CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
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Project Number
J1306

Project Title
Which Insulation Material Will Best Regulate Water Temperature?

Abstract

Objectives/Goals
Our objective was to determine which insulation material regulated water bottle temperature the best. Our hypothesis was that the insulation materials with the least of air pockets would be the best insulator. We believed this because the air pockets would change the water temperature, and without air pockets the water wouldn#t be able to come in contact with the air and drastically change the temperature.

Methods/Materials
We filled six plastic tubs with six insulation materials. These materials included, water, sand, wool, cotton balls, and aluminum foil, and control (air). We then filled six water bottles with cold water at 3º C. We placed the water bottles in the tubs, and after thirty minutes we took the water#s temperature. After another thirty minutes we took the temperature again. Then we repeated that procedure with hot water, heated to 50º C. We repeated this whole procedure two times before we analyzed the data and came up with our conclusion.

Results
On average wool insulated cold water (initial temperature 3ºC) the most effectively, with cotton coming in a close second. After 60 minutes wool insulated water was 7.4º Celsius and cotton was 7.45º C.
For our hot water (initial temperature 50ºC) averages after sixty minutes, cotton worked the best as an insulation at 46.7º C., and wool was 0.6º cooler than cotton after 60 minutes.
The worst insulator for cold water on average was room temperature water. Its water sample temperature had risen to 14.35ºC.
For hot water, the worst insulator was room temperature water again. Its water sample had dropped to 23.05º C. after 60 minutes.
In order from best to worst for our cold water experiment, the insulators were wool, cotton, control(air), aluminum foil, sand, and water.
For hot water, best to worst was cotton, wool, aluminum foil, control, sand, and water.

Conclusions/Discussion
The best two insulators were wool and cotton. The worst were sand and room temperature water. The opposite of our hypothesis was true: The more air-pockets there were, the better they insulated. We think that the temperature of the sample water heated or cooled the air in the insulation material, and the air retained that temperature longer than others because it was isolated from the outside air that would have changed the temperature.

Summary Statement
Our project is about which materials will keep the water bottle water temperature the closest to the beginning temperature.

Help Received
Father helped buy the materials.