**Heat Problems**

specific heat of water = 4.18 x 103 Jkg-1K-1  latent heat of vaporization water = 2.26 x 106 Jkg-1

specific heat of ice = 2.10 x 103 Jkg-1K-1 latent heat of fusion water = 3.34 x 105 Jkg-1

specific heat of steam = 2.00 x 103 Jkg-1K-1 specific heat of copper = 3.85 x 102 Jkg-1K-1

specific heat of steel = 4.50 x 102 Jkg-1K-1 specific heat of aluminium = 8.80 x 102 J kg-1 K-1

*NOTE: Value for Aluminium is 9.00 x 102 J kg-1 K-1 in Exploring Physics.*

1. 0.1 kg of an unknown metal is found to require 3.5 kJ to change its temperature from 250C to 820C. What is the specific heat of the metal?
2. The specific heat of copper is 3.85 x 102 J kg-1 K-1. A specific mass of copper has 1.74 x 104 J of energy added to it to change its temperature from 200C to 800C. What was the mass of copper?
3. If 15.7 kJ of heat energy is added to 250 mL of water at 200C, what will the new temperature be?
4. Over a period of 6 hours, a hot water bottle cools from 950C to 200C. If the hot water bottle held 2.5 L water, what is the rate of cooling in Js-1?
5. A kettle rated at 2000 W contains 1.8 L water at 150C. If it runs for 3.5 minutes, will the water boil?
6. How much heat energy is released when 423 g of steam at 1000C condenses to water also at 1000C?
7. 4.87 x 105 J of heat are added to a mass of ice at 00C. If the ice melts and becomes water at 21.50C, what was the mass of ice?
8. At what rate in Js-1 is a refrigerator absorbing heat if 2.15 kg of water at 21.50C is just frozen in 2.0 hours?
9. 20 g of milk at 5.00C is added to 250 g of coffee at 900C. What is the final temperature of the drink? (Specific heats: milk: 3.9 x 103 Jkg-1K-1, coffee 4.10 x 103 Jkg-1K-1.)
10. 100 g of a metal at 950C is added to 500 mL of water at 2.00C. If the final temperature of the water is 3.60C, what is the specific heat of the metal?
11. How much heat energy is needed to change 1.0 kg of ice at –3.00C to steam at 1070C?
12. How much ice at 00C must be added to 250 mL of coffee (specific heat: 4.10 x 103 Jkg-1K-1) in an insulated cup (assume no loss of heat to the container and surroundings) to cool the coffee from 950C to 650C?
13. Copper calorimeters are used to determine the specific heat of unknown substances. A calorimeter of mass 41 g, has 100 mL of water at 150C placed in it. 50 g of iron is heated to 1600C then carefully lowered into the water. What would be the final temperature of the water? (specific heat of copper is 385 Jkg-1K-1 , iron is 477 Jkg-1K-1)
14. 5.0 g of ice at –2.00C is placed into a 78 g copper calorimeter containing 120 mL of water at 900C. The water is stirred until all the ice has dissolved. What is the final temperature of the water?
15. (Do the following on file paper.) A 5.45 kg steel container contains 12.0 kg of water at 22.00C. When 2.65 kg of molten alloy (latent heat of fusion 2.50 x 104 J kg-1 K-1) at its melting point of 3270C is poured into the water the final temperature reached is 27.80C. Find the specific heat of the alloy.
16. How much ice at -4.000C must be added to an aluminium calorimeter of mass 47.0 g containing 150 g of water at 95.0 0C so that the final temperature once the ice has fully melted is 70 0C?