

Lab Activity: Temperature changes in sand versus water.

Introduction:

Objective: The objective of today's lab is to determine if water or sand heats up more quickly and "keeps" its heat longer. You will then use your collected data to answer the following question: **How does a hot, sunny day at the beach affect a fish in the water differently from a crab on the sand? Explain.**

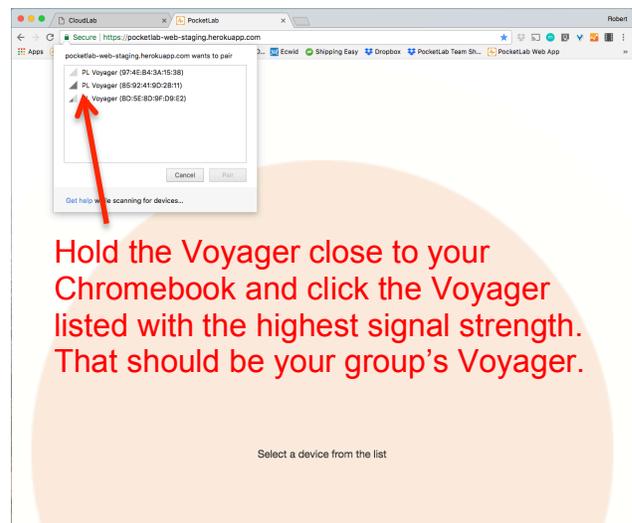
Write a prediction to the answer of the question in the "Hypothesis" box below. In today's lab activity we will test to see whether your hypothesis was correct.

Hypothesis:

Part 1: Collecting data with PocketLab

In part 1 of the lab activity, your group will collect data using PocketLab Voyager and the PocketLab app (The screenshots were taken using the PocketLab web app. The PocketLab mobile app will look slightly different). Follow the steps below:

1. Go to the PocketLab web app (in a Chrome browser) using the following address: <https://pocketlab-web-staging.herokuapp.com/> or open up the PocketLab mobile app.
2. Turn on the PocketLab Voyager by clicking the button on the top.
3. If using the web app, click the text that reads, "Click here to connect". If using the mobile app, the PocketLab Voyager should automatically connect.
4. Web app only: A pop-up box should appear showing all the PocketLab Voyagers that are turned on. Hold your PocketLab Voyager close to your computer/Chromebook. Click the PocketLab Voyager with the highest "signal strength."



5. Click on the "Change Graph" icon . Click "Temperature Probe" and unclick "Acceleration."
6. Plug in the temperature probe into the side of the PocketLab Voyager.
7. Lower the data rate to 1 pt/sec. by moving the "Frequency" slider all the way to the left.



You are now ready to collect data for your two runs and answer data analysis questions as a group.

<input type="checkbox"/>	Acceleration
<input type="checkbox"/>	Acceleration Scalar
<input type="checkbox"/>	Angular Velocity
<input type="checkbox"/>	Magnetic Field
<input type="checkbox"/>	Magnetic Field Magnitude
<input type="checkbox"/>	Range Finder
<input type="checkbox"/>	Range Finder Velocity
<input type="checkbox"/>	Range Finder Acceleration
<input type="checkbox"/>	Pressure Altitude
<input type="checkbox"/>	Pressure Barometric
<input type="checkbox"/>	Light Sensor
<input type="checkbox"/>	Internal Temperature
<input checked="" type="checkbox"/>	Temperature Probe
<input type="checkbox"/>	Humidity
<input type="checkbox"/>	Dew Point
<input type="checkbox"/>	Heat Index
<input type="checkbox"/>	Weather

Data collection for Run 1: Testing Temperature Change in Water.

1. Place the temperature probe in the water. Make sure the water is room temperature before beginning data collection.
2. Turn on a heat lamp.
3. Begin data recording by clicking the “Record” button at the bottom of the “Temperature Probe” graph.
4. You will record data for 20 minutes (1,200 seconds).
5. At 10 minutes (600 seconds), turn off the heat lamp.
6. Keep an eye on the graph. As a group, observe and discuss how the graph changes over time. Observe and discuss how it specifically changes at 10 minutes (600 seconds).
7. At 20 minutes (1,200 seconds), hit the “Stop” button at the bottom of the “Temperature Probe” graph.
8. Save your data and take a screenshot of the graph.
9. In your lab notes write down the original temperature at 0 seconds, the temperature at 10 minutes (600 seconds), and the final temperature at 20 minutes (1,200 seconds). You can also add any observations your group discussed.

Data collection for Run 2: Testing Temperature Change in Sand.

1. Repeat the steps from Run 1, except place the temperature probe in the sand, not the water. Save the data to Run number “2” instead of number “1”.

Data Analysis

Answer the following Data Analysis questions for both the run with the sand and the run with the water. You may need to go back and look at your previously collected data to answer the questions.

“Daytime Question” – When heat lamp is on:

Subtract the original temperature (0 seconds) from the temperature at 10 minutes (600 seconds). What is the temperature difference during the daytime?

“Nighttime Question” – When heat lamp is off:

Subtract the temperature at 10 minutes (600 seconds) from the final temperature at 20 minutes (1,200 seconds). What is the temperature difference during nighttime?

Part 2: Write a Lab Report

A lab report is a great way to summarize how you conducted your experiment and tested your hypothesis, the data collected, and any conclusions you can draw about the scientific question that was tested.

In your lab report include:

1. Your original hypothesis from the beginning of the lab.
2. The objective or scientific question you wanted to answer with the lab activity.
3. What materials you used in the experiment.
4. A detailed description of how the lab was set up and how you tested your hypothesis.
5. A summary of your data and the answers to your data analysis questions.
6. Any observations you made with your group.

A conclusion paragraph that answers the following questions:

-Did the water or sand have a greater temperature change during the daytime? How do you know? What does that tell you about which heats up faster?

-Did the water or sand have a greater temperature change during the nighttime? How do you know? What does that tell you about which retains its heat better?

-Was your hypothesis correct? How do you know?

-How would life be different for a fish in the water versus a crab on the beach on a hot, sunny day? How would it be different that night, when the sun goes down? Explain.