A3 · The action potential, threshold and all-or-none · Worked examples and practice

Name: _____ Date: _____

Worked examples

Read these first. There is one for each kind of question in this lesson.

Example 1 · Read an action potential graph

On a graph of an action potential, the line is falling from +40 mV. What is happening?

1. Use the five steps: the fall is step 4, repolarization.
2. Sodium channels have closed and potassium channels are open.
3. Potassium ions are diffusing out of the cell.

Answer: Repolarization: potassium ions are diffusing out.

Example 2 · Use the threshold level

A neuron has a threshold level of 5 units. What happens with a stimulus of 4 units, and of 9 units?

1. Compare each stimulus with the threshold level.
2. 4 is below 5: no action potential.
3. 9 is above 5: a full action potential, peak +40 mV.

Answer: No action potential at 4 units. A full action potential at 9 units.

Practice

Questions 1 to 4 are easy. Questions 5 to 8 are medium. Questions 9 and 10 are harder.

EASY

1. Name the ion that rushes into a neuron during depolarization.

EASY

2. State the membrane potential at the peak of an action potential.

EASY

3. Name the ion that diffuses out of a neuron during repolarization.

EASY

4. State how long the refractory period lasts.

MEDIUM

5. Calculate the total change in membrane potential from rest to the peak of an action potential.

MEDIUM

6. Explain what hyperpolarization is.

MEDIUM

7. Explain what "all-or-none response" means.

MEDIUM

8. Explain why an action potential travels faster along an axon with a myelin sheath.

HARDER

9. Light pressure and hard pressure on the skin give action potentials of the same size. Explain how the brain tells them apart.

HARDER

10. A drug keeps the sodium channels of a neuron closed. Predict the effect on the neuron. Explain.