Heat transfer lab

Lab: Heat transfer

Heat energy moves from hot to cold in three modes:

- Radiation: infrared light rays that can be reflected
- Conduction: contact transfer, can be blocked by insulators
- Convection: matter in motion, less dense matter rises

You will be using a very delicate (and expensive) infrared camera for this lab

1. focus the camera using the outer ring
2. don't touch the lens
3. do not drop or abuse it
4. do not press the yellow trigger while aiming at people

You will be creating a perfect heat container, using materials in the elab.
Keep in mind the three heat energy modes in your creation.
We will start by observing the heat decay of two containers, to see which one loses heat faster, and how
You will then create a much better heat container using foil, paper towels and whatever you can think of...

Procedure:

1. choose two containers you think might have different heat holding properties
2. put temp sensors in each, start the measurement on logger pro (green arrow)
3. fill both containers with hot water, measure with temp sensors as they cool down for a few minutes
4. watch the "heat decay curve" on the computer, look for the best and worst heat container
5. take a photo of the decay curve for your report
6. make some guesses about which modes are in action: radiation, conduction, and convection
7. look at each with the IR camera, note how heat energy is escaping to the cooler room
8. go nuts, creating what you think is a much better heat container
9. repeat the test, and record the new graph (photo is fine)

Questions:

1. what modes were prevalent in each case?
2. how did your creation improve on these?
3. how could you tell?
4. people in cold climates claim that wearing a hat keeps them warmer-why?
5. you might feel cooler if a fan is blowing on you-why?
6. how are the three modes blocked by a white, covered, paper coffee cup?
7. why do people blow on soup or hot drinks to cool them down?
8. why do emergency folks cover accident victims with a foil blanket?
9. if you want to pick up something hot, what sort of materials would you wrap your hands with?
10. track the flow of energy from the sun to rain over the equator, including each applicable process
11. climate change is impacted by the albedo of the planet. which mode of energy transfer is this?
12. climate change is also impacted by the thickness of the CO2 layer in our atmosphere, which mode is this?
13. as the planet warms, which mode(s) do you think will change the most?
14. Hadley cells are an example of what mode?
15. if air is a better insulator than any fabric, why would a sweater with gaps or holes be warmer?
16. why do some folks wear foil hats? (any answer is ok here)

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