

Introduction

This experiment tested the law of conservation of energy – specifically, as water is heated, its temperature will rise at a steady rate until it reaches the boiling point (212 F). Conservation of energy is a fundamental concept of physics and is necessary for foundational understanding and study in the field.

For this experiment, tap water was heated, and the temperature was recorded over time using two instruments: a thermocouple and a thermometer. Measurements were taken until the water reach a rolling boil; it took approximately 45 minutes for this to happen. The lab room was about 60 degrees.

Procedures

Materials: two 50 ml beakers, boiler plate, thermocouple, mercury thermometer, tap water

1. Fill each beaker with tap water to the top line.
2. Plug in boiler plate and allow to warm for 2 minutes.
3. Place thermocouple in beaker #1.
4. Place thermometer in beaker #2.
5. Measure temperature of each beaker and record.
6. Place beakers on boiler plate.
7. Measure and record temperatures at 2 minute intervals until water achieves a rolling boil.

Data

Time	Column1	Column2
(min:sec)	Thermocouple (°F)	Mercury Thermometer (°F)
0:00	71.9	75.2
2:00	84.4	77
4:00	94.2	81.2
6:00	109	88
8:00	114.9	92
10:00	123.8	95.4
12:00	133.9	101.9
14:00	146.6	110
16:00	156.6	115
18:00	165.2	119.3
20:00	172.1	124.1
22:45	184	128.3
24:00:00	191	132
26:00:00	198.2	171.7
28:00:00	205.6	204.3
31:00:00	212.1	211
35:00:00	212	210.6
40:00:00	212	210.3
45:00:00	212.4	210.9

Table 1: Temperature measurements of boiling water

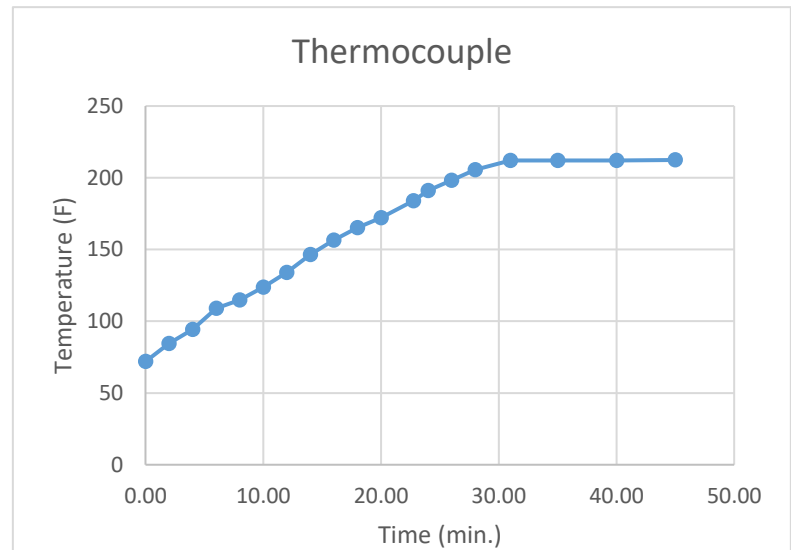


Figure 1: Temperature trend measured with Thermocouple

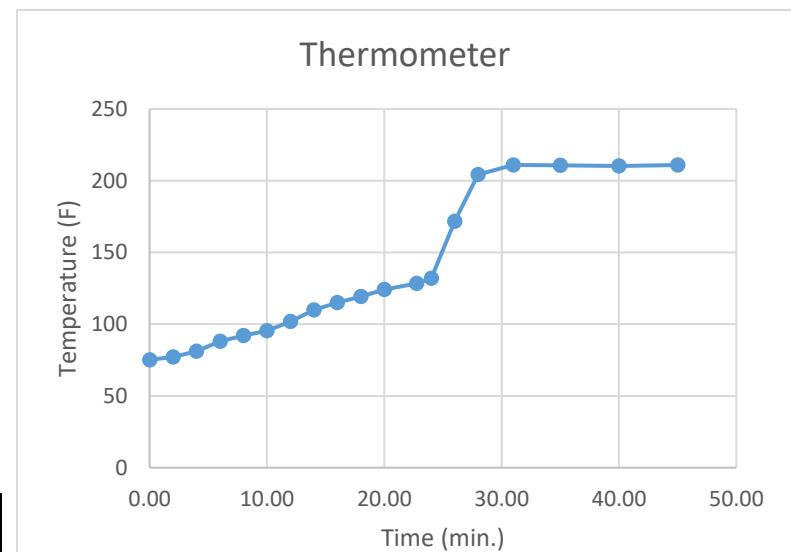


Figure 2: Temperature trend measured with Thermometer

Results and Analysis

The theory behind this lab is that as water is heated, its temperature will rise at a steady rate until it reaches the boiling point (212 F). The results of the lab indicate that the temperature reading of both the thermocouple and the mercury thermometer rose as the temperature of the water rose, which confirms the original theory. However, the real time temperature reading of the thermocouple (Figure 1) was higher, particularly at the midpoint of the lab. Looking at both Figures 1 and 2, the thermocouple readings tended to be more consistent and accurate to the trend line. The room temperature of 60 degrees may have had an impact on the measurement devices or on the time it took for the water to reach the boiling point.

Conclusion

The water did show a steady rise in temperature during this experiment, which supports the theory that it will rise at a steady rate to the boiling point. The thermocouple showed a more consistent trend line in temperature. The mercury thermometer did not show as consistent an increase in temperature of the water. The below-normal temperature of the room (60 degrees) may have adversely affected the capabilities of the mercury thermometer or had other impacts on the experiment that are unknown.