A4 · Crossing the synapse · Practice key

This is the worked key. Every practice question is worked step by step.

Worked examples

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

Example 1 · Follow a message across a synapse

An action potential reaches an axon terminal. What happens next?

1. Vesicles release the neurotransmitter into the synaptic cleft.
2. The neurotransmitter diffuses across.
3. It binds to receptors on the postsynaptic neuron.
4. Sodium channels open, and sodium ions enter.

Answer: The postsynaptic neuron is depolarized.

Example 2 · Predict what a drug does at a synapse

A drug blocks the acetylcholine receptors on a skeletal muscle. Predict the effect.

1. Step 1: it changes the receptors. Acetylcholine cannot bind.
2. Step 2: less neurotransmitter reaches the receptors.
3. Step 3: acetylcholine is excitatory at a skeletal muscle.
4. Step 4: the sodium channels do not open.

Answer: The muscle cannot contract.

Practice

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

EASY

1. Name the gap between a neuron and the next cell.

1. The two cells do not touch.
2. The gap is the synaptic cleft.

EASY

2. Name the chemical that carries a message across a synapse.

1. An action potential cannot cross the gap.
2. A neurotransmitter carries the message.

EASY

3. Name the enzyme that breaks down acetylcholine.

1. Its name ends in "ase", like many enzymes.
2. It is cholinesterase.

EASY

4. Name the neuron that has receptors for the neurotransmitter.

1. It is on the far side of the synaptic cleft.
2. It is the postsynaptic neuron.

MEDIUM

5. Name the two neurons at a synapse. State which one carries the action potential to the synapse.

1. They are the presynaptic neuron and the postsynaptic neuron.
2. The presynaptic neuron carries the action potential to the synapse.

MEDIUM

6. Explain how an inhibitory neurotransmitter makes a neuron less likely to fire.

1. It opens potassium channels, and potassium ions leave.
2. The inside becomes more negative.
3. The neuron moves away from the threshold level.

MEDIUM

7. Explain why acetylcholine must be broken down after it has acted.

1. While it stays on the receptors, the sodium channels stay open.
2. The postsynaptic cell could not recover or take the next message.

MEDIUM

8. Explain what summation is.

1. It is adding the effects of two or more neurons.
2. Together they may reach the threshold level when one alone cannot.

HARDER

9. A drug stops norepinephrine from being taken back into the presynaptic neuron. Use the four steps to predict the effect at an excitatory synapse.

1. It changes the removal: norepinephrine stays in the synaptic cleft.
2. More neurotransmitter acts on the receptors.
3. It is excitatory here.
4. The postsynaptic cell fires more often.

HARDER

10. Three neurons meet neuron Z. X and Y are excitatory. W is inhibitory. X and Y together just reach the threshold level. Predict what happens when all three fire. Explain.

1. X and Y together just reach the threshold level.
2. W moves Z away from the threshold level.
3. So Z does not reach it, and Z does not fire.