**Name: Period: Seat#:**

**S-7, 8, 9, 10**

**Directions:** Try these problems. If you can DO them, check the box (🗹).   
If you CANNOT do them, write some notes TO YOURSELF about what you need to study to succeed at these problems.

**S7 – Quick Check #1**

A picture containing chart

Description automatically generated

|  |  |
| --- | --- |
|  | Ethyl alcohol, molar mass = 46.08 g/mol |
|  | The heat of fusion of ethyl alcohol, ΔHfus, is 4.98 kJ/mol.  The heat of vaporization of ethyl alcohol alcohol, ΔHvap, is 39.40 kJ/mol. |

🞏 **Phase Change Equations**

Write an equation for alcohol vaporizing. Include the energy value.

|  |
| --- |
|  |

🞏 **Change on the** **Particulate Level**

If alcohol molecules looked like , draw a before and after picture of alcohol vaporizing.

|  |  |  |
| --- | --- | --- |
| **Before (liquid)** |  | **After (gas)** |
|  | → |  |

🞏 **Calculations**

How much heat is needed to boil 10.0 grams of ethyl alcohol? (Show work as a single line equation.)

How much heat is released when 25.0 grams of liquid ethyl alcohol freezes?   
 (Show work as a single line equation.)

**S8 – Quick Check #2**

🞎 **Exothermic & Endothermic**

When a solution of NaOH is neutralized by a solution of HCl, the solution gets very hot.

Is the water in the solution the ***system*** or the ***surroundings***? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| PE |  |

Add “heat” to this molecular equation: HCl(aq) + NaOH(aq) → NaCl(aq) + H2O(l)

Draw the Potential Energy curve for this reaction.

Time

🞎 **Calorimetry**

How much energy does it take to heat 150. grams of aluminum metal from 25 °C to 150. °C?

The specific heat of aluminum is 0.900 J/g·°C. (Show your work!)

If 375 J of energy is added to 25.0 mL of water at 20.0 °C, what is the final temperature of the water?  
 The specific heat of water is 4.18 J/g·°C. (Show your work!)

**S9 – Quick Check #3**

***The specific heat of water is 4.18 J/g·°C. The molar mass of C3H8 = 44.09 g/mol.***

🞎 **Calculating Enthalpy (ΔH) from Data:**

A 3.00 gram sample of propane, C­3H8, is burned and warms 100. g of water from 20.0°C to 100.0°C.   
  
 What is the ΔH of combustion for C3H8? \_\_\_\_\_\_\_\_\_\_\_\_\_ What is the sign of the ΔH? \_\_\_\_

🞎 **Heating Curves**

Consider the following heating curve of ice at -30 °C to steam at 130 °C.

Chart, line chart

Description automatically generated

a) Label the graph with “solid”, “liquid”, and “gas”

b) In which segment is ***boiling of the water*** occurring? \_\_\_\_\_\_\_ (AB, BC, etc.)

c) Where on this curve would you use the formula,   
 q = mCΔT? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

d) Describe what is happening to the H2O as you   
 move from point B to point D.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

e) ΔHfus would be used as the H2O goes from Point \_\_\_\_\_ to Point \_\_\_\_\_

**S10 – Quick Check #4**

1 – EXOTHERMIC AND ENDOTHERMIC

***Classify each statement as talking about an [EXO]thermic or [ENDO]thermic reaction:***

|  |  |
| --- | --- |
| \_\_\_\_\_ surroundings get hot  \_\_\_\_\_ PE diagram is uphill  \_\_\_\_\_ energy is a product  \_\_\_\_\_ ΔH is positive  \_\_\_\_\_ reactants have more energy | \_\_\_\_\_ ΔH is negative  \_\_\_\_\_ PE diagram is downhill  \_\_\_\_\_ surroundings get cold  \_\_\_\_\_ products have more energy  \_\_\_\_\_ energy is a reactant |

2 – HEAT CALCULATIONS

|  |  |
| --- | --- |
| A 45.0 mL sample of water is heated from 15.0°C to 35.0°C. How many joules of energy have been absorbed by the water? (Show work) | If 5430 J of energy is used to heat 1.25 L of room temperature water (23.0°C), what is the final temperature of the water? |

3 – HOT AND COLD OBJECTS

A 100. gram sample of aluminum (specific heat = 0.900 J·g-1·°C-1) in boiling water is added to an insulated cup containing 50.0 grams of water at 5.00°C. What will the final temperature of the mixture be? The specific heat of water is 4.184 J·g-1·°C-1.

4 – HEATS OF FUSION & VAPORIZATION

***Knowing that the ΔHfus for water is 6.02 kJ·mol-1, calculate the following:***

How much energy (in kJ) is absorbed by 45.0 g of ice as it melts?

What mass of ice can be melted with 75.0 kJ of energy?

5 – ΔH FROM DATA

When 10.0 grams of C5H12 is burned, 453 kJ of energy is released.

What is the ΔHcombustion for C5H12?

When 10.0 grams of aluminum melts, 3.929 kJ of energy is required. What is the ΔHfus of Al?

– HESS’S LAW—LONG VERSION

Iron ore can be converted to iron metal with CO gas.



7 – HESS’S LAW – SHORTCUT

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **chemical** | CO2(g) | H2O(l) | C5H12(*l*) | C2H5OH(*l*) |
| **ΔHf** | -393.5 kJ·mol-1 | -285.8 kJ·mol-1 | -173.1 kJ·mol-1 | -277.6 kJ·mol-1 |

Given the above ΔHf°’s, calculate the ΔHcombustion of pentane, C5H12.

Calculate the ΔHcombustion of ethyl alcohol, C2H5OH(*l*)

8 – MORE HESS’S LAW

|  |  |  |  |
| --- | --- | --- | --- |
| **chemical** | CO2(g) | H2O(l) | C8H18(*l*) |
| **ΔHf** | -393.5 kJ·mol-1 | -285.8 kJ·mol-1 | ??? kJ·mol-1 |

Knowing that the ΔHcombusion of octane, C8H18, is -5508.9 kJ·mol-1 calculate the ΔHf of octane.