FASCINATING FLUORESCENCE

The Science Behind Colored Lightbulbs and Their Relation to Heat Transfer

M3-18 PHYSICS

QUESTION

How does the color of a lightbulb effect the amount of heat that it puts out?

ABSTRACT

The project in which I completed for science fair was "Fascinating Fluorescence", which tested the way in which different color filters and colored glass coatings around lightbulbs effect the amount of heat in which they put out. For this experiment, I used multiple different colors to see which one would put out the most heat, and I measured this by placing a thermometer just above the lightbulb. The purpose of this experiment was to potentially find a new color or style of lightbulb that could be used in certain cases to reduce or increase the amount of heat in a room or area. My hypothesis for this experiment was, "If red, yellow, green, blue, and purple lightbulbs are all placed on the same lamp and the heat that they give off is measured, then the purple lightbulb will give off the most heat out of all of the bulbs because darker colors normally tend to obtain more heat". After completing the entire experiment, I realized that the purple lightbulb had the hottest average heat (101.03 F, average). Using this knowledge, I can conclude that the darker the color of the lightbulb, the more heat is expelled.

HYPOTHESIS

If I use red, yellow (basic), blue, green, and purple lightbulbs and turn them all on with the same lamp, then the purple lightbulb will get the hottest because it has the darkest color filter, and darker colors don't allow as many light waves through them, therefore transforming into more heat energy.

MATERIALS

- 1 lamp
- 1 transparent red 100 watt 130 volt A19 Medium Screw Base lightbulb
- 1 transparent yellow 100 watt 130 volt A19 Medium Screw Base lightbulb
- 1 transparent blue 100 watt 130 volt A19 Medium Screw Base lightbulb
- 1 transparent green 100 watt 130 volt A19 Medium Screw Base lightbulb
- 1 transparent purple 100 watt 130 volt A19 Medium Screw Base lightbulb
- 1 thermometer
- Data notebook for tracking information

PROCEDURE

i. Take off the current lightbulb attached to the lamp and set it down. Make sure you do this gently so that it doesn't shatter.

ii. Take one of the color lightbulbs. Screw it onto the lamp.

iii. Turn the lamp on with the newly attached lightbulb. Make sure that the lightbulb is working.

iv. Wait 10 minutes.

v. Hold the thermometer, and while doing so, lightly rest it on the lightbulb until the thermometer gives off a reading.

vi. Track the reading of the thermometer, and input the data into your notebook.

vii. Turn off the lamp. Wait 5 minutes for it to cool down a bit so that the next trial is the exact same, and the constant variable stays the same.

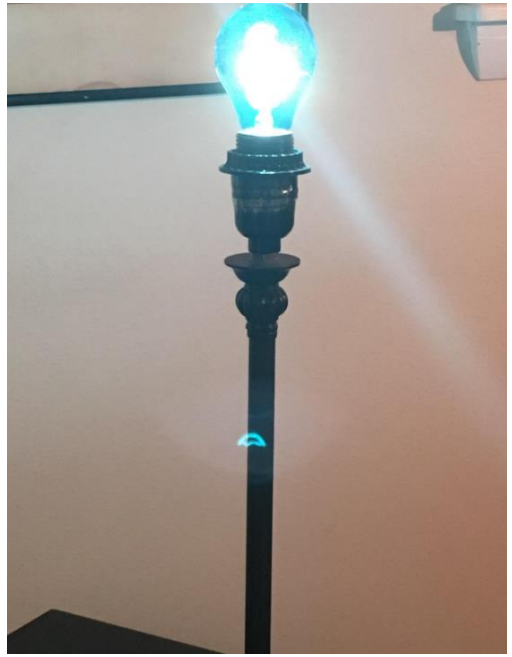
viii. Repeat the process for each color of lightbulb. This experiment should have 20 repeated trials.

EXPERIMENTAL PICTURES

The yellow bulb in action

The red bulb

The blue bulb with the lamp



All of the materials (the purple bulb was not in the photo)

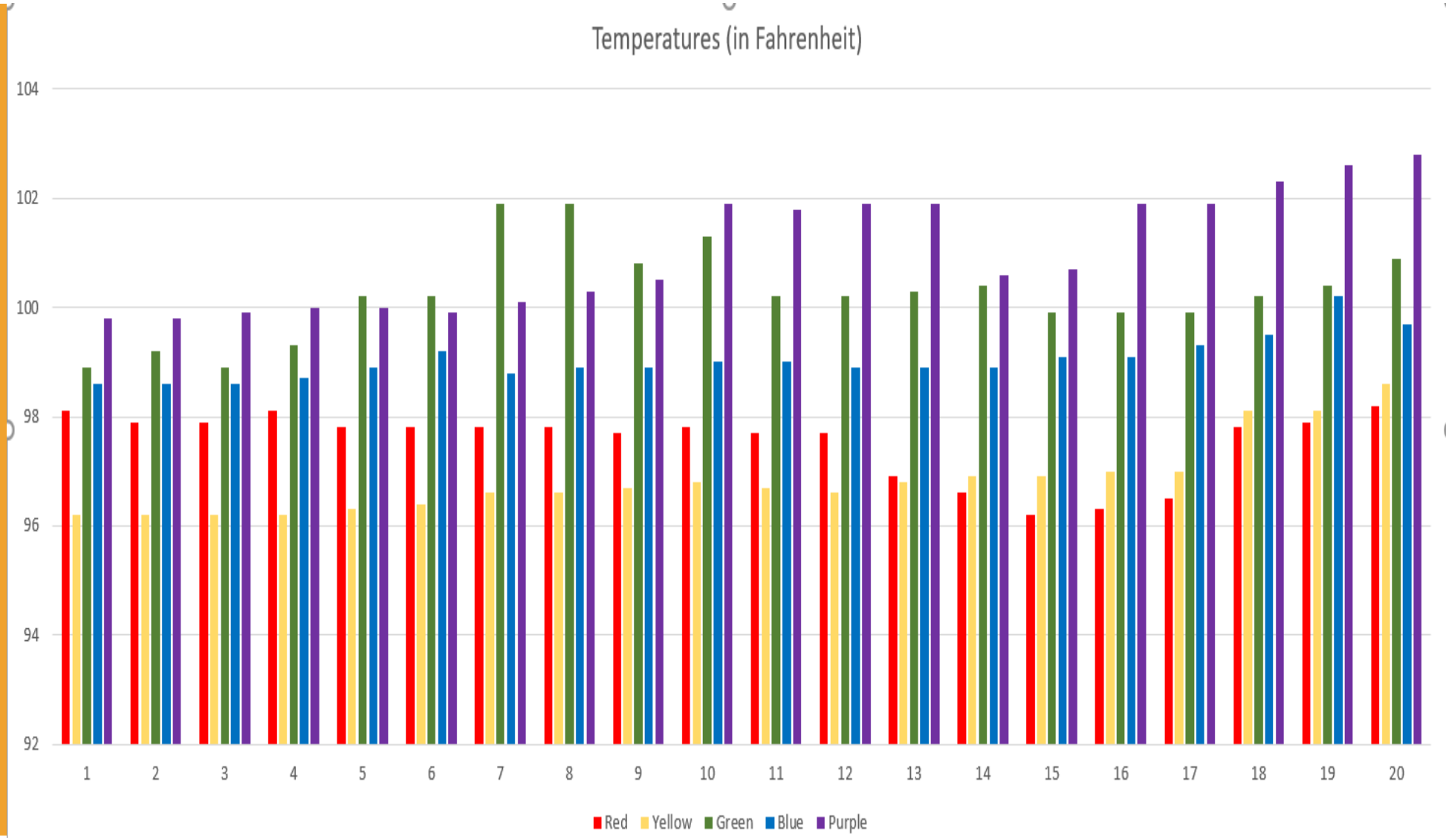
RESULTS

Trials	Red	Yellow	Green	Blue	Purple
1	98.1	96.2	98.9	98.6	99.8
2	97.9	96.2	99.2	98.6	99.8
3	97.9	96.2	98.9	98.6	99.9
4	98.1	96.2	99.3	98.7	100
5	97.8	96.3	100.2	98.9	100
6	97.8	96.4	100.2	99.2	99.9
7	97.8	96.6	101.9	98.8	100.1
8	97.8	96.6	101.9	98.9	100.3
9	97.7	96.7	100.8	98.9	100.5
10	97.8	96.8	101.3	99	101.9
11	97.7	96.7	100.2	99	101.8
12	97.7	96.6	100.2	98.9	101.9
13	96.9	96.8	100.3	98.9	101.9
14	96.6	96.9	100.4	98.9	100.6
15	96.2	96.9	99.9	99.1	100.7
16	96.3	97	99.9	99.1	101.9
17	96.5	97	99.9	99.3	101.9
18	97.8	98.1	100.2	99.5	102.3
19	97.9	98.1	100.4	100.2	102.6
20	98.2	98.6	100.9	99.7	102.8
Average	97.525	96.845	100.245	99.04	101.03

*Screenshot from Excel

Measurements are in Fahrenheit

RESULTS (GRAPH)



CONCLUSION

After completion of this experiment, it is possible to gather that the darker the color of the filter on the lightbulb, the more heat that it will output. This means that my hypothesis was in fact supported, since the purple lightbulb did put out the most heat. Since the order (from hottest to coolest) in average heat was purple, green, blue, red, then yellow, it is proven that the darkest color filters did have the hotter temperature. (The green bulb had a darker color than the blue, which was a very light cyan bulb). This happened because, as stated in my research, the darker the color of the glass that the light has to travel through, the more light waves that it absorbs, and more light converts into more heat energy.

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