OCR
RECOGNISING ACHIEVEMENT

Wednesday 25 January 2012 – Morning

A2 GCE BIOLOGY

F214 Communication, Homeostasis and Energy

F21O4O111

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 **20** pages. Any blank pages are indicated.

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Answer **all** the questions.

1 **(a)** The control of blood glucose is a very important aspect of homeostasis.

(i) Explain what is meant by the term *homeostasis*.

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

(ii) Describe how negative feedback is used to control blood glucose concentration.



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

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..... **[6]**

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(b) A 55 year old man visited the doctor and was newly diagnosed with diabetes.

- The doctor initially recommended to the man that he should change his diet to cut out excess carbohydrate, including sugars such as glucose and make a further appointment to check on his progress.
- At this second appointment, however, it was discovered that the dietary changes had not been effective, which was unexpected.
- It turned out that the man had a form of diabetes that required daily hormone injections to control his blood sugar concentration.

Using **only the information given above**, state how **this** man's form of diabetes is **similar** to:

(i) Type 1 diabetes

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

(ii) Type 2 diabetes.

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

[Total: 10]

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2 Urine is a liquid that is composed of a number of different substances.

(a) Urea is one compound that is excreted from the mammalian body in urine.

(i) Name the organ that **produces** urea.

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

(ii) It has been observed that the urea content of urine is relatively high when a person eats an excessive amount of protein in their diet.

Suggest why a high intake of protein in the diet will be likely to result in a high concentration of urea in urine.

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

(b) Suggest what condition is indicated by the presence of glucose in a person's urine.

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

(c) **(i)** Pregnancy may be detected by testing a woman's urine.

State the substance that is being tested for in urine when a pregnancy test is carried out.

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

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(ii) Ovulation is the release of an egg cell from the ovary. In order for pregnancy to occur, the egg cell must be fertilised within 24 hours of its release from the ovary.

Immediately before ovulation, the body produces a large amount of luteinising hormone (LH). This is known as the LH surge and triggers ovulation. It is during this time that fertilisation is most likely to occur.

- If a woman is trying to get pregnant, it can be useful to know when ovulation has occurred.
- It is possible to identify the LH surge by using a test stick to detect LH in urine.
- The test stick for LH works in a similar way to the test stick used for detecting pregnancy.

Fig. 2.1 shows the features of a test stick that can be used to test for LH in urine.

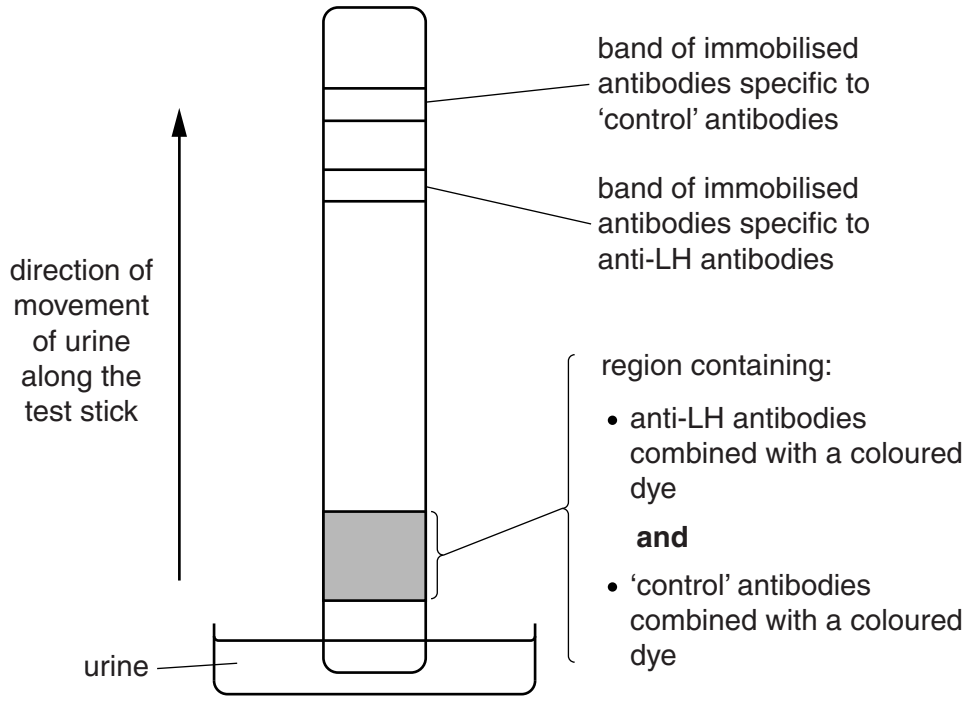


Fig. 2.1

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Using your knowledge of how a test stick works, suggest how the test stick in Fig. 2.1 can be used to indicate a positive result for LH in urine.

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

[Total: 9]

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3 **(a)** Fig. 3.1 is an electron micrograph of a chloroplast from a tobacco leaf.

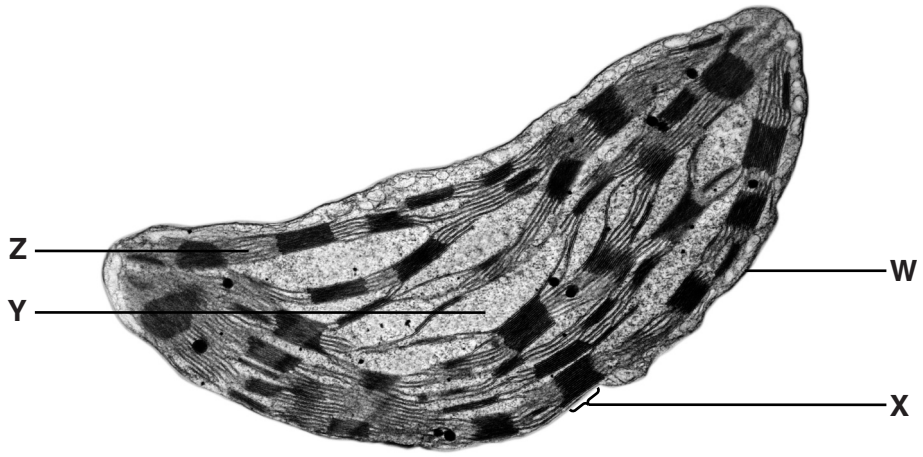


Fig. 3.1

(i) Identify the structures labelled **W** to **Z**.

W .....

X .....

Y .....

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

(ii) In addition to the structures seen in Fig. 3.1, a chloroplast also contains DNA and ribosomes.

Suggest the role of DNA and ribosomes **in this organelle**.

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

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(b) The table below contains statements that refer to the light-dependent stage of photosynthesis.

Complete the table, indicating with the letters **C**, **N** or **B**, whether each statement applies to:

- cyclic photophosphorylation only (**C**)

  or

- non-cyclic photophosphorylation only (**N**)

  or

- both cyclic and non-cyclic photophosphorylation (**B**)

The first one has been completed for you.

statement	letter
ATP is produced	**B**
an electron leaves photosystem I	
electrons are passed along an electron carrier chain	
electrons leave both photosystem I and photosystem II	
an electron from a water molecule replaces the electron lost from the photosystem	
the same electron returns to the photosystem	

[5]

[Total: 11]

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4 One way of calculating the rate of respiration is to measure the volume of oxygen taken up over a period of time.

A student carried out an experiment to investigate the effect of temperature on the rate of respiration in soaked (germinating) pea seeds and dry (dormant) pea seeds.

A simple piece of apparatus called a respirometer was used, as shown in Fig. 4.1.

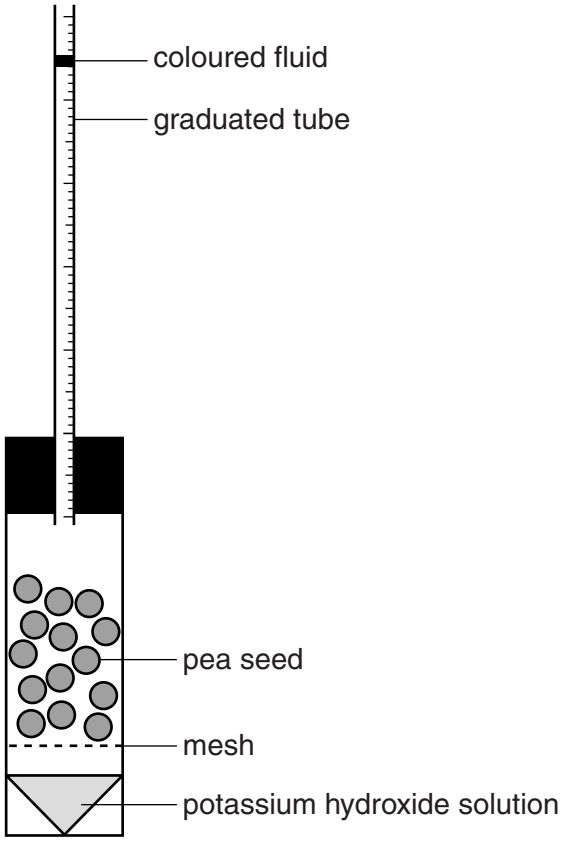


Fig. 4.1

The potassium hydroxide solution in this apparatus absorbs carbon dioxide. If the apparatus is kept at a constant temperature, any changes in the volume of air in the respirometer will be due to oxygen uptake.

(a) State the stage or stages of aerobic respiration during which:

(i) carbon dioxide is produced

.....

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

(ii) oxygen is used.

.....

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

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(b) The student set up three respirometers, **A**, **B** and **C**, in water baths at two different temperatures. The respirometers were left for 10 minutes in order to equilibrate.

The contents of each respirometer are shown in Table 4.1.

Table 4.1

temperature (°C)	respirometer	contents
15	**A**	30 soaked pea seeds
	B	glass beads + 30 dry pea seeds
	C	glass beads
25	**A**	30 soaked pea seeds
	B	glass beads + 30 dry pea seeds
	C	glass beads

At each temperature, respirometer **C,** which contained only glass beads, was a control.

Respirometer **B**, at each temperature, also contained some glass beads.

(i) Suggest why, at each temperature, respirometer **B** contained **some** glass beads.

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

(ii) Suggest how the student determined the quantity of glass beads to place in respirometer **B** at each temperature.

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

QUESTION 4(c) STARTS ON PAGE 12

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(c) After the student had left each respirometer to equilibrate, a small volume of coloured fluid was introduced into each graduated tube.

The respirometers were then left in the appropriate water baths for 20 minutes and maintained at the correct temperature. During this time, the coloured fluid in the graduated tube moved.

The level of the coloured fluid in each respirometer was recorded at the start of the experiment and after 20 minutes.

The results are summarised in Table 4.2.

Table 4.2

temperature (°C)	respirometer	reading at start (cm^3)	reading after 20 minutes (cm^3)	difference (cm^3)	corrected difference (cm^3)	rate of oxygen uptake ($cm^3\,min^{-1}$)
15	**A**	0.93	0.74	0.19	0.16	0.008
	B	0.93	0.86	0.07	0.04	0.002
	C	0.91	0.88	0.03		
25	**A**	0.94	0.63	0.31	0.27	
	B	0.93	0.84	0.09	0.05	0.003
	C	0.95	0.91	0.04		

(i) Table 4.2 is incomplete.

Calculate the missing value for the rate of oxygen uptake for soaked pea seeds (**A**) at **25 °C**.

Show your working.

Answer = ... $cm^3\,min^{-1}$ **[2]**

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(ii) Explain why there is an increased rate of respiration in soaked seeds at 25 °C compared with soaked seeds at 15 °C.

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

(iii) Suggest a reason for the difference in the rate of respiration between soaked and dry pea seeds.

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

[Total: 12]

QUESTION 5 STARTS ON PAGE 14

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5 Fig. 5.1 is a photomicrograph of a horizontal section through the cortex of a mammalian kidney.

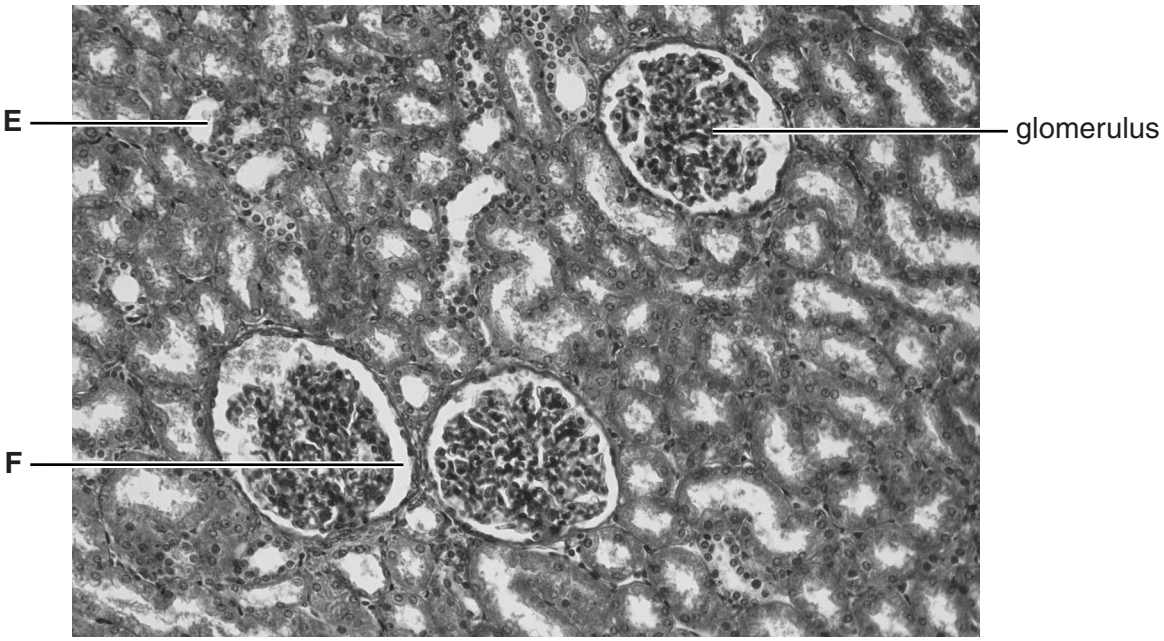


Fig. 5.1

(a) Identify the structures labelled **E** and **F** in Fig. 5.1.

E .....

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

(b) **(i)** Explain how the glomerulus is able to perform its function.

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

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

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(ii) **Name** the specialised cells present in structure **F** that assist in the function you described in **(b)(i)**.

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

(c) Kidney failure has serious consequences for the individual.

(i) Suggest the effects of complete kidney failure on the **composition of the blood**.

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

(ii) One way of treating a person with kidney failure is by giving them a kidney transplant.

Explain the need for close matching of the donated kidney to the recipient.

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

[Total: 11]

QUESTION 6 STARTS ON PAGE 16

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6 In order to survive, animals need to be able to respond to changes in the internal and external environment.

(a) Complete the following passage by using the most appropriate word(s) or term(s).

Specialised cells that are able to detect stimuli can be found both within and at the surface of an animal's body. These specialised cells can be found singly or in groups and are known as sensory ..... .

Each cell is specialised to respond to a particular type of stimulus. Some specialised cells in the retina of the eye respond to the ..... and wavelength of light. Groups of specialised cells in the nose and on the tongue detect ..... stimuli and this results in the ability to smell and taste.

When specialised cells receive an appropriate stimulus which is above the threshold ..... , the cells are able to convert this energy into a nerve ..... . **[5]**

(b) Following the detection of a stimulus, sensory and motor neurones co-ordinate the body's response to this stimulus.

State **one** way in which:

(i) the **structure** of a motor neurone differs from that of a sensory neurone

.....

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

(ii) the **function** of a motor neurone differs from that of a sensory neurone.

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

[Total: 7]

END OF QUESTION PAPER

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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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