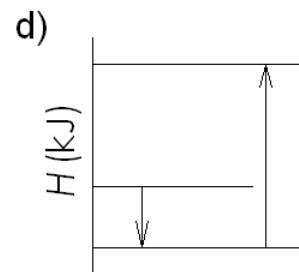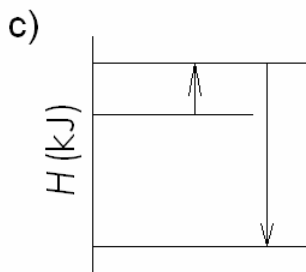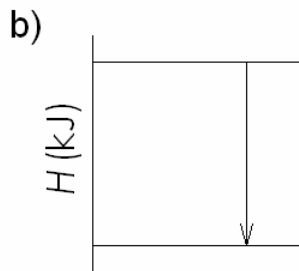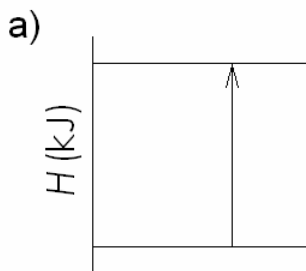|		**BLM 9.3.1**
ASSESSMENT	**Chapter 9 Test**	

Multiple-Choice Questions

Circle the letter for the choice that best completes the statement or answers the question.

1. The energy in fossil fuels originated from
   a) the food chain
   b) photosynthesis
   c) fossilization
   d) the Sun

2. Which of the following equations represents cellular respiration?
   a) $C_6H_{12}O_6(s) + 6O_2(g) \rightarrow 6CO_2(g) + 6H_2O(g)$
   b) $C_6H_{12}O_6(s) + 6O_2(g) \rightarrow 6CO_2(g) + 6H_2O(l)$
   c) $6CO_2(g) + 6H_2O(l) \rightarrow C_6H_{12}O_6(s) + 6O_2(g)$
   d) $6CO_2(g) + 6H_2O(g) \rightarrow C_6H_{12}O_6(s) + 6O_2(g)$

3. Which statement or expression is incorrect?
   a) For the universe, $\Delta E_{system} = -\Delta E_{surroundings}$.
   b) $\Delta E_{universe}$ is a positive quantity.
   c) $\Delta_c H$ for a fuel is a negative quantity.
   d) $\Delta H = n\Delta_r H$.

4. The heat capacity of a calorimeter is 14.26 kJ/°C. By how much will its temperature change if it gains 526.8 kJ of thermal energy?
   a) 36.9 °C
   b) 54.1 °C
   c) 0.27 °C
   d) 14.3 °C

5. Which of the following reactions corresponds to the equation for the standard molar enthalpy of formation for solid sodium chlorate, $NaClO_3$?
   a) $NaCl(s) + \dfrac{3}{2} O_2(g) \rightarrow NaClO_2(s)$

   b) $Na(s) + \dfrac{1}{2} Cl_2(g) + \dfrac{3}{2} O_2(g) \rightarrow NaClO_3(s)$

   c) $Na(s) + Cl(g) + 3O(g) \rightarrow NaClO_3(s)$
   d) $2Na(s) + Cl_2(g) + 3O_2(g) \rightarrow 2NaClO_3(s)$

6. Given the reaction, $2NO(g) + O_2(g) + 68\ kJ \rightarrow 2NO_2(g)$, what is the change in enthalpy, ΔH, for the reaction $NO(g) + \frac{1}{2}O_2(g) \rightarrow NO_2(g)$?

   a) 68 kJ
   b) −68 kJ
   c) 34 kJ
   d) −34 kJ

7. A burning candle is an example of a(n) _____ system.
   a) closed
   b) endothermic
   c) isolated
   d) open

8. Given the reaction, $Ca(s) + C(s) + \frac{3}{2}O_2(g) \rightarrow CaCO_3(s)\ \Delta H = -1205.8\ kJ$, how much heat is released when 3.750 g of calcium is allowed to react with excess oxygen and carbon?
   a) 1.29×10^4 kJ
   b) 4.22×10^3 kJ
   c) 1.21×10^3 kJ
   d) 1.13×10^2 kJ

9. Which of the following potential energy diagrams most accurately represents the combustion of ethane?

ASSESSMENT	**Chapter 9 Test**	**BLM 9.3.1**

10. The enthalpy of combustion for octane is −5470.1 kJ/mol. How much octane, $C_8H_{18}(l)$, would have to be burned to produce 397 kJ of energy?
 a) 0.0726 g $C_8H_{18}(l)$
 b) 8.29 g $C_8H_{18}(l)$
 c) 13.8 g $C_8H_{18}(l)$
 d) 1.57×10^3 g $C_8H_{18}(l)$

Numerical Response Questions

For each numerical response question, record the answer in the following response box.

11.
12.
13.
14.
15.

11. The specific heat capacity of nickel is 0.444J/g °C. How much energy is required to raise the temperature of 3.57 g of nickel by 7.00 °C?

12. A piece of stainless steel with a mass of 1.60 g absorbs 141 J of energy when its temperature increases by 178 °C. What is its specific heat capacity?

13. Liquid hydrogen peroxide is an oxidizing agent in many rocket fuel mixtures because it releases oxygen gas on decomposition: $2H_2O_2(l) \rightarrow 2H_2O(l) + O_2(g) + 196.1$ kJ. How much heat is released when 6.50 g $H_2O_2(l)$ decomposes?

14. The molar enthalpy of combustion of ethanol is −1234.8 kJ/mol. How much water can be heated from 13.5 °C to 24.7 °C by the combustion of 22.0 g of ethanol?

15. The enthalpy of combustion, $\Delta_c H$, for heptane, $C_7H_{16}(l)$, is –4464.7 kJ/mol. How much heat is released by the burning of 10.0 g of heptane?

Written Response Questions

Answer each question in the space provided. Use complete sentences, show problem-solving methods (with formulas), and include diagrams (with labels) when required.

16. Butane, $C_4H_{10}(g)$, is commonly used in lighters and curling irons. The molar enthalpy of combustion of butane is –2657.3 kJ/mol.
    a) Write a thermochemical equation for the combustion of butane in a curling iron. Draw a potential energy diagram to illustrate the energy involved in this reaction.

    b) If you were lost in the woods in the spring with a butane curling iron, how much butane (in grams) would you need to make a cup (250 mL) of instant hot chocolate from a very cold stream (10 °C) if you wanted to heat the water to 80 °C?

c) Using your answer from (b), how many cups of hot chocolate could you make if you had a full canister (35 g) of butane?

_____

_____

_____

_____

d) Do you think your answer to (c) is accurate? Explain.

_____

_____

_____

_____

_____

_____

17. In planning a camping trip, you decide to conduct a series of experiments to determine which foods would provide the most energy for the mass that you would have to carry. List three sources of experimental error that can occur in such a calorimetry experiment.

_____

_____

_____

18. In calorimetry experiments, the heat capacity of a bomb calorimeter is given rather than its specific heat capacity.
    a) What is the difference between the heat capacity and the specific heat capacity?

_____

_____

b) What is the advantage of using the heat capacity of a bomb calorimeter rather than the specific heat capacity?

_____

_____

_____

_____