

**ADVANCED GCE****BIOLOGY**

Environmental Biology

2805/03

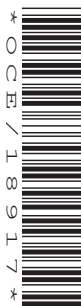
Candidates answer on the Question Paper

OCR Supplied Materials:

None

Other Materials Required:

- Electronic calculator
- Ruler (cm/mm)

Monday 25 January 2010**Afternoon****Duration:** 1 hour 30 minutes

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 **90**.
- You will be awarded marks for the quality of written communication where this is indicated in the question.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.
- This document consists of **20** pages. Any blank pages are indicated.

Examiner's Use Only:			
1			
2			
3			
4			
5			
6			
Total			

Answer **all** the questions.

- 1** It is estimated that each household in the UK throws away 4 kg of paper every week.

Most of this paper is made from cellulose fibre, sourced from pulped wood, cotton, grasses, sugar cane, straw or recycled waste paper.

In 2004, recycled paper provided the source materials for 76% of the 6.2 million tonnes of paper manufactured in the UK. However, such paper can only be recycled 4–6 times, as the cellulose fibres get shorter and weaker each time.

- (a)** Calculate the amount, in million tonnes, of manufactured paper that was made from non-recyclable sources in 2004.

Show your working and **express your answer to one decimal place.**

Answer = million tonnes **[2]**

- (b)** Explain why pulped wood, cotton, grasses, sugar cane and straw are good sources of cellulose fibre.

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 **[1]**

- (c)** A typical water pollutant from the manufacture of paper is chlorine, which is used to bleach the paper. This can have negative effects on most aquatic organisms especially simple algae.

Suggest how changes in chlorine levels in water might affect these photosynthetic organisms.

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 **[2]**

- (d) It is important for local councils to encourage recycling in their communities.

State **three** ways that councils could encourage every household to recycle paper.

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QUESTION 1 CONTINUES ON PAGE 4

- (e)** In this question, one mark is available for the quality of the use and organisation of scientific terms.

Many of the waste water products from industry enter sewage systems.

Describe **and** explain the processes involved in the treatment of sewage so that the discharge from it can be made safe and does not pollute the environment.

..... [8]

Quality of Written Communication [1]

[Total: 17]

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- 2** National Parks are areas of land which are of ecological significance where wild animals and plants can be conserved. These parks vary in size and location, some being found inland whilst others border the coast.

Table 2.1 shows some statistics for five National Parks in the UK.

Table 2.1

name of National Park	number of people living within boundary of National Park	total number of conservation areas within National Park	number of visitor days per year (million)
Norfolk Broads	5 700	18	5.4
Cairngorms	16 000	4	1.5
Dartmoor	29 100	21	4.0
Exmoor	10 600	16	1.4
Lake District	42 200	21	22.0

- (a)** Using information from Table 2.1, describe the major conservation issues faced by local authorities in the management of a National Park.

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- (b)** Explain how useful the data in Table 2.1 is for describing the effects of tourism on these five National Parks.

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- (c) Extensive forms of agriculture such as sheep farming are often employed within conservation areas of National Parks.

Describe the differences between **extensive** and **intensive** farming.

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- (d) Sites of Special Scientific Interest (SSSIs) are one type of conservation area within National Parks.

Explain the role of governmental agencies in protecting SSSIs.

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- (e) Exmoor National Park has specific areas of woodland providing good examples of sustainable forestry. Describe ways in which forestry can be sustainably managed.

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[Total: 15]

Turn over

- 3 Anti-fouling paints are used on the hulls of ships to stop sea creatures attaching themselves and causing damage. A commonly used chemical in anti-fouling paint was tributyl tin (TBT), which is particularly toxic.

TBT from ships' hulls slowly dissolves into the surrounding seawater and bioaccumulates through food chains.

A study of common mussels, *Mytilus edulis*, was carried out to investigate the relationship between shell thickness and the concentration of TBT found in their tissues. Scientists have suggested that the production of an abnormally thick shell is a response to TBT pollution.

Twenty five mussels were collected at eight different sites and the shell Thickness Index (TI) was determined. TI is a measure of shell thickness relative to the size of the organism.

The results are given in Table 3.1.

Table 3.1

study site	mean TBT in tissues ($\mu\text{g/g}$)	mean TI
1	1.66	0.50
2	3.56	0.56
3	0.27	0.48
4	0.45	0.45
5	0.74	0.44
6	1.75	0.48
7	0.04	0.42
8	0.04	0.39

- (a) Using the data in Table 3.1, describe the results of this study.

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- (b) Outline a statistical test that could be used on the data collected for this study.

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- (c) TBT accumulates in food chains and its concentration in tissues increases as it passes through trophic levels.

Suggest why this is the case.

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- (d) Mussel populations were used in this study because they are effective indicators of marine pollution. TBT is an endocrine toxin and chemical inhibitor.

Suggest **three** possible characteristics, **other** than shell thickness, that the scientists could have investigated to demonstrate the effects of TBT.

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QUESTION 3(e) STARTS ON PAGE 10

- (e) Describe, how named pollution indicators, **other than mussels**, could be used to assess **either** air pollution **or** water pollution.

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[Total: 15]

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- 4 There are over 40 000 plants at The Royal Botanic Gardens at Kew, which may be susceptible to attack by insect pests, such as whitefly, *Trialeurodes* spp.

Gardeners at Kew use biological control agents to help prevent pest attack.

Table 4.1 provides some information regarding the biological control agents of whitefly used at Kew.

Table 4.1

name of control agent	type of organism	mode of action	conditions required
<i>Verticillium lecanii</i>	fungus	infects and kills adults and larvae	high humidity
<i>Encarsia formosa</i>	parasitic wasp	eggs laid on larvae and adult emergence kills pest	low pest density
<i>Macrolophus calliginosus</i>	predatory walking bug	feeds on larvae	high pest density

- (a) Explain, using information from Table 4.1, why gardeners at Kew release only one control agent into one greenhouse at any particular time.

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- (b) Suggest why *E. formosa* would not be effective at high pest densities.

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(c) Explain why the gardeners at Kew prefer not to use pesticides.

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Some researchers investigated the effects of natural predators on another insect pest, Russian wheat aphid, *Diuraphis noxia*. The results from this study are shown in Fig. 4.1.

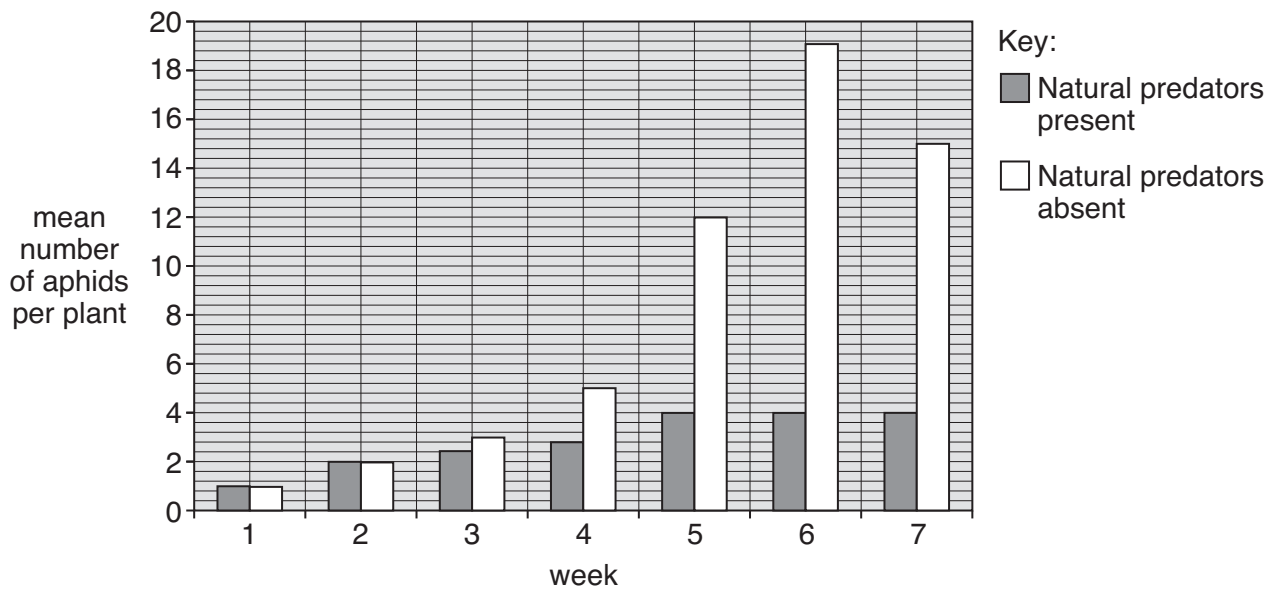


Fig. 4.1

(d) Describe the results of this study.

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- (e) Despite the environmental advantages of using biological control agents, most farmers still use pesticides to control pests. Suggest why this is the case.

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[Total: 16]

- 5 The release of polluted water into aquatic ecosystems can cause serious environmental problems. Reed beds can be used to clean polluted water.

The reed plants, which give reed beds their name, have underground stems called rhizomes. The plants release oxygen into the soil from their rhizomes, having transferred it from their leaves, via stems that are above ground.

Polluted water passes around the rhizomes and their attached roots, and is purified by the micro-organisms living in this region, which is known as the rhizosphere.

- (a) Explain the importance of oxygen in the rhizosphere.

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- (b) The biological oxygen demand (BOD) of polluted water can be significantly lowered as a result of passing the water through a reed bed.

Describe how you would compare the BOD of the water entering and leaving the reed bed.

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- (c) Reed beds are also efficient at removing the excess acidity from ground water that results from acid rain.

State **three** effects of acid rain.

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Describe how a **named** agricultural waste product could reduce the level of aquatic oxygen **and** explain the consequences of this reduction.

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[Total: 16]

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QUESTION 6 STARTS ON PAGE 18

- 6 Permafrost is a permanently frozen layer of soil, sediment or rock which remains at or below 0°C. Much of the world's permafrost is found at the polar regions and is thousands of years old.

Large quantities of methane and carbon dioxide are stored in permafrost.

Current scientific study has shown that global warming is causing a rapid melt of polar permafrost.

- (a) Explain why the rapid melting of permafrost is of great concern.

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- (b) Scientists have developed a way of storing carbon dioxide, similar to the natural process that has occurred in permafrost.

Carbon dioxide is liquefied and stored below ground level in salty, porous rock such as that found in disused mine shafts. This is a form of carbon capture.

Describe international efforts, **other than carbon capture**, that offset carbon dioxide emissions.

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- (c) Fig. 6.1 shows the atmospheric concentration of carbon dioxide (CO_2) in parts per million (ppm) measured in Hawaii from 1958 to the present day.

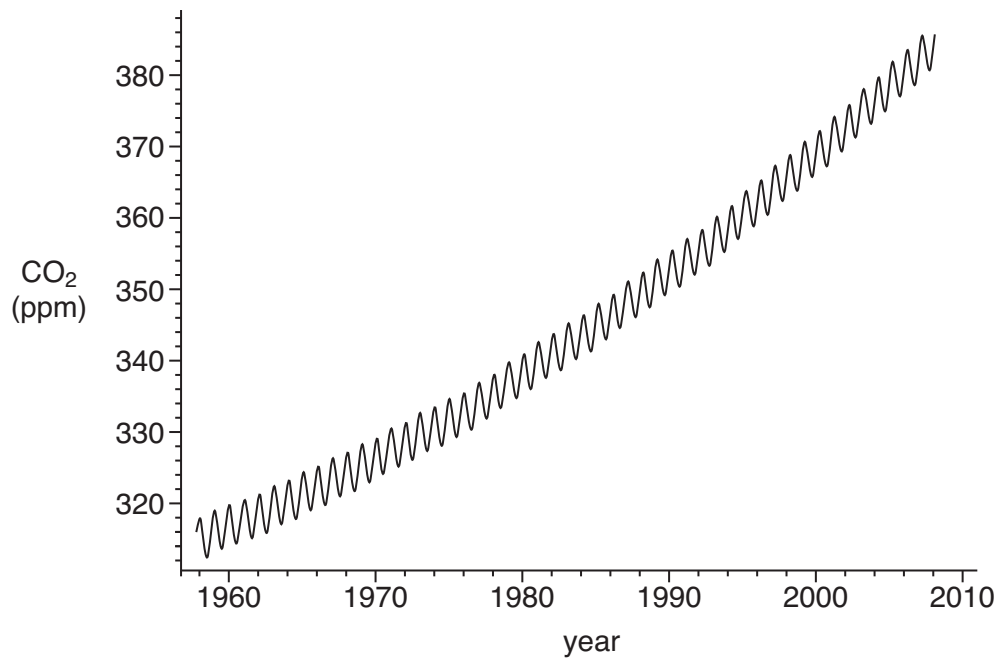


Fig. 6.1

- (i) Explain why the line of the graph fluctuates annually.

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- (ii) On Fig. 6.1, sketch the probable trend of atmospheric **methane** concentration from the period of 1958 to the present day. [1]

- (iii) Explain the shape of the trend line that you have drawn of Fig. 6.1.

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[Total: 11]

END OF QUESTION PAPER

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