

Pledge and signature:

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- (2) Combustion of 1.00 g of substance A raises the temperature of 1.000 kg of water by 2.00 K. Therefore combustion of 2.00 g of A will raise the temperature of 2.000 kg of water by
a. 0.50 K b. 1.00 K c. 2.00 K d. 4.00 K e. none of these
- (2) Combustion of 1.00 g of substance A raises the temperature of 1.000 kg of water by 2.00 K. Suppose the water is replaced by 1.000 kg of a liquid having exactly half the specific heat capacity of water and the experiment is repeated (again, combustion of 1.00 g of A). The observed T will be
a. 0.50 K b. 1.00 K c. 2.00 K d. 4.00 K e. none of these
- (2) Substance A has specific heat of combustion $q_{\text{spec,A}}$, while substance B has specific heat of combustion $q_{\text{spec,B}}$ that is exactly half the value for A. Thus, compared with the amount of heat produced by combusting 1.00 mol of A, the amount produced by combusting 2.00 mol of B will be
a. less b. the same c. more d. This cannot be determined w/o additional information.
- (4) Calculate the value of $H^\circ - E^\circ$ at 25°C for the combustion of 1.00 mol of cyclohexane (C_6H_{12}) to produce $\text{CO}_2(\text{g})$ and $\text{H}_2\text{O}(\ell)$. ($R = 8.3145 \text{ J mol}^{-1} \text{ K}^{-1}$.)

$$-7.437 \text{ kJ/mol}$$

- (4) In a calorimetry experiment at $\sim 25^\circ\text{C}$, 0.967 g of benzoic acid yields a T rise of 1.735 K. Then a second experiment run the same way, except using 1.237 g of an unknown, produces a T rise of 1.211 K. Calculate the specific heat of combustion for the unknown, given that the value for benzoic acid is -26.413 kJ/g .

$$q = m q_{\text{spec}} = C_K \cdot T \qquad q_{\text{spec,unk}} = q_{\text{spec,BA}} (m_{\text{BA}}/m_{\text{unk}}) (T_{\text{unk}}/T_{\text{BA}})$$
$$= -14.41 \text{ kJ/g}$$

- (2) In the determination just above, suppose the masses are both uncertain by 0.005 g and the T s by 0.008 K. Calculate the uncertainty in q_{spec} for the unknown. (Hint: First write your computations in (5) as a single expression, if you have not already done so.)

$$s_{q_{\text{spec}}}/q_{\text{spec}} = [(s_{m_1}/m_1)^2 + (s_{m_2}/m_2)^2 + (s_{T_1}/T_1)^2 + (s_{T_2}/T_2)^2]^{1/2} = 0.0104$$

$$s_{q_{\text{spec}}} = 0.15 \text{ kJ/mol}$$