

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

**A221/02**

Unit 1: Modules B1 B2 B3 (Higher Tier)

**Friday 21 May 2010  
Morning**

**Duration: 40 minutes**

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)



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. Additional paper may be used if necessary but you must clearly show your Candidate Number, Centre Number and question number(s).

**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.

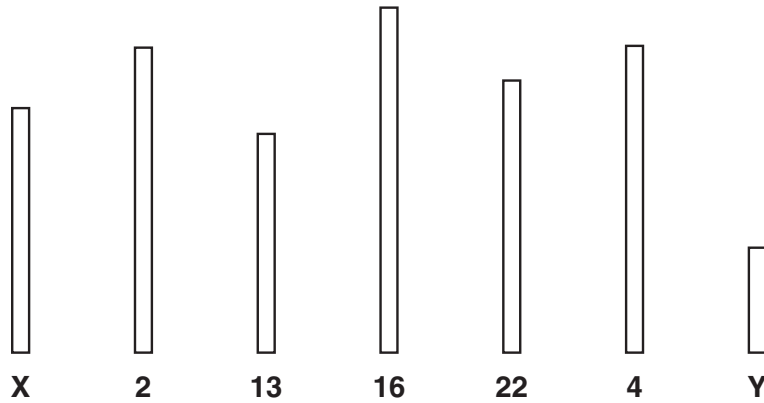
Answer **all** the questions.

1 Look at the diagrams of some different chromosomes taken from a human cell.

Each chromosome is given a number or a letter.

A gene on one chromosome is responsible for determining the sex of an embryo.

(a) Put a **ring** around this chromosome.



[1]

(b) Explain the role of this gene in determining sex.

.....  
.....  
..... [1]

(c) Which human feature is determined by several genes working together?

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

- broken leg**      **cystic fibrosis**      **height**      **Huntington's disorder**

[1]

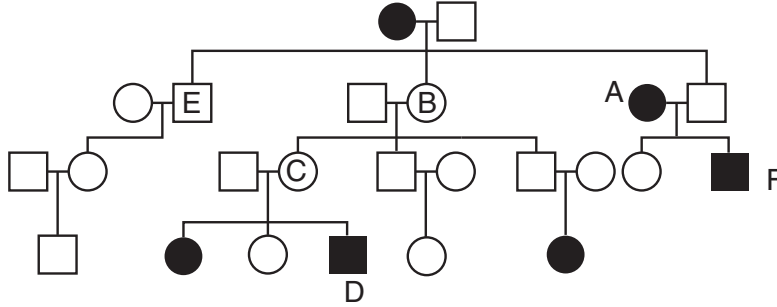
[Total: 3]

2 Mary has cystic fibrosis. She has alleles for cystic fibrosis.

(a) Where did Mary get her alleles from?

..... [1]

(b) The family tree shows the inheritance of cystic fibrosis.



○ female without cystic fibrosis      ● female with cystic fibrosis  
 □ male without cystic fibrosis      ■ male with cystic fibrosis

(i) Put a ring around the correct answer.

The allele that causes cystic fibrosis is described as ...

**co-dominant      dominant      normal      recessive**

[1]

(ii) Which person, **A, B, C, D, E** or **F**, is a female who has inherited two cystic fibrosis alleles?

answer ..... [1]

(iii) Which **three** people from **A, B, C, D, E** and **F** are carriers?

answer ..... [1]

(iv) Person **E** has a daughter.

We cannot tell from the family tree if the daughter is a carrier.


Explain why.


.....  
 .....  
 .....  
 ..... [3]

[Total: 7]

Turn over

3 Amrit and Raj are thinking about genetic testing.

<b>Amrit – an employee</b>

Raj, my boss wants me to have a genetic test. I am not sure that it is a good idea.

<b>Raj – an employer</b>

I want Amrit to have a genetic test as part of a genetic screening programme for all my employees.

Genetic testing can be used to find the chances of a person developing certain conditions in the future.

(a) Explain why Amrit may not want to have the genetic test.

.....  
.....  
..... [2]

(b) Explain why Raj wants to carry out a genetic screening programme.

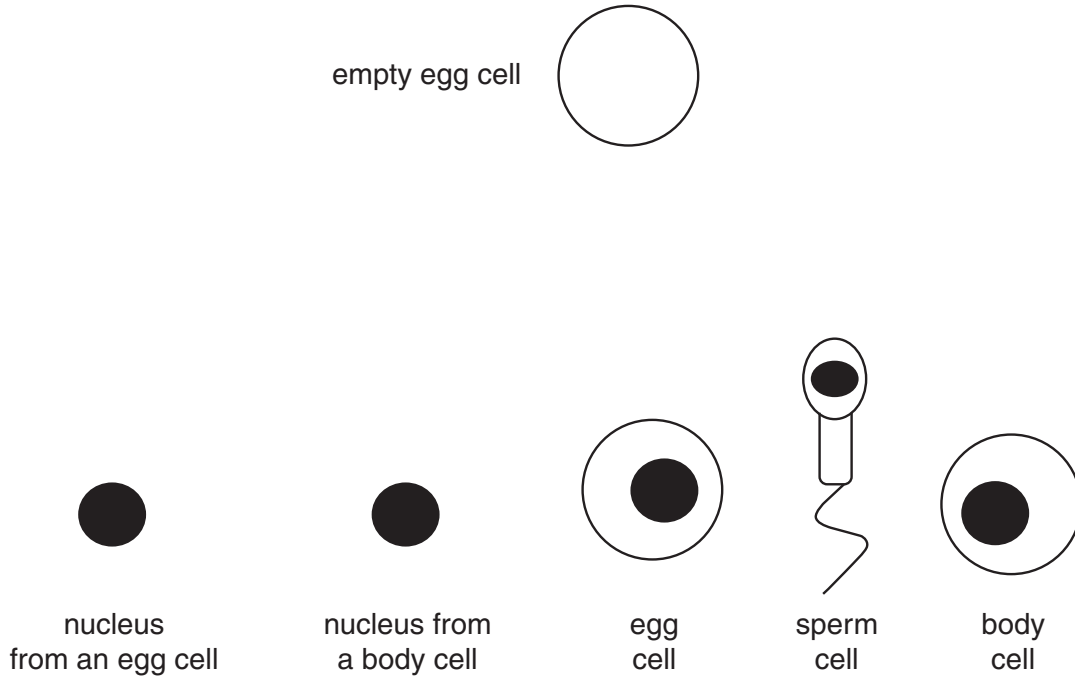
.....  
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..... [2]

[Total: 4]

4 Clones can be produced artificially.

(a) Look at the diagram of an empty egg cell.

Draw a straight line from the empty egg cell to the structure that you would add to the egg cell to make a clone.



[1]

(b) Which are examples of natural clones?

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

two plants made by asexual reproduction from the same parent

two photocopies of a picture

two bacteria produced from one bacterium

an artist's drawing of two identical flowers

identical twins

two sperm cells from the same man

[2]

(c) Clones can look different.

Which factors can cause clones to look different?

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

**genetic  
factors only**

**environmental  
factors only**

**both genetic and  
environmental factors**

**neither genetic nor  
environmental factors**

[1]

(d) Embryonic stem cells can be obtained from embryos.

Which of the statements about **embryonic stem cells** are true?

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

Embryonic stem cells ...

... are unspecialised cells that can develop into any type of cell.

... are unspecialised cells that cannot develop into any type of cell.

... could potentially be used to treat some diseases.

... can be used to grow different species of animals and plants.

... are specialised cells that can develop into any type of cell.

... are specialised cells that cannot develop into any type of cell.

[2]

[Total: 6]

5 Our bodies are sometimes invaded by microorganisms.

(a) We can protect ourselves by having a vaccination containing dead microorganisms.

Some of the statements describe how vaccination helps to protect us from disease-causing microorganisms.

They are in the wrong order.

Use **only** the correct statements and place them in their correct order.

The first one has been done for you.

- A Antibodies destroy the disease-causing microorganism.
- B White blood cells produce lots of antigens.
- C Our body rapidly makes antibodies to the disease.
- D Our body slowly makes antibodies to the disease.
- E The disease-causing microorganism enters the body.
- F The disease releases antibodies into our blood.
- G We receive a vaccination against the disease.

<b>G</b>				
----------	--	--	--	--

[3]

(b) Which statement best explains why it is difficult to develop a vaccine against HIV?

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

HIV damages the ...

- ... hormonal system and has a high mutation rate.
- ... hormonal system and has a low mutation rate.
- ... immune system and has a high mutation rate.
- ... immune system and has a low mutation rate.
- ... nervous system and has a high mutation rate.
- ... nervous system and has a low mutation rate.
- ... reproductive system and has a high mutation rate.
- ... reproductive system and has a low mutation rate.

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[1]

[Total: 4]


Turn over

6 Eating a diet containing a lot of fatty food can increase the risk of getting heart disease.

Different people have different views about this.


**Jane**

I read on the internet that eating fatty foods for 20 years will cause heart disease. But I believe scientists who say it will just increase my risk of developing heart disease.




**Ranjit**

My grandad ate fatty food all his life. He lived until he was 83 and died of influenza. It's a good job scientists examine lots of data before they conclude that a high fat diet increases the risk of heart disease.




**Peter**

We only know that fatty foods can cause heart disease because lots of different scientists have collected data. If the tests had not been repeated they would not have been reliable.



**Stella**

I am a food scientist. My findings are always checked by other scientists before they are published.



To answer these questions you may use each person once, more than once, or not at all.

- (a) Which person says that the absence of replication is a reason for questioning a scientific claim?

answer ..... [1]

- (b) Which person is suggesting that individual cases do not provide convincing evidence for or against a **correlation**?

answer ..... [1]



(c) Which person is describing the process of peer review?

answer ..... [1]

(d) Which **two** people are suggesting that factors might increase the chance of an outcome but not always lead to it?

answer ..... and ..... [1]

**[Total: 4]**

7 New drugs are tested using **blind** or **double-blind** trials.

(a) These people are talking about blind and double-blind trials.

**Nat**  
Both the patient and the doctor know if the drug is a placebo.



**Ben**  
Only the doctor knows if the drug is a placebo.



**Ali**  
Only the patient knows if the drug is a placebo.



**Louise**  
Neither the patient nor the doctor know if the drug is a placebo.



Which person is correctly describing ...

... a **blind** drugs trial?

answer .....

... a **double-blind** drugs trial?

answer .....

[1]

(b) Write about placebos.

Your answer should include

- what they are
- why they are used
- when they should not be used.

.....

.....

.....

.....

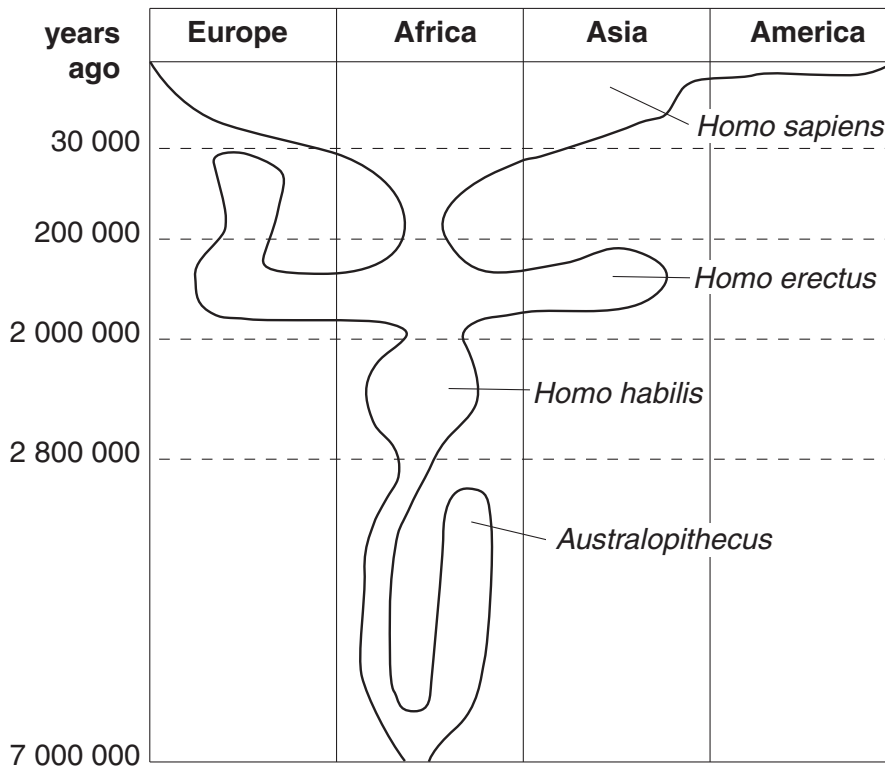
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.....

..... [3]

[Total: 4]

8 The chart shows the evolution of humans (*Homo sapiens*) over the last 7 million years.



(a) Neanderthals are another extinct relative of humans.

They did not evolve into *Homo sapiens*.

Neanderthals became extinct just over 30 000 years ago.

Shade in the part of the chart that represents the Neanderthals.

[1]

(b) Use the chart to answer the questions.

(i) Which of these statements is true?

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

All the species named on the chart evolved from a common ancestor.

Only one of the species evolved from a common ancestor.

*Australopithecus* evolved from *Homo habilis*.

None of the species evolved from a common ancestor.

*Homo erectus* was mainly found in America.

[1]

(ii) Which process is shown by the chart?

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

The chart shows ...

... central evolution.

... convergent evolution.

... divergent evolution.

... negative evolution.

[1]

(iii) Name **one** species shown on the chart that is not yet extinct.

answer ..... [1]

(c) Explain how changes to the brain influenced human evolution.

.....  
.....  
..... [2]

(d) Ideas about evolution have changed with time.

Darwin produced data to back up his theory of evolution by natural selection.

This data conflicted with the old explanations that many scientists believed.

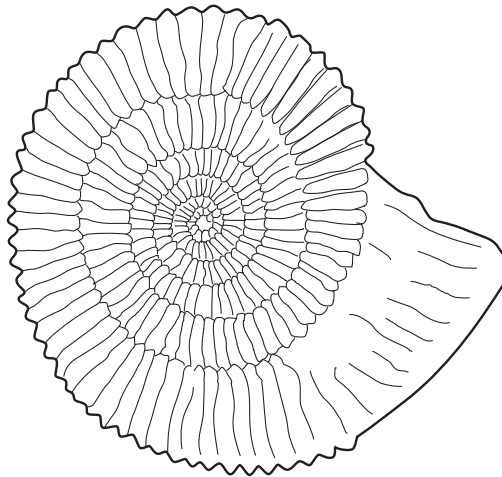
Even so, scientists were still reluctant to give up these old explanations.

Suggest **two** reasons why scientists involved in a scientific issue may disagree.

.....  
.....  
..... [2]

[Total: 8]

- 9 The fossil record has been put forward as evidence for the theory of evolution by natural selection.



What conclusions can be made from this evidence?

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

It proves the theory of evolution is correct.

It increases our confidence in the theory but does not prove that it is correct.

It makes no difference to our belief in the theory of evolution.

It decreases our confidence in the theory but does not prove that it is wrong.

It agrees with other data to support the theory of evolution.

It disagrees with other data that support the theory of evolution.

[2]

[Total: 2]

**END OF QUESTION PAPER**

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