Surname		Other Names	
Centre Number			Candidate Number									
Candidate Signature												

For Examiner's Use

General Certificate of Education
June 2008
Advanced Subsidiary Examination

ASSESSMENT and QUALIFICATIONS ALLIANCE

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

Tuesday 3 June 2008 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 black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. **Answers written in margins or on blank pages will not be marked.**
- Do all rough work in this book. Cross through any work you do not want to be marked.

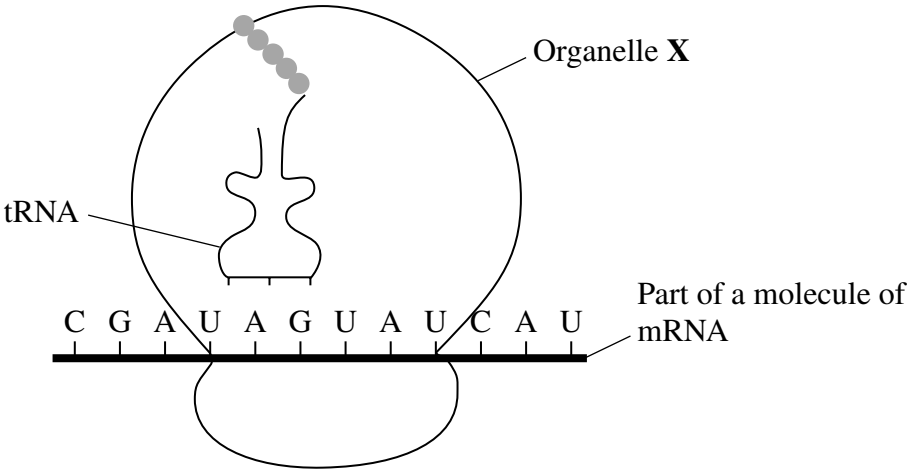
Information

- 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		10	
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 diagram shows a stage in protein synthesis.



1 (a) (i) Name organelle **X**.

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(1 mark)

1 (a) (ii) Give the anticodon of the tRNA molecule.

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(1 mark)

1 (a) (iii) Give the DNA code that would produce the mRNA base sequence shown in the diagram.

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(1 mark)

1 (b) Kanamycin is a drug that kills cells by interfering with translation. It binds to mRNA and causes a base to be missed out during translation.

Explain how kanamycin causes cells to produce non-functional proteins.

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(2 marks)

5

Turn over for the next question

2 The photographs show several stages in mitosis.

The photographs cannot be reproduced here due to third-party copyright constraints.

2 (a) Starting with **B**, put the stages in the correct sequence.

B …… …… …… …… *(1 mark)*

2 (b) Explain the arrangement of the chromosomes in stage **A**.

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(2 marks)

2 (c) Photographs of all the chromosomes in a cell can be useful to see if the chromosomes of an unborn baby are normal.

Some cells are collected, usually from the fluid in which the unborn baby is growing. These cells are stimulated to divide by mitosis. Next, a substance is added which inhibits the formation of the spindle. The cells are examined using a microscope and then photographed.

Suggest why it is important

2 (c) (i) that the cells examined with the microscope are dividing by mitosis.

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(1 mark)

2 (c) (ii) to inhibit the formation of the spindle.

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(1 mark)

5

Turn over for the next question

3 (a) Complete the table.

Blood group	Antigen(s) present on surface of red blood cells
A	
B	
AB	
O	

(1 mark)

3 (b) A person with blood group **AB** can receive blood safely from any donor. Explain why.

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(2 marks)

Scientists have found a bacterium that produces an enzyme which removes **B** antigens from the surface of red blood cells. They have found a different bacterium that produces an enzyme which removes **A** antigens from the surface of red blood cells. Scientists hope to use genetic engineering to produce one bacterium that makes both these enzymes. The scientists would then use these enzymes to destroy the antigens on the surface of red blood cells.

3 (c) What is the role of the following in the genetic modification of these bacteria?

3 (c) (i) Restriction enzymes

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(2 marks)

3 (c) (ii) DNA ligase.

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(1 mark)

3 (d) Explain why the enzyme-treated blood could be given safely to anyone.

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(2 marks)

8

Turn over for the next question

4 (a) Explain why the following are used in producing a DNA fingerprint.

4 (a) (i) Gel electrophoresis

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(2 marks)

4 (a) (ii) A radioactive probe

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(2 marks)

4 (b) A baby shark was born in an aquarium. Scientists believed that a female shark produced the baby without mating with a male, in a process that uses only mitosis. DNA fingerprints were made for the baby shark and the female. These DNA fingerprints proved that the female was the only parent of the baby shark. Explain how.

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(1 mark)

5

5 An enzyme was immobilised into alginate beads. It was found to have a lower rate of reaction and to be more thermostable than the enzyme in solution.

Suggest why the immobilised enzyme

5 (a) had a lower rate of reaction

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(3 marks)

(Extra space) .....

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5 (b) was more thermostable.

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(2 marks)

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Turn over for the next question

6 (a) Give **two** advantages, other than smell, of using inorganic fertiliser rather than organic fertiliser.

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(2 marks)

6 (b) Describe how adding inorganic fertiliser to fields may lead to the death of fish in a nearby stream.

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(4 marks)

(Extra space) .....

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6

7 Explain how each of the following features of rice allow it to grow in swampy conditions.

7 (a) Aerenchyma

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(2 marks)

7 (b) A tolerance to ethanol

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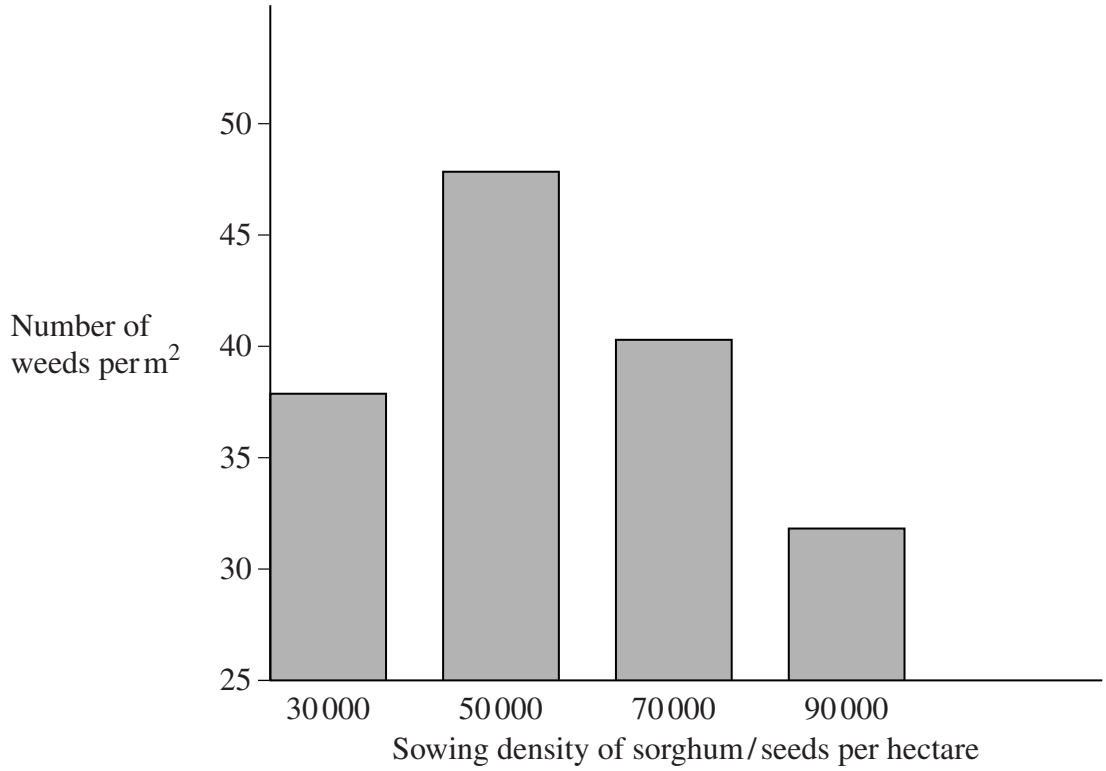
(2 marks)

4

Turn over for the next question

8 Scientists sowed sorghum seeds in four similar plots. They sowed a different number of seeds in each plot. They allowed the crops to grow to maturity. They then recorded the number of weed plants in each plot. The results are shown in the graph.



8 (a) (i) Describe the effect of sowing density on the number of weeds per m^2.

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(2 marks)

8 (a) (ii) Explain the results when sorghum was sown at between 50 000 and 90 000 seeds per hectare.

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(2 marks)

8 (b) When the sorghum seeds were sown at 30 000 seeds per hectare the number of weeds was low. Suggest an explanation for the low number of weeds.

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(2 marks)

8 (c) The scientists did **not** advise farmers to plant their seeds at 90 000 seeds per hectare. Explain why.

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(1 mark)

7

Turn over for the next question

9 Read the following passage.

Scientists discovered a protein in milk. This protein had antibacterial properties. They extracted the protein and determined its amino acid sequence. This information allowed them to make the gene for the protein. A vector was used to insert this gene into rice cells, together with a marker gene.

The scientists hope to use the genetically modified rice to make drinks that would combat diarrhoea. Diarrhoea is often caused by bacterial infections, and is a major killer of children worldwide. Many tests, however, would need to be carried out before the rice drinks could be sold to consumers.

The scientists have been given permission to plant a trial field of the genetically modified rice. They were told, however, that the trial field had to be a long way from any commercial rice farm.

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

9 (a) Scientists know the order of amino acids in the milk protein (line 2). Explain how they can use this information to obtain a gene that codes for this protein.

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(2 marks)

9 (b) (i) A vector was used to insert the new genes into rice cells (lines 3 and 4). Explain what is meant by a *vector*.

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(1 mark)

9 (b) (ii) A marker gene was used in genetically modifying the rice (line 4). Explain why.

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(2 marks)

9 (c) Many tests would be needed before the rice drinks could be sold to consumers (lines 7 and 8). Give **two** reasons why these tests would be needed.

1 .....

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2 .....

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(2 marks)

9 (d) The genetically modified rice will be grown a long way from any commercial rice farms (lines 10 and 11). Explain why this is important.

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(2 marks)

Question 9 continues on the next page

9 (e) Describe how the rice cells produce the milk protein from the inserted gene.

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(6 marks)

(Extra space) .....

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15

10 (a) Hormones can be used to make cows produce more eggs and to synchronise their breeding.

Describe how hormones have these two effects.

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(6 marks)

(Extra space) .....

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Question 10 continues on the next page

Scientists investigated the effect of the hormone BST on milk yield and composition. They put cows of the same breed in one of four groups, **A**, **B**, **C** or **D**. The cows in group **A** were not given BST. They injected each of the other groups of cows with a different dose of BST. The scientists then measured the yield and content of the milk these cows produced. The results of the investigation are shown in the table.

	Group **A**	Group **B**	Group **C**	Group **D**
Dose of BST / mg per day	0	10	20	30
Mean yield of milk / kg per day	26.1	31.0	31.2	28.8
Mean fat content of milk / %	3.19	3.22	3.31	3.66
Mean protein content of milk / %	3.43	3.29	3.28	3.43

10 (b) Give **two** conclusions that may be drawn from the table.

1 .....

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2 .....

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(2 marks)

10 (c) It was important that the cows were placed into the groups at random. Explain why.

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(1 mark)

10 (d) Explain why it was important in this investigation that all the cows were

10 (d) (i) the same breed

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(1 mark)

10 (d) (ii) given the same food.

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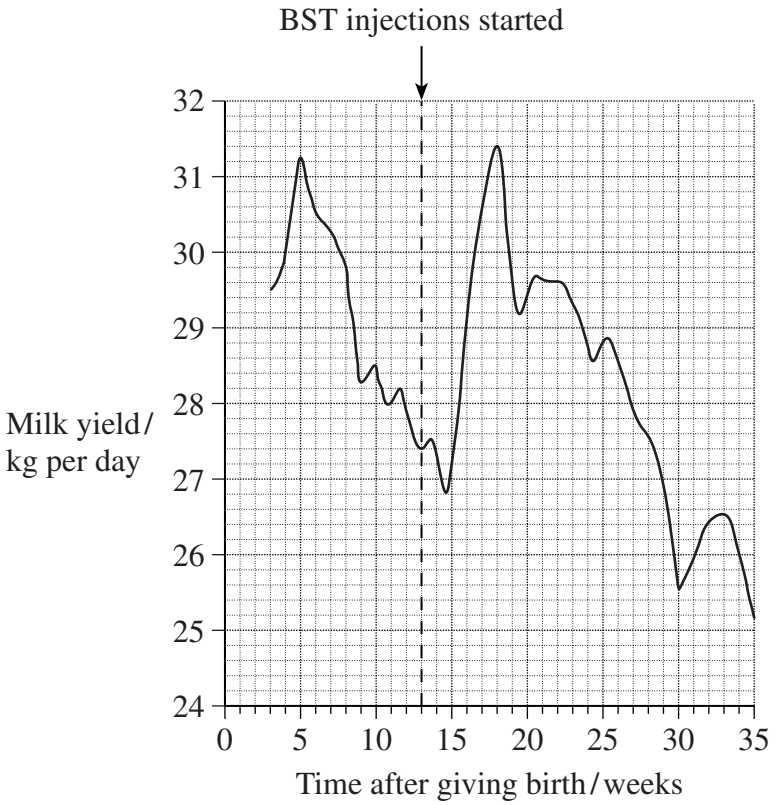
(2 marks)

Question 10 continues on the next page

10 (e) Cows in another group were injected with BST. Scientists started these injections 13 weeks after the cows gave birth. The graph shows the mean daily yield of milk for this group of cows.



10 (e) (i) Suggest why BST was **not** given to the cows in the first 13 weeks.

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(1 mark)

10 (e) (ii) Calculate the percentage increase in milk yield between weeks 13 and 18. Show your working.

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

END OF QUESTIONS

ACKNOWLEDGEMENT OF COPYRIGHT HOLDERS AND PUBLISHERS

Question 2 Photos from http://micro.magnet.fsu.edu/micro/gallery/mitosis/mitosis.html

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