

Friday 10 June 2016 – Morning

**GCSE TWENTY FIRST CENTURY SCIENCE
BIOLOGY A/ADDITIONAL SCIENCE A**

A162/02 Modules B4 B5 B6 (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



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. If additional space is required, you should use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

- The 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 **20** pages. Any blank pages are indicated.

Answer **all** the questions.

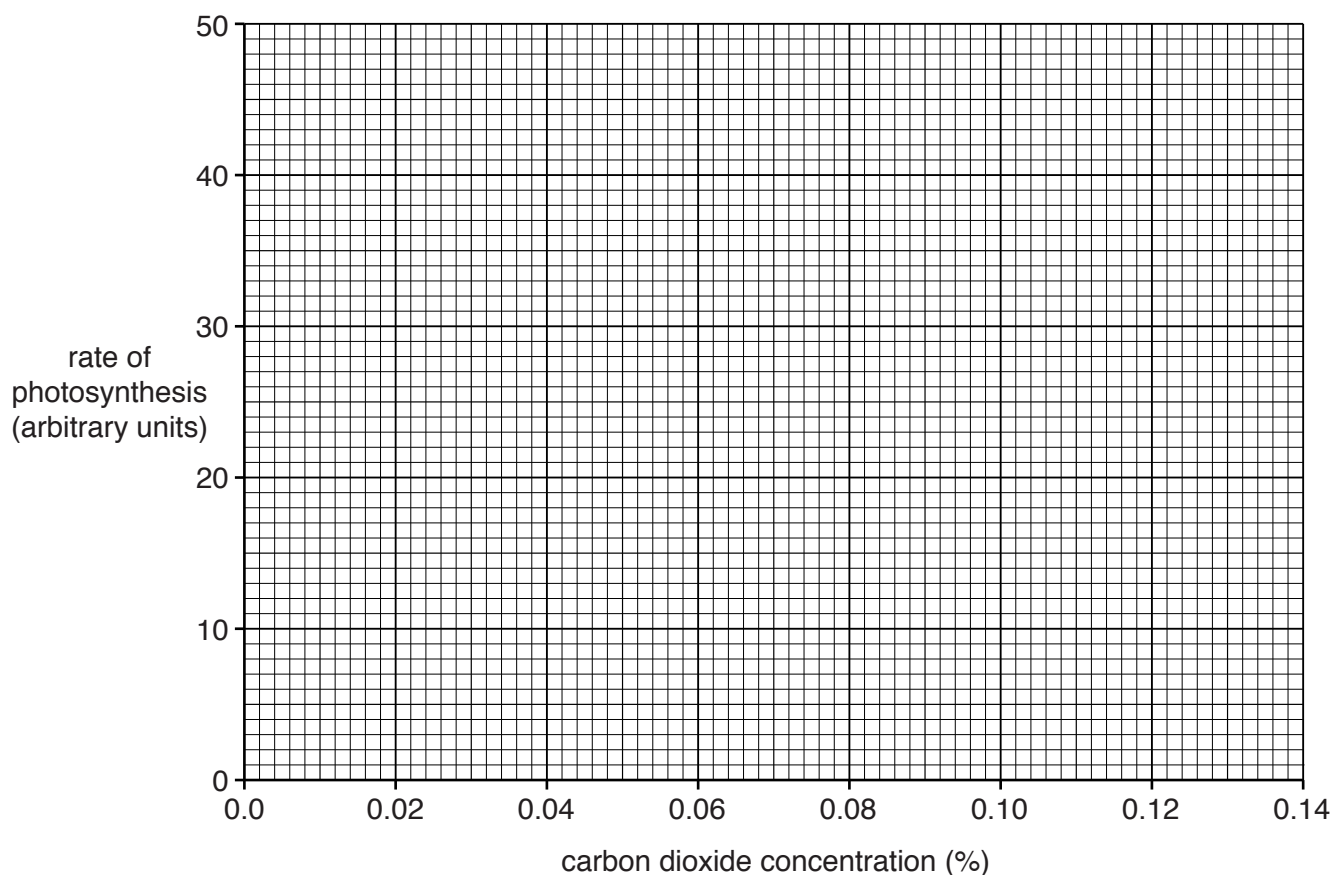
- 1 (a) Paresh does an experiment to investigate the effect of carbon dioxide on the rate of photosynthesis.

His results are shown below

Carbon dioxide concentration in the air (%)	Rate of photosynthesis (arbitrary units)
0.00	0
0.02	20
0.04	28
0.06	35
0.08	40
0.10	
0.12	43
0.14	43

- (i) Plot the data on the grid below.

[2]



- (ii) Use the points to draw an appropriate line of best fit.

[1]

- (iii) The table does not show the rate of photosynthesis when the concentration of carbon dioxide was 0.10%.

Use the graph to find the rate of photosynthesis when the carbon dioxide concentration was 0.10%.

rate of photosynthesis [1]

- (iv) What conclusions can be made about the effect of carbon dioxide concentration on the rate of photosynthesis?

.....

 [2]

- (v) Paresh measures the rate of photosynthesis at 0.13%.

The rate of photosynthesis was 22 (arbitrary units).

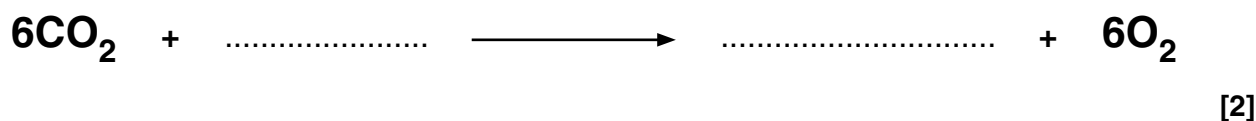
He decides **not** to include this in the data set.

Suggest why.

.....

 [2]

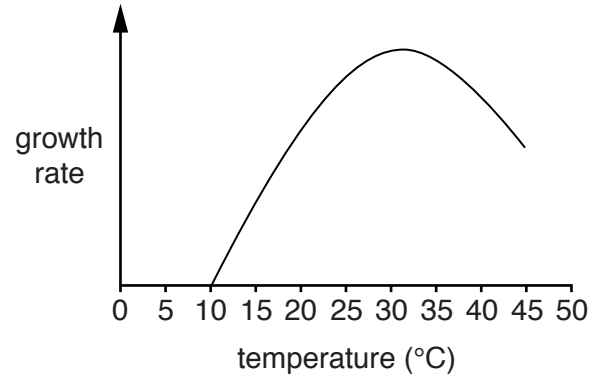
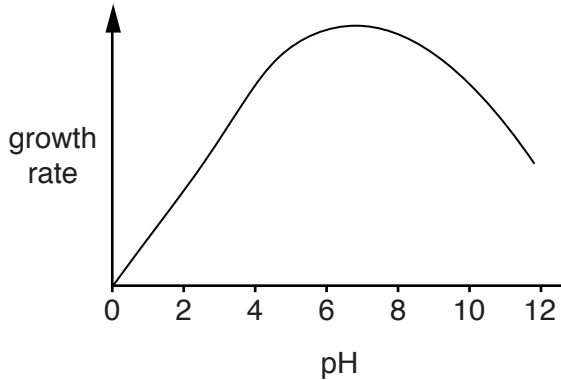
- (b) Complete the **balanced symbol equation** for photosynthesis.



(c) Paresh is a keen gardener. He wants to improve the growth rate of his tomatoes.

To do this he needs to provide the optimum conditions for growth.

Paresh read the information below in a gardening magazine. It shows the effects of pH and temperature on the growth rate of tomatoes.



Describe what conditions he should provide to grow his tomatoes. Use the information above and your biological knowledge in your answer.



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

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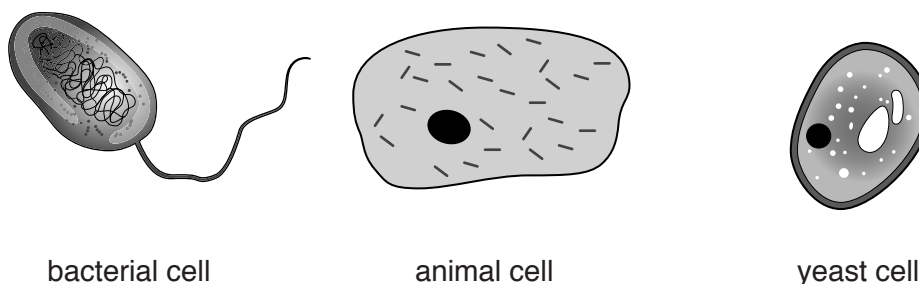
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..... [6]

[Total: 16]

2 The diagrams show three different types of cell.



(a) (i) Which of the structures below is **not** found in a bacterial cell?

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

cell wall	☐
circular piece of DNA	☐
cell membrane	☐
mitochondrion	☐

[1]

(ii) Which of the structures below is **not** found in an animal cell or a yeast cell?

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

cell wall	☐
circular piece of DNA	☐
cell membrane	☐
mitochondrion	☐

[1]

(iii) Which of the structures below is found in all **three** types of cell?

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

cell wall	☐
circular piece of DNA	☐
cell membrane	☐
mitochondrion	☐

[1]

(b) All cells respire.

- (i) Name **two** parts of animal cells that are involved in the process of respiration. Describe the function of each part.

Part 1

Function

.....

Part 2

Function

.....

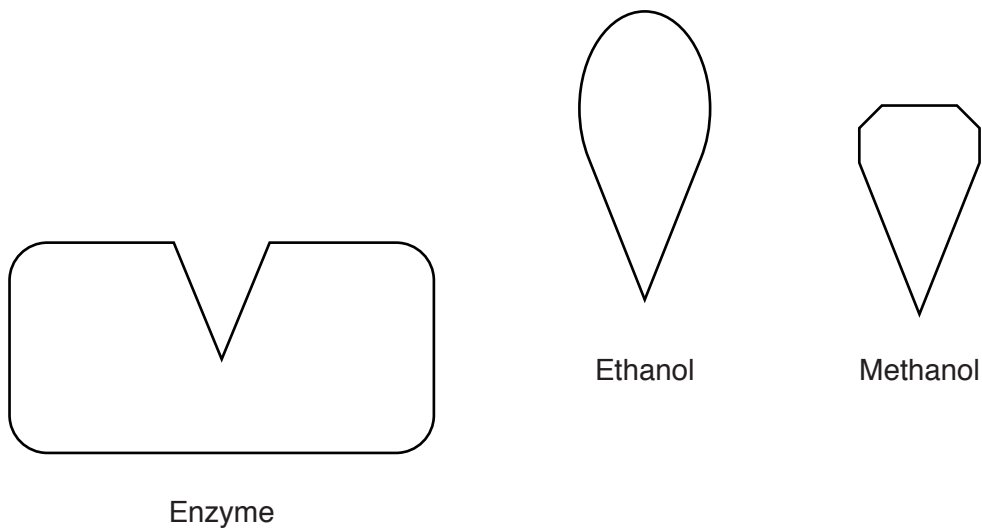
[4]

(ii) Methanol is a type of alcohol.

In the body, methanol is broken down by an enzyme.

The products of this process are poisonous.

Ethanol is a different type of alcohol. It can be used to treat methanol poisoning.



The diagrams show the shapes of the molecules of enzyme, ethanol and methanol.

Use your knowledge of enzymes to explain why ethanol is used to treat methanol poisoning.

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..... [3]

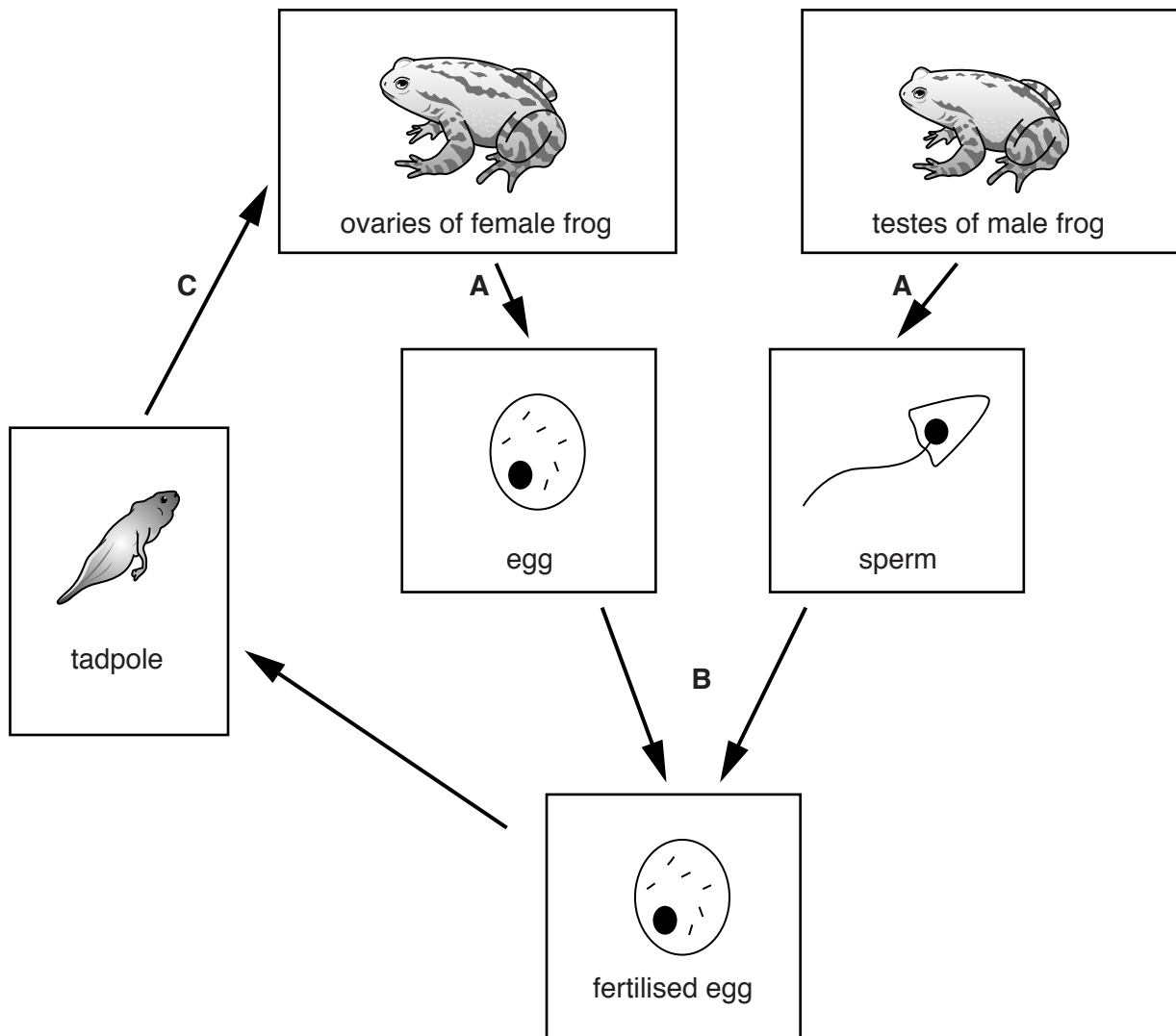
- (iii) During beer and wine making, yeast cells respire anaerobically to produce ethanol.

Write down one other useful application of anaerobic respiration in microorganisms.

..... [1]

[Total: 11]

3 The diagram below shows the life cycle of a frog.



Three stages of the life cycle have been labelled **A**, **B** and **C**.

Identify the **two** stages at which cell division takes place. Describe the similarities and differences between the cell division at these two stages. [6]



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

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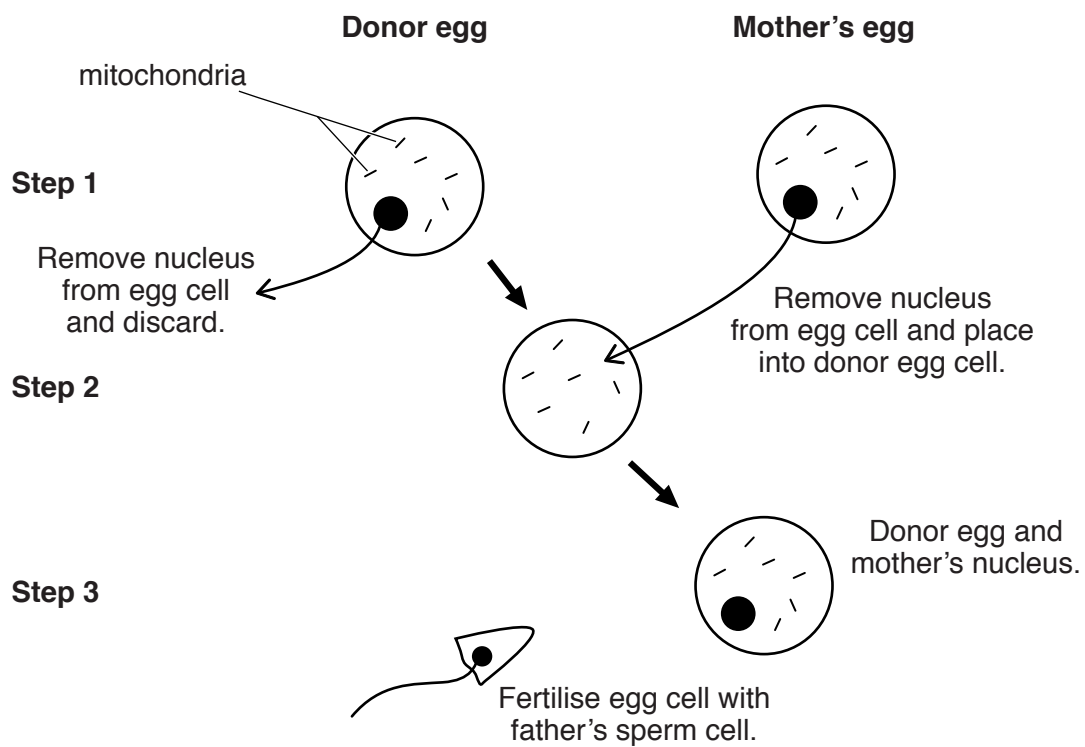
[Total: 6]

4 Scientists use cell structures from three people to make a baby:

- the nucleus from a mother's egg cell
- the nucleus from a father's sperm cell
- the mitochondria from a donor's egg cell.

This technique will help prevent some genetic diseases caused by faulty mitochondria.

The diagram below shows how the process will be done.



Step 4 Fertilised egg cell is then placed in the mother's uterus.

- (a)** Mitochondria contain 37 genes.

The nucleus of a fertilised egg cell contains 40 000 genes.

What percentage of its genes does the fertilised egg cell receive from the donor?

Give your answer to 2 decimal places.

Show your working.

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

- (b)** Most of the baby's physical characteristics will be inherited from its father and mother.

Suggest why.

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

- (c)** Genes code for proteins.

What type of protein could the genes in the mitochondria code for?

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

- (d)** Babies created by this new technique will contain the DNA from 3 different individuals.

Some people do not agree with the use of this new technique.

Suggest and explain why.

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

- (e) Approximately 1 in 200 children have faulty mitochondria.

1 in 6500 children will have serious diseases as a result.

Do you think this justifies the development of this new technique?

Explain your answer.

.....

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..... [2]

- (f) The DNA in the mitochondria of people affected by mitochondrial disease contains mutations.

A mutation is a change in the base sequence of the DNA.

Explain how these mutations can cause problems.

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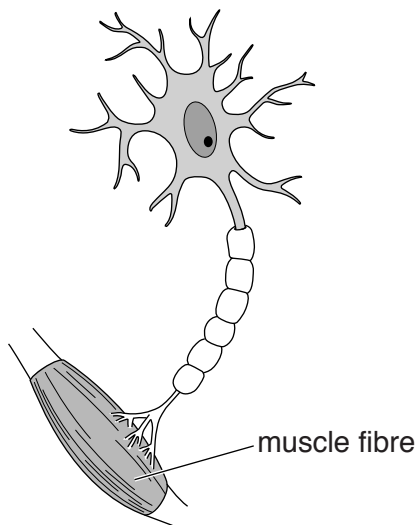
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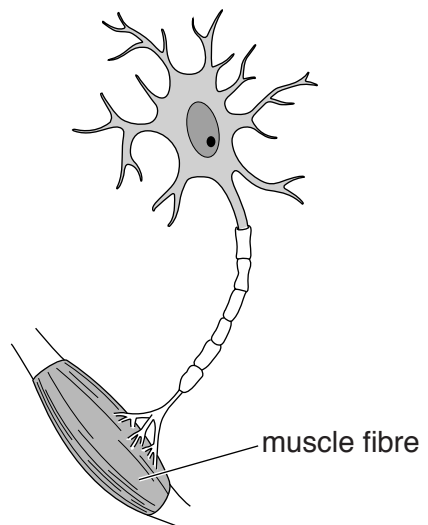
[Total: 11]

5 (a) Multiple sclerosis disease damages motor neurons.

The diagrams below show how a healthy neuron differs from a damaged neuron.



normal motor neuron



damaged motor neuron from multiple sclerosis

Use the diagrams to explain how multiple sclerosis changes the functioning of the motor neuron.

Suggest what effect this will have on a person with multiple sclerosis.



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

..... [6]

- (b) Multiple sclerosis affects about 100 000 people in the UK.

The population of the UK is about 64 000 000.

What is the ratio of affected people to unaffected people?

Show your working.

..... [2]

- (c) Read this newspaper article about multiple sclerosis.

Researchers in Spain may have discovered a way to treat multiple sclerosis (MS).

They used mice that had a form of MS.

They injected stem cells from healthy mice into the mice that had MS.

The neurons in the mice with MS were less diseased.

- (i) Stem cells from mice would not be used to treat a human with multiple sclerosis.

Suggest why.

.....

 [1]

- (ii) The stem cells needed to treat this disease in humans can be taken from umbilical cords or adult bone marrow.

Which would be the better choice of stem cells to use?

Explain your answer.

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..... [1]

[Total: 10]

- 6 (a) Pavlov did research on conditioned reflexes in dogs.

What do you understand by the term 'conditioned reflex'?

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.....

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..... [2]

- (b) Reflex responses are rapid and automatic.

Which of the following statements explain why reflex responses are rapid and automatic?

Put ticks in the boxes next to the **two** correct answers.

Information is sent to the brain for processing.

☐

Neurons are in a fixed pathway.

☐

Neurons do not connect with other neurons.

☐

Reflexes do not involve conscious thought.

☐

There are no synapses in a reflex arc.

☐

[2]

- (c) Kelly bakes a cake.

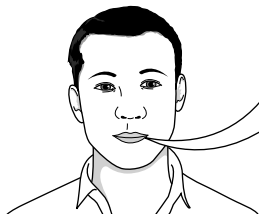
The cake is hot when she takes it out of the oven.

Her reflex response is to drop the hot cake.

However, Kelly does not drop the cake.

Her friends each give an explanation as to why this happens.

Which friend gives the best explanation?



Cillian

There are two different impulses sent to her muscles. The one to override the reflex is faster, so she doesn't drop the cake.



Simon

It's simple, Kelly just doesn't have a reflex response when she decides not to drop the cake.



Orla

Kelly's brain overrides the reflex and no impulses will be sent.



Amy

Kelly's brain sends a message via a motor neuron to the effector which makes her hold onto the cake.

Best explanation [1]

- (d) Newborn babies have some reflexes that are different from adult reflexes. These newborn reflexes usually disappear at around six months of age.

Write down the name of one newborn reflex.

..... [1]

[Total: 6]

END OF QUESTION PAPER

This image shows a blank sheet of white paper designed for writing. It features a series of evenly spaced horizontal blue lines across its entire width. A single vertical red line runs down the left side, creating a narrow margin. The paper is otherwise completely empty, with no text or markings.

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