**CHIN 323: INDUSTRY FORMULATION CHEMISTRY AND TECHNOLOGY**

**Instructions: Answer Question ONE and any other TWO questions.**

**QUESTION ONE (30 MARKS)**

a) Explain the term formulation chemistry (2 mks)

b) Briefly explain the following terms in relation to formulation chemistry:

i) Microemulsions (2mks)

ii) Nanoemeulsions (2mks)

iii) Foams (2mks)

c) Differentiate between anionic and cationic surfactants (3mks)

d) i) Explain the term dispersions (2 mks)

ii) Briefly explain two main processes utilized for the preparation of solid liquid dispersions (4mks)

e) Explain the concept of wetting (2mks)

f) Give two main procedures applied for the characterization of suspensions and assessment of their stability (2mks)

g) Using suitable examples discuss two industrial applications of emulsions (4mks)

h) Give four factors affecting stability of multiple emulsions (4mks)

i) Give four methods that may be applied to prepare nanoemulsions (2mks)

**QUESTION TWO (20 MARKS)**

a) Discuss the following terms in relation to formulation chemistry:

i) Suspensions (2mks)

ii) Latexes (2mks)

iii) Suspoemulsions (2mk)

iv) Nanosuspensions (2mks)

b) Give three light scattering techniques for characterization of suspensions (3mks)

c) Briefly discuss three methods used to prepare polymer dispersions (6mks)

d) Explain how to prepare a W/O/W multiple emulsion (3mks)

**QUESTION THREE (20 MARKS)**

a) Give three factors that determine the various states (structures) of concentrated suspensions (3mks)

b) Briefly discuss the following breakdown processes in emulsions:

   i) Creaming and Sedimentation (2mks)

   ii) Flocculation (2 mks)

   iii) Ostwald Ripening (Disproportionation) (2mks)

c) Briefly discuss suspoemulsions in sunscreens and colour cosmetics (4mks)

d) Give three advantages of nanoemulsion for application in personal care products and cosmetics (3mks)

e) Discuss two methods available to establish emulsion type (4mks)

**QUESTION FOUR (20 MARKS)**

a) Briefly explain three reasons why the formulation of suspoemulsions is not an easy task (6 mks)

b) Discuss three categories of multiple emulsions (6 mks)

c) Discuss i) Water-in-Oil-in-Water emulsions (2mks)

   ii) Oil-in-Water-in-Oil emulsions (2 mks)

d) Briefly discuss the following methods of formulation analysis:

   i) Total solid content (2mks)

   ii) Ash determination (2mks)