Heat and Calorimetry worksheet

Specific Heat Capacity $c_{H_2O} = 4.18$ J/g °C

1. How many joules are needed to warm 25.5 grams of water from 14°C to 22.5°C? (ans. 9.1 x 10^2 J)

   $q = m_{H_2O} c_{H_2O} \Delta T = 25.5\ g \times 4.18\ J/g\ °C \times (22.5 - 14)°C$

   $= 906\ J = 910\ J = 9.1 \times 10^2\ J$

2. Calculate the number of joules released when 75.0 grams of water are cooled from 100.0°C to 27.5°C. (ans. 2.27 x 10^4 J)

   $q = m_{H_2O} c_{H_2O} \Delta T = 75.0\ g \times 4.18\ J/g\ °C \times (100.0 - 27.5)°C$

   $= 22700\ J = 2.27 \times 10^4\ J$

3. If 1.13 x 10^4 J of heat is added to a water sample and the temperature rises from 88.0°C to its boiling point, what mass of water is in the sample? (ans. 225 g)

   $q = m_{H_2O} c_{H_2O} \Delta T$

   $1.13 \times 10^4\ J = m_{H_2O} \times 4.18\ J/g\ °C \times (100.0 - 88.0)°C$

   $m_{H_2O} = \dfrac{1.13 \times 10^4\ J}{50.16\ J/g} = 225\ g$

4. The specific heat capacity of gold is 0.128 J/g °C. How much heat would be needed to warm 250.0 grams of gold from 25.0°C to 100.0°C? (ans. 2.40 x 10^3 J)

   $q = m_{Au} c_{Au} \Delta T = 250.0\ g \times 0.128\ J/g\ °C \times (100.0 - 25.0)°C$

   $= 2400\ J = 2.40 \times 10^3\ J$

5. The specific heat capacity of zinc is 0.390 J/g °C. How many joules would be released when 454 grams of zinc at 98.0°C were cooled to 26.0°C? (ans. 1.28 x 10^4 J)

   $q = m_{Zn} c_{Zn} \Delta T = 454\ g \times 0.390\ J/g\ °C \times (98.0 - 26.0)°C$

   $= 12800\ J = 1.28 \times 10^4\ J$

6. How much heat is absorbed by 2.50 x 10^2 g of water and the 450. g Al can (c_{Al} is 0.900 J/g °C) when they are heated from 10.0°C to 85.0°C? (ans. 1.09 x 10^5 J)

   $q = m_{H_2O} c_{H_2O} \Delta T + m_{Al} c_{Al} \Delta T$

   $= (m_{H_2O} c_{H_2O} + m_{Al} c_{Al}) \Delta T$

   $= (250\ g \times 4.18\ J/g\ °C + 450\ g \times 0.900\ J/g\ °C) \times (85.0 - 10.0)°C$

   $= 109\ 000\ J = 1.09 \times 10^5\ J$

7. What is the temperature change if 1.566 x 10^3 J is absorbed by 60.0 g of copper which has a specific heat capacity of 0.385 J/g °C? (ans. 67.8°C)

   $q = m_{Cu} c_{Cu} \Delta T$

   $1.566 \times 10^3\ J = 60.0\ g \times 0.385\ J/g\ °C \times \Delta T$

   $\Delta T = \dfrac{1.566 \times 10^3\ J}{23.1\ J/°C} = 67.8\ °C$