

1. What is the specific heat of ethyl alcohol if 700.0 J of heat are required to raise the temperature of an 80.0-g sample from 30.0°C to 45.0°C?

$$\frac{700.0 \text{ J}}{80.0 \text{ g} \cdot 15.0^\circ\text{C}} = 0.583 \frac{\text{J}}{\text{g}^\circ\text{C}}$$

2. A 150.0 g sample of metal at 80.0°C is added to 150.0 g of H<sub>2</sub>O at 20.0°C. The temperature rises to 23.3°C. Assuming that the calorimeter is a perfect insulator, what is the specific heat of the metal? (Specific heat of H<sub>2</sub>O is 4.18 J/g°C.)

Heat gained H<sub>2</sub>O = Heat lost Metal

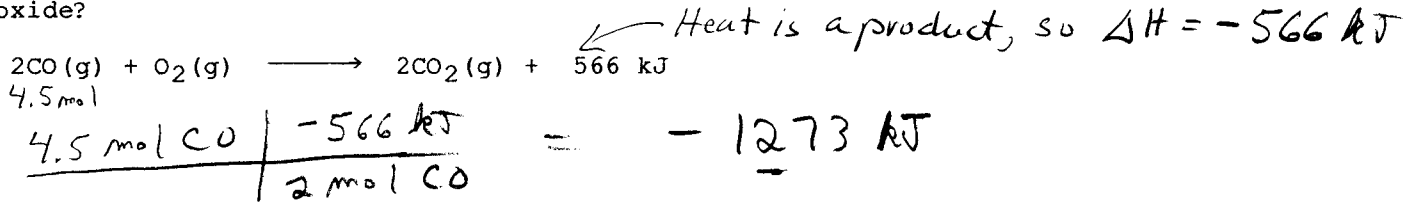
For H<sub>2</sub>O:  $\frac{4.18 \text{ J}}{\text{g}^\circ\text{C}} \cdot 150.0 \text{ g} \cdot 3.3^\circ\text{C} = 2069.1 \text{ J (gained)}$

For Metal Sp. Ht.  $\frac{2069.1 \text{ J}}{150.0 \text{ g} \cdot 56.7^\circ\text{C}} = 0.243 \frac{\text{J}}{\text{g}^\circ\text{C}}$

3. How much heat is lost when 35.5 g of iron cools from 429°C to 18.6°C? (The specific heat of iron is 0.450 J/(g · °C).)

$$\frac{0.450 \text{ J}}{\text{g}^\circ\text{C}} \cdot 35.5 \text{ g} \cdot (429 - 18.6)^\circ\text{C} = 6556 \text{ J}$$

4. What is the change in enthalpy when 4.5 moles of carbon monoxide are oxidized to carbon dioxide?



5. Calculate the enthalpy change, ΔH°, for the combustion of C<sub>3</sub>H<sub>6</sub>(g):



ΔH°<sub>f</sub> values in kJ/mol are as follows: C<sub>3</sub>H<sub>6</sub>(g) = 21; CO<sub>2</sub>(g) = -394; H<sub>2</sub>O(l) = -286.

$$\Delta H = \sum \Delta H_{\text{prod}} - \sum \Delta H_{\text{react}} = [3(-394) + 3(-286)] - [1(21) + \frac{9}{2}(0)] = -2061 \text{ kJ}$$

-2040      -21

6. Using the following data, calculate the heat of reaction for the coal gasification process  
 2C(s) + 2H<sub>2</sub>O(g) → CH<sub>4</sub>(g) + CO<sub>2</sub>(g).

- 1 C(s) + H<sub>2</sub>O(g) → CO(g) + H<sub>2</sub>(g) ΔH° = +131.3 kJ
- 2 CO(g) + H<sub>2</sub>O(g) → CO<sub>2</sub>(g) + H<sub>2</sub>(g) ΔH° = -41.2 kJ
- 3 CO(g) + 3H<sub>2</sub>(g) → CH<sub>4</sub>(g) + H<sub>2</sub>O(g) ΔH° = -206.1 kJ

