Answer on Question #63850 - Chemistry – General Chemistry

An unknown metal whose mass is 52.0 g is initially at 80.0°C. The metal is then submerged in 100.0 g of water initially at 22.0°C. At equilibrium, the temperature of both the metal and water is 24.6°C. Determine the heat flow for the water, q_{wat}. Give your answer in units of kJ to two significant figures.

Solution.

$q_{metal} = -q_{water}$

$m_{metal} \times c_{metal} \times (T_{f, metal} - T_{i, metal}) = -m_{water} \times c_{water} \times (T_{f, water} - T_{i, water})$

$52.0 \text{ g} \times c_{metal} \times (24.6 - 80.0 \text{ °C}) = -100 \text{ g} \times 4.2 \text{ J/g·°C} \times (24.6 - 22.0 \text{ °C})$

$c_{metal} \times (-55.4) = -1092$

$c_{metal} = 19.7 \text{ J/g·°C}$

$q_{wat} = 1092 \text{ J} = 1.09 \text{ kJ}$

Answer: $q_{wat} = 1.09 \text{ kJ}$