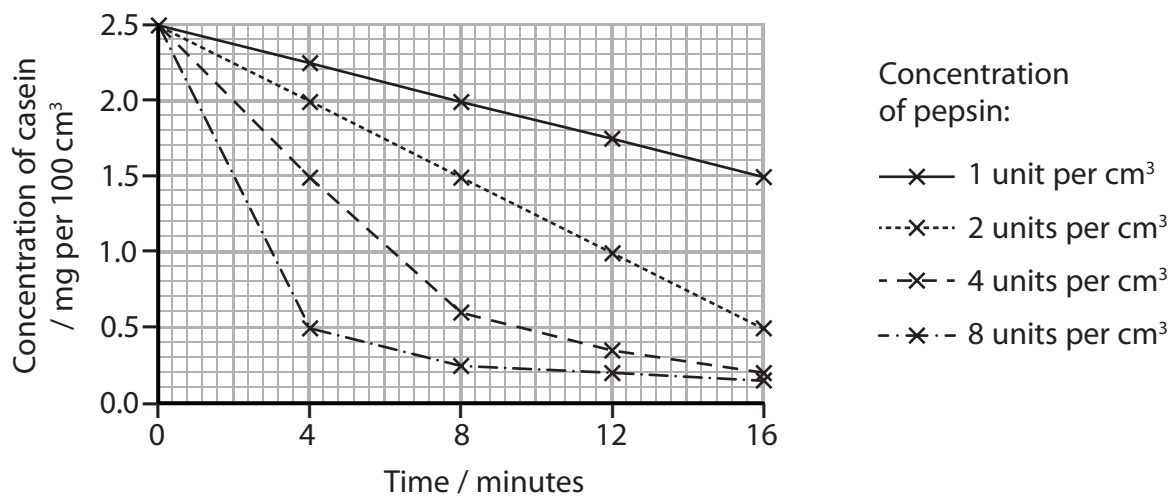
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

8 Casein is a protein that can be hydrolysed by the enzyme pepsin.

The graph below shows the effect of pepsin concentration on the hydrolysis of casein.



(a) Calculate the initial rate of hydrolysis for 8 units per cm<sup>3</sup> of pepsin.

Show your working.

(2)

(b) Using the information in the graph, describe the effect of pepsin concentration on the initial rate of hydrolysis.

(2)

.....

.....

.....

.....



(c) Explain the effect of pepsin concentration on the initial rate of hydrolysis.

(3)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA





DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

**BLANK PAGE**



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

**BLANK PAGE**



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

**BLANK PAGE**

