

27. (a) The specific heat is given by  $c = Q/m(T_f - T_i)$ , where  $Q$  is the heat added,  $m$  is the mass of the sample,  $T_i$  is the initial temperature, and  $T_f$  is the final temperature. Thus, recalling that a change in Celsius degrees is equal to the corresponding change on the Kelvin scale,

$$c = \frac{314 \text{ J}}{(30.0 \times 10^{-3} \text{ kg})(45.0^\circ\text{C} - 25.0^\circ\text{C})} = 523 \text{ J/kg}\cdot\text{K} .$$

- (b) The molar specific heat is given by

$$c_m = \frac{Q}{N(T_f - T_i)} = \frac{314 \text{ J}}{(0.600 \text{ mol})(45.0^\circ\text{C} - 25.0^\circ\text{C})} = 26.2 \text{ J/mol}\cdot\text{K} .$$

- (c) If  $N$  is the number of moles of the substance and  $M$  is the mass per mole, then  $m = NM$ , so

$$N = \frac{m}{M} = \frac{30.0 \times 10^{-3} \text{ kg}}{50 \times 10^{-3} \text{ kg/mol}} = 0.600 \text{ mol} .$$