

Centre No.						Paper Reference						Surname	Initial(s)	
Candidate No.						6	1	0	4	/	0	2	Signature	

Paper Reference(s)

**6104/02**

**Edexcel GCE**

**Biology**

**Biology (Human)**

**Advanced**

Unit 4B Core and Option

Food Science

Wednesday 24 January 2007 – Morning

Time: 1 hour 30 minutes

Examiner's use only

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Team Leader's use only

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Question Number	Leave Blank
1	
2	
3	
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Paper 21 Total	
6	
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9	
Paper 22 Total	
Total	

**Materials required for examination**

Ruler

**Items included with question papers**

Nil

**Instructions to Candidates**

In the boxes above, write your centre number, candidate number, your surname, initial(s) and signature.

The paper reference is shown above. Check that you have the correct question paper.

Answer ALL questions in the spaces provided in this booklet.

Show all the steps in any calculations and state the units. Calculators may be used.

Include diagrams in your answers where these are helpful.

**Information for Candidates**

The marks for the individual questions and parts of questions are shown in round brackets: e.g. (2).

The total mark for this question paper is 70.

**Advice to Candidates**

You will be assessed on your ability to organise and present information, ideas, descriptions and arguments clearly and logically, taking into account your use of grammar, punctuation and spelling.

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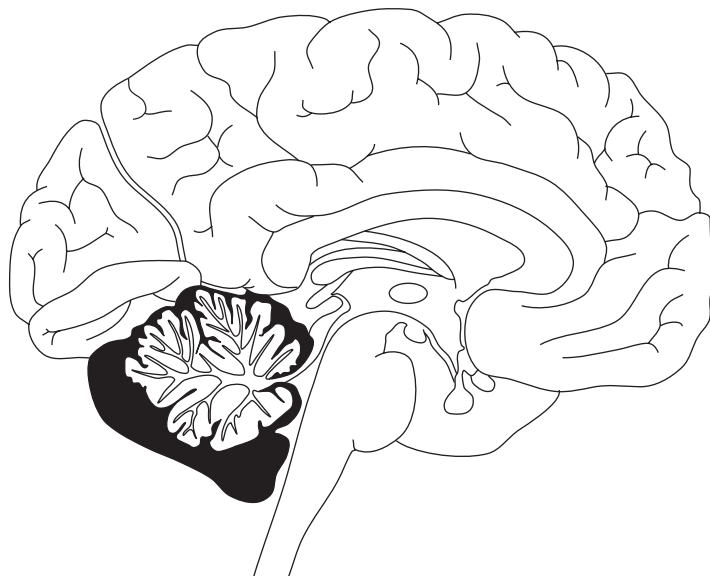


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**Answer ALL questions in the spaces provided.**

1. The diagram below shows a vertical section through a human brain.



(a) On the diagram, draw an arrow to show the position of the **hypothalamus**. **(1)**

(b) The forebrain, midbrain and hindbrain are the three main regions of the human brain.

State in which region of the brain the hypothalamus is found.

..... **(1)**

(c) Give **two** functions of the hypothalamus.

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2 .....

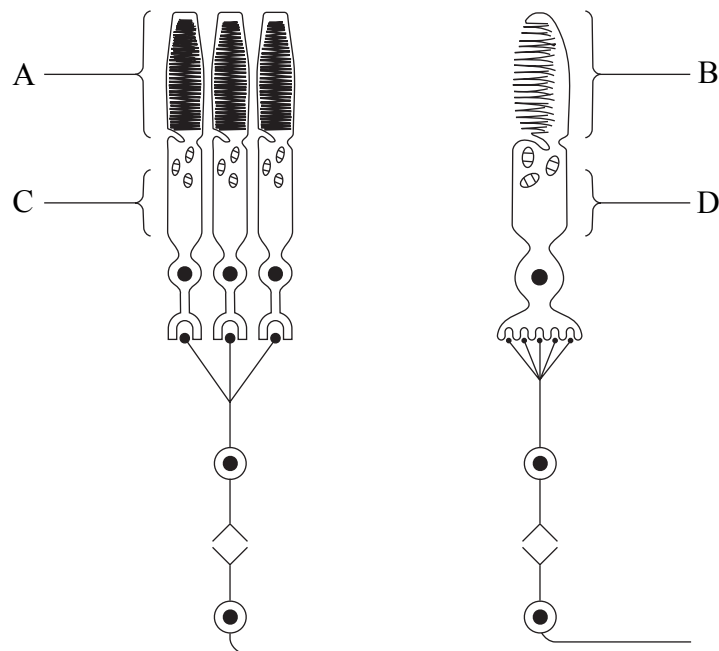
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**(2)** **Q1**

**(Total 4 marks)**



2. The diagram below shows a section through part of a mammalian retina.



(a) (i) State which of the parts labelled A, B, C or D, contains **iodopsin**.

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**(1)**

(ii) There are three different forms of iodopsin. State how many different forms of iodopsin would be present in the cells shown in the diagram.

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**(1)**



(b) Explain how **rhodopsin** is involved in the conversion of light energy into electrical energy.

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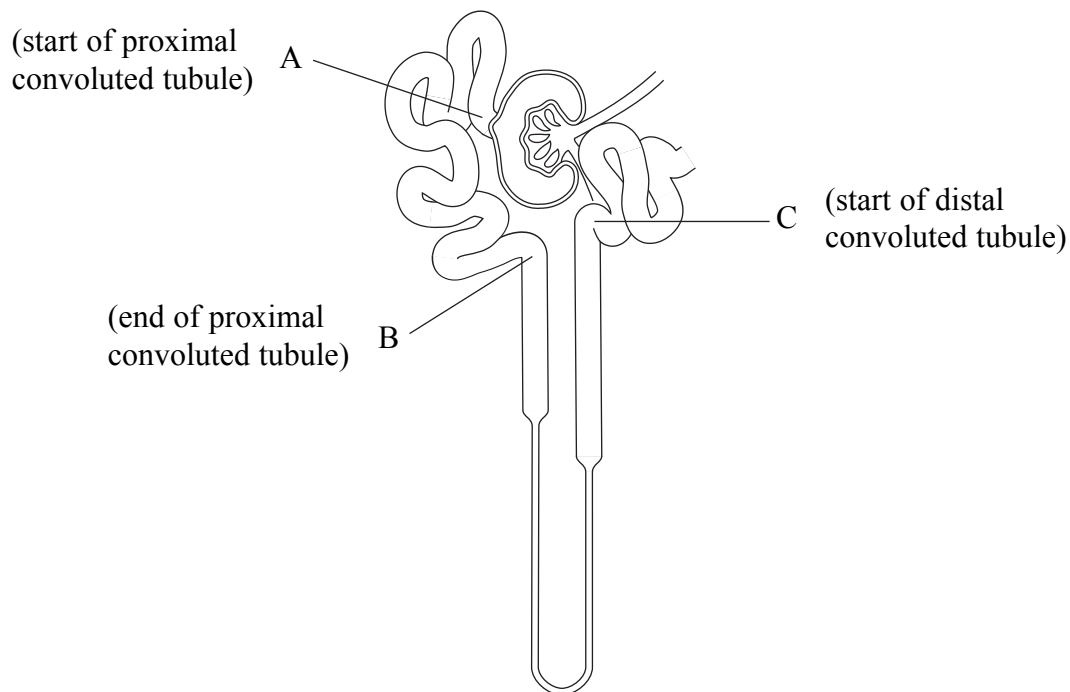
(4) Q2

(Total 6 marks)

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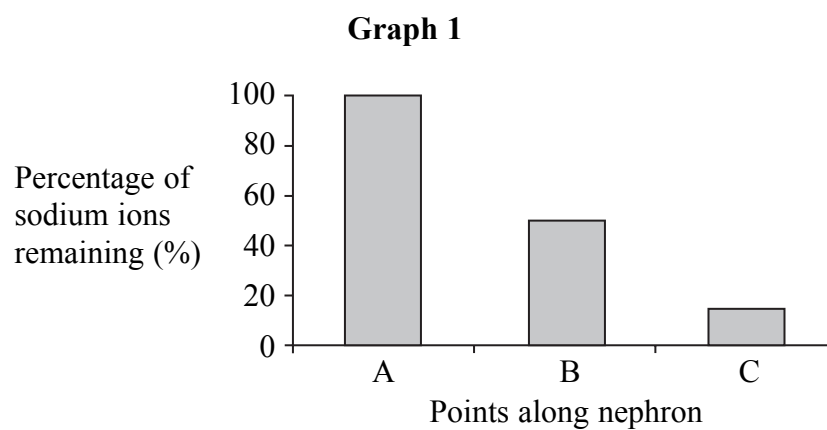


3. The diagram below shows a kidney tubule (nephron).



Ultrafiltration in the Bowman's capsule produces a filtrate that contains sodium ions. The sodium ion content of the filtrate changes as it passes along the nephron. The sodium ion content was measured at three points A, B and C along the nephron.

Graph 1 below shows the percentage of sodium ions remaining in the filtrate at points A, B and C.



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(a) Explain the reasons for the decreases in sodium ion content in the two regions below.

A to B

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B to C

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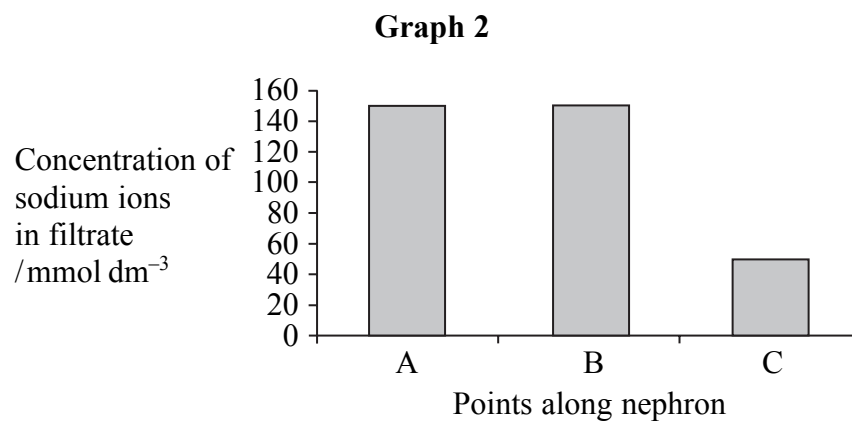
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**(3)**



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(b) Graph 2 shows the **concentration** of sodium ions in the same filtrate at points A, B and C.



Explain why there is no change in concentration of sodium ions in the filtrate, between points A and B.

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(2)





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(c) Describe the effect that an increase in secretion of ADH from the pituitary gland would have on the concentration of sodium chloride in the blood. Explain your answer.

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(3)

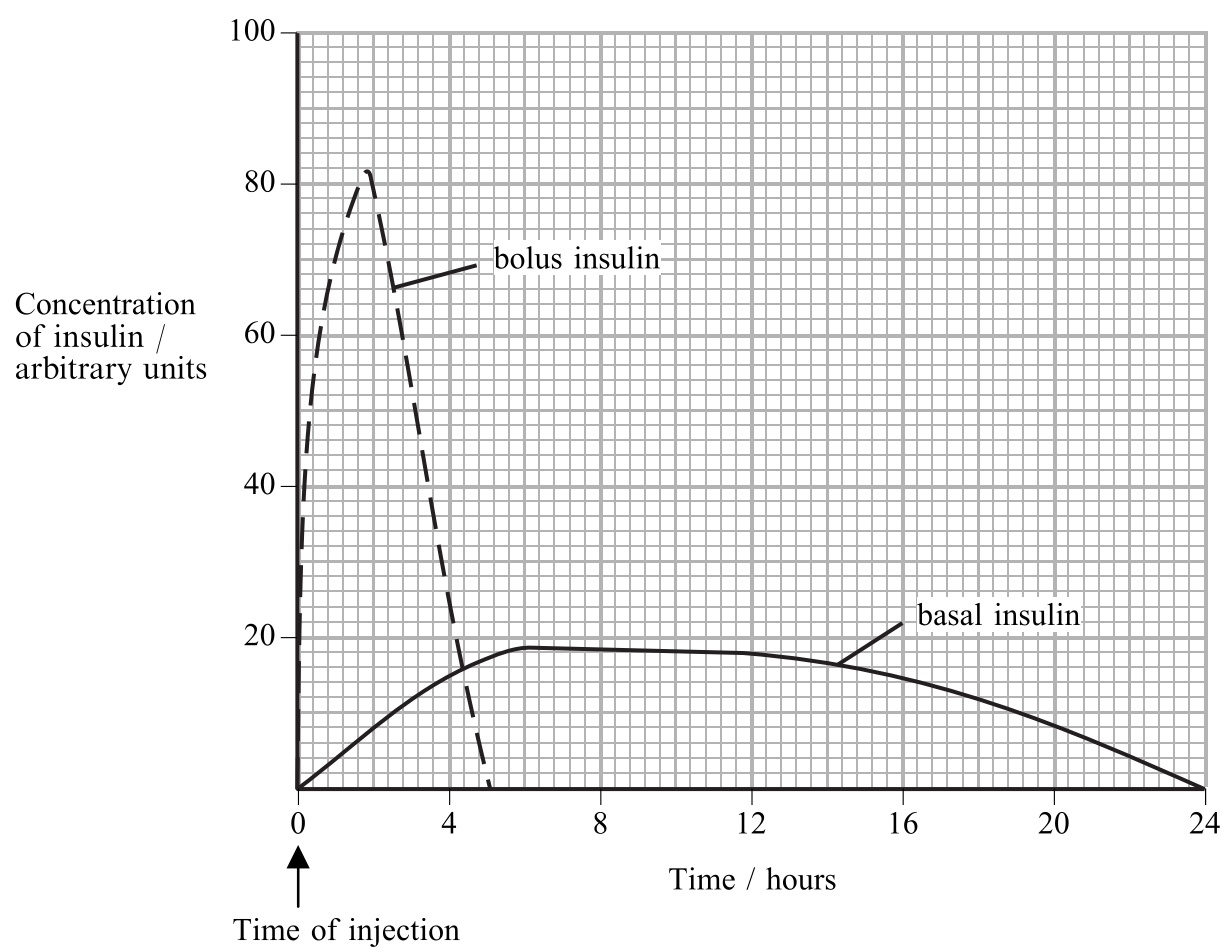
Q3

(Total 8 marks)



4. (a) Treatment of insulin-dependent diabetes is by injection of insulin. There are two types of insulin available, basal insulin and bolus insulin. Basal insulin is injected once a day and is absorbed slowly into the body. Bolus insulin is usually injected at each mealtime.

In an investigation, a diabetic person was injected with basal insulin and bolus insulin at the same time. The concentration of each type of insulin in the blood was measured during the 24 hours following the injection. The results are shown in the graph below.



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(i) Compare the changes in concentration of each type of insulin during the 24 hour period.

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**(3)**

(ii) Explain why a diabetic person might inject basal insulin as well as bolus insulin.

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**(3)**



(iii) Explain why diabetics should not inject bolus insulin more than 15 minutes before they eat.

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(2)

(b) Ray Swinner is an athlete who has insulin-dependent diabetes. Each unit of insulin that he injects lowers his blood glucose level by  $1.5 \text{ mmol dm}^{-3}$ . He has been advised to carry out carbohydrate counting. This involves estimating the number of grams of carbohydrate that is present in his meals. This enables him to calculate how much insulin to take to lower his blood glucose concentration.

Every 10 grams of carbohydrate is referred to as one carbohydrate portion (CP). He needs to inject 1.5 units of insulin for each CP that he eats. Ray eats the following meal for breakfast.

Food	Carbohydrate / g
Two fried eggs	0
Two slices of bacon	0
400 g of baked beans	65
Two slices of brown toast	40
150 cm <sup>3</sup> of fruit juice	15

Calculate the number of units of insulin that he should inject to control the rise in blood glucose level as a result of eating this meal. Show your working

Answer.....

(2)



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(c) State **two** ways in which insulin reduces blood glucose concentration.

1 .....

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2 .....

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(2)

Q4

(Total 12 marks)

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**Option B: Food Science.**

6. Describe the ways in which each of the following are used to delay the spoilage of food.

(a) Sterilisation

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**(2)**

(b) Vacuum packaging

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**(2)**

(c) Antioxidants

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**(2)**

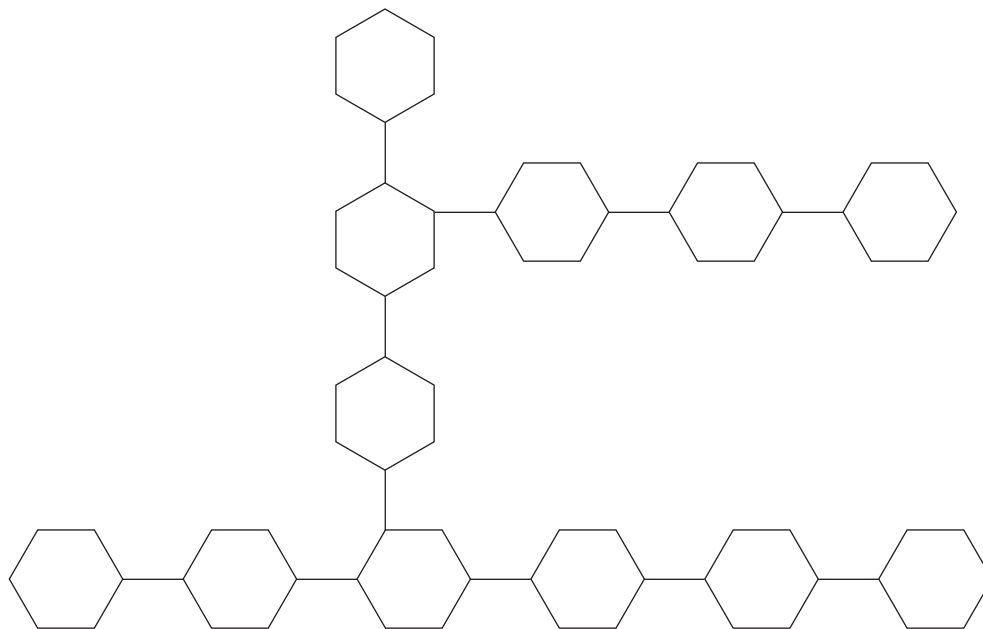
**(Total 6 marks)**

**Q6**





7. The diagram below represents part of a molecule of starch.



(a) (i) Draw an arrow on the diagram to show a bond which can be hydrolysed by the enzyme amyloglucosidase. (1)

(ii) Name the bond hydrolysed by this enzyme.

..... (1)

(b) Describe the role of glucose isomerase in the food industry.

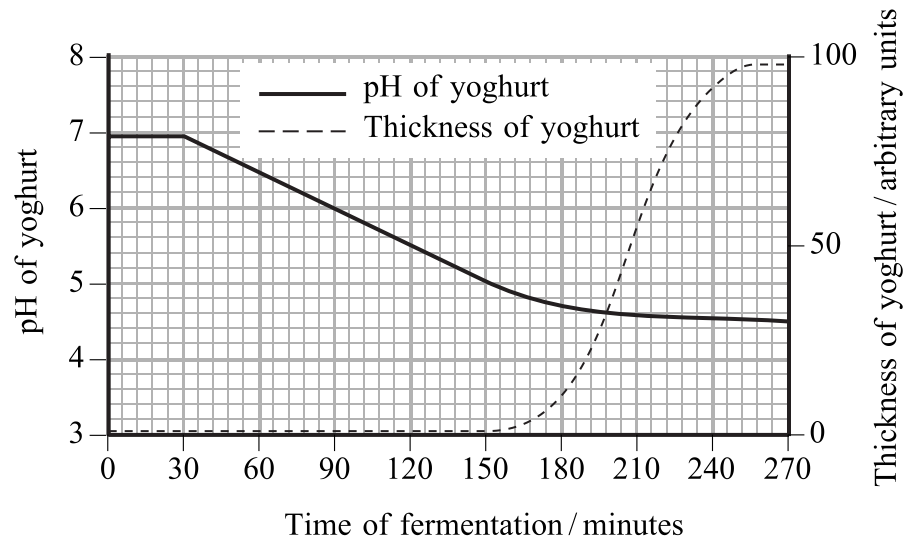
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**(Total 4 marks)**

**Q7**



8. The graph below shows the relationship between pH and the thickness of yoghurt as it is fermented from milk.



(a) Describe the change in pH during fermentation and the effect it has on the thickness of the yoghurt.

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(3)

(b) Skimmed milk powder is often used in the manufacture of yoghurt as it improves the nutritional content and thickens it. However, the lactose content of the yoghurt is higher and therefore can be unsuitable for those who are lactose-intolerant.

Explain what is meant by **lactose-intolerant**.

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(3)



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- (c) The lactose content of the milk used in the yoghurt production can be reduced by pre-treatment with an enzyme. The resulting yoghurt will be suitable for people who are lactose-intolerant.

There are two other advantages of this pre-treatment of the milk. Firstly, the yoghurt sets more rapidly as acid is produced faster at the beginning of fermentation. Secondly, the yoghurt is sweeter, reducing the need for adding sweeteners.

- (i) Describe an experiment to compare the initial rate of acid production in yoghurt made from untreated milk with yoghurt made from enzyme-treated milk.

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**(4)**

- (ii) Suggest why the yoghurt made from enzyme-treated milk is sweeter than yoghurt made from untreated milk.

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**(1)**

**(Total 11 marks)**

<b>Q8</b>	
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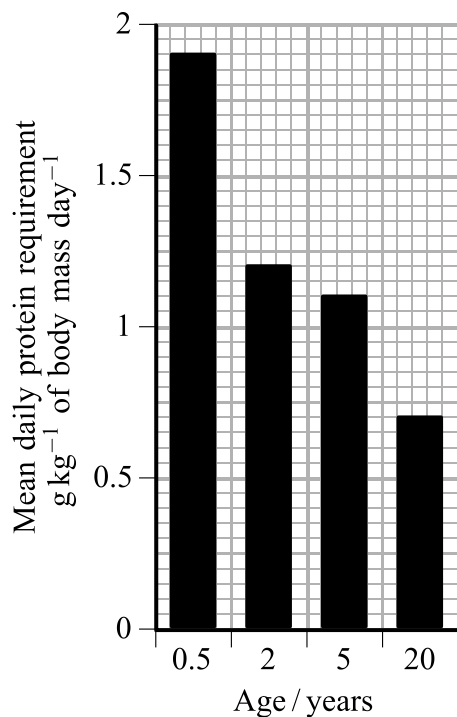
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9. The protein requirements of a person change as they get older.

The graph below shows the mean daily protein requirements in grams per kilogram of body mass per day, of people of different ages.



(a) (i) Using the data from the graph, describe and explain the changes in the mean protein requirements with age.

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(3)



(ii) Suggest **one** reason why the protein requirement of a 20 year old might be higher than the mean protein requirement for people of this age.

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**(1)**

(b) Protein can be obtained from a range of foods. The table below shows some foods and their protein content in grams per 100 grams of food.

<b>Food</b>	<b>Protein content / grams per 100 grams of food</b>
Cheese	25.4
Egg	12.5
Steak	31.0
Peanuts	25.6

(i) A 20 year-old man, with a mass of 75 kg, obtained all of his daily protein requirements by eating only cheese. Using the information in the table and the graph, calculate the mass of cheese required to satisfy his daily protein requirement. Show your working.

Answer .....

**(3)**



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(ii) Explain why eating only eggs as a source of protein might contribute to an unhealthy diet.

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(2)

Q9

(Total 9 marks)

**TOTAL FOR PAPER: 70 MARKS**

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