THIS IS A NEW SPECIFICATION

OCR
RECOGNISING ACHIEVEMENT

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Tuesday 14 May 2013 – Morning

GCSE TWENTY FIRST CENTURY SCIENCE BIOLOGY A

A161/02 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)

Duration: 1 hour

A137150613

A161102

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- 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).
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

- Your quality of written communication is assessed in questions marked with a pencil (✎).
- 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 **60**.
- This document consists of **16** pages. Any blank pages are indicated.

Answer **all** the questions.

1 Humans usually have two alleles for each gene.

Genes determine the characteristics shown by the person.

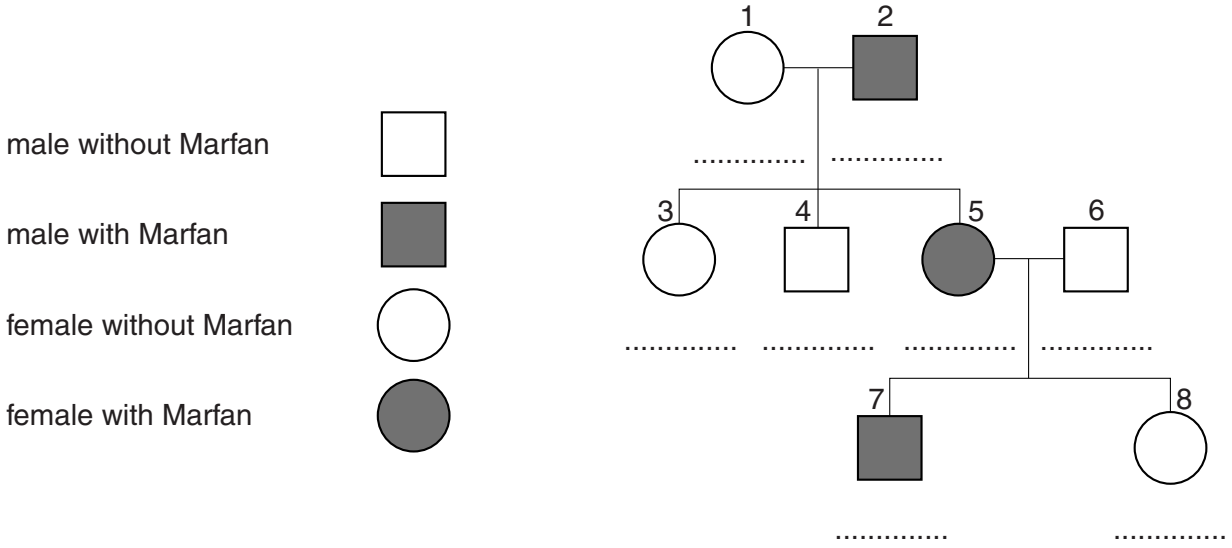
(a) Draw a straight line to connect each **word** with its correct **definition**.

word	definition
dominant	two alleles of a gene that are different
genotype	the genetic makeup of an organism
heterozygous	an allele that always shows an effect in the organism
homozygous	an allele that only shows an effect if both alleles of the pair are the same
phenotype	the observable characteristics of an organism
recessive	two alleles of a gene that are the same

[3]

(b) Marfan syndrome is a genetically inherited disorder.

(i) Look at the genetic diagram.



Marfan syndrome is caused by a dominant allele.
Complete the diagram to show the inheritance of Marfan syndrome.

Use **G** for the dominant allele and **g** for the recessive allele. **[3]**

(ii) Write down the three possible combinations of genotypes for the parents of individual **6**.

Combination 1 ..... and .....

Combination 2 ..... and .....

Combination 3 ..... and .....

[2]

(c) Janet and John are expecting a baby.
John has mild Marfan syndrome.
Marfan syndrome can produce a range of conditions from mild (long limbs and fingers) to severe (heart and lung defects).

Janet and John need to decide whether to have the fetus tested for Marfan syndrome.

Write down **three** things that Janet and John need to consider before deciding whether to have the test for Marfan syndrome.

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

[Total: 11]

2 Clones exist in nature and can be created by scientists.

What are clones? Explain how they are created in both plants and animals.

The quality of written communication will be assessed in your answer.

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..... **[6]**

[Total: 6]

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Question 3 begins on page 6

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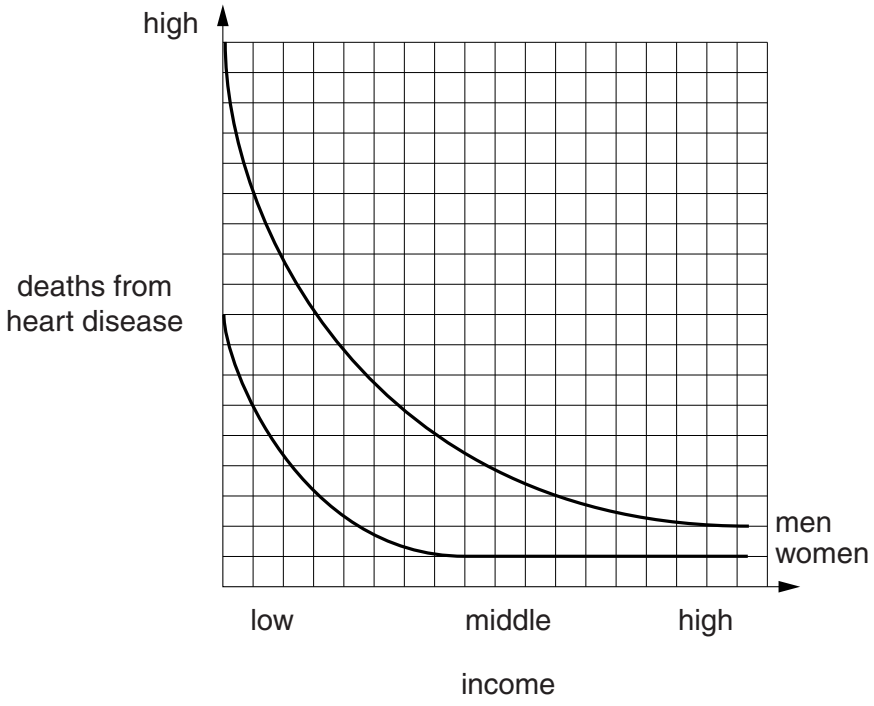
3 A student examined this graph about heart disease.

It shows the deaths from heart disease in men and women, depending upon how much money they earned (income).



(a) The student made the following conclusions.

Using **only** information from the graph, put ticks (✓) in the boxes next to the **three** correct conclusions.

With a very low income, women are certain to get heart disease. ☐

In women, each time income is halved, the risk of heart disease is doubled. ☐

Men are more at risk of heart disease than women. ☐

With a high income, women are more at risk of heart disease than men. ☐

There are other risk factors for heart disease apart from income. ☐

No one with a high income gets heart disease. ☐

For men, the lower the income the greater the risk of heart disease. ☐

From middle to high income, the risk for women remains unchanged. ☐

[3]

(b) Which **beginning**, **A**, **B**, **C** or **D**, and which **end**, **1**, **2**, **3** or **4**, of a sentence, when put together, gives the best conclusion?

	beginning
A	An outcome exists between a factor and a correlation …
B	The study needs to be repeated …
C	Low income increases the risk of heart disease …
D	The right decision is the one that leads to the best outcome …

	end
1	… and proves the factor is a causal link.
2	… and this needs to be peer reviewed by other scientists.
3	… and includes the greatest number of people involved.
4	… but does not always lead to it.

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

(c) Scientists need to consider different factors when designing a study.

When designing this study on heart disease, they decided on three factors to make sure the data collected was valid.

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

All the men should be the same height. ☐

Both the men and the women should be chosen at random. ☐

The sample size should be as large as possible. ☐

The women should all have a high income. ☐

Only people with a history of heart disease should be included. ☐

The two groups should be checked that they match on as many factors as possible. ☐

The study should be a double blind trial. ☐

[3]

[Total: 8]

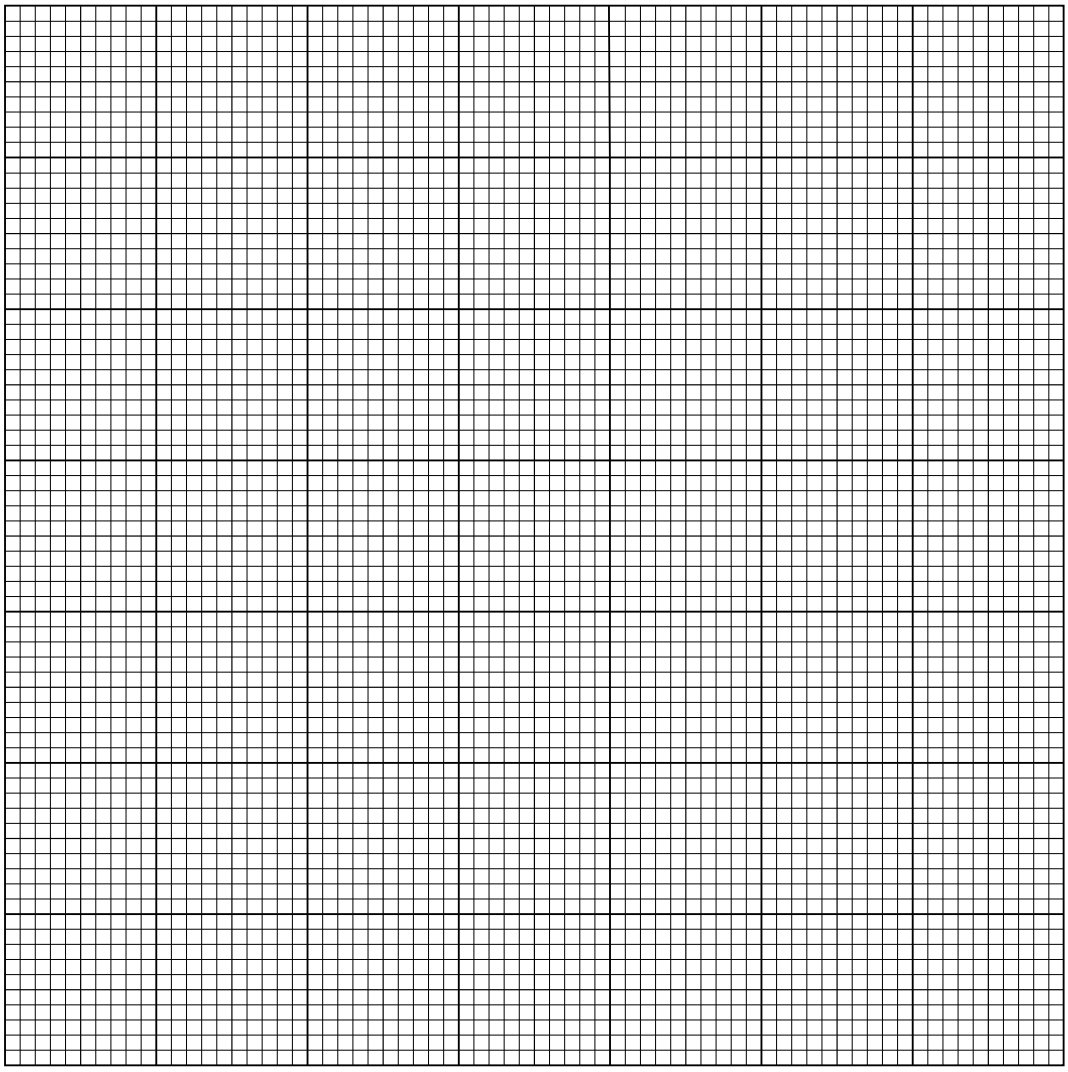
4 Jake gets a serious bacterial infection.

(a) The table shows the number of these harmful bacteria in Jake's body during the first two hours following the infection.

Time in minutes	Number of bacteria
0	1
30	3
60	8
90	24
120	64

(i) Draw a graph and plot the results on the grid below. **[2]**

number of bacteria



time in minutes

(ii) Draw a line of best fit on the graph. **[1]**

(iii) Use the data to determine the time interval for the number of bacteria to double.

time in minutes ..... **[1]**

(iv) What is the significance to Jake of this rate of growth?

.....

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

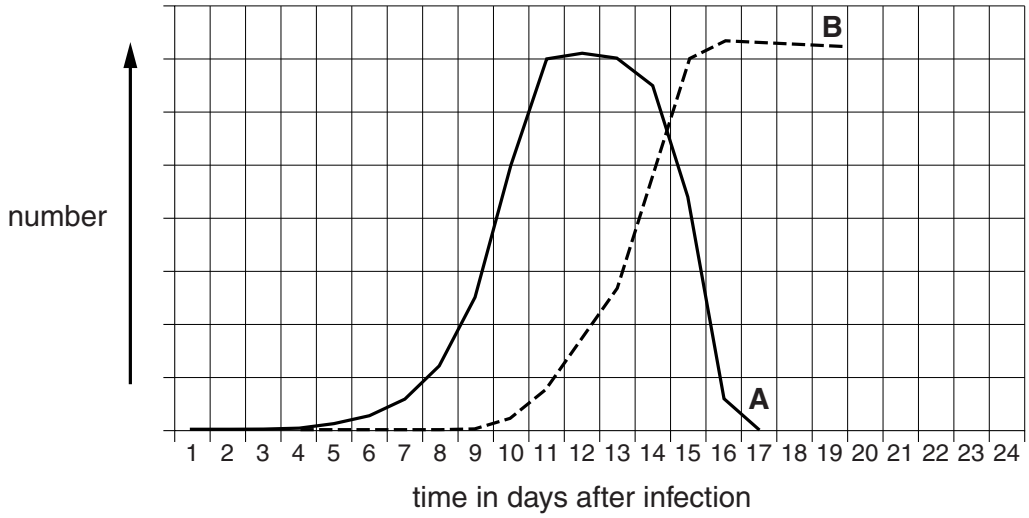
(b) When harmful bacteria entered Jake's body, he responded by producing antibodies to destroy these bacteria.

Jake had not come into contact with this type of bacteria before.

The graph shows the number of bacteria and antibodies in Jake's blood over a twenty-four-day period.

One line shows the number of bacteria.

The other line shows the number of antibodies.



Which line, **A** or **B**, shows the number of bacteria?

Explain your answer.

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.....

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

(c) Jake's white blood cells are used to destroy the invading bacteria.

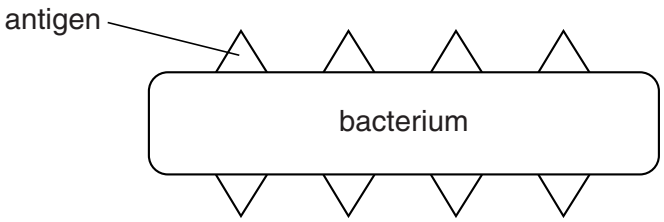
How can Jake's white blood cells do this?

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

engulf the bacteria	☐
stop the bacteria entering the body	☐
cause the bacteria to mutate	☐
cause the bacteria to reproduce	☐
digest the bacteria	☐
produce antibodies against the bacteria	☐

[2]

(d) The diagram shows one of the bacteria that entered Jake's body.



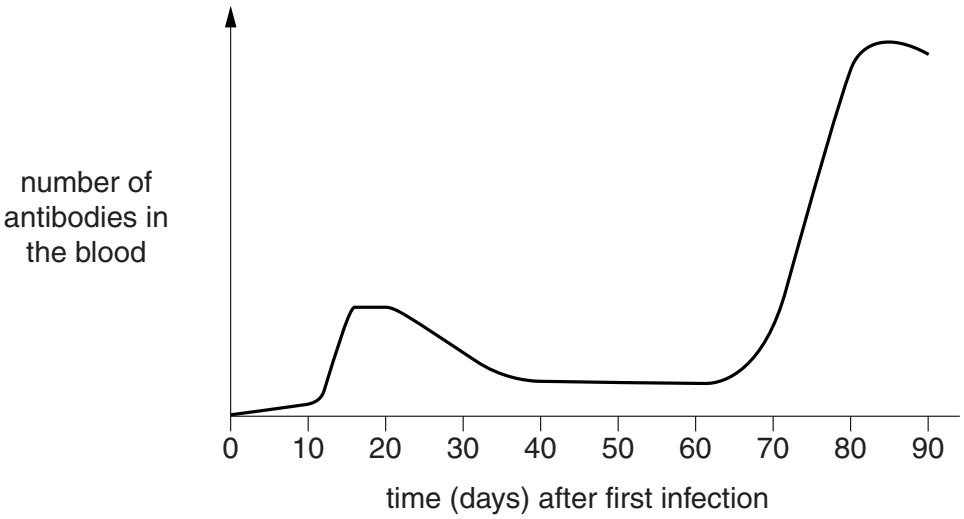
In the space below, draw a diagram of an antibody that Jake would produce to destroy the bacteria.

Explain your answer.

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

(e) Sometime later, Jake gets a second infection of the same bacteria.

The graph shows the level of antibodies in Jake's blood.



(i) How many days after the first infection did Jake get the second infection?

..... days **[1]**

(ii) Name the type of cell that enables a much stronger response to the second infection.

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

(iii) A student looked at Jake's graph.

He made these conclusions.

> After the first infection, Jake was immune to the harmful bacteria.
>
> The doctor gave Jake some antibiotics on day 83.

Evaluate the conclusions made by the student and explain the reasons for your judgement.

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

[Total: 15]

5 Ranjit has high blood pressure. It is increasing his risk of heart disease.

Explain blood pressure measurements and suggest why they may vary between individuals.

The quality of written communication will be assessed in your answer.

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[Total: 6]

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Question 6 begins on page 14

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6 Sunita studies biodiversity in four different habitats, **A**, **B**, **C** and **D**.

She measures the number of different species and the relative size of the population of the most common species in each habitat.

(a) These are her results.

	Habitat **A**	Habitat **B**	Habitat **C**	Habitat **D**
number of different species	20	106	10	255
relative size of populations	large	medium	small	large

(i) Which habitat, **A**, **B**, **C** or **D** shows the greatest biodiversity?

Explain your answer.

.....

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

(ii) Look at the following table of data.

Habitat	**Features**
part of a desert	medium number of species, but small populations
part of the Antarctic	large populations, but a small number of species
part of a tropical rain forest	large populations and a large number of species
part of a woodland	medium population size and medium number of species

Which habitat, **A**, **B**, **C** or **D**, is likely to be part of Antarctica?

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

(iii) Describe **one** criteria other than number of species or population size that Sunita could use to measure biodiversity.

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

(b) Which of the following are good examples of why biodiversity should be maintained?

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

The ultimate source of energy for food webs is the Sun.	☐
A new antibiotic is discovered in a rare species of plant.	☐
A gene is identified that could make crops grow in a drier climate.	☐
Classification is used to make it easier to identify different organisms.	☐
Mutations are required for the development of a new species.	☐
Evidence for evolution comes from the fossil record and from DNA.	☐
Darwin's theory of natural selection.	☐
All living organisms are dependent on other organisms for their survival.	☐

[3]

(c) Human activity can have an unintended direct impact on the environment.

Describe **one** example.

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

[Total: 8]

7 The process of evolution has produced many new species.

Explain how evolution produces new species.

The quality of written communication will be assessed in your answer.

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..... **[6]**

[Total: 6]

END OF QUESTION PAPER