Enthalpy Calculations: $n = \frac{m}{M}$ and $q = n\Delta H$

p. 643 #'s 15 - 18
p. 645 #'s 19 - 23
p. 648, 649 #'s 24 - 29

1. A puncture in the tubing of a refrigerator can cause severe frostbite as chloroethane, C_2H_5Cl, vaporizes. Use this thermochemical equation to calculate the heat absorbed when 23.6 g of chloroethane vaporizes at its boiling point. *(9.66 kJ)*

$$C_2H_5Cl_{(l)} + 26.4\ kJ \rightarrow C_2H_5Cl_{(g)}$$

2. This reaction occurs in the catalytic converter of an automobile.

$2\ CO_{(g)} + 2\ NO_{(g)} \rightarrow N_{2\,(g)} + CO_{2\,(g)} + 746\ kJ$

a) How much energy is released per mole of carbon dioxide gas produced? *(-746 kJ/mol)*

b) How much energy is released when 945 g of $CO_{2\,(g)}$ is produced? *(-160 kJ)*

3. Given that ΔH_{vap} for ammonia, NH_3, is +23.4 kJ/mol, calculate the heat change for condensing 10.0 g of ammonia? *(13.7 kJ)*

4. Calculate mass of sodium hydroxide will cause the release of 11.13 kJ of heat when dissolved in water. (ΔH_{soln} = -44.51 kJ/mol) *(10.0 g)*

5. Calculate the molar enthalpy of vaporization of ammonia if 34.25 kJ of heat is absorbed to vaporize 25.0 g of ammonia. *(23.3 kJ/mol)*

6. As Freon-12, $CCl_2F_{2(l)}$, absorbs energy from a refrigerator, it vaporizes. The vaporization of 5.00 g of Freon-12 requires 1.45 kJ of energy.

   a) Calculate the molar heat of vaporization of Freon-12. *(35.1 kJ/mol)*

   b) Calculate the amount of heat the Freon-12 must absorb in order to cool 115.3 g of air in a fridge from 7˚C to 5˚C. The specific heat capacity of air is 1.01 J/g•˚C. *(0.2 kJ)*

7. Perform calculations to determine the enthalpy change for each species. (Include an appropriate thermochemical equation in each of your answers.)

   a) the condensation of 10.0 g of methanol, CH_3OH. ΔH_{vap} = 39.23 kJ/mol *(12.2 kJ)*

   b) the formation of 5.00 g of potassium iodide. $\Delta H°_f$ = -327.9 kJ/mol *(-9.88 kJ)*

8. The molar heat for the combustion of ethyne is -1300 kJ/mol. Calculate the enthalpy change that occurs when 15.4 g of ethyne is burned under standard conditions. *(-770 kJ)*

---

9. Why does the molar heat of vaporization for a substance always seem to be greater than its molar heat of fusion?

10. Which event should cause a more severe burn: the condensation of 10.0 g of steam on skin or the cooling of 10.0 g of water from 100°˚C to 37°˚C?

11. If you are lost in the woods and you become thirsty, would it be better to drink water from a stream than to eat snow? Explain your choice in terms of hypothermia.

12. Why do strawberry farmers spray their crops with a fine mist of water when there is a risk of frost?