THIS IS A NEW SPECIFICATION

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 27 May 2010
Afternoon

Duration: 1 hour

G641

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

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. Additional paper may be used if necessary but you must clearly show your Candidate Number, Centre Number and question number(s).

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.

OCR is an exempt Charity

Turn over

AS SCIENCE RELATIONSHIPS SHEET

pressure = force ÷ area

energy transferred = mass × specific heat capacity × temperature rise

density = mass ÷ volume

wavenumber = 1 / wavelength

speed = frequency × wavelength

energy = Planck constant × frequency

current = charge ÷ time

power = voltage × current

power loss = $(current)^2$ × resistance

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Answer **all** the questions.

1 **(a)** An estuary is a body of water at the mouth of a river where fresh water mixes with sea water.

Fig. 1.1 represents an energy-flow diagram of an estuary in New Zealand.
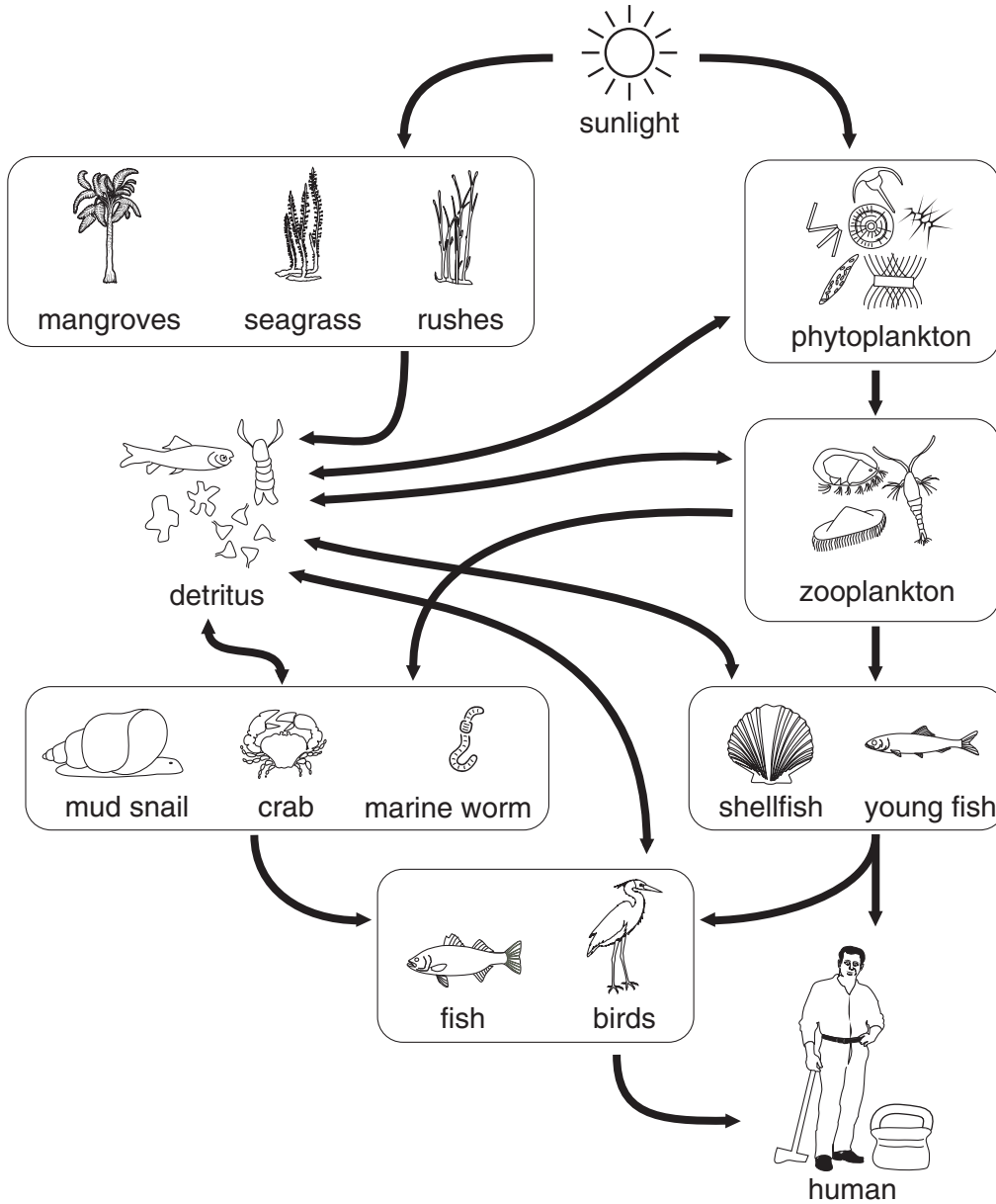
Fig. 1.1

(i) What is the source of the energy for all the organisms in Fig. 1.1?

.... **[1]**

(ii) Use Fig. 1.1 to suggest what 'detritus' might be made of.

.... **[1]**

(iii) The energy-flow diagram makes no mention of decomposers.

Write the name of a decomposer organism and explain what it does.

decomposer ....

function ....

....

.... **[3]**

(b) Table 1.1 gives some information about the productivities of ecosystems in different bodies of water.

Table 1.1

ecosystem	average productivity/$g\,m^{-2}\,yr^{-1}$
lake and stream	250
estuary	1500
open ocean	125

(i) What is meant by the term *productivity*?

....

....

.... **[2]**

(ii) State two things that can be deduced from the figures.

1. ....

....

2. ....

.... **[2]**

(iii) Explain two factors that could account for the different productivities.

1. ....

....

....

2. ....

....

.... **[4]**

Turn over

(c) New Zealand is thought to have separated from Australia about 80 million years ago. Over the next 50 million years, rising sea levels almost completely submerged New Zealand, so it existed as only a chain of small islands. The land then rose to form the shoreline that exists today as shown in Fig. 1.2.
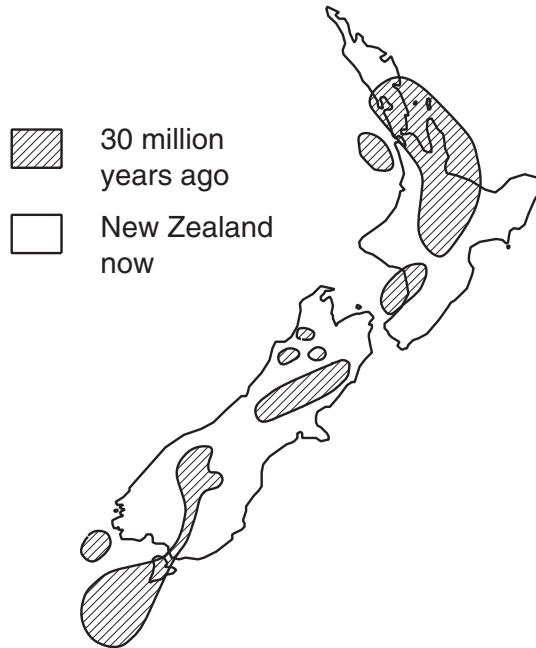

Fig. 1.2

Today, six distinct species of wren exist in New Zealand. These are thought to have evolved from one common ancestor in Australia.

Explain how this could have happened.

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

....

....

....

....

....

....

....

....

.... **[5]**

[Total: 18]

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QUESTION 2 STARTS ON PAGE 8 OVERLEAF

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2 **(a)** Leaves contain a number of pigments. They absorb electromagnetic radiation to provide energy required in photosynthesis.

   (i) Name a green pigment present in leaves.

   .... [1]

   (ii) In which organelles of plant cells is this pigment contained?

   .... [1]

(b) Pigments are involved in the light-dependent stage of photosynthesis.
Write a word equation for the process that takes place in the **light-dependent** stage of photosynthesis.

[3]

(c) Carotene is another pigment involved in photosynthesis.
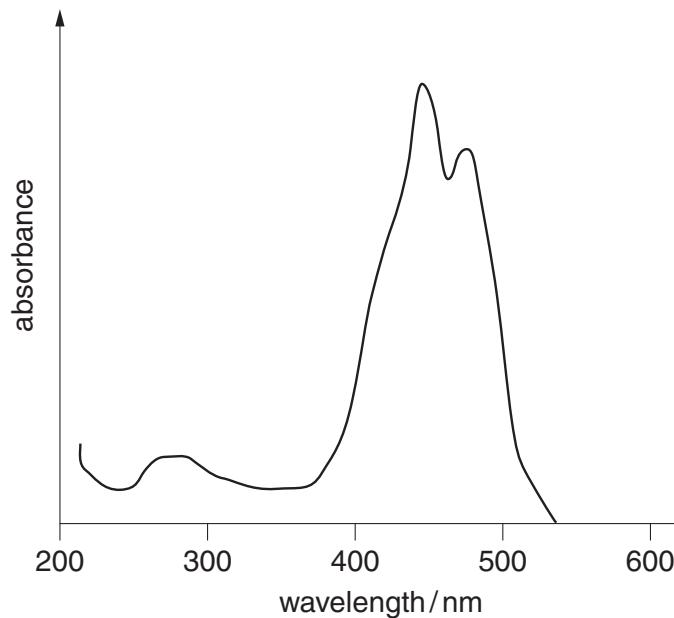
Fig. 2.1 shows the absorption spectrum of carotene.

Fig. 2.1

   (i) Use Fig. 2.1 to determine the wavelength at which carotene absorbs light most strongly.

   ....

   .... [1]

 (ii) The units of wavelength are given on the graph as nm.
 What term does the abbreviation nm stand for?

 .... **[1]**

 (iii) Calculate the frequency of light that has a wavelength of 400 nm.
 Give your answer in standard form. Show your working.

$$\text{speed of light} = 3 \times 10^8 \, ms^{-1}$$
$$1 \, nm = 1 \times 10^{-9} \, m$$

 frequency = ... unit ....**[4]**

 [Total: 11]

Turn over

3 The Earth receives its energy from the Sun in the form of electromagnetic radiation, mostly visible light and ultraviolet. Fig. 3.1 shows what happens to this radiation as it approaches Earth.
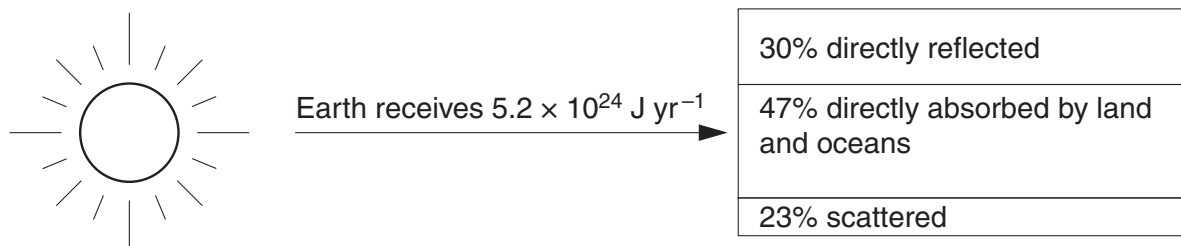
Earth receives 5.2×10^{24} J yr^{-1}

| 30% directly reflected |
| 47% directly absorbed by land and oceans |
| 23% scattered |

Fig. 3.1

(a) Visible light consists of a number of colours that form a spectrum.
Fill in the boxes below to show the complete range of colours in white light in order of their wavelengths.

[1]

(b) (i) Describe one cause of scattering in the atmosphere.

....

.... **[1]**

(ii) Not all wavelengths of visible light are scattered to the same extent. Scattering decreases as the wavelength increases.

Which colour of light will be scattered the most? Explain your answer.

colour ....

explanation ....

....

.... **[2]**

(c) 47% of the Sun's energy is directly absorbed by the land and oceans.

Describe what happens to this energy and how it is ultimately lost from the Earth again.

....

....

....

....

....

.... **[3]**

(d) Use information from Fig. 3.1 to calculate the quantity of energy directly reflected by the Earth each year.

quantity of energy = ... J **[2]**

(e) Most of the ultraviolet radiation is absorbed by the Earth's atmosphere.

(i) How does the frequency of ultraviolet radiation compare with that of visible light?

....

.... **[1]**

(ii) Describe a health hazard associated with ultraviolet radiation.

....

....

....

.... **[2]**

[Total: 12]

4 Most cells contain mitochondria.

(a) State where a mitochondrion would be found in a cell.

.... **[1]**

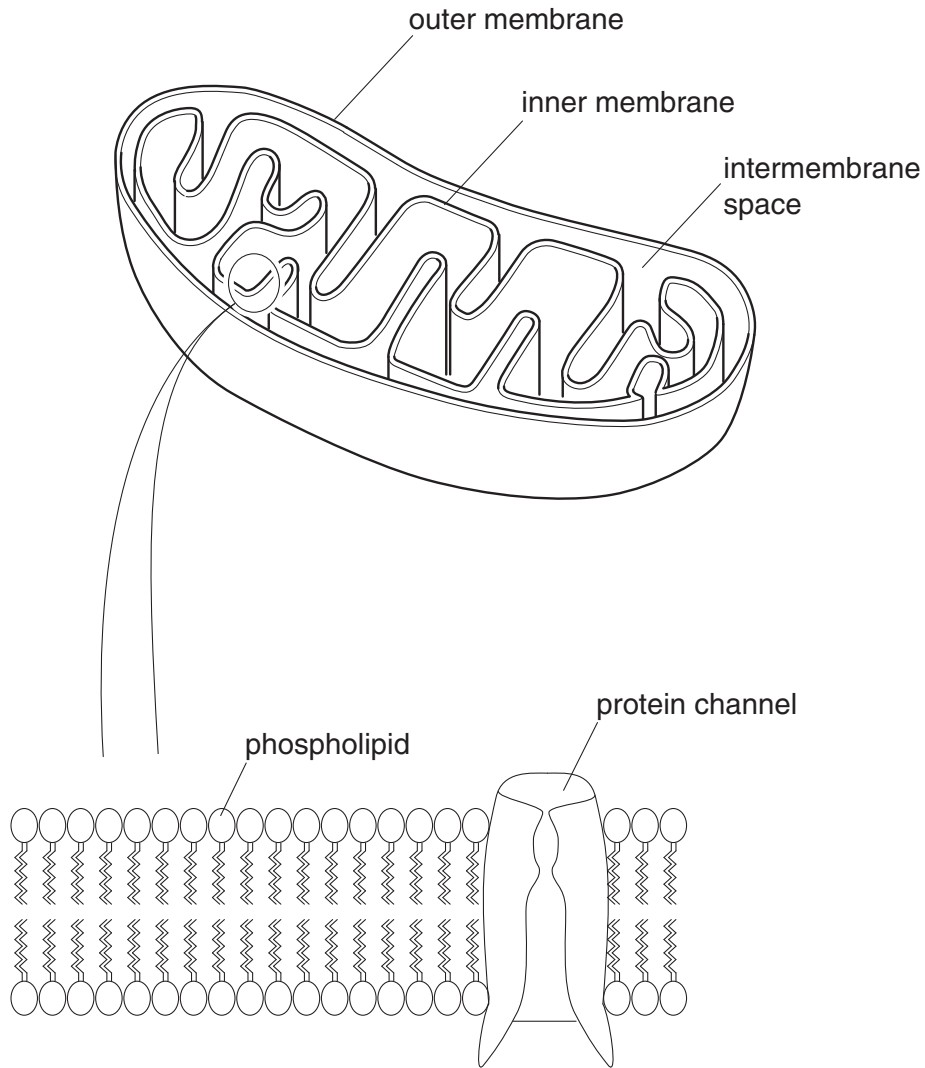**(b)** Fig. 4.1 is an image of a mitochondrion with a diagram of part of a membrane enlarged.

Fig. 4.1

   (i) Mitochondria are involved in aerobic respiration in the cell. For this to occur, a number of different molecules must cross the mitochondrial membrane shown in Fig. 4.1.

   Complete the table below to describe how each molecule is most likely to cross the membrane.
   Water has been done for you.

molecule	through protein channel	between phospho lipid molecules	by simple diffusion	by active transport
carbon dioxide				
glucose				
oxygen				
water		✓	✓	

[3]

   (ii) Write a word equation for aerobic respiration.

   .... [1]

   (iii) Describe how the energy produced by aerobic respiration can be used in a cell.

   ....

   ....

   ....

   .... [2]

   (c) Under some circumstances cells are unable to respire aerobically.

   (i) Suggest when this might happen.

   ....

   .... [1]

   (ii) State **one** disadvantage of anaerobic respiration.

   ....

   .... [1]

   (iii) Name **one** possible product of anaerobic respiration.

   ....

   .... [1]

   [Total: 10]

Turn over

5 **(a)** **(i)** State what is meant by the term *diffraction*.

....

....

....

.... **[2]**

(ii) Fig. 5.1 shows the pattern of water waves approaching the entrance to a harbour.
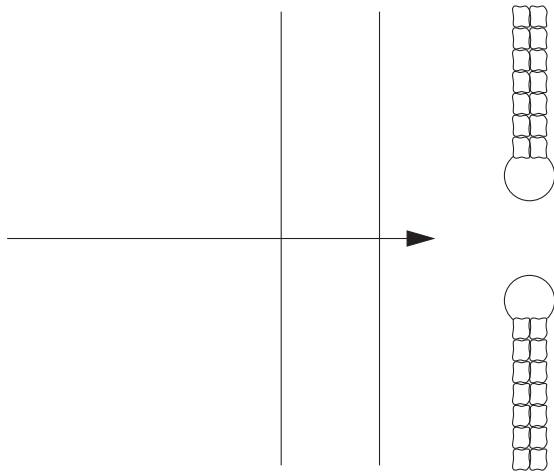
Fig. 5.1

On the diagram, draw the pattern of the waves once they have passed through the harbour entrance. **[2]**

(iii) Describe how the pattern of the waves in the harbour would be different if a storm destroyed part of the harbour wall making the entrance larger.

....

.... **[1]**

(b) A teacher challenges her class to turn on a TV using a remote control in a room arranged in the following way:

```
              ┌────┐
              │ TV │
              └────┘


         ┌──────────────┐
         │   barrier    │
         └──────────────┘




         ┌──────────────┐
         │   barrier    │
         └──────────────┘


                *
             student
```
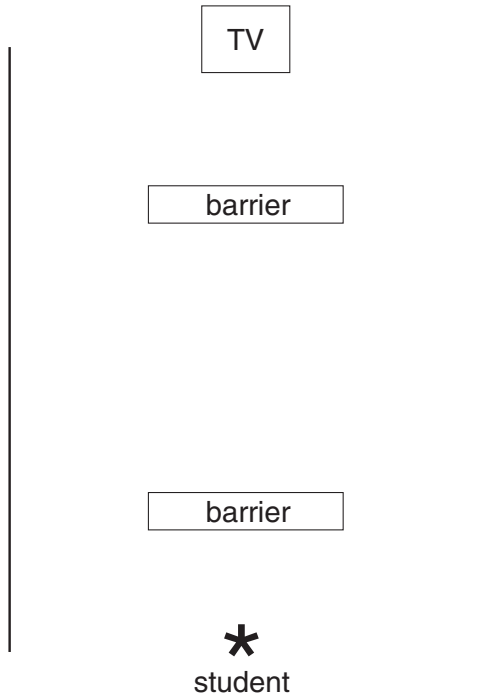
The only other equipment provided was two mirrors.

Describe how it could be done, explaining why it works. You should draw on the diagram to help your answer.

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

....

....

....

....

....

....

.... **[4]**

[Total: 9]

END OF QUESTION PAPER

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