Paper Reference(s)

6104/02

Edexcel GCE

Biology

Biology (Human)

Advanced

Unit 4B Core and Option

Food Science

Tuesday 24 January 2006 – Morning

Time: 1 hour 30 minutes

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.

Turn over

edexcel

Answer ALL questions in the spaces provided.

1. The diagram below summarises some of the stages of a metabolic pathway responsible for generating ATP in mitochondria.

reduced hydrogen carrier

oxidised cytochrome

2H (from reduced NAD)

$2e^-$

oxidised hydrogen carrier

reduced cytochrome

$2e^-$

$2H^+$
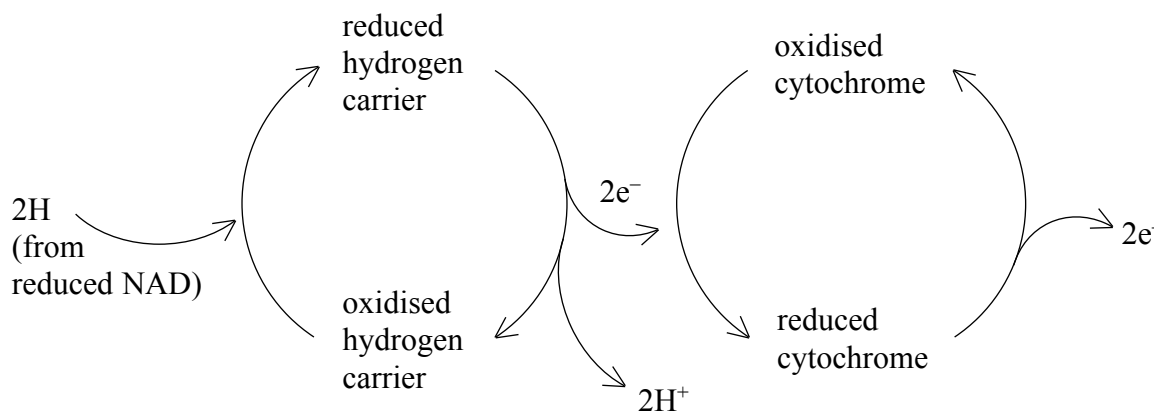
(a) (i) Name the metabolic pathway shown in this diagram.

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(1)

(ii) Name the type of enzyme involved in this pathway and explain its role.

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(2)

(b) Explain what happens to the electrons released at the end of this pathway.

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(2)

Q1

(Total 5 marks)

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2. (a) The graph below shows the changes in membrane potential of a myelinated nerve fibre when a nerve impulse travels along it. The maximum depolarisation in the nerve fibre is +40 mV.
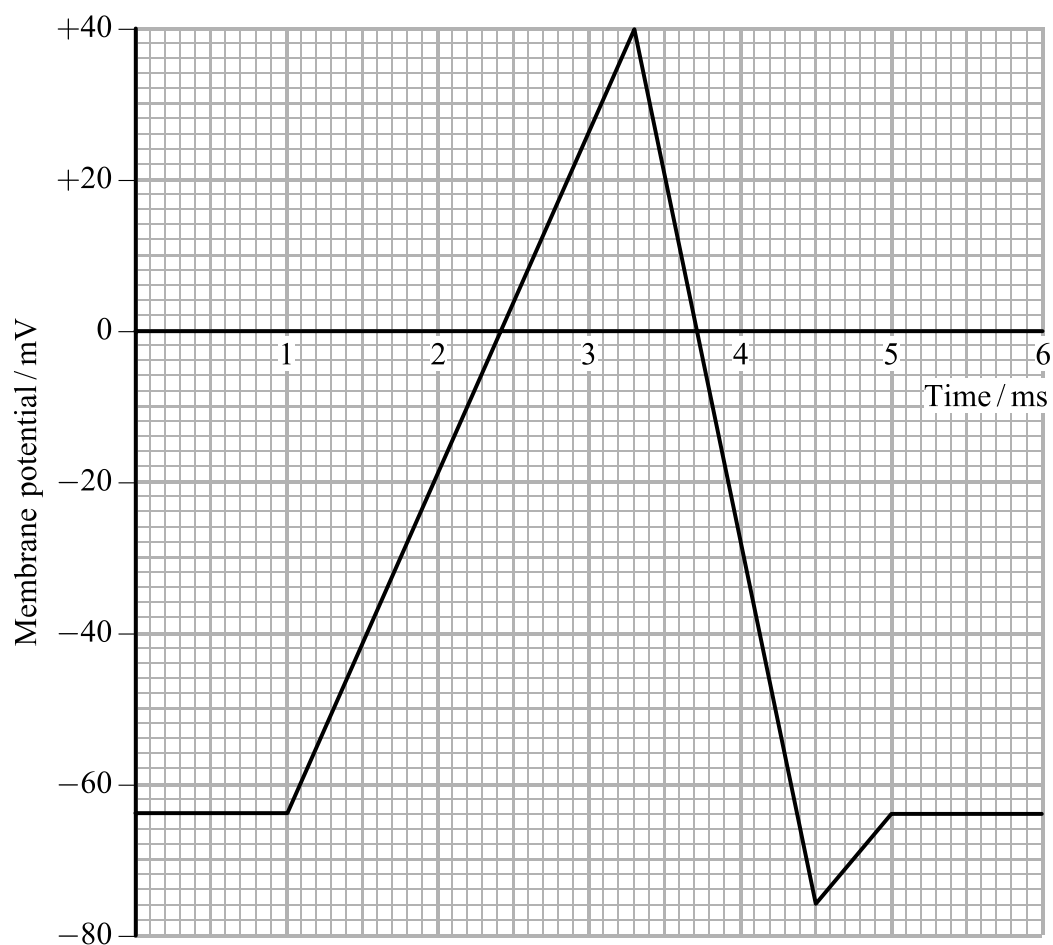
(i) On the graph, draw an arrow to show the time when the sodium ion channels open.

(1)

(ii) Explain the meaning of the term **myelinated**.

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(2)

(iii) State what effect myelination has on the speed of conduction.

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(1)

(b) On the graph below show the changes in membrane potential of a nerve fibre, with a resting potential of –60mV and a maximum depolarisation of +35mV, during the passage of an impulse.
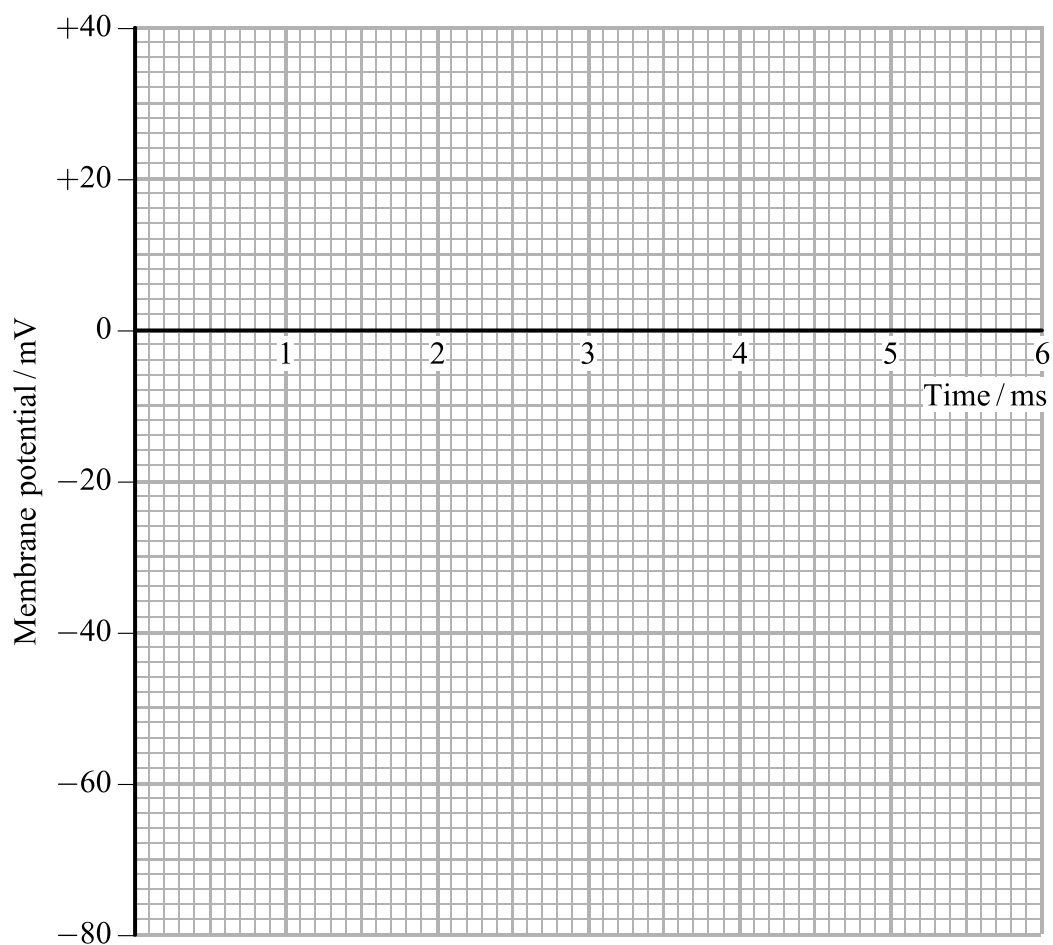
(2)   **Q2**

(Total 6 marks)

3. (a) Explain what is meant by the term **hormone**.

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(3)

(b) Several hormones are involved in the control and coordination of the human menstrual cycle. The graph below shows the changes in the concentrations of these hormones during one cycle.
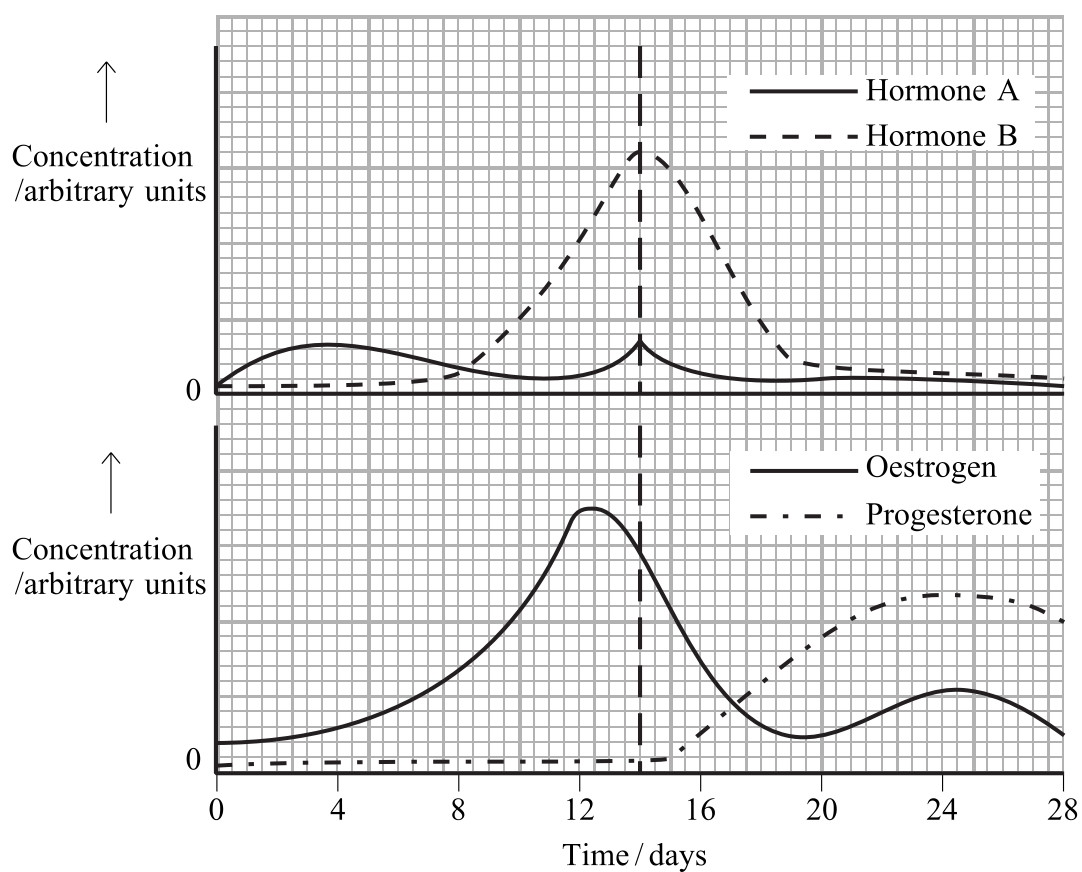
(i) Name hormones A and B.

Hormone A ....

Hormone B ....

(2)

(ii) Using the information shown in the graph, describe and explain the relationship between the concentrations of Hormone A and oestrogen from day 0 to day 14.

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(4)

(Total 9 marks)

Q3

4. (a) Explain how the loop of Henlé enables mammals to produce concentrated urine.

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(3)

(b) The concentration of solutes in the urine and in the blood plasma can be expressed as
a ratio. The table below shows the solute concentration ratios for a range of
mammals from different habitats.

Mammal	Urine : blood plasma solute concentration ratio
Beaver	2 : 1
Cat	10 : 1
Hopping mouse	25 : 1
Human	4 : 1

Using the information in the table, suggest which mammal is best suited for life in a
very dry habitat. Give an explanation for your answer.

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(3)

(c) Mammals excrete most of their waste nitrogen in the form of urea in their urine. Explain how urea is produced in the liver and how it is removed from the blood by ultrafiltration.

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(4)

(Total 10 marks)

Q4

N 2 3 4 1 2 A 0 9 2 0

5. (a) Describe the structure of the spinal cord.

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(4)

(b) Nerve impulses travel across a synapse from a sensory neurone to a relay neurone in the spinal cord.

Describe how a nerve impulse is transmitted across a synapse.

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(6)

(Total 10 marks)

Q5

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Option B: Food Science.

6. The table below refers to foods that are produced by fermentation. Complete the table by writing the appropriate word or words in the spaces.

Food produced	Raw food material	Main sugar used as substrate for fermentation
Sauerkraut		
Yoghurt	Milk	
	Grape juice	Sucrose

(Total 4 marks)

Q6

N 2 3 4 1 2 A 0 1 3 2 0

7. (a) (i) Describe how you would use skinfold measurements to estimate the subcutaneous fat level of a person.

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(4)

(ii) Suggest how this estimate can be used to determine the **lean body mass** of the person.

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(2)

(b) Give **two** differences between the human nutritional disorders anorexia nervosa and bulimia.

1 ....

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2 ....

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(2)

Q7

(Total 8 marks)

8. An investigation was carried out into the effect of storage conditions on the decay of strawberries.

Samples of strawberries were stored for three days at 5 °C, in atmospheres containing different percentages of carbon dioxide. The percentage of strawberries which had visible signs of decay was recorded for each sample. Each sample was then stored at 20 °C for a further day. The percentage of strawberries which had visible signs of decay was again recorded.

The results are shown in the table below.

Percentage of carbon dioxide in the atmosphere	Percentage of strawberries decayed	
	After 3 days at 5 °C	After a further day at 20 °C
0	11.4	35.4
10	4.5	8.5
20	1.7	4.7
40	1.3	4.0

(a) The decay of strawberries is affected by the concentration of carbon dioxide and the temperature at which they are stored.

(i) Describe the effect of carbon dioxide concentration on the decay of strawberries after three days at 5 °C.

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(2)

(ii) Describe the effect of storing the strawberries for a further day at 20 °C.

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(2)

(b) Suggest how strawberry producers might use the results from this investigation to improve the profit from their crops. Give reasons for your answer.

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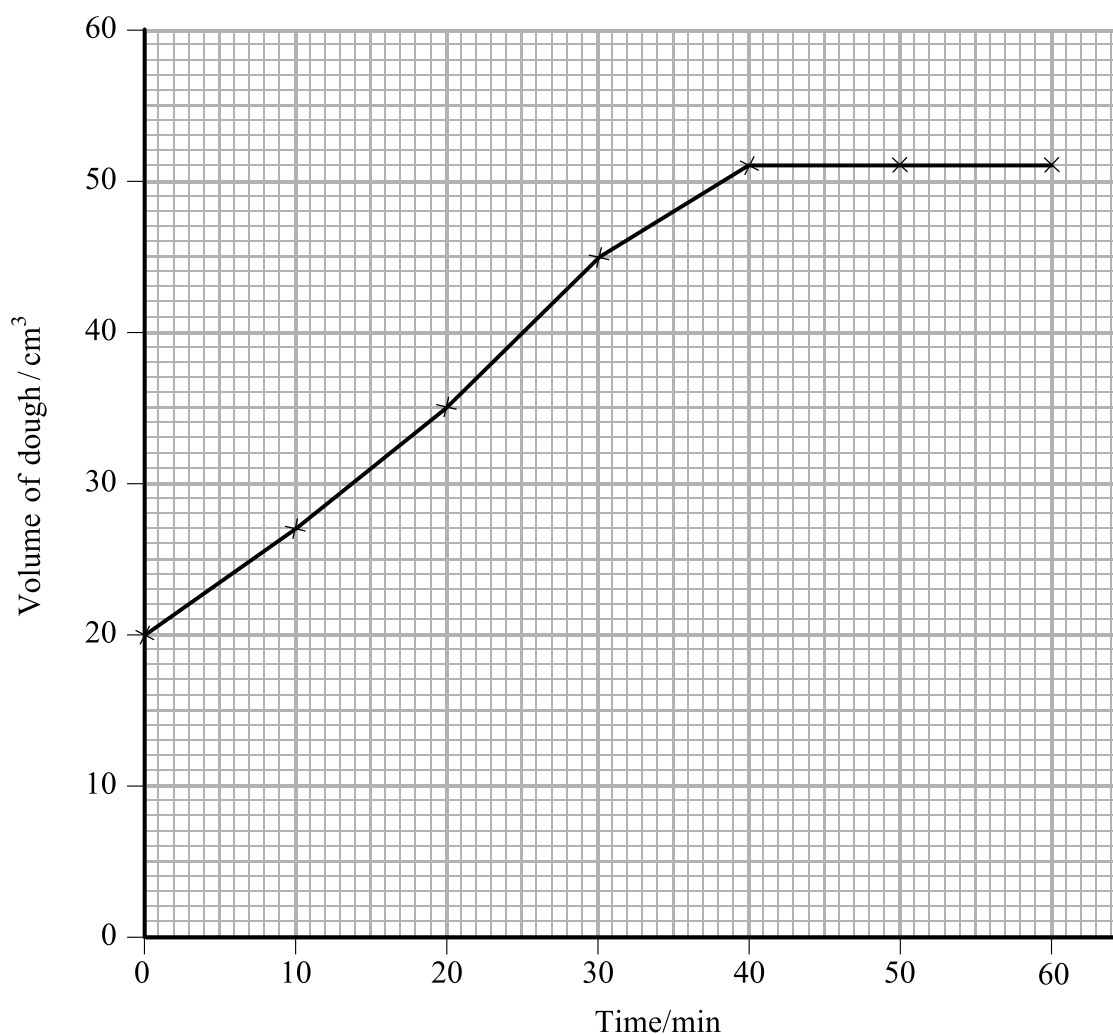
(3)

Q8

(Total 7 marks)

9. (a) Bread dough is made by mixing together wheat flour, water and yeast. An investigation was carried out into the effect of time on the volume of dough kept at a temperature of 20 °C.

The results are shown in the graph below.

Calculate the percentage increase in volume of the dough between 20 and 40 minutes. Show your working.

Answer ....%

(2)

(b) Describe and explain how the yeast in the dough mixture causes the dough to rise.

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(3)

(c) Suggest what effects the addition of the following to the dough mixture at the start of the investigation will have on the volume of dough after **thirty minutes**. Explain your answers.

(i) amylase

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(3)

(ii) ascorbic acid (vitamin C)

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(3) **Q9**

(Total 11 marks)

TOTAL FOR PAPER: 70 MARKS

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