Centre No.						Paper Reference (complete below)							Surname	Initial(s)
Candidate No.										/			Signature	

Paper Reference(s)

6106/03

Edexcel GCE

Biology

Biology (Human)

Advanced

Unit Test **6** Paper 03 Synoptic Paper

Friday 25 June 2004 – Afternoon

Time: 1 hour 10 minutes

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
2	
3	
4B	
5H	
Total	

Materials required for examination
Answer Book (AB04)
Ruler

Items included with question papers
Nil

Instructions to Candidates

In the boxes above, write your centre number, candidate number, the paper reference, your signature, your surname and initials. The paper reference is shown above.
Check that you have the correct question paper.
Answer Questions 1 and 2 in the spaces provided in this booklet.
You must then answer ***either*** Question ***3 or either*** 4B ***or*** 5H in a separate answer book.
Complete the details on the front of the answer book and fasten it loosely but securely inside this booklet.
If you need to use additional answer sheets, attach them loosely but securely inside this booklet.
Show all the steps in any calculations and state the units. Calculators may be used.
Include diagrams in your answers where these are helpful.

Information for Candidates

The marks for individual questions and parts of questions are shown in round brackets: e.g. (2).
The total mark for this paper is **38.**

Advice to Candidates

You will be assessed on your ability to organise and present information, ideas, descriptions and arguments clearly and logically, taking account of your use of grammar, punctuation and spelling.
This question paper is designed to give you the opportunity to make connections between different areas of biology and to use skills and ideas developed throughout the course in new contexts. You should include in your answers any relevant information from the whole of your course.

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Answer Questions 1 and 2 in the spaces provided.

Leave blank

1. Sickle cell disease is caused by a point mutation which results in the substitution of valine for glutamic acid in haemoglobin. This leads to the formation of haemoglobin S.

(a) Explain why a point mutation may result in a change in the primary structure of a protein.

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(2)

(b) People who are unaffected by sickle cell disease are homozygous for the gene for haemoglobin **A** (Hb^A Hb^A). People who are heterozygous (Hb^A Hb^S) are carriers of sickle cell disease.

Use a genetic diagram to find the probability that two parents who are heterozygous for sickle cell disease could have a child with sickle cell disease.

(3)

(c) People with genotypes $Hb^A Hb^A$ and $Hb^A Hb^S$ can be distinguished using techniques of DNA analysis. A sample of their DNA is treated with the restriction endonuclease Mst II and the DNA fragments produced are detected using a radioactive DNA probe.

Leave blank

Suggest why the DNA fragments produced from a carrier differ from the fragments produced from a person who is homozygous $Hb^A Hb^A$.

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(3)

Q1

(Total 8 marks)

2. Read through the following passage on ladybirds and then answer the questions that follow.

Leave blank

Ladybirds are beetles in which the forewings (elytra) have evolved to be thick and hard. The elytra protect the fiagile flight wings, which are kept folded underneath when the ladybird is not flying. The most familiar species are those in which the elytra are coloured yellow, orange or red and have black spots. The brightly coloured elytra, together with the ability to produce toxic chemical substances when touched, act as warning signals to potential predators. Birds, such as blue tits, will eat ladybirds but only if other food is scarce.

Ladybirds overwinter as adults and become active fiom May, when they come out of hibernation (a period of reduced metabolic activity). In October they enter hibernation again. During the summer months (June, July and August), there are larvae and adults feeding on aphids, scale-insects and mites, many of which are pests of crop plants. Both adults and larvae feed on the same food. The rate at which the larvae grow is largely dependent on the temperature, but also depends on the quality and quantity of the food available.

A single ladybird might eat 500 aphids during its lifetime. Some ladybird species will feed only on a single type of aphid found on a single type of plant. Other ladybird species are not restricted in their prey and feed on a wide range of aphid species.

(a) Using the information above, draw a diagram of **one** food chain. Label your diagram fully to indicate the trophic levels.

(3)

(b) Explain why temperature affects the rate of growth of ladybird larvae.

Leave blank

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(2)

(c) Suggest why aphids, scale-insects and mites are considered to be pests of crop plants.

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(3)

(d) It has been suggested that ladybirds could be used instead of pesticides to control insect pests. What evidence is there in this passage to indicate that this might be possible?

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(3)

This question continues on page 6

(e) Suggest reasons why it could be difficult to introduce and use ladybirds as biological control agents on a large commercial scale.

Leave blank

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(4)

Q2

(Total 15 marks)

Write an essay on ONE of the following topics.

Leave blank

For Biology you should choose EITHER Question 3 OR Question 4B.

3. The production and transport of metabolic wastes in mammals.

(15 marks)

4B. The effects of light on flowering plants.

(15 marks)

For Biology (Human) you should choose EITHER Question 3 OR Question 5H.

3. The production and transport of metabolic wastes in mammals.

(15 marks)

5H. The growth of human populations and their impact on the environment.

(15 marks)

Write your essay in a separate answer book. Complete all of the details on the front cover of the answer book and fasten it loosely but securely inside this booklet.

Marks will be awarded for scientific content, coverage of the topic, and the quality of written communication. You should include in your answers any relevant information from the whole of your course. You may include diagrams if you wish, but make sure that they are relevant to your essay and add extra information to it.

TOTAL FOR PAPER: 38 MARKS

END