

## Cross-Disciplinary

### Electric Eels

Read the following paragraphs, and complete the exercises below.

Electric eels are found in the Amazon, Orinoco, and other muddy rivers in the tropical regions of South America. They grow as large as 2.75 m (9 ft) long and weigh up to 22 kg (49 lb). Electric eels are one of the few animals that can make, store, and discharge electricity. Electric eels use this electricity to navigate, communicate, stun or kill their prey, and defend themselves.

#### ELECTROPLAQUES

You can understand how an eel generates electricity by imagining its body as a series of batteries. An eel's body contains an organ that produces electricity. This organ is made up of 5,000 to 6,000 special muscle cells called electroplaques. The electroplaques are lined up like cells in a dry battery. Each electroplaque produces only a small voltage. However, eels can activate all of their electroplaques at the same time and produce a much higher voltage. When electric eels discharge electricity, the current flows either from head to tail or in the opposite direction. The more electroplaques that are activated, the greater the discharge.

Electric eels have more than one level of discharge. They generally discharge about 25 to 75 V, but when they discharge from all the electroplaque cells at the same time, they can jolt the receiver with as much as 500 to 650 V of electricity.

#### EXERCISES

1. Would the size of an electric eel influence the amount of volts that it could discharge? Explain your answer.

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2. How does the highest discharge of an electric eel compare with the voltage that comes out of a normal wall socket?

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3. Would it be dangerous for a human to be in the water near an electric eel that discharged a jolt of electricity to stun a large fish? Explain your answer.

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## Recording Electricity in the Brain

Read the following paragraphs, and complete the exercises below.

The brain activity and its function is carried out by nerve cells such as neurons. Neurons use chemicals to produce electrical signals. These signals are passed from neuron to neuron along pathways called circuits. When the brain is active, the neurons in the brain show intense electrical activity.

The electroencephalogram machine, sometimes called an electroencephalograph, is used to detect and record electrical activity in the brain. To administer the test, a medical technician attaches a number of small electrodes to a person's scalp. The electrodes are receptors through which electric current from the brain and scalp is gathered and sent to the machine. The electrical activity of the brain is recorded on paper tape. The tape moves forward under ink pens that move back and forth with each change in the brain's electrical activity. The wavelike patterns in these recordings are called brain waves. The entire record is called an electroencephalogram, or EEG.

### MEDICAL USES OF THE EEG

The most common medical use of EEGs is to diagnose and study epilepsy. The brains of people who have epilepsy have excessive electrical activity that sometimes interferes with normal brain function. The interference can result in seizures. By studying a person's EEG, a physician can determine the parts of the brain that are responsible for causing the seizures.

EEGs are also used to study sleep. Research using EEG machines shows that the pattern of brain waves changes as a person falls asleep. The changes continue as the person moves through the various stages of sleep and returns to wakefulness.

### EXERCISES

1. What is likely to happen to brain waves when you relax?

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2. What happens to brain waves during epilepsy?

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3. How do neurons communicate with each other?

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