Intro to Sensors

by

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Introduction

The name sensor is based on the human senses. Our senses allow us to have a greater grasp of the world around us. So too, sensors allow for us to be able to perceive stuff the way we cannot using our own senses. The definition of a sensor is, "A device that responds to a stimulus, such as heat, light, or pressure, and generates a signal that can be measured or interpreted."

So how do we use sensors in today's society? One way which we use them everyday is in cars. Cars today have made amazing technological advances from mere years ago, which is greatly do to the amazing sensors involved. Anti-locks brakes use sensors to keep cars from skidding off the road. When a car is backing up a sensor will discern objects behind it and let out a shrill warning to the driver. These sensors are used to keep people in and around an automobile safe. But sensors are used in more than just cars, they are all around us. From industry through home use, sensors are used to make the world around us easier. This year we will be using sensors in laboratory experiments to enrich and enliven the Living Environment course.

Objective

1. To learn about some of the Vernier sensors we will be using this year in our laboratory experiments.
2. To be able to explain how some sensors are like the human senses.

Pre-Lab Questions

What are the five human senses?

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How do you think a sensor can mimic the human senses? Can you name one sensor and connect it to a human sense?

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Equipment List

Vernier *LoggerPro*
Temperature Sensor
Water
Lemon Juice
Hot Plate
pH Sensor
2 250ml beakers
Alka-Seltzer solution

Experimental Procedure

Using the Temperature Sensor:

1. Connect the temperature probe to channel 1 of the Vernier interface.
2. Open the *LoggerPro* software on the computer and make sure the computer is registering the sensor. If the computer does not register the sensor, disconnect the sensor from the interface and then reattach. Make sure all connections are fixed firmly.
3. Pour 200 ml of water into a beaker.
4. Record initial temperature of water in Table 1.
5. Turn on hot plate and place beaker on top.
6. Press the collect button to collect data on the temperature of the water.
7. Record final temperature of water in Table 1.

Using the pH Sensor:

1. Connect the pH sensor to channel 1 of the computer interface. Before each use of the pH probe, you need to rinse the tip of the electrode thoroughly with distilled water. To do this, hold the pH electrode above a rinse beaker and use the rinse bottle to thoroughly rinse the electrode tip.

Important: Do not let the pH electrode dry out. Keep it in a 250 mL beaker with about 100 mL of tap water when not in use. The tip of the probe is made of glass—it is fragile. Handle with care!

2. Fill one beaker halfway full of water.
3. Record the pH of the water in Table 2.
4. Fill a beaker with 100 ml lemon juice. Record the pH of the lemon juice in Table 2.
5. Fill a beaker with 100 ml water, and then put an antacid into the water. Record the pH of the antacid in Table 2.
6. Rinse the pH sensor with distilled water and return it to its case.

Using the Light Sensor:

1. Connect the light sensor to channel 1 of the computer interface.
2. Push the record button and slowly lift the light sensor to the light bulb in the ceiling. Watch the graph of light intensity on the screen as the light sensor moves towards a light source.
3. Push the record button and slowly move the light sensor under the lab bench. Watch the graph of light intensity on the screen as the light sensor moves away from a light source.
4. Graph the light intensity versus time for the sensor moving to and from a light source in the results.

Results

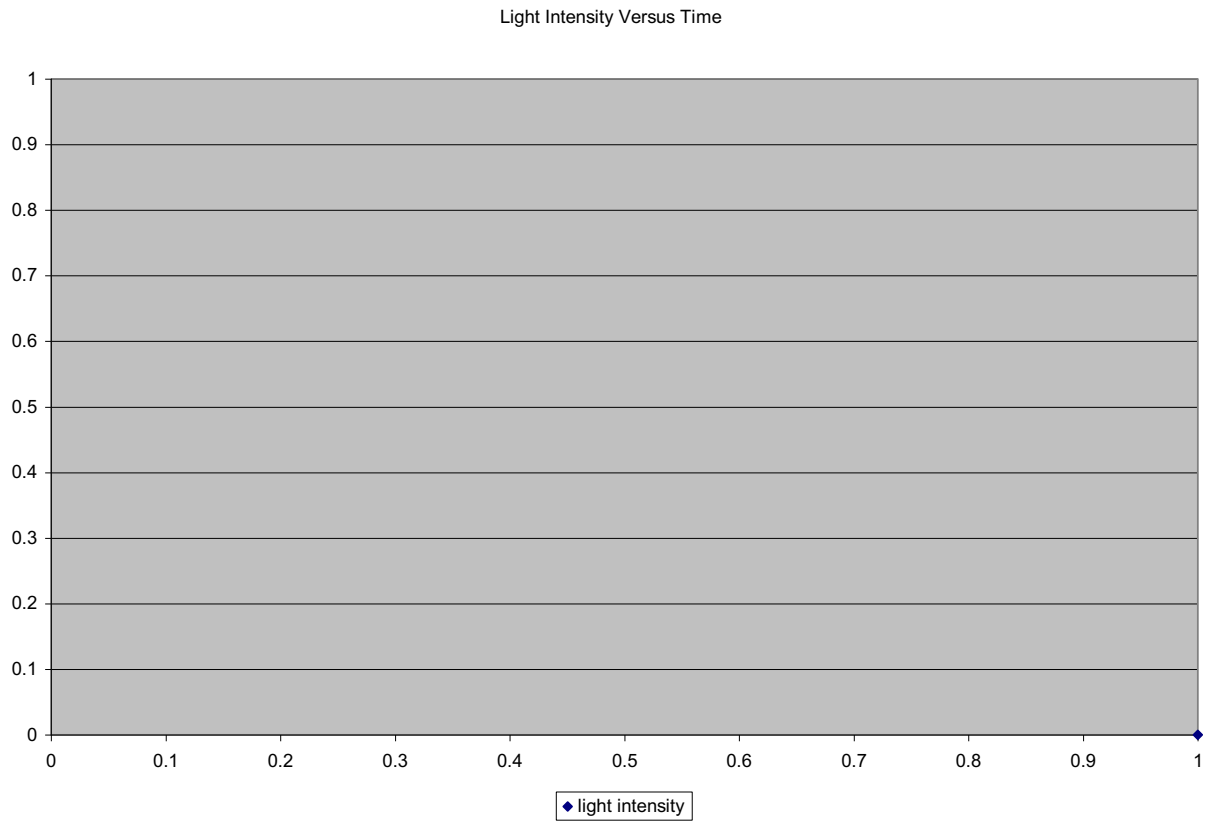
Temperature Sensor
Table 1:

Temperature Sensor	°C
Initial Temperature	
Final Temperature	

pH Sensor
Table 2:

pH Sensor	
Water	
Lemon Juice	
Antacid	

Light Sensor



Questions

Which human sense is the temperature sensor most like?

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Why is it important to know the temperature of a substance when doing an experiment?

How can we use the temperature sensor to regulate the temperature in an experiment?

Which human sense is the pH sensor most like?

Why is it important to know the pH of a substance?

The pH of pure water is 7. If your pH was not 7 what do you this accounts for the discrepancy?

Which human sense is the light sensor most like?

Why is light so important to biological organisms?