UNIVERSITY OF JAFFNA, SRILANKA
BACHELOR OF PHARMACY
SECOND YEAR FIRST SEMESTER EXAMINATION – AUGUST 2017
PHARMACEUTICAL CHEMISTRY II - PHACH 2124

DATE: 23.08.2017 **TIME: 3 Hours.**

ANSWER TO ALL SIX QUESTIONS.

1.

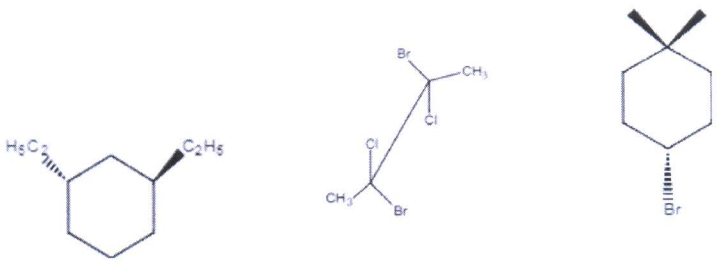
1.1. Define following types of isomers with two examples for each of them.

1.1.1. Stereo isomers (15 Marks)

1.1.2. Constitutional isomers (15 Marks)

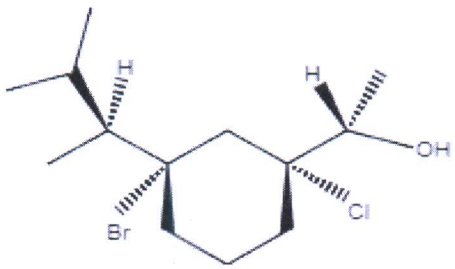
1.2. Mention whether molecules a, b and c are chiral or achiral.

(a) (b) (c)



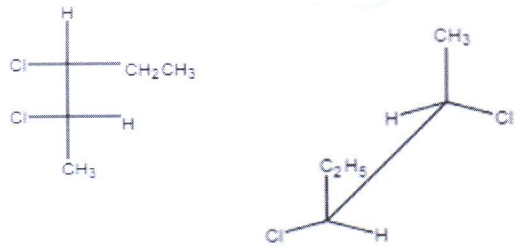
(15 Marks)

1.3. Find out the chiral centres in the given molecule below and assign R/S configuration for the chiral centres. (20 Marks)

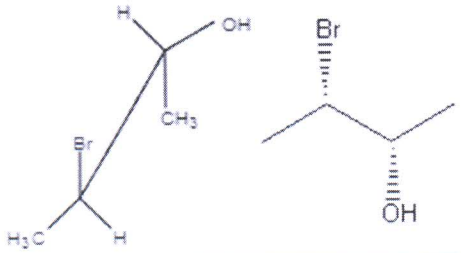


1.4. Two pairs of compounds are given below in 1.4.1 and 1.4.2. Indicate whether each pair is identical compounds or enantiomers or diastereomers. Give reason/s for your answer.

1.4.1



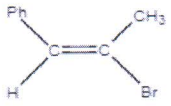
1.4.2



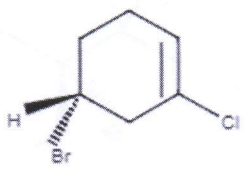
(20 Marks)

1.5. Specify the configurations whether E or Z in the following molecules given below in 1.5.1, 1.5.2 and 1.5.3.

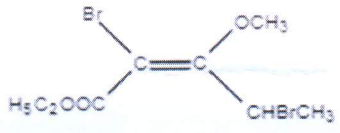
1.5.1.



1.5.2



1.5.3



(15 Marks)

2.

2.1. Define the following terms.

2.1.1. Enantiomer (10 Marks)

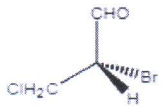
2.1.2. Racemic mixture (10 Marks)

2.1.3. Specific rotation (10 Marks)

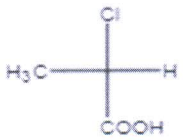
2.1.4. Enantiomeric excess (10 Marks)

2.2. Assign D/L configuration for the following molecules.

2.2.1.



2.2.2



(10 Marks)

2.3. Briefly describe the separation of racemic mixtures. (20 Marks)

2.4.

2.4.1. Forty millilitres (40ml) of one enantiomeric solution of the compound A was prepared by dissolving 12g of that enantiomer in a solvent.This solution was taken into a 100 mm polari meter tube and placed in a polari meter at 25°C. The observed rotation is 9.15° counter clockwise. Determine the specific rotation of this enantiomer. (15 Marks)

2.4.2. The specific rotation of S enantiomer of a compound X was + 31.8°. If the specific rotation of the mixture of both enantiomers (R and S) of X was - 6.36°. Calculate the percentage of each enantiomers present in the mixture. (15 Marks)

3.

3.1. Draw the structures of BF_3, Benzene and *trans*-2,3-dibromobutene and indicate the symmetry elements that are present. (30 Marks)

3.2.

3.2.1. List the conditions that are required for aromaticity. (10 Marks)

3.2.2. Give two (02) examples for

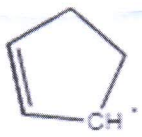
3.2.2.1. non benzenoid aromatic compounds (05 Marks)

3.2.2.2. heterocyclic aromatic compounds. (05 Marks)

3.3. State whether the following chemical species are aromatic or anti- aromatic or non-aromatic.

3.3.1.

3.3.2

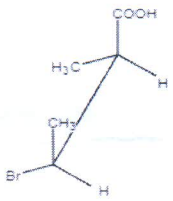


3.3.3

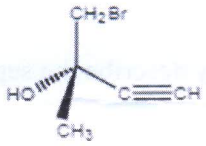
(15 Marks)

3.4. Draw the Fischer projection formula for the following molecules and assign R/S configuration for them.

3.4.1.



3.4.2



(20 Marks)

3.5. Draw the possible chair conformations for the *cis*-1-bromo-3-methylcyclohexane and indicate the most stable conformation. (15 Marks)

4.

4.1. Briefly describe the types of electron displacement effects in organic molecules.

(30 Marks)

4.2. Arrange the following compounds in the order of increasing pKa.

4.2.1. O_2NCH_2COOH, $ClCH_2COOH$, CH_3COOH, FCH_2COOH, $CH_3C{\equiv}CH$

(10 Marks)

4.2.2. *o*-$NO_2C_6H_4OH$, *o*-$CH_3C_6H_4OH$, PhOH, *m*-$CH_3C_6H_4OH$, *p*-$CH_3C_6H_4OH$

(10 Marks)

4.3.

4.3.1. Briefly explain the factors that affect the basicity of organic compounds.

(25 Marks)

4.3.2. Briefly discuss about the basicity of aniline, pyridine and pyrrole.

(25 Marks)

5.

5.1.

5.1.1. What is a reactive intermediate? (10 Marks)

5.1.2. List the common types of carbon intermediates. (10 Marks)

5.2. Arrange the following species in the order of decreasing stability.

5.2.1. $CH_3\text{-}C{\equiv}C^-$, $(CH_3)_2C{=}CH^-$, $(CH_3)_3\text{-}C\text{-}CH_2^-$ (10 Marks)

5.2.2. $CH_2{=}CH\text{-}CH_2^+$, CH_3^+, Me_3C^+, Me_2HC^+,MeH_2C^+, CH_2CH^+ (10 Marks)

5.2.3. $H_3C^{\cdot}$, $(CH_3)_3C^{\cdot}$,$(CH_3)_2HC^{\cdot}$,$CH_3H_2C^{\cdot}$ (10 Marks)

5.3. Following exothermal reaction follows first order kinetics and occurs in two steps.

$$(CH_3)_3CBr + 2H_2O \longrightarrow (CH_3)_3COH + Br^- + H_3O^+$$

5.3.1. Draw the labelled energy profile diagram of the above reaction and indicate the structures of transition states and intermediates. (30 Marks)

5.3.2. Explain the mechanism of the above reaction. (20 Marks)

6.

6.1. Write the end products of the reactions mentioned in 6.1.1 and 6.1.2 and write the mechanisms of the reactions.

6.1.1. Benzene $\xrightarrow[Con.H_2SO_4]{Con.\ HNO_3}$ (10 Marks)

6.1.2. $(CH_3)_2CH{=}CH_2 + HBr \longrightarrow$ (20 Marks)

6.2. Write the steps involved in the following conversion. Indicate the required chemicals and essential conditions for each step.

$C_6H_5CH_2CHO \longrightarrow C_6H_5CH_2CH_2COOH$ (20 Marks)

6.3. Give the chemical structure with one medicinal use of

6.3.1. phenytoin sodium. (10 Marks)

6.3.2. carbamazepine. (10 Marks)

6.3.3. metronidazole. (10 Marks)

6.4. Sketch the route of synthesis of

6.4.1. paracetamol from phenol. (10 Marks)

6.4.2. tolbutamide from methyl benzene. (10 Marks)

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