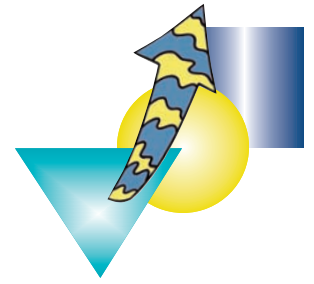


Making the Leap Part 2

Making the Leap Station Cards (Laminate for re-use)

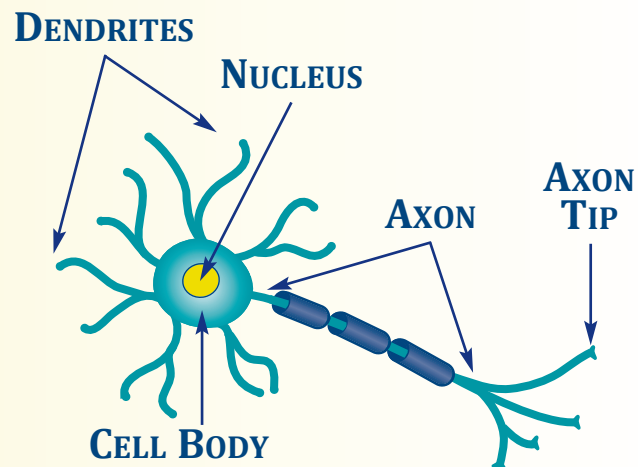


Making the Leap Station 1 Neuron Structure and Function

The nervous system is like an electrical network. It relays information to and from the brain and spinal cord, allowing communication among all body systems and the brain.

There are millions of nerve cells (neurons) in the body and they form complex nerve pathways. **Neurons** are especially designed to transmit nerve impulses. Neurons have branches off of the cell body called dendrites and axons.

Dendrites receive impulses and carry them to the cell body. **Axons** carry information away from the cell body. "Information" in the nervous system travels through neurons as electrical impulses.



Think Point:

(Write your answer on the Neuron Graphic Organizer)

Nerve cells are very different from other cells.

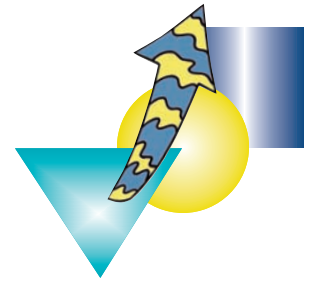
How are they especially designed to do their job?

1

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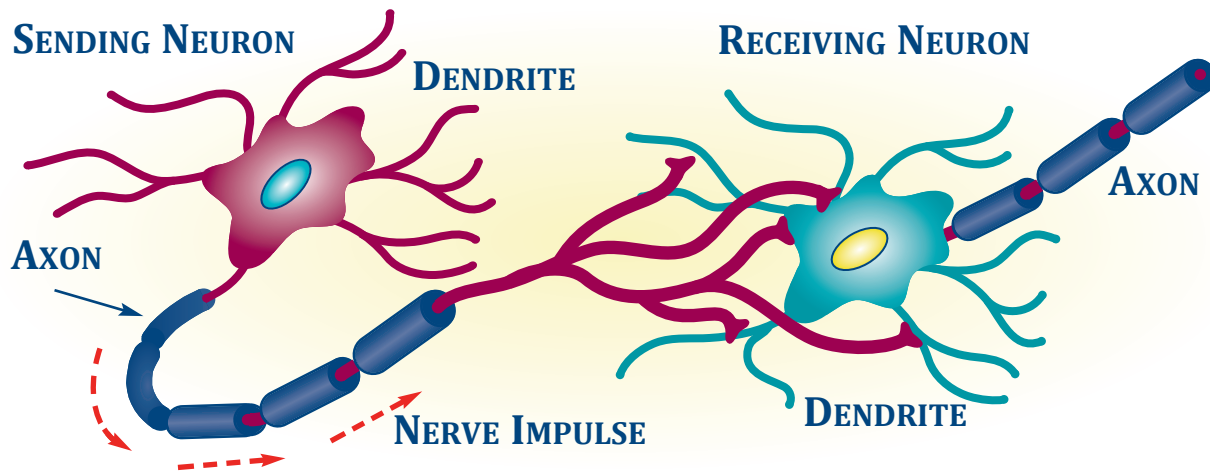
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Making the Leap Station 2: Stimulus Happens

A **stimulus** is anything that causes a reaction. A stimulus can be **external**, when it occurs outside the body (such as a temperature change or hitting your arm). A stimulus can also be internal, (such as feeling thirsty when the body needs water).

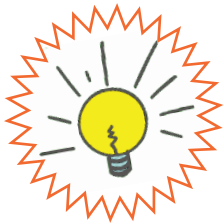
A stimulus starts the transmission of information through neurons. This transmission is called an **impulse**. The impulse travels through a single neuron first as an **electrical impulse**. This first neuron is the “**sending neuron**”. The next neuron to transmit the information is the “**receiving neuron**”. The impulse continues like this from one neuron to the next until it reaches its destination.



Think Point:

(Write your answer on the Neuron Graphic Organizer)

How is transmitting information in the nervous system like a relay race? Be sure to include the start of the race, the work of each “runner”, and the cooperation among runners in your answer.

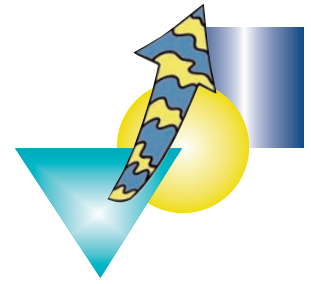


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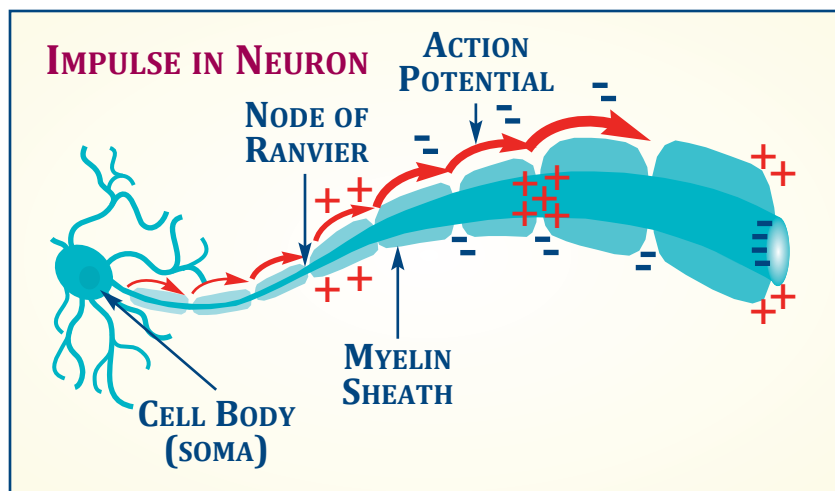
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Making the Leap Station 3: Positive Ions Flood Inside of Neuron

Important chemical elements in neurons are sodium, chloride, and potassium. These elements can exist as charged particles called **ions**. Ions can have either a positive or negative charge depending upon the numbers of protons and electrons. If there are more protons than electrons, the charge will be positive. If there are more electrons than protons, the charge will be **negative**. Sodium and potassium ions have a positive 1 (+1) charge. Chloride ions have a negative 1 (-1) charge.

Neurons at rest have a negative charge compared to the body tissue around them. When a stimulus occurs, it causes a change in the arrangement of the potassium and sodium



ions in and around the neurons. Sodium ions (+1) will begin to move *into* the neuron. The overall charge of the neuron begins to change. Sodium ions have a positive charge, so the **neuron becomes less negative as sodium ions move inside**. If enough sodium ions move in, an impulse will

be sent. If not, no impulse will be sent. It is an **“all or none”** event.



Think Points:

(Write your answer on the Neuron Graphic Organizer)

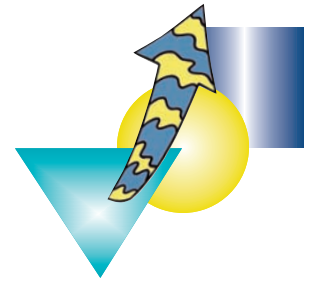
How do ions make the electrical impulses travel through neurons? What happens if there are not enough sodium ions moving into a neuron after a stimulus?

3

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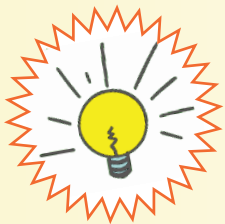
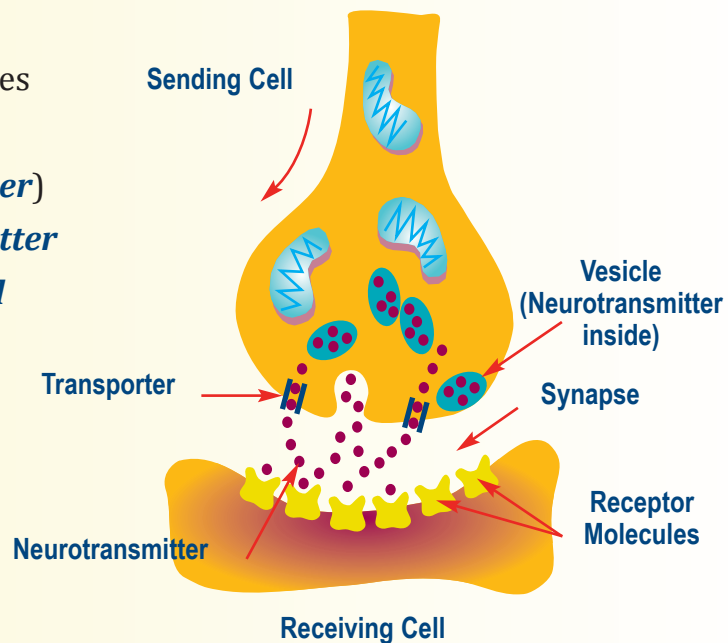
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Making the Leap Station 4: Neurotransmitter Crosses Synapse

There is not a direct connection between the axon tip of a sending neuron and the dendrite of a receiving neuron. Surprisingly, a gap or space called a **synapse** exists. The impulse is in an **electrical** form when it reaches the synapse and cannot cross in that form.

When the electrical impulse reaches the end of the axon, it causes a special chemical (**neurotransmitter**) to be released. The **neurotransmitter** crosses the synapse, in a **chemical** form, to the dendrites of the next neuron. This, in turn, starts the **electrical** impulse in the receiving neuron.



Think Point:

(Write your answer on the Neuron Graphic Organizer)

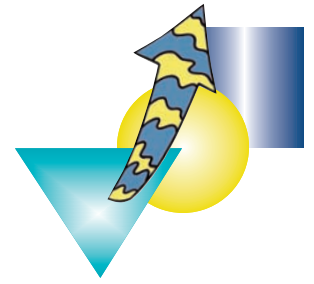
How does an impulse make the leap across a synapse?

4

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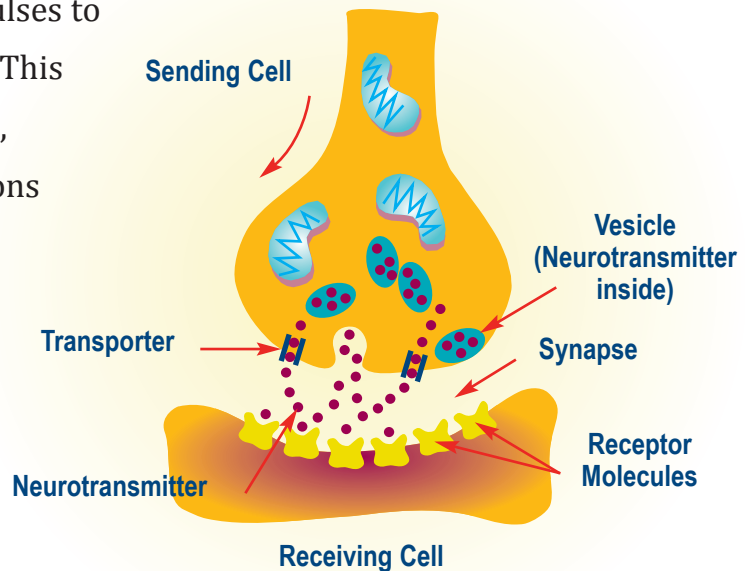
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Making the Leap Station 5 Neurotransmitter Arrives at Receiving Neuron

The neurotransmitter will spread (*diffuse*) out of the axon tip of the sending cell, and be “accepted” by specialized receptor areas on the receiving neuron. The receptors are specialized so they receive only their “own” neurotransmitter.

As the neurotransmitter is received by the receptor, it triggers electrical impulses to be sent through the receiving cell. This process will happen over and over, relay style, through multiple neurons until the “message” arrives at its destination.



Think Point:

(Write your answer on the Neuron Graphic Organizer)

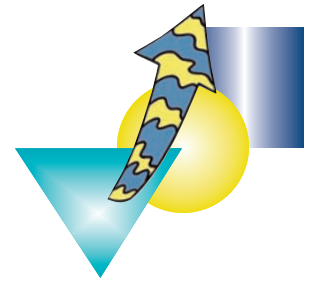
Why are neurotransmitters required before the message can be carried by the next neuron?

5

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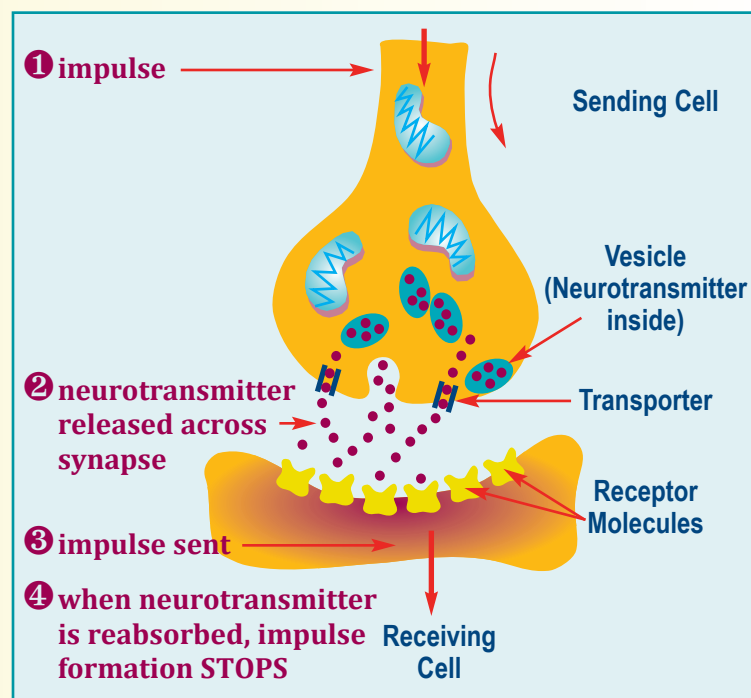


Making the Leap Station 6 Neurotransmitter Negative Feedback Loop

Once the electrical impulse has begun in the receiving neuron, the chemical neurotransmitter is no longer needed. Four things can happen to the leftover neurotransmitter. The neurotransmitter can:

1. diffuse or drift out of the cell
2. be destroyed by chemical reactions that take place in the “receiving” neuron
3. be destroyed by specialized “clean up” (glial) cells
4. be reabsorbed back into the “sending” neuron - this reabsorption will signal cells to STOP releasing additional neurotransmitter, until the next stimulus occurs

This signaling to STOP releasing more neurotransmitter is an example of a **negative feedback loop**. In a negative feedback loop, an action will continue until something tells it to stop.



Think Point:

(Write your answer on the Neuron Graphic Organizer)

Why is the negative feedback loop important?

6

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