

Chem 402—Physical Chemistry
Homework Problem Set—Chapter 25

Due Tuesday, Mar. 11, 2008

1. When the pressure of krypton is 0.48 Torr, 0.12 cm^3 of Kr (measured at STP) is adsorbed by 1 g of silver iodide at 77.5 K. The same volume of gas is adsorbed at 79.1 K when the pressure is 0.75 Torr. Calculate the isosteric enthalpy for the process.

2. The following data pertain to the adsorption of CO_2 on activated charcoal at 273 K.

P(Torr)	50	100	150	200	250	300
$v_{\text{CO}_2} (\text{cm}^3 \text{ g}^{-1})$	30.1	46.2	61.5	69.8	76.5	81.6

Show that the adsorption fits the Langmuir isotherm. Calculate the two constants in the isotherm.

3. Derive the Langmuir isotherm for the adsorption of O_3 on a surface, assuming that the molecule dissociates into atoms during adsorption, and three atoms combine to form O_3 during desorption.

4. The transfer coefficient of a certain electrode in contact with M^{2+} and M^{3+} in aqueous solution at 25°C is 0.42. The current density is found to be 17.0 mA cm^{-2} when the overvoltage is 105 mV. What is the overvoltage required for a current density of 72 mA?