ProTemp Sensor Temperature Sensor

for the LogIT Microsense® system

Instructions

Overview

ProTemp is a precision engineered Microsense® sensor designed to measure the temperature of liquids or gas within a maximum range of -30 to +130 °C (depending on the whether the software being used supports the full range). Accuracy is better than 1°C and resolution is such that your logger can show changes of less than 0.1°C, allowing very small changes to be monitored & recorded.

In Use

ProTemp can be used plugged directly into a LogIT data logger or used up to 4 metres away by connecting it to sensor extension cables.

ProTemp can also be used with LEGO® RCX using the LEGO® DCP sensor adapter.

ProTemp's probe is made from Stainless Steel and is waterproof but care must be taken never to let any liquid or steam go above the top of the probe. Always dry off any moisture when you have finished & if toxic substances have been used wash probe thoroughly before drying. If measuring acids etc which would attack stainless steel use a ptfe or similar sleeve for protection.

Specifications

Range:	-30 to +130˚C (software dependent)
Resolution:	Better than 0.1˚C
Accuracy:	Nominal +/- 0.5˚C (+/- 1˚C max)
Probe Length:	180mm
Microsense® ID code:	25
Product code:	D200047

Care

Never immerse the entire ProTemp in liquid or permanent damage will result.
Do not sterilise using an autoclave.
Take extra care if measuring very hot or cold substances for prolonged periods as ProTemp's metal plug may eventually reach that temperature; when in doubt use a retort ring stand to hold the probe.
Do not disassemble this sensor.

Example Applications

Monitoring temperature during fermentation
Looking at temperature during chemical reactions
Studies of conduction; convection; radiation
Studying land and sea temperatures and their effect on the climate
Temperature during changes in state
Gas laws (when used with LogIT pressure sensor)

Resources

The resources shown overleaf are available along with others for download in PDF format at www.logitworld.com

Waste electrical and electronic products must not be disposed of with household waste.
Please recycle where facilities exist.
Check with your Local Authority or Retailer for recycling advice.

DCP microdevelopments

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"Keeping warm"

Physics

Subject: Physics/Biology

Sensor: Temperature

Overview:
A human 'body' keeps warm in all sorts of ways using different materials. This experiment will compare every-day materials and see why some might be used for clothing. It can also show that some materials are better thermal insulators than others.

Equipment required: LogIT Datalogger
2 or 3 Temperature sensors (HiTemps or ProTemps with extension cables)
2 or 3 small bottles or similar vessels
Different materials eg. bubble wrap, tin foil, cotton wool etc.

Hazards:
Make sure the water is not too hot for the ability of the pupils. Water temperature above 55° C will scold children.
Care must be taken if using kettles to heat the water. Allow the temperature to cool before use.
Place the bottles into a tray to catch any spilt water should the bottles be knocked over.
BE CAREFUL NOT TO HAVE REALLY HOT WATER AS THIS CAN CAUSE SERIOUS BURNS AND WILL ALSO SOFTEN THE PLASTIC OF THE BOTTLES BEING USED.

Setup:

1. Connect the Temperature sensors to the datalogger.
2. You can use a clamp stand to hold the sensors if required.
3. Wrap one of the bottles in the first test material.

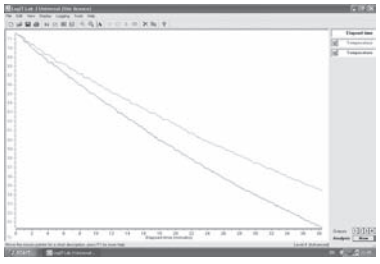
Note: The picture shows the use of ProTemps. These have been passed through some modified syringes glued into the top of the bottles. This gives a good tight fit and also ensures that the sensor is in the same position in each bottle for accuracy. In this example, we are comparing an insulated 'body' covered in bubble wrap and an uninsulated 'body'.

Method:
1. Switch on your datalogger or setup your software ready to start taking readings.
2. Fill both bottles with the same amount of hot water (not hotter than 55°C)
3. Start logging.
4. After 20-25 minutes stop logging.
5. If you have been using a remote datalogger, download the results to your computer and display the graph.

Note: If using a few materials, you can use all three channels or if you are using the LogIT DataVision you might like to set up six. Remember you can use the 'Overlay' feature in some datalogging software to place all the results onto one graph for comparison.

Results:

- Can you see any differences in the temperature of the bottles after 15 minutes?
- Which material is acting as the best insulator?
- Is this what you thought would happen?
- What would make the hot water cool down more quickly?



"Why do animals huddle?"

Subject: Biology

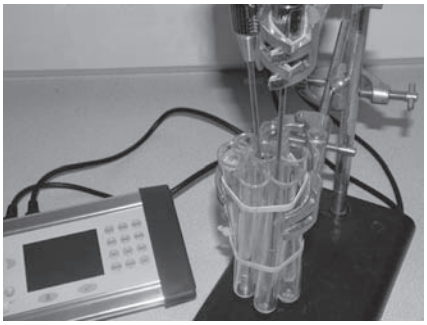
Sensor: Temperature

Overview:
Often when you see pictures of penguins they are standing close together, huddling. The same behaviour can be found in other animals especially small animals such as mice and woodlice. The question is why?
This experiment is designed to investigate the possible reasons why animals , including humans, huddle together.

Equipment required: LogIT Datalogger
2 Temperature sensors (HiTemps or ProTemps with extension cables)
7 small test tubes
1 elastic band (To hold the tubes together)
1 clamp stand or similar method to hold tubes
Hot water (Not greater then 55°C)

Hazards:
Make sure the water is not too hot for the ability of the pupils. Water temperature above 55° C will scold children.
Care must be taken if using kettles to heat the water. Allow the temperature to cool before use.
Place the tubes over a tray to catch any spilt water.

Setup:

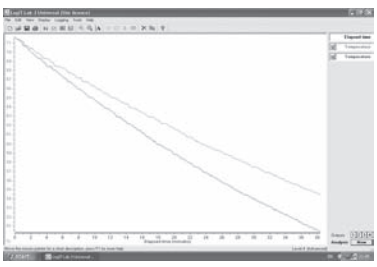


1. Connect the Temperature sensors to the datalogger.
2. You can use a clamp stand to hold the sensors if required.
3. Decide where you are going to place your temperature probes in the tubes. (We used the centre and one on the outside.)

Method:
1. Switch on your datalogger or setup your software ready to start taking readings.
2. Carefully pour hot water (not hotter than 55°C) into the test tubes and place your sensors into the test tubes you have chosen.
3. Record the change in temperature over 15 to 20 minutes.

Whilst this is happening think about the results you expect to obtain. What improvements could you suggest or is there an additional piece of equipment that could be used?

Results:
- Can you see any differences in the temperature of the animals after 15 minutes?
- Does the investigation show why animals huddle? If so how?
- Where is the best place to be in a huddle?



Going further:
- What happens if the animals stand further apart?
- What happens if the middle animal wears a coat?
- What if the outside animals have a coat and the middle doesn't?
- Try different size animals.
- What happens if there is wind (use an electric fan to simulate this)?
- Does it affect where the best position in the huddle might be?

Biology

"Endothermic Reactions"

Subject: Chemistry

Sensor: Temperature

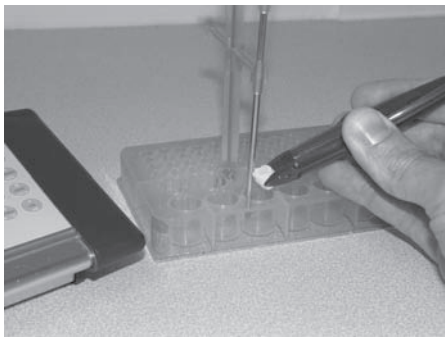
Overview:
There are a few reactions in Chemistry where energy is absorbed from the surroundings during the reaction. When this happens, the temperature of the reactants drops and an endothermic reaction has taken place. This simple experiment can be used to show the difference between a chemical or physical change. It can also be adapted to become a simple rate of reaction experiment in that you can vary the starting temperature of the water, size and shape of the antacid.

Equipment required: LogIT Datalogger
ProTemp temperature sensor
Small vessel or beaker
Antacid such as Alka-seltzer® (Sodium Bicarbonate and Citric Acid)
Water

Chemistry

Hazards:
Make sure the water is not too hot for the ability of the pupils. Water temperature above 55° C will scold children.
Care must be taken if using kettles to heat the water. Allow the temperature to cool before use.
Place the tubes over a tray to catch any spilt water.

Setup:



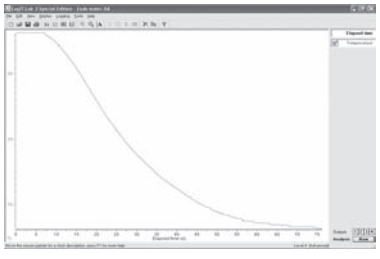
1. Connect the Temperature sensor to the datalogger.
2. You can use a clamp stand to hold the sensor if required.
3. Place the water into the small vessel or beaker.

Note: In the picture we have used a micro science kit with the Alka-Seltzer about to be introduced to the water. This allows for the use of small amounts of water and Alka-Seltzer (2.0ml of water and 0.3g of Alka-Seltzer in this example although you could alternatively use 200ml of water and a whole tablet).

Method:
1. Switch on your datalogger or setup your software ready to start taking readings.
2. When the temperature has reached a stable value start logging.
3. Add the Alka-Seltzer tablet.
4. Record until the temperature no longer falls.
5. Stop logging.
6. Repeat for different temperatures of water, different size or different shape of Alka-Seltzer.

Note: If you are varying the temperature of the water, you could use more channels and record the temperature changes on the same graph. This could also be achieved by using the 'Overlay' feature found in datalogging software.

Results:
- How much of a temperature change was there?
- How does this show that a reaction has taken place?



Going further:
- How would the shape and size of the Alka-Seltzer affect the graph?
- Try using vinegar instead of water. What might happen to the speed of the reaction and shape of graph this time?