

**ADVANCED SUBSIDIARY GCE
 SCIENCE**

Science and the Natural Environment

THURSDAY 22 MAY 2008

2841

Afternoon
 Time: 1 hour

Candidates answer on the question paper
Additional materials (enclosed): None

Additional materials (required):
 Electronic calculator



Candidate Forename

Candidate Surname

Centre Number

Candidate Number

INSTRUCTIONS TO CANDIDATES

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided.

INFORMATION FOR CANDIDATES

- The number of marks for each question is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is **60**.
- You will be awarded marks for the quality of written communication where this is indicated in the question.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.

FOR EXAMINER'S USE		
Qu.	Max.	Mark
1	18	
2	9	
3	18	
4	15	
TOTAL	60	

This document consists of **10** printed pages and **2** blank pages.

Answer **all** the questions.

1 Fig. 1.1 shows a plant cell.

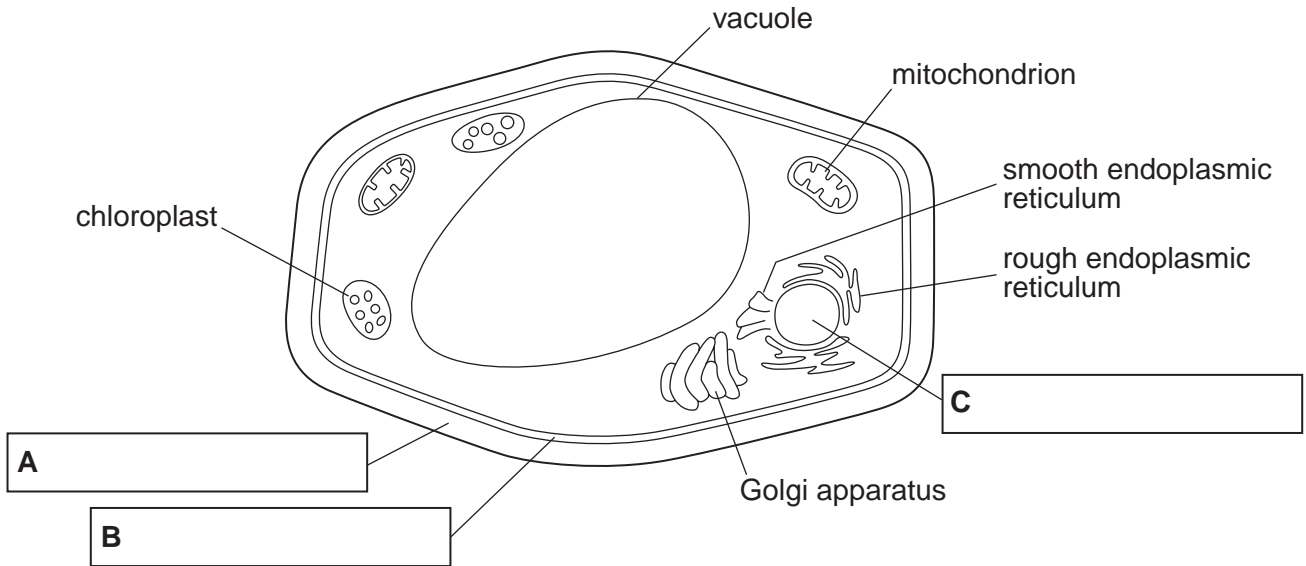


Fig. 1.1

(a) Complete labels **A**, **B** and **C** to name the parts. [3]

(b) Describe the function of the

(i) mitochondrion

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

(ii) rough endoplasmic reticulum.

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

(c) What **three** features of the cell show that it is a plant cell?

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

(d) (i) Suggest why detailed observation of the plasma membrane is difficult.

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

(ii) Describe how the structure of the plasma membrane allows **simple** diffusion to take place through it.

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

(e) Fig. 1.2 represents energy transfer to and from plant and animal cells.

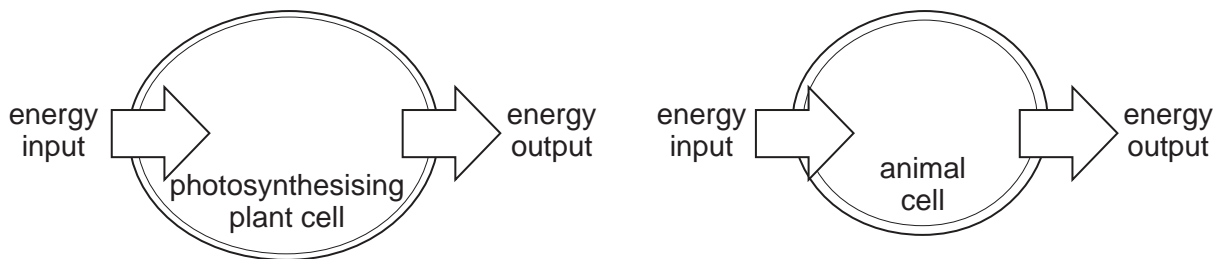


Fig. 1.2

(i) What provides the energy input to:

a plant cell

.....

an animal cell?

..... [2]

(ii) Describe **three** ways in which energy is transferred out of a cell.

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

[Total: 18]

- 2 The two images in Fig. 2.1 were taken at the same time, using different wavelengths of light. Both images show a river, top right.

Source: Centre for Remote Imaging, Sensing and Processing
<http://www.crisp.nus.edu.sg>

Fig. 2.1a was made using green light.

Fig. 2.1b was made using near infrared radiation.



X

Fig. 2.1a



X

Fig. 2.1b

© CNES / Distribution Spot Image / Processing CRISP

- (a) State what is meant by *wavelength*. A diagram may help you.

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

- (b) Explain how it is possible for the same camera to produce two images using two different wavelengths.

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

(c) Images can be displayed in different colours.

Fig. 2.1a can be displayed in blue so that dark areas of the image become dark blue. White areas remain white.

Fig. 2.1b can be displayed in red so that bright areas of the image become deep red. Black areas become white.

(i) State the name of the type of image that is made by displaying colours that do not correspond to the original imaging wavelengths.

..... [1]

(ii) Once the images have been displayed as described above, what will be the colour of the river in Fig. 2.1a?

..... [1]

(iii) Once the images have been displayed as described above, what will be the appearance of the feature marked **X** in Fig. 2.1b?

..... [1]

(iv) The coloured images are combined together to create a new display. What is now the colour of feature **X**?

..... [1]

(d) Describe **two** uses of coloured remotely-sensed satellite images in environmental monitoring.

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

[Total: 9]

3 Polonium-210 is an effective poison. It emits **α-particles** and has a **half-life** of approximately 0.4 years. Polonium-210 can be represented in symbols as:



(a) What is meant by

(i) α-particle

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

(ii) half-life?

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

(b) Explain why polonium-210 is

(i) hard to detect once inside a human body

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

(ii) very damaging when inside the body.

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

(c) Another isotope of the same element is polonium-208. Write a representation in symbols of polonium-208.

..... [2]

(d) Fig. 3.1 shows how the radioactivity of a sample of polonium-208 changes with time.

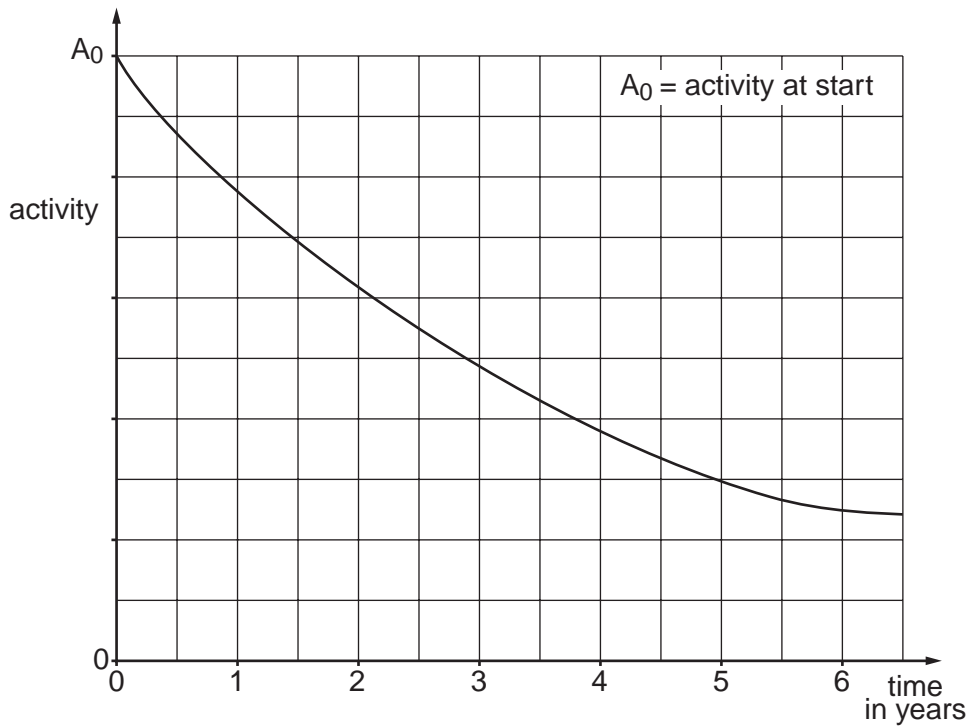


Fig. 3.1

(i) Use the graph to find the half-life of polonium-208. Show how you obtain your answer.

..... [2]

(ii) Sketch a curve on the graph to show how the radioactivity of **polonium-210** will change during the same time. [2]

(iii) A person is poisoned with a sample of polonium-210. Estimate the percentage of original level of radioactivity of the sample present in the body after 6 months.

..... [1]

(e) Polonium can be present at low concentration in tobacco smoke when certain types of fertiliser have been used to grow the tobacco. Experts have tried to assess the health risk that this produces.

State **one** point that would suggest

(i) that the polonium is a health risk likely to result in harm

.....
 [1]

(ii) that this exposure to polonium is a low health risk.

.....
 [1]

[Total: 18]

[Turn over

- 4 (a) A rainforest ecosystem is high in biodiversity. This means that there is a wide range of different species.

Suggest why an ecosystem with only one species would be unsustainable.

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

- (b) Fig. 4.1 represents a nutrient cycle in a rainforest ecosystem.

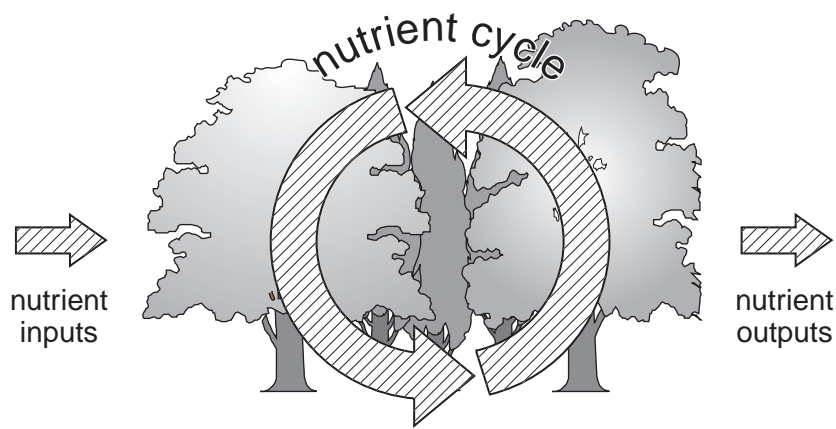


Fig. 4.1

In a steady state, nutrient inputs and nutrient outputs are balanced. Feedback mechanisms may affect these inputs and outputs.

- (i) State a likely immediate outcome if the nutrient output rate were faster than the nutrient input rate.

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

- (ii) Suggest **one** example of human action that could disturb the steady state of a rainforest ecosystem.

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

(iii) Describe an example of a process involving negative feedback that could help to restore the steady state.

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

(iv) What would happen if positive feedback processes have more influence than negative feedback processes?

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

(c) In this question, two marks are available for quality of written communication.

Evolution of species is likely to be faster in a changing rainforest than in a stable rainforest. Explain why.

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..... [6]

Quality of Written Communication [2]

[Total: 15]

END OF QUESTION PAPER

10
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11
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