

2528/204
2922/204
ENVIRONMENTAL ANALYTICAL
TECHNIQUES AND LABORATORY
MANAGEMENT
June/July 2016
Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL
DIPLOMA IN ENVIRONMENTAL SCIENCE AND TECHNOLOGY
MODULE II
ENVIRONMENTAL ANALYTICAL TECHNIQUES AND
LABORATORY MANAGEMENT

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examinations:

Answer booklet;

A non-programmable 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 in the answer booklet provided.

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

Maximum marks for each part of a question are as shown.

Do not remove any pages from this question paper.

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. (a) List **three** factors that make a material suitable for making tea bags. (3 marks)
- (b) Describe the advantage of vacuum filtration over gravity filtration. (1 mark)
can be used to filter very fine contents
2. Describe any two reasons for using an oil bath instead of a water bath in determining melting point of a substance. (4 marks)
3. (a) Write a mathematical expression for the distribution ratio, D , of a solute X , between an organic phase and an aqueous phase. (2 marks)
- (b) Explain all the terms of the expression in question 3(a) (2 marks)
4. Match the following types of resin with its respective permanently affixed ion exchange functional group. (4 marks)

Ion exchange resin type	Permanently affixed functional group
I: Strong acid cation resin	Quaternary ammonium ($-\text{CH}_2\text{N}(\text{CH}_3)_3^+\text{Cl}^-$)
II: Weak acid cation resin	Sulphuric group ($-\text{SO}_3\text{H}^+$)
III: Strong base anion resin	Free base ($-\text{NH}_2$)
IV: Weak base anion resin	Carboxylic group ($-\text{COO}^-\text{H}^+$)

5. (a) Explain the importance of using the most minimum amount of solvent to dissolve the solid during recrystallization process. (2 marks)
enable crystals form easily
- (b) State two reasons for the slow cooling of the hot filtrate during recrystallization. (2 marks)
*allow complete formation of crystals
allow all crystals to settle*
6. (a) Describe two conditions a compound must meet to be successfully separated by steam distillation. (2 marks)
*- highly soluble
- highly purified*
- (b) Explain the higher efficiency of a glass packed fractionating column compared to an ordinary column with no packing. (2 marks)
*it gives more time
creates more surface area to allow
the mixture to be separated effectively*
7. Explain the two functions that make management of an organization to undertake continuous planning and evaluation. (4 marks)
*enhance high productivity
to achieve future course of action*
8. List four factors that determine the amount of stock an organization can keep. (4 marks)
*- size of the organization
- demands of production
- security
- availability of stock*

$\frac{D}{X}$

9. State **four** characteristics that define management as a science. (4 marks)
10. Explain any **two** uses of an organization chart. (4 marks)

SECTION B (60 marks)

Answer any THREE questions from this section.

11. (a) State **four** conditions necessary for partition law to hold. (4 marks)
- (b) A solution contains 2 g of iodine dissolved in 20 ml of potassium iodide solution. If this solution is shaken with 20 ml of tetrachloromethane, determine the percentage of iodine remaining in the water. (5 marks)
- (c) Draw a labelled diagram of the soxhlet apparatus. (9 marks)
- (d) State **two** conditions that must be met for solvent extraction method to be used. (2 marks)
12. (a) Explain the following properties of primary standards.
- (i) stability; (2 marks)
- (ii) purity. (2 marks)
- (b) Differentiate between titration of a strong acid with a strong base and that of a strong acid with a weak base using titration curves. (6 marks)
- (c) (i) Name the most suitable indicator in a titration of acetic acid with sodium hydroxide solution. (2 marks)
- (ii) Explain the reasons for your answer in 12 C(i). (3 marks)
- (d) Determine the concentration of an ethanoic acid solution if 24.65 ml of the solution required exactly 25.20 ml of 0.1025 M potassium hydroxide solution to reach end point. (5 marks)
13. (a) Explain any **five** advantages of separating a mixture of organic compounds using thin layer chromatography instead of paper chromatography. (10 marks)
- (b) Describe the principle of an ion exchange process. (2 marks)
- (c) With the aid of equations, describe the removal of calcium and sulphate ions from a water sample by an ion exchange resin. (4 marks)
- (d) State **four** factors that determine the ion exchange capacity of a resin. (4 marks)

1) establish standards
 2) observe action
 3) evaluate deviation
 4) take appropriate action

- ✓ 14. (a) Outline the basic steps involved in the process of control in an organization. (4 marks)
- (b) Describe any four benefits an organization will get by using democratic leadership style of management. (8 marks)
- (c) Name three types of communication flow in an organization. (3 marks)
- (d) Explain the importance of budgeting to an organization. (5 marks)

- ✓ 15. (a) (i) Define the term price list. (1 mark)
- (ii) Explain the use of proforma invoice in a business enterprise. (2 marks)
- (b) Describe five challenges faced by a supermarket chain using a centralized purchasing system. (5 marks)
- (c) Describe any six duties of a storekeeper in a large organization. (12 marks)

stores goods
 P
 - orders
 - purchase
 - store
 - keep records
 - budgets

W
 - time consuming
 - loss of some goods
 - only for bulky goods

✓ Large chain
 ✓ time consuming
 ✓ loss of some goods
 ✓ delivery not in good terms - some are broken

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WOOD!
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