

## Lab 10: Heat Transfer by Radiation

### Purpose

To compare the rate at which thermal radiation is absorbed by three cans with different color surfaces (black, white and silver).

### Introduction

Heat is transferred in three ways: **conduction**, **convection**, and **radiation**. When an aluminum can with water sits in a room, the water loses heat by conduction through the aluminum sides (by direct contact with cooler molecules), by convection as air molecules collide with the aluminum, and by radiation as electromagnetic waves are emitted from the can's surface.

You can also heat the can by **conduction**, **convection** or **radiation**. In this lab you will expose three cans to a heat lamp in order to heat them by **radiation**. You will compare the thermal absorption ability of three surfaces: silver, black and white. You will do this by filling cans with these surfaces with water, then exposing the cans to a heat lamp. You will measure the temperature of the water in each of the cans while they are being exposed to the heat and see if there's a difference in the rate at which the temperatures increase



### Procedure

1. Add 100 ml of water to each of the cans.
2. Place the cans in front of the heat lamp. Arrange them so that the heat lamp will shine equally on all three cans.
3. Measure the temperature of the water in the cans, they should all be at the same temperature initially.
4. Turn the lamp and start timing.

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5. Measure the temperature of the water in each can every two minutes for 20 minutes and record your measurement in the data table.

## Data Collection

Time (minutes)	Silver Can Temperatures (°C)	Black Can Temperatures (°C)	White Can Temperatures (°C)
0	25	25	25
2	28	31	26
4	29	34	28
6	29.5	37	29.5
8	30	41	31
10	31.5	46	33
12	34	49	34
14	34	53	35
16	37	57	37
18	37.5	64	38
20	38	64.5	39

## Analysis

1. Make a plot on <https://www.desmos.com/calculator> with your temperature vs. time data for each of the cans. When you are done click on share and save the link, you will need the share link to get credit for your lab.
2. Complete the Lab 10 quiz on Canvas.