

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

A221/02

BIOLOGY A

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)

**Thursday 14 May 2009
Afternoon**

Duration: 40 minutes



Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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MODIFIED LANGUAGE

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

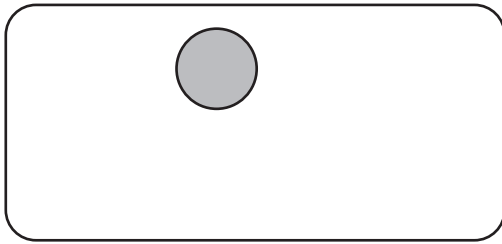
- The number of marks is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is **42**.
- This document consists of **16** pages. Any blank pages are indicated.



2

Answer **all** the questions.

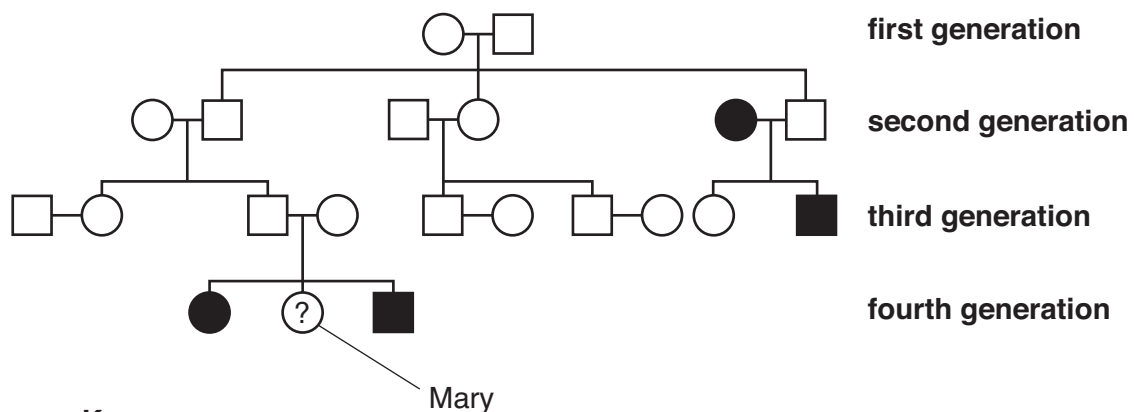
- 1 Look at the diagram of a cell.



instructions for how
an organism develops
are found here

- (a) Draw a label line to connect the label with the correct part of the cell. [1]

- (b) Alleles are the instructions for how an organism develops.
The family tree shows the inheritance of a faulty allele that causes cystic fibrosis.



Key

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

- (i) Which of the words **best** describes the allele that causes this disorder?

Put a (ring) around the correct answer.

dominant mixed recessive [1]

- (ii) The second generation of the family tree consists of six people.

How many people in the second generation have cystic fibrosis?

answer [1]

- (iii) When Mary is born it is not known whether or not she has cystic fibrosis.

What is the chance that Mary is a carrier?




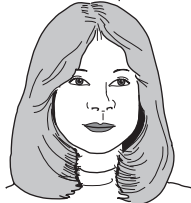
Put a (ring) around the correct answer.

100% 50% 30% 25% 0% [1]

[Total: 4]

3

- 2 Embryos can be tested to find out if they have any genetic defects. Four friends are discussing genetic testing.

<p>Jane</p> <p>Genetic testing is against my religion and goes against nature. It should never be used.</p> 	<p>Ali</p> <p>I think that genetic testing should be done to reduce the incidence of genetic disorders in society.</p> 
 <p>Peter</p> <p>It is now possible to use genetic testing to tell if your unborn child has a genetic disorder.</p>	 <p>Stella</p> <p>Genetic testing will allow insurance companies to increase their premiums for people who have a genetic disorder.</p>

- (a) Which person is making a statement about technical feasibility?

answer [1]

- (b) Which **two** people are making statements about values?

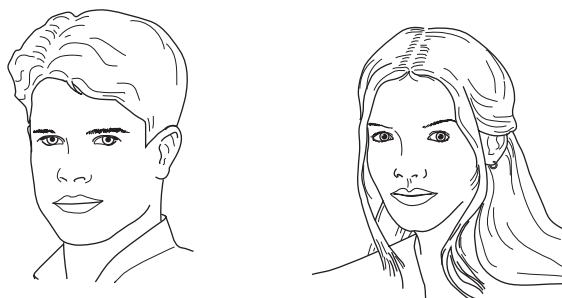
answer and [1]

- (c) Which **two** people are talking about an implication of genetic testing?

answer and [1]

[Total: 3]

3 Steve and Anita are brother and sister.



(a) Which pair of sex chromosomes will Steve and Anita have?

Choose from this list.

XX

YY

XY

YZ

ZZ

(i) Steve

[1]

(ii) Anita

[1]

(b) Which statements best explain how their sex is determined?

Draw **one** straight line linking the correct statement about **genes on chromosomes** to the correct statement about **what the gene does**.

genes on chromosomes

Sex is determined by a gene on both the X and the Y chromosome.

Sex is determined by a gene on the X chromosome.

Sex is determined by a gene on the Y chromosome.

Sex is determined by the absence of a gene on the X and the Y chromosome.

what the gene does

It causes the embryo to develop into a female.

It stops the sex organs from developing into either ovaries or testes.

It causes the sex organs to develop into either ovaries or testes.

It causes the embryo to develop into a male.

[1]

[Total: 3]

5

- 4 Here are seven statements about genes.
Some are correct and some are not.

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

A single gene contains several chromosomes. ☐

A single gene contains several nuclei. ☐

Genes can code for structural proteins. ☐

Each allele can consist of many genes. ☐

Genes can code for enzymes. ☐

Genes are sections of a DNA molecule. ☐

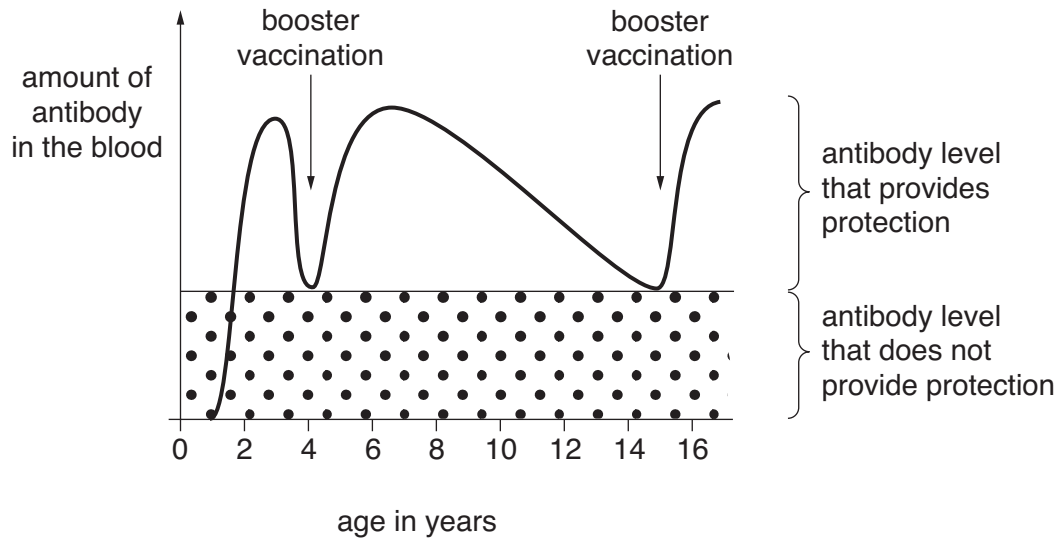
Genes can code for fats. ☐

[3]

[Total: 3]

6

- 5 Steve has been vaccinated three times against polio. Two of the vaccinations were boosters. The graph shows what effect the vaccinations have on the amount of antibodies in Steve's blood.



- (a) At what age (in years) was Steve most likely to get polio?

answer [1]

- (b) At what age (in years) did Steve have his first vaccination?

answer [1]

- (c) At what ages (in years) did Steve have booster vaccinations?

Put a ring around the correct answer.

2 and 6

0 and 4

4 and 15

3 and 6

[1]

- (d) The scientist Louis Pasteur developed a vaccine against rabies. It was injected into people after they had been bitten by a dog carrying the rabies virus. The vaccine was not completely successful in saving lives.

Which statement explains why?

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

Several injections were needed.

☐

Vaccinations work best if given after getting an infection.

☐

The side effects of the vaccine lasted too long.




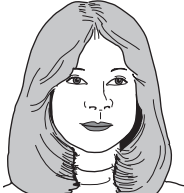
☐

People's bodies did not have time to make enough antibodies.

☐

[1]

- (e) The government has a measles, mumps and rubella (MMR) vaccination policy. It wants all children to be vaccinated with the MMR vaccine. Different people have different views about this policy.

<p>Jane</p> <p>I think the risk of catching measles is greater than the risk of developing autism. But some people think the reverse.</p> 	<p>Ranjit</p> <p>The MMR vaccine may cause autism.</p> 
 <p>Peter</p> <p>The MMR vaccine protects against measles, mumps and rubella.</p>	 <p>Stella</p> <p>Parents should be forced by law to have their children vaccinated.</p>

- (i) Which person is summarising two different views?

answer [1]

- (ii) Which person is describing an action which is hard to justify?

answer [1]

[Total: 6]

8

- 6 (a) Drug companies often use **double-blind** trials when testing a new drug.

Which of the statements describe a double-blind trial?

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

Only the doctor knows which patients are receiving the drug.

☐

Only the patient knows if they are receiving the drug.

☐

Both drugs and placebos are used in the trial.

☐

Neither the doctor nor the patient knows who is receiving the drug.

☐

Side effects of the drug may cause blindness.

☐

The drugs being tested are to prevent blindness in both eyes.

☐

[2]

- (b) A new type of antibiotic gradually becomes less effective over a period of time.

Put ticks (✓) in the boxes next to the **two** statements that best explain why.

The antibiotic has a short shelf life.

☐

Bacteria become used to the antibiotic.

☐

Bacterial mutations can produce varieties that are less affected by the antibiotic.

☐

Bacteria become resistant to antibiotics.

☐

The antibiotic has passed its sell by date.

☐

[2]

[Total: 4]

7 Look at the statements about heart disease.

- A** Mary has a heart attack after eating a banana.
- B** As ice-lolly sales increase, more people die of heart attacks.
- C** Fatty foods cause a build up of cholesterol which can block the coronary artery.
- D** Eating fatty foods increases the level of blood cholesterol which increases the risk of getting heart disease.

(a) Which statement, **A**, **B**, **C** or **D**, shows a correlation but not a causal link?

statement [1]

(b) Which two statements, **A**, **B**, **C** or **D**, contain a causal link?





statements and [2]

(c) Which statement, **A**, **B**, **C** or **D**, is an example of individual cases not providing sufficient evidence for a correlation?

statement [1]

[Total: 4]

- 8 People have different ideas about how life evolved on Earth.

<p>Jane</p> <p>Scientists think life evolved on Earth. Organisms that were better adapted to their environment had a better chance of survival.</p> 	<p>Ranjit</p> <p>It took millions of years for humans to evolve. How come some people think that life began 1000 years ago?</p> 
 <p>Peter</p> <p>The Earth formed billions of years ago, but we do not have enough data to say how or when life started.</p>	 <p>Stella</p> <p>Some people think that God made the world and everything in it.</p>

- (a) Which **two** people make statements which include data?

answer and [2]

- (b) Which person is making a statement which includes an agreed scientific explanation?

answer [1]

- (c) Which person is suggesting a reason why scientists disagree?

answer [1]

[Total: 4]

11

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Question 9 starts on page 12.

PLEASE DO NOT WRITE ON THIS PAGE

9 Biodiversity means all the different types of living organism that exist in the environment.

(a) Which of the following is likely to reduce biodiversity?

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

reduced competition between species

☐

direct and indirect human activity

☐

increased food supplies

☐

a stable, non-changing environment

☐

introduction of conservation areas

☐

introduction of a new predator species

☐

[1]

(b) Maintaining biodiversity is an important part of using the environment in a sustainable way.

Which of the statements **explain** why?

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

Species depend upon each other, not the environment.

☐

A food web consists of lots of food chains.

☐

Many species have a better chance of survival if they have a diverse food supply.

☐

Organisms usually have only one source of food.

☐

The extinction of a species in a food web has implications for many other species.

☐

[1]

13

- (c) Extinction of a species can have several causes.
Some of the statements are reasons for extinction, others are not.

Complete the table by entering the letter of each statement, **A**, **B**, **C**, **D**, **E** and **F**, into the correct column.

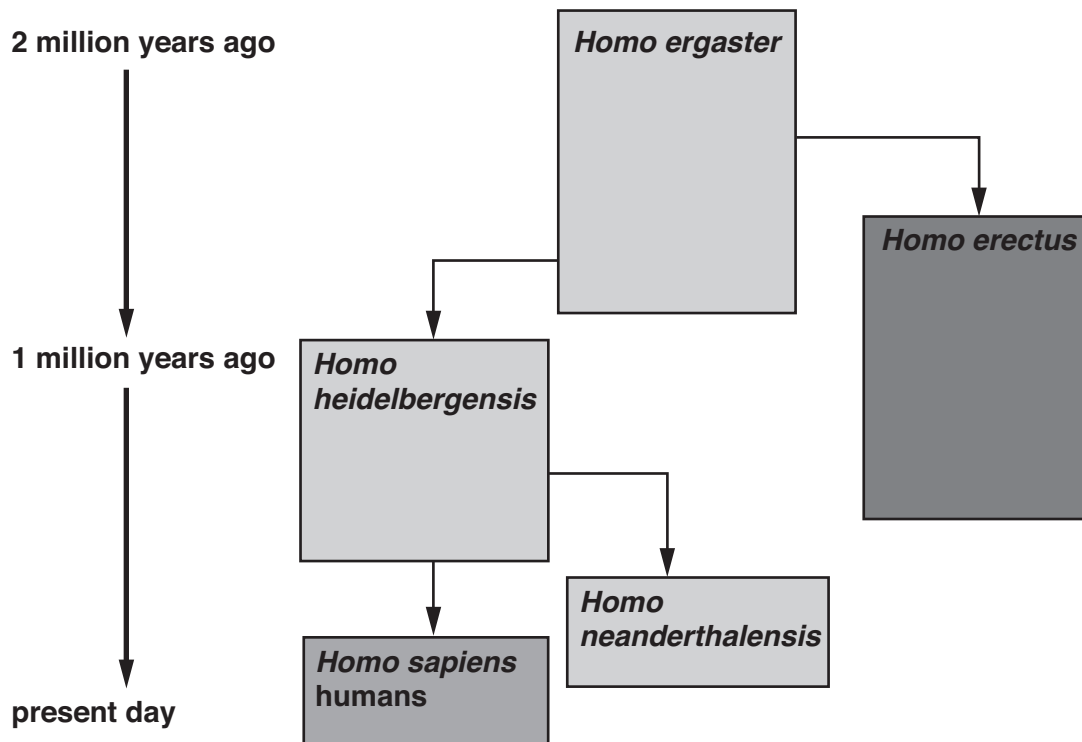
- A** Environmental conditions change.
B The environment remains isolated from the outside world.
C Biodiversity remains unchanged.
D A new disease-causing organism is introduced.
E Another organism in the food web becomes extinct.
F The environment is millions of years old.

not likely to cause extinction	may cause extinction

[3]

[Total: 5]

- 10 The diagram shows the possible evolution of human beings over the last two million years.



- (a) Which conclusions can be drawn from **this** diagram?

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

Humans evolved from single-celled organisms.

☐

Some *Homo* species were tool users.

☐

Only five different hominid species have ever existed.

☐

Human evolution shows different groups evolving from one common group.

☐

Some species became extinct.

☐

Homo sapiens evolved from *Homo erectus*.

☐

[2]

15

- (b) The human brain got larger during evolution.

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

A larger brain increases the chance of survival.

☐

The skull expanded allowing the brain to get bigger.

☐

The brain grew in size to match the growth in size of the human body.

☐

Humans thought a lot about making tools.

☐

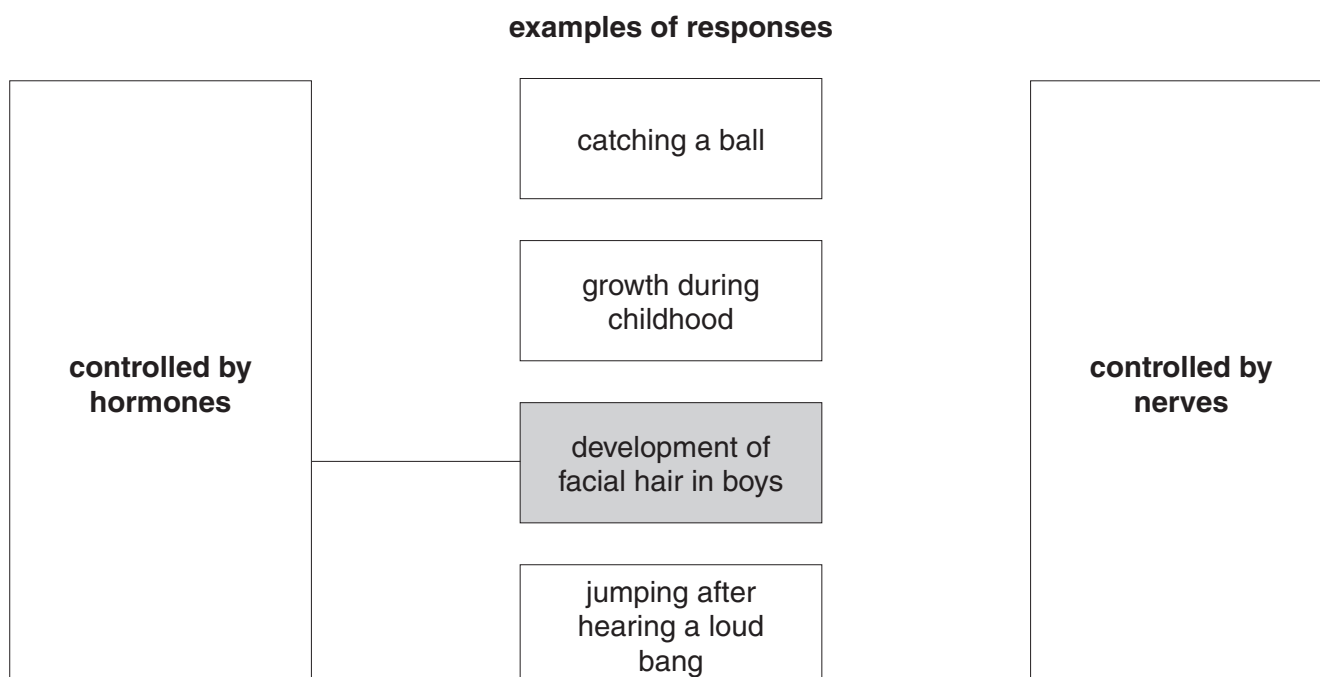
A larger brain allowed the development of new skills.

☐

[2]

- (c) The human brain coordinates responses within the body.
Hormones or nerves are used to control these responses.

Complete the diagram by drawing straight lines to correctly join each of the **examples of responses** with either **controlled by hormones** or **controlled by nerves**.
One has been done for you.



[2]

[Total: 6]

END OF QUESTION PAPER

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