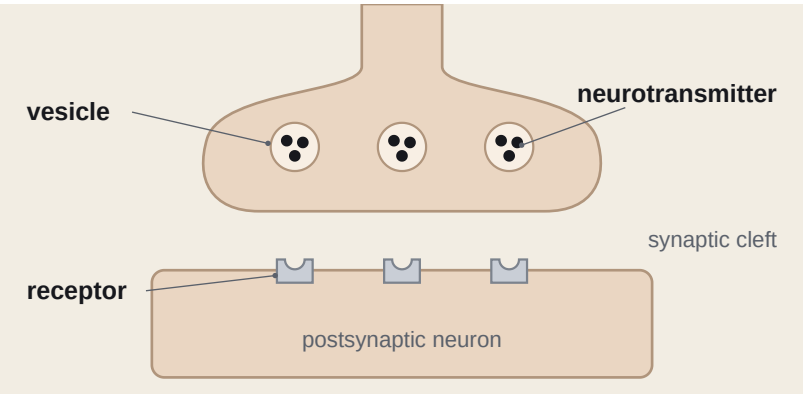
A4 · Crossing the synapse · Notes

Goals: Name the parts of a synapse. Describe the four steps that carry a message across a synapse. Say what acetylcholine, cholinesterase and norepinephrine are. Explain the difference between excitatory and inhibitory neurotransmitters. Explain summation. Predict what a drug or toxin does at a synapse.

Name: _____ Date: _____

Slide 1 of 6 · The synapse

In lesson A3, an action potential travelled to the end of an axon. The next cell is not joined to it. Today you see how the message gets across.



Key ideas

The place where a neuron meets the next cell is a _____.

The gap between them is the _____.

A chemical called a _____ carries the message across.

It is stored in _____. It fits _____ on the postsynaptic neuron.

Example

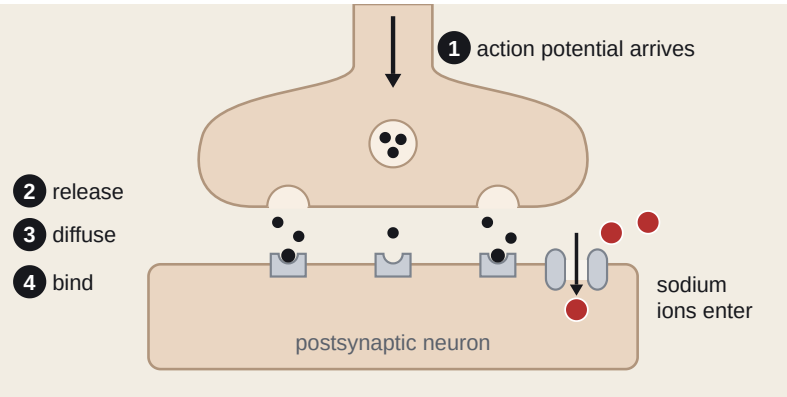
Name the neuron that releases the neurotransmitter, and the neuron that has the receptors.

Try it

State where the neurotransmitter is stored before it is released.

Slide 2 of 6 · Crossing the synapse in four steps

On the last slide you named the parts of a synapse. Now you follow one message across it. The steps are numbered on the picture.



Key ideas

An action potential arrives at the _____.

Vesicles _____ the neurotransmitter into the synaptic cleft.

It _____ across and binds to receptors.

_____ open in the postsynaptic membrane.

Example

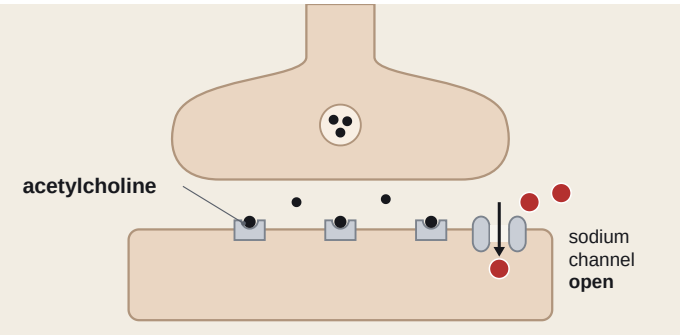
List the four steps that carry a message across a synapse.

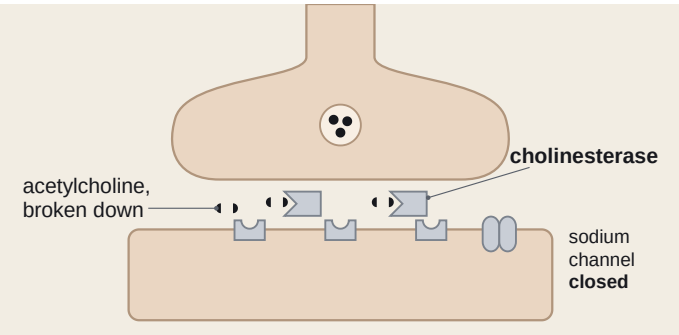
Try it

Explain why a message slows down at a synapse.

Slide 3 of 6 · Acetylcholine and cholinesterase

On the last slide, a neurotransmitter bound to receptors and sodium channels opened. Here is one neurotransmitter by name, and how it is cleared away.





Key ideas

_____ is a neurotransmitter. It opens sodium channels.

While it stays on the receptors, the sodium channels stay _____.

The enzyme _____ breaks down acetylcholine.

Then the postsynaptic cell can _____.

Example

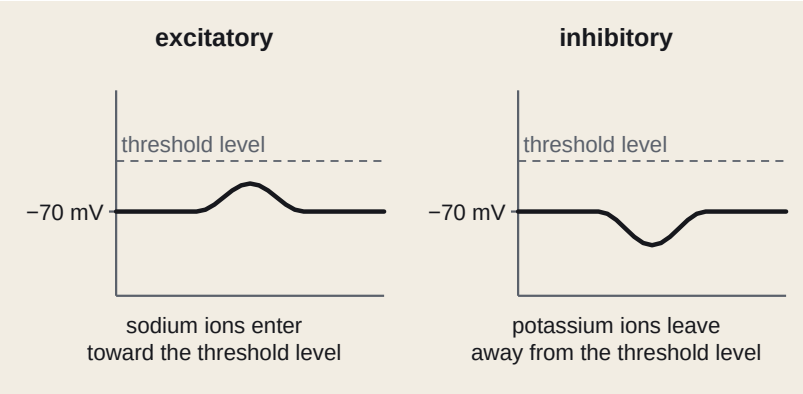
State the job of cholinesterase.

Try it

Predict what happens to a muscle if acetylcholine is not broken down.

Slide 4 of 6 · Excitatory and inhibitory neurotransmitters

On the last slide, acetylcholine opened sodium channels and excited the next cell. Some neurotransmitters do the opposite.



Key ideas

An _____ neurotransmitter lets sodium ions in. The neuron moves toward the threshold level.

An _____ neurotransmitter lets potassium ions out. The neuron moves away from it.

Acetylcholine is excitatory at _____.

_____ can be excitatory or inhibitory.

Example

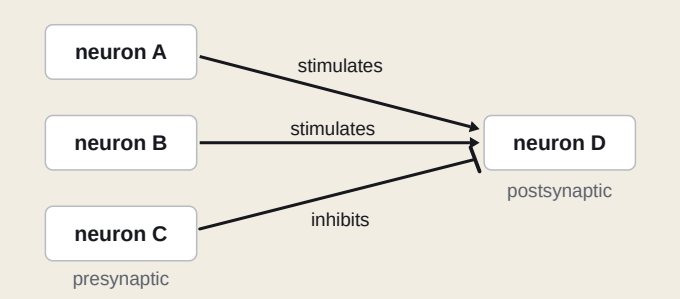
An inhibitory neurotransmitter binds to a neuron. State which ion moves and which way.

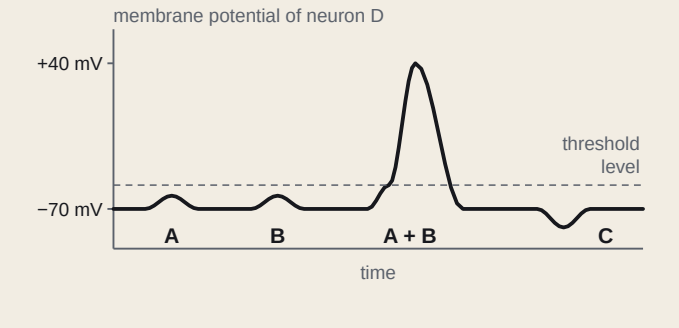
Try it

An excitatory neurotransmitter binds to a neuron. State which ion moves and which way.

Slide 5 of 6 · Summation

On the last slide, one neurotransmitter acted on one neuron. A real neuron has synapses with many neurons at once.





Key ideas

One neuron may not move the next neuron to the _____.

Two neurons _____ may reach it.

Adding the effects of two or more neurons is _____.

Example

Neuron A alone cannot make neuron D fire. Neuron B alone cannot. Together they can. Name this effect.

Try it

Neurons A and B are excitatory and C is inhibitory. All three fire. Is D more or less likely to fire than with A and B alone? Explain.

Slide 6 of 6 · Method: what a drug or toxin does at a synapse

Many drugs and toxins act at synapses. A toxin is a poison made by a living thing. These four steps predict the effect of any of them.

1. **Find** what the drug or toxin changes at the synapse.
2. **Decide** if more or less neurotransmitter reaches the receptors.
3. **Check** if the neurotransmitter is excitatory or inhibitory.
4. **State** what the postsynaptic cell does.



Check: more of an excitatory neurotransmitter means more firing.

Used again in: the page for this lesson

Key ideas

Step 1: find what the drug or toxin _____ at the synapse.

Step 2: decide if _____ neurotransmitter reaches the receptors.

Step 3: check if the neurotransmitter is _____ or inhibitory.

Step 4: state what the _____ does.

Example

Use the four steps. An insecticide stops cholinesterase from working at a muscle.

Try it

Use the four steps. A toxin stops vesicles from releasing acetylcholine at a muscle.