OCR GCSE 21ST CENTURY BIOLOGY B · J257

BIOLOGY



EXAM QUESTION PACK

B5.2 HOW DOES THE NERVOUS SYSTEM HELP US RESPOND TO CHANGES? (HIGHER)

SCORE	PERCENTAGE
/59	%

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1(a). 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]

(b). 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.

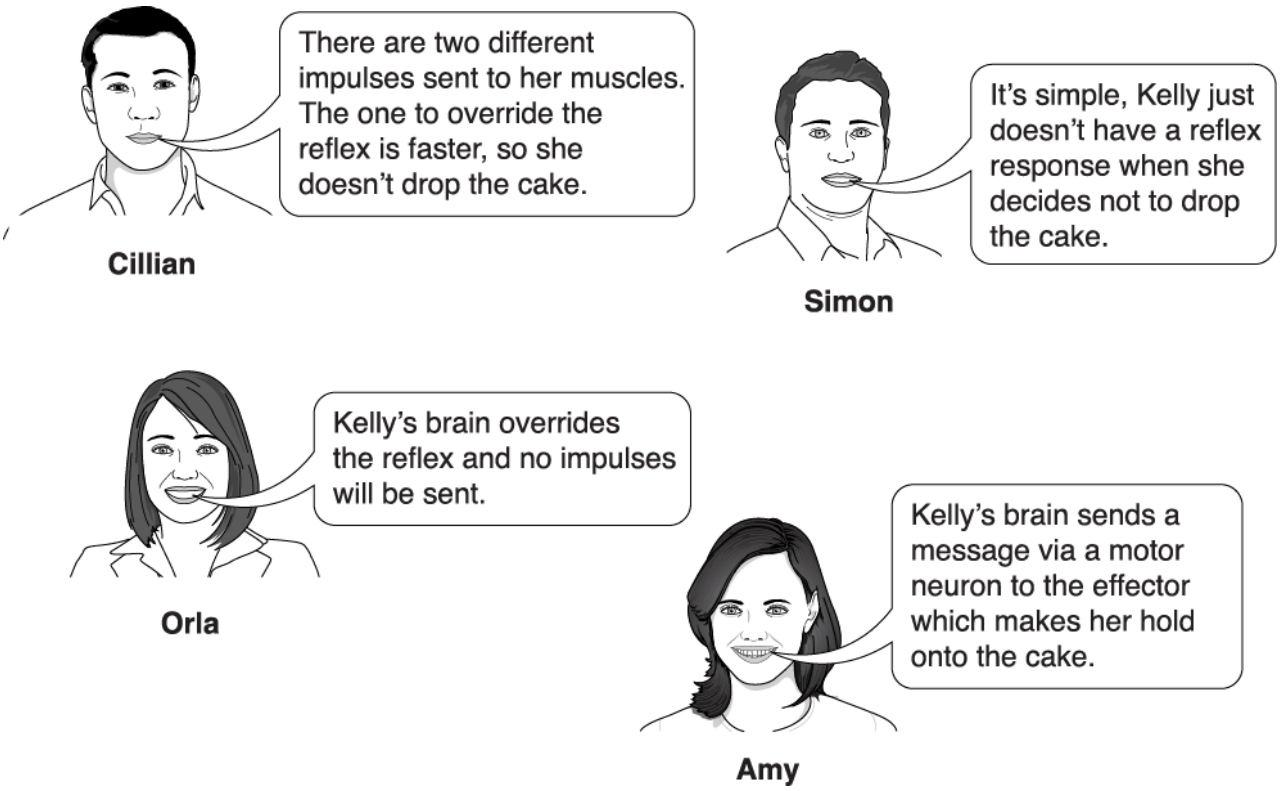
However, Kelly does not drop the cake.

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

Which friend gives the best explanation?

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Best explanation _____ [1]

(c). 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.

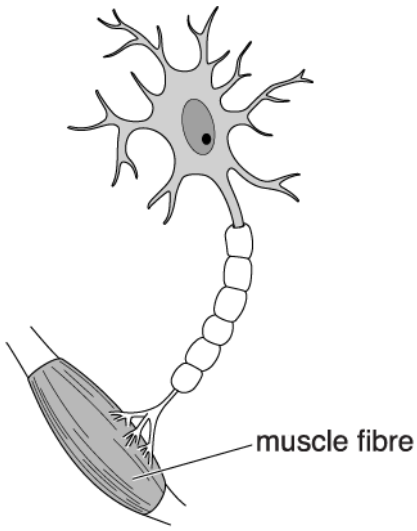
_____ [1]

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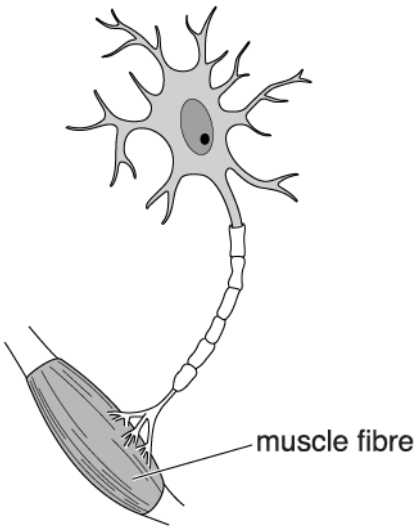
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2. 0 Multiple sclerosis disease damages motor neurons.

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.

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[6]

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3(a). Oxana was a feral child.

From the age of three, she lived with dogs.

At the age of eight she was found living in the wild. She could hardly speak.

(i) What is the name of the part of the brain associated with language?

---

[1]

(ii) Oxana learned how to speak.

Some children who were once feral may never learn to speak.

Suggest why.

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[1]

(b). Scientists use MRI scans and electrical stimulation of the brain to discover more about the brain.

Some people are concerned about the use of electrical stimulation of the brain but not the use of MRI scanners.

Suggest why.

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[2]

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4. Animals respond to changes in their environment.



A predator appears and causes a rapid response in a squirrel.

Suggest what this response might be.

Describe the processes that occur in the squirrel to cause this rapid response.

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

[6]

5. Dropping a hot plate is the result of a reflex arc.

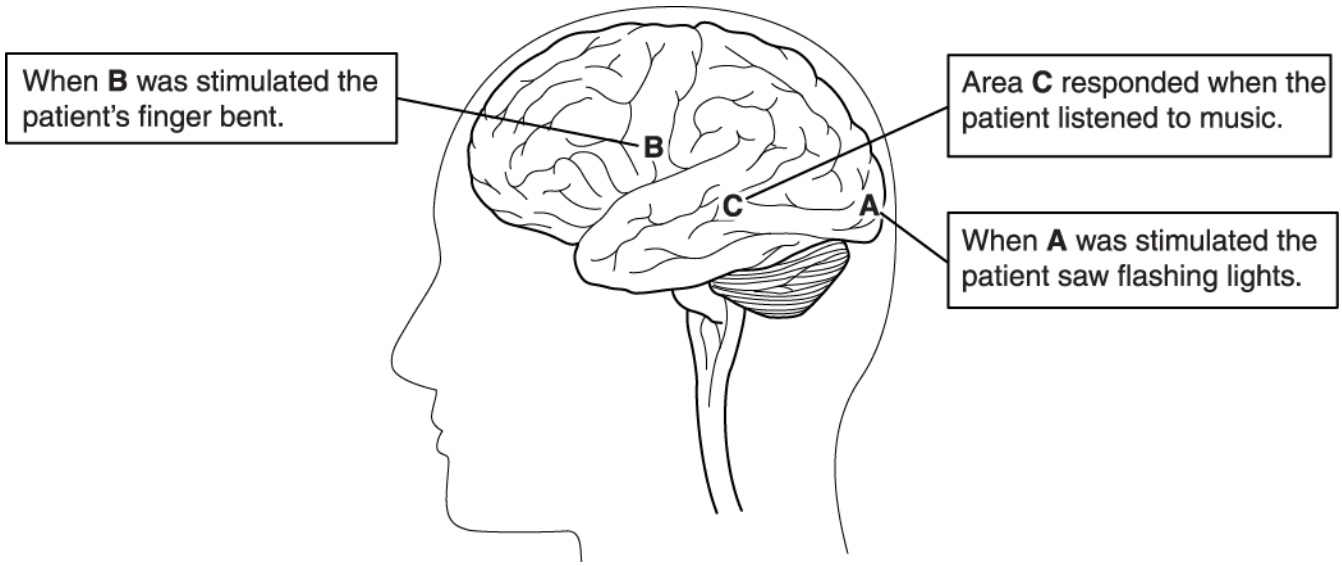
Explain how the brain can modify this reflex in order to keep hold of the hot plate.

[2]

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6(a). Scientists study different areas of the brain.

They discover this information.



A student makes two conclusions from this information:

- the lower back part of the brain is concerned with sensory information
- the upper front part of the brain is concerned with motor responses.

Comment on the student's conclusions.

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[2]

(b). Serotonin is a transmitter substance found in synapses in the brain.

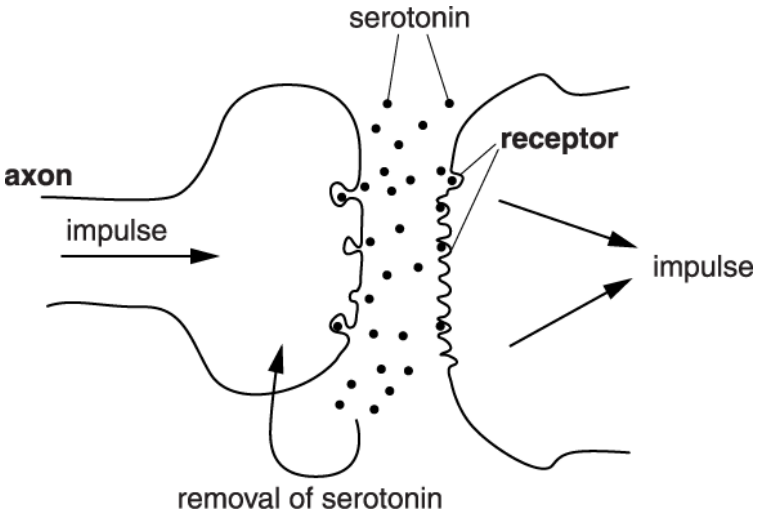
Impulses passing across these synapses prevent depression.

SSRIs are drugs used to treat depression. They act at the synapse.

The diagram shows a synapse.

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Four of these statements about SSRIs could be true.

Put ticks (?) in the boxes next to these **four** statements.

SSRIs break down serotonin molecules. ☐

SSRIs stop serotonin from being produced. ☐

SSRIs block sites where serotonin is removed from the synapse. ☐

SSRIs stimulate the serotonin receptor sites on the second neuron. ☐

SSRIs slow down the production of serotonin. ☐

SSRIs have a similar effect to serotonin. ☐

SSRIs are rapidly broken down in the synapse. ☐

SSRIs effects are due to an increased serotonin concentration in the synapse. ☐

[3]

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(c). Scientists discover a lot about the brain by studying patients with brain damage.

Discuss the ethical issues involved in this kind of scientific research.

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[2]

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7(a). Simple animals rely on **reflex actions** for most of their behaviour.

Simple reflexes involve three types of structure.

Complete the table to show the process carried out by each structure.

Structure	Process
effector	
processing centre	
receptor	

[2]

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(b). Electrical impulses travel along neurons in a simple reflex.

Jimmy tests three different types of neuron, **A**, **B** and **C**.

He records the speed of electrical impulses along each neuron.

Jimmy repeats his experiment five times.

Neuron	Speed of electrical impulse in m / s					
	1st	2nd	3rd	4th	5th	mean
A	84	86	83	81	78	82
B	70	80	75	104	91	84
C	50	55	55	60	49	54

(i) Jimmy knows that a fatty sheath speeds up the electrical impulses along neurons.

Only one neuron, **A**, **B** or **C** has a fatty sheath.

He concludes that this is neuron **B**.

Use the information in the table to evaluate his conclusion.

---

[3]

(ii) The fatty sheath speeds up the electrical impulses along neurons.

It also **insulates** each neuron from neighbouring neurons.

Suggest why this insulation from neighbouring neurons is an advantage.

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[2]

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(c). Jimmy's teacher tells him that a **synapse** is found between a sensory neuron and a relay neuron in a spinal reflex arc.

An electrical impulse travels along the sensory neuron and reaches the synapse.

Describe what happens at the synapse and suggest why the impulse cannot travel back from the relay neuron to the sensory neuron.

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

[6]

8(a). The human brain has billions of neurons.

Impulses are transmitted across synapses in the brain.

Identify **two** features of synapses to explain how impulses travel in only **one direction** between adjacent neurons.

[2]

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(b). Alzheimer's disease affects the brain.

In early stages of the disease, the most common symptom is the inability to acquire new memories.

Suggest which part of the brain is most directly affected by this disease in the early stages.

answer _____ [1]

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9(a). Mirek blinks when he gets dust in his eyes.

Blinking is a reflex action.

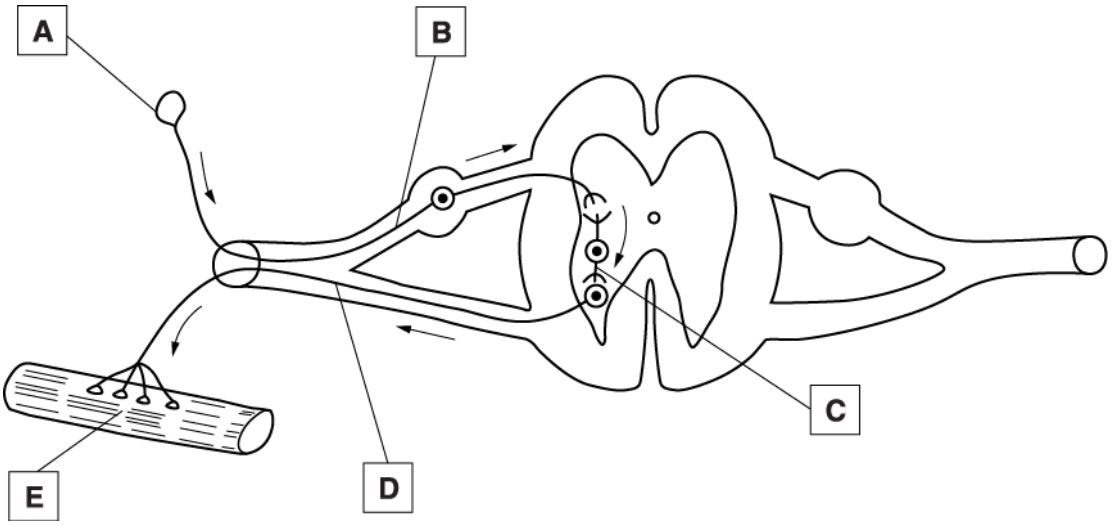
Name two features of blinking that are typical of a reflex action.

_____ and _____ [1]

(b). The spinal reflex arc involves a number of structures.

Look at the structures, **A, B, C, D** and **E**, in the diagram of a spinal reflex arc.

The arrows show the direction of the impulse.



(i) What are the structures found in the spinal reflex arc?

Write the correct name of each structure in the boxes next to letters, **A, B, C, D** and **E**, in the table.

A	_____
B	_____
C	_____

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D	_____
E	_____

[3]

(ii) The neurons and other structures are arranged in a fixed pathway in the spinal reflex arc.

Why is this an advantage?

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

The fixed pathway is an advantage because …

… no processing of information is required. ☐

… synapse chemicals are more easily recognised. ☐

… the transmission of impulses cannot be affected by toxins and drugs. ☐

… the neurons are more likely to be better insulated from neighbouring cells. ☐

[1]

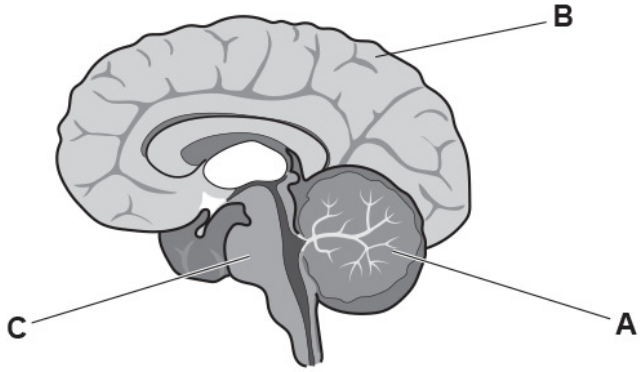
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10(a) Different areas of the brain are responsible for different functions.

.

Three areas have been labelled **A**, **B** and **C** on the diagram of the brain.



(i) The table describes the functions of areas **A**, **B** and **C**.

Complete the table by writing the correct area of the brain for each function.

Area of the brain	Function
	Responsible for conscious movement.
	Responsible for intelligence, memory, consciousness and language.
	Responsible for the regulation of heart rate and breathing rate.

[2]

(ii) Scientists want to find out more about the functions of the brain. One way they can do this is to use patients with brain damage.

Suggest why there are concerns about using patients with brain damage.

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[1]

(iii) Write down **one other** way scientists could study the brain.

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[1]

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(b). The cerebral cortex is a highly folded area of the brain made up of billions of neurons.

Describe the features of a neuron that allow it to transmit electrical impulses quickly and over long distances.

---

[2]

(c). Parkinson's disease is a disease of the central nervous system.

It is caused by the loss of neurons in one part of the brain. These neurons are responsible for producing a transmitter substance called dopamine.

(i) Dopamine acts as a transmitter substance in parts of the brain and nervous system that control movement.

Which neurons are most likely to be affected by Parkinson's disease?

Tick (✓) **one** box.

Relay neurons only. ☐

Relay and motor neurons. ☐

Sensory neurons only. ☐

Sensory and motor neurons. ☐

[1]

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(ii) At a synapse, transmitter substances are released from the first neuron.

Which word describes how the transmitter substances move across the gap from the first neuron to the second neuron?

Tick (✓) **one** box.

Active transport ☐

Diffusion ☐

Net movement ☐

Osmosis ☐

[1]

(iii) Scientists have been investigating the use of stem cells in the treatment of Parkinson's disease.

Suggest **one** feature of stem cells that makes them useful in the treatment of Parkinson's disease.

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[1]

END OF QUESTION PAPER

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Question			Answer/Indicative content	Marks	Guidance
1	a		neurons are in a fixed pathway; reflexes do not involve conscious thought;	2	Examiner's Comments Most candidates responded well and identified ‘neurons are in a fixed pathway’ and ‘reflexes do not involve conscious thought’. No clear pattern of alternative response could be identified.

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