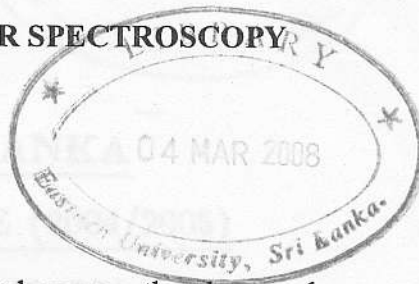


EASTERN UNIVERSITY, SRI LANKA
THIRD EXAMINATION IN SCIENCE (SECOND SEMESTER)
SPECIAL-REPEAT 2004/2005

CH 306: SURFACE CHEMISTRY AND MOLECULAR SPECTROSCOPY

TIME: 01 HOUR



1. (a) Write the B.E.T equation and identify the terms in it.
- (b) Arrange the B.E.T equation in (a) into linear form and express the slope and intercept of the plot $\frac{P}{v(P^0 - P)}$ vs $\frac{P}{P^0}$.
- c) Express the constant 'c' in terms of ΔH_L (heat of liquefaction) and ΔH_1 (heat of adsorption of first layer)
- d) B.E.T plot of $\frac{P}{v(P^0 - P)}$ vs $\frac{P}{P^0}$ for the adsorption of N_2 (g) at 90.1 K on certain solid yields a slope of 0.0173 cm^{-3} and intercept of $1.5 \times 10^{-4} \text{ cm}^{-3}$. Determine the following:
- The constant 'c'
 - The volume of mono layer formation (V_m)
 - The surface area of the solid in square meters (m^2) when the area of the nitrogen molecule is $1.62 \times 10^{-19} \text{ m}^2$.
 - $\Delta H_L - \Delta H_1$

2. (a) i) What type of molecules show rotational spectra?
- ii) State which of the following molecules show rotational spectra: H_2 , HCl , CH_4 , CH_3Cl and CO .
- iii) The first rotational line ($J = 0$ to $J = 1$) of CO molecule occurs at 3.842 cm^{-1} . Calculate the moment inertia and the inter nuclear distance of the ~~es~~ CO molecule.
- (b) The absorption of infra - red radiation of the above molecule shows an absorption band at 2100 cm^{-1} . Calculate the fundamental frequency of vibration and the force constant of the C - O bond (Assume the vibration is simple harmonic)
- [$\mu_{CO} = 1.138 \times 10^{-26} \text{ kg}$, $h = 6.62 \times 10^{-34} \text{ Js}$ and $C = 3 \times 10^8 \text{ ms}^{-1}$]