**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?

**Q = mcΔT**

**3500 = 0.1 x c x 57**

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**c = 6.1 x 102 J kg-1 K-1**

1. 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?

**Q = mcΔT**

**1.74 x 104 = m x 385 x 60**

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**m = 0.75 kg**

1. If 15.7 kJ of heat energy is added to 250 mL of water at 200C, what will the new temperature be?

**Q = mcΔT**

**15.7 x 103 = 0.25 x 4180 x (Tf – 20)**

**Tf – 20 = **

**Tf – 20 = 15.024**

**Tf = 350 C**

1. 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?

**Q = 2.5 x 4180 x 75**

**= 783750 J**

**Energy per second = **

**= 36 Js-1**

1. A kettle rated at 2000 W contains 1.8 L water at 150C. If it runs for 3.5 minutes, will the water boil?

 Q = mcΔT

Q = P x t 420000 = 1.8 x 4180 x (Tf – 15)

= 2000 x 3.5 x 60 Tf – 15 = 

= 420000 L Tf – 15 = 55.82

Tf = 55.82 + 15

Tf = 710C

So water will not boil.

1. How much heat energy is released when 423 g of steam at 1000C condenses to water also at 1000C?

**Q = mL**

**= 0.423 x 2.26 x 106**

**Q = 9.6 x 105 J**

1. 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?

**Q = melt ice + heat water**

**Q = mLf + mcΔT**

**4.87 x 105 = (m x 3.34 x 105) + (m x 4180 x 21.5)**

**4.87 x 105 = 3.34 x 105m + 89870m**

**4.87 x 105 = 423870 m**

**m = 1.15 kg ice**





