

**GENERAL CERTIFICATE OF SECONDARY EDUCATION
TWENTY FIRST CENTURY SCIENCE
BIOLOGY A**

Unit 1 Modules B1 B2 B3

HIGHER TIER

WEDNESDAY 20 JUNE 2007

H A221/02

Morning

Time: 40 minutes

Calculators may be used.

Additional materials: Pencil
Ruler (cm/mm)



* C U P / T 4 3 3 5 0 *

Candidate
Name

Centre
Number

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Candidate
Number

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INSTRUCTIONS TO CANDIDATES

- Write your name, Centre Number and Candidate Number in the boxes above.
- Answer **all** the questions.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- Do **not** write in the bar code.
- Do **not** write outside the box bordering each page.
- WRITE YOUR ANSWER TO EACH QUESTION IN THE SPACE PROVIDED. ANSWERS WRITTEN ELSEWHERE WILL NOT BE MARKED.

INFORMATION FOR CANDIDATES

- The number of marks for each question is given in brackets [] at the end of each question or part question.

FOR EXAMINER'S USE		
Qu.	Max.	Mark
1	5	
2	10	
3	7	
4	9	
5	4	
6	7	
TOTAL	42	

This document consists of **14** printed pages and **2** blank pages.

Answer **all** the questions.

1 Cystic fibrosis is an inherited disorder.

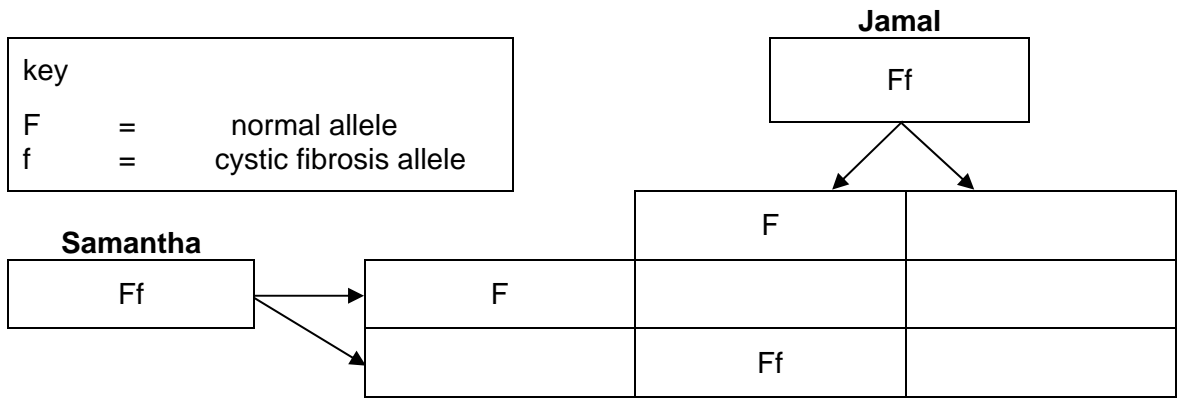
- (a) Samantha and Jamal are married.
They have a son who has cystic fibrosis.
They want to have another child.

Two images have been removed due to copyright restrictions

Details:
clipart-style illustrations of a woman and man

There is a 25% chance that the child will have the disorder.

- (i) Complete the genetic diagram below to show this.



[2]

- (ii) Put a ring around the combination that will produce cystic fibrosis.

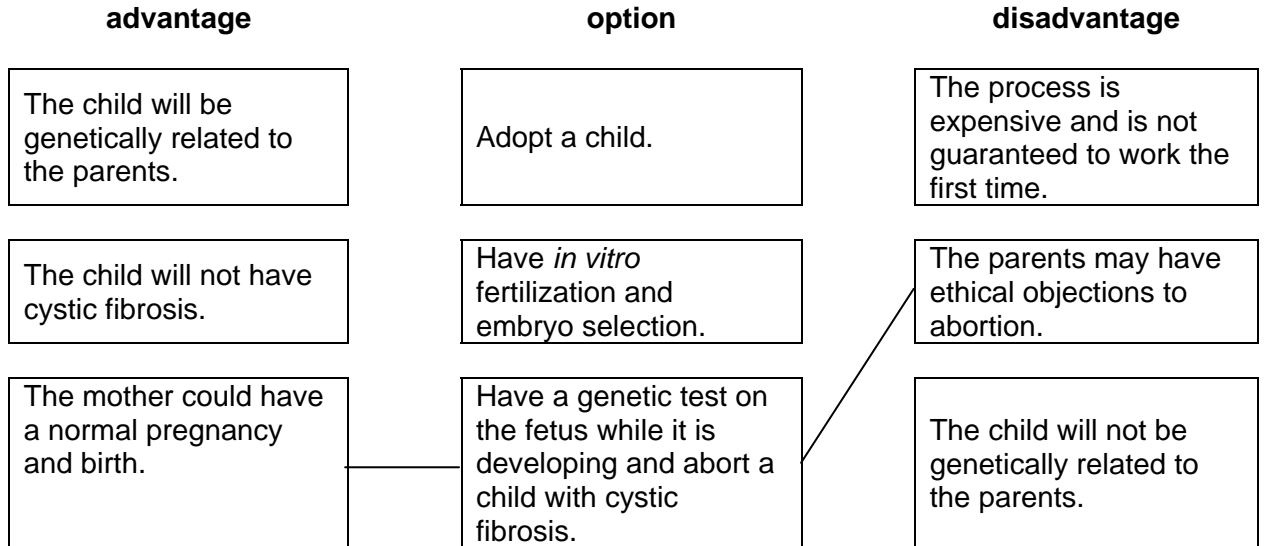
[1]

(b) Samantha and Jamal receive genetic counselling.

The counsellor explains the advantages and disadvantages of their options.

Join an **advantage** and a **disadvantage** to each **option** shown below.

One has been done for you.



[2]

[Total: 5]

2 (a) There are **two** main ways that cells destroy microorganisms.

Choose the correct words to complete the sentences.

antibodies antibiotics digest pathogens filter reproduce

Some cells engulf and microorganisms.

Other cells produce to destroy microorganisms. [2]

(b) Miriam is a young mother. She has a three month old daughter, called Natasha. Miriam takes Natasha to have a vaccination.



The sentences below describe how vaccination works against a disease-causing microorganism.

They are in the wrong order.

- A The immune system destroys the safe microorganism in the vaccine.
- B A safe form of the microorganism is injected into the body.
- C The microorganism cannot now make you ill.
- D The immune system remembers how to destroy the microorganism.

Write the letters **A**, **B**, **C** or **D** in the boxes to show the correct order.

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[3]

(c) (i) Miriam's grandfather Edward attends the clinic for a flu vaccination.

He says he doesn't need one because he had one last year.

How could Miriam explain to him why he needs another vaccination this year?

Put a **ring** around **two** correct letters **A**, **B**, **C**, **D** or **E**.

- A** The body only 'remembers' a flu virus for a year so another injection is needed.
- B** The flu virus can change so the body will not recognise it.
- C** Each antibody only works for one type of virus.
- D** Flu viruses have become resistant to antibiotics.
- E** Flu viruses are very infectious.

[2]

(ii) If Edward does **not** get vaccinated it could affect other people as well as himself.

People have different opinions about **compulsory** mass vaccination.

A
People might have to take time off work to look after relatives with flu.

B
There will be extra cost to produce vaccines for people most at risk from flu.

C
People could develop pneumonia if they get flu. This would cost the NHS more money.

D
If lots of people refused the vaccine there could be an epidemic.

E
People should be able to choose whether or not they have the vaccine.

Complete the table by putting the letters **A**, **B**, **C**, **D** and **E** in the correct column.

opinions for compulsory mass vaccination	opinions against compulsory mass vaccination

[3]

[Total: 10]

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Question 3 starts on page 8

PLEASE DO NOT WRITE ON THIS PAGE

- 3 David has been warned that he could develop coronary heart disease (CHD) because his blood shows high levels of cholesterol.

He has been asked to take part in a clinical trial of a new drug.
Doctors hope it will reduce cholesterol levels in blood.

- (a) Why must new drugs be tested in humans before they are approved for use?

Put ticks (✓) in the boxes next to the **two best** answers.

The drugs must not be too expensive.

The drugs must not have any side effects.

The drugs must not have serious side effects.

The drugs must be effective against the disease.

The drugs must be in a form that is easy for people to take.

The manufacturer must be able to make a lot of the drug.

[2]

(b) The clinical trial will study two groups of patients with high cholesterol levels.

It will be conducted as a **double blind** trial.

(i) Put ticks (✓) in the boxes next to the statements that describe a **double blind** trial.

The patients are divided randomly into two equal sized groups.

The patients with high cholesterol levels are put into one group; those with lower cholesterol levels are put into a second group.

One group is given the new drug, and the other group is given a harmless substitute.

All the patients are given the new drug.

The doctors know which patients are in each group, but the patients do not.

Neither the doctors nor the patients know which patients are in each group.

[3]

(ii) Some people disagree with the use of placebos in drug trials.

Explain why.

Put ticks (✓) in the boxes next to the **two** correct statements.

The new drug may not work.

It is not right to save money in this way.

People taking the placebo may get worse.

The side effects of the drug are not known.

All patients have the right to the best available treatment.

[2]

[Total: 7]

4 Read the following article.

SCIENTISTS FIND NEW SPECIES OF 'HOBBIT' HUMANS.

The remains of a human have been discovered on an Indonesian island. The skeleton was only 1 metre tall and is 18 000 years old.

The pelvis showed that the skeleton was a woman. Her teeth were worn and her skull bones fused together suggesting an adult of around 30 years old.

Nearby were found remains of stone tools, charred wood and roasted animals. These suggest that the woman was intelligent, cooked food and might even have built rafts and used language.

The little humans may be descendants of a *Homo erectus* population that became isolated.

'Various factors such as isolation, poor resources and few predators have led to a small body size by natural selection,' said one leading scientist.

(a) The table contains some statements from the article.

Which are examples of data? Which are possible explanations? Which are neither?

Tick (✓) the correct box for each statement.

statement	data	explanation	neither
'The skeleton was only 1 metre tall'			
'her skull bones were fused together'			
'Various factors such as isolation, poor resources and few predators have led to a small body size by natural selection'			
'These suggest that the woman was intelligent and cooked her food.'			
'The little humans may be descendants of a <i>Homo erectus</i> population'			

[5]

- (b) (i) The scientist believed the small size was due to natural selection.

Which of the following factors could have led to the evolution of small size?

Put a tick (✓) in the box next to the most likely factor.

limited food on the island

living in caves

eating small mammals

[1]

- (ii) Choose the **best** statement from each pair to explain how natural selection happens.

Put the correct letter, **A** or **B**, in each of the boxes below.

- 1 **A** All the original members of the population were the same size.
B Members of the original population varied in their size.

- 2 **A** Smaller individuals needed less food to survive.
B Some of the individuals did not get enough food, so they did not grow.

- 3 **A** Smaller members of a population are more likely to survive and reproduce.
B The smaller sized individuals were more fertile.

- 4 **A** The smaller sized females had more babies than the larger females.
B The small size is passed on to the offspring in the genes.

- 5 **A** More of the population have the genes for small body size.
B The genes for small body size become more dominant.

[3]

[Total: 9]

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5 Our nervous system and hormone system allow different parts of the body to communicate.

Complete the sentences below to show the differences between hormonal and nervous communication.

Use words from this list.

- a long time
- a short time
- chemicals
- electrical impulses
- fast
- forever
- instantaneous
- slow
- vibrations

Messages are carried by nerves as [1]

Nervous communication is and lasts [1]

Messages are carried by hormones which are [1]

Hormonal communication is and lasts [1]

[Total: 4]

- 6 Otters live in holes on river banks and eat fish.



Before 1977, otters were in danger of becoming extinct.

Conservationists started to monitor their numbers.

The table shows the results of surveys of otters from 1978 to 1993.

National Otter Surveys: 1978, 1985 and 1993

country	number of places surveyed	number of places where otters were found		
		1978	1985	1993
England	2940	170	284	687
Wales	1008	207	393	529
Scotland	2650	1511	1717	2211
Great Britain total	6598	1888	2394	3427

Source: *Former NCC and Vincent Wildlife Trust National Otter Surveys, Environment Agency*

- (a) (i) What percentage of places surveyed, in **England** in **1978**, had otters?

Put a **ring** around the correct answer.

5.8% **9.0%** **20.5%** **58.0%**

[1]

- (ii) Which **two** statements are correct about the changes from 1978 to 1993 in the number of places where otters are found?

Put ticks (✓) in the **two** correct boxes.

In Wales the number of places has increased about 2.5 times.

In England the number of places has increased about 2 times.

In Scotland the number of places has increased about 1.5 times.

In Scotland the number of places has increased about 2.5 times.

In England the number of places has increased about 3 times.

[2]

- (b) (i) Over 100 years ago, otters were very common in all areas of Britain.

Which of the following factors could have caused otters to become scarce?

Put ticks (✓) in the boxes next to the **two** best answers.

Hunting for otters was banned.

Rivers became polluted and the fish died.

Rising sea levels made some rivers dry up.

Animals were introduced from abroad and competed with the otters for food.

The otters were killed by many predators.

[2]

- (ii) Keeping biodiversity is part of using the environment in a sustainable way.

Put ticks (✓) in the boxes next to the **two** most important reasons why biodiversity is important to sustainability.

Living things can provide us with new materials.

Living things have a right to survive just as much as humans.

Living things may provide us with new medicines in the future.

Living things eat the food that humans want to use for themselves.

[2]

[Total: 7]

END OF QUESTION PAPER