

CHUKA



UNIVERSITY

## UNIVERSITY EXAMINATIONS

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

**CHIN 323: INDUSTRY FORMULATION CHEMISTRY AND TECHNOLOGY****STREAMS: BSC. INDUSTRIAL CHEMISTRY****TIME: 2 HOURS****DAY/DATE: WEDNESDAY 07/07/2021****5.00 P.M. – 7.00 P.M.****Instructions: Answer Question ONE and any other TWO questions.****QUESTION ONE (30 MARKS)**

- a) Explain the term formulation chemistry (2 marks)
- b) Briefly explain the following terms in relation to formulation chemistry:
- i) Microemulsions (2 marks)
  - ii) Nanoemulsions (2 marks)
  - iii) Foams (2 marks)
- c) Differentiate between anionic and cationic surfactants (3 marks)
- d) i) Explain the term dispersions (2 marks)
- ii) Briefly explain two main processes utilized for the preparation of solid liquid dispersions (4 marks)
- e) Explain the concept of wetting (2 marks)
- f) Give two main procedures applied for the characterization of suspensions and assessment of their stability (2 marks)
- g) Using suitable examples discuss two industrial applications of emulsions (4 marks)
- h) Give four factors affecting stability of multiple emulsions (4 marks)
- i) Give four methods that may be applied to prepare nanoemulsions (2 marks)

**QUESTION TWO (20 MARKS)**

- a) Discuss the following terms in relation to formulation chemistry:
- i) Suspensions (2 marks)
  - ii) Latexes (2 marks)
  - iii) Suspoemulsions (2 marks)
  - iv) Nanosuspensions (2 marks)
- b) Give three light scattering techniques for characterization of suspensions (3 marks)
- c) Briefly discuss three methods used to prepare polymer dispersions (6 marks)
- d) Explain how to prepare a W/O/W multiple emulsion (3 marks)

**QUESTION THREE (20 MARKS)**

- a) Give three factors that determine the various states (structures) of concentrated suspensions (3 marks)
- b) Briefly discuss the following breakdown processes in emulsions:
- i) Creaming and Sedimentation (2 marks)
  - ii) Flocculation (2 marks)
  - iii) Ostwald Ripening (Disproportionation) (2 marks)
- c) Briefly discuss suspoemulsions in sunscreens and colour cosmetics (4 marks)
- d) Give three advantages of nanoemulsion for application in personal care products and cosmetics (3 marks)
- e) Discuss two methods available to establish emulsion type (4 marks)

**QUESTION FOUR (20 MARKS)**

- a) Briefly explain three reasons why the formulation of suspoemulsions is not an easy task (6 marks)
- b) Discuss three categories of multiple emulsions (6 marks)
- c) Discuss i) Water-in-Oil-in-Water emulsions (2 marks)
- ii) Oil-in-Water-in-Oil emulsions (2 marks)
- d) Briefly discuss the following methods of formulation analysis:
- i) Total solid content (2 marks)
  - ii) Ash determination (2 marks)