



**ADVANCED SUBSIDIARY GCE
SCIENCE**

Remote Sensing and the Natural Environment

G641

Candidates answer on the question paper

OCR Supplied Materials:
None

Other Materials Required:

- Electronic Calculator

**Tuesday 13 January 2009
Afternoon**

Duration: 1 hour



Candidate Forename		Candidate Surname	
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Centre Number							Candidate Number				
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INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use 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, however additional paper may be used if necessary.

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**.
- You are advised to show all the steps in any calculations.



Where you see this icon you will be awarded marks for the quality of written communication in your answer.

This means for example you should:

- ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear;
- organise information clearly and coherently, using specialist vocabulary when appropriate.
- 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.

FOR EXAMINER'S USE		
Qu.	Max.	Mark
1	13	
2	12	
3	11	
4	12	
5	12	
TOTAL	60	

AS SCIENCE RELATIONSHIPS SHEET

pressure = force \div area

energy transferred = mass \times specific heat capacity \times temperature rise

density = mass \div volume

wavenumber = 1 / wavelength

speed = frequency \times wavelength

energy = Planck constant \times frequency

current = charge \div time

power = voltage \times current

power loss = (current)² \times resistance

3
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Answer **all** the questions.

1 On 26th April 1986, one of the nuclear reactors at Chernobyl, in the Ukraine, exploded releasing radioactive particles which can emit gamma radiation into the environment.

(a) State a health hazard caused by gamma radiation.

..... [1]

(b) (i) A gamma ray is an electromagnetic wave.

Sketch an electromagnetic wave below. Label the wavelength and the amplitude. [3]



(ii) Gamma waves travel at a speed of $3 \times 10^8 \text{ ms}^{-1}$.

Calculate the frequency of the gamma waves which have a wavelength of $2 \times 10^{-12} \text{ m}$.
Use the relationship $c = f\lambda$.

Show your working and give your answer in standard form.

frequency = unit [3]

(c) A wide area around the Chernobyl disaster site has been exposed to gamma radiation. Despite this, **some** animal life has flourished.

(i) Describe how this can be explained by natural selection.

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

(ii) The human population has been removed from the area. There has been an unexpectedly large increase in the number of wolves.

Suggest **two** reasons for the increase in the wolf population.

1.
.....
2.
..... [2]

[Total: 13]

2 Fig. 2.1 represents a nitrogen cycle.

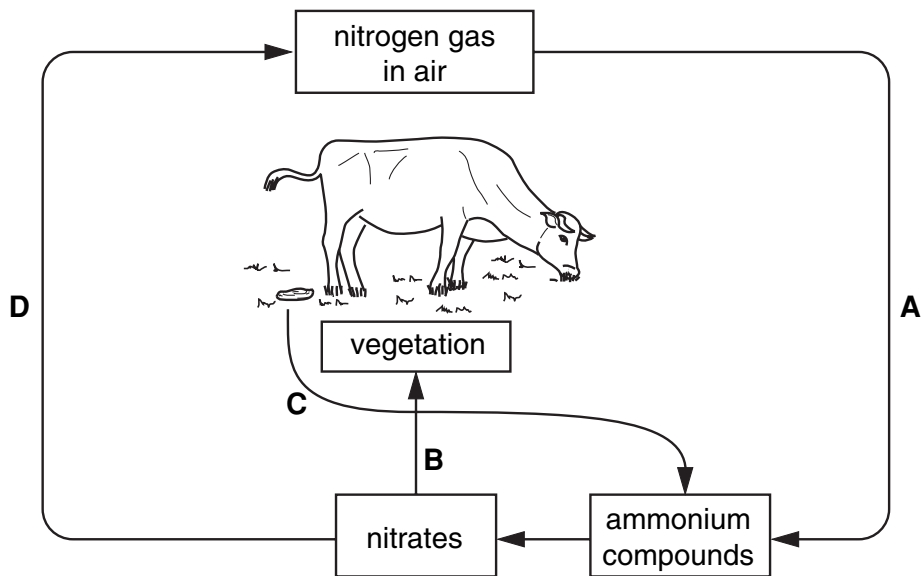


Fig. 2.1

(a) The letters, **A**, **B**, **C** and **D** represent processes in the cycle.

(i) Complete the table below to name these processes, selecting from the following terms:

decomposition **denitrification** **nitrification** **nitrogen fixing**

Process **B** has been done for you.

process	name of process
A	
B	assimilation
C	
D	

[3]

(ii) Micro-organisms are involved in the nitrogen cycle. Tick **one** of the following boxes to indicate the processes they are involved in.

C only	<input type="checkbox"/>
A & C only	<input type="checkbox"/>
C & D only	<input type="checkbox"/>
A, C & D only	<input type="checkbox"/>
A, B, C & D	<input type="checkbox"/>

[1]

(b) Farming activities can upset the balance of the nitrogen cycle.

Give one example of such an activity and explain how this affects the cycle.

activity:

.....

explanation:

.....

..... [3]

(c) Nitrates can be leached out of the soil into nearby water.

Describe and explain the effect they will have on the ecosystem in that body of water.



You should ensure your explanation is clear with correct spelling and punctuation.

.....

.....

.....

.....

.....

..... [4]

(d) Name another nutrient element that can be cycled within an ecosystem.

..... [1]

[Total: 12]

3 Waste from homes and industry can be treated biologically by bacteria. Fig. 3.1 illustrates such a process.

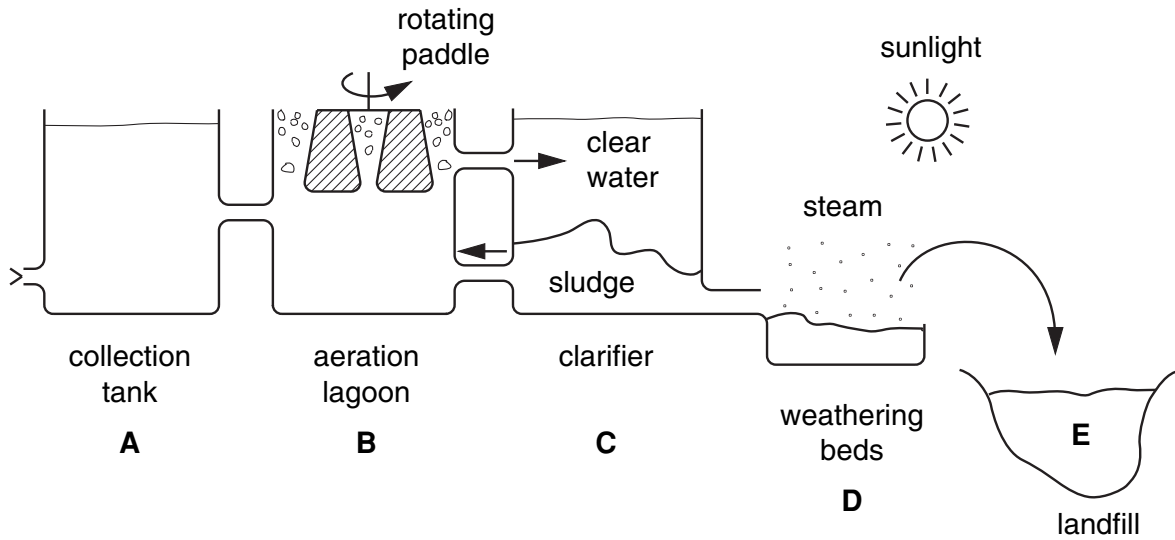


Fig. 3.1

(a) Aerobic and anaerobic bacteria are involved in the process.

(i) In which of the stages **A – E** is **aerobic** respiration most likely to occur?

stage [1]

(ii) Name a gas produced by:

1 aerobic bacteria

2 anaerobic bacteria [2]

(iii) State an advantage to the bacteria of using:

1 aerobic respiration

.....

2 anaerobic respiration

..... [2]

- (b) Respiration involves the breakdown of glucose which must enter eukaryotic cells through the plasma membrane.

Fig. 3.2 is a diagram of a plasma membrane.

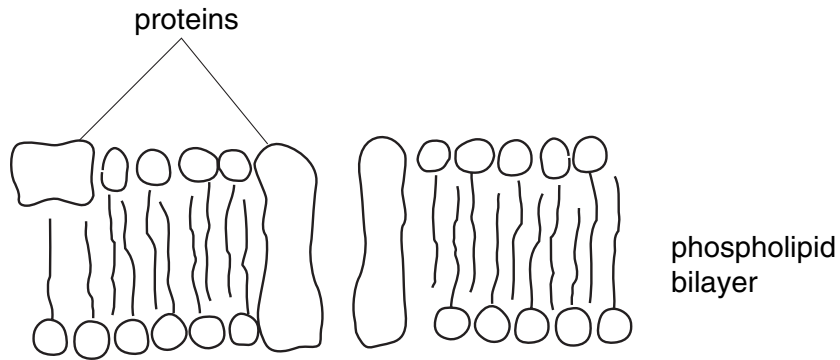


Fig. 3.2

- (i) Describe how glucose crosses the plasma membrane.

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

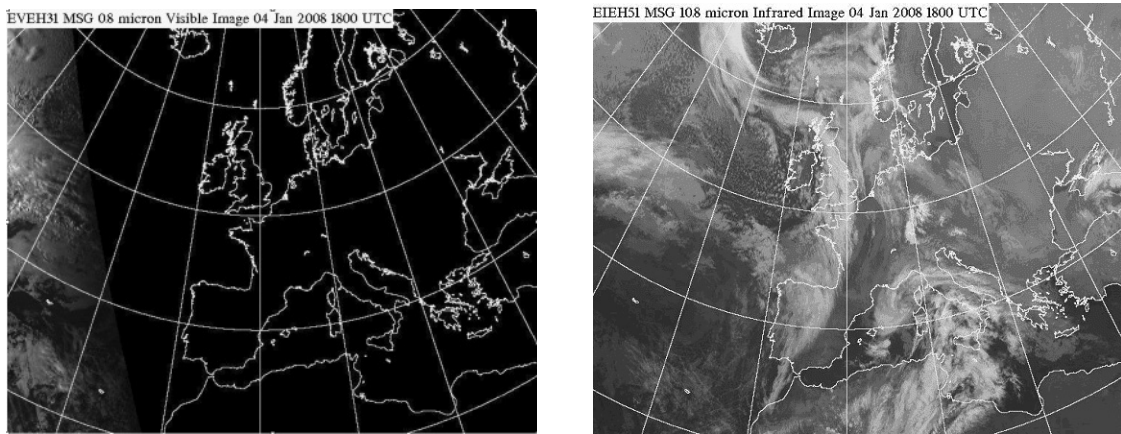
- (ii) Briefly describe how energy is produced from glucose in cells.

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

[Total: 11]

4 This question is about information that can be obtained by satellites.

Fig. 4.1 shows a visible image and an infrared image of Europe taken by a satellite at 6 o'clock in the evening on Jan 4th 2008.



visible image

infrared image

Fig. 4.1

(a) (i) State why the clouds cannot be seen on the visible image.

..... [1]

(ii) State why the clouds **can** be seen on the infrared image.

..... [1]

(b) The infrared image is a negative image.

(i) Suggest why it is presented in this way.

..... [1]

(ii) What does the infrared image tell you about the temperatures of the clouds?

.....

Explain your reasoning.

.....

..... [3]

- (c) Radar can also be used by satellites to get information about the Earth. Radar consists of microwave radiation.

Fig. 4.2 represents a satellite orbiting above the Earth. It emits a radar beam.

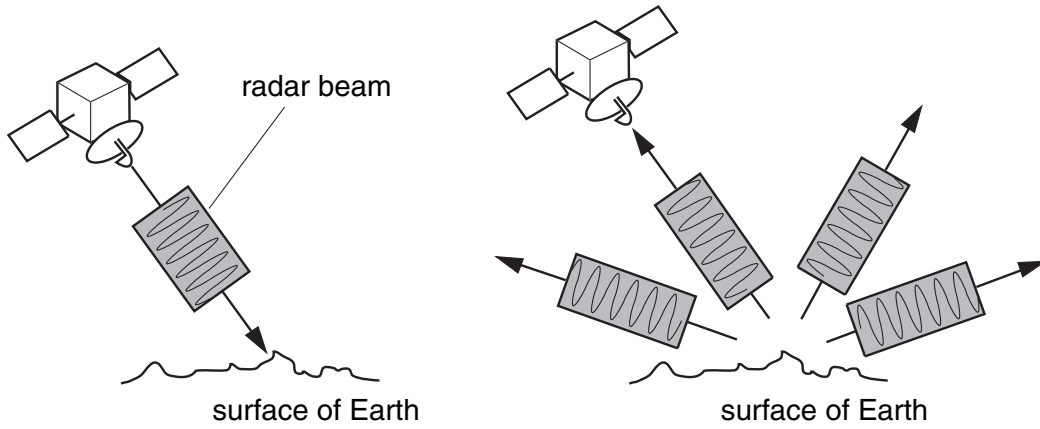


Fig. 4.2

- (i) How does the frequency of the microwaves used in a radar beam differ from both visible and infrared?

..... [1]

- (ii) Use the diagram to help you state what happens to the radiation in the radar beam when it hits the Earth's surface?

..... [1]

- (iii) Suggest what information can be obtained about the Earth's surface using this technique.

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

- (d) State **three** factors which can limit the resolution of remotely sensed images.



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

1.
2.
3. [3]

[Total: 12]

5 A student wanted to investigate the effect of growing radishes under different coloured lights.

She planted 2 seeds in each of 5 pots and covered them with different coloured plastic bags to form miniature greenhouses. She stood the pots on a tray containing water and placed them under a lamp so they all received the same amount of light. See Fig. 5.1 below.

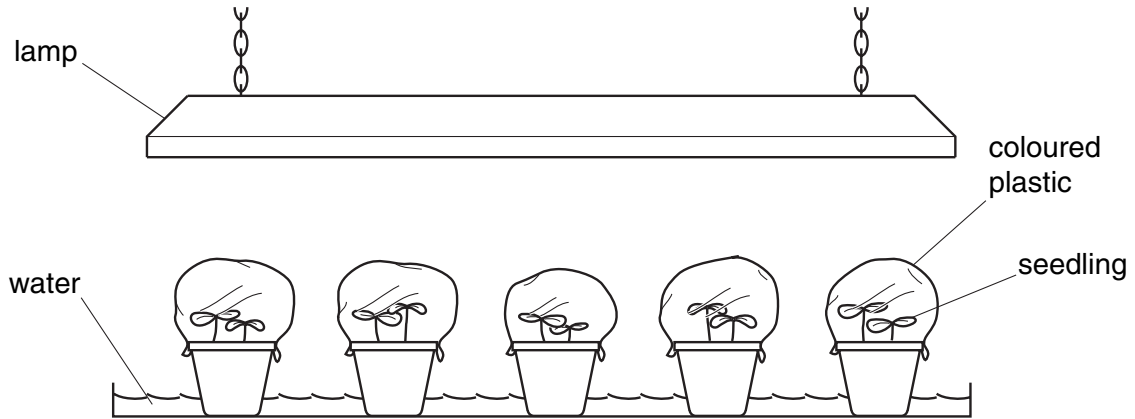


Fig. 5.1

After 3 weeks, she removed the plants and rinsed any soil from the roots. She measured the height of each plant, and then she averaged the results from the two plants in each pot.

(a) Explain **two** ways in which her method may have limited the accuracy of her results.

1.

2.

 [4]

(b) Fig. 5.2 is a bar chart of her results.

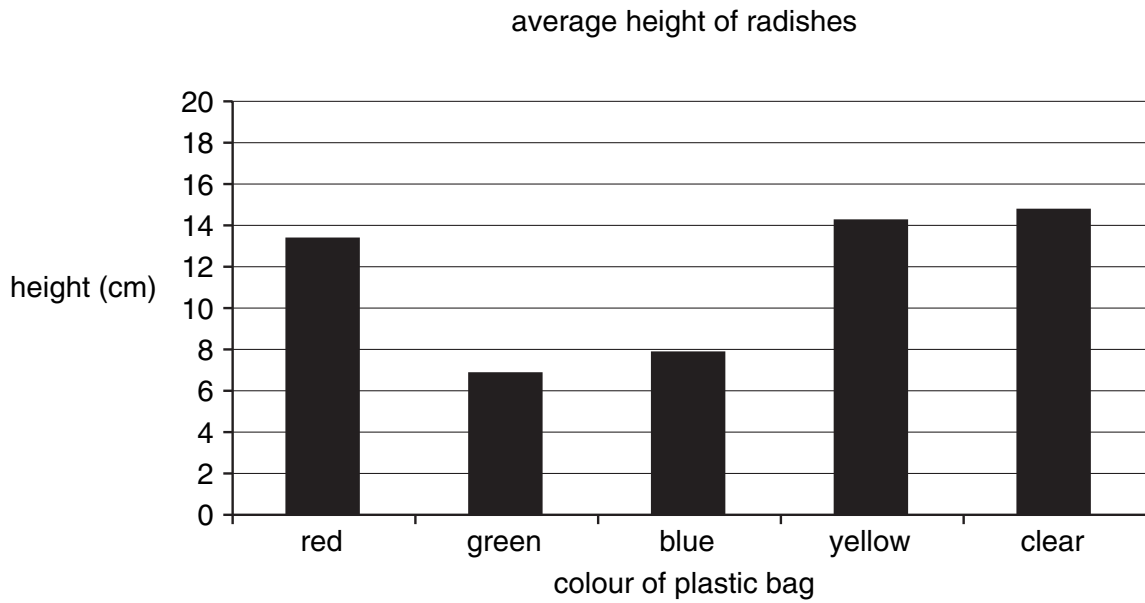


Fig. 5.2

Explain why the plants covered in green plastic grew least well.

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

(c) Plants use the process of photosynthesis to grow.

Write a word equation for the process of photosynthesis.

..... [3]

(d) Photosynthesis occurs in chloroplasts.

Suggest where in the plant you would expect to find the greatest concentration of chloroplasts. Give a reason.

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

(e) Plants are examples of organisms that can use simple inorganic compounds to produce biomass with the help of an external source of energy.

By what general name are such organisms known?

..... [1]

[Total: 12]

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