

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

**A221/02**

Unit 1 Modules B1 B2 B3  
(Higher Tier)

Candidates answer on the question paper  
A calculator may be used for this paper

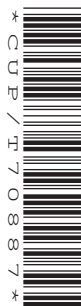
**OCR Supplied Materials:**  
None

**Other Materials Required:**

- Pencil
- Ruler (cm/mm)

**Monday 12 January 2009  
Morning**

**Duration:** 40 minutes



Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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**INSTRUCTIONS TO CANDIDATES**

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

**INFORMATION FOR CANDIDATES**

- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **42**.
- This document consists of **16** pages. Any blank pages are indicated.

**FOR EXAMINER'S USE**

Qu.	Max.	Mark
1	4	
2	5	
3	4	
4	5	
5	6	
6	4	
7	7	
8	3	
9	4	
<b>TOTAL</b>	<b>42</b>	

2

Answer **all** the questions.

1 Gender in humans is determined by two different chromosomes.

- (a) Complete the table to show the combination of sex chromosomes in human males and females.

human male	human female

[2]

- (b) The sex of a human embryo is determined by a gene on one of these sex chromosomes.

On which of the sex chromosomes is this gene found?

answer ..... [1]

- (c) Which statement best describes the job of **this gene**?

Put a tick (✓) in the box next to the **correct** answer.

It causes the ovaries to develop.

☐

It causes the testes to develop.

☐

It causes both ovaries and testes to develop.

☐

It stops development of both ovaries and testes.

☐

It has no effect on the ovary or the testes.

☐

[1]

[Total: 4]

3

2 Huntington's disorder and cystic fibrosis are examples of genetic disorders.

(a) Draw straight lines linking each **disorder** with its correct **symptom** and the correct **cause**.

symptoms	disorder	cause
difficulty in breathing and digesting foods		one dominant allele of a single gene
high temperature and sweating	Huntington's disorder	two recessive alleles of a single gene
bleeding gums and wounds that will not heal	cystic fibrosis	three recessive alleles of a single gene
falling over, clumsiness and loss of memory		four dominant alleles of a single gene

[2]

(b) The tables show the different combination of alleles that can be inherited for each of the two disorders.

#### Huntington's disorder

<b>A</b>	HH
<b>C</b>	Hh
<b>E</b>	hh

#### cystic fibrosis

<b>B</b>	CC
<b>D</b>	Cc
<b>F</b>	cc

Choose from the combinations to answer the following questions.

(i) Which **one** of the combinations, **A, B, C, D, E** or **F**, is a carrier?

answer ..... [1]

(ii) Which **two** combinations of alleles, **A, B, C, D, E** or **F**, cannot pass the disorder on to their children?

answer ..... and ..... [2]

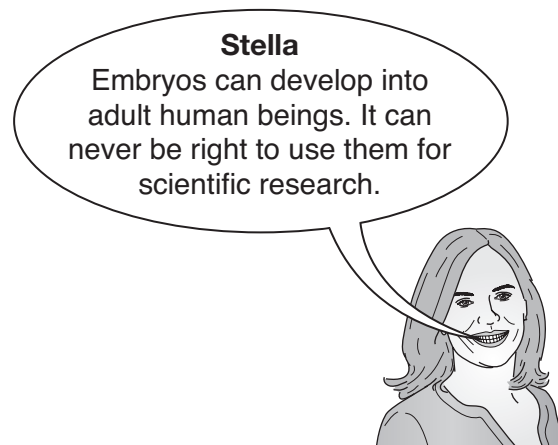
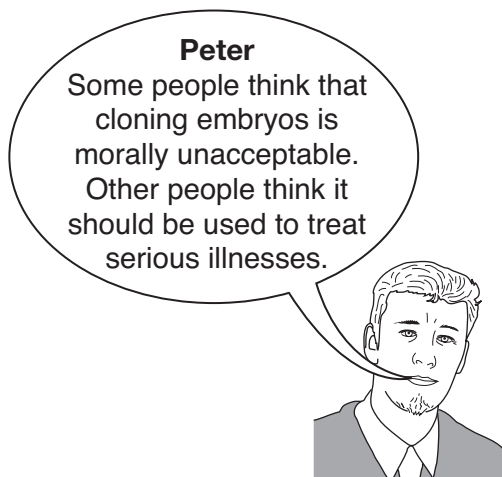
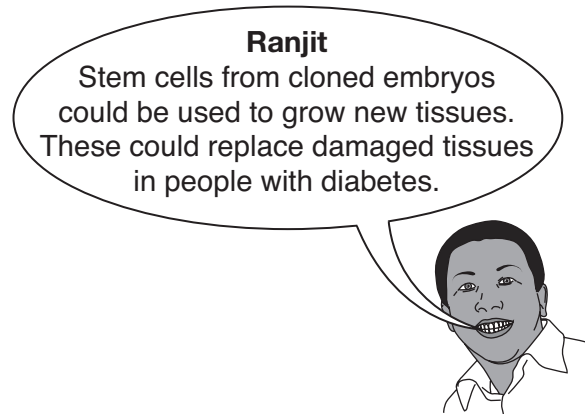
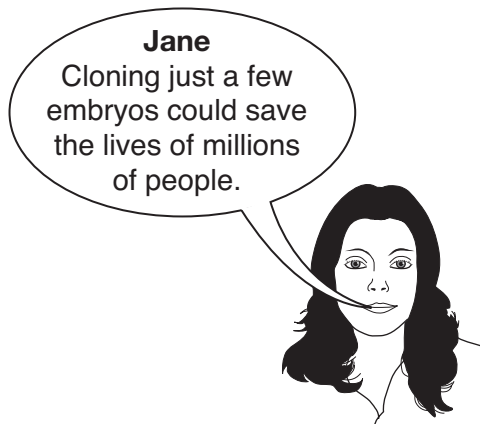
[Total: 5]

**3** Stem cells could be useful in treating some diseases.

Cloning of embryos can be used to produce large numbers of stem cells.

Different people have different views about cloning embryos.

Read the views of these people and then answer the following questions.



**(a)** Which person is stating two different views about cloning embryos?

answer ..... [1]

**(b)** Read the following statement.

Cloning embryos may enable new tissues to be grown to treat diseases.

Which person's view agrees with this statement?

answer ..... [1]

5

- (c) Which person supports the view that the right decision is the one that leads to the best outcome for the majority of people involved?

answer ..... [1]

- (d) Which person is saying that certain actions are never justified because they are unnatural or wrong?

answer ..... [1]

[Total: 4]

6

4 HIV is the virus that causes AIDS.

(a) Why is it difficult to develop an effective vaccine against the HIV virus?

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

The virus damages the immune system.

☐

AIDS is caused by a virus and not bacteria.

☐

The disease acts too quickly for the body to produce antibodies.

☐

The vaccine is broken down by the body's immune system.

☐

The virus has a high mutation rate.

☐

[2]

(b) Smallpox is the only disease that has been totally eliminated due to vaccination.

Which **two** statements explain why?

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

Everyone in the world was vaccinated against the disease.

☐

The vaccine was very effective.

☐

A large percentage of the world's population was vaccinated against the disease.

☐

The disease was very contagious.

☐

[1]

7

- (c) England has a vaccination policy for measles, mumps and rubella.

Read the statements about the vaccination policy.

Write a **V** in the box next to the statement which identifies a **value** (what should be done).

Write a **T** in the box next to the statement which identifies what is **technically feasible** (what can be done).

The vaccine works against three different diseases.

☐

All school age children should receive the vaccine.

☐

The vaccine is given by injection.

☐

It has only been possible to vaccinate 81% of children.

☐

[2]

[Total: 5]

5 Ray has cancer.

A drug company develops a new anti-cancer drug.

The company want to test the drug to see if it is effective.

(a) One way to test the drug is to use a placebo.

Which statements about **placebos** are true?

Put ticks (✓) next to the correct answers.

A placebo is a pure form of the drug being tested.

☐

Drugs are called placebos before they are approved for general use.

☐

Placebos are harmless chemicals that have no effect on the body.

☐

The patient does not know if they are taking a placebo.

☐

A placebo is a mixture of different drugs.

☐

[2]

(b) Ray does not want to take a placebo.

Which statement explains why **placebos** are not commonly used in human drug trials?

Put a tick (✓) in the box next to the correct answer.

It is morally wrong to give placebos when other more effective treatments are available.

☐

Placebos are very expensive and reduce funds available for other forms of treatment.

☐

The risk of side effects from taking placebos is too great a risk for the patient.

☐

It is much better to wait until the drug has been proved effective against the disease.

☐

[1]



9

- (c) Ray agrees to be part of an experiment to compare two new drugs.

He is placed on a double-blind trial.

Which statements best explain what is meant by a **double-blind trial**?

Put ticks (✓) next to the correct answers.

- |  |                          |
|--|--------------------------|
| Ray's doctor knows which of the two drugs Ray will be taking.                                | <input type="checkbox"/> |
| Both Ray and his doctor will know which of the two drugs he will be taking.                  | <input type="checkbox"/> |
| Only an independent drug testing agency will know which of the two drugs Ray will be taking. | <input type="checkbox"/> |
| Neither Ray nor his doctor will know which of the two drugs he will be taking.               | <input type="checkbox"/> |
| Only Ray will know which of the two drugs he will be taking.                                 | <input type="checkbox"/> |

[2]

- (d) Ray wants to know why his doctor is using **double-blind trials**.

Which statement best explains why?

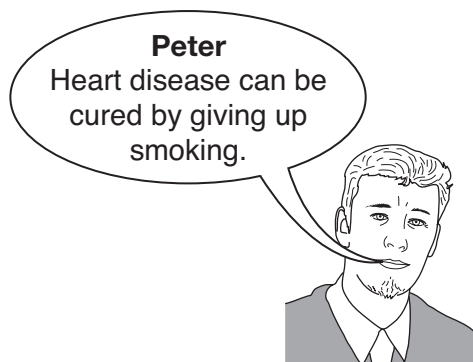
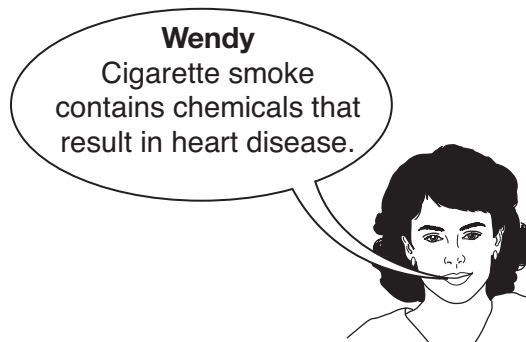
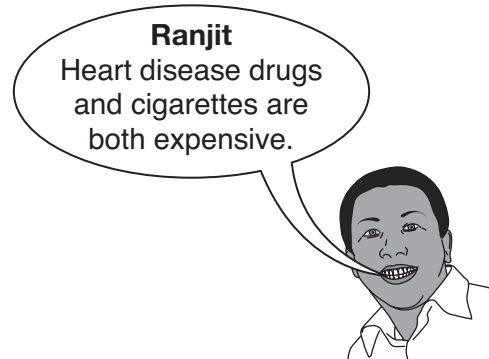
- |  |                          |
|--|--------------------------|
| to be able to test the drugs on more patients  | <input type="checkbox"/> |
| to speed up the testing period                 | <input type="checkbox"/> |
| to enable the drug company to make more profit | <input type="checkbox"/> |
| to obtain data that is more reliable           | <input type="checkbox"/> |

[1]

[Total: 6]

6 Read the statements about cigarette smoking.

(a)



(i) Which person is describing a **cause**?

answer ..... [1]

(ii) Which person is describing a **correlation**?

answer ..... [1]

11

(b) Which of the following is an example of a correlation between a factor and an outcome?

Put a tick (✓) in the box next to the **correct** answer.

It is cold at the North Pole.

☐

Ice cream sales increase in hot weather.

☐

The average temperature in the summer is 22 °C.

☐

Ice cream can be made in different flavours.

☐

[1]

(c) Which of the following does **not** provide convincing evidence for a correlation?

Put a tick (✓) in the box next to the **best** answer.

Rain is more likely to fall on days that are most cloudy.

☐

People who eat lots of food are more likely to be overweight.

☐

John caught a cold when visiting Mary in hospital.

☐

Babies vaccinated with MMR are less likely to get measles.

☐

[1]

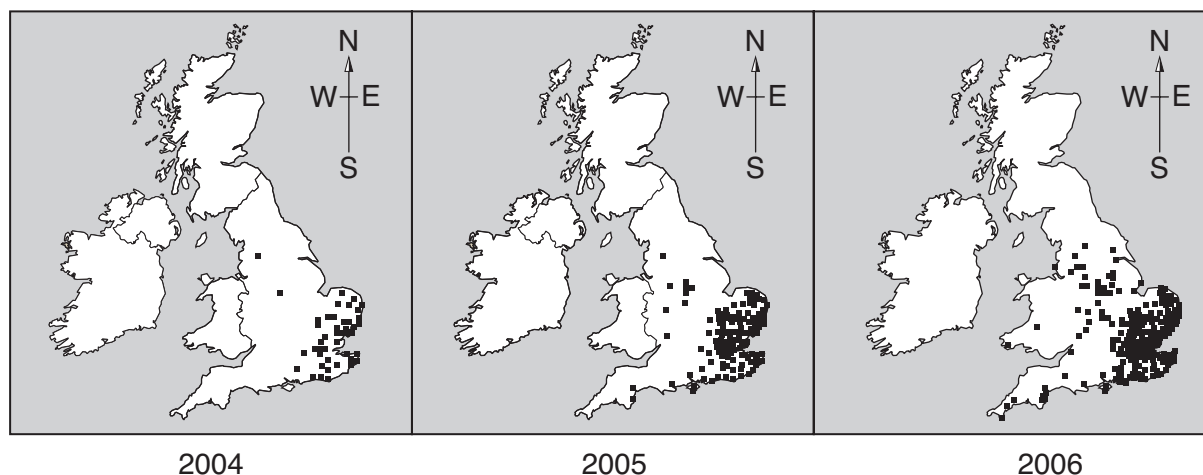
[Total: 4]

- 7 The harlequin ladybird has only been spotted in Britain in recent years.

It has a slightly different shape and colour to resident ladybirds.

It is spreading and destroying the resident ladybirds normally found in Britain.

The three maps show the reported sightings of harlequin ladybirds over a three year period.



<http://www.harlequin-survey.org>

- (a) Which of the statements can be concluded from the above data alone?

Put a tick (✓) in the boxes next to the **correct** answers.

Harlequin ladybirds are destroying resident ladybirds.

☐

The numbers of sightings are increasing.

☐

No harlequin ladybirds were spotted in Britain in 2003.

☐

Harlequin ladybirds will have reached Scotland by 2007.

☐

The harlequin ladybirds are spreading across the country.

☐

Harlequin ladybirds were first reported in the South East of England.

☐

[2]

13

(b) Harlequins feed upon other insects.

Some insect species protect themselves by producing poison.

The poison may be produced by a single 'poisonous' gene.

Which statements, when taken together, best explain how the insect inherited this gene?

Put a tick (✓) in the boxes next to the **correct** statements.

eating the poison and recycling it

☐

the mutation of a 'non poisonous' gene to a 'poisonous' gene

☐

inheriting the gene from its parents

☐

natural selection of the 'poisonous' gene

☐

eating another insect that had the 'poisonous' gene

☐

the insect species has always had the 'poisonous' gene

☐

by combining two 'non poisonous' genes

☐

[3]

(c) Scientists do not yet know what the final effect of the harlequin ladybird will be on the resident ladybirds living in Britain.

Which of the statements suggest why?

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

There is not enough data currently available.

☐

The number of harlequin ladybirds is increasing.

☐

Scientists do not know how other species will adapt.

☐

Harlequin ladybirds are being found in more places.

☐

The harlequin ladybird is larger than resident ladybirds.

☐

[2]

[Total: 7]

8 Most scientists believe that life on Earth today exists because of evolution.

(a) Look at the statements about how variation may be caused.

- A** only by genes
- B** by both genes and the environment
- C** by neither genes or the environment
- D** only by the environment

(i) Which statement **A, B, C** or **D** states the cause of variation in all living things?

answer ..... [1]

(ii) Which statement **A, B, C** or **D** describes how variation is passed on to the next generation?

answer ..... [1]

(b) Look at the statements about evolution.

Which statement explains how evolution by natural selection could have produced different results?

Put a tick (✓) in the box next to the **best** answer.

if conditions on Earth had been slightly different from what they actually were

☐

if a slightly shorter time had been available for evolution to happen

☐

if a slightly longer time had been available for evolution to happen

☐

if conditions on Earth were the same as they actually were

☐

[1]

[Total: 3]

15

9 Our bodies use a nervous system as a means of communication.

(a) The statements **A**, **B**, **C**, **D** and **E** are stages in this process.

They are in the wrong order.

Write out the stages in the correct order.

Use the letters **A**, **B**, **C**, **D**, and **E**.

The last one has been done for you.

- A** An impulse is passed to an effector.
- B** An impulse is passed to the central nervous system.
- C** A stimulus arrives at a receptor.
- D** A response is produced to the stimulus.
- E** The brain processes the information.

				<b>D</b>
--	--	--	--	----------

[2]

(b) Our bodies also use a hormonal system as a method of communication.

Which statements about the nervous system and the hormonal system are true?

Put a tick (✓) in the boxes next to the correct answers.

The nervous system works faster than the hormonal system.

☐

Only the hormonal system is used in homeostasis.

☐

The hormonal system only produces short lived responses.

☐

Only the nervous system is used in homeostasis.

☐

The nervous system uses electrical impulses.

☐

[2]

[Total: 4]

**END OF QUESTION PAPER**

**PLEASE DO NOT WRITE ON THIS PAGE**



Q. 7. University of Cambridge, Anglia Ruskin University and the Biological Records Centre (part of the Centre for Ecology and Hydrology – CEH, *The Ladybird Harlequin Survey*, [www.harlequin-survey.org](http://www.harlequin-survey.org), Defra.

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