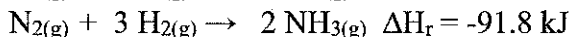
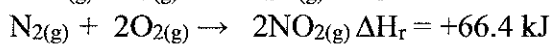
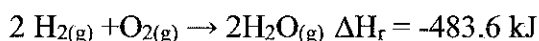
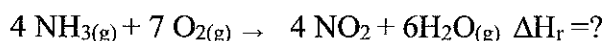


Thermochem review Ch.17

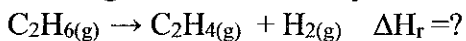
1. Consider 2 metals, A and B, each having a mass of 100g and an initial temperature of 20⁰C. The specific heat of A is larger than that of B. Under the same heating conditions, which metal would take longer to reach 21⁰C? Explain.
2. A chemical reaction where heat is transferred to the surroundings is a(n) _____ reaction. If it were taking place in a beaker, the beaker would feel _____.
3. Which of the following is an endothermic process?
 - a. Jet fuel burning in a jet engine
 - b. Combustion of methane
 - c. Freezing of water
 - d. Vaporization of water
4. Which is true if $\Delta H = -95\text{J}$?
 - a. Both the system and the surroundings are gaining 95J
 - b. Both the system and the surroundings are losing 95J
 - c. The system is losing 95J, while the surroundings are gaining 95J
5. Explain why the formula for q is $q = mc\Delta t$ but the calorimeter formula is $nH = -mc\Delta t$. Why the negative in the calorimeter formula?
6. State the 3 assumptions of calorimetry
7. Two aqueous solutions at room temperature are mixed in a coffee cup calorimeter. The reaction causes the temperature of the resulting solution to fall to below room temperature. Which of the following statements is true?
 - a. Energy is leaving the system during the reaction
 - b. The products have a lower potential energy than the reactants
 - c. This type of experiment directly yields ΔE_{rxn}
 - d. The mixing is endothermic
 - e. The solution has properties that enable it to violate the first and second law of thermodynamics
8. The standard heat of formation of a free element in its standard state is always:
 - a. Zero
 - b. Negative
 - c. Positive
 - d. Higher for solids
9. Explain in terms of potential versus kinetic energy and change in temperature what is happening as you heat a solid, it melts, you heat a liquid and it boils.
10. Which phase changes are endothermic, which are exothermic?
11. Give the combustion reaction for propane. ($\text{C}_3\text{H}_8(\text{g})$). If the molar enthalpy of combustion is -134.5 kJ/mol, write the thermochemical equation for the combustion of propane. Draw the potential energy diagram for this reaction.
12. Define: molar enthalpy of: a) solidification b) fusion c) vaporization d) condensation e) formation f) combustion
13. How much heat is required to melt 3.9 moles of NaCl ($H_{\text{fus}} = 30.2 \text{ kJ/mol}$) at its melting point?
14. Calculate ΔH for the following reaction.
 $\text{C}_2\text{H}_4(\text{g}) + \text{H}_2(\text{g}) \rightarrow \text{C}_2\text{H}_6(\text{g})$
(H_f^0 for $\text{C}_2\text{H}_4(\text{g}) = 52.5 \text{ kJ/mol}$; H_f^0 for $\text{C}_2\text{H}_6(\text{g}) = -84.7 \text{ kJ/mol}$)

15. Calculate the molar enthalpy for the solidification of gallium metal (Ga) if 20.0 g of gallium causes 100. ml of water to change temperature from 24.0 to 29.5 C when it solidifies.
16. In a chemistry experiment 15 g of urea NH_2COHN_2 is added to 250.0 ml of water in a simple coffee cup calorimeter. A temperature decrease of 5.7 C is noticed. Calculate the molar enthalpy of urea.
17. What total energy must be absorbed to change 3.00 kg of ice at -30.0°C on a lake surface in February to liquid water at 25.0°C in July?
18. Ammonia was used as one of the many alternative fuels by Germany during World War (II). Use Hess's law and the evidence given below calculate the enthalpy change for the combustion of ammonia.



19. Calculate the quantity of heat that flows into a 1.2L kettle of water at 12°C that heats to 97°C .

20. Most ethane extracted from natural gas is converted into ethane by the following cracking reaction. The ethylene is used to produce hundreds of consumer products.



- What is the standard enthalpy change for the cracking of ethane?
- What is the amount of energy released by 10 g of ethane?
- Draw a potential energy diagram to represent the cracking of ethane.

- 21.a) Write the complete combustion reaction for propane. b) Find the molar enthalpy of propane using Hess's law. c) How much heat is released by burning 75 kg of propane?

22. The specific heat capacity of graphite is 0.71 J/gC . Calculate the energy required to raise the temperature of 775g of graphite by 160 degrees celcius.

23. A 45.0 g piece of copper wire is heated, and the temperature of the wire changes from 19.0 degrees Celsius to 86.0 degrees. The amount of heat absorbed is 343 J. What is the specific heat of copper?

24. Given the following thermochemical data, calculate ΔH for:



- $\text{H}_2(\text{g}) + \frac{1}{2} \text{O}_2(\text{g}) \rightarrow \text{H}_2\text{O}(\text{l}) \quad \Delta H = -285 \text{ kJ}$
- $\text{CaO}(\text{s}) + \text{H}_2\text{O}(\text{l}) \rightarrow \text{Ca}(\text{OH})_2(\text{s}) \quad \Delta H = -64 \text{ kJ}$
- $\text{Ca}(\text{s}) + \frac{1}{2} \text{O}_2(\text{g}) \rightarrow \text{CaO}(\text{s}) \quad \Delta H = -635 \text{ kJ}$

25. In a calorimetry experiment, the temperature of 500. mL of water rose from 19.78°C to 23.61°C when 1.0g of sodium metal reacted according to the following equation.
 $2\text{Na}(\text{s}) + \text{H}_2\text{O}(\text{l}) \rightarrow 2\text{NaOH}(\text{aq}) + \text{H}_2(\text{g})$ Calculate the molar enthalpy of reaction for sodium metal.