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AP Chemistry – Thermochemistry – 31

Name _____Per ___

1. The decomposition of zinc carbonate into zinc oxide and carbon dioxide requires the addition of 71.5 kJ/mole of zinc carbonate. (a) Write a balanced chemical equation for the reaction. (b) What bonds must be broken, and which are formed?

2. Methanol, CH_3OH, decomposes into carbon monoxide and hydrogen gas which requires 90.7 kJ/mole of methanol. (a) Is this reaction exothermic or endothermic?

(b) Write a balanced chemical equation for the reaction.

(c) Calculate the amount of heat transferred when 1.60 kg of methanol is decomposed by this reaction at constant pressure.

(d) For a given sample of methanol, the enthalpy change on reaction is 64.7 kJ. How many grams of hydrogen gas are produced?

(e) What is the value of ΔH for the reverse of this reaction?

(f) How much heat, in kJ, is released when 32.0 g of carbon monoxide reacts completely with hydrogen gas to form methanol at constant pressure?

3. A gas is confined to a cylinder under constant atmospheric pressure. When 518 J of heat is added to the gas, it expands and does 127 J of work on the surroundings. What are the values of ΔH and ΔE for this process?

4. What is the molar heat capacity of liquid water?

5. What is the heat capacity of 8.42 moles of liquid water?

6. How many kJ of heat are needed to raise the temperature of 2.56 kg of water from 44.8°C to 92.0°C?

7. The specific heat of toluene, C_7H_8 is 1.13 J/gK. How many J of heat are needed to raise the temperature of 62.0 g of toluene from 16.3°C to 38.8°C?

8. Here are two hypothetical reactions: X → Y ΔH = -35 kJ/mole and X → Z ΔH = 90 kJ/mole. Construct an enthalpy diagram for substances X, Y and Z and calculate the enthalpy change for the reaction Y → Z.

9. Many lighters contain liquid butane, $C_4H_{10(l)}$. (a) Write the chemical equation for the combustion of butane in air. (b) Using enthalpies of formation, calculate the quantity of heat produced when 1.0 g of butane is completely combusted in air.