



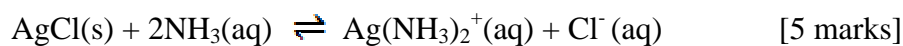
NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF APPLIED CHEMISTRY
END OF SEMESTER TWO EXAMINATIONS: TTE – MAY 2013
ANALYTICAL CHEMISTRY I – SCH 1206
TIME: 3 HOURS

INSTRUCTIONS TO CANDIDATES

Answer **ALL** questions from this question paper.

Total Marks – 100

-
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 HNO₃ to the equilibrium solution defined by the reaction:



4. (a) Define chemical equilibrium? [2 marks]
- (b) What is the molar solubility of calcium carbonate in a saturated solution at 298K?
 $K_{\text{sp}} = 5.0 \times 10^{-10} \text{ mol}^2 \text{ dm}^{-6}$ [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 $\text{Pb}(\text{IO}_3)_2$ in $1.0 \times 10^{-4} \text{ M Pb}(\text{NO}_3)_2$. Given that K_{sp} for $\text{Pb}(\text{IO}_3)_2$ is 2.5×10^{-13} . [6 marks]

End of question Paper!!!