Surname		Other Names	
Centre Number			Candidate Number									
Candidate Signature												

For Examiner's Use

General Certificate of Education
June 2007
Advanced Level Examination

ASSESSMENT and QUALIFICATIONS ALLIANCE

BIOLOGY (SPECIFICATION B) **BYB6/A**
Unit 6 Section A Applied Ecology

Friday 22 June 2007 1.30 pm to 3.45 pm

For this paper you must have:
- Section B provided as an insert (enclosed).
- a ruler with millimetre measurements.

You may use a calculator.

Time allowed: The total time for Section A and Section B of this paper is 2 hours 15 minutes

Instructions

- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- Answer the questions in the spaces provided.
- **Section A** and **Section B** will be marked by different examiners. You must ensure that any supplementary sheets are fastened to the appropriate question paper answer book.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The maximum mark for **Section A** is 50.
- The marks for questions are shown in brackets.
- You are reminded of the need for good English and clear presentation in your answers.
- Use accurate scientific terminology in your answers, where appropriate.
- You are advised to spend 1 hour on **Section A**.
- You are reminded that **Section A** requires you to use your knowledge of different parts of the specification as well as Module 6 in answering synoptic questions. These questions are indicated by the letter **S**.

For Examiner's Use			
Question	Mark	Question	Mark
1			
2			
3			
4			
5			
6			
7			
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			

There are no questions printed on this page

SECTION A

Answer **all** questions in the spaces provided.

1 (a) Nodules on the roots of some plants enable them to survive in soils with a low concentration of nitrate ions. Explain how.

.....

.....

.....

.....

(2 marks)

(b) Waterlogged soil may have a low concentration of nitrate ions. Explain why.

.....

.....

.....

.....

(2 marks)

4

Turn over for the next question

2 (a) Explain how oil spillages that float on the surface of sea water kill

(i) sea birds

.....

.....

(1 mark)

(ii) photosynthesising algae.

.....

.....

(1 mark)

(b) When an oil tanker has unloaded oil, sea water is pumped into the tanker's ballast tanks. This is called ballast water. When the tanker goes to load up with more oil, the ballast water is emptied into the sea. Ballast water can transport organisms from one part of the ocean to another.

(i) The introduction of a new species can have harmful effects on populations of local species. Explain how.

.....

.....

.....

.....

(2 marks)

S (ii) From 2009, ballast water must be treated to kill microorganisms before it is returned to the sea. Ultraviolet (UV) light can be used to kill microorganisms. Explain how UV light kills microorganisms.

.....

.....

.....

.....

(2 marks)

6

3 Free-tailed bats are mammals that spend the summer in the United States. They fly to central America for the winter. The mean winter temperature is higher in central America than it is in the United States.

(a) What name is given to the movement of animals from one area to another when the seasons change?

.....

(1 mark)

(b) Give **two** explanations of the advantage to the bats of their movement to central America for the winter.

1 .....

.....

2 .....

.....

(2 marks)

S (c) A very low environmental temperature may lead to a fall in core body temperature in the bats.

(i) Describe how mammals such as bats detect a fall in their core body temperature.

.....

.....

.....

.....

(2 marks)

(ii) Describe **three** physiological responses to this fall.

1 .....

.....

2 .....

.....

3 .....

.....

(3 marks)

8

4 (a) Explain how the following sea fishing regulations protect fish stocks.

Net size restrictions

.....

.....

Close seasons

.....

.....

(2 marks)

(b) The table shows data about one species of fish in four different fisheries.

	Biomass of fish / thousands of tonnes per year			
Fishery	**In populations at start of year**	**Added by growth of young fish**	**Caught by fishing**	**Lost other than by fishing**
A	46	28	17	11
B	58	31	24	14
C	96	58	35	28
D	101	33	18	19

Which fishery is most likely to maintain a stable fish population? Explain your answer.

Fishery .....

Explanation .....

.....

.....

.....

.....

.....

(3 marks)

LEAVE MARGIN BLANK

S (c) Sea water can be polluted with mercury compounds that accumulate in food chains. Mercury binds to sulphur-containing groups in proteins. This prevents enzymes catalysing reactions. Explain how.

.....

.....

.....

.....

(2 marks)

7

Turn over for the next question

5 (a) Some students wanted to capture organisms living among the stones on the bed of a stream. They wanted to use the results to calculate an index of diversity. Describe a suitable method for capturing the organisms.

.....

.....

.....

.....

(2 marks)

(b) The table shows information about five species captured at two different sites in the stream.

Species	Number of organisms per m^2 of stream bed at site X	Number of organisms per m^2 of stream bed at site Y
E	23	0
F	12	0
G	14	0
H	0	60
I	4	2

S (i) The organisms that the students classified as species **E** were two different colours. Describe **one** way to show that the organisms of both colours belong to the same species.

.....

.....

(1 mark)

(ii) An index of diversity can be calculated using the following formula

$$d = \frac{N(N-1)}{\sum n(n-1)}$$

where N = total number of organisms of all species
and n = total number of organisms of each species.

Calculate the index of diversity for site **Y**.

Index of diversity = ... *(2 marks)*

(c) The students thought that site **Y** was polluted. Give **two** advantages of using an index of diversity rather than an indicator species to assess the level of organic pollution.

1 .....

.....

2 .....

.....

(2 marks)

7

Turn over for the next question

6 Organic and inorganic fertilisers increase crop yield.

(a) Other than cost, give **one** advantage and **one** disadvantage of using an organic fertiliser.

Advantage .....

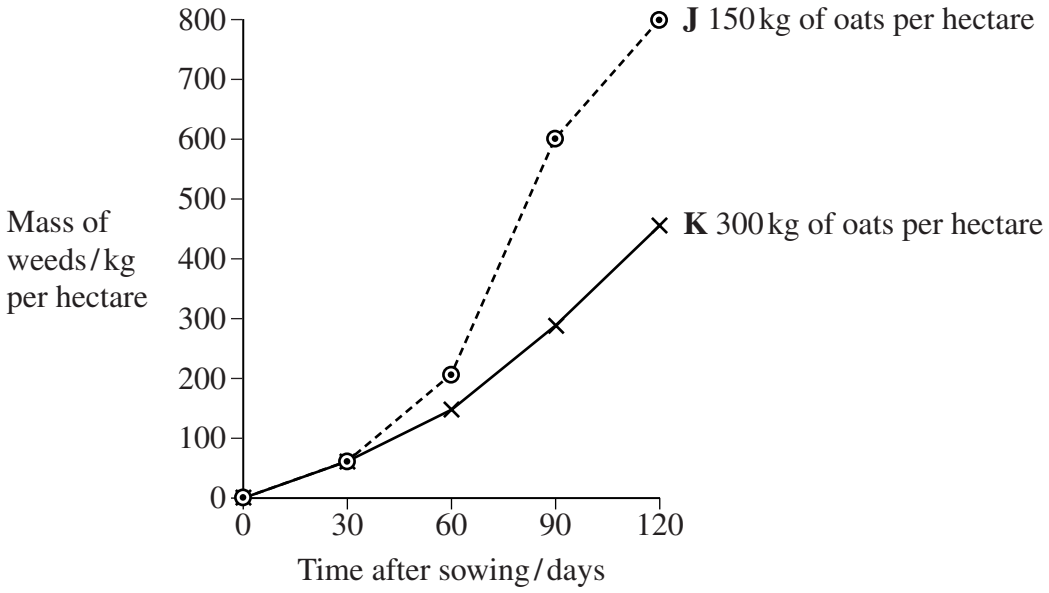
.....

Disadvantage .....

.....

(2 marks)

(b) Scientists investigated the effect on weed growth of sowing oats at two different densities, **J** and **K**. The graph shows their results.



(i) Describe the results of the investigation.

.....

.....

(1 mark)

S (ii) Use your knowledge of photosynthesis to explain the results.

.....

.....

.....

.....

.....

.....

.....

.....

(4 marks)

(iii) Over the 120 days, the leaf area index increased in both the oat crop and the weeds. What is meant by *leaf area index*?

.....

.....

(1 mark)

8

Turn over for the next question

7 Dugongs are marine mammals. They are found in shallow water where they dive and graze on sea grass growing on the seabed. An adult dugong weighs between 250 kg and 400 kg. Scientists investigated the population density of dugongs at different locations. They carried out aerial surveys by flying over the areas concerned.

The table below shows the results of an aerial survey of one species of dugong.

Location	Area / km^2	Population estimate	Population density / dugongs per km^2
L	3400	2000	0.59
M	14 300	10 000	0.70
N	31 000	9000	0.29

(a) (i) Why is an aerial survey a suitable method for assessing dugong numbers?

.....

.....

(1 mark)

(ii) What is the advantage of calculating population density rather than using the total population estimate?

.....

.....

(1 mark)

(iii) At which location would you consider the population to be in most danger of extinction? Explain your answer.

Location .....

Explanation .....

.....

(1 mark)

(b) (i) Dugongs are threatened with extinction as a result of human activity. Describe **two** ways in which the species could be conserved.

1 .....

.....

2 .....

.....

(2 marks)

(ii) Suggest **two** reasons for protecting dugongs from extinction.

1 .....

.....

2 .....

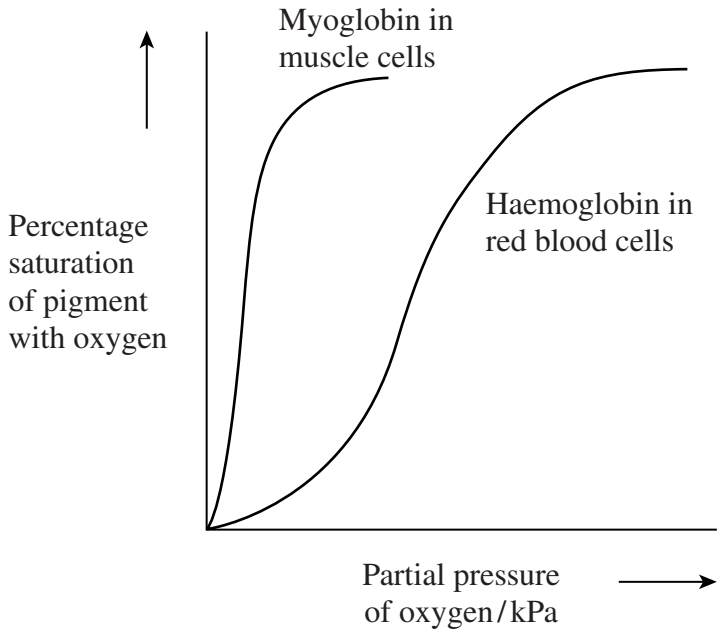
.....

(2 marks)

Question 7 continues on the next page

S (c) Dugongs come to the surface to breathe. They then dive for four to six minutes. Their muscle cells contain high concentrations of the pigment myoglobin, which binds to oxygen in a similar way to haemoglobin.

The graph shows the oxygen dissociation curves for myoglobin and haemoglobin.



During a dive, the concentration of oxygen in the muscle cells falls to a very low partial pressure.

(i) Explain how myoglobin stores oxygen when the dugong breathes.

.....

.....

.....

.....

(2 marks)

(ii) Explain the advantage to the dugong of the curve for myoglobin being different from the curve for haemoglobin.

.....

.....

(1 mark)

10

END OF SECTION A

SECTION B IS PROVIDED AS AN INSERT

There are no questions printed on this page

There are no questions printed on this page