Synapses and a withdrawal reflex

Student activity • observation and reasoning

YEAR 11 / LESSON 75 / BIOLOGY + SCIENCE (DOUBLE AWARD)

The question

How can a signal cross a synapse and produce a rapid protective response?

Use the supplied examples, record your reasoning and correct it using evidence.

Equipment

- Student booklet, paper models, pencil and ruler

Paper, modelling and written reasoning only. No chemicals or biological samples are handled.

Course coverage: Shared Biology / Double Award: 2.89–2.90. Synapses and reflex arcs.

Plan, model or apparatus sketch

Draw and label the apparatus or biological model; identify one limitation.

Method and reasoning

Read the whole sequence before starting

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1. Draw a presynaptic ending, synaptic gap and postsynaptic membrane with receptors.

2. Sequence impulse arrival, neurotransmitter release, diffusion across the gap and receptor binding.

3. Explain how receptor activation can initiate the next impulse and why transmitter must then be removed or broken down.

4. Trace a withdrawal reflex from skin receptor through sensory, relay and motor neurones to a muscle.

5. Explain why withdrawal can begin before conscious awareness, while information also reaches the brain.

6. Use diagrams or paper cards only; do not test the reflex using heat, sharp objects or painful stimuli.

Cleanup

- Return models and keep the corrected work.

Record your evidence

Blank spaces are for your own work

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Reference and task data

At a typical chemical synapse, neurotransmitter carries the signal across the gap. A reflex is rapid and automatic. The simple withdrawal model includes a relay neurone in the spinal cord; conscious processing can follow or occur alongside the protective response.

Example / trial	Observation / evidence	Explanation / limit
Evidence / comparison		
Explanation		
Limit / correction		

Show your calculations, labelled model or correction here.

Explain and evaluate

Use evidence and show calculation steps where relevant

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1. What crosses the synaptic gap?

2. What binds the transmitter?

3. Why remove the transmitter?

4. Put the three neurone types in reflex order.

5. What is the effector in finger withdrawal?

6. Must you consciously decide before withdrawing?