**Specific Heat Capacity – Method of Mixtures**

**Q = m c ΔT**

1. The hot water tap of a bath delivers water at 80 °C. Ten litres of hot water are added to a bath containing 30 litres of water at 20 °C. Ignoring the energy losses to the surrounding environment, what will be the final temperature of the water bath? The specific heat capacity of water is 4.18 × 103 J kg-1 K-1, and its density is 1.00 kg L-1.
2. A mass of 2.80 x 102 g of a particular metal is at 1.00 x 102 °C. It is dropped into a 1.00 x 102 g container which is made from a material with a specific heat capacity of 4.00 x 102 J kg-1 K-1. The container holds 2.00 x 102 g of water which is used to cool down the metal. Both the container and the water are originally at 5.00 °C. The final temperature of the mixture is 15.0 °C. Assuming that there are no appreciable losses to the surrounding environment, find the specific heat capacity of the cast metal.
3. In a simple experiment, a student places 1.00 x 102 mL of water at 90.0 °C into an insulated cup containing 45.0 mL of water at 15.0 °C. Assuming no loss of energy to the surroundings, what is the final temperature of the water?
4. In a school laboratory, a student heats 500 mL of alcohol which was initially at 15.0 °C for 2 minutes. The Bunsen burner supplies 700 J/s of heat energy to the alcohol, which has a boiling point of 64.7 °C. Assuming all the energy goes into the alcohol, will the alcohol reach its boiling point? You must show working to justify your answer. (c for alcohol = 2430 J kg-1 K-1; density of alcohol = 0.789 kg/L)
5. A 2.00 x 103 watt kettle holds 3.00 kg of water at 20.0 °C. It is turned on for 5.00 minutes. If all the energy supplied is used to heat the water, will it reach its boiling point? Justify your answer.
6. 3.50 kg of cold water at 10.0 °C is added to 2.35 kg of hot water. The final temperature of the warm mixture is 32.0 °C. What was the original temperature of the hot water?
7. To find the specific heat of a new composite material, a 0.150 kg sample is heated to 540 °C and then quickly placed in 4.00 kg of water at 10.0 °C, which is contained in an insulated 2.00 kg aluminium calorimeter. The final temperature of the water is measured and found to be 82.4 °C. Using the information given, find the specific heat of the new alloy. Assume no heat lost to the surroundings. (c for aluminium = 900 J kg-1 K-1)