

Name: \_\_\_\_\_

Period: \_\_\_\_\_

Seat#: \_\_\_\_\_

**1 – EXOTHERMIC AND ENDOTHERMIC**

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

\_\_\_\_\_ surroundings get hot

\_\_\_\_\_  $\Delta H$  is negative

\_\_\_\_\_ PE diagram is uphill

\_\_\_\_\_ PE diagram is downhill

\_\_\_\_\_ energy is a product

\_\_\_\_\_ surroundings get cold

\_\_\_\_\_  $\Delta H$  is positive

\_\_\_\_\_ products have more energy

\_\_\_\_\_ reactants 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

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

### 4 – HEATS OF FUSION & VAPORIZATION

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Knowing that the  $\Delta H_{\text{fus}}$  for water is  $6.02 \text{ kJ}\cdot\text{mol}^{-1}$ , 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**

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When 10.0 grams of C<sub>5</sub>H<sub>12</sub> is burned, 453 kJ of energy is released.

What is the ΔH<sub>combustion</sub> for C<sub>5</sub>H<sub>12</sub>?

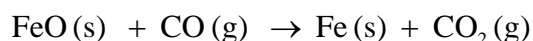
When 10.0 grams of aluminum melts, 3.929 kJ of energy is required. What is the ΔH<sub>fus</sub> of Al?

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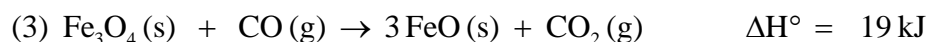
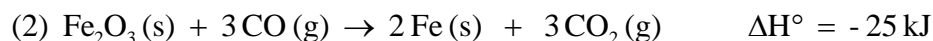
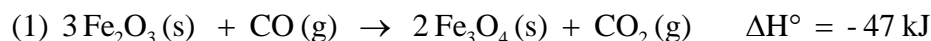
**– HESS'S LAW—LONG VERSION**

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



Calculate the standard enthalpy change for this reaction from these reactions of iron oxides with CO :



**7 – HESS'S LAW – SHORTCUT**

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<b>chemical</b>	CO <sub>2</sub> (g)	H <sub>2</sub> O(l)	C <sub>5</sub> H <sub>12</sub> (l)	C <sub>2</sub> H <sub>5</sub> OH(l)
<b>ΔH<sub>f</sub></b>	-393.5 kJ·mol <sup>-1</sup>	-285.8 kJ·mol <sup>-1</sup>	-173.1 kJ·mol <sup>-1</sup>	-277.6 kJ·mol <sup>-1</sup>

Given the above ΔH<sub>f</sub><sup>o</sup>'s, calculate the ΔH<sub>combustion</sub> of pentane, C<sub>5</sub>H<sub>12</sub>.

Calculate the ΔH<sub>combustion</sub> of ethyl alcohol, C<sub>2</sub>H<sub>5</sub>OH(l)

**8 – MORE HESS'S LAW**

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<b>chemical</b>	CO <sub>2</sub> (g)	H <sub>2</sub> O(l)	C <sub>8</sub> H <sub>18</sub> (l)
<b>ΔH<sub>f</sub></b>	-393.5 kJ·mol <sup>-1</sup>	-285.8 kJ·mol <sup>-1</sup>	??? kJ·mol <sup>-1</sup>

Knowing that the ΔH<sub>combustion</sub> of octane, C<sub>8</sub>H<sub>18</sub>, is -5508.9 kJ·mol<sup>-1</sup> calculate the ΔH<sub>f</sub> of octane.