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|-------------|---------------|------------------|
| Surname | Centre Number | Candidate Number |
| Other Names | | 0 |



GCSE

0235/02

**SCIENCE
HIGHER TIER
BIOLOGY 1**

A.M. MONDAY, 28 January 2013

45 minutes

| For Examiner's use only | | |
|-------------------------|--------------|--------------|
| Question | Maximum Mark | Mark Awarded |
| 1 | 6 | |
| 2 | 6 | |
| 3 | 3 | |
| 4 | 6 | |
| 5 | 8 | |
| 6 | 6 | |
| 7 | 6 | |
| 8 | 5 | |
| 9 | 4 | |
| TOTAL | 50 | |

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ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

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.

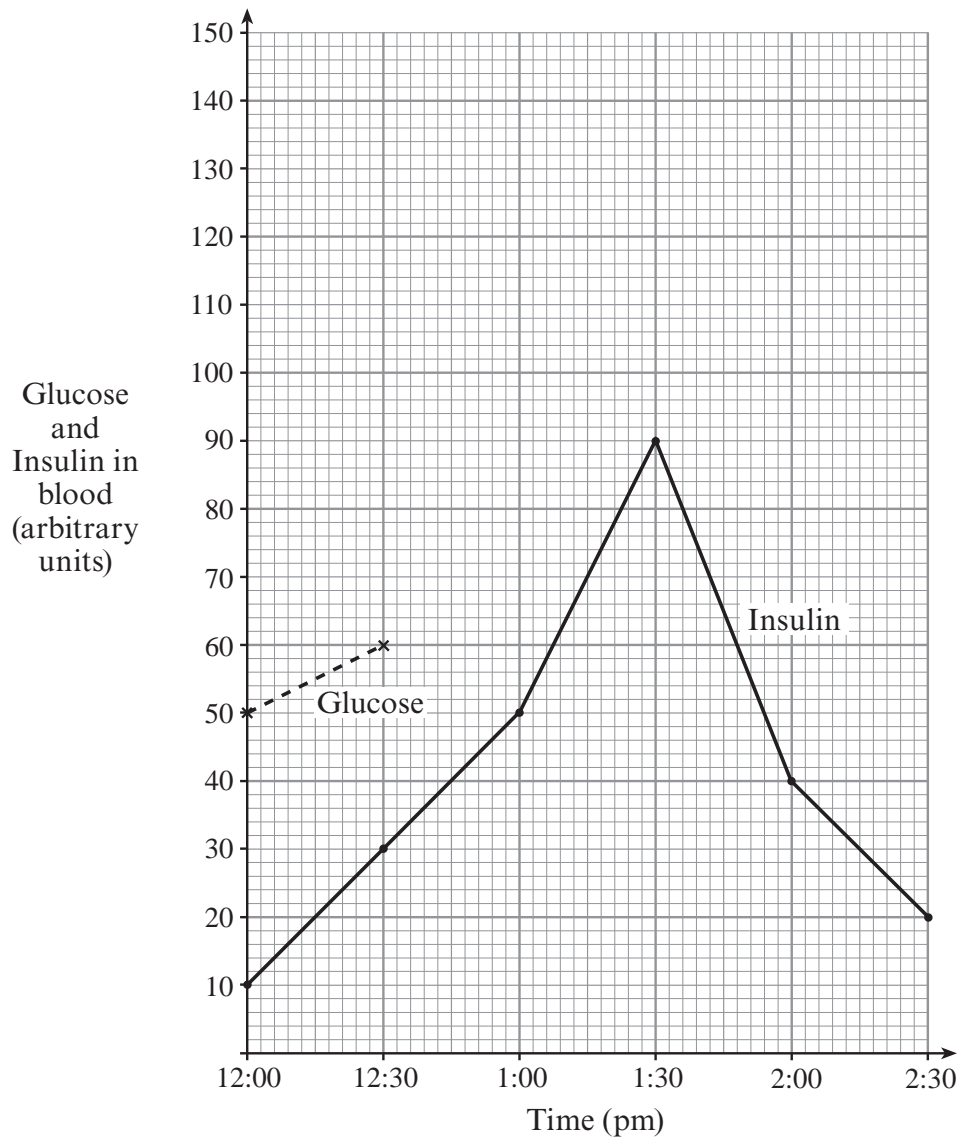
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1. In the human body, *insulin* controls the levels of sugar (glucose) in the blood.

The levels of insulin and glucose in Rehana's blood were measured during an investigation which started at lunchtime.

Rehana is not diabetic and eats lunch. The results are shown in the table and on the graph.

| Time (pm) | Glucose in blood (arbitrary units) |
|-----------|------------------------------------|
| 12.00 | 50 |
| 12.30 | 60 |
| 1.00 | 140 |
| 1.30 | 120 |
| 2.00 | 60 |
| 2.30 | 50 |



(a) The results for insulin have been plotted as a graph opposite.
Plot the results for glucose onto the same graph. Join the points with a ruler. The first two points have been done for you. [3]

(b) From the graph

(i) How much insulin is in the blood at 1.45 pm? [1]

.....

(ii) Suggest a possible reason for the increase in glucose in Rehana's blood between 12.00 pm and 1.00 pm. [1]

.....

(iii) Rehana rests after 12.00 pm. State what has caused the decrease in glucose between 1.00 pm and 1.30 pm. [1]

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2. Gregor Mendel made important discoveries on how characteristics or traits are passed from parents to offspring.
In one of his experiments he crossed pea plants that produced seeds with round coats with plants that produced seeds with wrinkled coats.

Seeds with wrinkled coats



Seeds with round coats

R. W. Van Norman/Visuals Unlimited, Inc

The results of this cross were plants (F1) that only produced round coated seeds. Mendel explained this by saying that pea plants passed on **factors** (alleles) from one generation to the next. He also said that the factor for round seeds is dominant over the factor for wrinkled seeds.

Use the information in the passage and your knowledge to answer the following questions.

- (a) (i) Complete the following to show how the F1 plants were produced in Mendel's experiment.

R = allele for round seeds
r = allele for wrinkled seeds

Phenotype of parents

Round × Wrinkled

Genotype of parents

RR

rr



Gametes

.....

.....

[1]

- (ii) Complete the Punnett square to show the genotypes produced in this cross. [2]

| | | | |
|-----------|----------------|--|--|
| F1 | <i>Gametes</i> | | |
| | | | |
| | | | |

- (b) (i) Mendel then crossed two of these F1 plants together. Draw your own Punnett square and complete it to show the genotypes of the offspring that would be produced. [2]

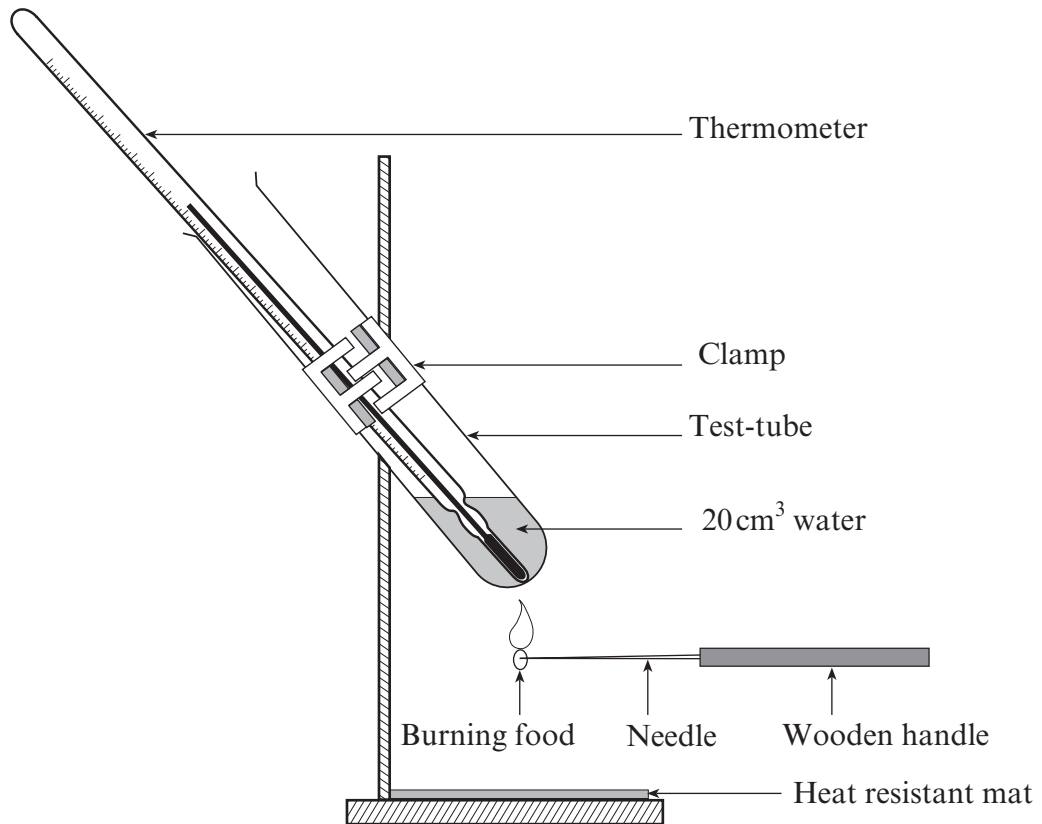
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- (ii) What is the ratio of round to wrinkled seeds produced above? [1]

..... round: wrinkled

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3. The following apparatus was set up to measure the energy content of a piece of food.



- (a) State **two** measurements that you must take in order to find the energy content of the food. [2]

.....

.....

- (b) If you were comparing the energy content of two **different** foods state **one other** measurement that must be taken. [1]

.....

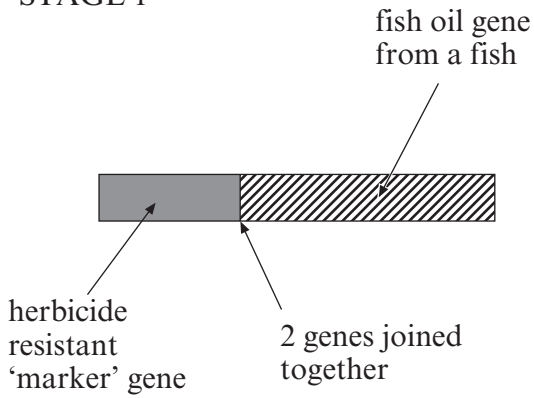


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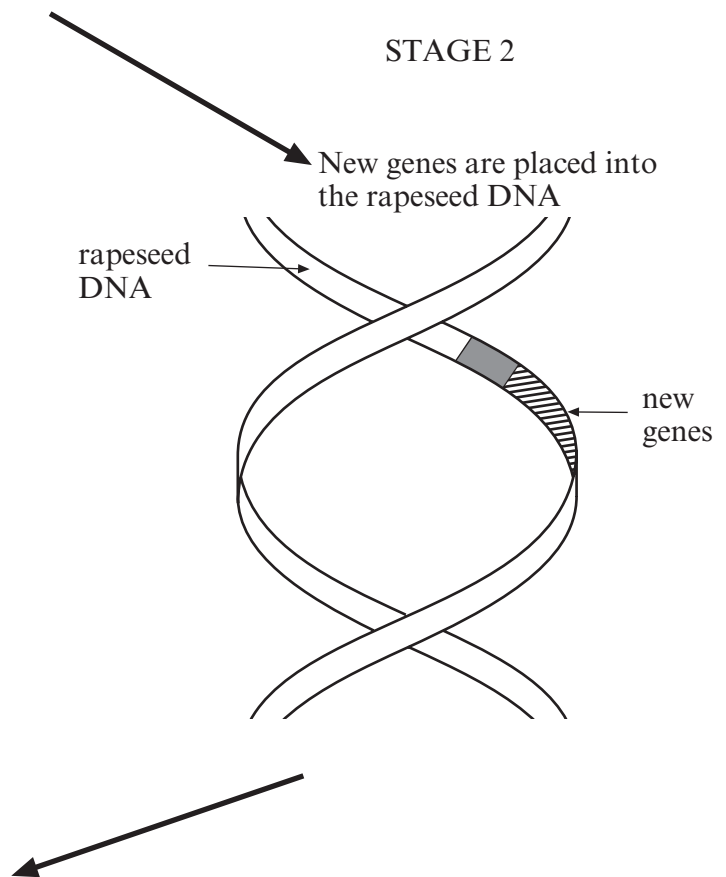
4. Genes can be transferred artificially from one organism to another. Scientists transferred a gene, which controls production of fish oil (such as cod liver oil) from a fish and a herbicide resistant 'marker' gene into a rapeseed plant. The rapeseed plant will now produce fish oil. The diagram below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

STAGE 1



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STAGE 2



STAGE 3

The rapeseed plant should now contain the new genes

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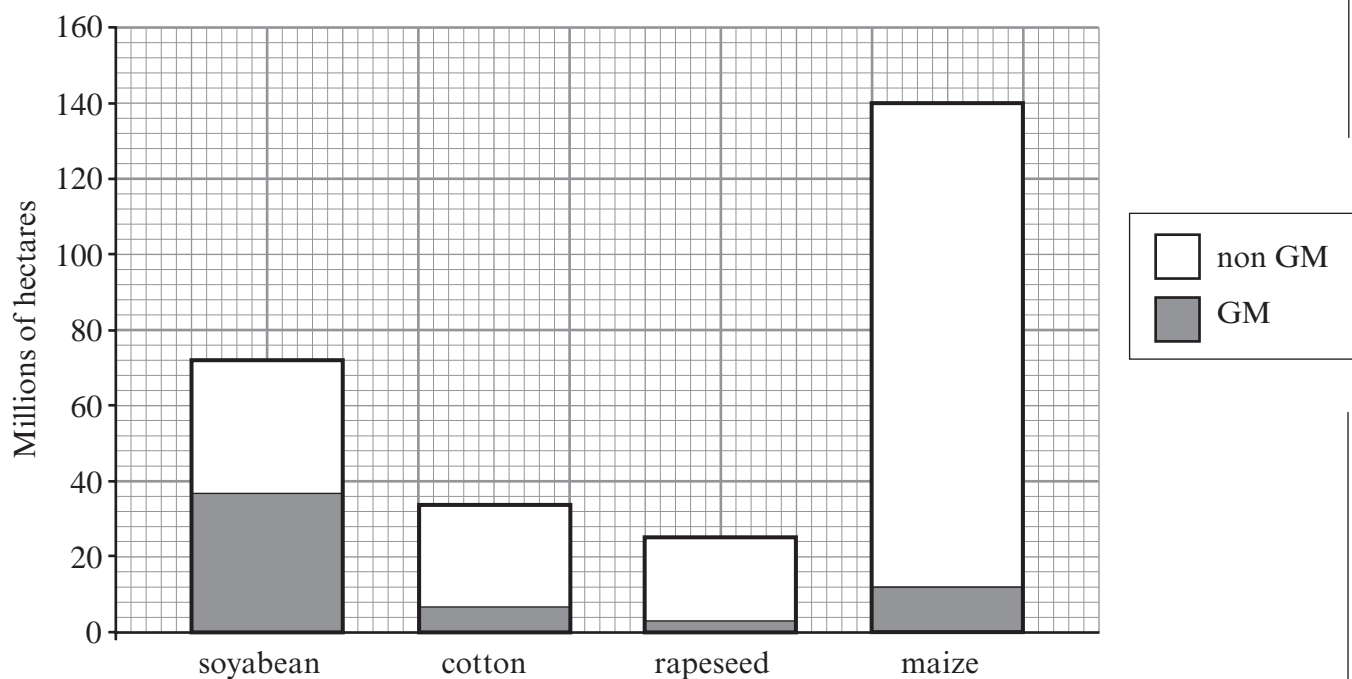
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- (b) The worldwide cultivation of the four main commercial GM crops in 2002 and 2006 is shown in the table below.

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

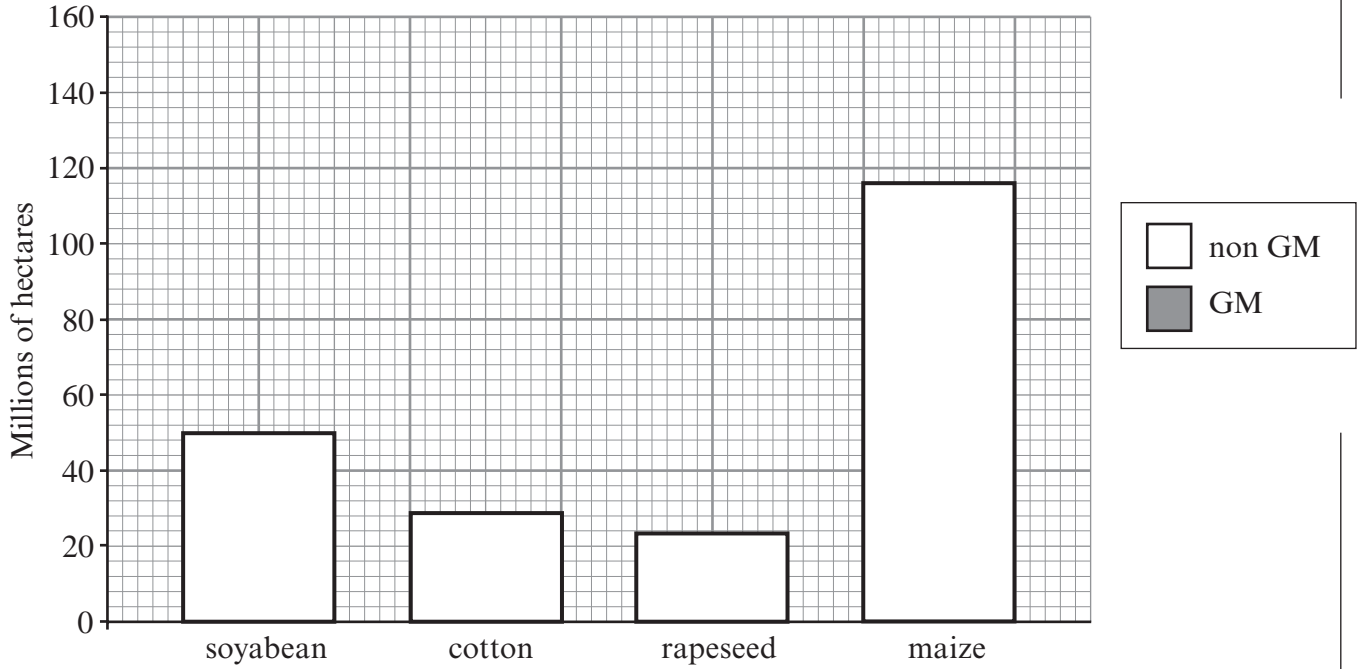
- (i) Plot the data for the millions of hectares of GM crops grown in **2006** on the **2006** chart opposite. [1]

2002



2006

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(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]

..... %

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5. A scientist measured the volume of sweat and urine a person produced at different air temperatures.

Here are the results:

| Air temperature ($^{\circ}\text{C}$) | Sweat produced (cm^3 per hour) | Urine produced (cm^3 per hour) |
|--|--|--|
| 0 | 4 | 100 |
| 5 | 4 | 90 |
| 10 | 8 | 80 |
| 15 | 20 | 62 |
| 20 | 40 | 54 |
| 25 | 60 | 40 |
| 30 | 100 | 30 |
| 35 | 200 | 20 |

- (a) Describe the changes in the volumes of sweat and urine as the air temperature increases.

[2]

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(b) Explain how the body causes the volume of sweat to change with increased air temperature and state the advantage of this change to the person. [2]

(i) Explanation

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(ii) Advantage

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(c) Apart from sweating, describe how else the skin controls body temperature when

(i) the body temperature increases, [2]

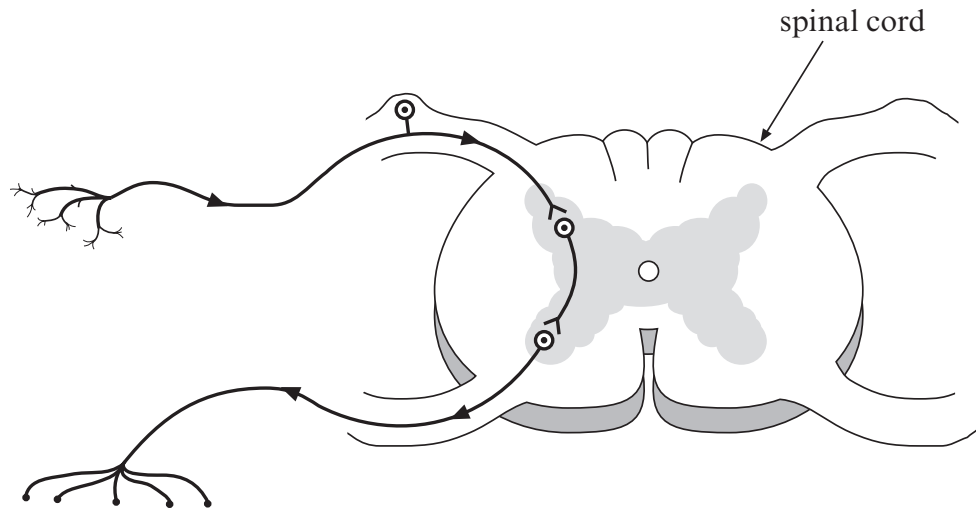
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(ii) the body temperature decreases. [2]

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6. The diagram below shows a reflex arc.



(a) On the diagram, label:

- (i) the sensory nerve cell;
- (ii) the connecting nerve cell;
- (iii) a synapse;
- (iv) the receptor.

[4]

(b) In some diseases the motor nerve cells are damaged. Explain how this would affect reflex actions.

[1]

.....

.....

(c) When nerve impulses travel along nerves, chemical energy is changed into another form of energy. Name this form of energy.

[1]

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7.



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- Male guppies, as shown above, are colourful tropical fish.
- Their colours occur in various patterns.
- The patterns are controlled by genes.
- Some patterns are more commonly seen than others.
- Predators find it more difficult to target the rarer, most colourful patterns but easily find the less colourful patterns.
- Female guppies select the most colourful males to breed.

Use this information to explain how natural selection results in male guppies existing in such a rich variety of colours. [6]

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8. An investigation was carried out into the effect of caffeine on the reaction time of some people.

Each person was given 2 g of instant coffee dissolved in 200 cm³ boiling water. A computer programme was used to measure the reaction time of the people before and after drinking the coffee.

In order to measure the reaction time, each person had to push a button as soon as a signal was heard.

The results are shown in the table.

| person | age | gender | Reaction time(s) | |
|--------|-----|--------|------------------|--------------|
| | | | before coffee | after coffee |
| A | 15 | male | 0.17 | 0.16 |
| B | 17 | female | 0.15 | 0.14 |
| C | 19 | female | 0.18 | 0.15 |
| D | 16 | male | 0.19 | 0.17 |
| E | 17 | male | 0.14 | 0.12 |
| F | 20 | male | 0.17 | 0.14 |
| G | 18 | male | 0.21 | 0.15 |
| H | 16 | female | 0.17 | 0.16 |

- (a) What is the effect of caffeine on the reaction times of the people tested? [1]

.....

- (b) State **one** factor that has been kept constant. [1]

.....

- (c) State **three** *other* factors which should have been kept constant to make this a fair test. [3]

(i)

(ii)

(iii)

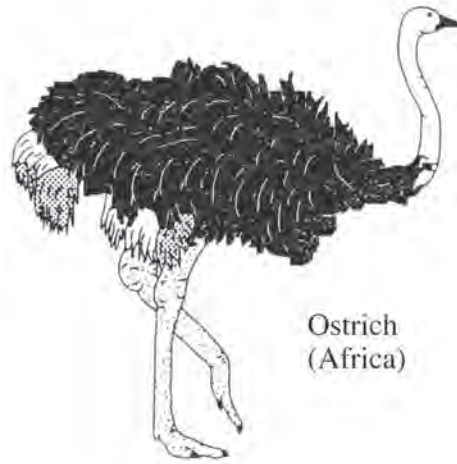
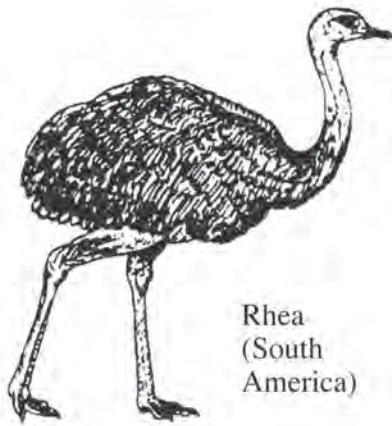
9. (a) (i) Name the theory which states that all living things have a common ancestor. [1]

.....

(ii) Which famous scientist proposed this theory in his book *The origin of species* in 1859? [1]

.....

(b) The drawings (not drawn to scale) show three species of bird from three different continents.



Scientists think that these three birds all developed from the same ancestor. Use the drawings to suggest **two** features of this ancestor. [2]

(i)

(ii)

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