

2915/202
INDUSTRIAL CHEMISTRY I AND
INSTRUMENTAL METHODS OF
ANALYSIS I
Oct. / Nov. 2022
Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN ANALYTICAL CHEMISTRY
MODULE II

INDUSTRIAL CHEMISTRY I AND INSTRUMENTAL METHODS OF ANALYSIS I

3 hours

INSTRUCTIONS TO CANDIDATES

*You should have the following for this examination: Answer booklet;
Scientific calculator.*

This paper consists of TWO sections; A and B.

Answer ALL the questions in section A and any THREE questions from section B.

Each question in section A carries 4 marks while each question in section B carries 20 marks.

Maximum marks for each part of a question are indicated.

Candidates should answer the questions in English.

This paper consists of 4 printed pages.

**Candidates should check the question paper to ascertain that all
the pages are printed as indicated and that no questions are missing.**

SECTION A (40 marks)

Answer ALL the questions in this section.

1. State **four** advantages of the lovibond colour comparator as used in colorimetry. (4 marks)
2. State the causes of physical interferences in UV-visible spectrophotometry. (4 marks)
3. (a) Name **two** methods of sample storage in the laboratory. (2 marks)
(b) Differentiate between composite and grab sampling. (2 marks)
4. 250 ppm potassium ions solution gave an absorbance of 58.5 in a UV-spectrophotometer when measured in a 1 cm cell. Calculate the molar absorptivity of the solution in $l\text{mol}^{-1}\text{cm}^{-1}$
 $K = 39$. (4 marks)
5. Distinguish between matrix matching and wet ashing as used in flame photometry. (4marks)
6. Describe **two** chemical interferences encountered in FAEs. (4 marks)
7. List **four** sources of glycerides of fatty acids that are used in soap making. (4marks)
8. Explain the use of the following equipments in the analysis of cellulose:
 - (a) scanning electron microscope (SEM); (2 marks)
 - (b) Fourier transform infrared (FTIR). (2 marks)
9. Differentiate between vacuum and steam distillation. (4 marks)
10. Name **four** types of cosmetic products. (4 marks)

SECTION B (60 marks)

Answer THREE questions from this section.

11. Describe using examples, the causes of deviation from Beer-Lambert's law, under the following heading:
- (a) spectral interferences; (6 marks)
 - (b) chemical interferences. (9 marks)
 - (c) instrumental factors. (5 marks)
12. (a) Outline the steps that lead to the production of analytical signal in AES. (8 marks)
- (b) Describe **four** factors that determine the percentage of the atomised sample in AES. (12 marks)
13. (a) Describe the preparation of 100 cm³ of a solution of concentration 100 ppm with respect to potassium using potassium permanganate by the method of direct weighing
K = 39, Mn = 55, O = 16. (5 marks)
- (b) (i) Give any **three** factors to be considered when choosing a method of analysis for a given sample. (3 marks)
- (ii) Name **two** methods of classifying analytical methods. (2 marks)
- (c) (i) Define the following terms as used in UV-visible spectrophotometry:
- (I) chromophore; (2 marks)
 - (II) auxochrome. (2 marks)
- (ii) State **four** limitations of AES. (4 marks)
- (iii) Explain how memory effects are minimised during analysis of a sample by flame photometry. (2 marks)

14. (a) Describe the main stages of soap manufacturing in the industry. (10 marks)
- (b) State the application of the following unit operations in the industry:
- (i) filtration; (3 marks)
 - (ii) blending. (3 marks)
- (c) Explain the following physicochemical parameters as used in water analysis:
- (i) electrical conductivity;
 - (ii) biochemical oxygen demand;
 - (iii) alkalinity;
 - (iv) total dissolved solids. (4 marks)
15. (a) (i) Differentiate between cellulose and hemicellulose. (4 marks)
- (ii) Explain **four** factors that must be well planned in order to achieve proper sampling of waste water. (8 marks)
- (iii) List general steps required in water quality analysis procedure. (4 marks)
- (b) Describe how microbial test is conducted in lipsticks. (4 marks)

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