OCR
RECOGNISING ACHIEVEMENT

Friday 22 June 2012 – Morning

A2 GCE BIOLOGY

F214 Communication, Homeostasis and Energy

F21040061 1

Candidates answer on the Question Paper.

OCR supplied materials:
None

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

Duration: 1 hour 15 minutes

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. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- 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.
- 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 **(a)** The cells of the body need to communicate with one another.

State the name given to this process of communication.

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

(b) Fig. 1.1 is an electron micrograph of the junction between two neurones.

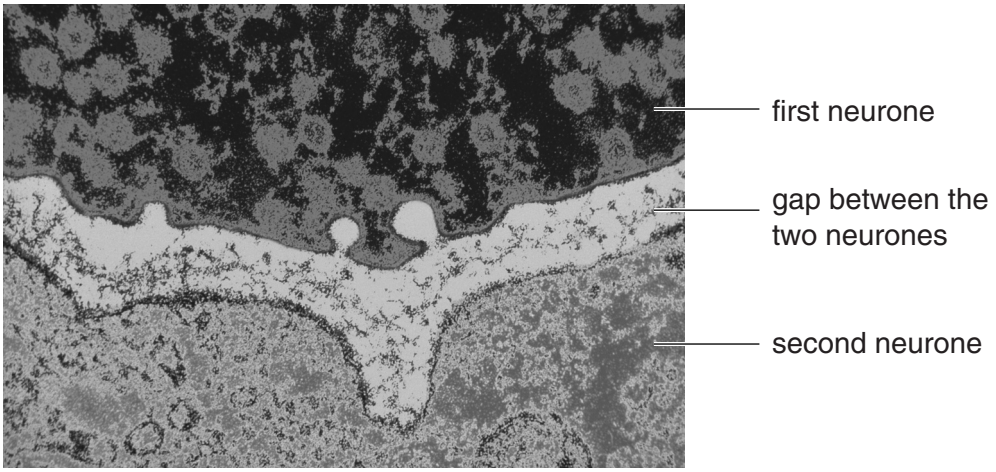

Fig. 1.1

(i) State the name given to the gap between the two neurones at this junction.

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

(ii) Outline how the first neurone communicates with the second neurone across the gap.

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

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

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(iii) Outline the importance of the junctions between neurones in the functioning of the nervous system.

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

The nervous system and the hormonal system are involved in the maintenance of core body temperature.

(c) Give the **most suitable** word or term that has the same meaning as each of the following descriptions:

(i) animals that are able to regulate and maintain their core body temperature within narrow limits;

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

(ii) the increase in the diameter of the lumen of an arteriole to allow more blood to flow through.

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

(d) (i) Name a hormone that increases the metabolic rate and so generates heat.

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

(ii) Name the part of the brain where the thermoregulatory centre is located.

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

[Total: 12]

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2 The kidney is composed of many nephrons.

Fig. 2.1 is a diagrammatic representation of a nephron. The numbers represent the relative concentrations of solutes in the tubule and the tissue fluid surrounding the tubule.

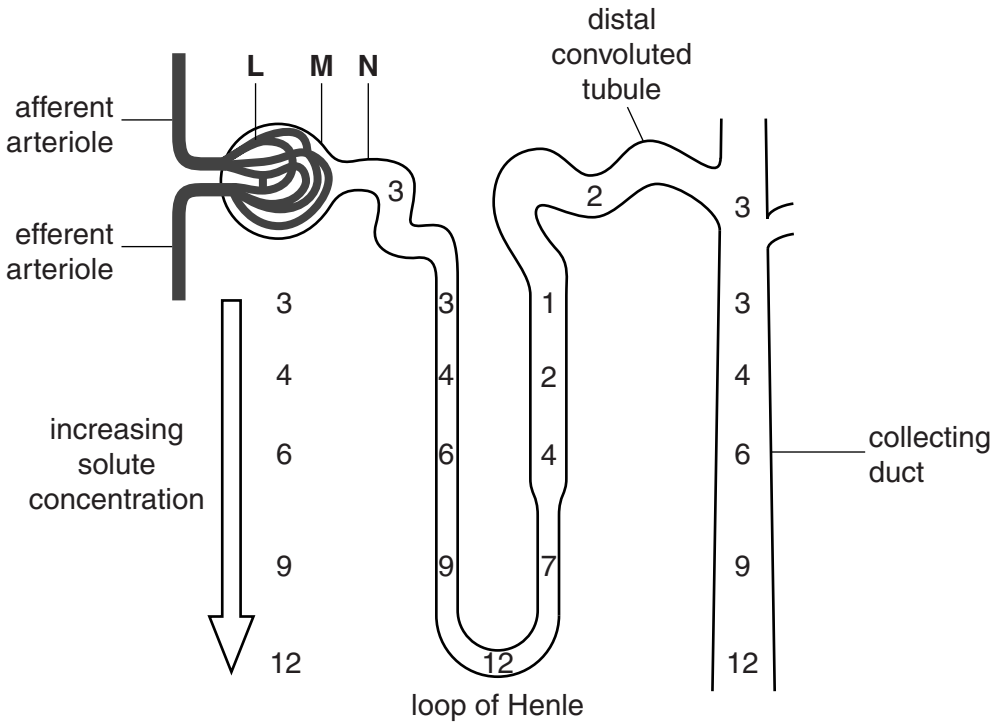

Fig. 2.1

(a) **Name** the parts of the nephron labelled **L**, **M** and **N**.

L .....

M .....

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

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(b) Which part(s) of the nephron corresponds to each of the statements in the table below?

statement	part(s) of the nephron
walls are impermeable to water	
glucose is reabsorbed into the blood	
ADH acts on the walls	
contains podocytes	
most of the water is reabsorbed into the blood	

[5]

(c) With reference to Fig. 2.1, explain the role of the loop of Henle in the production of urine.

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

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

[Total: 13]

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3 The compound 2,3,5-triphenyl-tetrazolium chloride (TTC) is an electron acceptor. TTC will diffuse into actively respiring cells and accept electrons from the electron transport chain.

When TTC accepts electrons and becomes reduced, it changes from colourless to pink. The tissues in which this reaction takes place will be stained a pink colour.

(a) State the **precise** location of the electron transport chain in the cell.

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

(b) A student carried out an investigation into the respiratory activity of plant tissue. She used three groups of germinating broad bean seeds. These were first treated as shown in Table 3.1.

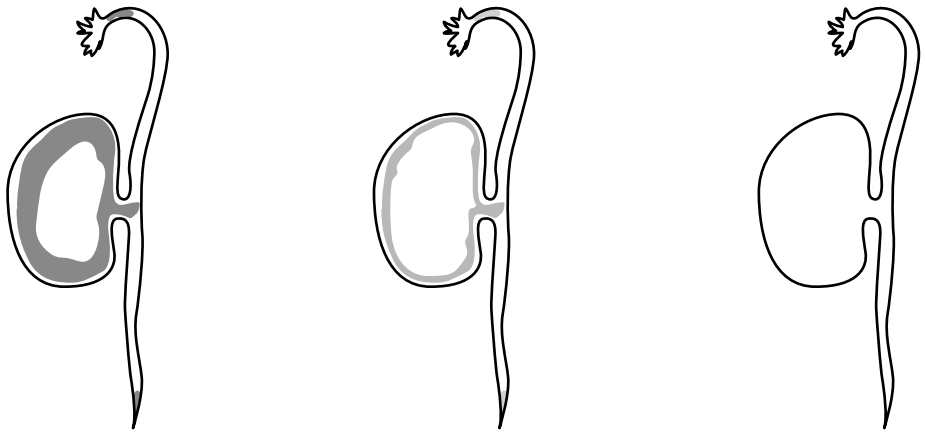
Table 3.1

seed	treatment
group **A**	kept at 22 °C for 24 hours before the investigation
group **B**	kept at 6 °C for 24 hours before the investigation
group **C**	kept at 22 °C for 24 hours and then placed in water at 90 °C for 5 minutes before the investigation

The groups of seeds were then sliced longitudinally and placed, cut surface down, in a shallow dish containing a small volume of TTC solution. The cut surfaces remained in contact with the solution for 10 minutes.

The seeds were then removed from the dish. The excess TTC solution was wiped off and the cut surfaces of the seeds in each group were observed.

The appearance of the seeds in each group is shown in Fig. 3.1. The shaded areas are the regions where the tissues have stained a pink colour.



seeds in group A **seeds in group B** **seeds in group C**

Fig. 3.1

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(i) Describe the differences observed in the seeds in groups **A**, **B** and **C**.

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.....

.....

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

(ii) Suggest reasons for the results observed in the seeds in group **A**.

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

(iii) Suggest reasons for the difference in the amount of staining observed in the seeds in groups **B** and **C** when compared to those in group **A**.

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

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(c) If oxygen is not present or is in short supply, respiration can take an anaerobic pathway **after glycolysis**. In plant cells, this pathway is the same as the one used in yeast cells.

(i) Name the hydrogen acceptor in this pathway.

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

(ii) Name the intermediate compound in this pathway.

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

(iii) Name the products of this pathway.

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

(iv) Explain why this pathway is important for the plant cell.

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

[Total: 11]

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QUESTION 4 STARTS ON PAGE 10

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4 One way to determine the rate of photosynthesis is to measure the uptake of carbon dioxide.

(a) Discuss why measuring carbon dioxide uptake may or may not give a better indication of photosynthetic activity than measuring oxygen production.

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

(b) Fig. 4.1 shows the relationship between light intensity and the relative carbon dioxide uptake and production in a plant.

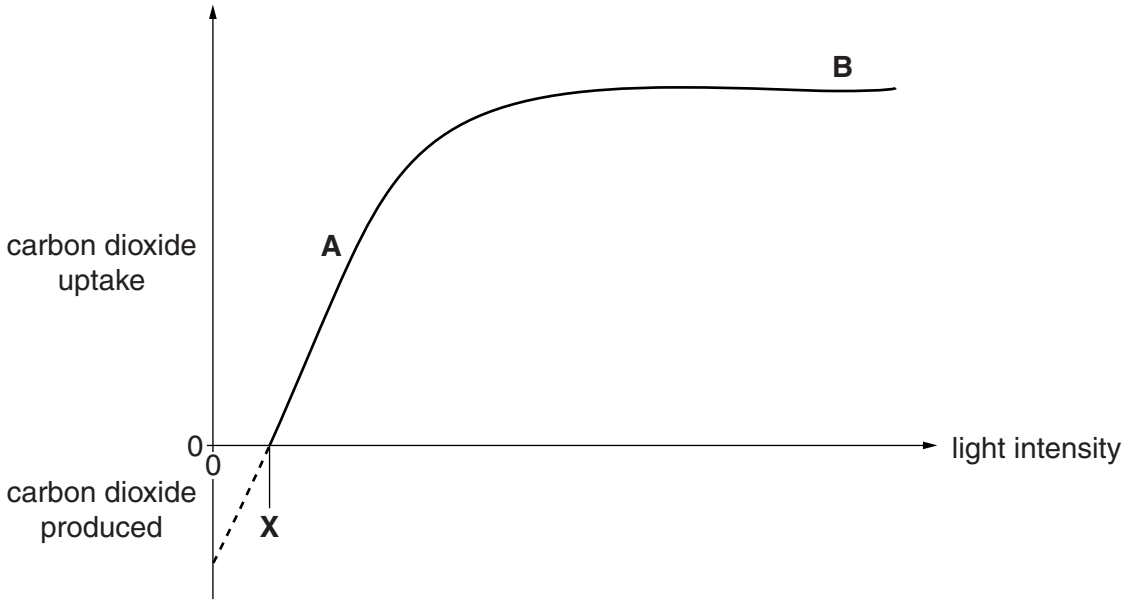

Fig. 4.1

(i) State the factor that is limiting the rate of photosynthesis at **A** on the graph.

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

(ii) Suggest **one** factor that may limit the rate of photosynthesis at **B**.

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

(iii) Carbon dioxide is given off by the plant when the light intensity is lower than **X**.

Name the process that **produces** carbon dioxide in the plant.

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

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(iv) With reference to Fig. 4.1, explain the biochemical processes that are occurring in the plant:

- as light intensity increases from 0 (zero) to **X**.
- at light intensity **X**.
- at light intensities greater than **X**.

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

(c) (i) Name the products of the light-dependent stage of photosynthesis.

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

(ii) Paraquat is a weedkiller. It binds with electrons in photosystem I.

Suggest how paraquat results in the death of a plant.

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

[Total: 13]

QUESTION 5 STARTS ON PAGE 12

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5 The regulation of blood glucose concentration is important for homeostasis and involves hormonal control.

(a) **(i)** Name the endocrine tissue in the pancreas that is responsible for secretion of hormones.

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

(ii) Identify the **specific** cell type in pancreatic tissue that secretes the hormone insulin.

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

(b) The incomplete flowchart below outlines the way in which the secretion of insulin from a pancreatic cell is controlled.

Complete the flowchart by inserting the most appropriate word(s) in the spaces provided.

Insulin secretion is stimulated when the blood glucose concentration

.....

↓

Glucose enters the pancreatic cell through channel proteins. The glucose enters the..... pathway and ATP is produced.

↓

The increase in ATP causes ATP-controlled potassium ion channels to close and the cell membrane becomes .....

↓

This results in the opening of voltage-gated ..... ion channels and the concentration of this ion inside the cell increases.

↓

The increased concentration of these ions causes the secretion of insulin from the cell by the process of .....

[5]

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(c) (i) Insulin is a polypeptide molecule.

State where in a pancreatic **cell** insulin molecules are synthesised.

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

(ii) Outline the events that occur after the synthesis of an insulin molecule until it is ready to be secreted from the pancreatic cell.

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

[Total: 11]

END OF QUESTION PAPER

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ADDITIONAL PAGE

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

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