OCR
RECOGNISING ACHIEVEMENT

ADVANCED GCE

BIOLOGY

F214

Communication, Homeostasis and Energy

Candidates answer on the question paper.

OCR supplied materials:
None

Other materials required:
- Electronic calculator
- Ruler (cm/mm)

Monday 24 January 2011
Afternoon

Duration: 1 hour

OCE/25763

F 2 1 4

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. If additional space is required, you should use the lined pages at the end of this booklet. The question number(s) must be clearly shown.
- Answer **all** the questions.
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **60**.
- Where you see this icon you will be awarded marks for the quality of written communication in your answer.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.
- This document consists of **16** pages. Any blank pages are indicated.

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Answer **all** the questions.

1 Organisms require energy in order to carry out essential metabolism. Organisms are able to release energy by carrying out both aerobic and anaerobic respiration.

(a) Complete the table to compare **anaerobic** respiration in mammals and yeast.

	mammal	yeast
name of hydrogen acceptor after glycolysis		
is CO_2 produced?		
name of final product		

[3]

(b) Suggest **one** benefit of anaerobic respiration to an organism.

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..... **[1]**

[Total: 4]

2 **(a)** Fig. 2.1 represents the end region of a neurone at a cholinergic synapse.

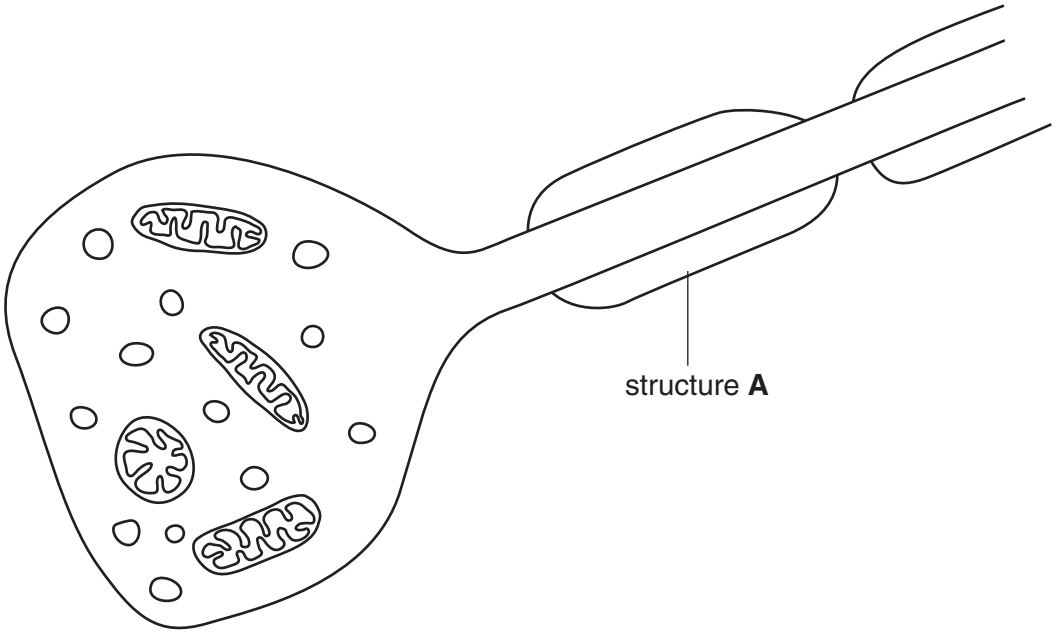

Fig. 2.1

(i) Describe the function of **structure A**.

In your answer, you should use the appropriate technical terms, spelt correctly.

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..... **[4]**

(ii) Name the process by which acetylcholine leaves the neurone shown in Fig. 2.1.

..... **[1]**

(iii) Name the process by which acetylcholine travels across the synaptic cleft.

..... **[1]**

(iv) A feature of synapses is that they allow transmission in only one direction.

State how this is achieved.

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..... **[1]**

(b) The chemical nature of synaptic transmission makes it susceptible to disruption by toxins.

(i) Atropine is a toxin produced by the deadly nightshade plant, *Atropa belladonna*.

Atropine is a similar shape to acetylcholine. The presence of atropine prevents the initiation of an action potential in the post-synaptic neurone.

Explain how the presence of atropine in the synapse will prevent the initiation of an action potential.

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..... **[3]**

(ii) Nerve gases have been used as chemical weapons. Some nerve gases act by inhibiting acetylcholinesterase, prolonging the effect of acetylcholine.

Suggest how atropine could act as an antidote to nerve gas.

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..... **[2]**

[Total: 12]

3 Fig. 3.1 represents some of the reactions that take place in a leaf cell of a flowering plant.

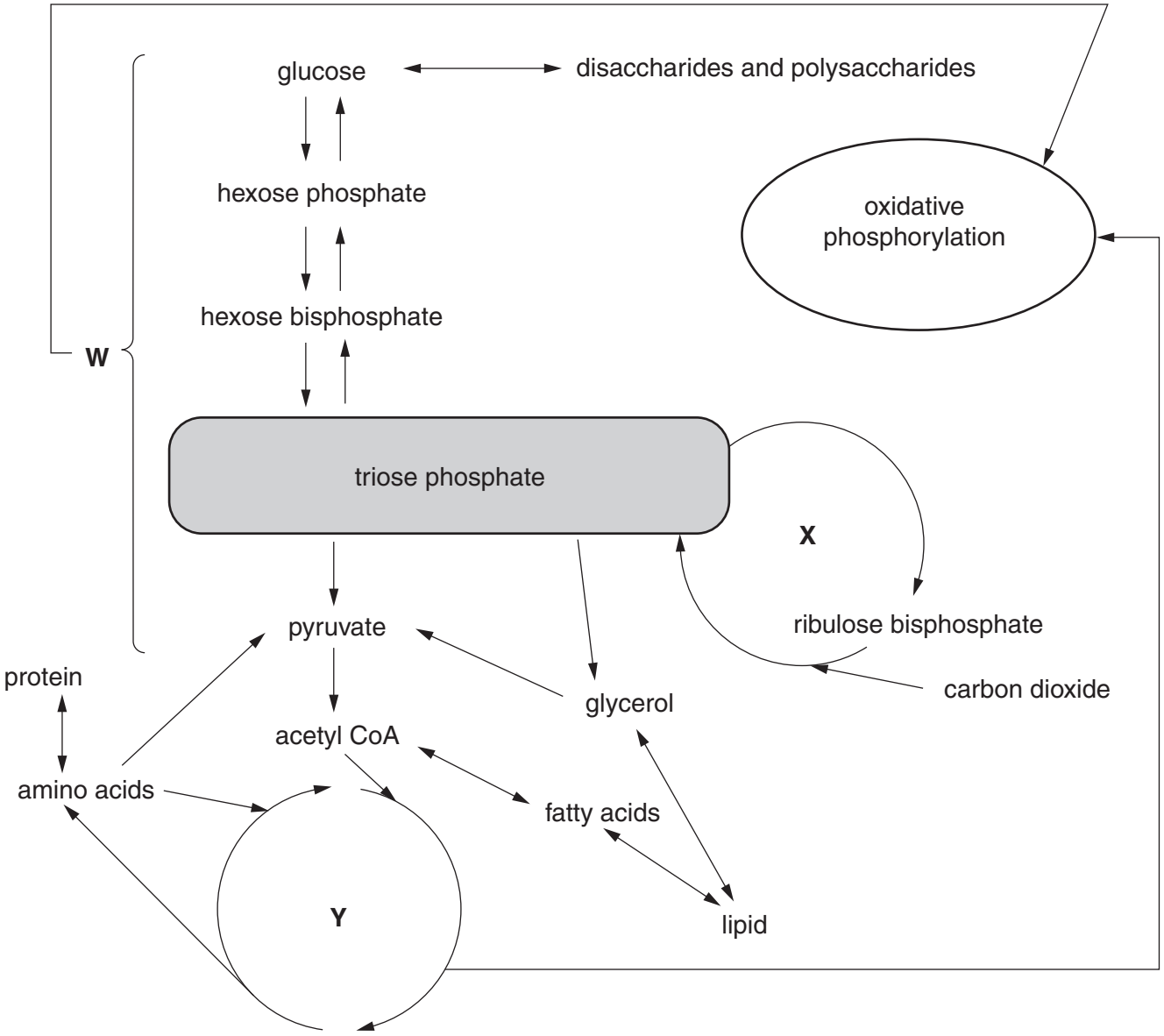

Fig. 3.1

(a) (i) Name the reaction pathways indicated by the letters **W**, **X** and **Y**.

W .....

X .....

Y ..... **[3]**

(ii) Triose phosphate is a compound that is central to the metabolism of this cell.

Explain how **the three** reaction pathways (**W**, **X** and **Y**) are able to work independently of each other in the same leaf cell.

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..... **[3]**

(iii) Identify which of **these three** reaction pathways (**W**, **X** and **Y**) are associated with:

photosynthesis .....

aerobic respiration..... **[2]**

(iv) Fig. 3.1 shows that compounds from two of the three pathways are used in oxidative phosphorylation.

State the products of oxidative phosphorylation.

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..... **[2]**

(b) Explain the role of coenzymes in this leaf cell, with respect to the metabolic reactions outlined in Fig. 3.1.

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..... **[3]**

[Total: 13]

4 Osmoregulation is a key feature of homeostasis and maintains the water potential of the blood within certain limits. This is achieved by the action of anti-diuretic hormone (ADH).

(a) Explain the likely effect on the blood cells if the water potential of the plasma was allowed to increase significantly.

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..... **[2]**

Fig. 4.1 is a simplified diagram of the structure of ADH.

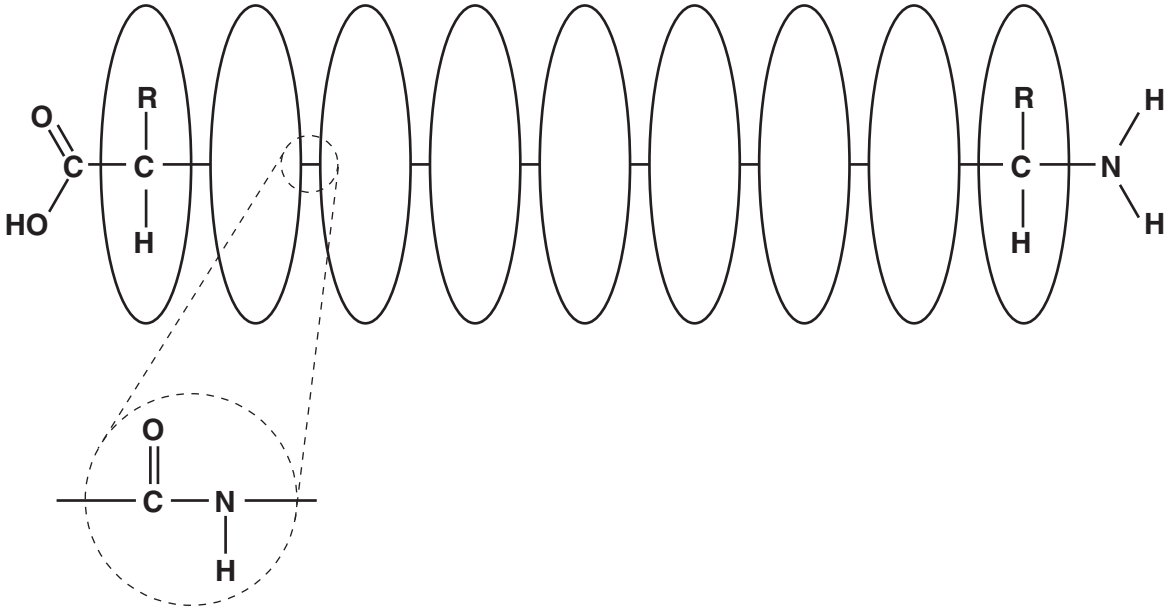

Fig. 4.1

(b) Name the type of monomer that makes up a molecule of ADH and the bond that joins the monomers together.

type of monomer.....

name of bond..... **[2]**

(c) Complete the following passage, using the **most suitable** term in each case:

ADH is a hormone that is produced by specialised nerve cells known as

..... cells. These cells detect changes in the water

potential of the blood flowing through the ..... . If the water

potential of the blood is too low then ADH is released.

ADH is not secreted immediately into the blood but passes along the

..... of the specialised nerve cells to the

.... gland, from where it is

released into the blood.

ADH acts on the cells of the ....

The ADH molecule attaches to receptors on the ..... of these

cells and causes protein channels known as ..... to insert

themselves into the membrane. Water passes through these channels by

..... and a smaller volume of more concentrated urine is produced.

[8]

(d) ADH does not stay in the blood indefinitely.

Suggest where ADH is removed from the blood **and** describe what then happens to the ADH molecule.

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..... **[3]**

[Total: 15]

5 **(a)** Fig. 5.1 represents the sequence of events that takes place when adrenaline reaches a liver cell.

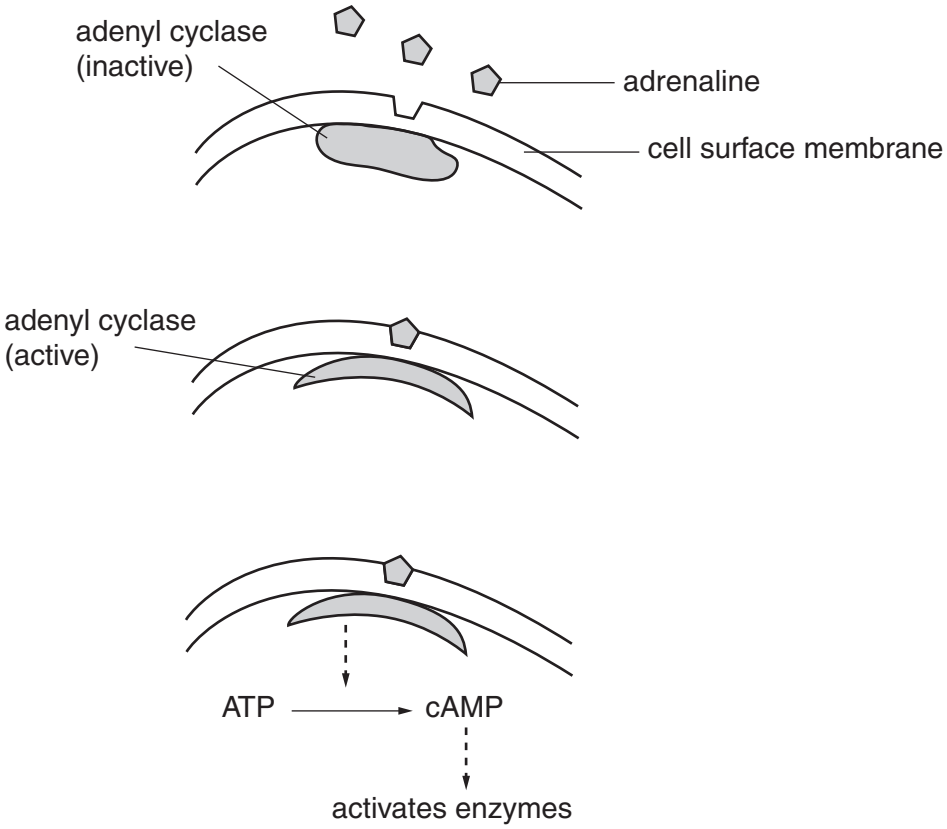

Fig. 5.1

(i) In terms of cell signalling, name the compound in Fig. 5.1 that is acting as:

the second messenger.....

the first messenger..... **[2]**

(ii) Suggest what happens to polysaccharides in the liver cell as a result of the events shown in Fig. 5.1.

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..... **[1]**

(iii) Adrenaline affects a range of target tissues in the body.

Suggest how the adrenaline molecule can cause different effects in different target tissues.

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..... **[2]**

(b) Outline the **hormonal** and **nervous** mechanisms involved in the control of heart rate.

In your answer, you should use the appropriate technical terms, spelt correctly.

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..... **[5]**

[Total: 10]

6 The leaves of flowering plants have the ability to develop differently, depending on environmental conditions such as the amount of sun or shade a leaf receives.

A student carried out an investigation into sun and shade leaves from different parts of the same plant. Her observations and results are shown in Table 6.1.

Table 6.1

type of leaf	number of leaves studied	mean no. of stomata per mm^2 on lower surface	mean thickness of leaf (μm)	cuticle
sun	55	170	208	thick
shade	8	92	93	thin

(a) Calculate the percentage difference in the **mean thickness** of the sun leaves compared to the shade leaves.

Show your working.

Answer = ... **[2]**

(b) Suggest **and** explain one benefit of the greater **mean number** of stomata per mm^2 on the lower surfaces of the sun leaves.

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..... **[2]**

(c) Describe **two** ways in which the student could improve her investigation.

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..... **[2]**

[Total: 6]

END OF QUESTION PAPER

ADDITIONAL PAGES

If additional space is required, you should use the lined pages below. The question number(s) must be clearly shown.

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