CHUKA  **UNIVERSITY**

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE IN INDUSTRIAL CHEMISTRY

CHEM 326: COLLOID AND SURFACE CHEMISTRY

STREAMS: EB2, EB8 & EB14 **TIME: 2 HOURS**

DAY/DATE: TUESDAY 09/04/2024 **11.30 A.M. – 1.30 P.M.**

INSTRUCTIONS

- **Answer Question ONE (Compulsory) and Any Other Two Questions**
- **Do not write on the question paper**

QUESTION ONE (30 MARKS)

(a) (i) Name any four systems which are colloidal (2 marks)

(ii) Highlight three types of solutions giving an example of each (3 marks)

(b) Basically, the formation of colloidal material involves either degradation of bulk matter or aggregation of small molecules or ion.

(i) Give two reasons why dispersion of bulk material by simple grinding in a colloid mill or by ultrasonic may not generally lead to extensive subdivision (2 marks)

(ii) State two ways on how finer dispersions can be obtained (2 marks)

(iii) Using this technique explain how a Sulphur sol in the upper colloidal range can be prepared (2 marks)

(c) (i) A satisfactory detergent must possess three types of properties. Highlight them (3 marks)

(ii) State four models that guide the simplest quantitative treatment of the diffuse part of the double layer as proposed by Gouy (1910) and Chapman (1913) (4 marks)

(d) (i) Explain two practical difficulties that may arise in measuring osmotic pressure if the solution is simply allowed to rise and seek its own equilibrium level (4 marks)

(ii) State two ways of overcoming the difficulties mentioned in d(i) above with respect to measuring osmotic pressure (2 marks)

(e) (i) Explain the Tyndall effect (Turbidity) based on light scattering on colloidal solutions or Dispersions (2 marks)

(ii) State four advantages of light scattering over other alternative techniques of particle-size Analysis (4 marks)

QUESTION TWO (20 MARKS)

(a) State and explain three examples of hydrosols which can be prepared by suitably controlled chemical reaction (6 marks)

(b) Using a suitable example, state and explain additional polymerization (4 marks)

(c) Stated three assumptions of Stokes' law (3 marks)

(d) Explain the following

(i) Brownian motion (3 marks)

(ii) Fick's first and second law of diffusion (4 marks)

QUESTION THREE (20 MARKS)

(a) Explain stepwise how the scanning electron microscope can be used to increase the resolving power of a microscope so that matter of colloidal dimensions may be observed directly (8 marks)

(b) State and explain six factors that favour emulsion stability (12 marks)

QUESTION FOUR (20 MARKS)

(a) State the type of surface tension in the following molecules;

(i) Water (1mark)

(ii) Mercury (1mark)

(iii) Hydrocarbons (1mark)

(b) Using a suitable example, explain any three classifications of surfactants (9 marks)

(c) Highlight three classes of light scattering (3 marks)

(d) Colloids can be classified based on the type of particles of dispersed phase. Explain (5 marks)

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