

Candidate Name	Centre Number	Candidate Number
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**GCSE**

235/02

**SCIENCE  
HIGHER TIER  
BIOLOGY 1**

A.M. FRIDAY, 12 June 2009

45 minutes

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1	2	
2	6	
3	7	
4	4	
5	6	
6	7	
7	9	
8	9	
<b>Total</b>	<b>50</b>	

**ADDITIONAL MATERIALS**

In addition to this paper you may require a calculator.

**INSTRUCTIONS TO CANDIDATES**

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

**INFORMATION FOR CANDIDATES**

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

You are reminded of the necessity for good English and orderly presentation in your answers.

Answer all questions.

- The following front page headline appeared in the Western Mail newspaper in January 2008.

**Outrage as one in ten of us is on the DNA database**

Almost one in ten people in Wales are on the national DNA database. Many of the 264 420 on the database have never been charged with any criminal offence but their DNA sample is kept for life.

- (a) Suggest **one** reason why some people, who have never been charged with an offence, object to their DNA samples being kept on record. [1]

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.....

- (b) Suggest **one** advantage of the police keeping a DNA database. [1]

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2

- In sheep, white colour (**D**) is dominant to black colour (**d**).

A white ewe (female) crossed with a black ram (male). All the **F1** offspring are white.



- (a) (i) Complete the following genotypes: [1]

White ewe ..... X Black ram .....

- (ii) Complete the Punnett square to show the offspring from a mating between the white ewe and the black ram. [2]

<b>F1</b>	Gametes		

- (b) (i) Show, in the Punnett square below, the cross if two of the **F1** offspring are mated together. [2]

<b>F2</b>	Gametes		

- (ii) Complete the following to show the ratio of the different genotypes in the **F2** generation. [1]

..... homozygous white : ..... heterozygous white : ..... homozygous black

3. Hormone replacement therapy (HRT) is a method of giving people hormones when their bodies cannot make enough of them.

One method is to put a hormone into patches of material which can be attached to the skin.

The hormone can then diffuse through the skin.

In the 1990s this method was tried with insulin to treat diabetics.

(a) How is the hormone carried from the skin to the organ that it affects? [1]

.....

(b) In which organ is insulin normally produced? [1]

.....

(c) In which organ does insulin carry out its function? [1]

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(d) Explain how insulin reduces blood sugar levels. [1]

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.....

(e) Name **two other** methods of treating diabetes. [2]

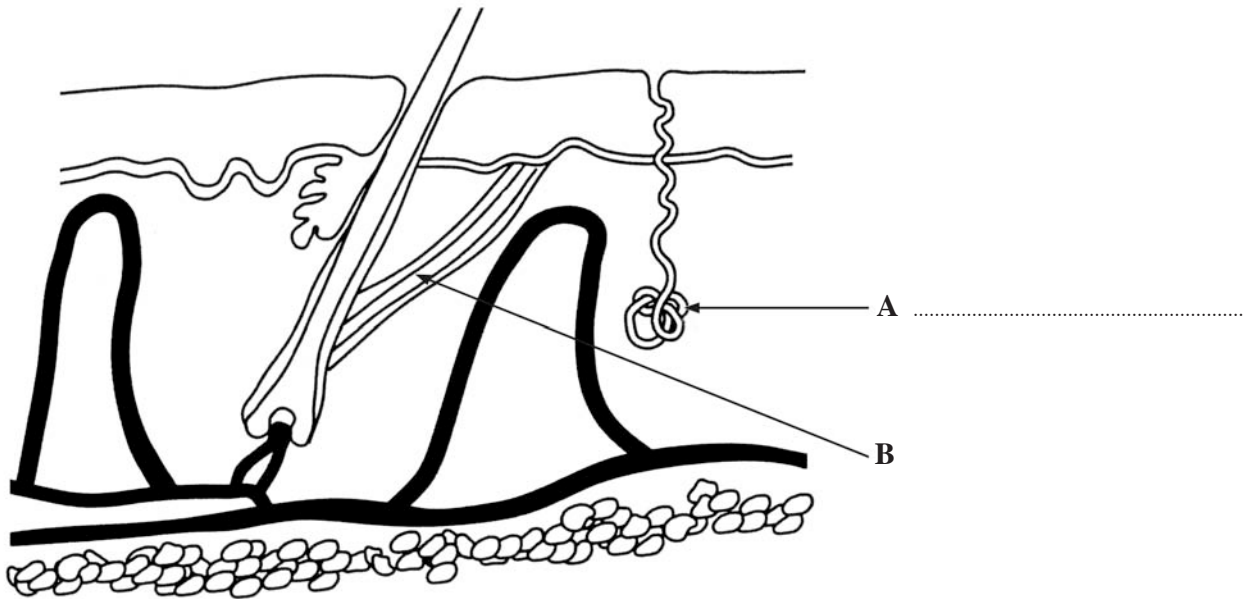
(i) .....

(ii) .....

(f) To which group of chemicals does the hormone, insulin belong? [1]

.....

4. The diagram shows a section through the skin.



(a) Label part A on the diagram. [1]

(b) What change will occur in part B during cold weather? [1]

.....

(c) Explain how the skin capillaries help to control body temperature in hot weather. [2]

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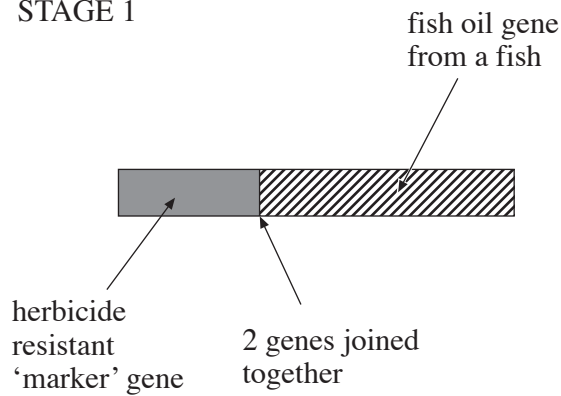
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5. Genes can be transferred artificially from one organism to another. Scientists transferred a gene, which controls production of fish oil (such as cod liver oil) from a fish and a herbicide resistant 'marker' gene into a rapeseed plant. The rapeseed plant will now produce fish oil. The diagram below shows this process.

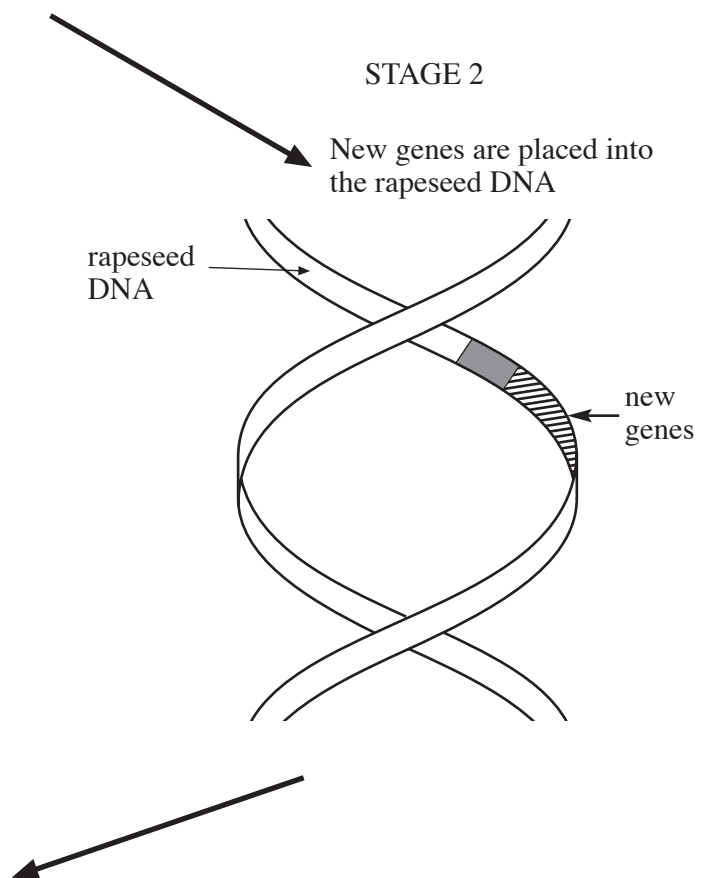
## STAGE 1



## STAGE 3

The rapeseed plant should now contain the new genes

## STAGE 2



- (a) (i) The scientists don't know whether the gene for the production of fish oil has been successfully introduced into the DNA of the rapeseed plant. Suggest how the herbicide resistant 'marker' gene will allow them to find out. [1]

.....

.....

- (ii) Fish oils are said to be good for the heart and nervous system. The world market for fish oils has grown very quickly over the last 25 years. Suggest **one** advantage of growing genetically modified (GM) rapeseed crops for the production of fish oils. [1]

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- (iii) Suggest why some people are concerned about the transfer of genes from one species to another, especially between animals and plants. [1]

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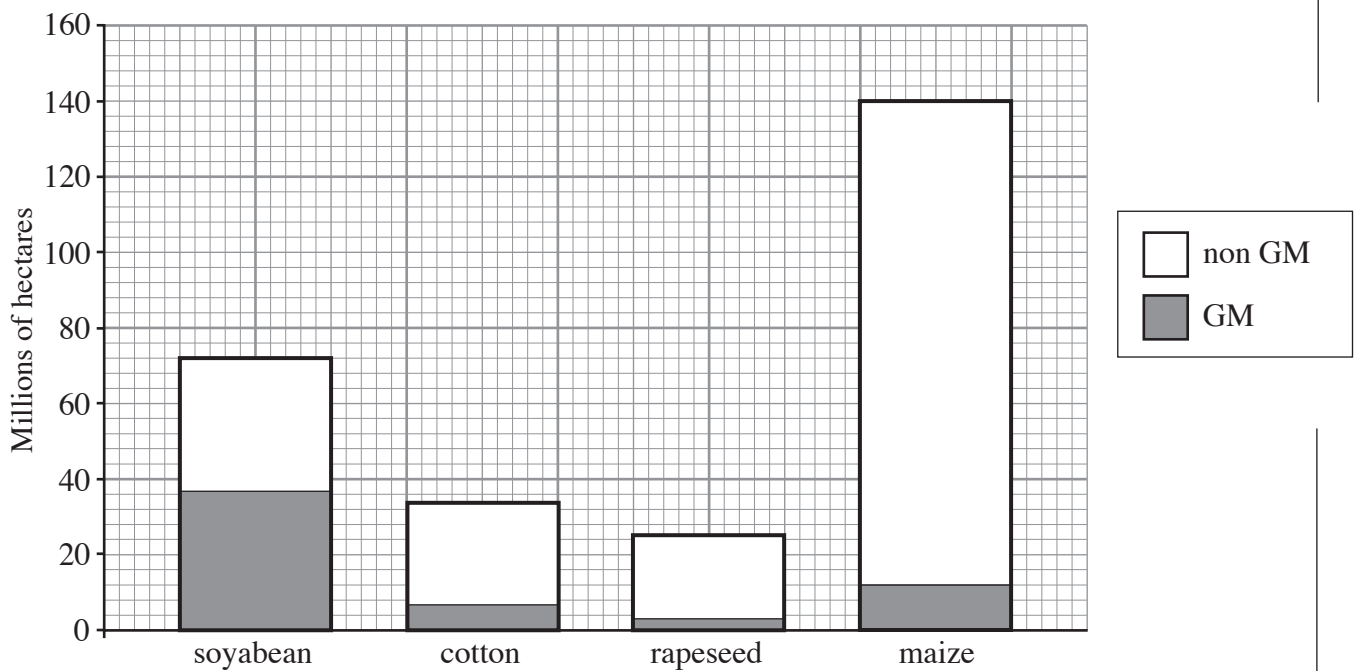
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- (b) The worldwide cultivation of the four main commercial GM crops in 2002 and 2006 is shown in the table below.

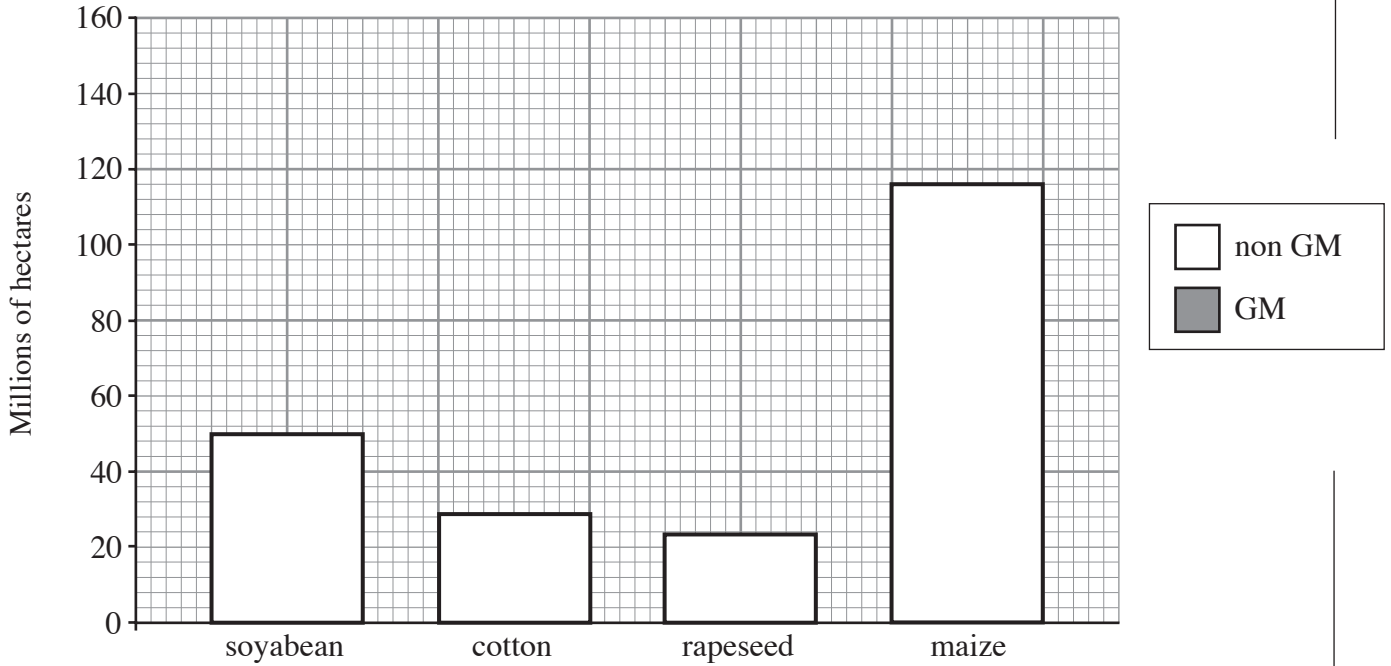
<i>Crop</i>	<i>Millions of hectares</i>			
	<i>2002</i>		<i>2006</i>	
	<i>Non GM</i>	<i>GM</i>	<i>Non GM</i>	<i>GM</i>
Soyabean	72	37	50	45
Cotton	34	7	29	13
Rapeseed	25	3	24	4
Maize	140	12	116	36

- (i) Plot the data for the millions of hectares of GM crops grown in **2006** on the **2006** chart opposite. [1]

**2002**



2006



(ii) What is the relationship between the amount of non GM and GM crops grown in 2006 compared to 2002? [1]

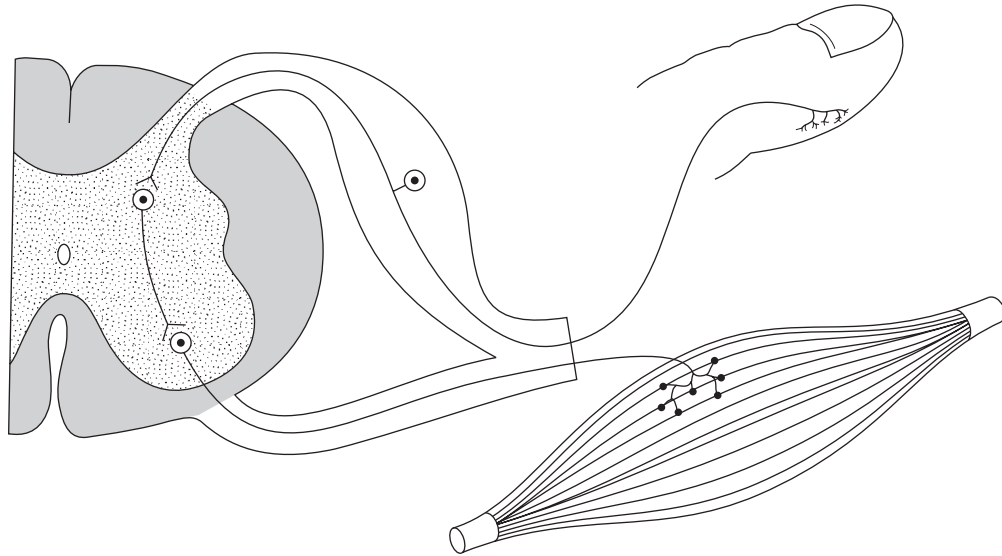
.....

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(iii) What is the **percentage** increase in GM maize production in 2006 compared to 2002? [1]

..... %

6. The diagram shows part of the nervous system involved in a withdrawal reflex action.



(a) On the diagram, label the [4]

- (i) motor nerve cell;
- (ii) connecting nerve cell;
- (iii) synapse;
- (iv) sensory nerve cell.

(b) (i) Name the path taken by a nerve impulse in the reflex action shown in the diagram. [1]

.....

(ii) Draw an arrow on each nerve cell to show the direction taken by the nerve impulse. [1]

(c) Name the stimulus which could affect the receptor in the skin when you touch a flame. [1]

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7. Too much fat in the diet can lead to cholesterol building up in the blood.

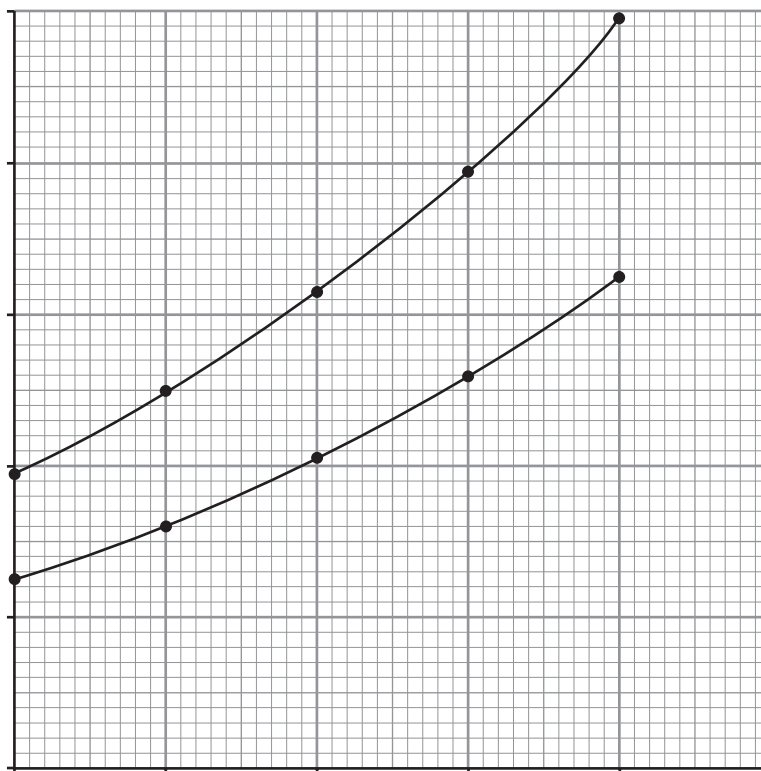
This can cause heart disease.

The table shows the results of a study of the relationship between blood cholesterol levels and the risk for non-smokers and smokers of developing heart disease within six years.

All people taking part in the study were 45-year-old men with the same blood pressure.

	Blood cholesterol /mg per cm <sup>3</sup>	200	220	240	260	280
Risk of developing heart disease within 6 years / %	non-smokers	2.5	3.2	4.1	5.2	6.5
	smokers	3.9	5.0	6.3	7.9	9.9

The results are plotted in the graph below, using the same scale for non-smokers and smokers on the axes.



(a) On the graph, clearly label the [3]

- (i) axes;
- (ii) scales;
- (iii) smokers and non smokers.

(b) State **two** conclusions based on the data above, about the risk of developing heart disease. [2]

- (i) .....
- .....
- (ii) .....
- .....

(c) State **three** factors which helped to make the investigation a fair comparison. [3]

- (i) .....
- (ii) .....
- (iii) .....

(d) Name **one other** cause of heart disease besides poor diet and smoking. [1]

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8. Today more than 90% of adult Europeans can digest milk. In 2007 a scientist found evidence that this ability only developed in humans in the past 7000 years. Most mammals are unable to digest milk when they are adult.

A sudden change in the gene which now allows adult humans to digest the sugar in milk took place within the last 7000 years.

- (a) What is the name given to this sudden change in a gene? [1]

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- (b) Explain how this example is evidence for Charles Darwin's theory of evolution. [3]

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- (c) The evidence was gained by analysing the structure of a molecule from prehistoric human skeletons.  
What molecule was analysed? [1]

.....

- (d) In order to form a valid comparison, suggest what other data the scientist would need beside the data from **prehistoric** humans. [1]

.....  
.....

- (e) After the publication of the scientist's results, other scientists repeated the investigations. Underline the correct scientific reason for repeating the investigations. [1]

- (i) It improved accuracy.  
(ii) It improved reliability.  
(iii) Other scientists did not believe the original results.  
(iv) Other scientists did not understand the results.

- (f) In the account of the first investigations, the prehistoric bones were described as coming from *Homo sapiens*. Modern day humans are also *Homo sapiens*. Other prehistoric remains of humans include those of *Homo erectus*, *Homo ergaster* and *Homo habilis*. Suggest why it was important for the original research scientist to use the name, *Homo sapiens* rather than prehistoric man. [2]

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