



EDO UNIVERSITY, IYAMHO, EDO STATE
FACULTY OF SCIENCE
DEPARTMENT OF CHEMISTRY
First Semester Examination, 2016/17 Session

Course Title: Experimental Chemistry I

Course Code: CHM 215

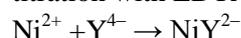
Date: May, 2017

Instruction: *Answer two (2) questions in all*

Time allowed: 3 hours

SECTION A (COMPULSORY)

1. The concentration of Ni^{2+} ion in a solution of nickel (II) sulphate can be determined by complexometric titration with EDTA (Y^{4-}) as shown in the equation below:



You are provided with 2.6 g of hydrated nickel (II) sulphate in 100 cm^3 of deionised water and 0.01 mol l^{-1} EDTA. Carefully follow the procedure below to determine the % of Ni^{2+} ion in a hydrated nickel sulphate solution.

- i. Pipette 20 cm^3 of the nickel (II) solution into a conical flask and dilute it to about 100 cm^3 with deionised water.
- ii. Add Murexide indicator (approximately 0.05 g) to the diluted nickel salt solution together with approximately 10 cm^3 of ammonium chloride solution.
- iii. Titrate the mixture with the EDTA solution and after the addition of about 15 cm^3 make the solution alkaline by adding approximately 10 cm^3 of 0.88M aqueous ammonia (concentrated ammonia solution). Continue the titration to the end-point.
- iv. Repeat the titrations until two concordant results are obtained.
- v. Calculate the percentage by mass of nickel in the sample of hydrated nickel(II) sulphate.
- vi. Calculate the theoretical percentage by mass of nickel in $\text{NiSO}_4 \cdot 6\text{H}_2\text{O}$ and compare this with the experimental value. Account for any difference.

(Ni = 57.8, H= 1.00, O= 16, S= 32)

SECTION B

2a. Define the following terms:

- i. Acid-base indicators..
- ii. pH

b. Give 5 examples of acid-base indicators.

c. Give the acid/base pairs which will produce the following salts:

- i. Sodium nitrate
- ii. potassium sulphate
- iii. ammonium chloride
- iv. ferric chloride
- v. sodium acetate.

d. In the following acid/base titrations, state with reasons, whether the pH at the equivalence point will be greater than, equal to, or less than 7.

- i. Sodium hydroxide/acetic acid
- ii. Sodium carbonate/hydrochloric acid
- iii. Sulphuric acid/ammonia
- iv. Sodium hydroxide/nitric acid

2e. Suggest suitable indicators for the acid/base titration in 2d above.

3a. Define the following terms

- (i) Rate of a reaction (ii) Order of a reaction (iii) Pseudo order reaction

3b. The hydrolysis of methyl acetate is catalysed by hydrogen ion, and proceeds according to the reaction.



A student carefully monitored the rate of hydrolysis of methyl acetate (a pseudo-first order reaction) using acid-base titration. The volume of acetic acid produced at intervals was titrated with 25cm³ of 1M sodium hydroxide using phenolphthalein as indicator. The average titre of NaOH used at various time intervals are shown in the table below:

Time (mins)	10	15	20	25	30
Volume of NaOH used (cm ³)	4	10	15	18	35

Given V_∞ to be 40.00 cm³,

- (i). Show that the reaction is a first order reaction
- (ii) Write the rate law
- (iii) What is the molecularity of the above reaction?