

Thermochemistry Practice 2 Answers

$$1) \left(\frac{3150 \text{ J}}{^{\circ}\text{C}} \right) (34.3 \text{ }^{\circ}\text{C} - 23.0 \text{ }^{\circ}\text{C}) = 3.56 \times 10^4 \text{ J}$$

$$2) \begin{array}{l} \text{heat reaction} + \text{heat calorimeter} = 0 \\ (H_{\text{rxn}})(\text{moles reaction}) + (C_{\text{cal}})(\Delta T) = 0 \qquad C_{\text{cal}} = 643 \text{ J/}^{\circ}\text{C} \\ (105 \text{ kJ/mol})(25.0 \times 10^{-3} \text{ moles}) + (C_{\text{cal}})(-4.08 \text{ }^{\circ}\text{C}) = 0 \end{array}$$

$$3) \begin{array}{l} \text{heat reaction} + \text{heat calorimeter} = 0 \\ (H_{\text{rxn}})(\text{moles reaction}) + (C_{\text{cal}})(\Delta T) = 0 \qquad H_{\text{rxn}} = -3000 \text{ kJ/mol} \\ (H_{\text{rxn}})(1.05 \times 10^{-3} \text{ moles}) + (618 \text{ J/}^{\circ}\text{C})(27.3 \text{ }^{\circ}\text{C} - 22.2 \text{ }^{\circ}\text{C}) = 0 \end{array}$$

$$4) \left(\frac{43.5 \text{ kJ}}{\text{mole eth}} \right) \left(\frac{20.0 \text{ g eth}}{46.0 \text{ g eth}} \right) = 18.9 \text{ kJ}$$

$$5) \left(\frac{-6.01 \text{ kJ}}{\text{mole water}} \right) \left(\frac{1 \text{ tray}}{1 \text{ tray}} \right) \left(\frac{12 \text{ cubes}}{1 \text{ tray}} \right) \left(\frac{60.0 \text{ g water}}{\text{cube}} \right) \left(\frac{\text{mole water}}{18.0 \text{ g water}} \right) = -240 \text{ kJ}$$

$$6) \left(\frac{1 \text{ mole F21}}{24.4 \text{ kJ}} \right) \left(\frac{100.0 \text{ kcal}}{1 \text{ kcal}} \right) \left(\frac{4.184 \text{ kJ}}{1 \text{ kcal}} \right) \left(\frac{102.92 \text{ g F21}}{1 \text{ mole F21}} \right) = 1760 \text{ g F21}$$

$$7) \begin{array}{l} \text{heat steel} + \text{heat water} = 0 \\ (\text{specific heat capacity steel})(\text{grams steel})(\Delta T) + (\text{specific heat capacity water})(\text{grams water})(\Delta T) = 0 \\ (C_{\text{steel}})(25.00 \text{ g steel})(27.3 \text{ }^{\circ}\text{C} - 200.0 \text{ }^{\circ}\text{C}) + (4.184 \text{ J/g}\cdot^{\circ}\text{C})(100.0 \text{ mL})(1 \text{ g/mL})(27.3 \text{ }^{\circ}\text{C} - 22.0 \text{ }^{\circ}\text{C}) = 0 \\ C_{\text{steel}} = 0.51 \text{ J/g}\cdot^{\circ}\text{C} \end{array}$$

$$8) \begin{array}{l} \text{heat ice} + \text{heat air} = 0 \\ \left(\frac{6.01 \text{ kJ}}{\text{mole water}} \right) \left(\frac{\text{mole water}}{18.0 \text{ g water}} \right) \left(\frac{9.0 \text{ g ice}}{18.0 \text{ g water}} \right) + (\text{specific heat capacity air})(\text{grams air})(\Delta T) = 0 \\ 3005 \text{ J} + (C_{\text{air}})(1.20 \text{ g/L})(113 \text{ L})(0 \text{ }^{\circ}\text{C} - 22 \text{ }^{\circ}\text{C}) = 0 \\ C_{\text{air}} = 1.0 \text{ J/g}\cdot^{\circ}\text{C} \end{array}$$

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| 9) a) -2877.04 kJ/mole butane | e) -186.1 kJ/mole propene |
| b) -9976.9 kJ/mole acid | f) -71.89 kJ/mole propene |
| c) -1861.4 kJ/mole acid | g) -131.8 kJ/mole CO ₂ |
| d) -136.94 kJ/mole ethene | h) -188 kJ/mole CO ₂ |