



**UNIVERSITY OF RUHUNA – FACULTY OF MEDICINE**  
**ALLIED HEALTH SCIENCES DEGREE PROGRAMME**  
**FIRST BPHARM PART I EXAMINATION – AUGUST 2017**  
**PH 1112 PHARMACEUTICAL CHEMISTRY I (SEQ)**

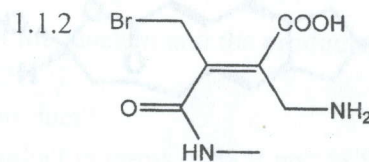
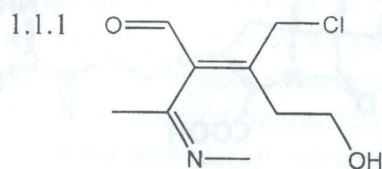
**TIME: TWO HOURS**

**INSTRUCTIONS**

- Answer **all four (04)** questions.
- Do not use any correction fluid.
- Answer questions in the books provided for each question.
- Marks will be deducted for illegible hand writing.

01. Answer all parts

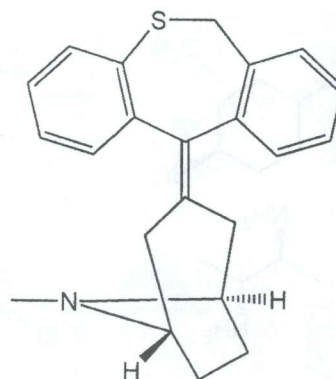
1.1 By assigning priorities to the groups attached, designate either E or Z (as appropriate) to the molecules shown.



(10 marks)

1.2 What is the relationship between 1,2,3-trimethylcyclopropane, methylcyclopentane, and cyclohexane? Draw their structures. (15 marks)

1.3 Tropatepine whose structure is shown below, is a drug used in the treatment of Parkinson's disease, Assign appropriate stereochemistry descriptors and indicate whether this molecule is chiral or not.



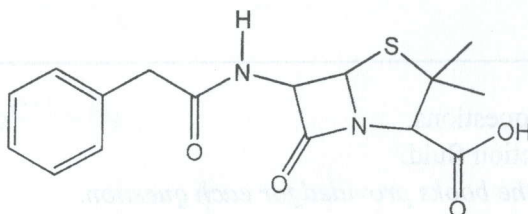
(10 marks)

1.4

1.4.1 Find all chiral centers in the molecule Penicillin G (structure shown below), and mark them with an asterisk\*.

1.4.1 What is the maximum number of isomers that can be formed?

1.4.2 Assign (R) or (S) to each chiral center.

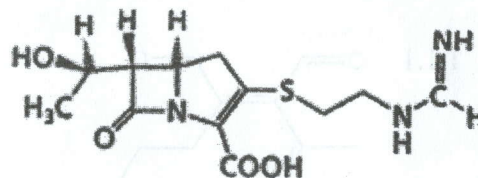
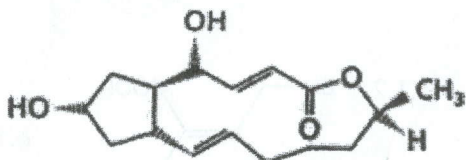


(15 marks)

1.5 For the following bioactive molecules, assign (R) or (S) to each chiral center and (E) or (Z) to each double bond.

1.5.1 Brefeldin A, an antiviral agent

1.5.2 Imipenim, an antibacterial agent



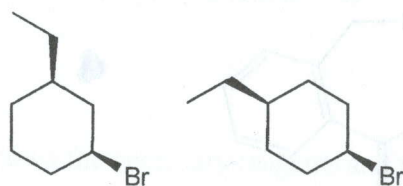
(20 marks)

1.6 Use a Fisher projection to draw *meso*-2,3-difluorobutane. Explain why it is a *meso* compound.

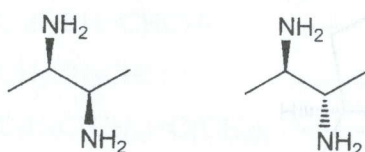
(10 marks)

1.7 Determine the relationship between the following pairs of molecules: enantiomers, diastereomers, identical, or structural (constitutional) isomers.

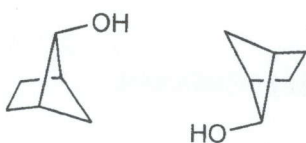
1.7.1

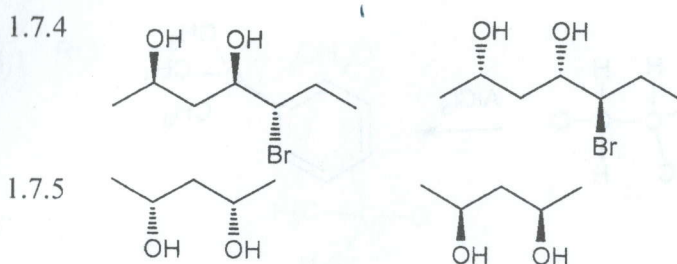


1.7.2



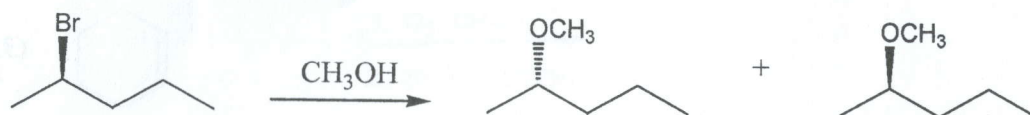
1.7.3





(10 marks)

1.8. Consider the following solvolysis reaction:



The pure (R) enantiomer of 2-bromopentane has a specific rotation of  $-33^\circ$ . The pure (R) enantiomer of 2-methoxypentane has a specific rotation of  $+18^\circ$ . When optically pure (R)-2-bromopentane is allowed to warm in methanol, 2-methoxypentane is formed with a measured specific rotation of  $-6^\circ$ .

1.8.1 Assign (R) or (S) to each chiral center of the reactant and the products,

1.8.2 What is the optical purity of the product?

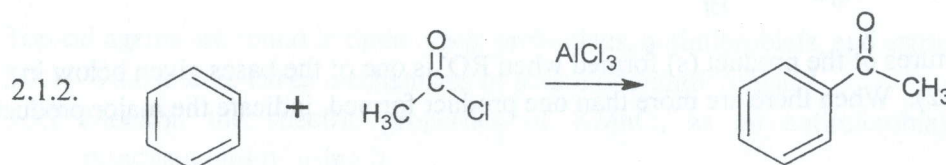
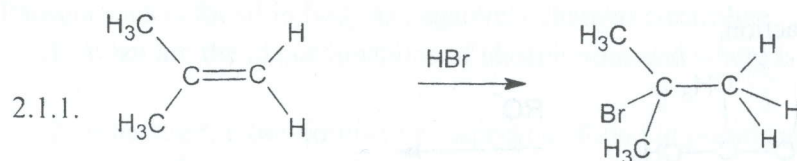
1.8.3 What is the enantiomeric excess of the product?

1.8.4 What is the actual composition of the product in terms of % R and % S enantiomers?

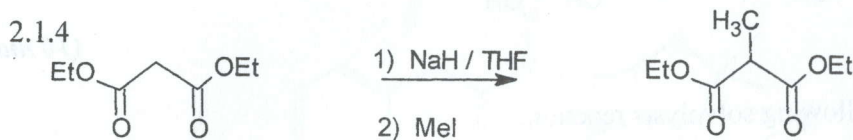
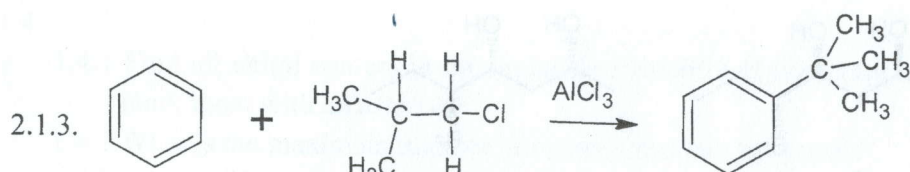
(10 marks)

02. Answer all parts.

2.1. Draw the structure(s) of the intermediates formed in each of the following reactions and, giving necessary structures, comment on the stability of each intermediate you proposed.

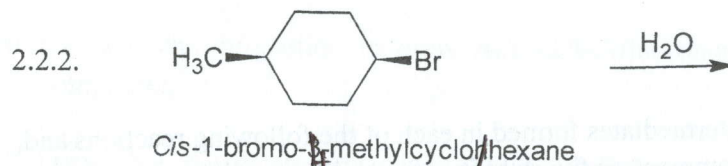
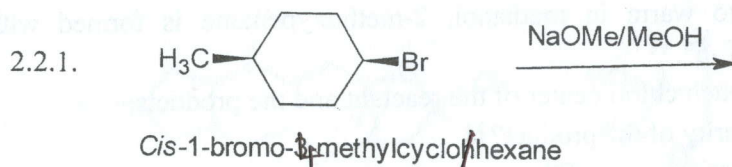






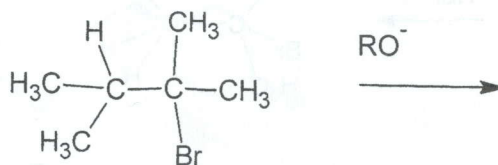
(32 marks)

2.2. Giving emphasis to the stereochemistry, draw the structure(s) of the products formed when *cis*-1-bromo-3-methylcyclohexane is treated with two reagents given in (2.2.1.) & (2.2.2.). Give a plausible mechanism for the formation of product(s) in the reaction (2.2.2).

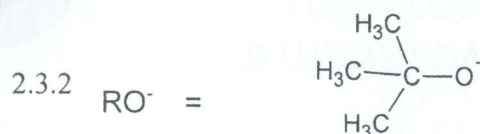
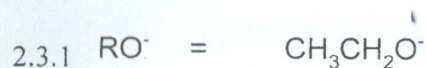


(30 marks)

2.3. Consider the following reaction,

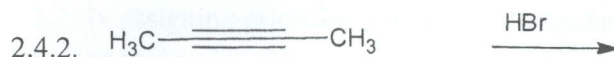


Draw the structure(s) of the product (s) formed when  $\text{RO}^-$  is one of the bases given below in (2.3.1.) & (2.3.2). When there are more than one product formed, indicate the major product.



(20 marks)

2.4. Draw the structures of the product(s) formed in the reactions given below.



(18 marks)

03. Answer **all** parts.

3.1. About 60% of the adult human body is fluid, which composed of water and electrolytes.

3.1.1. What are the large amounts of ions present in intracellular fluid and extracellular fluid in the human body? (08 marks)

3.1.2. As a body fluid, water helps to maintain body temperature. Briefly explain the mechanism of it. (08 marks)

3.1.3. Give **three** examples for which fluids protect and lubricate body tissues. (12 marks)

3.2. Phosphorous is found in body as negatively charged electrolyte.

3.2.1. What are the major functions of phosphorous and where is it found in the body? (12 marks)

3.2.2. What are the **two** forms of phosphorous found in plasma and describe briefly how they act as a buffer system? (16 marks)

3.3. Topical agents are found in three types: protectives, antimicrobials, and astringents.

3.3.1. What are the **three** mechanisms of action of antimicrobials? (08 marks)

3.3.2. Mention the specific properties of  $\text{KMnO}_4$  as an antimicrobial and give the disadvantages of using it. (20 marks)

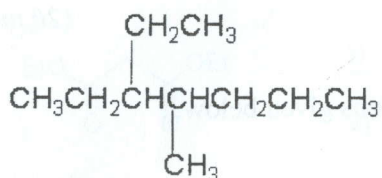
3.3.3. Zn is an essential metal for living organisms. Give specific functions of Zn that involves in the body. (16 marks)

4. Answer **all** parts.

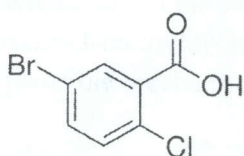
4.1. Give the IUPAC names of the following compounds.



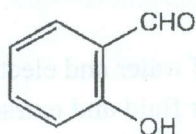
4.1.2



4.1.3



4.1.4



(28 marks)

4.2. Draw the structures for the following compounds.

4.2.1. 2-methylpropanol

4.2.2. 2,3-dihydroxypropanal

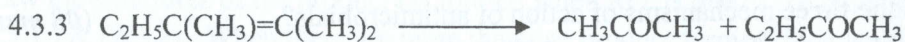
4.2.3. 2-hydroxycyclohexanone

4.2.4. cyclopentanecarbaldehyde

4.2.5. 3,5-dimethyl-4-hexenoic acid

(40 marks)

4.3. Write down the necessary reagents and reaction conditions for the following reactions.



(32 marks)

@@