



**ELIZADE UNIVERSITY,  
ILARA-MOKIN, NIGERIA**

**FACULTY: BASIC & APPLIED SCIENCES**

**DEPARTMENT: BIOLOGICAL SCIENCES**

**SECOND SEMESTER EXAMINATION**

**2020/2021 ACADEMIC SESSION**

**COURSE CODE: EMT 202**

**COURSE TITLE: METHODS IN ENVIRONMENTAL ANALYSIS I**

**COURSE UNIT: 3 UNITS**

**DURATION: 2 HOURS**

**HOD's SIGNATURE**

**NAME:.....**

**MAT. No:.....**

**INSTRUCTION: ANSWER ANY 2 QUESTIONS FROM EACH SECTION**

## SECTION A

Table of critical values for Rejection Quotient

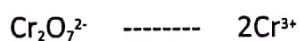
Number of observation	6	7	8	9	10
$Q_{critic}$ (90 % confidence), Reject if $Q_{exp} >$	0.56	0.51	0.47	0.44	0.41

## SECTION A

- 1a. During the calibration of a 10 mL pipette, a student obtained the following values in mL: 9.986, 9.973, 9.463, 9.990, 9.983, 9.980 and 9.988. From the given information, determine:
- if there is an outlier that should be rejected and hence, calculate the mean value.
  - the relative error of the mean in percentage.
  - the standard deviation and then write the result for volume of the pipette.
- b(i) State the supersaturation ratio. From it, which two conditions lead to a good precipitate?
- (ii) Give two types of gravimetric method of analysis. (20 Marks)
- 2a(i) Define sampling. Why is correct sampling very important in environmental analysis?
- (ii) Give two importance of environmental analysis.
- b(i) Explain nucleation.
- (ii) State in order, three steps in the procedure of gravimetry by precipitation.
- (iii) An ore is analysed for the manganese content by converting the manganese to  $Mn_3O_4$  and weighing the  $Mn_3O_4$ . If a 2.53 g sample yields  $Mn_3O_4$  of 0.238 g, calculate the gravimetric factor and hence, the %  $MnO_2$  in the sample. (O = 15.9994, Mn = 54.938) (20 Marks)
- 3a(i) State two differences between indeterminate error and determinate error.
- (ii) Give two types of systematic error based on source.
- (iii) Write a short note on determination of blank reagent in analysis.
- b. Define standard solution and name three apparatus for preparing a standard solution.
- c. A bottle of concentrated trioxonitrate (V) acid has a label stating: Specific gravity = 1.42, Percent Purity = 70 and Molecular mass = 63. From the information given, determine the:
- molarity of the acid;
  - volume of the stock solution needed to prepare 250 cm<sup>3</sup> of 0.50 M solution. (20 Marks)

## SECTION B

1. (a) Give 4 properties of primary standard
- (b) Differentiate between the following:
- Arrhenius acid and base
  - Bronsted lowry acid and base
  - Lewis acid and base
2. (i) Explain the indicators involved in precipitation titration
- (ii) What is the transition range for an indicator with an acid dissociation constant of  $1.0 \times 10^{-5}$
3. (i) Give the indicator involve in complexometric titration
- (ii) Calculate the potential of half equation



Carried out at pH of 2, given  $[\text{Cr}_2\text{O}_7^{2-}] = 10^{-3} \text{ M}$ ;  $[\text{Cr}^{3+}] = 10^{-2}$ ,  $[\text{H}^+] = 10^{-2}$  and  $E^\circ \text{Cr}_2\text{O}_7^{2-} / \text{Cr}^{3+} = 1.33 \text{ V}$