

9JABAZ

Want more books?

Visit 9jabaz.ng and download for free!!



TOPICS IN ANALYTICAL CHEMISTRY (CHM 423) 2024/2025 Mid-semester Exam

Instructions:

Answer all questions

Time: 60 minutes

Q1

- b. (i). Write the structure and Molecular formula for EDTA
(ii). Write two other names for EDTA
(iii). What is the basic principle involved in EDTA titration?
(iv). Mention one indicator used in EDTA titration
(v). How many EDTA is/are in operation
- b. (i). Give stepwise account of the procedure involved in increasing selectivity of EDTA by Chemical separation.
(ii). Explain the role of pH in EDTA titration.
(iii). What is/are the advantage(s) of EDTA as titrant?
- c. Explain the principle of Flame Emission Spectroscopy (FES).
- 2a. Explain briefly the general guidelines for the sampling of the soil.
- b. In not more than *four* lines in each case, describe the following terms as applied in the field of Environmental Chemistry: i. Sampling procedure and ii. Sampling unit .
- c. Itemize *four* objectives of sample preparation (15 marks).

H₄⁺
Na₂CO₃

repr

titrimetric

alkalimetric



OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE, NIGERIA
DEPARTMENT OF CHEMISTRY
B.Sc. (Chemistry) Degree Examination Part IV
Harmattan Semester Examination (2024/2025 Session)
CHM 423: TOPICS IN ANALYTICAL CHEMISTRY

So Pb and Br
Ca and Pb

no cv

Time Allowed: 2 hours

Date: 2nd March 2026

INSTRUCTION: Answer FOUR Questions in all, at least two in each section.

SECTION A

- 1(a). Explain how you can carry out the analysis of Lead (Pb) in wastewater using flame emission spectrometry. (5 marks)
 - (b). High temperature is not required for the analysis of Alkali metals, why? (1 mark)
 - (c). State four factors affecting the intensity of flame in emission spectrometry. (4 marks)
 - (d). Differentiate between interference and interferent. (2 marks)
 - (e). Explain the principle of Flame Emission Spectroscopy (FES). (3 marks)
- 2(a). Explain step by step how you will determine the total hardness of water using EDTA (5 marks)
 - (b). Based on definition, nature and significance, differentiate between Equivalent point and End point (3 marks)
 - (c). Why is buffer added in EDTA Titration (1 mark)
 - (d). Given 10 cm³ of 0.01 M Ca²⁺ solution buffered at pH 10 and titrate with 0.01 M EDTA solution Calculate the pCa at different stages of titration such as:
 - (i) At the start of the titration
 - (ii) After addition of 1.0 cm³ of titrant EDTA
 - (iii) At Equivalent point
 Give explanations for the answer at each stage (6 marks)

Volume = 10 cm³
conc = 0.01 of Ca²⁺, 0.01 M EDTA
pH = 10 n = CV
- log [Ca] (6 marks)

SECTION B

- 3(a). A set of scientists recently received a grant from World Health Organization (WHO) to carry out proximate analysis of octopus present in the Indian Ocean. They were instructed by the organization to exclude all octopus of less than 1.0 kg by weight from their investigation. Name and briefly explain the best sampling technique you would advise the scientists to use. (6 Marks)
 - b). Explain briefly the general guidelines for sampling of soil. (6 Marks)
 - c). In not more than five lines in each case, explain the following terms:
 - (i) Sampling unit
 - (ii) Gross sample and,
 - (iii) Analyte
- 4(a). Assuming your project title is "Investigation of the contamination profile of groundwater system in Ile-Ife senatorial district" Name and describe an appropriate sampling method you will use. (6 Marks)
 - 4(b). Briefly explain the terms transportation and Storage of Samples (6 Marks)
 - 4(c). Briefly describe the general Steps in Sampling Techniques for most geochemical analysis programmes. (6 Marks)

$$\frac{C_1 V_1}{10^3} \times \left(\frac{10}{10^3}\right)^3 \times \left(\frac{10^{-1}}{10^3}\right)^3$$

$C_1 V_1 = C_2 V_2$
 $C_1 \times 10 =$

Ca-oxalate
Mg-ammonium phosphate

Survey
Detailed consideration

5(a). Briefly explain the following techniques used in sampling of an atmosphere:

(i) Acidimetric method

(ii) Colorimetric method and,

(iii) Coulometric method

(6 Marks)

(b). Briefly explain the term acid leaching. State the advantage of acid leaching over HF dissolution and fusion technique

(6 Marks)

(c). (i) Briefly describe the term proximate composition

(ii) State how the five standard proximate in industry can be obtained analytically. (6 Marks)



OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE, NIGERIA
DEPARTMENT OF CHEMISTRY
B.Sc. Chemistry Degree Examination
CHM 423: TOPICS IN ANALYTICAL CHEMISTRY
2018/2019 Harmattan Semester Examination

Time Allowed: 2 Hours

Date: 1st August, 2019

Instructions: Answer all questions, each section in a separate booklet

SECTION A

- 1a. Briefly explain the following sampling procedures, backing your explanation with at least an example in each case.
- Judgmental sampling
 - Systematic sampling
- b. A research student wishes to study the concentrations of potentially toxic metals in groundwaters within Ibadan metropolitan. As an Analytical Chemist, suggest and describe an appropriate sampling method you would recommend for the research student.
- 2a. Briefly describe the typical stages of geochemical investigation that laboratory analysis of geological and environmental materials will pass through.
- b. Classify and describe briefly the chemical methods for the analyses of gaseous N and S compound pollutants.
- c. Explain briefly the term proximate composition ii. State how the five standard proximates in industry can be obtained analytically.
- d. State five merits of Particle induced x-ray emission (PIXE) over Atomic absorption spectrometry (AAS).

SECTION B

- 3a. Discuss, using suitable diagram, the electron arrangement/rearrangement in an atom exposed to X-Radiation.
- b.
- Explain the basic instrumentation set-up of X-ray fluorescence spectroscopy.
 - Briefly outline the different stages involved in XRF analysis.
 - Outline the limitations to X-ray fluorescence technique.
- C. Discuss the differences in both Atomic Absorption Spectrophotometry and X-ray fluorescence spectrometry under the followings:
- Instrumentation;
 - Sample preparation;
 - Sample requirement, and
 - Depth of probe
- 4a. Explain the basic working principle of ICP-AES technique.
- b.
- Briefly outline the advantages of ICP-MS Technique.
 - Explain in detail, an analytical technique you will use in determining the Concentrations of heavy metals in an air sample
- c. Draw a chemical structure of EDTA and explain the uniqueness of EDTA in chemical analysis.

Practice questions – CHM 423

1. Distinguish between an analyte and a sample.
2. An undergraduate project student intends to work on the artesian wells water system within Ife Central Local Government Area. As an Analytical Chemist, describe the type of sampling method you would recommend for the student.
3. Write a note on the general guidelines for the sampling of soil medium.
4. A group of Hydrologists are working on the assessment of potential toxic elements pollution of marine environment using African cuttlefish (*Sepia bertholoti*) from the Gulf of Guinea as an environmental bio-indicator. The grant for the work was facilitated by the Food and Drug Organization (FAO) and the organization instructed them to exclude cuttlefish of less than 1.0 kg by weight from the study. Describe the best sampling method you would advise the Scientists to use.
5. Write briefly on the general guidelines for the sampling of water
6. In not more than *four* lines in each case, describe the following terms as applied in the field of Environmental Chemistry: **i.** Sampling procedure **ii.** Sampling unit **iii.** Gross sample and **iv.** Analyte
7. Suppose your Research Project (CHM 421/CHM 422) topic is “Determination of the contamination profile of groundwater in Ilesa township” Name and explain a suitable sampling technique you will employ.
8. Describe briefly the general stages of geochemical study that the laboratory investigation of geological and environmental materials will pass through.
9. A student from Elizade University, Ilara Mokin, Ondo State wish to work on soils for his B.Sc degree research project and he is looking up to you as a student of a Nigerian first generation university. The goal of the research is to investigate the concentrations of available metals in the soil samples using Total Reflection X-ray fluorescence or Atomic absorption spectrometry. As an Analytical Chemist, describe the best type of sample preparation method you would recommend for the student.
10. Briefly explain the following sampling procedures, backing your explanation with at least an example in each case. **i.** Judgmental sampling and **ii.** Systematic sampling
11. A research student wishes to study the concentrations of potentially toxic metals in groundwaters within Ibadan metropolitan. As an Analytical Chemist, suggest and describe an appropriate sampling method you would recommend for the research student.

12. Briefly describe the typical stages of geochemical investigation that laboratory analysis of geological and environmental materials will pass through.
13. Classify and describe briefly the chemical methods for the analyses of gaseous N and S compound pollutants.
14. Explain briefly the term proximate composition
15. State how the five standard proximates in industry can be obtained analytically.
16. Name and describe the best sampling technique you would recommend for an air pollution expert investigating air pollution of a metropolitan area.
17. Briefly describe the common guidelines for the sampling of the soil.
18. List *four* objectives of sample preparation
19. As an Environmental Chemist, briefly educate a B.Sc. degree research project student on the usefulness of chemical methods of instrumental analysis as applied in Mineral exploration and exploitation by listing **five** important information these methods can provide.
20. Categorize and briefly describe the chemical procedures for the analyses of gaseous N and S compound pollutants.
21. Describe briefly the general guidelines for the sampling of the herbage.
22. In not more than *four* lines in each case, describe the following terms as applied in the field of Environmental Chemistry: **i.** Sampling procedure and **ii.** Sampling unit

CHM 423 - Practice questions

1 (a) An Environmental Chemist is working on the assessment of aerial (air) pollution of Ile-Ife metropolis using air particulates as indicators. The grant for the work was facilitated by the Federal Ministry of Environment, Nigeria. Name and describe the best sampling method you would recommend for the researcher to use.

(b) Supposing your Research project (CHM 421/CHM 422) topic is “Mineralogy of herbage” within Obafemi Awolowo University Farm, Ile-Ife”. Describe briefly the general guidelines for the sampling of the herbage.

(c) In not more than *four* lines in each case, describe the following terms as applied in the field of Environmental Chemistry: **i.** Sample **ii.** Sampling procedure **iii.** Sampling unit **iv.** Gross sample and **v.** Analyte

2 (a) List *four* objectives of sample preparation

(b). A Geoscience student of Elizade University, Ilara Mokin, Ondo State wish to carry out rock analysis for his B.Sc degree research project and he is looking up to you as a student of “GREAT IFE” for advice. Convince him to use chemical methods of instrumental analysis as applied in Mineral exploration and exploitation (MEE) by stating *five* critical information these methods can provide.

(c) Classify and describe briefly the chemical methods for the analyses of gaseous N and S compound pollutants.

(d) i. Explain briefly the term proximate composition **ii.** State how the five standard proximates in industry can be obtained analytically.