

Universidade de São Paulo

Instituto de Química

QFL 0425

Prof. Dr. Sérgio Henrique

- 1) Calculate the standard Gibbs energy of the reaction $\text{CO(g)} + \text{CH}_3\text{OH(l)} \rightarrow \text{CH}_3\text{COOH(l)}$ at 298 K, from the standard entropies and enthalpies of formation given in the Data section.
- 2) The standard enthalpy of combustion of solid urea ($\text{CO(NH}_2)_2$) is -632 kJ mol^{-1} at 298 K and its standard molar entropy is $104.60 \text{ J K}^{-1} \text{ mol}^{-1}$. Calculate the standard Gibbs energy of formation of urea at 298 K.
- 3) Calculate the maximum non-expansion work per mole that may be obtained from a fuel cell in which the chemical reaction is the combustion of propane at 298 K.
- 4) Suppose that 2.5 mmol Ar(g) occupies 72 dm^3 at 298 K and expands to 100 dm^3 . Calculate ΔG for the process.
- 5)) The change in the Gibbs energy of a certain constant-pressure process was found to fit the expression $\Delta G/\text{J} = -73.1 + 42.8(T/\text{K})$. Calculate the value of ΔS for the process.
- 6) Calculate the change in chemical potential of a perfect gas when its pressure is increased isothermally from 92.0 kPa to 252.0 kPa at 50°C .
- 7) The fugacity coefficient of a certain gas at 290 K and 2.1 MPa is 0.68. Calculate the difference of its molar Gibbs energy from that of a perfect gas in the same state.
- 8)) Estimate the change in the Gibbs energy of 1.0 dm^3 of water when the pressure acting on it is increased from 100 kPa to 300 kPa.
- 9)) Calculate the change in the molar Gibbs energy of oxygen when its pressure is increased isothermally from 50.0 kPa to 100.0 kPa at 500 K.
- 10) 4 Show that, for a perfect gas, $(\partial U/\partial S)_V = T$ and $(\partial U/\partial V)_S = -p$.