

Comparing Heat Loss Between A Single Test Tube and Test Tubes in a Huddle

Aim

I aim to prove whether heat loss is reduced by huddling test tubes, as opposed to the heat loss of a single test tube, which is more exposed to the air.

Background Information

Controls	Variables
The number of test tubes.	Time taken to carry out the experiment.
The number of thermometers.	Starting temperature.
Amount of water added to each test tube.	Final temperature.
15 readings, which are repeated for an average.	
The number of elastic bands required supporting the huddle.	
The number of beakers and stands required supporting the test tubes.	

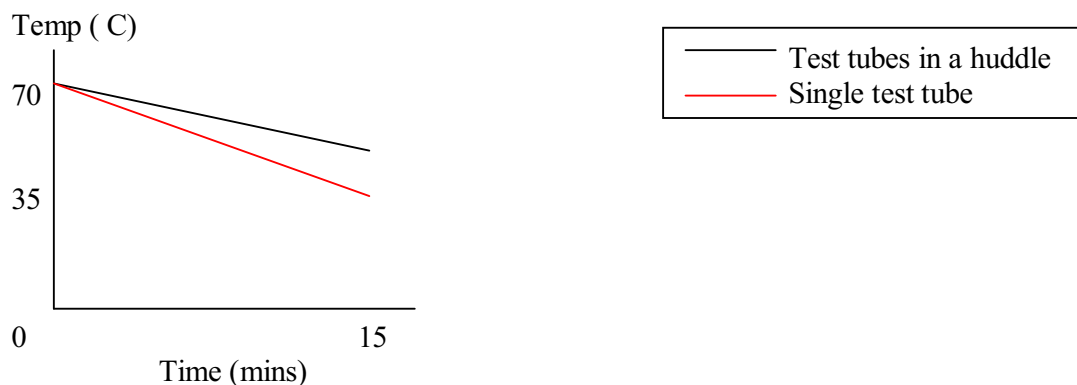
Prediction

I predict that the single test tube is more exothermic than the test tubes in the huddle. This is because, by huddling, a smaller surface area of the test tubes is exposed to the air. Thus, less heat is given off.

Heat can be lost in various ways. However, by huddling the test tubes, heat loss via convection and radiation can be reduced.

Examples where huddling is vital for survival occur in nature. As evidence that huddling is a learned response, animals like penguins and seals would die if they were not taught these basic skills.

If my prediction is correct my graph should resemble the one shown below:



Method

To make comparisons between the temperature loss of a single test tube and the test tubes in a huddle, I required eight test tubes.

First, I placed one test tube in a stand and gave it a thermometer. The remaining seven test tubes were held together by an elastic band and placed in a large beaker. A thermometer was then placed in the centre test tube of the huddle.

Next, my teacher poured boiling water to the brim of each test tube. At this point, I started the stop-clock, reading each thermometer every minute for 15 minutes and recording the temperature in a results table.

After documenting the final result, I refreshed the water in each test tube and repeated the experiment to record my second readings.

Conclusion

My results show that the test tubes in a huddle lost 24.5 C and the single test tube lost 28 C. Thus the test tubes in a huddle restored 3.5 C more than the single test tube. As a result the test concurs with my prediction, that the single test tube is more exothermic than the test tubes in the huddle.

I also configured results to show the percentage change of the single test tube and the test tubes in a huddle. The percentage change for the single test tube was 33.26% and 24.809% for the test tubes in a huddle. The percentage change for the test tubes in a huddle was 8.451% less than that of the single test tube. Thus indicating the single test tube has a higher percentage change.

Evaluation

My investigation into the heat loss of a single test tube and test tubes in a huddle was successful as the results coincide with my prediction and predicted graph. Thus proving my results was correct.

It was imperative that I made the experiment a fair test by complying with the following:

- The size of each test tube had to be the same.
- The temperature of the single test tube and the test tubes in a huddle had to be the same before the experiment began.
- The amount of water added to each test tube had to be the same.
- Each result had to be recorded every minute.
- The thermometers had to be kept still, inside the test tubes, at all times e.g. no picking up in order to read the temperature. This is so the temperature is not affected.

To improve my investigation, I would accomplish the following:

- By repeating the experiment more than twice, I can get more readings and thus improve my average results. This makes the experiment more accurate.
- I can begin the experiment at higher temperatures. This will give me more varied results.
- Beginning the experiment at higher temperatures will also enable me to expand the time. Providing me with more results.
- By carrying out the same experiment in different temperatures, I can resolve how much the results are affected and make comparisons.
- I could also cover the test tubes in different materials like cotton and foil to resolve whether they affect the temperature.
- I can differ the water level in the single test tube compared to that of the test tubes in a huddle to determine whether the amount of water affects the results.

Investigation to Compare Heat Loss Between a Single Test Tube and Test Tubes in a Huddle

