

FACULTY OF ALLIED HEALTH SCIENCES UNIVERSITY OF RUHUNA DEPARTMENT OF MEDICAL LABORATORY SCIENCE

Year 1, Semester 1, End-Semester Examination – February 2023

MLS1122 Basic Chemistry I - Theory

Date: 03rd February 2023

Time: 11.30 am - 12.30 pm

- Use of calculators is allowed.
- Answer all questions on this paper itself.
- Write your answer in the space provided for each question. Please note that the space provided is sufficient for the answer and that extensive answers are not expected.

Index Number

For Examiner's Use Only

	Question No	Marks	
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	2		
	3		
forming intra-molecular hydrogen	ni disom su	ndiainna	A Circle the stoms that that
	4		bonding in above structure
	Total		A.
	Percentage	k	9
		02	

01. Answer all parts.

1.1 Identify the stereo centers of the following drug, ephedrine and assign R/S configuration.



(30 marks) 1.2 Convert the above molecule to its fisher projection and draw its enantiomer also.

(30 marks)

1.3 State the absolute configurations of the possible diastereomers of ephedrine.	
	•
(20 marks)

1.4 Circle the atoms that can participate mostly in forming intra-molecular hydrogen bonding in above structure.

(20 marks)

OH CH_3 HN H_3

02. Answer all parts.

2.1 Draw the two chair conformations of cis-1-chloro-3-methyl cyclohexane, and state which conformer is more stable.

(30 marks)

2.2 Identify the strong acid and strong base of the following acid base reaction and predict the position of equilibrium.



	20 marks)
2.3 Calculate the equilibrium constant.	
and the second	
(8,451ama (8+)	
	20 marks)
2.4 Calculate pH of a buffer solution prepared by adding 10.00 mL of 0.10 mol dm ⁻³ a to 20.00 mL of 0.1 mol dm ⁻³ sodium acetate. (pKa = 4.74)	acetic acid

(30 marks)

3

03. Answer all parts.

3.1 A 1.50 g sample of a mixture of Na₂CO₃ and NaHCO₃ was dissolved in water and titrated with 0.50 mol dm⁻³ HCl using phenolphthalein (pKa = 9.3) as the indicator. The first endpoint was observed at 15.00 mL. Next the titration was continued after the addition of methyl orange (pKa = 3.7) and a second endpoint was observed after addition of another 22.00 mL. Thus, the endpoint was read at 37.00 mL. $(Na_2CO_3 = 105.99g/mol)$ $(NaHCO_3 = 84.01 \text{ g/mol})$ 3.1 Write down the reactions that take place in the presence of different indicators. (10 marks) 3.2 Calculate the percentage composition of the mixture. (40 marks) 3.3 Calculate the pH of the solution after addition of 38.00 mL of acid. (30 marks) 3. 4 List two common metallochromic indicators used for EDTA titrations.

And 1 A station are as to conduct an exponent to determine the rate of a sension and the set of a sension of the set of t

- (10 marks)
- 3.5 Describe what properties metallochromic indicators should possess to be used in an EDTA titration with a metal ion.

(10 marks)

04. Answer all parts

4.1 Concentration of a Fe²⁺ in a soil sample was analyzed by dissolving 2.250 g of sample in 50.00 mL water and titrating with 0.0250 mol dm⁻³ potassium permanganate under acidic conditions. The endpoint was reached at 17.50 mL.

4.1.1 Write the redox half reactions and deduce the balanced equation for the above titration.

(20 marks)

4.1.2 Calculate the Fe^{2+} percentage in the soil sample. (Fe = 55.85 g/mol)

(30 marks)

4.2.

4.2.1 A student needs to conduct an experiment to determine the rate of a reaction. State two quantities that must be measured to establish the rate of a chemical reaction. (10 marks) 4.2.2 In a reaction mechanism what is meant by the rate-determining step? (20 marks) 4.2.3 $H_2O_2(aq) \rightarrow H_2O(l) + \frac{1}{2}O_2(g),$ In the above reaction if the initial concentration of H_2O_2 is 0.254 mol dm⁻³, and the initial rate of reaction is 9.32×10^{-4} M s⁻¹. What will be concentration of H₂O₂ at t = 40 s? (20 marks)