

PhysioEx Lab Report

Exercise 3: Neurophysiology of Nerve Impulses

Activity 2: Receptor Potential

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Date: 12 February 2025

Session ID: session-1fa1f569-7b2f-5fc3-830b-ffe68b0163d5

Pre-lab Quiz Results

You scored 100% by answering 4 out of 4 questions correctly.

- 1 Assuming that the resting potential of a sensory neuron is -70 mV, which of the following represents a depolarization?

You correctly answered: a change to -60 mV.

- 2 Which of the following is a sensory modality (type of sense)?

You correctly answered: all of the above.

- 3 Which of the following is a sensory stimulus?

You correctly answered: all of the above.

- 4 Which of the following is true of the response of a sensory neuron to the appropriate sensory stimulus?

You correctly answered: Both of the above.

Experiment Results

Predict Questions

- 1 Predict Question 1: The adequate stimulus for a Pacinian corpuscle is pressure or vibration on the skin. Which of the following modalities will induce the largest amplitude receptor potential in the Pacinian corpuscle?

Your answer: moderate-intensity pressure.

- 2 Predict Question 2: The adequate stimuli for olfactory receptors are chemicals, typically odorant molecules. Which of the following modalities will induce the largest amplitude receptor potential in the olfactory receptor?

Your answer: moderate-intensity chemical.

Stop & Think Questions

1 Why didn't the Pacinian corpuscle respond to high-intensity light?

You correctly answered: Light-transducing proteins are not present in the Pacinian corpuscle.

2 Judging from these results, does light have a smell?

You correctly answered: No.

3 Why did the free nerve ending respond to several different modalities?

You correctly answered: The sensory end of this nerve is less specialized.

Experiment Data

Receptor	Modality	Intensity	Resting Potential (mV)	Peak Value of Response (mV)	Amplitude of Response (mV)
Pacinian corpuscle	---	---	-70	-70	0
Pacinian corpuscle	Pressure	Low	-70	-60	10
Pacinian corpuscle	Pressure	Moderate	-70	-45	25
Pacinian corpuscle	Pressure	High	-70	-30	40
Pacinian corpuscle	Chemical	Low	-70	-70	0
Pacinian corpuscle	Chemical	Moderate	-70	-70	0
Pacinian corpuscle	Chemical	High	-70	-70	0
Pacinian corpuscle	Heat	Low	-70	-70	0
Pacinian corpuscle	Heat	Moderate	-70	-70	0
Pacinian corpuscle	Heat	High	-70	-70	0
Pacinian corpuscle	Light	Low	-70	-70	0
Pacinian corpuscle	Light	Moderate	-70	-70	0
Pacinian corpuscle	Light	High	-70	-70	0

Olfactory receptor	---	---	-70	-70	0
Olfactory receptor	Pressure	Low	-70	-70	0
Olfactory receptor	Pressure	Moderate	-70	-70	0
Olfactory receptor	Pressure	High	-70	-70	0
Olfactory receptor	Chemical	Low	-70	-64	6
Olfactory receptor	Chemical	Moderate	-70	-58	12
Olfactory receptor	Chemical	High	-70	-45	25
Olfactory receptor	Heat	Low	-70	-70	0
Olfactory receptor	Heat	Moderate	-70	-70	0
Olfactory receptor	Heat	High	-70	-70	0
Olfactory receptor	Light	Low	-70	-70	0
Olfactory receptor	Light	Moderate	-70	-70	0
Olfactory receptor	Light	High	-70	-70	0
Free nerve ending	---	---	-70	-70	0
Free nerve ending	Pressure	Low	-70	-70	0
Free nerve ending	Pressure	Moderate	-70	-70	0
Free nerve ending	Pressure	High	-70	-65	5
Free nerve ending	Chemical	Low	-70	-70	0
Free nerve ending	Chemical	Moderate	-70	-70	0
Free nerve ending	Chemical	High	-70	-70	0
Free nerve ending	Heat	Low	-70	-60	10

Free nerve ending	Heat	Moderate	-70	-40	30
Free nerve ending	Heat	High	-70	-20	50
Free nerve ending	Light	Low	-70	-70	0
Free nerve ending	Light	Moderate	-70	-70	0
Free nerve ending	Light	High	-70	-70	0

Post-lab Quiz Results

You scored 100% by answering 4 out of 4 questions correctly.

- 1 A very intense stimulus can sometimes stimulate sensory neurons that have evolved for a different modality. Thus, with a blow to the eye, one "sees stars." In this example the photoreceptors in the eye are responding to

You correctly answered: **intense pressure.**

- 2 Olfactory receptor neurons respond to low concentrations of chemical odorants because there are membrane proteins in the receptor ending of this sensory neuron that

You correctly answered: **can bind and respond to the specific odorant.**

- 3 The sequence of events starting with a sensory stimulus and ending with a change in membrane potential is called

You correctly answered: **sensory transduction.**

- 4 Starting at a resting membrane potential of -70 mV, a change to which of the following represents the largest receptor potential?

You correctly answered: **a change to -50 mV.**

Review Sheet Results

- 1 Sensory neurons have a resting potential based on the efflux of potassium ions (as demonstrated in Activity 1). What passive channels are likely found in the membrane of the olfactory receptor, in the membrane of the Pacinian corpuscle, and in the membrane of the free nerve ending?

Your answer:

Potassium ligand ion gated channels will be found on the olfactory receptors, the membranes of the Pacinian corpuscles, and in the membrane of the free nerve endings.

2 What is meant by the term graded potential?

Your answer:

Graded potentials are changes in membrane potential that vary in size, as opposed to being all-or-none.

3 Identify which of the stimulus modalities induced the largest amplitude receptor potential in the Pacinian corpuscle. How well did the results compare with your prediction?

Your answer:

The moderate-intensity pressure modality causes a receptor potential in the pacinian corpuscle as predicted. There was not enough pressure in a low intensity environment and too much pressure in a high intensity environment.

4 Identify which of the stimulus modalities induced the largest amplitude receptor potential in the olfactory receptors. How well did the results compare with your prediction?

Your answer:

The moderate intensity chemical modality causes a receptor potential to occur in the olfactory receptors.

5 The olfactory receptor also contains a membrane protein that recognizes isoamylacetate and, via several other molecules, transduces the odor stimulus into a receptor potential. Does the Pacinian corpuscle likely have this isoamylacetate receptor protein? Does the free nerve ending likely have this isoamylacetate receptor protein?

Your answer:

Neither the Pacinian corpuscle or Free nerve ending proved to have either the isoamyl acetate receptor protein because they did not show response to the odor stimulus applied to them.

6 What type of sensory neuron would likely respond to the green light?

Your answer:

Optic sensory neuron will respond to green light because they are the only one that have receptors for light that we tested.