



**NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY**  
**DEPARTMENT OF APPLIED CHEMISTRY**  
**BACHELOR OF SCIENCE HONOURS DEGREE**  
**END OF FIRST SEMESTER EXAMINATIONS – JANUARY 2011**  
**ANALYTICAL CHEMISTRY III – SCH 4206**  
**TIME: 3 HOURS**

**INSTRUCTIONS TO CANDIDATES**

Answer **ANY FOUR** questions out of **FIVE** questions provided.  
Each question carries 25 marks.

---

1. (a) Sampling and sample preparation are two very important stages in Analytical Chemistry. With specific examples explain this statement. [15 marks]
- (b) What is the difference between a gross sample and a laboratory sample? [10 marks]
2. (a) What is the difference between essential water and nonessential water in relation to the molecular or crystalline structure of a compound in a solid state/ [10 marks]
- (b) Distinguish between wet ashing and dry ashing. [10 marks]
- (c) What is the effect of temperature and humidity on the water content of solids? [5 marks]
3. (a) Describe any two techniques that are employed in dealing with interferences. Please give specific examples. [10 marks]
- (b) Lead forms a neutral complex  $PbO_2$  with the ligand  $Q^-$ . The constant  $K_{ex}$  for the distribution of this complex between water and  $CCl_4$  has been found by experiment to be  $2.0 \times 10^4$ . A 25.0mL aliquot of an aqueous solution that is  $5.00 \times 10^{-4}$  M in  $Pb^{2+}$  and 0.500M in  $HClO_4$  is extracted with two 10.0mL portions of  $CCl_4$  that are 0.0250 M in HQ. Calculate the percentage of unrecovered  $Pb^{2+}$  in the aqueous solution. [15 marks]

4. (a) Differentiate between the following terms as used in solvent extraction.
- (i) An exhaustive and countercurrent extraction. [8 marks]
  - (ii) Distribution coefficient and a distribution ratio. [8 marks]
- (b) What is ion exchange mechanism, give examples of the application of this technique. [9 marks]
5. (a) What problems are encountered during the separation of species in the trace amounts by precipitation. [10 marks]
- (b) Describe with an example how separation by electrolyte precipitation is achieved. [10 marks]
- (c) What are the main disadvantages of solvent extraction. [5 marks]

*End of question Paper!!!*