EASTERN UNIVERSITY, SRI LANKA

THIRD YEAR SECOND SEMESTER EXAMINATION IN SCIENCE

2008/2009 (Sept. / Nov. 2010)

CH 306 SURFACE CHEMISTRY AND MOLECULAR SPECTROSCOPY

Answer all questions Time: 01 hour

Gas constant (R) = 8.314 J K^{-1} mol^{-1} Speed of Light (c) = $3x10^8$ m s^{-1}

1) (a) (i) Derive the Langmuir adsorption isotherm stating the assumptions made in the derivation.

(20 marks)

(ii) Two gases A and B adsorbed on a metal surface and they compute for the same adsorption sites. Assume Langmuir behaviour derive expressions for the fractions θ_A and θ_B of the surface covered by A and B molecules respectively.

(30 marks)

(b) At 70 K the equilibrium pressure of O_3 (g) adsorbed by surface was 6.397 x 10^3 N m^{-2}. To cover the same fraction at 90 K the pressure required was 9.997 x 10^3 N m^{-2}. Calculate the enthalpy of adsorption.

(30 marks)

(c) Explain why the surface active substances decrease the surface tension of liquid.

(20 marks)

2) (a) (i) Write the energy equation (in cm^{-1}) for anharmonic vibration.

(10 marks)

(ii) The molecule CO vibrates like an anharmonic oscillator with equilibrium vibrational frequency 2214 cm^{-1} and anharmonicity constant 6.85 x 10^{-3}. Calculate the frequencies for the fundamental transition, the first overtone and second overtone bands.

(40 marks)

Turn Over

(b) The wave number of the fundamental vibrational transition of $^{35}Cl_2$ is 564.9 cm^{-1}. Calculate the force constant of the bond.

(25 marks)

(c) Briefly explain the appearance of stokes and anti stokes line in the Raman spectroscopy.

(25 marks)

End of Paper