Surname		Other Names	
Centre Number			Candidate Number									
Candidate Signature												

For Examiner's Use

General Certificate of Education
June 2007
Advanced Subsidiary Examination

ASSESSMENT and QUALIFICATIONS ALLIANCE

BIOLOGY (SPECIFICATION A) **BYA2**
Unit 2 Making Use of Biology

Monday 4 June 2007 9.00 am to 10.30 am

For this paper you must have:
- a ruler with millimetre measurements.

You may use a calculator.

Time allowed: 1 hour 30 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.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The maximum mark for this paper is 75.
- The marks for questions are shown in brackets.
- You will be marked on your ability to use good English, to organise information clearly and to use accurate scientific terminology where appropriate.

For Examiner's Use			
Question	Mark	Question	Mark
1		9	
2			
3			
4			
5			
6			
7			
8			
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			

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

1 The table shows some mRNA base sequences and the amino acid sequences that would be produced from them.

mRNA base sequence	**Amino acid sequence**
AGU AGU AGU AGU AGU	ser-ser-ser-ser-ser
CAC ACA CAC ACA CAC	his-thr-his-thr-his
CAA CAA CAA CAA CAA	gln-gln-gln-gln-gln
AAC AAC AAC AAC AAC	asn-asn-asn-asn-asn
ACC ACC ACC ACC ACC	thr-thr-thr-thr-thr
ACA CAC ACA CAC ACA	

(a) Complete the table to show the sequence of amino acids produced from the final mRNA base sequence. *(1 mark)*

(b) Use the information in the table to give

(i) **one** sequence of DNA bases that codes for the amino acid ser,

.....

.....

(ii) **one** anticodon for the amino acid ser.

.....

.....

(2 marks)

(c) The genetic code is described as non-overlapping and degenerate.
Explain the evidence from the table that this code is

(i) non-overlapping,

.....

.....

.....

.....

(ii) degenerate.

.....

.....

.....

.....

(4 marks)

7

2 (a) Describe the role of the following structures in mitosis.

(i) Centromere .....

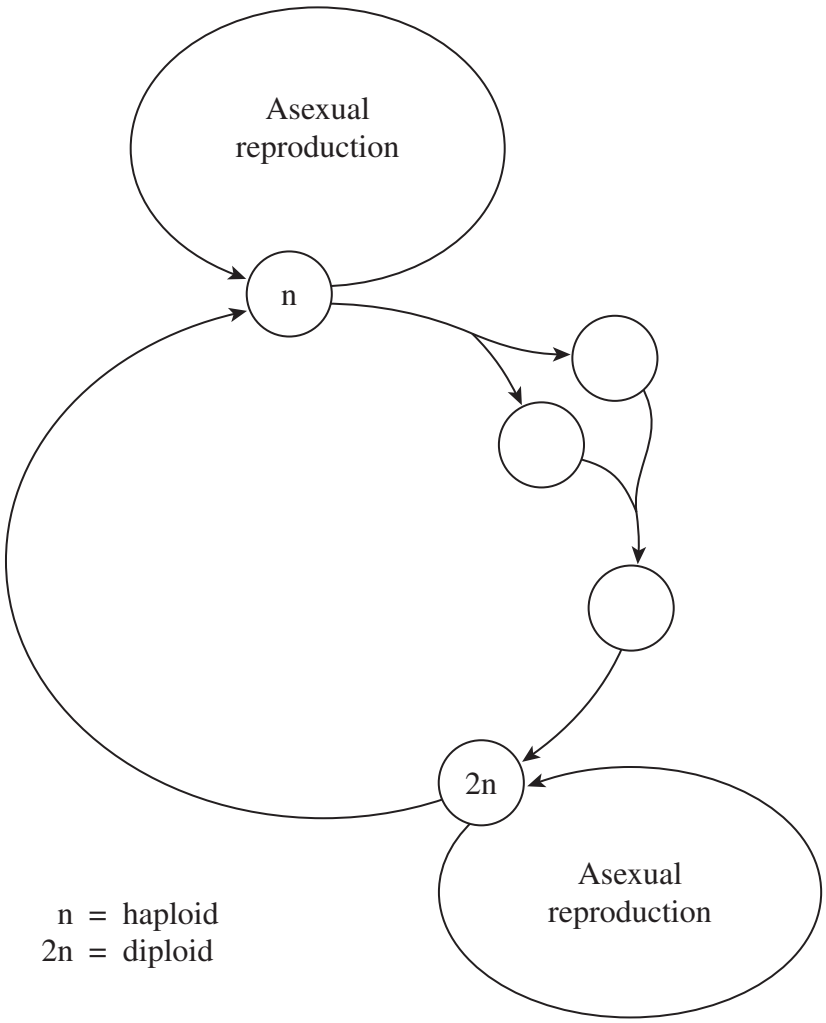
.....

(ii) Spindle fibres .....

.....

(2 marks)

(b) Yeast is a single-celled organism. It can reproduce sexually or asexually. The diagram shows the life cycle of yeast.



(i) The diagram shows some haploid stages and some diploid stages. Complete the diagram to show the stages that are haploid and the stages that are diploid. Write 'n' in the appropriate circle to show a haploid stage and '2n' to show a diploid stage.

(1 mark)

(ii) Write '**X**' on the appropriate arrow to show the stage in which yeast divides by meiosis.

(1 mark)

4

3 In an investigation, bean plants were grown in several plots under standardised conditions. Weeding of each plot was started at a different time over a nine-week period. The yield of beans in each plot was measured. The graph shows the results.

(a) The beans were grown under standardised conditions. Explain why.

.....

.....

(1 mark)

(b) (i) The time when weeding started affected the yield of beans. Describe how.

.....

.....

.....

.....

(2 marks)

(ii) Give an explanation for your answer to part (i).

.....

.....

.....

.....

(2 marks)

5

4 (a) The polymerase chain reaction (PCR) is used in investigating crime. Explain why.

.....

.....

(1 mark)

(b) Scientists have found a new method of copying DNA that is faster than PCR. The new method is called HDA. HDA uses an enzyme to separate the two strands of DNA. This means that DNA can be copied at a constant temperature of 37 °C. In all other ways, HDA works in exactly the same way as PCR.

(i) Substances must be added when DNA is being copied in both PCR and HDA. Give **two** of these substances.

1 .....

.....

2 .....

.....

(2 marks)

(ii) HDA is faster than PCR. Explain why.

.....

.....

(1 mark)

4

Turn over for the next question

5 A species of bacterium produces amylase as an extracellular enzyme.

(a) Describe how to obtain large amounts of amylase from these bacteria.

.....

.....

.....

.....

.....

.....

(3 marks)

(b) Amylase hydrolyses starch. The amylase can be immobilised in alginate beads.

Give **two** advantages of using immobilised amylase to hydrolyse starch.

1 .....

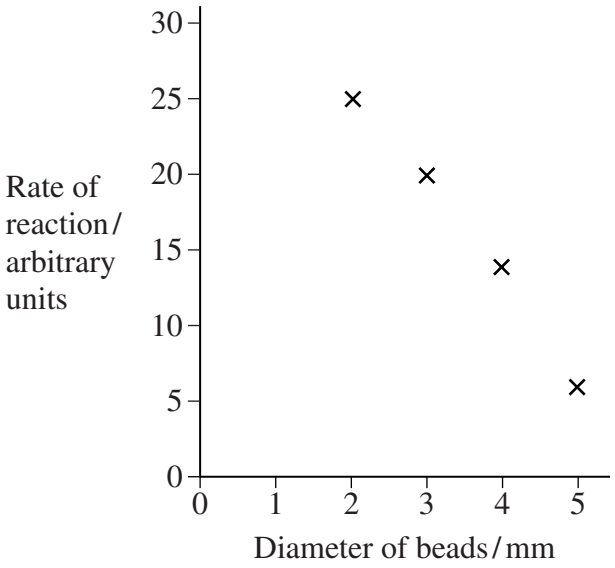
.....

2 .....

.....

(2 marks)

(c) Scientists investigated the effect of bead size on the rate of starch hydrolysis. The concentration of amylase was the same in each bead. The graph shows the results.



(i) Explain the results shown in the graph.

.....

.....

.....

.....

(2 marks)

(ii) You could use the graph to predict the results for beads of 1 mm diameter. Explain how.

.....

.....

.....

.....

(2 marks)

9

Turn over for the next question

6 (a) The table shows two enzymes used in genetic engineering.
Complete the table to show their functions.

Enzyme	Function
Reverse transcriptase	
DNA ligase	

(2 marks)

(b) Chymosin is an enzyme used to coagulate milk in cheese-making. It was obtained from the stomachs of calves. Now it can be made using gene technology.

The scientists who first used gene technology to produce this enzyme inserted the chymosin gene into plasmids. The plasmids were then mixed with yeast cells. Some of the yeast cells took up the plasmids and some did not. The yeast cells which took up the plasmids produced chymosin.

(i) What is a marker gene?

.....

.....

(1 mark)

(ii) A marker gene could be used to obtain a sample of yeast cells which all contain the chymosin gene. Explain how.

.....

.....

.....

.....

(2 marks)

(iii) Antibiotic resistance genes are often used as marker genes.
Explain why some people are concerned about this use of antibiotic resistance genes.

.....

.....

.....

.....

(2 marks)

(iv) Suggest **one** advantage of making cheese with chymosin from yeast, rather than from calves.

.....

.....

(1 mark)

8

Turn over for the next question

7 (a) Give **two** features of sorghum and explain how each adapts the plant to grow in hot, dry conditions.

Feature .....

Explanation .....

.....

Feature .....

Explanation .....

.....

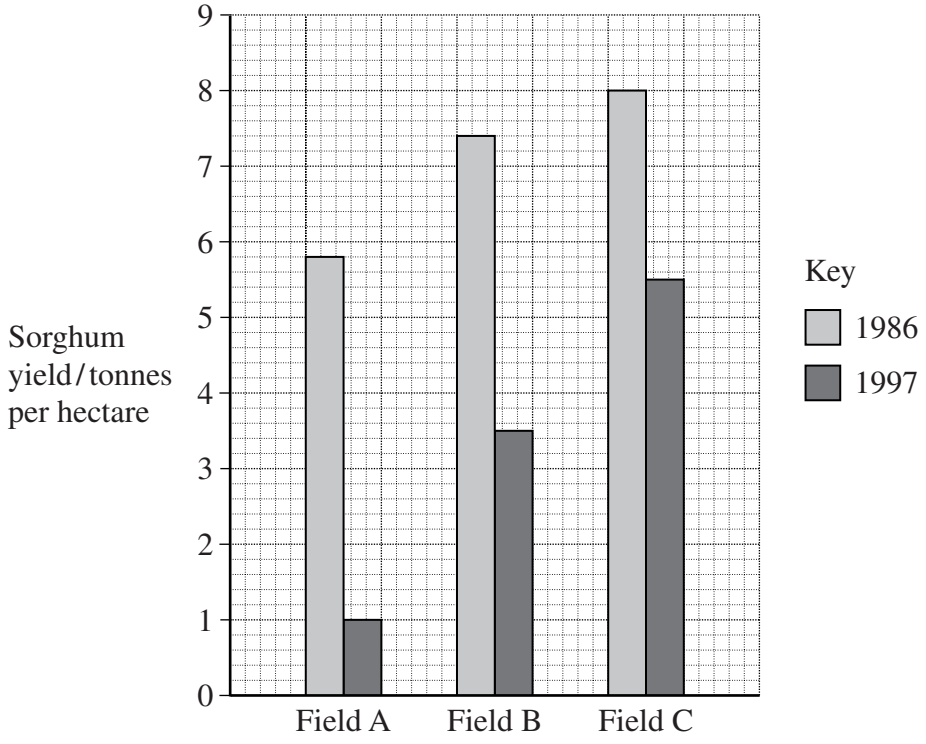
(4 marks)

(b) Scientists investigated the growth of sorghum in three fields, **A**, **B** and **C**. They treated the fields in the following way

Field **A** received no fertiliser.
Field **B** had fertiliser containing nitrate and phosphate added each year.
Field **C** had fertiliser containing nitrate, phosphate and potassium added each year.

They planted a new sorghum crop in each field at the beginning of each year. At the end of the year they harvested the sorghum crop and measured its yield.

The graph shows the results.



(i) Explain the differences in yield between the three fields in 1986.

.....

.....

.....

.....

(2 marks)

(ii) A change took place in the yield of sorghum in field **B** between 1986 and 1997. Suggest an explanation for this change.

.....

.....

.....

.....

(2 marks)

8

Turn over for the next question

8 Read the following passage.

Malaria is a disease which kills over two million people every year. It is caused by a microorganism that lives in the blood. This microorganism is spread from people with malaria to uninfected people by mosquitoes.

A common fungus could become a valuable weapon in the fight against malaria. It kills the mosquitoes that carry the malaria-causing microorganism. As a result of a laboratory investigation, scientists have found that spraying with the fungus could help to prevent the spread of malaria.

A second investigation was then carried out. Fungal spores were sprayed on walls of houses. Scientists found that, when a mosquito came into contact with the spores, the spores germinated and the fungus grew slowly in the body of the mosquito. The mosquito then died.

The use of the fungus in killing mosquitoes was an important discovery because many mosquitoes have developed resistance to chemical insecticides. Those insecticides that are still effective, such as DDT, are now banned because they can accumulate in food chains.

Use information from the passage and your own knowledge to answer the following questions.

(a) (i) What is meant by biological control ?

.....

.....

.....

.....

(2 marks)

(ii) Describe the advantages and disadvantages of using biological control to kill mosquitoes that transmit malaria.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(6 marks)

(b) Explain why scientists carried out the second investigation (line 8).

.....

.....

.....

.....

(2 marks)

(c) Explain how insecticides such as DDT accumulate in food chains (lines 14–15).

.....

.....

.....

.....

.....

.....

(3 marks)

(d) Scientists suggested that, as a result of these investigations, the fungus could be used to control mosquitoes. They thought that it would be necessary to use an insecticide as well as the fungus for the first few weeks.
Explain why it would be necessary to use an insecticide as well as the fungus for the first few weeks.

.....

.....

.....

.....

(2 marks)

15

9 (a) The oestrous cycle in a female mammal is controlled by hormones.
Describe the part played by FSH and LH in the control of the oestrous cycle.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(6 marks)

(b) The oestrous cycle of female sheep can be synchronised by giving them low doses of progesterone. When the progesterone treatment is stopped, these sheep come into oestrus a few days later.

Explain why these sheep come into oestrus a few days after progesterone treatment is stopped.

.....

.....

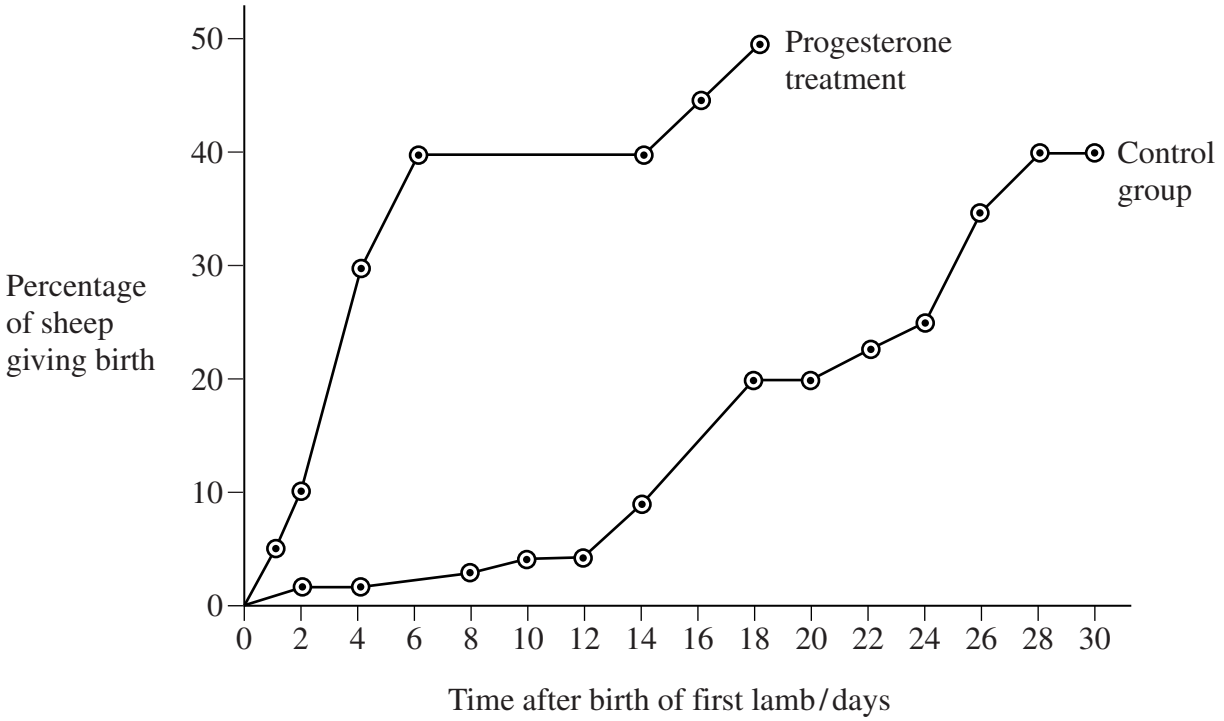
.....

.....

(2 marks)

(c) In an investigation, a group of female sheep was given progesterone treatment. A second group acted as a control.

In each group, the number of sheep giving birth was recorded. The graph shows the results.



(i) Suggest how the control group should have been treated.

.....

.....

.....

.....

(2 marks)

(ii) Using the information in the graph, suggest the advantage to a farmer of using progesterone treatment.

.....

.....

.....

.....

(2 marks)

Question 9 continues on the next page

In a second investigation, a group of female sheep which were given progesterone treatment and a control group were kept in a field with male sheep. The table shows some data from this investigation.

	Control group	**Progesterone treatment**
Total number of female sheep	185	216
Mean number of lambs born to each female sheep	1.86	1.95

(d) (i) Suppose the sheep in the control group had been given progesterone treatment. How many more lambs would you have expected as a result of progesterone treatment?
Show your working.

Answer ..... *(2 marks)*

(ii) Progesterone treatment could produce more lambs, but a farmer may decide **not** to use the treatment.
Explain why.

.....

.....

(1 mark)

15

END OF QUESTIONS

ACKNOWLEDGEMENT OF COPYRIGHT-HOLDERS AND PUBLISHERS

Question 3. T A HILL, *The Biology of Weeds, IoB Studies in Biology,* Edward Arnold 1977. "Reproduced by permission of Edward Arnold".

Question 8. Adapted from an article by Mark Henderson, *The Times*, London

Permission to reproduce all copyright material has been applied for. In some cases efforts to contact copyright-holders have been unsuccessful and AQA will be happy to rectify any omissions of acknowledgements in future papers if notified.