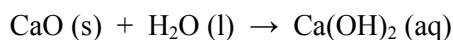
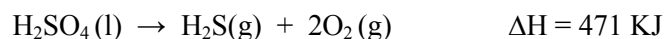


## Chapters 8 & 11 Extra Practice

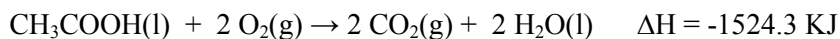
- What is the difference between heat and temperature?
- When you place your hand on a light bulb that has been on for about 25 minutes, described what happens regarding heat transfer and why it feels hot to your touch.
- Write the correct symbol and units for the following:
  - change in energy
  - change in enthalpy
  - heat
  - heat of reaction
  - change in temperature
  - specific heat capacity
- For the reaction  $2 \text{Al (s)} + \text{Fe}_2\text{O}_3 \text{(s)} \rightarrow 2 \text{Fe (s)} + \text{Al}_2\text{O}_3 \text{(s)}$  the heat of reaction is -852 kJ.
  - Is heat being absorbed from the surroundings or released to the surroundings?
  - Is the reaction exothermic or endothermic?
  - Rewrite the equation with the heat as either a reactant or a product.
  - When 5.00 g of aluminum reacts, how much heat is given off?
- Determine if the following are exothermic or endothermic processes.
  - evaporation of water
  - formation of ice
- A piece of unknown metal has a mass of 5.6329 g and gives off 125 J of heat when placed in water at 25.0°C. The highest temperature of the water after the metal is placed in the calorimeter is 82.6°C. What is the metal? (Refer to page 287 in section 8.8 of your text)
- When 2.579 g of calcium oxide is added to 50.00 mL of water at 25°C in a calorimeter, the temperature of the water increase to °C. Assuming the specific heat capacity of the solution is 4.18 J/g°C and the calorimeter itself absorbs a negligible amount of heat, calculate the heat of reaction ( $\Delta H$ ) in kJ.



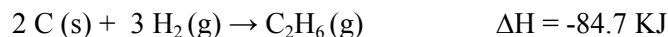
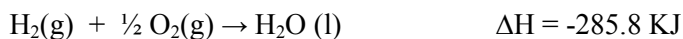
- When 30.0 mL of 2.00 M  $\text{Ca(OH)}_2$  is added to 20.0 mL of 1.50 M HCl in a calorimeter, the temperature increases by 45.6°C. Assuming the specific heat capacity and density are the same as water, calculate the heat of reaction ( $\Delta H$ ) in kJ.
- Use Hess's Law to find the heat of reaction for  $\text{SO}_3 \text{(g)} + \text{H}_2\text{O (l)} \rightarrow \text{H}_2\text{S (g)} + 2\text{O}_2 \text{(g)}$   $\Delta H^\circ_{\text{rxn}} = ?$



10. Use Hess's Law to find the heat of reaction for  $\text{CH}_3\text{COOH}(\text{l}) \rightarrow 2 \text{C}(\text{graphite}) + 2 \text{H}_2(\text{g}) + \text{O}_2(\text{g})$   $\Delta H^\circ_{\text{rxn}} = ?$



11. Use Hess's Law to find the heat of reaction for  $2 \text{CO}_2(\text{g}) + 3 \text{H}_2\text{O}(\text{l}) \rightarrow \text{C}_2\text{H}_6(\text{g}) + 7/2 \text{O}_2(\text{g})$   $\Delta H^\circ_{\text{rxn}} = ?$



12. Calculate the standard change in enthalpy ( $\Delta H^\circ_{\text{rxn}}$ ) for the reaction of solid zinc in aqueous hydrochloric acid. Use appendix B for  $\Delta H^\circ_{\text{f}}$  values.

13. Calculate the standard change in enthalpy ( $\Delta H^\circ_{\text{rxn}}$ ) for the combustion of acetic acid,  $\text{CH}_3\text{CO}_2\text{H}(\text{l})$ . Use appendix B for  $\Delta H^\circ_{\text{f}}$  values.

14. The heat of reaction at standard state,  $\Delta H^\circ_{\text{rxn}}$ , for  $\text{Fe}_2\text{O}_3(\text{s}) + 3 \text{CO}(\text{g}) \rightarrow 2 \text{Fe}(\text{s}) + 3 \text{CO}_2(\text{g})$  is -24.8 kJ. If the  $\Delta H^\circ_{\text{f}}$  value for  $\text{CO}_2(\text{g})$  is -393.5 kJ/mol and the  $\Delta H^\circ_{\text{f}}$  value for  $\text{CO}(\text{g})$  is -110.5 kJ/mol, calculate the  $\Delta H^\circ_{\text{f}}$  value for  $\text{Fe}_2\text{O}_3$ . Compare your answer to the  $\Delta H^\circ_{\text{f}}$  value in appendix B.

15. Use bond dissociation energies in table 7.1 to calculate the heat of reaction for the combustion of butane,  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$ , gas at standard state.

## Chapter 11 -----

1. Identify the solute and the solvent in the following:

a. humid air                      solute \_\_\_\_\_ s, l, or g?    solvent \_\_\_\_\_ s, l, or g?

b. ice water                        solute \_\_\_\_\_ s, l, or g?    solvent \_\_\_\_\_ s, l, or g?

c. salt water                        solute \_\_\_\_\_ s, l, or g?    solvent \_\_\_\_\_ s, l, or g?

d. a penny (Zn and Cu)            solute \_\_\_\_\_ s, l, or g?    solvent \_\_\_\_\_ s, l, or g?

2. What is molarity,  $M$ ? Calculate the molarity of a solution made by placing 5.00 g of calcium chloride into a 250.0 mL volumetric flask and filling it with water up to the meniscus.

3. What is molality,  $m$ ? Calculate the molality of a solution made by placing 5.00 g of calcium chloride into 250.0 mL of water.

4. What is m/m % concentration? Calculate the m/m % of a solution made by placing 5.00 g of calcium chloride into 250.0 mL of water.

5. Calculate the mass of solute present in 33.9 g of a 45.5% NaCl solution.

6. Calculate the mass of solvent required to dissolve 4.890 g of potassium bromide to make a 60.0% KBr solution.

7. What is mole fraction,  $X$ ? What is the mole fraction of oxygen gas in a mixture of gasses containing 2.20 g of  $O_2$ , 3.15 g of  $N_2$ , and 2.98 g of Ar?
8. Define the following:
- unsaturated
  - saturated
  - supersaturated
9. How does temperature affect the solubility of a solid dissolved in a liquid?
10. How does temperature affect the solubility of a gas dissolved in a liquid?
11. Why does a solution evaporate more slowly than a pure solvent?
12. Calculate the solution vapor pressure for water at  $25^\circ\text{C}$  when 3.00 mol of KBr is dissolved in 20.0 mol of water. the partial pressure of water at  $25^\circ\text{C}$  is 23.76 mm Hg.
13. Use the like-dissolves-like rule to determine if the following are soluble, insoluble, miscible, or immiscible in ethanol,  $\text{CH}_3\text{CH}_2\text{OH}$ , a polar solvent.
- |                                 |         |           |          |            |
|---------------------------------|---------|-----------|----------|------------|
| a. $\text{NaNO}_3$ (s)          | soluble | insoluble | miscible | immiscible |
| b. $\text{Br}_2$ (l)            | soluble | insoluble | miscible | immiscible |
| c. $\text{CH}_3\text{NH}_2$ (l) | soluble | insoluble | miscible | immiscible |
| d. $\text{K}_3\text{PO}_4$ (s)  | soluble | insoluble | miscible | immiscible |
| e. $\text{CCl}_4$ (l)           | soluble | insoluble | miscible | immiscible |
| f. $\text{I}_2$ (s)             | soluble | insoluble | miscible | immiscible |
| g. Water                        | soluble | insoluble | miscible | immiscible |
14. The boiling point of a pure solvent is (higher / lower) than the boiling point of a solution. The freezing point of a pure solvent is (higher / lower) than the freezing point of a solution.
15. Calculate the freezing point of a solution containing 0.600 kg of  $\text{CHCl}_3$  and 42.0 g of eucalyptol ( $\text{C}_{10}\text{H}_{18}\text{O}$ ), a fragrant substance found in the leaves of eucalyptus trees. ( $K_f$  of  $\text{CHCl}_3 = 4.68^\circ\text{C}/\text{m}$ , normal freezing point =  $-63.5^\circ\text{C}$ )
16. Calculate the boiling point of a solution containing 53.4 g of  $\text{CCl}_4$  and 1.23 kg of ethanol ( $\text{CH}_3\text{CH}_2\text{OH}$ ,  $K_b = 1.22^\circ\text{C}/\text{m}$ , normal boiling point =  $78.4^\circ\text{C}$ ).
17. What is a colligative property? Give one example.