

Investigation on Heat Loss in Organisms

Introduction: Heat loss is extremely important for all types of organism in any habitat. The temperature of the body has to be correct otherwise the organism will not be able to survive, so it is vital that organisms can control factors to keep their body temperature at a safe, constant temperature. Heat loss is so vital because it can easily kill an organism if its temperature rises or decreases by a certain amount, which could easily happen under the world's varying climate. In a cold habitat, obviously there is not a lot of heat to be gained outside, so the heat inside the body of an organism has to be kept by other methods, to keep the body temperature constant and at a safe temperature. One method, is having a layer of fat to maintain the heat already inside their bodies. However, a more important and influential factor, is that in cold places such as the Arctic, you tend to only find large animals, such as Polar Bears, and Penguins, with the smallest organisms being Arctic Foxes. This means that they have less skin per cm³ of volume - and so have a smaller surface area : volume ratio. This means that through their skin, they lose less heat than that of smaller organisms, who have more skin per cm³ of volume. So, these larger animals lose less body heat and so are suited to the colder conditions of the Arctic. The same applies for the desert, at the other end of the extreme. The desert contains generally quite small organisms, such as mice, gerbils, and snakes. These organisms have more skin per cm³ volume, and so lose heat much quicker. In the hot conditions of the desert, these animals do not want to gain heat and increase the temperature, so the fact that they lose heat quickly suits them to living in the hot conditions of the desert. There are many factors that will affect the rate of heat loss, and here are a few of them:

- Temperature outside - This will increase the heat lost depending on how much cooler it is outside compared to the body temperature of that particular organism.
- Volume - Depending on how much heat is stored inside the organism, will affect how much heat is lost from that organism.
- Surface area - The amount of skin per cm³ of skin decides how easily the heat is

lost from the organism - the greater the amount of skin per cm³ of skin, the easier the heat loss for that organism.

Aim: In this investigation, I will be investigating the heat loss of a certain volume of water inside a test tube. Here is a table of all the variable and how

I will control them:

Variable	Method of Control
Independent Variable	Volume
Dependant Variable	Heat Loss
Controlled Variables	Surface Area Starting Temperature Room Temperature

The water in all test tubes shall be measured accurately in a measuring cylinder before being placed inside the test tube. Measured every minute using a stopwatch to take accurate measurements. All test tubes will be the same size, and the water in every test tube will start at a certain temperature to give the water in each test tube time to settle inside the test tube, which will all be placed inside the same room.

Prediction: I predict that as the volume increases, the time taken for the heat to be lost will increase. This is because as the volume gets the larger, the amount of 'skin' per cm³ volume will decrease, and so will lose heat slower. This can be seen in the worlds organisms: An elephant has a larger volume than a mouse, but loses heat slower, as it has less skin per cm³ volume compared to a mouse, which has less volume, and so lo ses heat much quicker.

Method: Here is a step by step guide to the method used in this investigation:

Firstly, the apparatus were set up, so that the kettle contained boiling water, and there were six test tubes in the rack, with a stopwatch and measuring cylinder next to them.

10 cm³ of the boiling water was poured into one test tube, and a thermometer was placed inside that test tube.

When the temperature of the water lowered to 70 oC, the stopwatch was started, and the experiment for that test tube had begun.

Every thirty seconds, the temperature of the water was recorded, until the experiment had been running for 10 minutes, when the final temperature was recorded.

This was repeated for the water inside the other five test tubes, so that the six volumes of water inside the test tubes were 10, 15, 20, 25, 30, and 35cm³,

with the stopwatch starting when they lowered 70 °C, and the temperature recorded every thirty seconds for ten minutes. All the experiments were done inside the same room, so that the room temperature remained the same for all experiments, and the measuring cylinder was used to measure out exactly the correct volume of water for each test tube. The final results were recorded, and the equipment was packed away.

Apparatus used: Here is a list of all the apparatus used in this investigation:

Six, equally sized boiling tubes
A thermometer
Test tube rack
Kettle (to boil the water)
A stopwatch
A measuring cylinder