

PROBLEM SET 1 ANSWERS – THERMODYNAMICS

1. Calculate the approximate rise in solution temperature if 1L of 1N Sulfuric Acid is mixed with 1L of 1N Sodium Hydroxide?

ANS : 6.67°C, Final Temp = 31.67°C

2. Determine the net heat of combustion of ethane gas from standard enthalpies of formation?

ANS: -1427.75 KJ/mol of ethane

3. How many KJ of heat are required to evaporate 1L of water at 1atm, if the initial temperature of the water is 20°C?

ANS: 2592.72 KJ

4. Define the terms:

- a. Heat
- b. Work
- c. Enthalpy
- d. Entropy
- e. Gibb's free energy

5. a) Using standard free energies of formation, calculate K_{sp} for CaCO_3 (s) at 25°C.

b) If water is in equilibrium with CaCO_3 (s) at 25°C, what is the Ca^{2+} concentrations in mg/L if the CO_3^{2-} concentration is 5 mg/L?

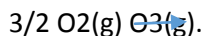
c) Calculate K_{sp} for a temperature of 16°C, which is typical for ground waters

d) A sample of ground water with 16°C has 100 mg/L of Ca^{2+} and 10 mg/L of CO_3^{2-} . Is this water in equilibrium with CaCO_3 (s)? if not, is CaCO_3 (s) is dissolving or precipitating?

6. Given the equation:

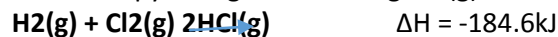


calculate ΔH for the reaction.



ANS: +142.7 KJ

7. What is the enthalpy change when 12.8g H_2 (g) reacts with excess Cl_2 (g) to form HCl (g)?



ANS: -1.17 * 10³ KJ