

ADVANCED SUBSIDIARY (AS) General Certificate of Education January 2012

Centre Number 71 **Candidate Number**

Biology

Assessment Unit AS 2 assessing Organisms and Biodiversity

[AB121]





TIME

1 hour 30 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

Write your answers in the spaces provided in this question paper.

There is an extra lined page at the end of the paper if required. Answer all eight questions.

You are provided with Photograph 2.2 for use with Question 2 in this paper. Do not write your answers on this photograph.

INFORMATION FOR CANDIDATES

The total mark for this paper is 75.

Section A carries 60 marks. Section B carries 15 marks.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

You are reminded of the need for good English and clear presentation in your answers. Use accurate scientific terminology in all answers. You should spend approximately 20 minutes on Section B. You are expected to answer Section B in continuous prose. Quality of written communication will be assessed in Section E and awarded a maximum of 2 marks.
7587

For Exa	
Question Number	Marks
1	
2	
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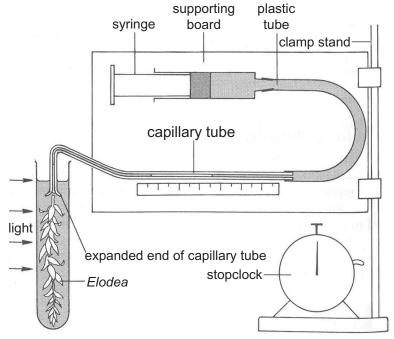
Section A

tify the terms described by each of the following statements.		
An index used to measure species diversity.		
A group of individuals that closely resemble each other and are capable of interbreeding to produce fertile offspring.		
The role of an organism in its environment.		
Ecological factors in soil, such as pH, aeration of soil and nutrient availability, that influence the distribution of organisms.		
	[4]	

notograph 2.2 shows a section through a leaf of a water lily.	Exami Marks
) State the term that is used to describe plants, such as water lilies, are adapted to grow in water.	
	_ [1]
Explain the role of the spaces labelled X that are evident in the photograph.	
State where you would expect to find stomata on a water lily leaf. Explain the importance of this location.	
Location	
Explanation	
	_ [3]

3 The diagram below shows the Audus apparatus. This is used to measure the rate of photosynthesis in a water plant like Canadian pondweed (*Elodea canadensis*). The volume of oxygen produced is used as a measure of the rate of photosynthesis.

Examin	er Only
Marks	Remark



© Advanced Biology Principles and Applications by C J Clegg with D G MacKeen, P H Openshaw and R C Reynolds, published by Hodder Murray, 1996

(a) The pondweed is placed in a solution of sodium hydrogen carbonate during the experiment. Explain the reason for this.

_____[1]

(b) A lamp was placed known distances from the pondweed to investigate the effect of light intensity on the rate of photosynthesis. State **one** factor which should have been monitored in order to ensure the validity of the experiment.

______[1]

(c) The graph below shows the trend line for the experimental results.

Volume of oxygen produced/mm³ min-1		
	Light intensity/arbitrary units	

Describe and explain the trend line shown.

		[3]

Examiner Only

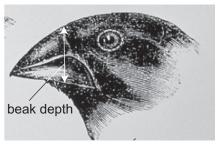
(co as	gdom Fungi includes edible mushrooms such as <i>Agaricus bisporus</i> mmon mushroom) and <i>Agaricus campestris</i> (field mushroom) as we a variety of moulds such as <i>Mucor mucedo</i> and <i>Penicillium</i> species. Fir cells are described as eukaryotic.	Marks	Remark
	cteria belong to the kingdom Prokaryotae whose cells are described karyotic.	as	
(a)	State two differences between prokaryotic and eukaryotic cells.		
	1		
	2		
		_ [4]	
(b)	Identify the species name of the field mushroom.		
		[1]	
	mbers of both kingdoms are involved in the decomposition of dead anisms with the resultant recycling of nutrients.		
(c)	Describe how the fungi carry out decomposition of dead or waste organic materials.		
		[3]	

Ear	ly cla	assification systems, such as that used by Carl Linnaeus, divided	Examin	er Only
	_	nisms into two kingdoms, Plantae and Animalia. Bacteria, fungi, ans and algae were all included in the Plantae.	Marks	Remark
sug	gest	ne middle of the twentieth century various scientists have ted more appropriate divisions of organisms, such as the 'five n' system: Prokaryotae, Protoctista, Fungi, Plantae and Animalia.		
(d)	_	ggest two reasons why it is inappropriate to classify fungi in the ntae.		
	1			
	2			
		[2]		
with	n cell	eds are algae which are autotrophic. They contain eukaryotic cells, lulose cell walls, which are aggregated into tissues showing limited tiation.		
(e)		ae are now classified as the Protoctista instead of the Plantae, but all scientists agree with this.		
	(i)	Suggest one reason why some scientists might think it is more appropriate to include the algae in the Plantae.		
		[1]		
	(ii)	Suggest one reason why many scientists think it is not appropriate to include algae in the Plantae.		
		[1]		

5 The medium ground finch, *Geospiza fortis*, is found on the island of Daphne Major in the Galapagos Islands, off the coast of Ecuador. The species was one of many noted by Charles Darwin, when he visited the islands in 1835.

Examiner Only Marks Remark

Since 1973, other scientists have been studying this finch in relation to natural selection. One characteristic they have studied is the depth of the finches' beaks.



© Dr Jeremy Burgess/Science Photo Library

In 1975, the mean beak depth in the *G. fortis* population on Daphne Major was 9.42 mm. In 1978, when a new generation of birds had reached maturity, it was 9.84 mm.

(a) Calculate the percentage increase in beak depth between 1975 and 1978. (Show your working.)

8

[2]

Some scientists have suggested an explanation for the increase in beak Examiner Only depth. Marks Remark They knew that a severe drought in 1976 affected Daphne Major, significantly limiting plant growth on the island. As a result, the availability of seeds became very low. Those birds with a greater beak depth were able to crack open and eat larger seeds than those with smaller beaks. These scientists argued that the larger beak size was selected for, since it represented increased fitness. (b) Explain what is meant by the term 'fitness'. (c) Suggest how the mean beak depth in the population might have increased between 1975 and 1978. ____ [4] (d) State the type of selection shown by the increase in beak depth in G. fortis.

[1]

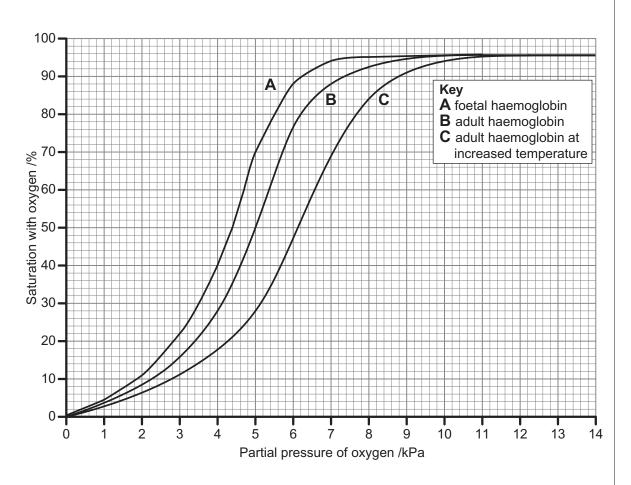
Some information about the classification of Geospiza fortis and three Examiner Only Marks Remark other finch species, Vidua macroura, Geospiza fuliginosa and Certhidea olivacea is given below. The small ground finch, Geospiza fuliginosa, is also found on the Galapagos Islands. G. fortis is a member of the order Passeriformes, as are finches of the genus Vidua (family Viduidae) Both G. fortis and the warbler finch, Certhidea olivacea, are members of the family Thraupidae. (e) State two distinct types of evidence which may be used to classify species. (f) (i) Which of the three species is most closely related to *G. fortis*? [1] (ii) Which species is most distantly related to *G. fortis*?

6 ((a)	When blood vessels are damaged, the process of blood clotting is initiated.	Exam Marks	Remar
		Describe the sequence of events which begins with a damaged blood vessel and results in the formation of a blood clot.		
		[/]		
		[4]		

(b) The graph below shows some oxygen dissociation curves for human haemoglobin.

Examiner Only

Marks Remark



(i) As temperature increases, the oxygen dissociation curve for adult haemoglobin becomes displaced to the right (curve **C**). Explain the physiological significance of this for exercising muscles.

_____[3]

	(ii)	The unloading tension is the partinate haemoglobin is 50% saturated.	ial pressure of oxy	gen at which	Examiner Only Marks Remark
		Use the graphs to determine the haemoglobin (curve A) and for ac			
		Foetal haemoglobin	kPa		
		Adult haemoglobin	kPa	[2]	
	(iii)	Suggest why it is important that the haemoglobin is different from the			
(c)		initial binding of an oxygen moleculing of subsequent oxygen molecu			
				[2]	

Woodlands are complex ecosystems containing plants that grow to different heights. The leaf cover of the taller trees creates shade for those below. Different tree species provide varying degrees of shading. A fallen tree reduces the shading at that point.

Examiner Only

Marks Remark

A student was investigating the difference in ground-level plant species at different locations in a deciduous woodland ecosystem. The procedure followed by the student is outlined below.

- A transect line was positioned from the centre of the wood to the edge.
- Six sample sites were identified at 20 metre intervals along the transect line.
- One quadrat was placed at each sample site and the names of the main species present in the quadrat were recorded.

The following results were recorded by the student:

- Mosses were found mainly at site 1, but there were also some present at sites 2, 3 and 5.
- Bluebells were found in abundance at sites 2, 3 and 5 and a few were also present at site 4.
- Wood anemone was found at sites 2, 3 and 5
- Primroses were found at sites 4 and 6.
- Lesser celandine was found mainly at sites 2 and 3, but there was also a little of this at site 1.
- Grass was present at all sites but it was densest at sites 4 and 6.
- (a) Organise these results into an appropriate table to show the presence or absence of each of the species recorded by this student. The relative abundance of plants does not need to be distinguished. Your table should have a caption and suitable column headings.

The following notes on the different sample sites were also made by the Examiner Only Marks Remark student: Sample point 1 was in the centre of the woodland. The tree cover was very dense, so it was the darkest and wettest of the six sample sites. A dead tree lay near the quadrat at sample site 4, so the tree cover was less dense, and sample site 6 was at the edge of the woodland. These two sample sites were only lightly shaded and were also the driest areas of the woodland. Sample sites 2, 3 and 5 appeared to have similar levels of light and moisture. They were drier and lighter than site 1, but darker and moister than sites 4 and 6. (b) Using the information from your table and the notes made by the student on the different sites, describe the conditions favoured by each of the following plants. Mosses _____ Bluebells _____ Primroses _____ (c) Explain why the student chose to place a transect line through the woodland, rather than selecting six random sites.

		•	•
(d)	This student simply recorded the presence of certain species at each site, although he did comment on the relative amount of some of the species. He also made general observations on the relative light and moisture conditions at each site.	Examine Marks	er Only Remark
	Explain how this student could have obtained more meaningful and reliable results at each sample site.		
	[3]		

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(Questions continue overleaf)

Examiner Only

Marks Remark

Section B

Quality of written communication is awarded a maximum of 2 marks in this section.

8

ection.			
(a)	Give an account of the role of surface area and volume in the metabolism of an organism and the effect of increasing body size on the relationship between these two factors.]	
(b)	Using the lungs and the blood system as examples, explain how mammals have compensated for increasing body size. [8]	1	
	Quality of written communication [2]	1	
(a)	Give an account of the role of surface area and volume in the metabolism of an organism and the effect of increasing body size on the relationship between these two factors.		
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		Marks	Remark
(b)	Using the lungs and the blood system as examples, explain how		
` ,	mammals have compensated for increasing body size.		

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GCE Biology Advanced Subsidiary (AS) Assessment Unit AS 2 assessing Organisms and Biodiversity January 2012

Photograph 2.2

(For use with Question 2)

