RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B.Sc. (Honours) Degree in Chemistry
Fourth Year - Semester II Examination – February/March 2019

CHE 4203 – SURFACE AND COLLOIDAL CHEMISTRY

Time: Two (2) hours

Answer any four (04) questions. Only first four (04) answers will be graded.

R= 8.314 J K^{-1} mol^{-1} c = 3.0×10^8 m s^{-1}, Boltzmann constant, k = 1.381×10^{-23} J K^{-1}

1. a) i. Discuss the term "Surface Tension". Use required diagrams and equations in your answer.

ii. A soap film with a width of 5 cm, was expanded in 15 mm in length. Calculate the work done and the surface tension of the film. The force used was 1.5 mN.

(30 marks)

b) i. Explain the capillary action by means of a surface wetting liquid.

ii. Discuss the statement, "capillary action cannot be used to get a continues flow".

(40 marks)

c) i. Elaborate dialysis in the context of colloidal chemistry

ii. Clarify the importance of electrodialysis.

(30 marks)

2. a) Obtain Gibb's adsorption isotherm for two component system where the solute is nonionic. Given that Gibb's adsorption isotherm is $d\gamma = -RT \Sigma \Gamma_i d(\ln a_i)$.

(30 marks)

b) Explain how the cross-sectional area of a surfactant molecule is estimated using Gibb's adsorption isotherm equation. **(30 marks)**

c) Argue which of the two molecules; $C_{11}H_{23}N(CH_3)_3Br$ or $C_{15}H_{31}N(CH_3)_3Br$, has lower critical micelles concentration. **(20 marks)**

d) i. Define the craft temperature.

ii. Describe the behavior of surfactants above and below the craft temperature.

(20 marks)

3. a) There are two immiscible liquids in a vessel, water (50 mL) and oil (5 mL).

i. Explain how to make a permanent dispersion out of these liquids.

ii. Describe a technique to identify a dispersion.

iii. What type of dye one has to use to colour the dispersion prepared above.

(40 marks)

b) i. Account for the lipophilic and lipophobic sols

ii. Explain how to stabilize a lipophilic sol.

(30 marks)

c) Justify the sudden drop in potential to Zeta potential in an electrical double layer.

(30 marks)

4. Use the following data given for the adsorption of CO on charcoal at 273 K.

P/ Nm^{-2}	13300	26700	40000	53300	66700	80000
V/ cm^3	10.2	18.6	25.5	31.5	36.9	41.6

Langmuir adsorption isotherm is given below.

$$\theta = \frac{Bp}{1+Bp} \quad \text{where } \theta = \frac{V}{V_m}$$

a) Obtain a linear relationship from the above isotherm and define the terms therein

(30 marks)

b) Show the data given above fit to the Langmuir isotherm using the linear relationship obtained. **(35 marks)**

c) Find the value of B and the number of adsorption sites present in charcoal. **(35 marks)**

5. a) Compare and contrast chemisorption and physisorption. **(50 marks)**

b) Discuss coagulation and flocculation in detail. **(50 marks)**

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