

Thermal Contact 2:
[a little bit more difficult problems on the same concept]

Three Objects

Get a piece of plastic, a piece of paper, and a piece of metal. Touch them all.

Which is the coldest?

If you said the piece of metal....you're wrong!

Unless one has recently been heated or cooled, they all have the same temperature! As stated above, (almost) all objects in the same room are in *thermal equilibrium*!

Metal feels cooler because it is a better conductor of heat than other substances. It takes heat away from your hand more effectively, and thus feels cooler. But is it not actually colder!

1. You're at a football game in November! You sit down on the metal bleachers and....they are freezing!

- a) Are the bleachers colder than the air around them?
- b) Why do the bleachers feel colder?

2. Months go by, now you are rooting for the lacrosse team in June. On an extremely hot day, you down on the same metal bleachers and...they are so hot!

- a) Are the bleachers warmer than the air around them?
- b) Why do the bleachers feel warmer?

More facts on thermal equilibrium:

Look around the room you are in. Right now, just about everything in the room is in **thermal equilibrium**! Any objects that have been round each other for a long time are in thermal equilibrium.

The only exception is something that is continuously being heated or cooled. This includes:

- yourself, because your body burns energy to maintain a temperature of 37 degrees Celsius (98 degrees Fahrenheit)
- A computer, or any electrical device that generates heat (although they generate less because people have been generating more efficient appliances)
- Something near a window, if the temperature outside is warmer or sunlight is coming in
- Water in an open container: water is usually cooler than the environment around it due to a process called *evaporation*. However, for evaporation to happen, water must be in an open container.

Imagine you are in a typical high school classroom, and the temperature of this classroom is about 23 degrees Celsius. Look around at everything in the room! Everything with a temperature of 23 degrees Celsius is in thermal equilibrium, and *almost* everything is in thermal equilibrium. But, some things are not. For each item on this list, state if it is in thermal equilibrium or not. If it is not, state if it is warmer or colder than the rest of the room and briefly explain why.

- 3 The books on the shelf
- 4 The blackboard
- 5 Your friend

- 6 A bottle of water in a closed bottle
- 7 A bottle of water in a
- 8 A book that has been sitting right near the window...and assume it is January!
- 9 Your chair
- 10 A cold-feeling piece of metal
- 11 A dog! (why is there a dog, I don't know?)
- 12 Your pencil
- 13 Your pencil, after you've been holding it a long time.

Extra Practice

Somebody throws a very hot rock into a bowl of cold water.

14a How does heat move?

- A. From the rock to the water
- B. From the water to the rock
- C. Heat does not move

14b. What happens to the temperature of the rock?

14c. What happens to the temperature of the water?

14d. When does heat stop moving?

coming soon:
estimating final temperature