



UNIVERSITY OF RUHUNA – FACULTY OF MEDICINE
ALLIED HEALTH SCIENCES DEGREE PROGRAMME
FIRST BPHARM PART II EXAMINATION - JANUARY 2017
PH 1213 PHARMACEUTICAL CHEMISTRY II (SEQ)

TIME: THREE HOURS

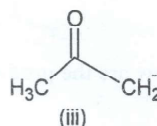
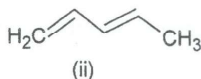
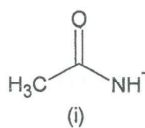
INSTRUCTIONS

- Answer **all** questions in the given booklets.
- Do not use any correction fluid.
- Use illustrations where necessary.

01. Answer **all** parts

1.1

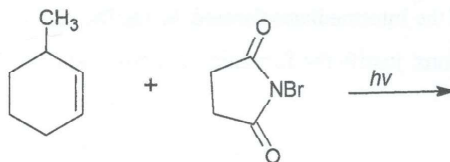
1.1.1 Draw the resonance structures for the following molecule and ions.



1.1.2 Of the resonance structures drawn for each molecule and ion above, which resonance structure (s) contributes mostly to the properties of a particular molecule and ion? Justify your answer.

(30 marks)

1.2 Consider the following reaction:



1.2.1 Draw the structure of the product (s) that would be formed in this reaction.

1.2.2 Write down the plausible mechanism for the formation of the above product in 1.2.1.

(26 marks)

1.3

1.3.1 Draw the energy level diagram for π -molecular orbitals of cyclopentadienyl anion.

1.3.2 Fill π - electrons to the energy levels drawn.

1.3.3 Comment on the stability of cyclopentadienyl anion based on its π -molecular orbital diagram.

1.3.4 Show the stabilization of cyclopentadienyl anion by resonance.

(30 marks)

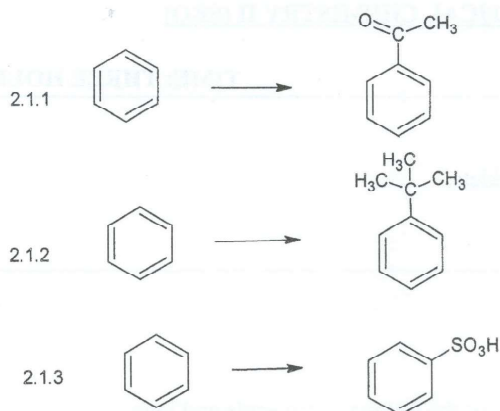
1.4 Applying Huckel rule, indicate whether the following molecules are aromatic or not.



(14 marks)

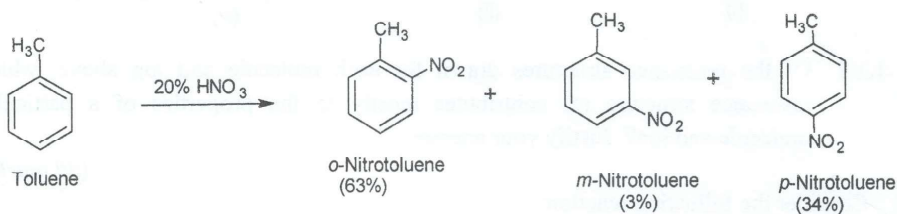
02. Answer all parts

- 2.1 Write down the reagent(s) which is necessary for each of the conversions given below. If more than one reagent is necessary, indicate the sequence of adding them.



(15 marks)

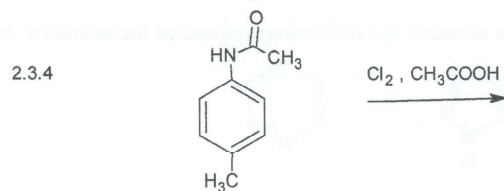
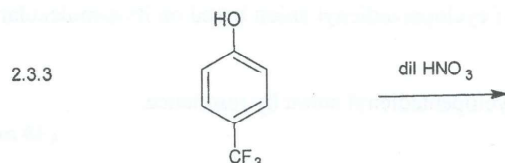
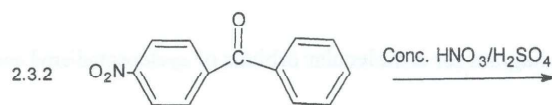
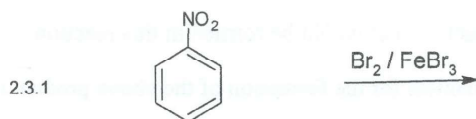
- 2.2 Given below are the products yielded on nitration of toluene with dilute nitric acid.



Considering the stability of the intermediates formed during the attack of electrophile at *ortho*, *meta* and *para* positions, justify the formation of above products with relative yields.

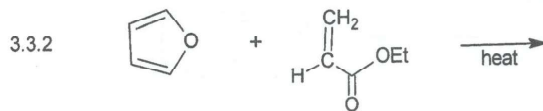
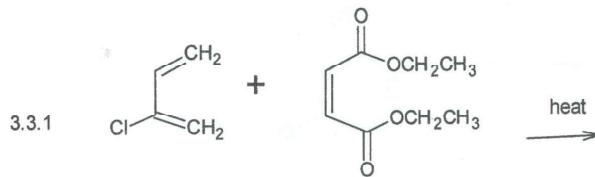
(30 marks)

- 2.3 Draw the structure(s) of the product(s) formed in each of the reactions given below.



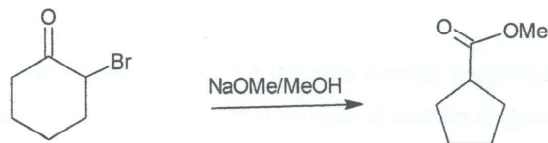
(25 marks)

3.3 Giving emphasis to the stereochemistry, draw the structure of the product(s) formed in each of the following reactions.



(30 marks)

3.4 Consider the reaction given below:



3.4.1 Give the name of the above reaction.

3.4.2 Write down the mechanism for the formation of the product shown.

(16 marks)

04. Answer all parts.

4.1

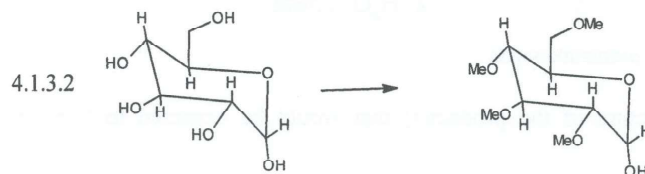
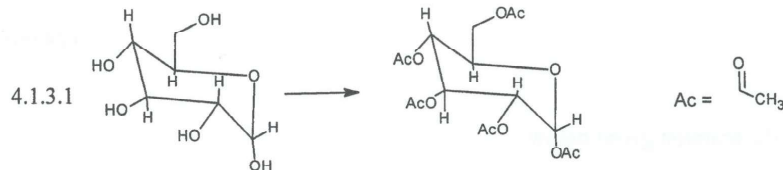
4.1.1 Draw the structures of the simplest aldose and ketose.

(06 marks)

4.1.2 Explain the term "mutarotation". Which structural properties of monosaccharides are necessary to show mutarotation?

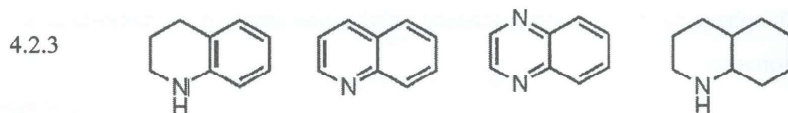
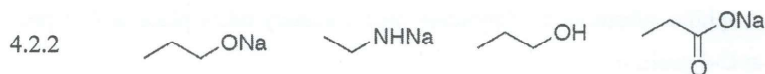
(10 marks)

4.1.3 Give reagent(s) which is necessary for each of the conversions shown below. If more than one reagent is necessary indicate the sequence of adding them.



(09 marks)

4.2 Rank the basicity of the following sets of compounds (from the strongest to the weakest).



(15 marks)

4.3 Indicate whether equilibrium favors products or reactants in the following acid base reaction.



(05 marks)

4.4 For the following acid-base reaction, indicate

4.4.1 the weakest base, the weakest acid in the reaction

4.4.2 whether the equilibrium goes to the right or left.



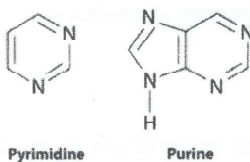
(15 marks)

4.5 *m*-nitrophenol has a pK_a value of 9.3, whereas the *p*-nitrophenol has pK_a value of 7.2. Which one is more acidic? Explain your answer.

(15 marks)

4.6

4.6.1 Label the following structures of purine and pyrimidine heterocyclic ring systems according to the international system of numbering.



(10 marks)

4.6.2 Draw the structures of 2-oxo-4-aminopyrimidine and 2-amino-6-oxopurine and give their trival names.

(08 marks)

4.6.3 Using the structures, show how guanine and cytosine base pairing occurs in DNA strands.

(07 marks)

05. Answer all parts

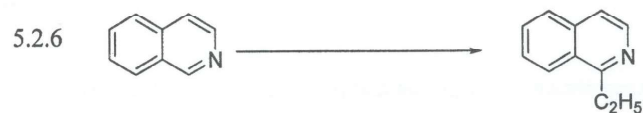
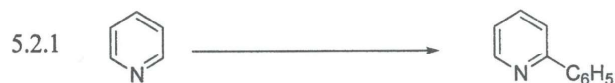
5.1 Briefly explain the following.

5.1.1 Electrophilic substitution of pyridine predominately takes place at C-3 position, not at C-4 position.

5.1.2 Thiophene has the greatest resonance stabilization amongst the mono-heterocyclic aromatics.

(30 marks)

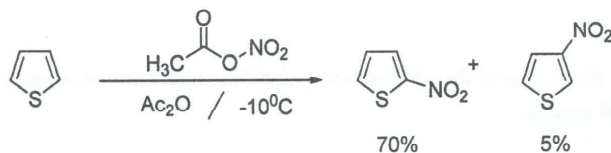
5.2 How would you carry out following conversions?

*(30 marks)*

5.3 Briefly explain the orbital structure of imidazole.

(20 marks)

5.4 Comment on the product-ratio of the following reaction.

*(20 marks)*

6.1 Twenty different common α -amino acids are used in the synthesis of proteins.

6.1.1 Give the names and three-letter codes of two (02) amino acids each from the two groups which are **positively charged** and **negatively charged** at physiological pH.

(04 marks)

6.1.2 Draw the chemical structures of the amino acids you mentioned above.

(08 marks)

6.1.3 What is the unique property associated with Cys among other amino acids?

(03 marks)

6.2 Peptides and proteins can be defined as polymers of amino acids.

6.2.1 What is a peptide bond?

(02 marks)

6.2.2 Give four (04) properties of a peptide group.

(08 marks)

6.3 The hydrolysis of an octapeptide **P** gives the following amino acids, Ala, Arg, Gly, Lys, Met, Phe, Ser, and Tyr. It was found that the N-terminal and C-terminal residues of the peptide **P** are Arg and Ala respectively.

Determine the amino acid sequence of peptide **P** by using the results obtained from the following treatments (i-iii).

(i) with CNBr it cleaves into two tetrapeptides.

(ii) with trypsin it cleaves to a dipeptide (Ala, Ser), a pentapeptide **L** (Gly, Lys, Met, Phe, Tyr), and Arg.

(iii) with chymotrypsin it gives a dipeptide (Arg, Tyr) and two tripeptides **M** (Gly, Met, Phe) and **N** (Ala, Lys, Ser).

(25 marks)

6.4

6.4.1 List **three** techniques which can be performed to the lipid analysis.

(09 marks)

6.4.2 Giving chemical reactions where appropriate, describe briefly the principle of **one** of the techniques you have mentioned above in 6.4.1.

(15 marks)

6.4.3 State **five** criteria which should be followed in polymer selection.

(10 marks)

6.4.4. Define the term biodegradation.

(06 marks)

6.4.5. Give the necessary reagents and reaction conditions for the following conversions.



(05 x 2 marks)

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