**Differential Absorption of Energy by Radiation Experiment**

Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Block:\_\_\_\_\_\_\_\_\_ Partners:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Objective:** To carry out an experiment that tests how the absorption of energy via radiation varies throughout materials when either the texture, color, or medium itself is changed.

**Requirements of the experiment**:

-Data must be taken at intervals of one minute over a ten minute time span (up to 15 minutes if further data is needed)

-Equal volumes of each material must be sampled at the same time (you must measure this before you start)

-All samples must be exposed to direct angles of radiation and placed equal distances from the light source/spaced evenly below the light source to ensure equal distribution of heat.

-Thermometers must be placed within the materials or directly on them if they are unable to be submerged.

-Infrared thermometers for surface temperature are available for students testing materials in which a thermometer cannot be submerged

**Once you are at the selected experiment group, please complete the following prior to starting your experiment:**

1. What variable are you testing? (Color, texture or a difference in specific heat)
2. What specific materials are you using to conduct this experiment?
3. What is your projected outcome of the experiment? (This is your hypothesis- which material do you think will heat the fastest/slowest and why?)
4. Draw a diagram of your experiment set up below; this should depict how your materials are arranged while you and your group will be collecting data. Please label your materials.

Data tables: If you need to take additional data, please do so in the spaces below the data table for a max of 15 min.

Material 1:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Time (min) |  1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Temperature (Thermometer/ C or F) |  |  |  |  |  |  |  |  |  |  |
| OptionalTemperature(Infrared gun) |  |  |  |  |  |  |  |  |  |  |

Material 2:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Time (min) |  1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Temperature (Thermometer/ C or F) |  |  |  |  |  |  |  |  |  |  |
| OptionalTemperature(Infrared gun) |  |  |  |  |  |  |  |  |  |  |

Material 3:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Time (min) |  1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Temperature (Thermometer/ C or F) |  |  |  |  |  |  |  |  |  |  |
| OptionalTemperature(Infrared gun) |  |  |  |  |  |  |  |  |  |  |

After your experiment, put all of the materials back into their original containers (plastic bags) and wipe any surfaces if necessary. Your station must be set up **exactly** the way you found it. Get your teachers signature below for 10 points.

Teachers Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Conclusions:

1. Create a graph that displays time vs. temperature for every material you tested (maximum of 3). Only choose one of the temperatures you measured to plot (the thermometer OR infrared gun, which ever instrument proved more reliable). Choose an appropriate scale that will allow you to utilize most of the graph to display your data. Label each axis with the correct variable (time or temperature) and the units for each. Each material should have its own graph line plotted. When you are finished, connect your plots and create a key that depicts a different color for each material tested.

2.)In the space below, calculate the RATE OF CHANGE (pg 1 ESRT) for each of the materials you tested. Show all work.

Graph Key (color or symbol with material)

Material 1:

Material 2:

Material 3:

3.) According to your calculations above, were your original predictions correct? If not, explain where you could have made errors, either in understanding the materials you were testing or possible errors that could have occurred while your experiment was taking place.

**Final conclusion:** If you were building a vacation home for the summer, how would the selection of your materials for things like the siding and the roof differ from your selection if you were building a winter home? Make sure you include explanations for your answer. Be sure to include information on color, texture, and if applicable, actual material.