

**ADVANCED SUBSIDIARY GCE**

**SCIENCE**

Remote Sensing and the Natural Environment

**G641**

Candidates answer on the question paper.

**OCR supplied materials:**

None

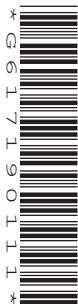
**Other materials required:**

- Electronic calculator
- Ruler (cm/mm)

**Thursday 13 January 2011**

**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, 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)<sup>2</sup>  $\times$  resistance

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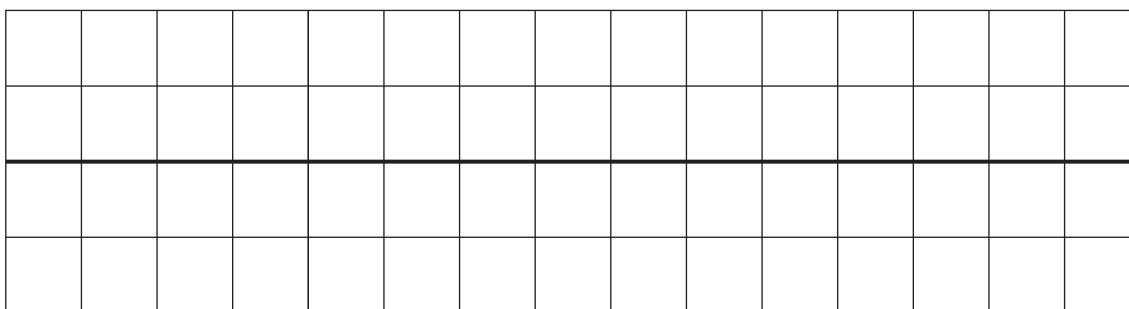
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Answer **all** the questions.

- 1 Concerns are frequently raised in the media about the dangers of mobile phone use.

Mobile phones emit radio waves that are non-ionising electromagnetic radiation. They have a wavelength of about 0.12 m in air.

- (a) Use the grid below to draw a diagram of this wave to scale.  
1 square = 1 cm



[2]

- (b) In human tissue, the wavelength of the radio wave changes. Calculate the wavelength in human tissue if the wave has a speed of  $4.4 \times 10^7 \text{ ms}^{-1}$  and a frequency of  $2.5 \times 10^9 \text{ Hz}$ . Give your answer in standard form.

wavelength = ..... units ..... [3]

- (c) Ultraviolet radiation also causes alarm in the media. State one property of an ultraviolet wave that causes it to be more damaging than a radio wave.

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

- (d) Radio waves are non-ionising. Name a type of radiation that is ionising and explain how it causes damage to human tissue.

radiation .....  
problems .....  
.....  
.....  
..... [3]

[Total: 9]

2 Starch forms a large part of the human diet. Wheat, which is an important source of starch, grows mostly in temperate regions of the world.



(a) State the main features of a temperate climate.

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

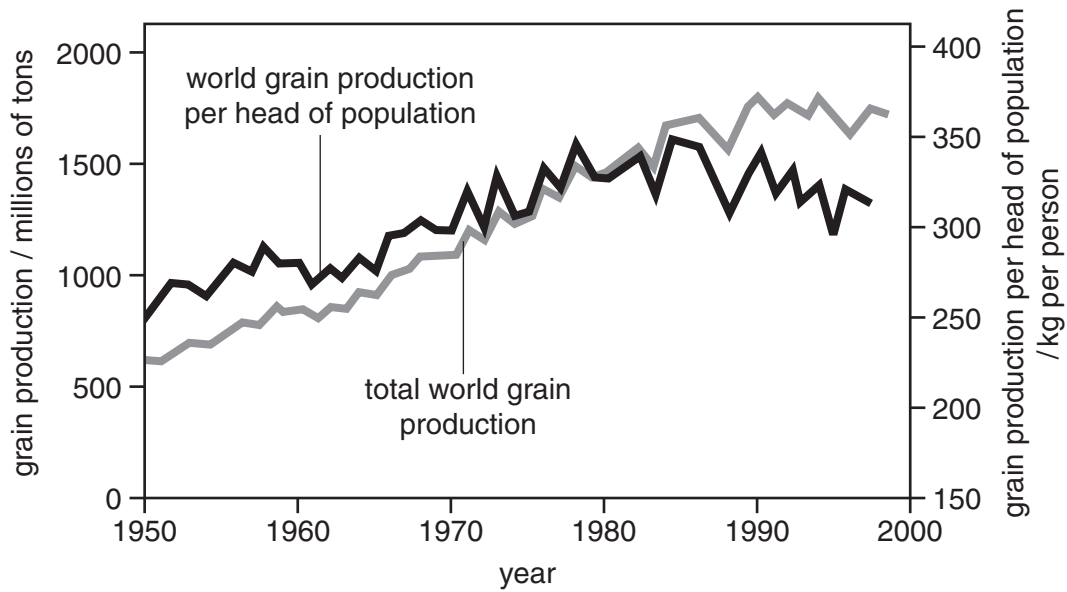
(b) Explain how the wheat plant produces starch.



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

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

(c) Fig. 2.1 shows the trend in total world grain production and the production per head of world population.



**Fig. 2.1**

(i) Describe the trend in total world grain production.

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

(ii) Suggest a reason for this trend.

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

(iii) The trend in world grain production *per head of population* is different from the trend in *total world grain production*.

- Describe the difference.
- Suggest a reason for the difference in the two trends.

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

(d) Phosphorus is an essential mineral for the growth of plants. Fig. 2.2 illustrates part of the phosphorus cycle.

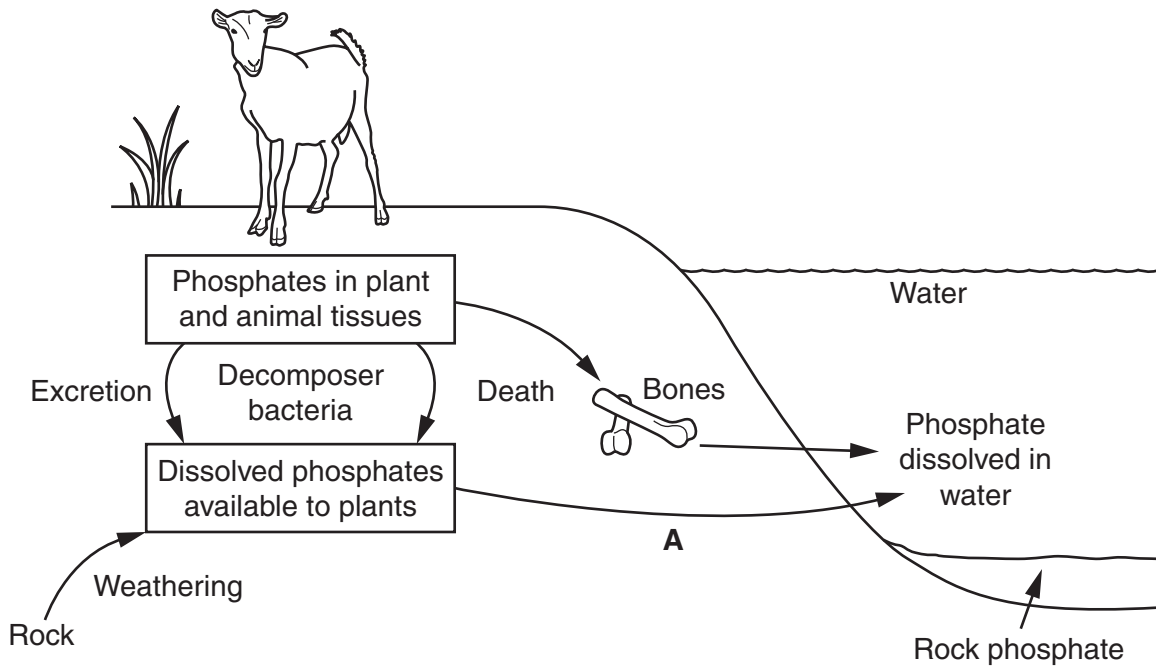


Fig. 2.2

(i) Name a reservoir of phosphorus in the cycle.

..... [1]

(ii) What is the name of process A?

..... [1]

(iii) The amount of phosphorus in many ecosystems is said to be in a steady state. What is meant by the term *steady state*?

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

(iv) The land on an organic farm was found to be depleted in phosphorus. Use Fig. 2.2 to suggest a naturally occurring substance, other than manure, that the farmer could apply to restore it.

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

(e) Name one other nutrient **element** that plants need.

..... [1]

[Total: 17]

Turn over

3 Socotra is a group of four islands in the Indian Ocean, see Fig. 3.1.

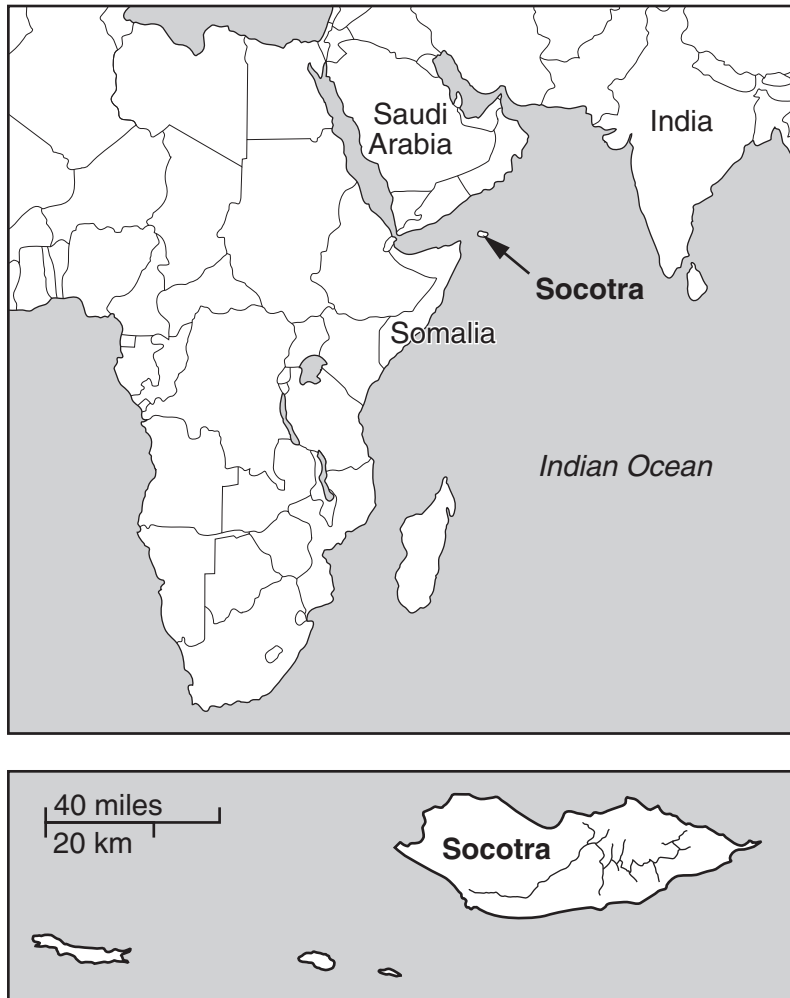


Fig. 3.1

The main island consists of a flat area at the coast, rising to high mountains in the middle which run along its whole length. It has been described as a biodiversity hotspot.

(a) State what is meant by the term *biodiversity*.

.....

.....

.....

..... [2]



- (b) The Socotra Islands have been described as ‘the Galapagos of the East’ because they contain a large number of species that are only found there.  
Describe and explain reasons why this might have occurred.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

- (c) Goats are herbivores. They have been introduced to the islands by humans. This has had a harmful effect on the biodiversity of the islands.

- (i) Explain how the introduction of goats has led to a loss of biodiversity.  
.....
- .....
- .....
- .....
- .....
- .....
- .....
- .....
- .....
- ..... [3]

- (ii) Suggest **two** reasons why scientists are concerned by the loss of biodiversity.  
.....
- .....
- .....
- .....
- ..... [2]

[Total: 11]

**10**  
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4 False colour images can be produced by combining information from different sensors on a satellite.

(a) A false colour image of the south east of England was produced.

On it

- areas of vegetation appear red. The degree of redness depends on the density of the vegetation. The more vegetation, the redder the image.
- areas with no vegetation appear white.
- lakes, rivers and seas appear blue. The deeper the water, the darker the colour.

Fig. 4.1 shows a map of south east England.



Fig. 4.1

(i) Complete Table 4.1 to show the colour you would expect to see on the false colour image for the following locations.

Table 4.1

location	colour on image
London	.....
North Sea	.....
River Thames	.....
Thetford Forest	.....

[2]

(ii) Suggest how the managers of Thetford Forest might find a false colour image useful.

.....

..... [1]

- (iii) Water heavily polluted with nitrate fertiliser may appear purple on the false colour image. Explain why this is so.

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

- (b) One of the wavebands used to produce the false colour image is *near* infrared. Weather satellites use *thermal* infrared.

State one difference between the waves of thermal infrared and near infrared.

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

- (c) Fig. 4.2 is a thermal infrared image taken by a satellite over western Europe at 10.00 am on 02 June, 2009.

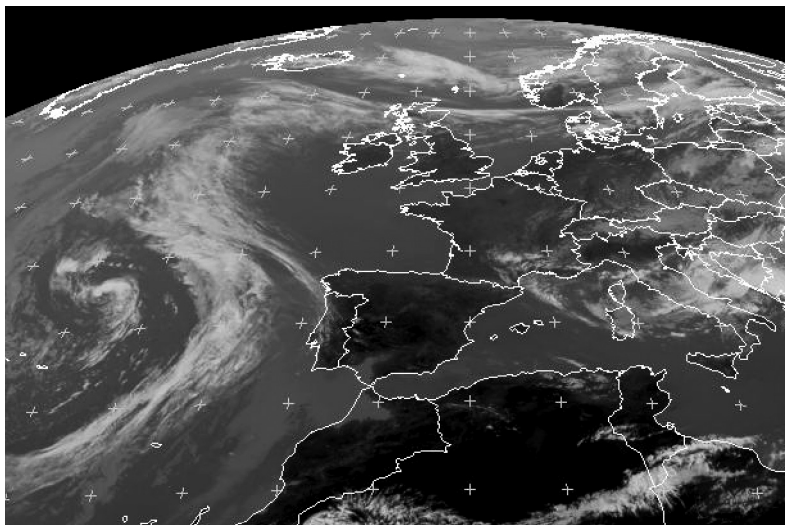


Fig. 4.2

- (i) What was the weather like over SE England when the image was taken?

..... [1]

- (ii) This infrared image is a negative image. Why is it presented in this way?

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

(iii) What does the infrared image, Fig. 4.2, tell you about the temperature of the clouds? Explain your reasoning.

.....

.....

.....

.....

.....

.....

.....

..... [3]

[Total: 12]

5 Fig. 5.1 is part of a food web of organisms found in the countryside in the UK.

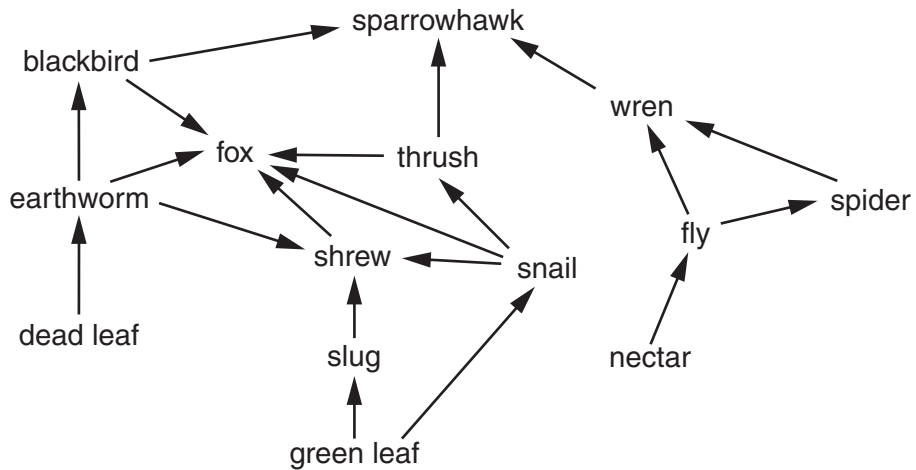


Fig. 5.1

(a) (i) What type of **organisms** are the producers in food webs?

..... [1]

(ii) A thrush eats a snail that contains 160kJ of energy.  
Calculate the amount of energy the thrush will store if it converts 12% of this energy to biomass.

amount of energy = ..... kJ [2]

(iii) What might have happened to the energy not converted into biomass?

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

(b) New Zealand flatworms have been imported into the UK by accident. They eat large numbers of earthworms.  
Describe and explain the effect their arrival will have on the food web shown in Fig. 5.1.

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

(c) Earthworms do not possess lungs. Instead, they exchange gases through their skin.

Name the gas that diffuses into the earthworm and explain how it is used in its cells to release energy.



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

gas .....

explanation .....

.....

.....

.....

.....

.....

..... [4]

[Total: 11]

**END OF QUESTION PAPER**

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