ELIZADE UNIVERSITY
FACULTY OF BASIC AND APPLIED SCIENCES
DEPARTMENT: PHYSICAL AND CHEMICAL SCIENCES
PROGRAMME: CHEMISTRY **EXAM TITLE: DEGREE EXAMINATION**
COURSE CODE & TITLE: CHM 207 – EXPERIMENTAL CHEMISTRY I
TIME ALLOWED: 3.5 hrs **SEMESTER/SESSION: FIRST / 2020/2021**
INSTRUCTIONS: Write your matriculation number on the cover page of the exam booklet.

HOD's SIGNATURE

Attempt ONE (1) question

QUESTION ONE [40 MARKS]

You are provided with 0.125g sample of egg shell. Place the egg shell sample in 250 mL of conical flask, add 50.00 mL of 0.200 M HCl using a pipette and back titrate the excess HCl with 0.250 M NaOH.

A. Outline the procedure for this experiment [9 Marks]

B. Write a balanced chemical equation for the reaction and derive an expression for the equilibrium constant. [5 Marks]

Calculate:

C. The concentration of Ca^{2+} from the saturated $Ca(OH)_2$ solution [6 Marks]

D. The standard deviation of your result [5 Marks]

E. The solubility product of $Ca(OH)_2$ [3 Marks]

F. Compare the observed value to the theoretical value by calculating the percentage error in your observed value and theoretical value. Give plausible reason(s) for the difference in these values [10 Marks]

G. How will you prevent the conversion of the supernatant solution to carbonate [2 Marks]

QUESTION TWO [40 MARKS]

A student is provided with 3.2 g of $KMnO_4$ crystal, 0.1 M of H_2SO_4, 4.5 g of $K_2C_2O_4\ H_2O$ solid and 0.2 g of $Fe(NH_4)_2(SO_4)_2 \cdot 6\ H_2O$.

A. Write down the procedure for the standardization of $KMnO_4$ against 10 ml of $K_2C_2O_4\ H_2O$ [3 Marks]

B. Using the half-reaction method, balance the redox reaction of permanganate with oxalate ion in acidic media and state which half-cell reaction is either reducing or oxidizing

[3 Marks]

C. Determine the average volume of $KMnO_4$ consumed from your concordant titres

[4 Marks]

D. Calculate the molar concentration (molarity) of the standardized KMnO4 solution

[4 Marks]

E. Suppose that the KMnO4 solution you have prepared is primary standard; what should be its molar concentration? [3 Marks]

F. Outline the procedure for the determination of Iron in Iron(II) ammonium sulfate solid salt

[5 Marks]

G. Balance the redox reaction of permanganate with Iron (II) in acidic media. [4 Marks]

H. Determine the average volume of $KMnO_4$ consumed from your concordant titres

[5 Marks]

I. Calculate the mass percentage of Fe in $Fe(NH_4)_2(SO_4)_2 \cdot 6\ H_2O$

[5 Marks]

J. Explain Redox reaction [2 Marks]

K. Give reasons why indicator is not needed for this reaction [2 Marks]