Name _____Key_____ Period _____

2nd Semester Final Review - Thermochemistry

1. Make the following conversions:

   850 calories = .850 Calories 440 cal = 1800 joules 1.8 KJ = 1800 joules

   0.45 kJ = 108 cal 35 Cal = 3500 cal 25 kcal = 104.5kJ

2. Define the following terms:
   exothermic- releases heat to surroundings, heat is a product in the chemical reaction
   endothermic-absorbs heat from the surroundings, heat is a reactant in a chemical reaction
   specific heat capacitythe amount of heat required to raise the temp of 1g of a substance 1 °C
   Activation energy-the energy required to form the activated complex
   Catalyst- a substance that speeds up the rate of a chemical reaction without itself being used up.

3. What is the specific heat capacity of liquid water in terms of calories and joules?
   1 cal/g°C or 4.18 J/g°C

4. How many kJ of heat is absorbed when 1.00 L of water is heated from 18°C to 85°C?
   280 kJ

5. $MgCO_3$ (s) → MgO (s) + CO_2 (g) ΔH_{rxn} = 117.3 KJ
   a. Is heat absorbed or released in the rxn? +ΔH, heat is absorbed
   b. What is ΔH_{rxn} for the reverse reaction? –117.3 kJ

6. When 1 mol KBr(s) decomposes to its elements, 394 KJ of heat is absorbed.
   a. Write a balanced thermochemical equation for this reaction.
      788 kJ + 2 KBr → 2 K + Br_2 or 294 kJ + KBr → K + 1/2 Br_2
   b. How much heat is released when 10.0 kg KBr forms from it's elements?
      3.31×10^4 kJ

7. 40.0 g of substance has its temp. increased from 25.0 °C to 50.0°C by addition of 4,067 J of heat. What is the specific heat in J / g°C for the substance?
   4.067 J/g°C

8. What quantity of heat is needed to raise the temp of 500.0 g of Cu from 20.0°C to 50.0°C? (Specific heat of Cu = 24.5 J / mol°C)
   5.79 kJ

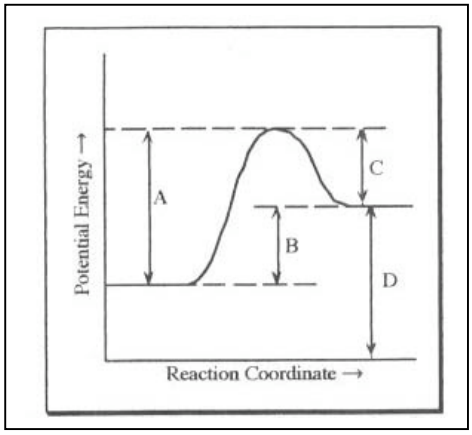
9. A 195 g aluminum engine part at an initial temperature of 3.00°C absorbs 40.0 KJ of heat. What is the final temperature of the part? Specific heat of Aluminum =0.21 cal/g°C.
   236.7 °C

10. Calculate the heat required to cause 10.0 g of H_2O to go from a -20.0°C solid to a gas at 110.0°C.
    7340 cal

11. How many calories are required to raise the temperature of 125.0 g of water from 20.0°C to 50.0°C? 3750 cal or 3.75 kcal

12. Calculate the heat change in calories when 65.3g of steam at 100°C condenses to water at the same temperature. 3.42×10^4 cal or 34.2 kcal

13. How much heat is produced when 310.0 g of Cl_2 react according to the following thermochemical equation: $Si(s) + Cl_2(g) \rightarrow SiCl_2(l) + 687$ kJ ? 3.00×10^3 kJ



14. Describe what each letter on the graph represents for the forward reaction.
    - A Activation energy of the forward reaction
    - B ΔH of the reaction
    - C Activation energy of the reverse reaction
    - D Potential energy of the reactants

15. How could you lower A and C?
    Add a catalyst.
    Note that this would not change B or D

16. 8,500 calories of heat are absorbed by 31.0 grams of solid water. The initial temperature is -21.0°C. What is the final temperature of the water, and its state of matter?

100°C liquid and gaseous water

solid water	.5 cal/g°C (31.0 g) (21°C)	= 325.5 cal
melting	80 cal/g (31.0 g)	= 2400 cal
liquid	1cal/g°C (31.0g) (100°C)	= 3100 cal
Total used to get liquid water at 100°C		5825.5 cal

You have 2674.5 cal left to vaporize the water (8500cal-5825.5cal). This is not enough to vaporize the 31.0 g of water. This would require 540 cal/g(31.0g) = 16740 cal. So, only some of the water is vaporized. All the water will be at 100°C and some of it will be gas and some will still be liquid.

17. Calculate the value of ΔH for the reaction $CaCO_3 \rightarrow CO_2 + CaO$ from the following enthalpy changes:

$Ca + C + 3/2O_2 \rightarrow CaCO_3$	ΔH = -1206.9 kJ
$2Ca + O_2 \rightarrow 2CaO$	ΔH =- -1270.2 kJ
$C + O_2 \rightarrow CO_2$	ΔH = - 393.5 kJ

ΔH_{rxn} =178.3 KJ

Use Hess's law