Candidate forename		Candidate surname	

Centre number						Candidate number				

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

ADVANCED GCE

F214

BIOLOGY

Communication, Homeostasis and Energy

MONDAY 24 JANUARY 2011: Afternoon
DURATION: 1 hour

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

Candidates answer on the question paper.

OCR SUPPLIED MATERIALS:

None

OTHER MATERIALS REQUIRED:

Electronic calculator
Ruler (cm/mm)

READ INSTRUCTIONS OVERLEAF

DC (CW/SW) 11MEP01264 41435/1

INSTRUCTIONS TO CANDIDATES

- **Write your name, centre number and candidate number in the boxes on the first page. 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.**

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.**

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.

_____

_____ **[1]**

[Total: 4]

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

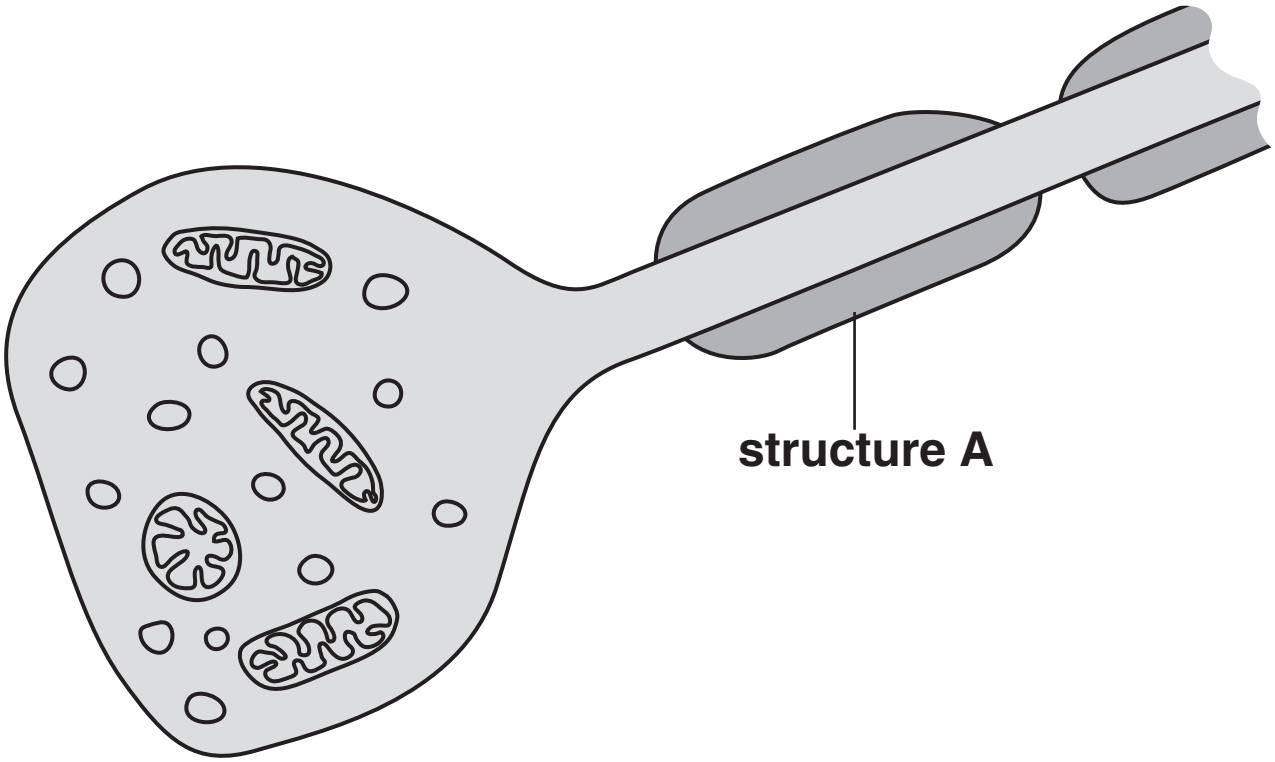

Fig. 2.1

(i) Describe the function of STRUCTURE A.

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

_____

_____

_____

_____

_____

_____

_____

_____

_____ [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.

_____

_____

_____ [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.

_____

_____

_____

_____

_____

_____

_____ **[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.

_____

_____

_____

_____

_____ **[2]**

[Total: 12]

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

(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.

_____

_____

_____

_____

_____

_____

_____

_____ **[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.

_____

_____ **[2]**

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

_____

_____

_____

_____

_____

_____

_____

_____ **[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.

_____

_____

_____

_____

_____ **[2]**

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

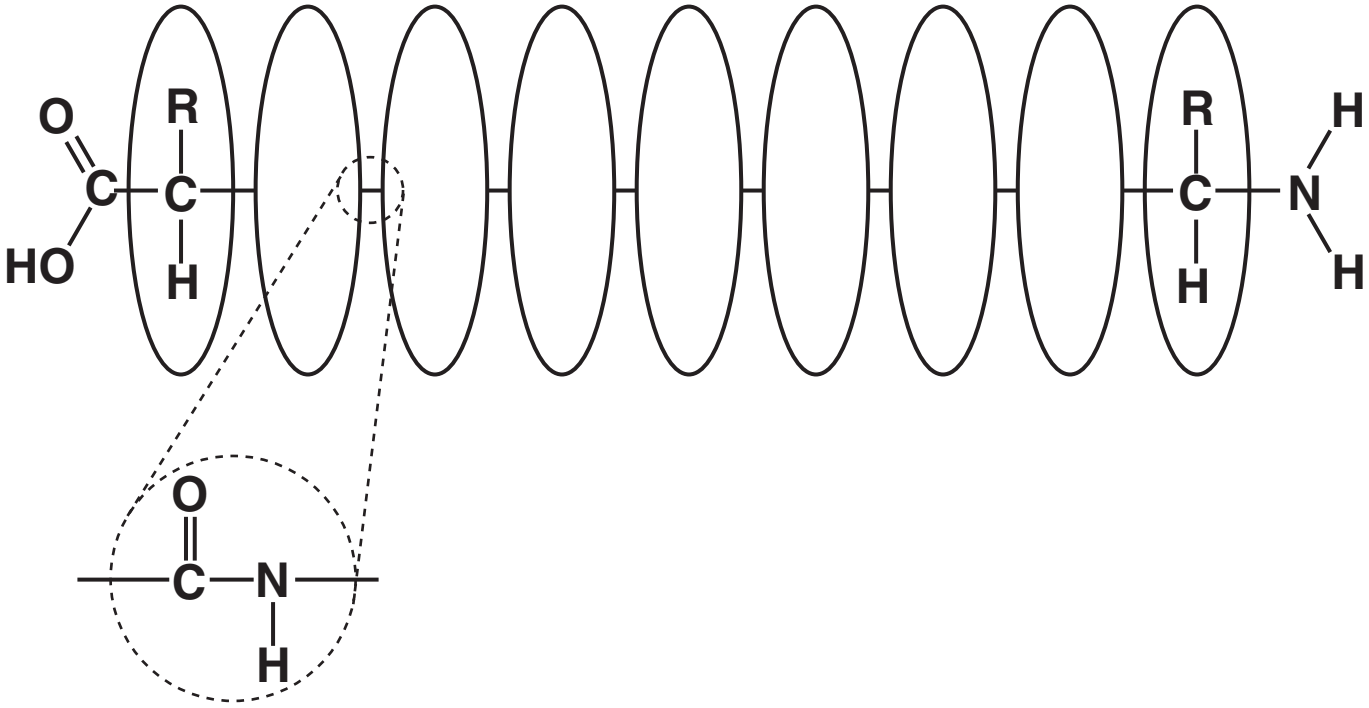

Fig. 4.1

(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.

_____

_____

_____

_____

_____

_____

_____

_____ **[3]**

[Total: 15]

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

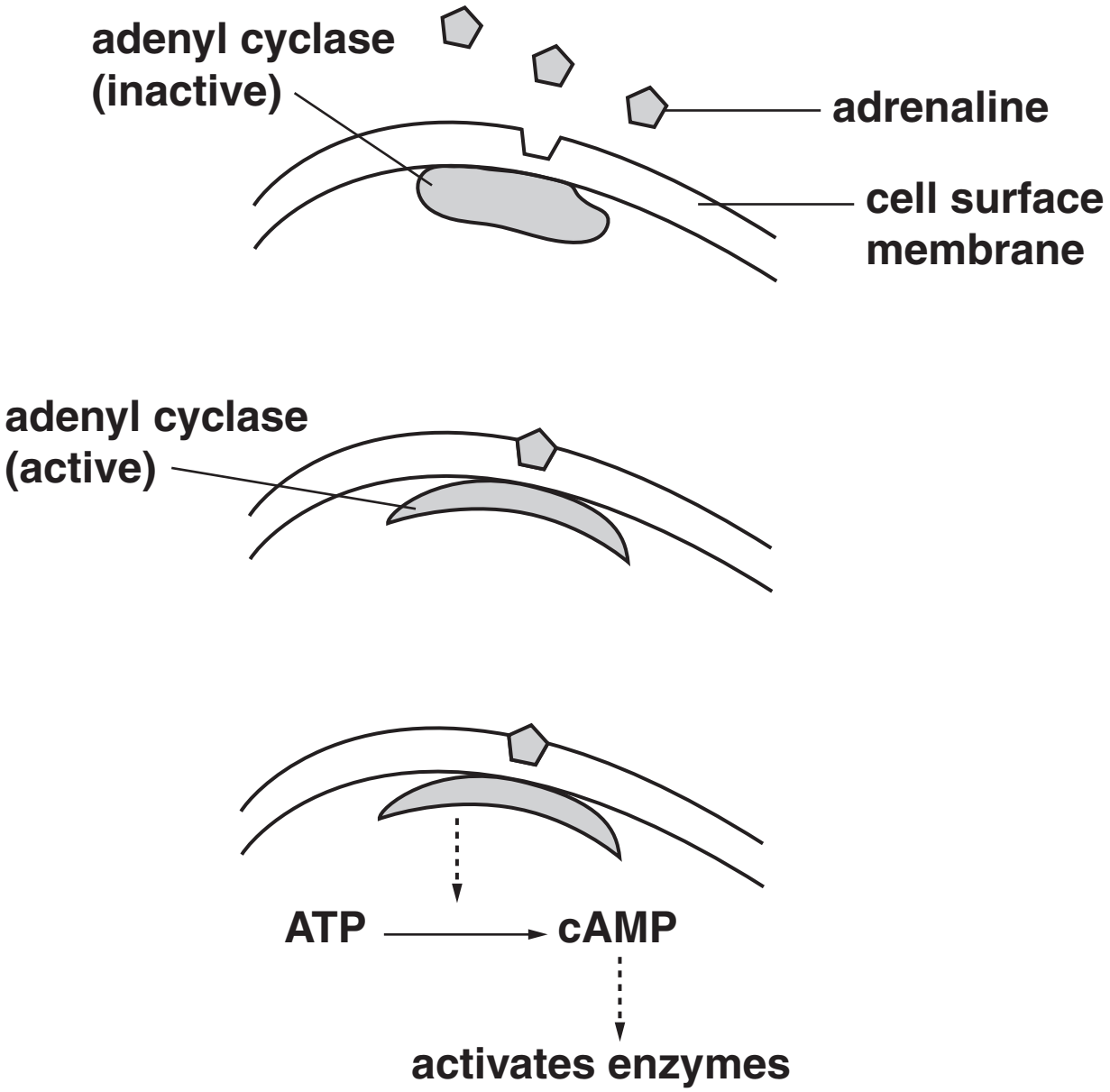

Fig. 5.1

(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.

_____

_____

_____ **[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.

_____

_____

_____

_____

_____

_____ **[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.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ **[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.

_____

_____

_____

_____

_____ **[2]**

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

_____

_____

_____

_____

_____ **[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.