

Chem E-1a
Friday Review Problems
Chapter 6: Energy Relationships in Chemical Reactions

1. a) Write a complete balanced equation for the combustion of **one mole** of solid sucrose, $C_{12}H_{22}O_{11}$. Include state symbols such as (s) and (g).
- b) A bomb calorimeter and its contents has a total heat capacity of $10.73 \text{ kJ/}^\circ\text{C}$. When 1.243 g of sucrose are completely combusted in this calorimeter, the temperature increases by 1.91°C . Use this information to calculate the standard enthalpy change ΔH° for the combustion of sucrose in kJ/mol .
- c) Now use the information provided below to calculate the standard enthalpy change ΔH° for the combustion of solid sucrose.
- | | |
|---|---|
| $\Delta H^\circ_f(\text{CO}_2(g)) = -393.5 \text{ kJ/mol}$ | $\Delta H^\circ_f(\text{H}_2\text{O}(l)) = -285.8 \text{ kJ/mol}$ |
| $\Delta H^\circ_f(\text{C}_{12}\text{H}_{22}\text{O}_{11}(s)) = -2221.7 \text{ kJ/mol}$ | |

2. You wish to prepare a pitcher of iced tea by mixing some amount of ice at -10°C with 400 g of hot tea at 80°C . You want your final pitcher of iced tea to be at 10°C . Determine the mass of ice you should use.

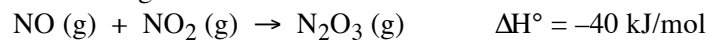
Useful Info: specific heat of ice = $2.09 \text{ J/g}^{\circ}\text{C}$

specific heat of tea = specific heat of liquid water = $4.18 \text{ J/g}^{\circ}\text{C}$

$\Delta H^{\circ}_{\text{fusion}}(\text{H}_2\text{O}) = +6.01 \text{ kJ/mol}$

2. (cont. – Additional space for work.)

3. a) Given the following information:



Calculate ΔH° for the following reaction:



b) Calculate ΔU , q and w for the complete reaction of 5 moles of $\text{N}_2\text{O}_3 \text{ (g)}$ according to the above reaction at 25°C with a constant external pressure of 1.00 atm.

3. (cont. – Additional space for work.)