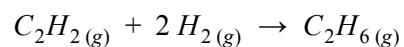


Midterm Prep Worksheet

2. A bowl containing 56 grams of ice cream is sitting out in the sun. The heat from the sun completely melts the ice cream and raises its temperature to 30°C . Assuming that the ice cream was initially a solid with a freezing point at 0°C , how much energy was supplied to the ice cream? (ΔH_{fusion} of ice cream is 210 J/g and the specific heat capacity of liquid ice cream is 3.1 J/g $^{\circ}\text{C}$)

3. Determine the reaction enthalpy for the hydrogenation of ethyne to ethane:



$$\Delta H_{combustion}^o C_2H_{2(g)} = -1300 \text{ kJ/mol}$$

$$\Delta H_{combustion}^o C_2H_{6(g)} = -1560 \text{ kJ/mol}$$

$$\Delta H_{combustion}^o H_{2(g)} = -286 \text{ kJ/mol}$$

4. Under what conditions is the work done by the system equal to heat absorbed by the same system? Also state relevant equations.

5. 1.00 mol of an ideal gas is compressed reversibly at a constant temperature ($T=500 \text{ K}$) and $w = 1000 \text{ J}$. Find the following quantities for this process:

a. ΔU

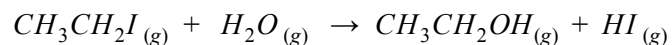
b. q

c. $\frac{V_f}{V_i}$

d. ΔS_{gas}

e. $\Delta S_{surrounding}$

6. The reaction between gaseous iodoethane and water vapor generates ethanol and HI:



36.00 g of $H_2O_{(g)}$ is converted to ethanol and HI gas completely. The initial volume of the system is 20 L. The internal energy change of the reaction is 84.00 kJ. The reaction occurs under constant pressure (1 atm) and room temperature ($25^\circ C$).

$$\Delta H_f^\circ H_2O_{(g)} = -241.82/\text{mol}$$

$$\Delta H_f^\circ CH_3CH_2I_{(g)} = -51.39 \text{ kJ/mol}$$

$$\Delta H_f^\circ CH_3CH_2OH_{(g)} = -277.69 \text{ kJ/mol}$$

Bond enthalpies:

H—O 463 kJ/mol

C—C 348 kJ/mol

H—I 299 kJ/mol

C—I 238 kJ/mol

- a. Calculate work and heat of the reaction process.
- b. Is the reaction endothermic or exothermic?
- c. What is the enthalpy of the reaction for 1 mol of $H_2O_{(g)}$?
- d. What is $\Delta H_f^\circ HI_{(g)}$?
- e. Answer the following regarding bond enthalpies:
 - i. Only two bonds are formed during the reaction. Which bond is formed during the reaction besides H-I?
 - ii. What is its bond enthalpy?

7. Which of the following processes lead to an increase in entropy? Circle all that apply.
- a. The pressure of 1 mole of O_2 doubles isothermally.
 - b. CO_2 expands isothermally to 10 times its original volume.
 - c. The temperature of 1 mol of He is increased to $25^\circ C$ at constant pressure.
 - d. $N_{2(g)}$ is compressed isothermally to half its original volume.
 - e. A glass of water loses 100J of energy reversibly at $30^\circ C$.
8. A crystal formed from 8 identical molecules can have 3 possible equal energy orientations. What is the minimum entropy for this system?
9. What is the standard molar entropy of vaporization of water at 373K given that the standard molar enthalpy of vaporization is 40.7kJ/mol?
10. A balloon filled with 0.150 moles of He gas expands isothermally from 3.3L to 5.7L. What is ΔS ?
11. Another balloon expands from 3.3L at 298K to 9.2×10^5 L at 333K. What is ΔS ?