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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: 03<sup>rd</sup> 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.

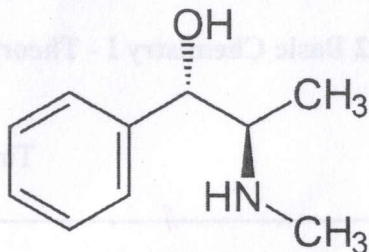
Index Number .....

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Question No	Marks
1	
2	
3	
4	
<b>Total</b>	
<b>Percentage</b>	

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.

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(30 marks)

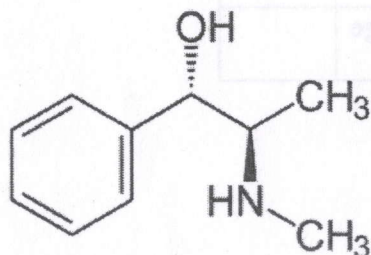
1.3 State the absolute configurations of the possible diastereomers of ephedrine.

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(20 marks)

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

(20 marks)



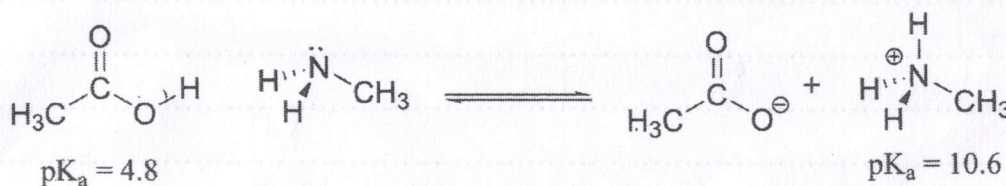


02. Answer all parts.

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.

(20 marks)

2.4 Calculate pH of a buffer solution prepared by adding 10.00 mL of 0.10 mol dm<sup>-3</sup> acetic acid to 20.00 mL of 0.1 mol dm<sup>-3</sup> sodium acetate. (pKa = 4.74)

(30 marks)





3.4 List two common metallochromic indicators used for EDTA titrations.

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**(10 marks)**

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

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**(10 marks)**

04. Answer all parts

4.1 Concentration of a  $\text{Fe}^{2+}$  in a soil sample was analyzed by dissolving 2.250 g of sample in 50.00 mL water and titrating with  $0.0250 \text{ mol dm}^{-3}$  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.

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**(20 marks)**

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

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**(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.

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(10 marks)

4.2.2 In a reaction mechanism what is meant by the rate-determining step?

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(20 marks)

4.2.3  $\text{H}_2\text{O}_2(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l}) + \frac{1}{2} \text{O}_2(\text{g}),$

In the above reaction if the initial concentration of  $\text{H}_2\text{O}_2$  is  $0.254 \text{ mol dm}^{-3}$ , and the initial rate of reaction is  $9.32 \times 10^{-4} \text{ M s}^{-1}$ . What will be concentration of  $\text{H}_2\text{O}_2$  at  $t = 40 \text{ s}$ ?

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(20 marks)

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(30 marks)