

Thermal Energy Lab (40 Points)

Introduction:

Thermal Energy is the heat energy. It is the energy that as a result of friction between vibrating molecules in a substance. As things get hotter they have more thermal energy. When they get less hot (colder) they have less thermal energy. There are three types of thermal energy, conduction, convection and radiation. In this lab you will determine with type of thermal energy is most efficient at doing work. The work you will be doing in this lab is popping popcorn! To determine this we must first define efficiency. For this application, efficiency will be defined as the making the most popcorn using the least amount of energy and time. Electronic devices use the unit Watts to quantify the amount of energy they use.

Pre-Lab Questions:

Define the following terms:

1. Conduction:
2. Convection:
3. Radiation:

Materials:

Each group will be testing one of the three ways thermal energy is transferred. We will then share our data, come up with some averages and draw conclusions about which type of thermal energy transfer is most efficient.

Microwave Station:

1. Microwave
2. 3.5oz. Bag of Microwave popcorn
3. Timer
4. Paper plate
5. Digital Scale
6. Cup

Hot Air Popper Station:

1. Hot air popper
2. Popcorn kernels
3. Cup
4. Digital Scale
5. Plastic bag
6. Timer
7. Paper plate

Stove Top Station:

1. Hot plate
2. 4.5 oz Jiffy pop stove top popcorn
3. Plastic knife
4. Timer
5. Paper plate
6. Cup
7. Digital scale

Procedure:***Microwave Station:***

1. Prepare the popcorn as directed on the bag.
2. While it is popping record the amount of energy the microwave uses in watts.
3. Record the time it took to pop the bag of popcorn.
4. Open the bag and collect the un-popped kernels. Determine the mass of the kernels in the American unit ounces. Record.
5. Subtract the final mass of the remaining kernels from the initial mass of the bag. This will give you the mass of the kernels that popped. Record.
6. Divide the mass of the popped kernels by the initial mass of the popcorn to get the percent of kernels that popped. Record.

Hot Air Popper Station:

1. Use the plastic cup and digital scale to measure 4 ounces of popcorn kernels.
2. Look on the hot air popper and find how much energy it uses in watts. Record.
3. Place the kernels in the hot air popper and turn it on. Catch the popped popcorn in the plastic bag.
4. Pop the kernels until you hear about 1 pop per 2 seconds. Record the amount of time it took to pop the 4 ounces of popcorn.
5. Gather the un-popped kernels and measure their mass in ounces. Record.
6. Subtract the mass of un-popped kernels from the initial mass of kernels. This is the mass of popped kernels. Record.
7. Divide the mass of the popped kernels by the initial mass of popcorn to get the percent of kernels that popped. Record.

Name: _____ Date: _____ Period: _____

Stove Top Station:

1. Look up the amount of energy (look on the bottom) that the hot plate uses. Record.
2. Turn the hotplate on medium/high and place the jiffy pop stove top pan on the hotplate and begin popping. Make sure you remove the cardboard packaging.
3. Record the amount of time it takes to pop the pan of popcorn. You can stop popping when you hear about 1 pop every 2 seconds.
4. Open the popcorn pan and collect the un-popped kernels. Determine the mass in ounces of the un-popped kernels and record.
5. Subtract the mass of the un-popped kernels from the initial mass of the popcorn. This is the mass of the popped kernels. Record.
6. Divide the mass of the popped kernels by the initial mass of the popcorn to get the percent of kernels popped. Record.

Data:

Microwave Station			Hot Air Popper Station			Stove Top Station		
Initial Mass of Kernels:	Mass of Un-popped Kernels:	Mass of Popped Kernels:	Initial Mass of Kernels:	Mass of Un-popped Kernels:	Mass of Popped Kernels:	Initial Mass of Kernels:	Mass of Un-popped Kernels:	Mass of Popped Kernels:
Wattage of Device:	Time:	Percent of Popped Kernels:	Wattage of Device:	Time:	Percent of Popped Kernels:	Wattage of Device:	Time:	Percent of Popped Kernels:

Post Lab Questions:

1. Use your data to identify the type of heat transfer modeled by each popping station

	Air Popper	Microwave	Stove top/pan
Type of heat transfer			
Evidence of heat transfer			
Diagram how heat moved			

Name: _____ Date: _____ Period: _____

2. Based on the evidence which mode of thermal energy was most efficient?