

Physics

Temperature & Heat Homework

1. Bring your Physics Binder, paper, and pencil to class on Thursday (and every day afterward).
2. What are Mr. Schneider's phone number and email address?
3. Describe in detail how you would go about finding the class web site from your home computer.
4. Name a potential consequence for a group if one member forgets to bring their Physics Binder to class.
5. What is the definition of the word **plagiarism**?
6. Name three different techniques for figuring out what has been assigned on a day that you're absent.
7. Which part of the Learning Algorithm should you be taking care of while the homework group is writing the answers up on the board and student homework is being spot-checked?
8. Compute your final semester grade assuming that you turn in a **perfect** Engineering Project on Tuesday, January 17th (after being out sick on the 13th) and average 97.5% in all other Assignment Categories.
9. Which has more internal KE, an iceberg or a hot cup of coffee? Explain why.
10. Explain what physicists mean when they use the word "temperature".
11. Explain the difference at the molecular level between a cold gas and a hot gas. Do the same for a cold solid and a hot solid.
12. Why can't you estimate your own temperature by holding your hand up to your forehead?
13. At what Celsius temperatures does water freeze and boil at? At what Fahrenheit temperatures does water freeze and boil at? At what Kelvin temperatures does water freeze and boil at?
14. Which represents a larger change in temperature, an increase of 5°C or an increase of 5°F? Justify your answer.
15. Convert 45°C to Fahrenheit, then convert your answer back to Celsius to check it. What temperature is this in Kelvin? Give an example of something that might have this temperature.
16. Explain why a large glass thermometer wouldn't accurately measure the temperature of 10ml of water in a test tube.
17. Which requires more energy, raising the temperature of a swimming pool by 1°C or raising the temperature of 1 liter of water from 0°C to 100°C?
18. Suppose a fast-moving marble crashes into a random scatter of slow-moving marbles. Is the fast-moving marble more likely to speed up or slow down? Does the fast-moving marble gain or lose kinetic energy? How about the slow-moving marbles it runs into? Explain what this has to do with the direction of heat flow.
19. How many Calories are there in 254,300 calories? How many kilocalories are there in the same amount of energy? How many Joules? How would this be reported on a food box?
20. Suppose that a 2 kg rock is thrown at a speed of 10 meters/second. How many Joules of KE does it now possess?

21. Calculate the amount of energy required to raise 3 liters of water from 50°C to 70°C.
22. Which has a greater specific heat capacity, sand or water?
23. Complete the **Calorimetry** practice sheet.
24. Explain why the Concorde supersonic airplane is 20cm longer when in flight.
25. How would a thermometer be different if glass expanded more with increasing temperature than mercury does?
26. Suppose that a spoon has an α of $0.000009 \frac{1}{^\circ\text{C}}$ and that when it's 21°C, it is 20.00 cm long. How long would it be after removing the spoon from the dishwasher at 48°C?
27. Complete the **Expansion** practice sheet.
28. In desert regions that are very hot in the daytime and very cold in the nighttime, the walls of houses are often made of mud. Why is it important that these mud walls be thick?
29. Which would keep a hot cup of coffee warmer, placing it inside an empty plastic picnic cooler or leaving it on the picnic table? Explain why.
30. Carefully explain why double-paned windows insulate your house better than single-paned ones. What would be the best possible thing to have between the panes if you wanted to maximize the insulation?
31. You can hold your fingers fairly close to the side of a candle flame without harming them, but placing them the same distance above the flame will result in a serious burn. Explain why.
32. Which direction does the wind blow near the shore of a lake during the daytime? What does this say about the specific heat of water compared to that of the land?
33. Will convection work in a solid? How about a liquid? How about a gas? What is the key difference between when convection works and when it's impossible?
34. How are light waves and heat waves similar? What is the essential difference between them?
35. Suppose that **coffee mug A** absorbs all of the visible and heat radiation that hits it, and **coffee mug B** reflects all of the visible and heat radiation that hits it. What color will each coffee mug appear? Which mug will warm up quicker when placed in the sun? Which mug will keep coffee hot longer on a cold night?
36. Since a hot cup of tea loses heat more rapidly than a lukewarm cup of tea, would it be correct to say that the hot cup of tea will reach room temperature first? Explain why or why not.
37. Suppose that it takes 2 minutes for a cup of tea to cool from 100°C to 90°C in a room where the temperature is 25°C. About how long will it take for a cup of tea to cool from 100°C to 90°C if it's placed inside a 75°C oven instead?