

ADVANCED GCE 2805/03

**BIOLOGY** 

**Environmental Biology** 

**MONDAY 28 JANUARY 2008** 

Morning

Time: 1 hour 30 minutes

Candidates answer on the question paper. **Additional materials:** Electronic calculator Ruler (cm/mm)

Candidate Forename			Candidate Surname			
Centre Number			Candidate Number			

### **INSTRUCTIONS TO CANDIDATES**

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Answer **all** the questions.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Do not write in the bar codes.
- Do **not** write outside the box bordering each page.
- Write your answer to each question in the space provided.

### **INFORMATION FOR CANDIDATES**

- The number of marks for each question 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.

FOR EXAMINER'S USE		
Qu.	Max.	Mark
1	14	
2	18	
3	13	
4	16	
5	16	
6	13	
TOTAL	90	

[Turn over

This document consists of **15** printed pages, **1** blank page and an insert.

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## Answer all the questions.

1 Table 1.1 shows the mean percentage annual change in forest cover for three countries from 1990 to 2005. A negative number indicates deforestation within that country and a positive number indicates an increase in tree cover.

Table 1.1

country	total land area / thousands of hectares	total forested area in 2005 / thousands of hectares	mean percentage annual change of forest cover from 1990 to 2000	mean percentage annual change of forest cover from 2000 to 2005
Brazil	851 488	477 698	-0.52	-0.63
Rwanda	2634	480	0.82	7.91
Malaysia	32975	20890	-0.35	-0.65

(a)	(i)	With reference to Table 1.1, describe the <b>overall</b> changes in forest cover for Brazil <b>and</b> Rwanda for the period from 1990 to 2005.
		[2]
	(ii)	Calculate the percentage area of Brazil that was forested in 2005.
		Answer =% [1]
(b)		prestation often involves the removal of forest by humans cutting and burning trees. This ides building materials and fuels as well as land for agriculture, homes or industry.
	Stat	e three environmental problems of deforestation.
	1	
	2	
	3	
		[3]

(C)	The	rates of deforestation for Brazil and Malaysia between 1990 and 2005 are similar.
		gest why the data in Table 1.1 make it difficult to compare the impacts of deforestation ween these two countries.
		[2]
(d)	eco	ests usually provide habitats for a great number of species. The loss of species from systems is likely to affect food webs. However, predicting how the removal of one species a food web might affect others is difficult.
	Sug	gest why it might be difficult to predict such effects.
		[3]
(e)	Und sink	listurbed rainforests are thought to be globally important because they may act as carbon s.
	(i)	State what is meant by a carbon sink.
		[1]
	(ii)	One possible reason for an increase in tree cover in countries where rainforests are being cut down is the establishment of oil palm plantations. These have different carbon storage capacities compared with undisturbed rainforest.
		Suggest why this might be so.
		[2]

[Total: 14]

**2** Fig. 2.1 and Fig. 2.2, **on the insert**, show the results of a long-term study into the annual and monthly mean phytoplankton colour for the North Sea.

The colour intensity of phytoplankton is measured using a colour index. A high colour index value indicates a high chlorophyll concentration.

Phytoplankton are the primary source of food for all oceanic food chains. The colour intensity of the phytoplankton is directly proportional to the water temperature.

Phytoplankton is, therefore, a very sensitive indicator of sea temperature change.

(a)	Usir 200	ng Fig. 2.1, describe the <b>overall</b> pattern of phytoplankton colour intensity from 1950 until 0.
		[0]
(b)	Fig.	2.2 shows the monthly changes that occurred in the colour index value of the phytoplankton 1950 to 2000.
	(i)	Explain why colour intensity of the phytoplankton varies throughout the year.
		[2]
	(ii)	Using the monthly data in Fig. 2.2, compare the pattern for 1955 with the pattern for 2000.
		[3]

(c) Explain why the colour intensity of phytoplankton is directly proportional to the se				
		[3]		
(d)		ing this study, scientists also considered many abiotic and biotic factors that influenced phytoplankton.		
	(i)	Define the term abiotic.		
		[1]		
	(ii)	Suggest a <b>biotic</b> factor that the scientists might have measured which could have affected the growth of the phytoplankton <b>and</b> explain your choice.		
		[2]		
(e)	sug	entists, such as those working for the Intergovernmental Panel on Climate Change (IPCC), gest that global climate change is the main cause for such a rise in sea temperatures and dictive models suggest that this will continue to increase.		
		scribe <b>and</b> explain the changes to the atmosphere that are thought to be responsible for pal climate change.		
		[5]		

[Total: 18]

6

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**3** Golf courses are heavily treated with chemicals to control weeds and insect pests. The application rates for golf courses are about seven times those of agricultural land.

The United States Environmental Protection Agency has identified many of the organophosphate pesticides commonly used and linked these to various human health problems such as cancer, reproductive complications, neurotoxic damage and skin irritation.

A phenomenon termed 'treadmilling' is often seen on golf courses whereby pesticides need to be continuously reapplied during the summer months to control pest species.

(a)	Suggest where in the human body organophosphates might act to cause 'neurotoxic damage'.	2
	[1	
(b)	Explain why, even with treadmilling, pest species are often not eliminated.	-
	[3	]

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(c)	In this question, one mark is available for the quality of spelling, punctuation and grammar.
	The armyworm, <i>Spodoptera frugiperda</i> is the most common pest species that attacks grasses on golf courses in Florida, USA.
	The caterpillar stage of the armyworm has a natural control agent, <i>Cotesia marginiventris</i> , a parasitoid wasp. This wasp lays its eggs inside the caterpillar, and these hatch into larvae, which eat their host.
	Describe how you would <b>set up</b> and <b>establish</b> biological control of the pest <i>S. frugiperda</i> on a golf course <b>and</b> outline how you would evaluate the success of the biological control.

 [8]

Quality of Written Communication [1]

[Total: 13]

- 4 The Environment Agency assesses the aesthetic quality of waterways in England and Wales. This assessment is based on the colour and odour of the water as well as the presence or absence of litter and oil.
  - Colour and odour are assessed qualitatively at the bank side.
  - Litter items in the waterways and on the banks are counted.
  - Oil is assessed as a percentage cover of the water surface.

	Using this information	, a waterway	v is classified	into one	of four	grades:
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	grade 1 – good grade 2 – fair grade 3 – poor grade 4 – bad.
(a)	Suggest one advantage and one disadvantage of this method of assessing water quality.
	advantage
	disadvantage
	[2]
(b)	State <b>two</b> abiotic factors you would measure to assess the water quality <b>and</b> explain why you have chosen each factor.
	factor
	explanation
	factor
	explanation
	[4]

(c)	Suggest why a change in water colour might indicate signs of eutrophication.
	[2]
(d)	Industry is often responsible for poor river water quality and may also contribute to poor quality of the air.
	Suggest how a <b>named</b> indicator species may be used to assess water <b>or</b> air pollution in a given area.
	[3]
(e)	Describe how air pollution by <b>named</b> gases can acidify rivers and lakes <b>and</b> explain the effect of acidification on these aquatic ecosystems.
	[5]

[Total: 16]

**5** Fig. 5.1 shows the data collected for the percentage cover of scarlet oak, *Quercus coccinea*, on a 130 metre long transect through virgin forest.

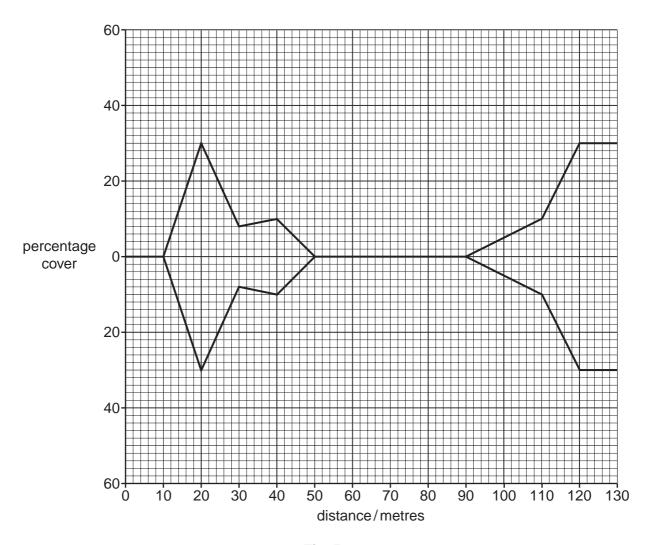


Fig. 5.1

(a)	With reference to Fig. 5.1, describe the distribution of <i>Q. coccinea</i> along the transect.
	[2]
(b)	Suggest <b>two</b> reasons why the trees are not evenly distributed along the transect.
	1
	2
	[2]

` ,	State <b>one</b> advantage of using a kite diagram to represent the data.
	[1
(d)	In this study the scientists used a belt transect.
	State <b>two</b> ways in which a belt transect differs from a line transect.
	1
	2
	[2

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

terms.
Q. coccinea is mainly found in upland regions where the soils are gravelly or sandy and dry.
Describe how you would carry out a soil <b>structure</b> analysis in these upland regions.
[8]

Quality of Written Communication [1]

[Total: 16]

6

Many local wildlife trusts raise funds to transform agricultural land into nature reserves. At Abbotts Hall Farm in Essex, the Essex Wildlife Trust together with the Worldwide Fund for Nature and

a١	Discuss some of the problems that a wildlife trust could face when attempting to convert
uj	former agricultural land into a nature reserve.
	[4]
b)	Suggest <b>two</b> economic <b>benefits</b> of creating and maintaining nature reserves.
	1
	2
	[2]
c)	Many of the picnic tables and chairs on nature reserves have come from companies that use sustainably produced timber.
	Suggest how timber production could be managed sustainably.
	[3]

(d)	Describe the steps that central government could take to increase the recycling done by local councils in the UK.
	[2]
(e)	Recycled paper consists mostly of cellulose and can be used as a mulch. Mulch is used to cover the surface of the soil and prevents weed growth without the need for pesticides. The mulch takes a long time to degrade.
	Suggest why mulch made from paper takes a long time to degrade.
	[2]
	[Total: 13]

### **END OF QUESTION PAPER**

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