

ADVANCED SUBSIDIARY GCE

SCIENCE

Remote Sensing and the Natural Environment

G641

Tuesday 24 May 2011

Morning

Duration: 1 hour

Candidates answer on the question paper.

OCR supplied materials:

None

Other materials required:

- Electronic calculator
- Ruler (cm/mm)




Candidate forename		Candidate surname	
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Centre number						Candidate number				
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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. Pencil may be used for graphs and diagrams only.
- 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. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Answer **all** the questions.
- 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**.
- 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.
- This document consists of **16** pages. Any blank pages are indicated.

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

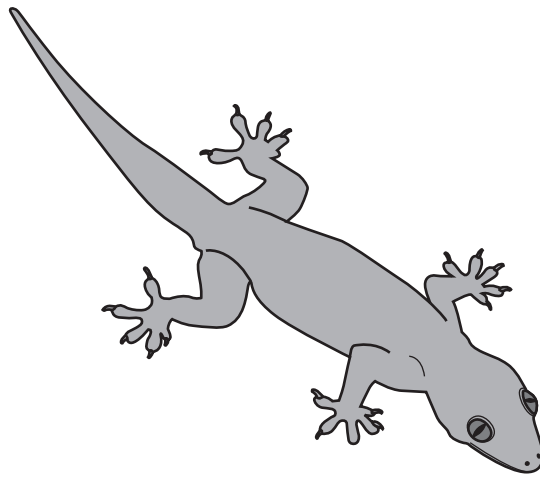
power loss = (current)² \times resistance

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Answer **all** the questions.

1 Geckos are small lizards that live in warm areas of the world.



(a) (i) A gecko's eye is similar to a human eye. It contains two different types of photoreceptor.

Where in the eye would these photoreceptors be found?

..... [1]

(ii) Name the two types of photoreceptor cells and describe the type of light that they detect.

1.

.....

2.

..... [4]

(b) Geckos, unlike humans, can detect ultraviolet light.

State how an ultraviolet light wave differs from a light wave that we can see.

.....

..... [1]

(c) When a light wave strikes the lens of the eye, it is refracted.

Complete Fig. 1.1 to show the path of the light wave.

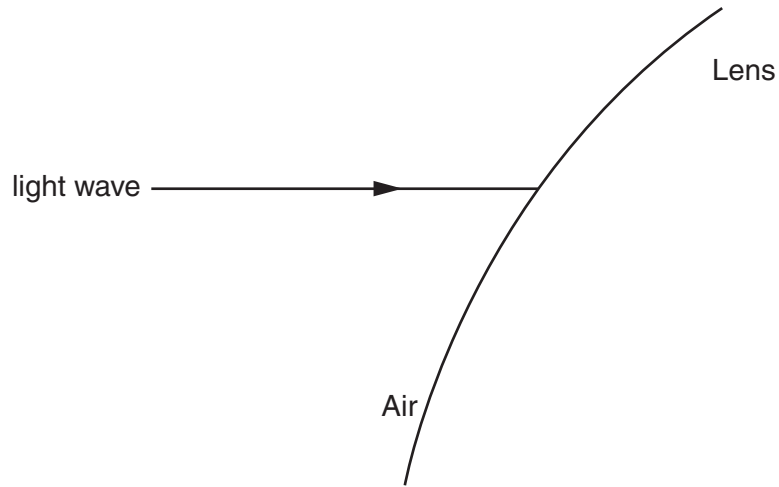


Fig. 1.1

[2]

(d) Some geckos have evolved to see colours in low light levels.

Suggest how this might have happened.

.....

.....

.....

.....

.....

.....

.....

..... [3]

[Total: 11]

2 Reed beds are becoming more common as a way of purifying waste water from homes and industry.

The reeds are planted in gravel and the dirty water is allowed to flow over their roots. This is shown in Fig. 2.1.

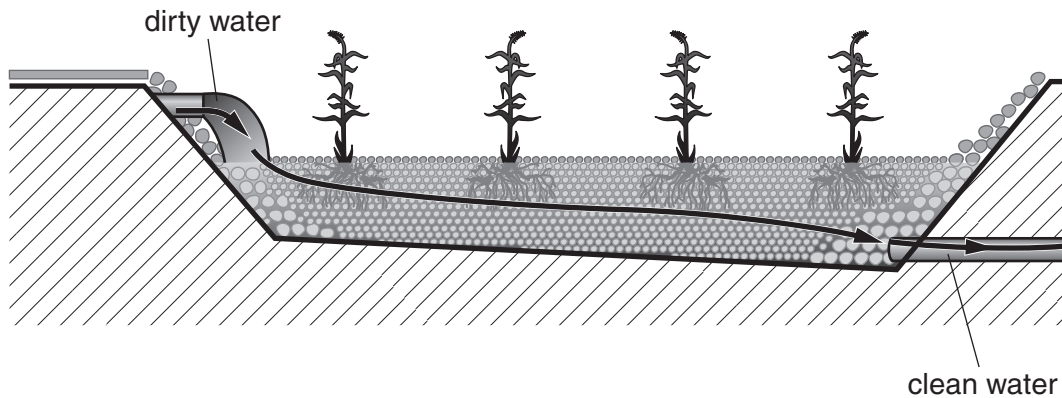


Fig. 2.1

Oxygen from the air is captured by the reeds and transported down hollow tubes to their roots. Bacteria living there use the oxygen to help break down organic matter in the dirty water.

(a) (i) What is the general name for bacteria that use oxygen?

..... [1]

(ii) Name two products formed when organic matter is broken down in this way.

1.

2. [2]

(iii) Explain why the system becomes smelly if oxygen is prevented from reaching the dirty water.

.....

 [2]

(b) Reeds grow particularly fast if the dirty water contains sewage.

Name a chemical present in sewage that would encourage growth.

..... [1]

(c) If the reeds are embedded in buoyant matting, the reed bed will float. This can be used to clean up bodies of water that become stagnant or covered in algae.

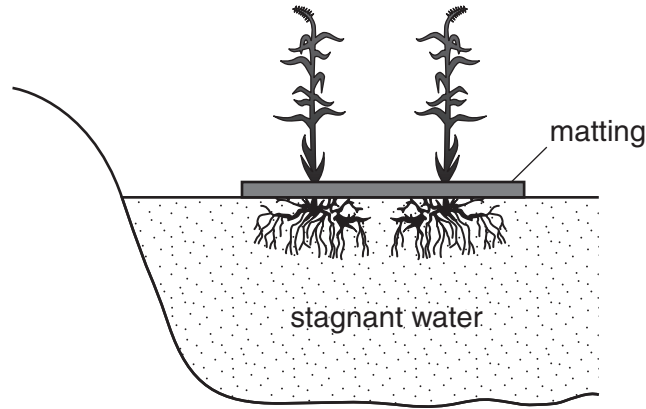


Fig. 2.2

Suggest how this would work and the effect it would have on the ecosystem.

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

(d) Reeds grown in reed beds can be harvested and used.

Suggest a possible use.

.....

..... [1]

[Total: 11]

3 (a) Radar is a form of electromagnetic radiation.

(i) Draw a diagram to illustrate a radar wave with a wavelength of 2.8 cm. Label wavelength and amplitude.

[3]

(ii) Calculate the frequency of this wave if it travels at a speed of $3 \times 10^8 \text{ m s}^{-1}$. Give your answer in standard form.

frequency = units [4]

(b) Satellites can use information they receive from reflected radiation to generate digital grey-scale images.

Explain how they do this.

.....

.....

.....

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.....

.....

.....

..... [4]

(c) Fig. 3.1 shows a grey-scale image taken by a satellite using radar after an earthquake.

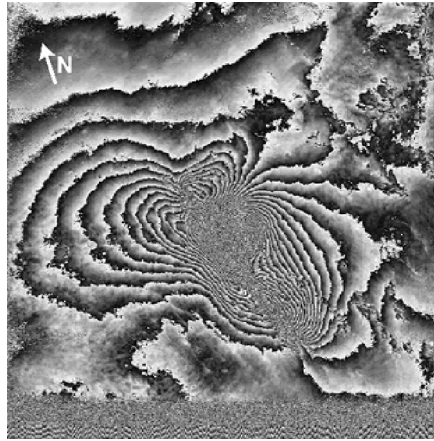


Fig. 3.1

This grey-scale image can be displayed as a *pseudocolour* image where the digital information is represented by colours.

(i) Suggest how a pseudocolour image is produced from a digital image.

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

(ii) Suggest why a pseudocolour image may be preferred to the one in Fig. 3.1.

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

[Total: 14]

4 The data below shows the total amount of carbon absorbed or released from 1 m² of a forest in North America every month in the year 1998. If carbon is released, it is shown as a negative number.

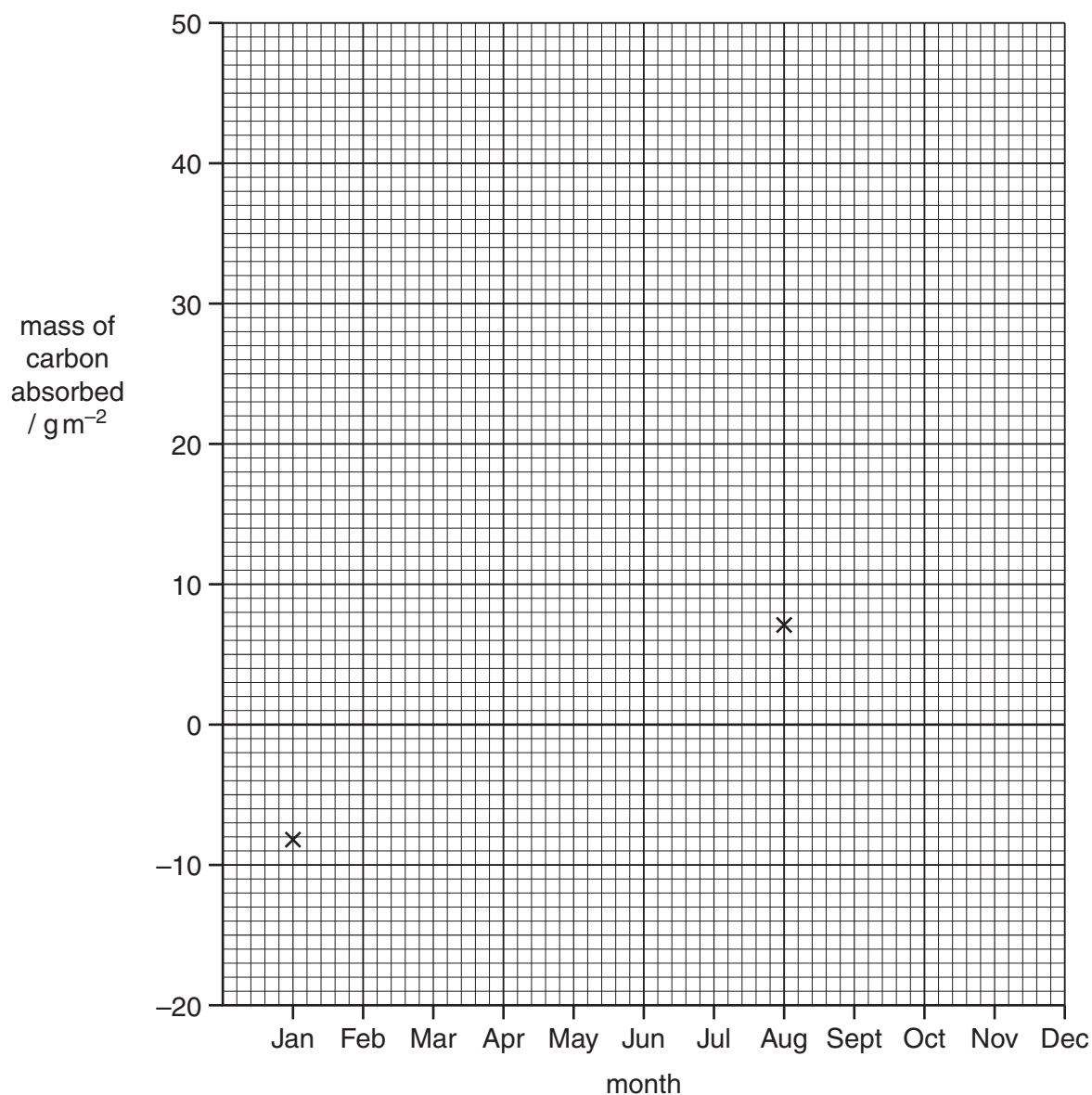
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
mass of carbon absorbed / gm ⁻²	-8.2	-1.2	-6.6	9.8	47.2	9.2	1.7	7.1	1.0	-19.6	-1.7	-0.2

(a) In your answer to part (i), the technical terms you use should be spelled correctly.



(i) What process causes carbon to be absorbed by plants
 released by plants? [2]

(ii) Plot the data on the grid below. January and August have been done for you.



[2]

(iii) Describe and explain the general pattern in the movement of carbon throughout the year.

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

(iv) Suggest a reason for the apparently anomalous figure in July.

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

(b) Forest ecosystems are usually in a 'steady state'.

(i) Suggest how the steady state in a forest might be disrupted.

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

(ii) Name the process that maintains a steady state in the forest.

..... [2]

[Total: 11]

- 5 Satellite remote sensing has made it possible to investigate the health of vegetation in remote regions using near-infrared (NIR).

Fig. 5.1 shows an NIR image of a remote region in India.

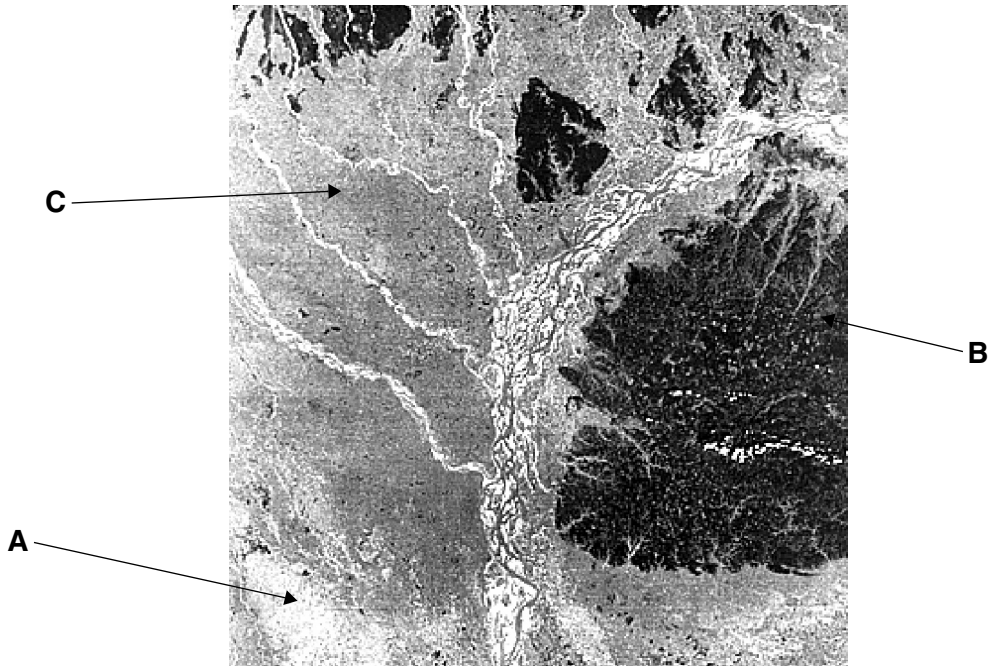


Fig. 5.1

- (a) (i) **A**, **B** and **C** are areas of the region with different patterns of vegetation.

Decide which of the phrases in Table 5.1 best describes the vegetation in each area and insert the appropriate letter in the box.

Table 5.1

vegetation	area
no vegetation	
vegetation struggling to survive	
healthy vegetation	

[1]

- (ii) What fact about NIR did you use to help you make your choice?

.....

..... [1]

- (b) Visible light can also be used to produce satellite images of vegetation. However, there are some limitations when using visible light.

Describe some of these limitations.



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

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

- (c) Radiation can have many other uses.

- (i) Some types of radiation are used in communication.

Use the words in the box to complete the table below.
Each type of radiation may be used once, more than once, or not at all.

gamma ray	infrared	microwave	radio
ultraviolet	visible light	X-ray	

use	type of radiation
to transfer information between mobile phones	
broadcasting national TV	
remote control device to switch on TV	
reading DVDs with lasers	

[4]

(ii) Name two types of electromagnetic radiation that are ionising.

1.

2. [1]

(iii) What property of electromagnetic radiation causes it to be ionising?

.....

..... [1]

[Total: 13]

END OF QUESTION PAPER

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