

Answers to Review Questions pg. 350 #2-10,14-18

2. c 3. d

$$4. m = 10.0 \text{ g}, \Delta T = 1.00 \text{ }^\circ\text{C}$$

$$Q = mc\Delta T$$

$$= 10.0 \text{ g} \times 4.19 \text{ J/g} \cdot \text{ }^\circ\text{C} \times 1.00 \text{ }^\circ\text{C}$$

$$= 41.9 \text{ J}$$

The correct answer is b.

5. The mass of the sample does not affect the answer.

$$C = 2.337 \text{ kJ/}^\circ\text{C} \quad \Delta T = 3.03 \text{ }^\circ\text{C}$$

$$Q = C\Delta T$$

$$= 2.337 \text{ kJ/}^\circ\text{C} \times 3.03 \text{ }^\circ\text{C}$$

$$= 7.08 \text{ kJ}$$

The correct answer is b.

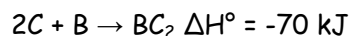
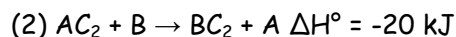
$$6. \% \text{ efficiency} = 40.0 \text{ kJ}/50.0 \text{ kJ} \times 100\% = 80.0\%$$

The correct answer is c.

7. e

8. Reverse equation (1) and add equation (2) to it.

Cancel compounds found on opposite sides of the equations.



The correct answer is a.

9. e

10. It takes 31.8 kJ to decompose 1 mol of Ag_2S .

Find the number of moles. $n = m/M$

$$M = 2 \times 107.868 \text{ g/mol} + 32.065 \text{ g/mol} = 247.801 \text{ g/mol}$$

$$n = 123.9 \text{ g} \times 1 \text{ mol}/247.801 \text{ g} = 0.5000 \text{ mol}$$

$$Q = n\Delta H_r$$

$$= 0.5000 \text{ mol} \times 31.8 \text{ kJ/mol}$$

$$= 15.9 \text{ kJ}$$

The correct answer is a.

$$14. n\text{AlCl}_3 = 6.85 \text{ g} \times 1 \text{ mol}/133.341 \text{ g} = 0.051372 \text{ mol}$$

$$\Delta H^\circ = n\Delta H_{\text{soln}}$$

$$= 0.051372 \text{ mol} \times (-373.8 \text{ kJ/mol})$$

$$= -19.2029 \text{ kJ}$$

$$\text{Heat absorbed by water} = 19.2029 \text{ kJ} = 19\,202.9 \text{ J}$$

$$Q = mc\Delta T$$

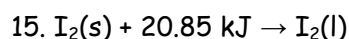
$$19\,202.9 \text{ J} = 255.0 \text{ g} \times 4.19 \text{ J/g}^\circ\text{C} \times \Delta T$$

$$\Delta T = 17.973^\circ\text{C}$$

$$T_f - T_i = 17.973^\circ\text{C}$$

$$48.7^\circ\text{C} - T_i = 17.973^\circ\text{C}$$

$$T_i = 30.7^\circ\text{C}$$



$$16. \Delta H_r = [\sum(n\Delta H_f^\circ \text{ products})] - [\sum(n\Delta H_f^\circ \text{ reactants})]$$

$$\Delta H_r = [(1 \text{ mol})(\Delta H_f^\circ \text{C}_2\text{H}_2(\text{g})) + (1 \text{ mol})(\Delta H_f^\circ \text{Ca}(\text{OH})_2(\text{s}))] - [(1 \text{ mol})(\Delta H_f^\circ \text{CaC}_2(\text{s})) + (2 \text{ mol})(\Delta H_f^\circ \text{H}_2\text{O}(\text{l}))]$$

$$-128.0 \text{ kJ} = [(1 \text{ mol})(227.4 \text{ kJ/mol}) + (1 \text{ mol})(-985.2 \text{ kJ/mol})] - [(1 \text{ mol})(\Delta H_f^\circ \text{CaC}_2(\text{s})) + (2 \text{ mol})(-285.8 \text{ kJ/mol})]$$

$$\Delta H_f^\circ \text{CaC}_2(\text{s}) = -58.2 \text{ kJ/mol}$$

$$17. \Delta H_{\text{neutralization}} = -55.31 \text{ kJ/mol of HNO}_3(\text{aq})$$

$$n(\text{HNO}_3(\text{aq})) = 0.0500 \text{ mol/L} \times 0.400 \text{ L} = 0.0200 \text{ mol}$$

$$\Delta H_{\text{neut}} = Q/n$$

$$-55.31 \text{ kJ} = Q/0.0200 \text{ mol}$$

$$Q = 1.1062 \text{ kJ} = 1106.2 \text{ J}$$

Heat absorbed by solutions:

$$Q_{\text{soln}} = 1106.2 \text{ J} = mc\Delta T$$

$$\Delta T = 19.00^\circ\text{C} - 18.67^\circ\text{C} = 0.33^\circ\text{C}$$

$$1106.2 \text{ J} = m \times 4.19 \text{ J/g}^\circ\text{C} \times 0.33^\circ\text{C}$$

$$\text{Total mass of solutions} = m = 800.0289 \text{ g} = 800.0 \text{ g}$$

$$\text{Total volume of solutions} = 800.0 \text{ g} \times 1.000 \text{ g/mL} = 800.0 \text{ mL}$$

$$\text{Volume of KOH solution} = 800.0 \text{ mL} - 400.0 \text{ mL} = 400.0 \text{ mL}$$

