RAJARATA UNIVERSITY OF SRI LANKA

FACULTY OF APPLIED SCIENCES

B.Sc. (Special) Degree in Chemistry / B.Sc. (Joint Major) Degree in Chemistry & Physics

Fourth Year Semester II Examination – April / May 2016

CHE 4203– SURFACE AND COLLOIDAL CHEMISTRY

Answer **all** questions Time: Two hours

1. a. Name and describe three types of interfaces that a liquid can form [05 marks]

   b. Describe the terms Surface and Interface. Name the facts to be considered to understand "why colloidal dispersions can either be stable or unstable"? [05 marks]

   c. Explain the surface complexation reactions using illustrations and examples [05 marks]

   d. Differentiate between Gouy-Chapmen double layer model and the Stern-Grahame triple layer model using illustrations. [05 marks]

   e. Rutile has 2 sites/nm^2 and a specific surface area of 25 m^2/g. If Rutile powder is in 100ml of water, calculate site concentration in mol/l. [05 marks]

2. a. Explain the Freundlich Isotherm using a relevant plot. Discuss the Freundlich Isotherm equations for a linear and a nonlinear model separately. [10 marks]

   b. Name and define the general groups of surface-active agents [05 marks]

   c. The surface tension of mercury is 0.471 Nm^{-1} at 25^0C, while its density is 13.6×10^3 kgm^{-3}. To what depth will the mercury level be depressed inside a capillary of radius 1mm when placed in a pool of mercury. (angle of contact $\theta = 137^0$ and $g = 9.8$ m s^{-2}). [10 marks]

3. Describe the "Industrial application of Colloids" using at least three examples [25 marks]

4. a. A solution of palmitic acid (M = 256 g mol^{-1}) in benzene contains 4.24 g of the acid per liter. When this solution is dropped on a water surface, the benzene evaporates and the palmitic acid forms a mono molecular film. If we wish to cover an area of 500 cm^2 with a monolayer, what volume of acid solution should be used (area occupied by one palmitic acid molecule = 21×10^{-20} m^2. [10 marks]

b. A protein with a molar mass of 60,000 g mol^{-1} forms a perfect gaseous film on water. What area of film per milligram of protein will produce a pressure of 0.005 N m^{-1} at 25^0 C? (R = 8.314 (J $K^{-1}mol^{-1}$)) [10 marks]

c. List the characteristics for surfactants that must be evaluated for various applications [05 marks]