NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF APPLIED CHEMISTRY
BACHELOR OF SCIENCE HONOURS DEGREE
END OF FIRST SEMESTER EXAMINATIONS – FEBRUARY 2010
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.

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1. (a) Assume that the average particle in the carload of lead ore just considered is judged to be approximately spherical with a radius of about 5mm. Roughly 4% of the particles appear to be galena (~70% Pb), which has a density of 7.6g/cm^3 and contain little or no lead. How many pounds of ore should the gross sample contain if the sampling uncertainty is to be kept below 0.5% relative? [10 marks]

   (b) Differentiate between:

   (i) sorbed water, adsorbed water and occluded water. [5 marks]

   (ii) essential water and non-essential water. [5 marks]

   (iii) gross sample and laboratory sample. [5 marks]

   (iv) Explain the effect of temperature and humidity variations on (i) and (ii).

2. (a) In sample preparation several sources of error are encountered. Describe any three of these, giving examples. [10 marks]

   (b) Distinguish between wet ashing and dry ashing. [10 marks]

   (c) What fluxes are suitable for the determination of alkali metals in silicates? [5 marks]

3. (a) There are two general methods of dealing with interferences. Describe these and give specific examples. [8 marks]

(b) The distribution coefficient for a weak acid between diethyl ether and water is found to be 800, and its acid dissociation constant in water is 1.50×10^{-5}. Calculate the analytical concentration of HA, c_{HA}, remaining in an aqueous solution after the extraction of 50.0mL of 0.0500 MHA with 25.0mL of ether, assuming the aqueous solution is buffered to a pH of (a) 2.00 and (b) 8.00. [17 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 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!!!