Temp Probe Altimeter

Adaptation

Overview

How do animals survive in freezing tundras, scorching deserts, or atop towering mountains? In this investigation, you'll explore how temperature and altitude shape the survival of living organisms, from modern species to ancient dinosaurs. Using databot™, you'll measure temperature and height in real-world settings, compare them to the comfort zones of diverse creatures, and uncover the incredible adaptations that allow life to thrive across Earth's extremes. This lab connects temperature and altitude to adaptation, giving you hands-on insight into how organisms conquer sizzling lows, icy highs, and everything in between!

Grades: Middle School
Time: 45 Minutes
Subject: Life Science
Topics: Adaptation, Thermoregulation, Temperature, Altitude

What You Will Need/Prep

- databot with temperature sensor
- IOS/Android Smart Device
- Heat and cold sources
- Ladder or other devices to simulate different heights
- Install Vizeey™ on your Smart device.
- Scan the QR code to load the experiment.
- Test your databot™ connection.
- You will be prompted to select and connect to databot™ each time you launch an experiment.
- If there are two or more databot™'s listed, the one closest to your device will be highlighted.
- Study the background information and terms and prepare to explore!

Background

Temperature and altitude are nature's ultimate survival tests. Every creature—whether a desert lizard basking in heat, a yak trudging up snowy peaks, or a massive dinosaur lumbering across ancient landscapes—has adapted to thrive within specific ranges of heat and height. These factors have sculpted life for millions of years, sparking adaptations like thick fur for icy cold, efficient lungs for thin air, or large bodies for heat retention. Modern species demonstrate these traits daily, while extinct ones, like soaring pterosaurs or ground-dwelling sauropods, show how temperature and altitude shaped the past.

Extremes push life to its limits. Freezing temperatures demand insulation or heat-trapping behaviors, while scorching heat calls for cooling tricks like sweating or shade-seeking. High altitudes, with their low oxygen and pressure, require specialized breathing or sturdy frames, while depths below sea level challenge organisms with crushing forces. Dinosaurs, thriving in a warmer, flatter Mesozoic world, adapted differently than today's altitude-dwelling species. Studying these factors helps us understand climate shifts, protect ecosystems, and even imagine life on other worlds—perhaps a Martian mountain or a lunar plain!

Temp Probe Altimeter

Databot™ brings this exploration to life. By measuring temperature in real-world conditions and simulating altitude with a creative scaling trick, you'll compare your data to the needs of living and extinct organisms. This investigation bridges the past and present, showing how adaptation equips life to endure Earth's wildest corners—from blistering deserts to lofty peaks.

Learning Objectives

In this investigation you will master the following knowledge and skills:

- Investigate how temperature and altitude affect the survival and adaptation of organisms.
- Use databot™ to measure temperature and altitude, comparing results to the comfort zones of modern and extinct species.
- Analyze how adaptations help organisms endure extreme temperatures and altitudes.
- Build data collection and critical thinking skills by recording and interpreting experimental findings.

Important Terms

Temperature: A measure of heat or cold, recorded in degrees Celsius (°C), shaping an organism's survival.

Altitude: Height above or below sea level, measured in meters (m), influencing air pressure and oxygen levels.

Comfort Zone:- The ideal range of temperature or altitude where an organism thrives effortlessly.

Adaptation: A trait or behavior enhancing survival, like fur for warmth or wings for high flight.

Thermoregulation: How organisms maintain body temperature, using insulation, sweat, or movement.

Extinct Species: Organisms like dinosaurs, no longer alive, offering clues about ancient environments.

Ecosystem: A network of organisms and their surroundings, molded by temperature, altitude, and more.

Interesting Facts

Frosty Survivors: The Siberian salamander can freeze solid at -5°C and then come back to life after thawing—nature's own popsicle!

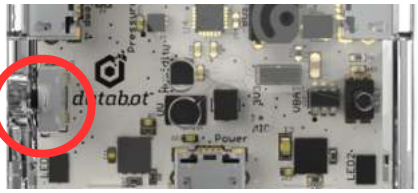
Hot and Cold Records: The Sahara's sand hits 50°C, while Antarctica dips to -50°C—yet life adapts to both extremes.

Temp Probe Altimeter

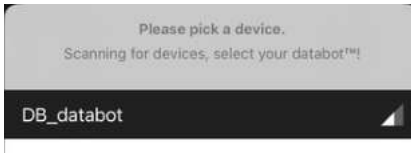
Using Vizeey

To work with the experiment, you need to run the Vizeey application. If you don't have it, you can download it from the Play Store or the App Store.

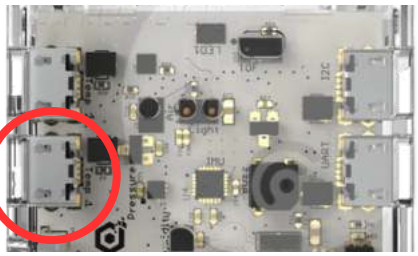
Turn on databot by pressing the button.



Then in the Vizeey app, select "**Add experiment from QR code**" and scan the QR code prepared for this experiment. Your experiment will appear in the list of experiments. When you start the experiment you will be immediately offered to connect to your databot.

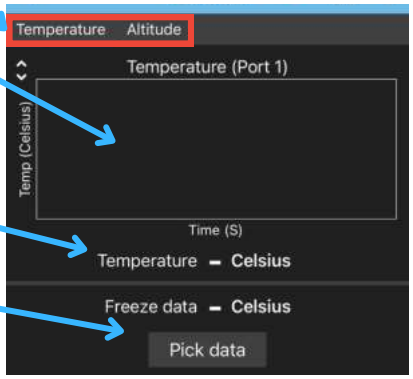


In this experiment, you're going to use 2 different sensors. One of them is a temperature sensor. You must connect it to port "**Temp 1**"



You can see two different tabs for this lesson, so select the one you need from here

Here you will see a graph that illustrates the changes in temperature over time.

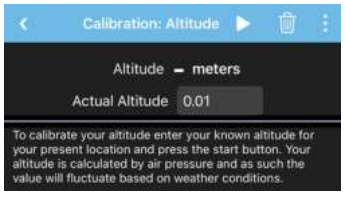


Current temperature

You can fix the current temperature value by pressing this button

Before measuring height with the altimeter sensor, calibrate it first by scanning the QR code.
This is a system tool used for managing databot.

Enter the height data 0.01 and run the program.
More details are written in experiment 2



Temp Probe Altimeter

Part 1: Initial Observations and Questions

Take a moment to think about how temperature and altitude affect the animals and plants around you—or even creatures from the distant past! Before diving into the experiment, discuss these questions with your classmates or jot down your thoughts:

Why might some animals, like polar bears or desert lizards, prefer extreme temperatures while others, like humans, stick to milder conditions?

How do you think living high in the mountains changes an organism compared to living deep under the sea?

What kinds of adaptations might dinosaurs have needed to survive the warm climates of their time?

How could temperature or altitude affect where plants and animals can live today?

Part 2: Hypothesis

Before you start measuring with databot™, think about what you expect to discover about temperature and altitude. A hypothesis is your best guess—your prediction—about what will happen, based on what you already know or imagine. Use the questions below to guide you in forming your own hypotheses for the two parts of this experiment. Write them down in the format: "I predict that… because…"

Temperature and Survival

How do you think temperature affects where animals can live comfortably?

Example: *"I predict that colder temperatures will suit animals like polar bears because they have thick fur to keep warm."*

Temp Probe Altimeter

Your turn:

I predict that _____ will be best for _____because
(temperature condition) *(animal)*

_____
(reason)

I predict that _____ will be best for _____because
(temperature condition) *(animal)*

_____
(reason)

Altitude and Adaptation:

What do you expect to happen to an organism's comfort zone as altitude increases or decreases?

Example: *"I predict that higher altitudes will suit birds like eagles because they can fly and breathe in thin air."*

Your turn:

I predict that _____ will be best for _____because
(altitude condition) *(animal)*

_____
(reason)

I predict that _____ will be best for _____because
(altitude condition) *(animal)*

_____
(reason)

Part 3: Experiment Procedure

In this experiment, you'll use databot™ to create and measure the perfect temperatures for a variety of creatures—both modern and extinct. Teams of two will compete to find and fix these temperatures with databot™, and the team with the most accurate readings wins! This investigation will test your creativity, teamwork, and quick thinking as you explore how temperature shapes life on Earth.

Temp Probe Altimeter

Creature Comfort Zones

Here are the animals you'll be working with, along with their ideal temperatures. Your goal? Find and fix these values in Vizeey™ as precisely as possible!

- Ursus maritimus (Polar Bear): **5°C** – thrives in icy Arctic conditions.
- Dipsosaurus dorsalis (Desert Iguana): **40°C** – loves the scorching desert sun.
- Loxodonta africana (African Elephant): **30°C** – enjoys warm savanna climates.
- Macropus rufus (Red Kangaroo): **25°C** – hops happily in mild Australian outback heat.
- Androctonus australis (Desert Scorpion): **45°C** – rules the hottest desert sands.
- Smilodon fatalis (Sabertooth Cat): **15°C** – roamed cooler prehistoric plains.

Form Your Team:

Pair up with a classmate. One of you will be the Temperature Hunter, searching for ways to hit the target temperatures, while the other is the Data Fixer, ready to capture the readings in Vizeey™.

Step 1:

- Connect the temperature sensor to databot™ using the Temp 1 port.
- Tap on "**Adaptation**" in Vizeey to load the experiment. Use the first tab of the experiment *"Temp Probe"* for this part of the measurements.
- You will be prompted to connect to databot.
  - Hint- if there is more than one databot in use, the one closest to you will be in blue!
  - A solid blue light on databot means you are connected.
- Start your experiment using: ▶
- Use these icons ▶ ⏸ at the top of the screen in Vizeey to start and to pause the experiment.

Temp Probe Altimeter

Step 2:

Your challenge is to match the comfort zones of the creatures listed above. Get creative!

- Need 5°C for the polar bear? Try holding the sensor near an air conditioner or a cold glass of ice water.
- Want 40°C or 45°C for the iguana or scorpion? Place databot™ in sunlight, near a warm lamp, or even over a cup of hot water (safely!).
- Aiming for 25°C or 30°C for the kangaroo or elephant? Experiment with room temperature spots or a sunny windowsill.
- Targeting 15°C for Smilodon? A shady corner or a cool breeze might do the trick.
- Work fast—the clock's ticking, and accuracy wins!

Step 3:

- Watch the temperature readings in Vizeey™. When you hit a value close to your target (e.g., 5°C for Ursus maritimus), shout "Got it!" and tap the "Pick data" button to freeze the data.
- Show your recorded reading to your teacher for review. Then record it in the table below.
- Move on to the next creature's temperature. Can your team conquer all six?

Creature	Ideal Temperature (°C)	Your Measured Temperature (°C)	Difference (°C)
Ursus maritimus	5		
Dipsosaurus dorsalis	40		
Loxodonta africana	30		
Macropus rufus	25		
Androctonus australis	45		
Smilodon fatalis	15		

Once all teams have finished, calculate the "Difference" column (subtract your measured temperature from the ideal one, ignoring negatives). The team with the smallest total difference across all creatures wins the Survival Challenge!

Temp Probe Altimeter

Experiment 2

Ever wondered how creatures adapt to life deep beneath the waves or high atop rugged peaks? In this altitude adventure, you'll explore how height above or below sea level shapes the survival of diverse organisms—from glowing deep-sea fish to hardy mountain marmots. Using databot™, you'll measure altitude and scale it up by 1000 to recreate the perfect living conditions for each species. Just like in the temperature challenge, teams of two will compete to match these heights as closely as possible. The team with the most precise fixes wins the Altitude Survival Crown! Get ready to climb, dive, and discover adaptation in action.

Creature Comfort Zones

Here's your lineup of organisms and their ideal altitudes. Your task is to simulate these heights by scaling databot™ readings (multiply by 1000) and fixing them in Vizeey™!

- Deep-water lionfish (Myctophum punctatum): **-1000** m – glows in the dark depths of the ocean.
- Sea sponge (Spongia officinalis): **-500** m – filters life from the ocean floor.

- Humans (Homo sapiens): **0–200** m – breathes easy at sea level.

- Sparrowhawk (Accipiter nisus): **500–1500** m – hunts with precision in hilly forests.
- Mountain goat (Oreamnos americanus): **1000–2000** m – leaps across rocky mountain slopes.

- Alpine babak (Marmota marmota): **1500–2500** m – hibernates in chilly alpine meadows.

Form Your Team:

Pair up with a classmate. One of you is the Height Seeker, moving databot™ to hit target altitudes, while the other is the Data Fixer, capturing readings in Vizeey™.

Temp Probe Altimeter

Step 1:

- Tap on "**Adaptation**" in Vizeey to load the experiment. Use the second tab of the experiment *"Altitude"* for this part of the measurements.
- You will be prompted to connect to databot.
  - Hint- if there is more than one databot in use, the one closest to you will be in blue!
  - A solid blue light on databot means you are connected.
- Start your experiment using:
- Use these icons at the top of the screen in Vizeey to start and to pause the experiment.
- Once you run the experiment, look at the data: you will see your altitude above sea level. When you raise databot, the data will increase, and when you lower it, the data will decrease. Working with this data can be challenging, since there is no exact reference point. Let's calibrate it.

Calibrate the Altitude Sensor:

Before you start your measurements, calibrate databot™. Scan the QR code for the calibration service app. Place databot™ on the table, run the calibration program, and enter the altitude - 0.01 m. This is your sea level starting point!

Step 2:

Return to Vizeey™, tap **"Adaptation"** and switch to the *"Altitude"* tab. Hit the play button to start recording altitude data in real time. Notice how the numbers change now: lift databot™ up, and the altitude increases; lower it, and the values drop.

Your goal is to match the ideal altitudes by moving databot™ and scaling the readings (multiply by 1000). Here's how:

- -1000 m (**Deep-sea Fish**): Lower databot™ 1 m below your starting point (e.g., down a staircase or to the floor). Reading: -1 m × 1000 = -1000 m.
- -500 m (**Sea Sponge**): Lower databot™ 0.5 m (e.g., halfway down a desk). Reading: -0.5 m × 1000 = -500 m.
- 0–200 m (**Human**): Keep databot™ at 0 m (table level) or lift slightly to 0.2 m. Reading: 0.2 m × 1000 = 200 m.
- 500–1500 m (**Hawk**): Raise databot™ 0.5–1.5 m (e.g., stand on a chair or climb stairs). Reading: 1 m × 1000 = 1000 m.
- 1000–2000 m (**Mountain Goat**): Lift databot™ 1–2 m (e.g., higher stairs or a tall teammate's reach). Reading: 2 m × 1000 = 2000 m.
- 1500–2500 m (**Marmot**): Raise databot™ 1.5–2.5 m (e.g., top of a staircase). Reading: 2.5 m × 1000 = 2500 m.
- Use stairs, desks, or floors—be creative but safe!

Temp Probe Altimeter

Step 3:

- When you reach a height close to your target (e.g., 1 m for 1000 m), yell “Locked!” and tap the “Pick data” button in Vizeey™.
- Multiply your reading by 1000 to match the creature’s zone.
- Show your fixed altitude to your teacher, then log it in the table below.
- Move on to the next creature. Can your team master all six altitudes?

Creature	Ideal Altitude (m)	Your Measured Altitude (m) *1000	Difference (m)
Myctophum punctatum	-1000		
Spongia officinalis	-500		
Homo sapiens	0-200		
Accipiter nisus	500-1500		
Oreamnos americanus	1000-2000		
Smilodon fatalis	1500-2500		

Part 5: Concept Questions

Which creature was the hardest to figure out the ideal temperature for? What do you think made it so difficult - the tools, the environment, or something else?

What would happen to a polar bear if it lived in a scorpion desert for a week at 45°C?

What was the hardest altitude to model with databot™? Why do you think small changes in altitude within a class were harder or easier to control?

How do you think a deep-sea fish's body would react if it was suddenly transported to an altitude of 2,000 meters, like a mountain goat?

Temp Probe Altimeter

Part 6: Reflection

After testing both temperature and altitude, what's one adaptation you'd give an animal to survive an extreme combo—like a freezing mountain or a hot ocean trench? Why?

How did this experiment change your understanding of why animals (or even dinosaurs!) live where they do?

What's one question you'd ask a scientist about adaptation now?