Answer on Question #76893 – Chemistry – General Chemistry

In an experiment, 22.5 g of metal was heated to 98.0°C and then quickly transferred to 150.0 g of water in a calorimeter. The initial temperature of the water was 26.0°C, and the final temperature after the addition of the metal was 32.5°C. Assume the calorimeter behaves ideally and does not absorb or release heat.
What is the value of the specific heat capacity (in J/g·°C) of the metal?

Solution:

$q_{\text{released by metal}} = q_{\text{absorbed by water}}$

$-(mC_p\Delta T)_{\text{metal}} = (mC_p\Delta T)_{\text{water}}$

$-(26\ \text{g})C_p(32.5°\text{C} - 98.0°\text{C}) = (150\ \text{g})(4.18\ \text{J/g}\cdot°\text{C})(32.5°\text{C} - 26.0°\text{C})$

$C_p(\text{metal}) = 2.39\ \text{J/g}\cdot°\text{C}$