

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

Friday 12 June 2009 – Afternoon

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	
7	
8	
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 NINE 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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Answer ALL questions in the spaces provided.

1. Rhodopsin is the light-sensitive pigment contained in rod cells.

The diagram below shows a rod cell from the retina of a mammal.



(a) Use the letter **R** to label on the diagram where rhodopsin is found in the rod cell. **(1)**

(b) When a person enters a dimly-lit room, after being in bright sunlight, objects in the room only gradually become more visible. Give an explanation for this.

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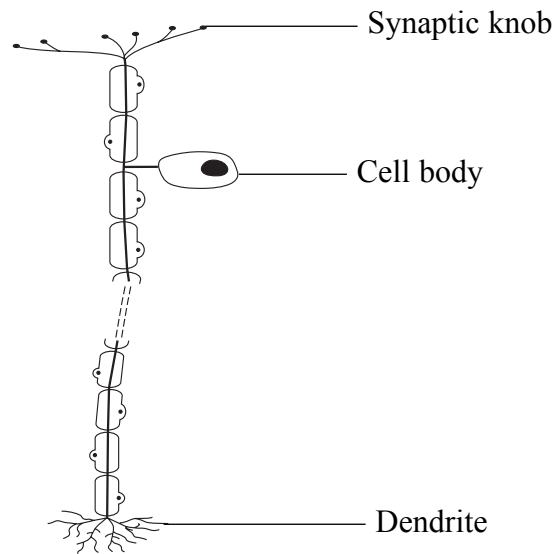
(3)

Q1

(Total 4 marks)



2. (a) The diagram below shows one type of mammalian neurone.



(i) Name the type of neurone shown in this diagram.

..... (1)

(ii) Describe the function of this type of neurone.

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..... (2)

(iii) Draw an arrow on the diagram to show the direction in which a nerve impulse would travel. (1)

(b) Explain what is meant by the term **action potential**.

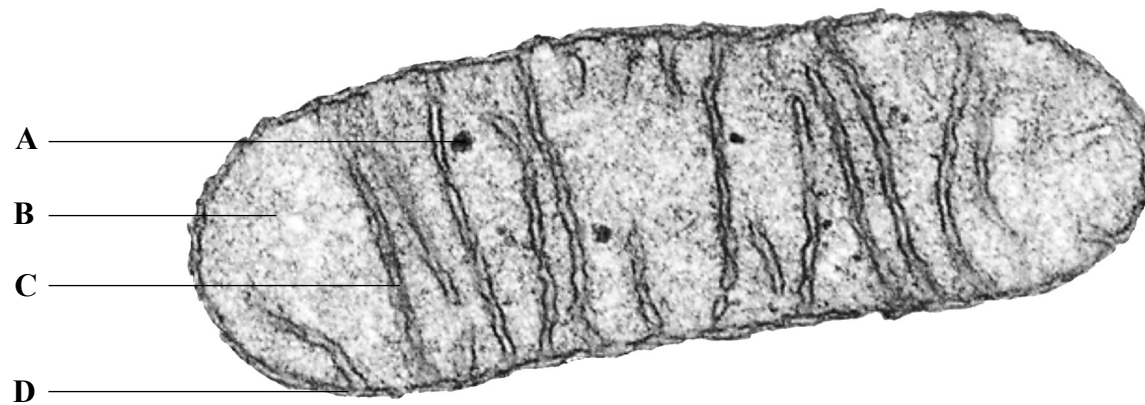
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(Total 6 marks)

Q2



3. (a) The photograph below shows a mitochondrion as seen using an electron microscope.



PR. G Gimenez Martin/Science Photo Library
Magnification $\times 20\,000$

(i) Name the parts labelled **B** and **C**.

B

C

(2)

(ii) Give the **letter** that represents the location of the electron transport chain.

.....

(1)



(b) Antimycin A is an inhibitor of the electron transport chain. It binds to one of the electron carriers in the chain. An experiment was carried out to investigate the effect of Antimycin A on the respiration of yeast cells.

Yeast cells were mixed with a buffer solution containing ADP, phosphate ions and glucose to form a suspension. This suspension was then placed in a waterbath at 30 °C and incubated for 30 minutes. During this time, the oxygen content of the suspension was measured.

The experiment was then repeated with Antimycin A added to the suspension 5 minutes after the start of the incubation.

The results are shown in the table below.

Time of incubation / mins	Oxygen content of suspension / arbitrary units	
	Without Antimycin A	With Antimycin A added 5 minutes after the start of incubation
0	6.4	6.4
5	3.7	3.7
10	2.4	3.7
15	1.6	3.7
20	0.9	3.7
25	0.5	3.7
30	0.5	3.7

(i) Suggest why the oxygen content of the suspension of cells without Antimycin A did not reach zero.

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(2)



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(ii) Explain why the oxygen concentration of the suspension did not decrease after Antimycin A was added.

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(2)

(iii) Suggest what effect the addition of Antimycin A will have on the production of ATP.

Give an explanation for your answer.

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(3)

(Total 10 marks)

Q3



4. (a) An investigation was carried out to study the effect of the age of a person on the ability to control blood glucose concentration.

A group of non-diabetic men of different ages fasted (did not eat) for 12 hours and then their blood glucose concentration was measured. Each man then drank the same volume of a solution containing a high concentration of glucose.

The blood glucose concentration of each man was measured 30 minutes after drinking the solution. This allows time for all of the glucose to be absorbed into the bloodstream. The blood glucose concentration was measured again 120 minutes after drinking the solution.

The results are shown in the table below.

Age / years	Blood glucose concentration / mmol dm ⁻³		
	After fasting, before drinking glucose solution	30 minutes after drinking glucose solution	120 minutes after drinking glucose solution
30	5.3	8.8	6.1
40	5.5	8.9	6.5
50	5.4	8.8	6.7
60	5.6	9.0	7.6
70	5.7	8.9	8.1
80	5.7	8.8	8.2

- (i) The blood glucose concentration at 120 minutes is lower than at 30 minutes after drinking the glucose solution.

Using information from the table, describe the effect of age on the rate at which blood glucose concentration falls.

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(3)



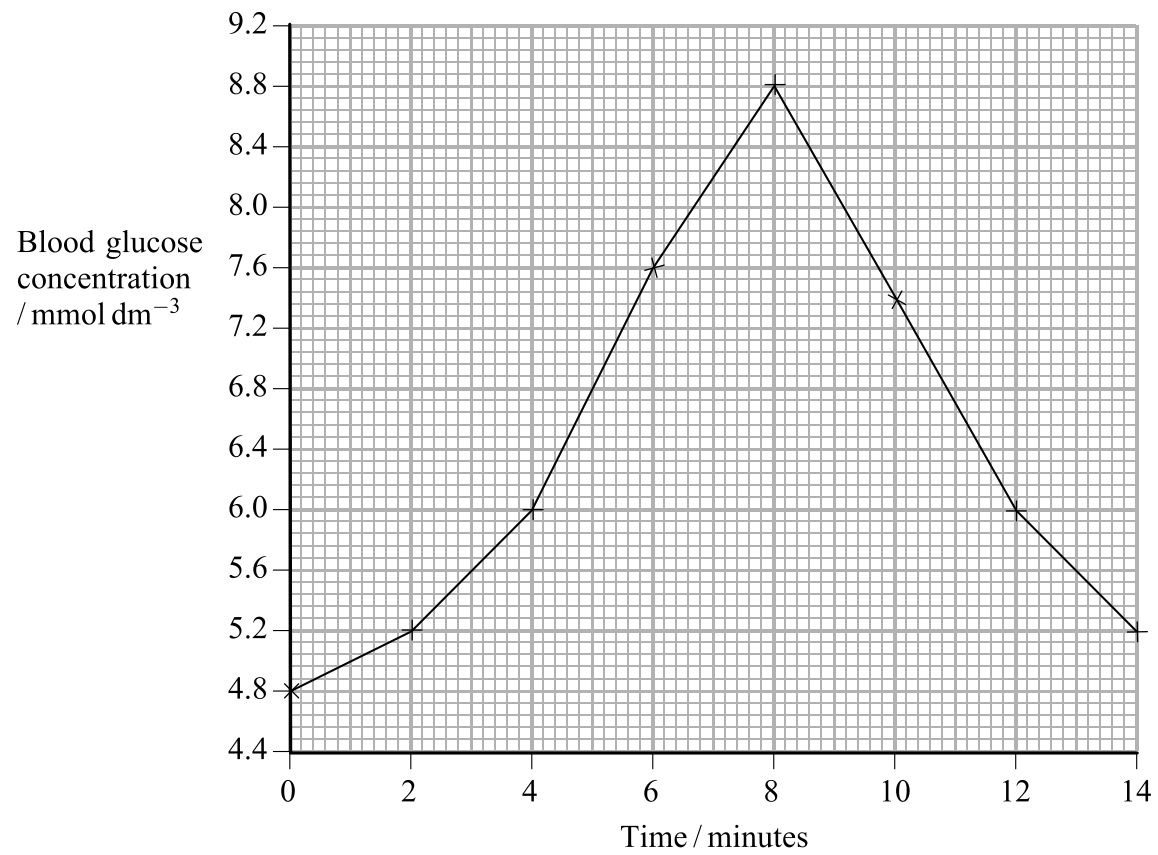
(ii) Suggest **one** explanation for the effect of age on the ability to control blood glucose concentration.

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(1)

(b) In a separate investigation, a man fasted for three hours and was then given an injection of glucagon. His blood glucose concentration was measured at two minute intervals after the injection.

The results are shown in the graph below.



Leave
blank

- (i) Calculate the percentage increase in blood glucose concentration between 0 and 8 minutes after the injection of glucagon. Show your working.

Answer%
(3)

- (ii) Explain how glucagon causes an increase in blood glucose concentration.

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(3)

- (iii) Name **one** other hormone that causes an increase in blood glucose concentration.

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(1)

(Total 11 marks)

Q4

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Option B: Food Science

6. The table below refers to some processes used in the preservation of foods, the method of preservation and their means of reducing food spoilage. Complete the table by writing the most appropriate word or words in the empty boxes.

Preservation process	Method of preservation	Means of reducing food spoilage
Vacuum packaging	Low oxygen	
Lactic acid fermentation		Inhibits growth of microorganisms
Addition of ascorbic acid	Antioxidant	
Pasteurisation		Kills most bacteria

(Total 4 marks)

Q6



7. The energy expenditure of individuals is affected by their gender, basal metabolic rate and the type of physical activity they are involved in.

(a) Explain the meaning of the term **basal metabolic rate**.

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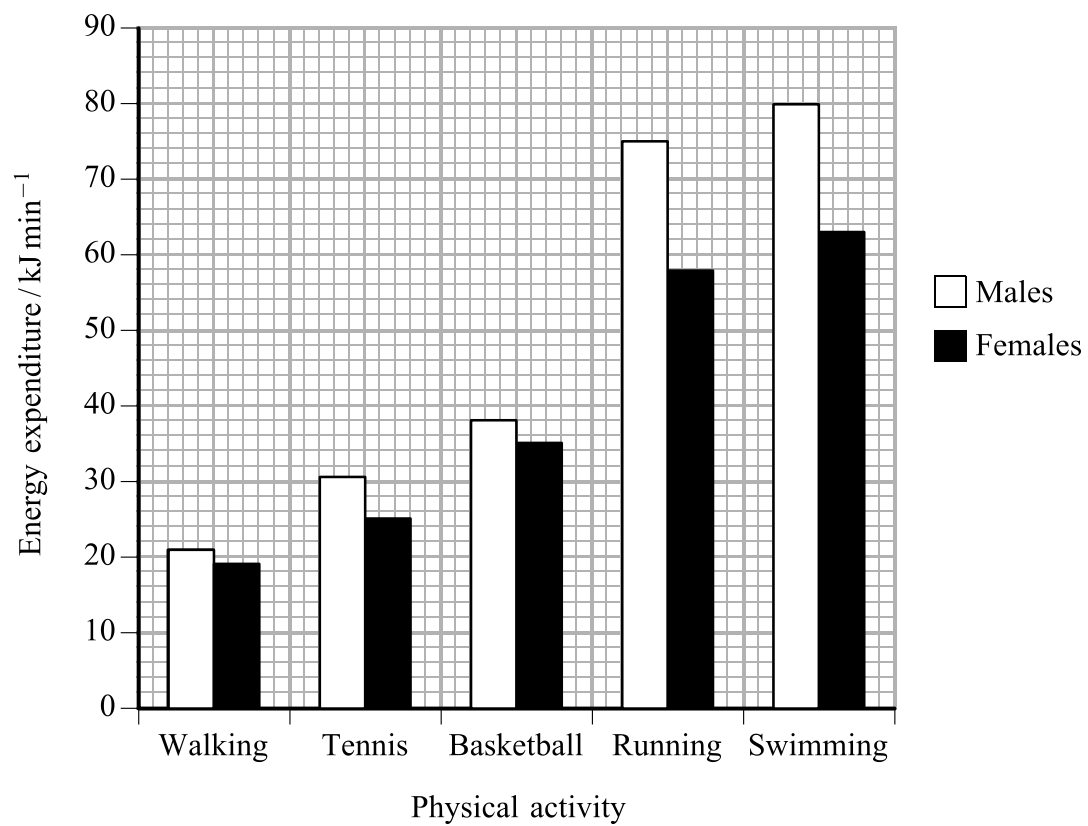
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(2)

(b) The graph below shows the energy expenditure of males and females during some physical activities.



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(i) Compare the energy expenditure of males with females during physical activity.

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(2)

(ii) Suggest **two** reasons for these differences between the energy expenditure of males and females.

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(2)

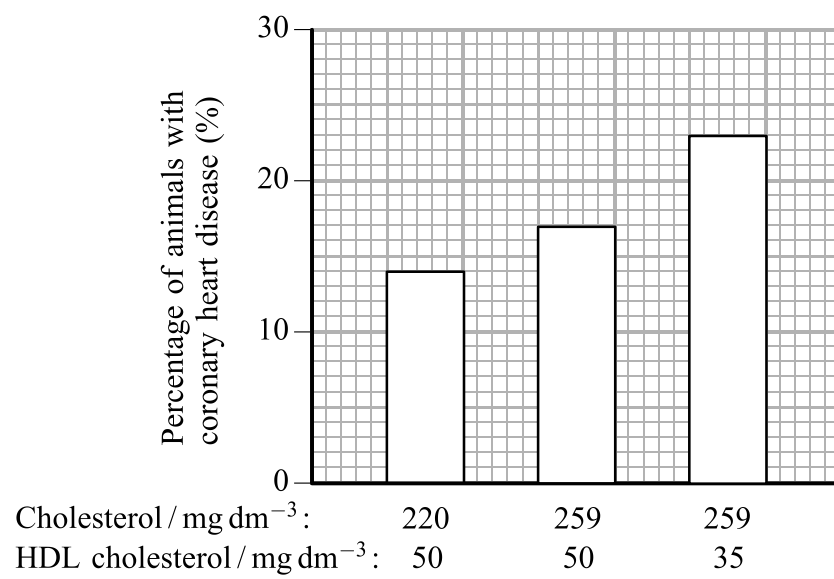
Q7

(Total 6 marks)



8. The health of individuals can be influenced by their diet.

- (a) Three groups of animals were fed on a diet containing different combinations of two lipids: cholesterol and HDL cholesterol. The graph below shows the percentage of animals that developed coronary heart disease.



Describe the effect of cholesterol and HDL cholesterol on the development of coronary heart disease in these animals.

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(2)



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(b) Describe the relationship between diet and the incidence of coronary heart disease.

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(3)

(c) Explain the importance of fibre in the diet in maintaining a healthy bowel.

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(4)

Q8

(Total 9 marks)



9. Microorganisms are involved in the production of sauerkraut.

(a) (i) Name **two** raw ingredients that are required to produce sauerkraut.

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 (2)

(ii) Name **two** bacteria involved in the production of sauerkraut.

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 (2)

(b) An investigation was carried out into the changes in pH that occur during the production of sauerkraut over 15 days. The pH was recorded daily using a pH probe.

The results are shown in the table below.

Time /days	pH
0	7.5
1	7.5
2	7.5
3	7.0
4	6.5
5	6.0
6	5.5
7	6.0
8	6.5
9	5.5
10	4.5
11	3.5
12	3.0
13	2.5
14	3.0
15	3.5



Leave blank

- (i) Calculate the maximum rate of change in pH seen during the experiment. Show your working.

Answer
(2)

- (ii) Describe and explain the changes in pH over the 15 days.

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(4)

- (iii) After 15 days, only slight fluctuations in pH are seen. Suggest a reason why, during the commercial production of sauerkraut, packaging does not begin until between 21 and 30 days.

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(1)

(Total 11 marks)

Q9

TOTAL FOR PAPER: 70 MARKS

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