



200

# KIBABII UNIVERSITY

**UNIVERSITY EXAMINATIONS  
2017/2018 ACADEMIC YEAR**

**SECOND YEAR YEAR SECOND SEMESTER  
MAIN EXAMINATIONS**

**FOR THE DEGREE OF B.ED (SCIENCE)**

**COURSE CODE: SCH 220**

**COURSE TITLE: ANALYTICAL CHEMISTRY I**

**DURATION: 2 HOURS**

**DATE: 7/8/ 2018 TIME: 9-11AM**

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**INSTRUCTIONS TO CANDIDATES**

- Answer **QUESTION ONE** (Compulsory) and any other two (2) Questions.
- Indicate **answered questions** on the front cover.
- Start every question on a new page and make sure question's number is written on each page.

This paper consists of 3 printed pages. Please Turn Over



**KIBU observes ZERO tolerance to examination cheating**

## Question one (30 marks)

- 1.
- Define the term sample. **(1mks)**
  - Name four methods of sample storage **(4mks)**
  - Describe two different sampling methods one would apply when collecting Laboratory soil samples. Give the strengths and weaknesses of each. **(4mks)**
  - Define the term Gravimetric analysis. **(1mks)**
  - In actual weighing procedure, the exact squence of operations depent upon the make balance in use and arrangement of controls. Outline the squence of operations when using a simple beam balance. **(2mks)**
  - State any **four** characteristics of a solution. **(4mks)**
- g) Differatiate by defining;
- specific preccipitating agent. **(1mks)**
  - selective precipitating agent. **(1mks)**
- h) What is **sample preparation**? Why is it important to prepare a sample before analysis? **(2mks)**
- i) Explain the following sample preparation techniques. **(7mks)**
- Dissolution,
  - Extraction,
  - Pulverizing,
  - Chelating
  - Masking,
  - Filtering,
  - Sub-Sampling.
- j) State four desirable qualities of a primary standard. **(2mks)**
- k) Describe how you would prepare one litre of 100ppm solution of  $\text{Na}^+$  using solid  $\text{Na}_2\text{CO}_3$  stock. ( $\text{Na}_2\text{CO}_3 = 106.00\text{g}$ ) **(2mks)**

## Question two (20 marks)

- Describe the procedure for gravimetric analysis of a sample. **(5mks)**
- A 2.00g sample of limestone was dissolved in dilute HCl and all the  $\text{Ca}^{2+}$  ions in the sample converted into solution. Excess ammonium oxalate  $\{(\text{NH}_4)_2\text{C}_2\text{O}_4\}$  was added to precipitate the  $\text{Ca}^{2+}$  ions as  $\text{CaC}_2\text{O}_4(\text{s})$ . The solid was filtered, dried and weighed to a constant mass of 2.43g. Calculate the percentage of calcium in limestone. **(3mks)**
- State four properties of a good precipitate. **(2mks)**
- State FOUR sources of error in the process of analysis in (a) above that would lead to inaccurate percentage composition. **(4mks)**

- e) Explain how the sources of error in c(i) above affect the final yield of the analyte. (2mks)
- f) A certain Barium halide has formula  $BaX_2 \cdot 2H_2O$  exists as a hydrated salt where X is the halogen. In an experiment 0.2650g of that salt was dissolved in  $200cm^3$  of water. Barium was then precipitated using sulphuric acid and the mixture digested at boiling point for 45 minutes to produce crystals of Barium sulphate. The final dried mass of Barium sulphate was 0.2533g. calculate the RAM of X in the formula hence identify X. (4 mks)

### Question three (20 marks)

- a) What is **Supercritical carbon dioxide** ( $sCO_2$ )? Explain why it is a popular industrial solvent. (4mks)
- b) By using a suitable diagram as appropriate, describe how the following extraction methods are done (4mks)
- Steam distillation
  - Vacuum distillation
- c)
- State "distribution law" (1mks)
  - Why is distribution constant important? (2mks)
  - Write an expression to show the concentration of analyte [A] remaining in the aqueous phase after several extractions. (1mks)
- d) The distribution constant K for Iodine between an organic solvent and water is 85. Find the concentration of Iodine remaining in the water layer after extraction of  $10^{-3}$  mol.L<sup>-1</sup> iodine solution with the following quantities of organic solvent. (5mks)
- One portion of 50ml
  - Two portions of 25ml
  - Five portions of 10ml
- e) What are the limitations of Liquid-liquid extraction. (3mks)

### Question four (20 marks)

- a) The following are a set of Separation Processes based on "Basic separation Techniques".
- Distillation
  - Crystallization
  - Magnetic separation
  - Electrophoresis
- Explain the underlying principle of each technique. (8mks)
- b) What is the separation by polymer membrane? (2mks)
- c) How would a chemist separate the following pairs in a laboratory? (10mks)

- i. Oxygen rich components and Nitrogen rich components?  
o-Xylene and m-Xylene products of the same compounds?
- ii. Oil and Hexane separated?
- iii. A mixture of isopropyl alcohol and water is be separated?
- iv. A mixture of iron and copper fillings is be separated?
- v. The DNA fragments be separated from DNA?