OCR

Wednesday 21 May 2014 – Morning

AS GCE BIOLOGY

F211/01 Cells, Exchange and Transport

Candidates answer on the Question Paper.

OCR supplied materials:
None

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

Duration: 1 hour

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 page 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 Plant and animal cells have different structural features.

(a) (i) Name **two** features of plant cells that are not features of animal cells.

1 .....

2 .....

[2]

(ii) Name **one** structure present in animal cells that is not present in plant cells.

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

(iii) The cytoskeleton in cells consists of microtubules and microfilaments.

Describe the roles of the cytoskeleton.

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

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(b) The pancreas is an organ that secretes protease enzymes.

Outline how the organelles in pancreatic cells work together to produce and release these protein molecules from the cells.

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

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

[Total: 11]

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2 Many teachers use models to demonstrate and explain breathing and lung function in mammals.

Fig. 2.1 is a model of the mammalian chest.

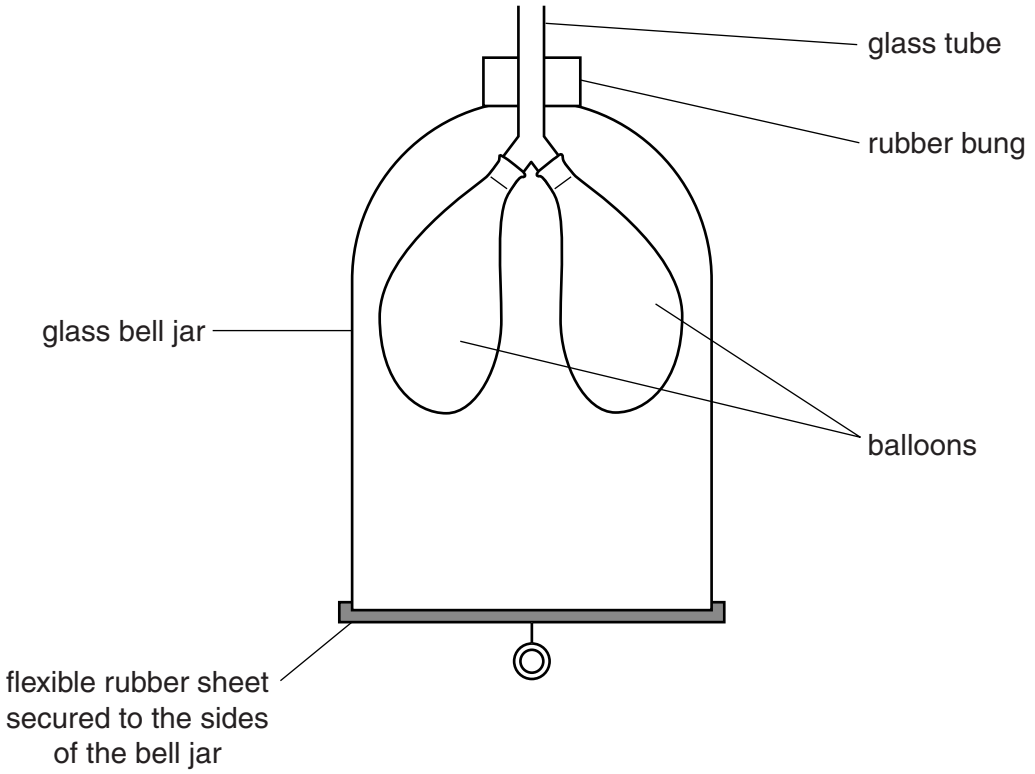

Fig. 2.1

(a) When the rubber sheet is pulled down the balloons expand.

Explain why the balloons expand.

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

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(b) A teacher used the model in Fig. 2.1 to demonstrate the difference between tidal volume and vital capacity.

(i) Explain the meaning of the term *tidal volume*.

.....

.....

.....

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

(ii) Suggest how the teacher may have used the model to demonstrate tidal volume.

.....

.....

.....

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

(iii) Explain the meaning of the term *vital capacity*.

.....

.....

.....

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

(iv) Suggest how the teacher may have used the model to demonstrate vital capacity.

.....

.....

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

[Total: 10]

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3 **(a)** Blood contains erythrocytes and neutrophils.

Tissue fluid may contain neutrophils but does not contain erythrocytes.

Tissue fluid is formed from plasma by pressure filtration through the capillary walls.

All materials exchanged between the blood and cells pass through the capillary wall.

Explain why tissue fluid does not contain erythrocytes.

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

(b) Erythrocytes are full of haemoglobin.

Describe the role of haemoglobin in transporting oxygen around the body.

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

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(c) Most carbon dioxide is transported as hydrogencarbonate ions in the plasma.

Hydrogencarbonate ions are produced in the erythrocytes and diffuse into the plasma.

(i) Describe how the hydrogencarbonate ions are **produced** in the erythrocytes.

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

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

(ii) High concentrations of carbon dioxide in the blood reduce the amount of oxygen transported by haemoglobin.

Name this effect and explain why it occurs.

name .....

explanation .....

.....

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[3]

[Total: 12]

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4 Plants transport water and assimilates through specialised tissues.

(a) Fig. 4.1 shows a tissue plan of a vertical section through part of a leaf.

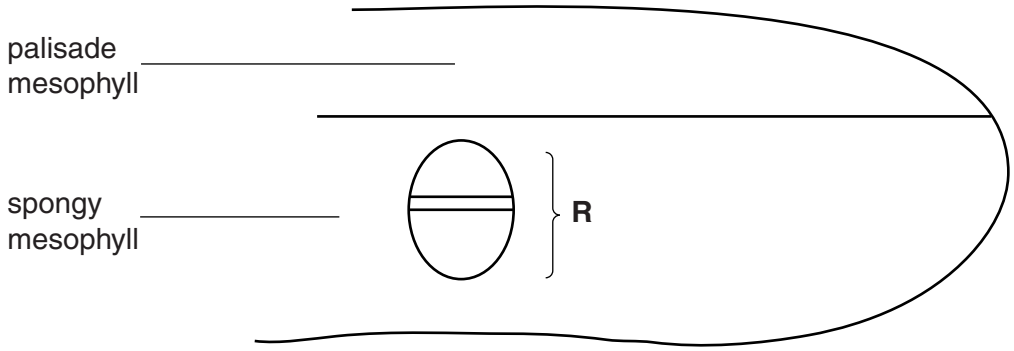

Fig. 4.1

(i) **On Fig. 4.1**, identify with a letter **X** the position of the xylem **and** identify with a letter **P** the position of the phloem.

The answer to this question should be drawn on Fig. 4.1. **[1]**

(ii) Name structure **R**.

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

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(b) The majority of cells in phloem tissue are either companion cells or sieve tube elements.

A scientist isolated companion cells and conducted some experiments to investigate the mechanism involved in loading sucrose into the sieve tubes.

He recorded the following observations:

observation 1 isolated companion cells became slightly negatively charged compared with their surroundings

observation 2 companion cells could decrease the pH of the surrounding solution from 7.0 to 5.6

observation 3 the pH inside the companion cells rose from 7.0 to 8.2

observation 4 treatment with cyanide (which stops aerobic respiration) prevents the change in pH occurring

From **observation 1**, the scientist concluded that the mechanism involved a transfer of charged particles (ions) between the companion cells and their surroundings.

(i) What conclusions can be drawn from **observations 2 and 3** about the mechanism?

.....

.....

.....

.....

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

(ii) What conclusions can be drawn from **observation 4** about the mechanism?

.....

.....

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

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(c) The scientist drew a diagram to explain the mechanism used to load sucrose into the sieve tube elements.

His diagram is shown in Fig. 4.2.

A
charged particles are removed from the companion cells

B
co-transport of charged particles and sucrose into the companion cells

C
sucrose moves into the sieve tube elements

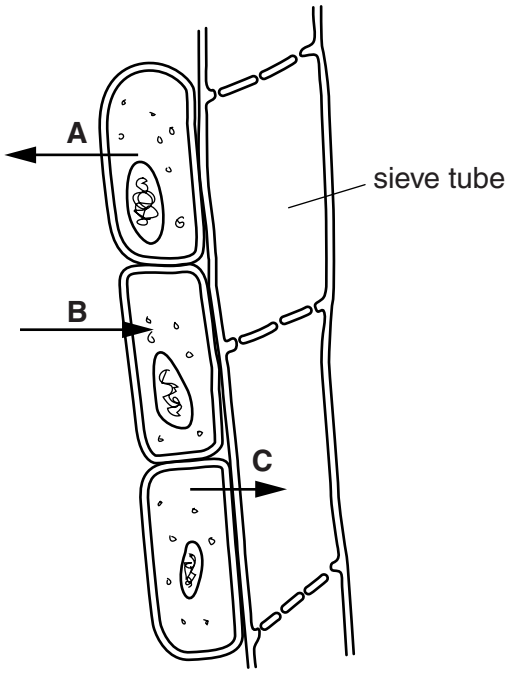

Fig. 4.2

(i) The following paragraph is an extract from the scientist's work.

Complete the paragraph.

At step **A**, charged particles are moved out of the companion cells by the process of ..... . This creates a ..... gradient between the companion cell and its surroundings. At step **B**, the charged particles and assimilates are co-transported by ..... diffusion into the companion cells. The assimilates build up in the companion cells and move by ..... into the sieve tube elements at step **C**. Assimilates, such as sucrose and ..... , can be loaded in this way. **[5]**

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(ii) The structure of cells is usually adapted to carry out their functions.

The scientist used an electron microscope to look for further evidence to support the mechanism involved in loading sucrose into the sieve tubes.

Suggest what evidence the scientist might expect to see in companion cells, using an electron microscope.

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

[Total: 12]

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5 A group of microorganisms called slime moulds includes the species *Dictyostelium discoideum*.

The life cycle of *D. discoideum* is shown in Fig. 5.1.

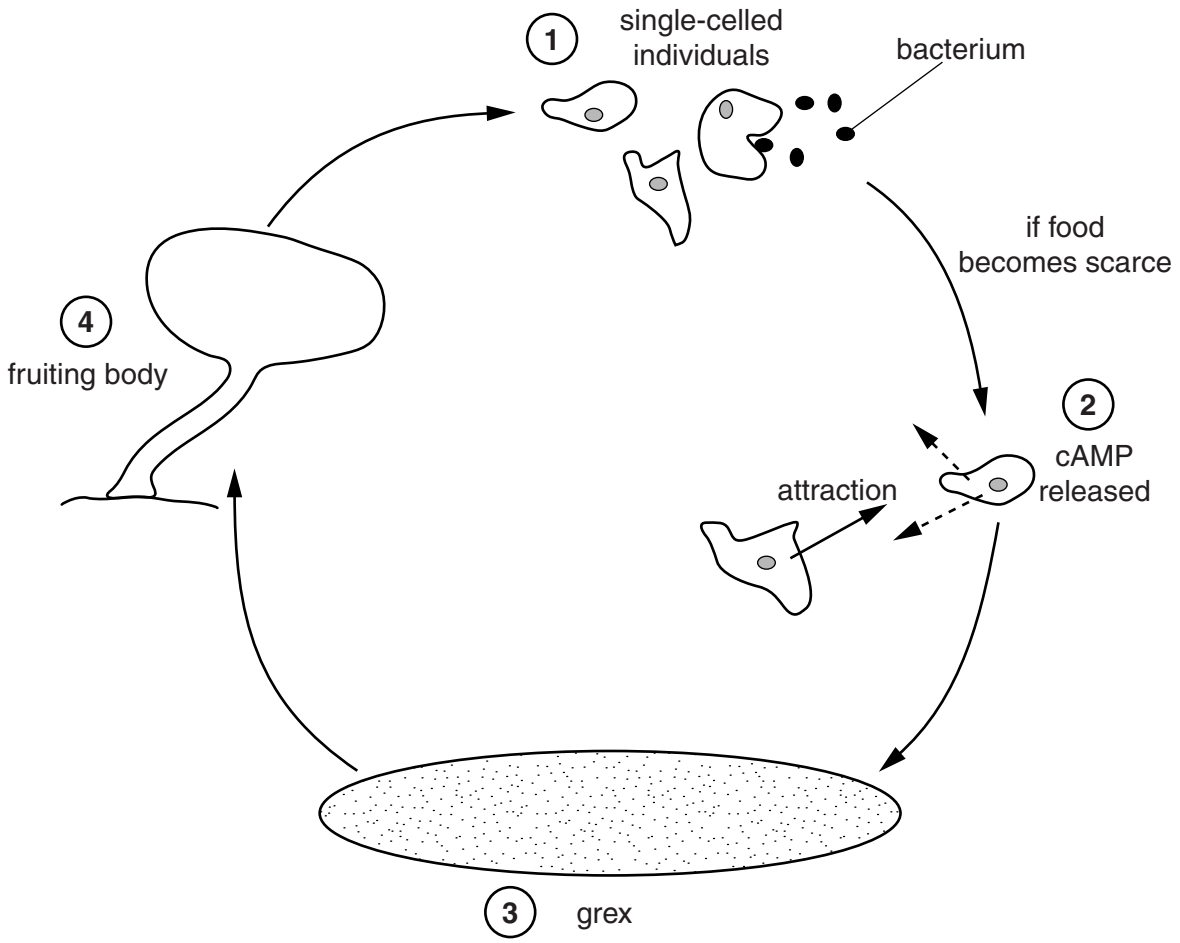

Fig. 5.1

(1) When plenty of food is available this slime mould exists as single-celled individuals which feed and reproduce asexually.
The slime mould cells feed on bacteria.
The slime mould cells are attracted to folic acid which has been released by the bacteria.

(2) When food becomes scarce the slime mould cells release a chemical (cAMP) which attracts other slime mould cells.

(3) The slime mould cells then group and stick together to form a multicellular mass called a grex.
The grex moves in a coordinated way in search of a more suitable environment.
As the grex moves, the cells release the chemical DIF. DIF causes some cells to become stalk cells and others to become spore cells.

(4) When the grex reaches suitable conditions, it forms a fruiting body consisting of a stalk and spores.
These spores are released and develop into new, individual, slime mould cells.

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(a) **(i)** Suggest the type of cell division used by *D. discoideum* for reproduction during stage (1) of its life cycle.

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

(ii) At what stage of the life cycle does differentiation begin?

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

(b) Communication and cooperation between cells is essential for the survival of *D. discoideum*.

(i) State the correct term for communication between cells.

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

(ii) Describe **two** examples of communication between cells that occur during the life cycle of *D. discoideum*.

.....

.....

.....

.....

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

(iii) The plasma membranes of the slime mould cells are specially adapted for communication.

Using the information on page 12, and your biological knowledge, suggest how the plasma membrane of *D. discoideum* is adapted for cell communication.

.....

.....

.....

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

(c) Individual cells of *D. discoideum* can divide once every hour. A grex may consist of 100 000 individual cells.

Calculate how many hours it would take for one cell to produce enough cells to form a grex.

Answer = ... hours **[1]**

[Total: 8]

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6 State the correct term for each of the following definitions.

(a) A pair of chromosomes that contain genes for the same characteristics.

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

(b) A group of organs working together to perform an essential function.

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

(c) A type of circulatory system that does not keep the blood within blood vessels.

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

(d) A type of cell division that produces genetic variation.

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

(e) The detailed structure of cells visible only with an electron microscope.

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

(f) The pathway that transports water along cell walls and between cells in plants.

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

(g) The bulk transport of materials out of a cell.

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

[Total: 7]

END OF QUESTION PAPER

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ADDITIONAL ANSWER SPACE

If additional answer space is required, you should use the following lined page. The question number(s) must be clearly shown in the margin.

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