

Monday 14 January 2013 – Afternoon

AS GCE SCIENCE

G641/01 Remote Sensing and the Natural Environment

Candidates answer on the Question Paper.

OCR supplied materials:

None

Other materials required:

- Electronic calculator
- Ruler (cm/mm)

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. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- 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. If additional space is required, you should use the lined pages at the end of this booklet. The question number(s) must be clearly shown.
- 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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Question 1 begins on page 4

PLEASE DO NOT WRITE ON THIS PAGE

Answer **all** the questions.

1 This question is about an ecosystem in the North Sea.

(a) Algae are autotrophs.

State what is meant by the term *autotroph*.

.....
 [2]

(b) Fig. 1.1 shows the typical abundance over the course of a year of one species of algae in the North Sea in the 1970s and the 1990s.

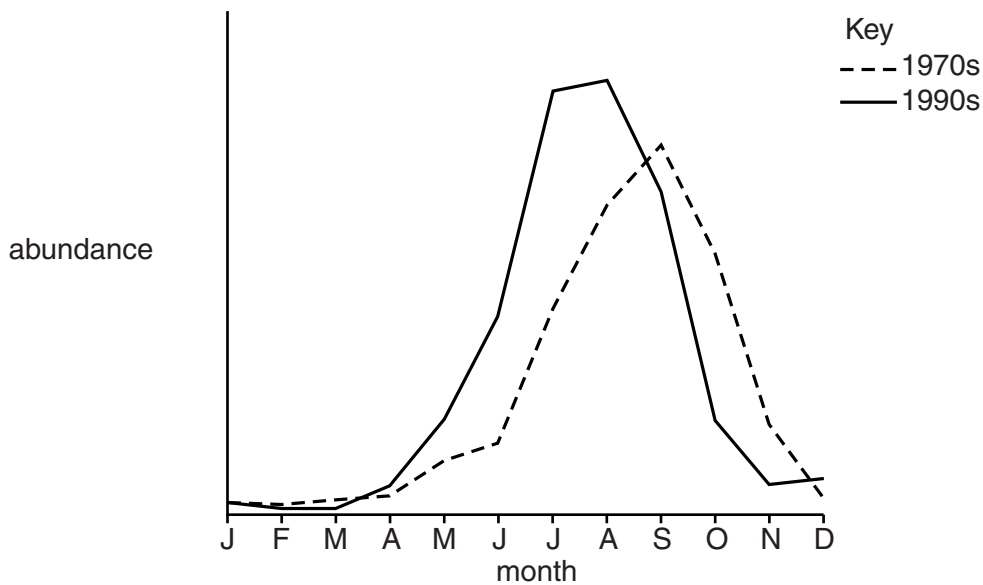


Fig. 1.1

(i) Describe the variation in the abundance of the algae during the course of a year in the 1970s.

.....
 [2]

(ii) Suggest **two** reasons for this pattern of abundance over the course of a year in the 1970s.

1

2

[2]

(iii) Describe how the pattern of abundance of the algae has changed between the 1970s and the 1990s.

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

(iv) Suggest **two** reasons for this change.

1
2 [2]

(c) When algae die, they fall to the seabed and are broken down.

Describe how this happens.

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

(d) Fishing has affected the biodiversity of the North Sea.

What is meant by the term *biodiversity*?

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

(e) Fig. 1.2 represents a food web in the North Sea.

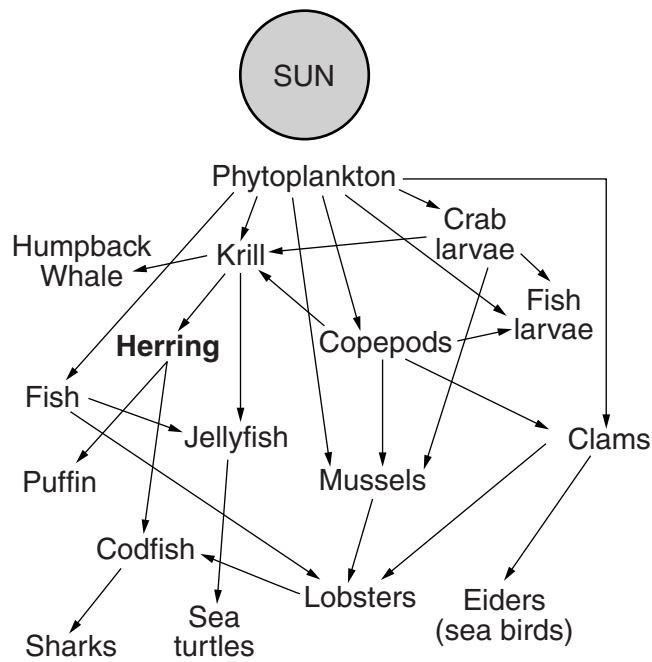


Fig. 1.2

Describe and explain the effect that over-fishing for herring will have upon the populations of different organisms in the food web.

.....

.....

.....

..... [3]

[Total: 16]

2 Fig. 2.1 shows a plant and its roots.

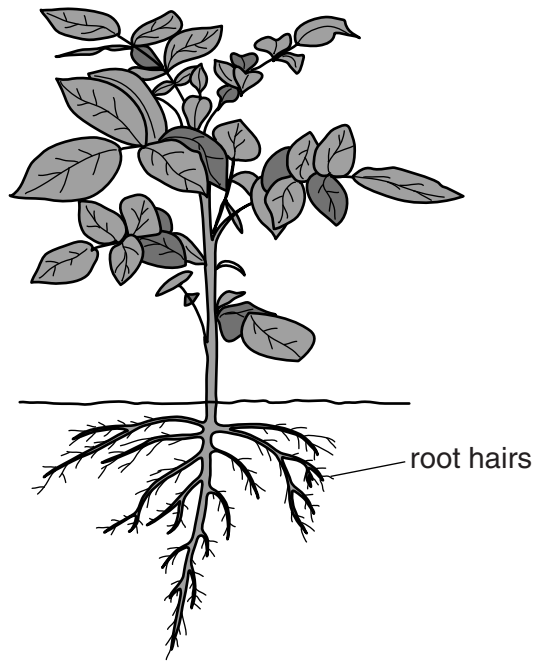


Fig. 2.1

(a) Plants absorb water and mineral ions through fine hairs at the tips of their roots. Mineral ions are essential for healthy plant growth.

Name **one** such mineral ion, and state its function in the plant.

ion

function [2]

(b) Substances including mineral ions can pass through the cell membrane of the root hair.

Fig. 2.2 shows a diagram of a cell membrane.

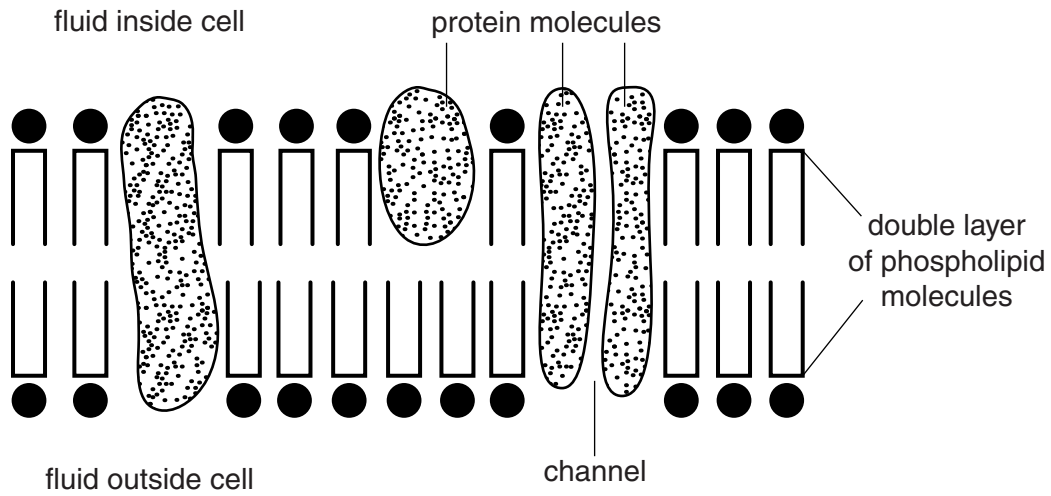


Fig. 2.2

Describe the processes by which substances can pass through the cell membrane.



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

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..... [5]

(c) The root hair cells only function well if the soil structure is open enough to let plenty of air in.

(i) Which gas is essential for the roots to work efficiently?

..... [1]

(ii) Explain why it is necessary.

.....

..... [2]

(d) If a soil becomes waterlogged, the air in the soil is replaced by water.

Explain how this causes loss of nutrient ions from the soil.

.....

.....

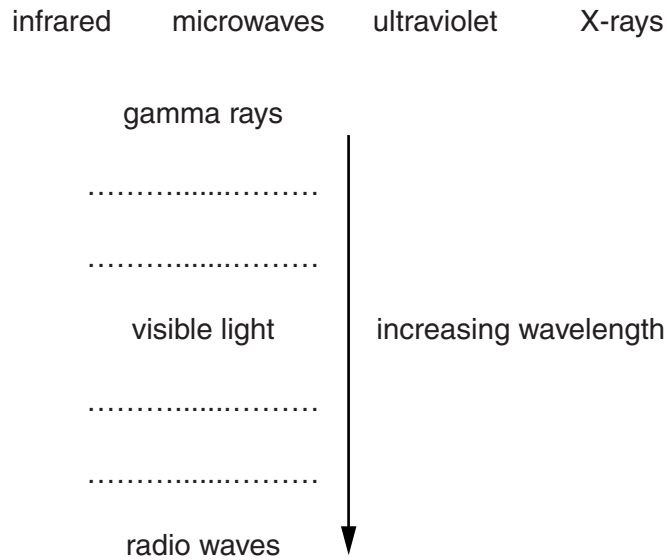
.....

..... [3]

[Total: 13]

3 Radar is a detection system which uses microwaves, a form of electromagnetic radiation.

(a) Insert each of the following types of electromagnetic waves onto the appropriate line on Fig. 3.1 below:



[2]

Fig. 3.1

(b) The Cassini spacecraft (Fig. 3.2) used radar to investigate Titan, one of the moons of the planet Saturn.

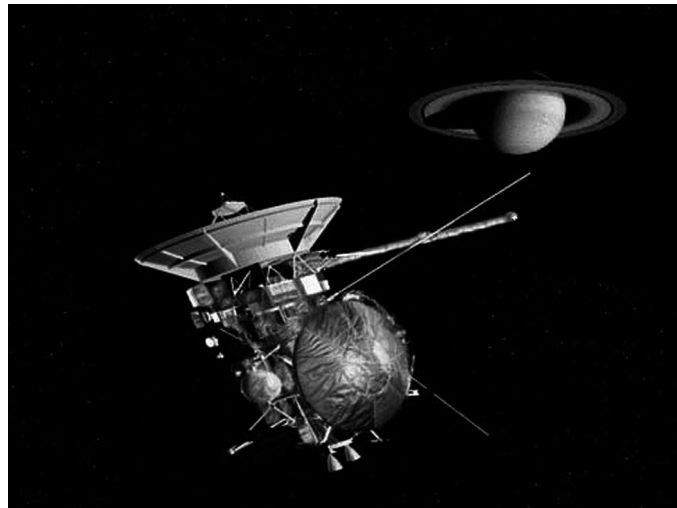


Fig. 3.2

(i) Describe how radar was used to obtain information about Titan.

.....

.....

..... [3]

(ii) Suggest what this information told scientists about the surface of Titan.

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

(iii) Suggest how the data was sent back to Earth.

..... [1]

(c) Saturn can be viewed from the Earth's surface using a telescope.

Describe how the Earth's atmosphere makes viewing objects in space more difficult.

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

(d) Astronomers usually look through telescopes at night.

Name the type of cells in the eye responsible for vision in low light.

..... [1]

[Total: 12]

4 The Amazon rainforest has suffered two major droughts in recent years.



dry rainforest

(a) Water is essential for trees to photosynthesise.

Describe what happens to water molecules during photosynthesis.



In your answer you should make clear how the steps in the process are sequenced.

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

(b) If trees are unable to photosynthesise, they will die.

Explain the effect this will have on the amount of carbon dioxide gas in the atmosphere.

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

(c) A change in atmospheric carbon dioxide levels could result in a positive feedback loop.

(i) What is meant by the term *positive feedback loop* in this context?

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

(ii) Suggest how a change in atmospheric carbon dioxide could trigger a positive feedback loop in the Amazon rainforest.

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

(d) The health of the trees in the rainforest can be monitored by satellite using electromagnetic radiation.

(i) State the type of electromagnetic radiation used in this way.

..... [1]

(ii) The radiation used has a wavelength of 790 nm.
 $1.0\text{ nm} = 1.0 \times 10^{-9}\text{ m}$

Calculate the frequency of the radiation, if its speed is $3.0 \times 10^8\text{ ms}^{-1}$.

Give your answer in standard form and to **2 significant figures**.

frequency = unit [4]

(e) Scientists are concerned about the extinction of plant species within the rainforest. Suggest **one** reason for their concern.

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

[Total: 19]

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

If additional answer space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margins.

This block contains a large area of lined paper for writing answers. It features a vertical margin line on the left side and horizontal dotted lines for writing. The lines are evenly spaced and extend across the width of the page.

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