



NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
BACHELOR OF SCIENCE HONOURS DEGREE
DEPARTMENT OF APPLIED CHEMISTRY
END OF SEMESTER TWO EXAMINATIONS – MAY 2011
ANALYTICAL CHEMISTRY I – SCH 1206
TIME: 3 HOURS

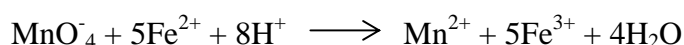
INSTRUCTIONS TO CANDIDATES

Answer **ANY FOUR** questions from this question paper.
Total Marks – 100

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1. (a) Compare and contrast the following concepts
- (i) Precision and Accuracy
 - (ii) Systematic and Random errors
 - (iii) Mean and Median
 - (iv) Absolute and relative error
 - (v) Constant and proportional error [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, and 59.77. Calculate:
- (a) the arithmetic mean,
 - (b) the standard deviation, and
 - (c) the relative standard deviation (in percent). [10 marks]
2. (a) Define the following:
- (i) Normality.
 - (ii) Molarity.
 - (iii) Equivalent weight.
 - (iv) Ionic strength.
 - (v) Activity coefficient. [15 marks]
- (b) A 0.1799 g sample of an organic compound was burned in a stream of oxygen, and the CO₂ produced was collected in a solution of barium hydroxide. Calculate the percentage of carbon in the sample if 0.5613 g of BaCO₃ was formed. [10 marks]
3. (a) Explain the difference between:
- (i) a colloidal and a crystalline precipitate [4 marks]
 - (ii) precipitate and co-precipitate [4 marks]
 - (iii) occlusion and mixed crystal formation [4 marks]

- (b) A 0.6407 g sample containing chloride and iodide ions gave a silver halide precipitate weighing 0.4430g. This precipitate was then strongly heated in a stream of Cl_2 gas to convert the AgI to AgCl ; upon completion of this treatment, the precipitate weighed 0.3181 g. Calculate the percentage of chloride and iodide in the sample. [13 marks]

4. (a) A 0.8040g sample of an iron ore is dissolved in acid. The iron is then reduced to Fe^{2+} and titrated with 47.22 mL of 0.02242 M KMnO_4 solution. Calculate the results of this analysis in terms of (a) % Fe (55.847 g/mol) and (b) % Fe_3O_4 (231.54 g/mol). The reaction of the analyte with the reagent is described by the equation:-

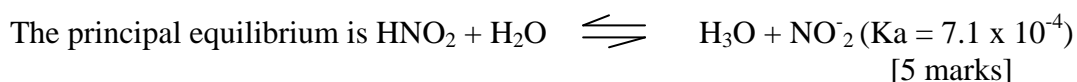


[15 marks]

- (b) Distinguish between:

- (i) The equivalence point and the end point of a titration. [5 marks]
(ii) A primary standard and a secondary standard. [5 marks]

- (c) Calculate the hydronium ion concentration in 0.120M nitrous acid.



5. (a) Briefly describe the following:

- (i) A weak electrolyte. [5 marks]
(ii) The conjugate base of a Bronsted acid. [5 marks]

- (b) Calculate the ionic strength of:

- (i) 0.040M FeSO_4 [4 marks]
(ii) 0.10M in FeCl_3 and 0.02M FeCl_2 [5 marks]

- (c) Why are the standard reagents used in neutralization titrations generally strong acids and bases rather than weak acids and bases?

[6 marks]

End of question Paper!!!