CHUKA   **UNIVERSITY**

UNIVERSITY EXAMINATIONS

THIRD YEAR EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR SCIENCE

CHEM 326: COLLOID AND SURFACE CHEMISTRY

STREAMS: BSC   **TIME: 2 HOURS**

DAY/DATE: MONDAY 15/4/2019   **11.30 A.M. – 1.30 P.M.**

INSTRUCTIONS: Answer question ONE and any other TWO questions

QUESTION ONE (30 MARKS)

(a)   Using a suitable example give the three types of solutions   [3 marks]

(b)   Give three classification of colloids   [3 marks]

(c)   Discuss the following terms in reference to colloids

    (i)   Nucleation and growth

    (ii)   Dialysis

    (iii)   Translation diffusion   [7 marks]

(d)   (i)   Give the expression of the stokes law and define the terms   [2 marks]

    (ii)   List the three assumptions for the derivation of the stokes law   [3 marks]

(e)   List three advantages of light scattering over other alternative techniques of particle size

    analysis   [3 marks]

(f)   Briefly explain the following terms:

    (i)   Rayleigh scattering

    (ii)   Debye scattering

    (iii)   Mie scattering   [3 marks]

(g)   Discuss three factors affecting critical micelle concentration   [6 marks]

QUESTION TWO (20 MARKS)

(a)   Using a graph of particle size and concentration show the dependence of particle size on reagent concentration for the participation of a sparingly soluble material as shown in the equation below

(b)   Discuss the four stages of addition polymerization   [4 marks]

(c)   Using a diagram discuss the four types of adsorption isotherms   [8 marks]

(d)   Discuss briefly the two factors that determine the type of emulsion formed when a pair of immiscible liquids is homogenized   [4 marks]

QUESTION THREE (20 MARKS)

(a)   State the three assumptions of the Langmuir adsorption isotherm   [3 marks]

(b)   Give the mathematical expression of the Langmuir adsorption isotherm and define the terms   [3 marks]

(c)   Briefly discuss the following terms:
   (i)   Foams
   (ii)   Microemulsions
   (iii)   Gibbs – Marangoni surface elasticity effect   [6 marks]

(d)   (i)   Give the equation for the mass average relative molecular mass or particle (M_r)
                  and define the terms

       (ii)   Explain the following system when

               (I) M_r (mass average) *¿* M_r (Number average)   [3 marks]

               (II)   Mr (Mass average) = Mr (number average)   [2 marks]

(e)   Give the mechanism of emulsion polymerization   [3 marks]

QUESTION 4 (20 MARKS)

(a)   Write the Brunauer, Emmct and Teller equation (BET) equation and define the terms

                                                                                                                         [3 marks]

(b)   (i)   Define detergency   [1 mark]

        (ii)   Give two main draw backs of soap as a detergent   [2 marks]

        (iii)   Explain briefly the properties of a good detergent   [3 marks]

(c)   Discuss the diffuse double layer   [4 marks]

(d)   (i)   Define electrokinetic phenomena   [1 mark]

        (ii)   Discuss briefly two electrokinetic phenomena   [4 marks]

(e)   Discuss briefly two factors that favour emulsion stability   [2 marks]