NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF APPLIED CHEMISTRY
END OF SEMESTER TWO EXAMINATIONS:TTE – MAY 2013
ANALYTICAL CHEMISTRY I – SCH 1206
TIME: 3 HOURS

INSTRUCTIONS TO CANDIDATES
Answer ALL questions from this question paper.
Total Marks – 100

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1. (a) Describe three systematic errors in analytical chemistry and discuss how each can be minimised. [15 marks]

   (b) The following results were obtained for replicate determinations of the percentage of chloride in a solid chloride sample: 59.83, 60.04, 60.45, 59.88, 60.33, 60.24, 60.28, 59.77.

   Calculate:

   (i) the arithmetic mean,
   (ii) the standard deviation, and
   (iii) the relative standard deviation (in percent) [10 marks]

2. (a) Volumetric analysis requires the use of standard solution. What are the ideal properties of a standard solution? [10 marks]

   (b) Briefly describe or define (with specific examples)

   (i) A weak electrolyte [5 marks]
   (ii) Auto protolysis [5 marks]
   (iii) A strong acid [5 marks]

3. (a) What factors affect end-point sharpness in an acid/base titration? [6 marks]

   (b) What variables can cause the pH range of an indicator to shift? [6 marks]

   (c) What is a buffer solution and what are its properties? [8 marks]

   (d) State Le-Charteliers' principle? Using this principle explain what happens to the solubility of AgCl if we add concentrated HNO_3 to the equilibrium solution defined by the reaction:

$$AgCl(s) + 2NH_3(aq) \rightleftharpoons Ag(NH_3)_2^+(aq) + Cl^-(aq)$$ [5 marks]

4. (a) Define chemical equilibrium? [2 marks]

(b) What is the molar solubility of calcium carbonate in a saturated solution at 298K? $K_{sp} = 5.0 \times 10^{-10}$ mol^2 dm^{-6} [5 marks]

(c) What is the solubility of calcium carbonate (from above) in 0.1 mol dm^{-3} sodium carbonate solution? [6 marks]

(d) Given that the solubility of CaF_2 is 27 mg dm^{-3} , calculate the solubility product of CaF_2? [6 marks]

(e) Calculate the solubility of $Pb(IO_3)_2$ in 1.0×10^{-4} M $Pb(NO_3)_2$. Given that K_{sp} for $Pb(IO_3)_2$ is 2.5×10^{-13}. [6 marks]

End of question Paper!!!