OCR GCSE 21ST CENTURY BIOLOGY B · J257

BIOLOGY



EXAM QUESTION PACK

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

SCORE	PERCENTAGE
/81	%

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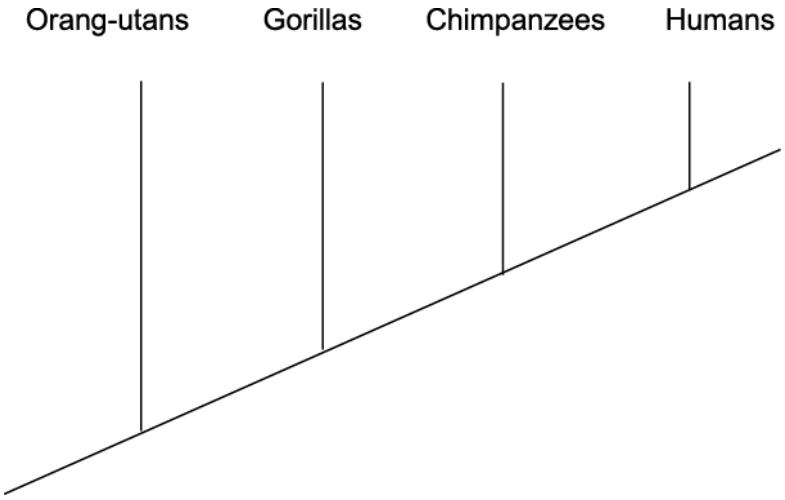
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1.

(i) DNA has been used to help classify organisms. The more DNA we have in common with another species, the more closely related we are to them.

This relationship can be shown in a diagram.



Which species are humans most closely related to?

---

[1]

(ii) Scientists think chimpanzees are intelligent animals.

Which part of the brain is associated with intelligence?

Put a tick (✓) in the correct box.

Brain stem	☐
Cerebral cortex	☐
Cerebellum	☐
Hypothalamus	☐

[1]

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2(a). Dementia is caused by damage to the brain.

People with dementia often have difficulty remembering things they have just done. However, they can clearly remember things from many years ago.

Which part of their memory is still functioning well and which part is not?

---

[2]

(b). Name a technique that could be used to find the area of the brain that is damaged.

---

[1]

(c). Emma is trying to remember a phone number but is finding it difficult.

Suggest a method that she could use to help her remember it.

---

[1]

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3(a). The human nervous system consists of the central nervous system (CNS) and the peripheral nervous system (PNS).

Name the **two** main parts of the **CNS**.

1

2

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[2]

(b). The nervous system has receptors to detect changes in the environment and effectors to carry out responses.

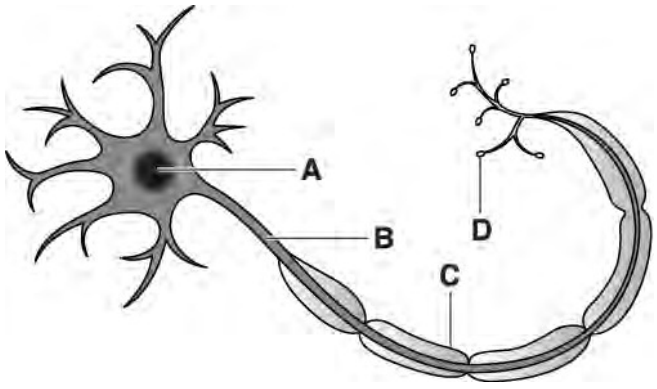
(i) Decide if the following statements are **true** or **false**.

Put a tick (?) in **one** box in each row.

Statement	True	False
Light sensitive cells in the retina are effectors.		
Hormone-secreting cells in a gland are receptors.		
Muscle cells in a muscle are effectors.		

[2]

(ii) The diagram below shows a motor neuron.



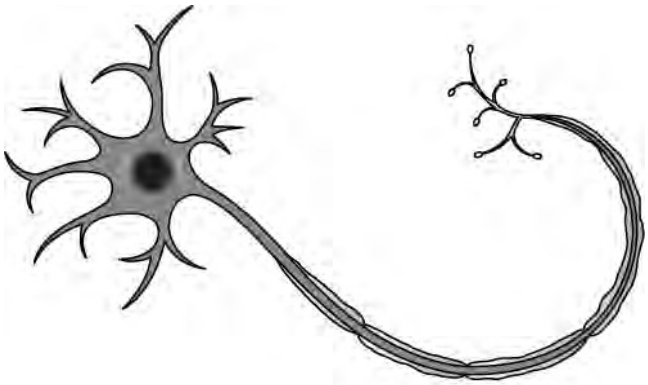
Which of the labels, **A**, **B**, **C** or **D** is the fatty sheath?

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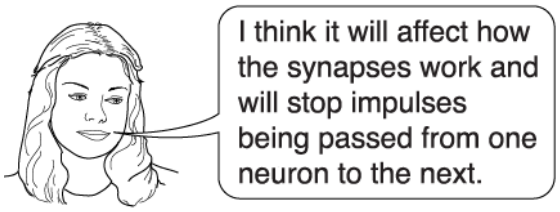
_____ [1]

(iii) In some diseases motor neurons are damaged as shown in the diagram.

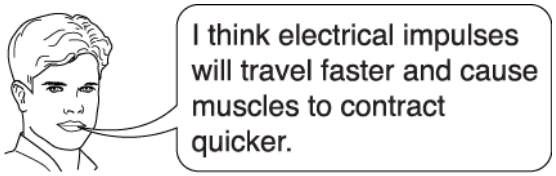


Damaged motor neuron

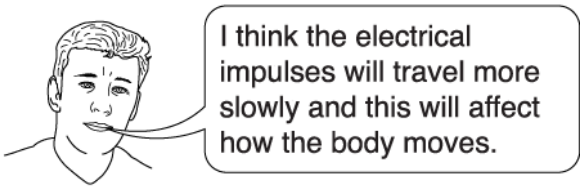
Three friends talk about the effect this will have on people.



Kavita



Oliver



Tomas

Which friend is correct?

_____ [1]

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(c). The nervous system and hormonal system allow humans to respond to their environment.

Each system has special features. These include:

- the type of messenger
- the route it travels
- the speed of the effect and how long it lasts.

Compare these features in the hormonal system and the nervous system.

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

[6]

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

Simple reflexes are made up of three main processes.

Each process is carried out by a specific structure.

Which structures perform these processes?

Write the name of the structure in the box next to each process.

Choose words from the list.

effector

fatty sheath

processing centre

receptor

synapse

Process in a simple reflex	Structure
detection of stimuli	
receiving information and coordinating responses	
producing a response	

[3]

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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	85	60	70	75	80	74
B	45	50	40	35	55	45
C	120	95	100	105	90	

(i) Calculate the **mean** speed of electrical impulse for neuron **C**.

Write your answer in the box in the table.

[1]

(ii) One of these neurons is surrounded by a fatty sheath.

Which neuron, **A, B** or **C**, is surrounded by a fatty sheath?

Use information in the table to justify your choice.

---

[2]

(iii) Jimmy noticed that the five results obtained for neuron **A** were all different.

Suggest **two** reasons why the measurements recorded may not be the 'true value' of the speed of the electrical impulses for neuron **A**.

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[2]

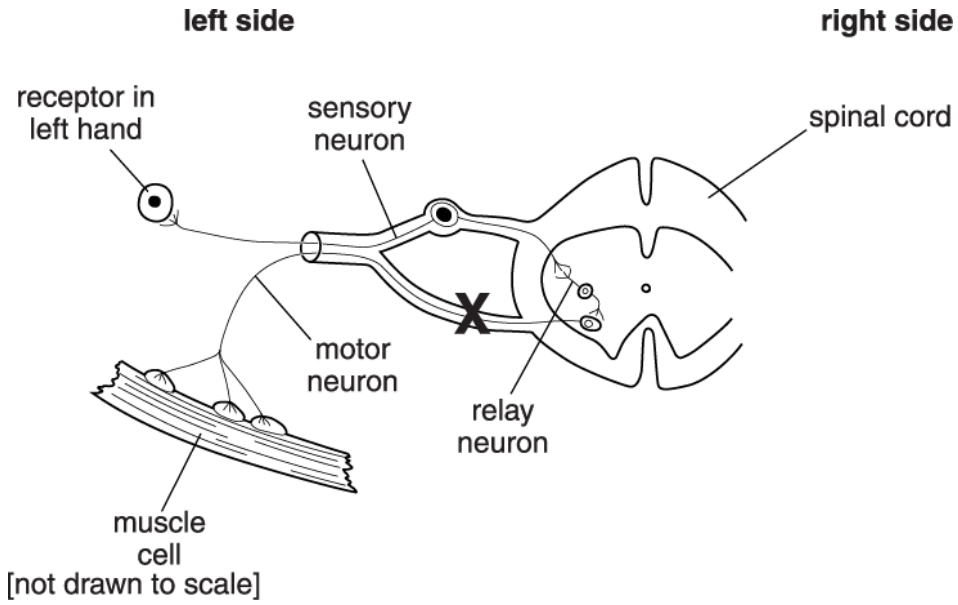
(c). Shalina has damaged her spinal reflex arc.

The diagram shows damage to the structure at **X** on the **left side** of her body.

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The right side of her body has **no damage**.



Describe and explain what will happen when **both** of Shalina's hands touch a hot plate.

Use the information provided in the diagram and your knowledge of spinal reflex arcs in your answer.

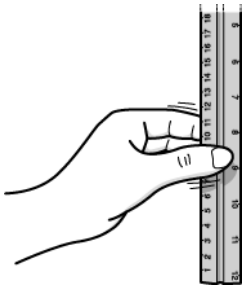
The quality of written communication will be assessed in your answer.

[6]

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5(a). Owen and Tamson do an investigation on reaction times.

Owen holds the top of a 1 m ruler and drops it.



Tamson reacts and catches it.

They measure how far the ruler falls before Tamson catches it.

They repeat the investigation with Tamson holding the ruler and Owen catching it.

Here are their results.

Name	Trial	Distance ruler drops (cm)	Mean (cm)
Owen	1	69.0	67.5
	2	80.3	
	3	53.2	
Tamson	1	32.5	
	2	26.8	
	3	24.7	

Calculate the mean value for Tamson's data.

Show your working.

mean = _____ cm **[2]**

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(b). What conclusions can Owen and Tamson make from their results?

Put ticks (✓) in the boxes next to the **two** correct conclusions.

Tamson has the faster reaction times.	☐
Owen's reaction time gets faster with each trial.	☐
The ranges of Owen's and Tamson's reaction times overlap.	☐
Owen had the greater range of reaction times.	☐
The range was the same for both Tamson's and Owen's data.	☐

[2]

(c). Three trials were done for each person.

Explain why.

---

[2]

(d). Suggest **three** sources of error in this investigation.

---

[3]

[Total: 9]

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6. Helen has a biology exam next month. She starts her revision.

She has difficulty learning and remembering information.

Describe **how** learning takes place and suggest **ways** that could help Helen remember the information.

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

[6]

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7(a). The human brain is an organ of the nervous system.

Which part of the nervous system in humans is made up of only the brain and spinal cord?

answer _____ nervous system **[1]**

(b). The human brain has a centre for memory.

Which part of the brain acts in this way?

answer _____ **[1]**

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

Blinking is a reflex action.

What features are typical of a reflex action?

Put a ring around the **three** correct features.

involuntary

long-lasting

rapid

short-lived

slow

voluntary

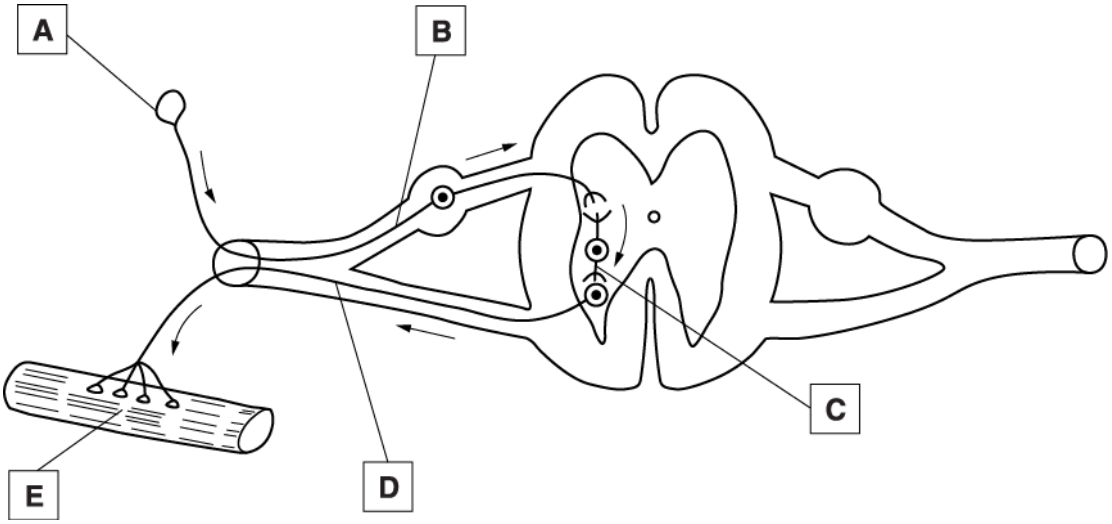
[2]

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(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.



Write the letter, **A, B, C, D** or **E**, in each box next to the correct structure in the table.

effector	
motor neuron	
receptor	
relay neuron	
sensory neuron	

[2]

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9. 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.

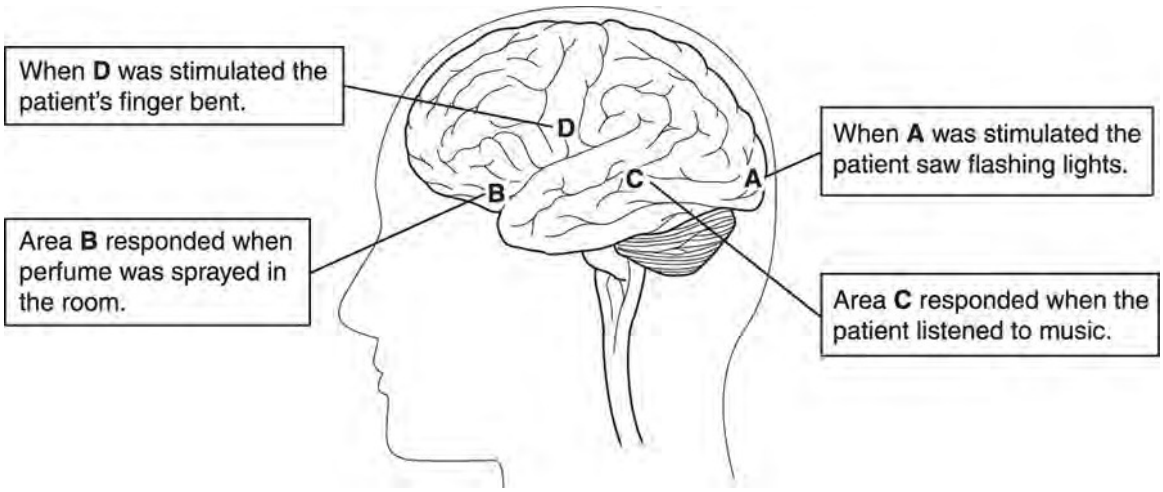
[6]

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10(a) Scientists studied four different areas of the brain, **A, B, C** and **D.**

.

They discovered this information.



Use this information to draw four straight lines linking each **area of the brain** to its **function**.

area of brain	function
A	smell
B	movement
C	sight
D	hearing

[3]

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(b). Which part of the brain, **A, B, C** or **D,** is involved with motor responses?

Explain your answer.

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[2]

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

(i) Two of these statements are **ethical** issues involved in this kind of scientific research.

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

The patient's brain contains millions of neurons. ☐

The patient's CNS consists of both motor and sensory neurons. ☐

Some brain damaged patients are paralysed. ☐

The patient may not benefit from the research. ☐

The patient needs to give informed permission for the research. ☐

[2]

(ii) Scientists sometimes ask patients to take part in low risk studies.

Two of these statements describe why patients may be willing to take part in low risk studies.

Put ticks (?) in the boxes next to the **two** best statements.

People are more willing to accept risk when it is something that they choose to do. ☐

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A correlation is a link between a factor and an outcome. ☐

Scientists do not believe claims that cannot be repeated by any other scientists. ☐

People are happy to take risks if this leads to the best outcome for most people. ☐

Certain actions are wrong whatever the consequences. ☐

[2]

(d). Synapses are small gaps between the ends of neurons.

Chemicals allow impulses to cross the gap.

Some poisons stop these chemicals from working.

What effect would these poisons have on your fingers?

Put ticks (?) in the boxes next to the **two** best answers.

Your fingers would be painful. ☐

Your fingers would feel numb. ☐

There would be no effect on your fingers. ☐

The muscles in your fingers would contract. ☐

Your fingers would not move. ☐

Your fingers would turn white. ☐

[2]

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11. Amir is investigating what happens to pupil size when a person moves from an area of bright light to an area of darkness.

He measures the size of his friend's pupil in bright light.

His results are shown in the table below.

Experiment number	Pupil size (mm)
1	4.0
2	3.8
3	6.0

(i) Calculate the mean pupil size.

Mean pupil size = ---------- mm **[2]**

(ii) Amir reads an article that suggests the average pupil size in bright light should be in the range of 2 – 4 mm.

Amir thinks one of his results is an anomalous result.

Which result is most likely to be the anomalous result?

Give a reason for your choice.

---**[2]**

(iii) What can Amir do to make his results more precise?

---**[1]**

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(iv) To create dark conditions Amir asks his friend to put on sunglasses.

Amir draws two diagrams (**Fig. 1.1** and **Fig. 1.2**) to show how the pupil changes when the light conditions change.

Fig. 1.2 is incomplete.

Complete **Fig. 1.2** to show the pupil in dark conditions.

Pupil in bright light

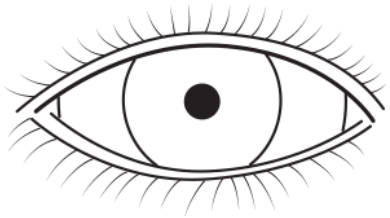


Fig. 1.1

Pupil in the dark

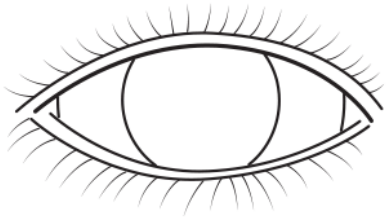


Fig. 1.2

[1]

(v) The change in pupil size is an example of a reflex.

Which statement best describes a reflex?

Tick (✓) **one** box.

A rapid and involuntary response. ☐

A rapid and voluntary response. ☐

A slow and involuntary response. ☐

A slow and voluntary response. ☐

[1]

(vi) What name is given to the structure that transmits electrical impulses from the eye to the central nervous

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system?

Put a (ring) around the correct answer.

effector receptor relay neuron sensory neuron

[1]

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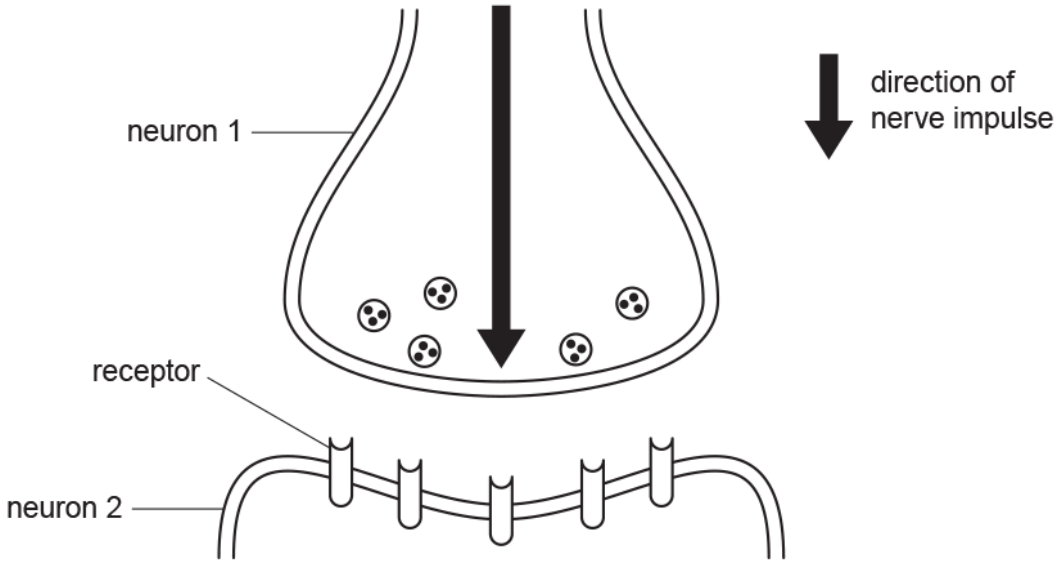
12. Insecticides called neonics are widely used by farmers.

Neonics kill insect pests that live on crop plants.

Neonics block receptors in synapses in the nervous system of an insect.

This stops the transmission of a nerve impulse across the synapse.

The diagram shows these receptors in a synapse.



Explain how neonics blocking receptors in a synapse stops the transmission of a nerve impulse across the synapse.

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[3]

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