

Describing Heat and Temperature

Name: _____

Purpose: Describe the difference between heat and temperature.
Describe the relationship between thermal conductivity and thermal “feel” of an object.

Background Information:

The temperature of an object is the measure of an object’s average Kinetic Energy. When two objects of different temperatures come in contact with each other, some of that energy is transferred to the object with the lower temperature. The energy that is transferred is called “heat.”

Example: When making macaroni and cheese, you boil water. The burner is at a higher temperature than the water. As a result, heat flows from the burner to the water, allowing the noodles to cook.

Safety:

Be very careful with the thermometers, they break easily. You will be responsible for the replacement cost.

Procedure & Questions:

Get a thermometer from your instructor. Record the room temperature in °C.

Hold the thermometer in your hand and wrap your fingers around it. Record your body temperature in °C.

Room Temp: _____ °C

Body Temp: _____ °C

Pick 5 surfaces in the room that are exposed to the open air. Examples would be a wall, the door, or the whiteboard. Try to choose different materials for your samples. Place your hand on the object and predict its temperature. Record it in the chart below. After you have made your predictions, place the thermometer on the object (you may tape it on some surfaces). Record the actual temperature of the surface in the chart below.

Surface	How it feels (Hot, Cool, etc.)	Predicted Temperature	Actual Temperature

- Did all types of surfaces feel the same temperature?
 - Looking at your actual temperatures, were all of the surfaces around the same temperature?
 - Is your hand the same temperature as the objects (Body temperature)? What can you feel leaving your body that is trying to equalize the temperature?
 - Use the above answers, background information, and data table to explain why these surfaces feel different temperatures but are all about the same temperature?

2. The specific heat of an object is the amount of energy it takes to raise a 1 Kilogram (Kg) piece of the object 1°C. The higher the specific heat, the more energy it will need.

Substance	Specific Heat J/Kg°C	Category
Styrofoam	13000	
Copper	385	
Glass	840	
Air	1012	
Water	4184	
Methane Gas	2191	
Silver	233	
Silica (Sand)	703	
Iron	450	

- A. Use what you know about the substances to categorize them into groups. Label these under "Category." You can use states of matter, types of elements, etc. to guide your grouping.
- B. Analyze the Specific Heats of the objects you placed in each category. Are they similar in each group? Describe similarities of each category.
- C. When an object moves energy well it is called a c _____. (Think about a material that moves electric charges well).
- D. An object that does not move energy well is called an i _____. (You put this on the outside of the house to keep heat in or out.)
- E. What is the relationship between conductivity, insulation and specific heat?
- F. If a glass of water and a piece of metal of equal mass are placed in the sun, which will heat up faster? In other words, do all objects heat up/cool down at the same rate? Why or why not?
- G. How much energy was required per kilogram to raise water 1°C? How much would have been used to raise the same amount of iron 1°C?

FINAL QUESTION: Do not write an answer until the instructor tells you to.

A 50g piece of iron, with a temperature 90°C, is placed into 50g of water at 20°C. Do you think the final temperature of the system will be more, less or equal to 55°C (halfway point between the two objects)? Why? When does the reaction stop, when the energy of the two objects is equal or when the temperature is equal?