



Neuroscience 7-9 Syllabus

Course Goals

1 Understanding of Neuroscience

Students gain a better understanding of the field of Neuroscience and how it relates to Biology, Psychology, Physiology, and Chemistry.

2 Research in Neuroscience

Students learn how to conduct research in Neuroscience through a series of lab experiments.

3 Neuroscience in Today's World

Students learn how to relate Neuroscience to today's world through investigating topics like neurodegenerative diseases and animal ethics.

Course Topics

1 Brain Anatomy

Students learn about the different lobes and areas of the brain.

2 Neurons

Students learn about the structure and function of neurons.

3 Action Potentials

Students investigate how neurons work by learning about action potentials, saltatory conduction, and synapses.

4 Nerve Fibers

Students learn about the different types of nerve fibers in the Central Nervous System and the Peripheral Nervous System.

5 Brainwaves

Students learn about brainwaves, brainwave patterns, and the research techniques used to measure and record them.

6 Sensory Systems

Students learn about the different sensory systems by conducting a lab experiment devoted to sensory illusions.

7 Brain Controlled Movements

Students learn about how the brain controls movements by conducting a series of cockroach experiments.

8 Neurodegenerative Diseases

Students explore specific neurodegenerative diseases and learn about their similarities and differences.

Course Schedule

Day 1

Introduction & Icebreakers

Students gain an understanding of what is to be expected from them in class. They will review the syllabus and any additional classroom rules.

Discussion: What is Neuroscience?

Students learn about the field of neuroscience and basic brain anatomy.

Activity: Modeling the Brain

Students gain an introduction to the gross structures of the brain and their major functions by constructing a model of the brain out of play-dough.

Activity: Brain Hat

Students construct a "brain hat" to further their understanding of brain anatomy.

Day 2

Discussion: Neurons

Students learn about neuron morphology and function.

Activity: Modeling a Neuron

Students use what they have learned to create a model of a neuron.

Discussion: Saltatory Conduction

Students learn about saltatory conduction.

Activity: Saltatory Conduction

Students model a single neuron transmitting an electrical signal to gain an understanding about saltatory conduction.

Discussion: Synapses

Students learn about synapses.

Activity: Rope Neuron

Students gain an understanding about how neurons transmit messages and the difference between electric and chemical signals.

Activity: Neuron Worksheet

Students work in groups to further develop their understanding of neuron structure and function.

Activity: Message Transmission

Students reinforce what they have learned about electrochemical message transmission by modeling a chain of neurons.

Day 3

Discussion: Glial Cells and Nerve Fibers

Students learn about the importance of glial cells and the different types of nerve fibers.

Activity: Reaction Times

Students gain an understanding about transmission speed of signals.

Discussion: CNS and PNS

Students gain an understanding of the CNS and PNS.

Video: Model Organisms

Students watch a video to introduce the topic of model organisms.

Discussion: Animal Ethics

Students discuss the ethical implications of the use of animals in neuroscience.

Activity: Animal Ethics Debate

Students further their knowledge on animal ethics by participating in a debate.

Day 4

Experiment: Measuring Electrical Signals in a Cockroach

Students explore what they have learned about action potentials by observing neuronal firing in a cockroach leg.

Activity: Gelatin Brain Mold

Students construct gelatin models of the brain to further investigate brain anatomy.

Final Group Projects

Students gain understanding of neurodegenerative diseases by participating in a group project.

Day 5

Sheep Brain Dissection

Students learn about in-depth neural anatomy through participating in a lab dissection.

Discussion: Sheep Brain Dissection Post-lab

Students review the dissection lab in order to answer any questions that they might have.

Day 6

Discussion: EEG and brainwave patterns

Students learn about brainwaves and their patterns.

Activity: Brainwave Controlled Helicopter (puzzlebox)

Students further their understanding of brainwaves by using them to 'control' a helicopter.

Activity: Mindset Headset

Students explore their own brainwaves and the control they have over their own mind.

Discussion: Sleep

Students learn about sleep and sleep brainwave patterns.

Day 7

Lab: Confusing the Senses

Students learn about the different senses by completing a lab.

Day 8

Discussion: Brain Controlled Movements

Students learn about brain controlled movements and a simple reflex neuronal circuit.

Experiment: Roboroach (Day 1)

Students explore brain controlled movements by participating in a Roboroach lab.

Activity: Neuroimaging

Students learn about the different imaging modalities used in neuroscience. Students learn about different diagnostic tools used in neurology and neuroscience.

Day 9

Experiment: Roboroach (Day 2)

Students explore brain controlled movements by participating in a Roboroach lab.

Final Group Projects

Students gain understanding of neurodegenerative diseases by participating in a group project.

Day 10

Final Group Project Presentations

Students further their understanding of neurodegenerative diseases.

Review Game

Students play a review game to summarize what they have learned in the course.

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