In this lesson today, we will be discussing nerve impulses and action potentials. So an action potential is basically just another way of saying a nerve impulse. An action potential occurs when a stimulus causes the voltage difference across a cell membrane to shift. And this voltage difference is caused by concentrations of potassium and sodium ions. So potassium and sodium are very important in setting the stage for an action potential. And the threshold is the minimum shift needed for an action potential to occur.

So in order for this action potential to occur, the voltage difference across a cell membrane has to shift by a certain amount. And once it's shifted by that amount, an action potential can happen. So we are going to take a look at these steps right here that set the stage for an action potential. They're the steps that occur in an action potential. So first, an electrical disturbance has to occur. So signals will reach the input zone of a neuron. And those signals will change what occurs in the cell membrane of that neuron.

So the action-- or I'm sorry, this electrical disturbance will occur, causing sodium gates in the membrane of the cell to open. And what this does is allow sodium to rush into the cell. Now normally in a resting membrane, the outside of the cell is negative relative-- I'm sorry, the outside of the cell is positive relative to the inside of the cell. So as these sodium gates open, sodium will rush in, causing more gates to open until that threshold we discussed is reached. And then the voltage difference across the cell membrane is reversed.

Now in order for another action potential to occur, we have to restore our resting membrane potential. And this is done so by sodium potassium pumps. So in just a few minutes, we're going to take a look at a diagram that kind of explains these steps right here. But before we do that, I want to discuss the structure of a neuron here. OK, so a neuron is a nerve cell. And it's made up of dendrites, which are part of the input zone. So information will move through the input zone, through the dendrites, to the cell body. And you'll notice we have the nucleus in here as well.

From there, the signal will travel along this long narrow part of the neuron called the axon, and then down to the axon endings. So information goes through the input zone, through the cell body, along the axon, to the axon endings. And then from there, that signal will be sent either to another neuron or to a muscle or a gland cell. So let's take a look at this diagram here. I'm going to zoom out just a little bit. OK. So we're going to take a look at what happens in an action potential.

So this here is going to be our resting membrane. As I had mentioned, the outside of the neuron is generally positive relative to the inside. And we have our cell membrane right here. And then embedded within that, we have something called a sodium potassium pump. And then we have our gated sodium channels. And normally, these gated sodium channels are closed, making the cell membrane more or less impermeable to sodium. So

sodium is not allowed to just flow through freely.

But when a disturbance happens and it causes an action potential, sodium gates will open. So the sodium gates will open, allowing sodium to flow into the cell. And then as that happens, more and more of these gates will open, allowing more and more sodium to flow in. And this will continue to happen, as I mentioned earlier, until the threshold is reached and the voltage difference is reversed.

Now this will actually happen in patches across the membrane. So this isn't all happening throughout the whole membrane at the same time. It occurs in patches of the membrane. So as sodium moves in to the cell in one patch, the previous patch of that membrane will allow potassium to leak out. So this is happening, reversing that voltage difference across the cell membrane. And this will cause the impulse to propagate along that cell membrane in patches.

Now eventually, that resting membrane potential has to be restored. So that's where our sodium potassium pumps in pink here come into play. So our sodium potassium pumps will restore that resting membrane potential. But in order to do that, it has to use the cell's ATP. So it's a form of active transport because it's using ATP in order to restore this membrane potential.

So what the sodium potassium pump will do is it will put sodium back out and potassium back in. So as that action potential was happening, we had our sodium leaking in, potassium leaking out, which was reversing our voltage difference across the membrane. But in order to restore that resting membrane potential, we have to get the sodium back out and the potassium back in. And then our resting membrane potential can be restored.

So this lesson has been an overview on nerve impulses and action potentials.