Index No: .....

UNIVERSITY OF RUHUNA – FACULTY OF MEDICINE

ALLIED HEALTH SCIENCES DEGREE PROGRAMME

SECOND BPHARM PART II EXAMINATION – JANUARY 2014

PH 2244: MEDICINAL CHEMISTRY & PHARMACOGNOSY I A

03 HOURS

INSTRUCTIONS

- Answer **all** questions.
- No paper should be removed from the examination hall.
- Marks will be penalized for illegible handwriting.
- Do not use any correction fluid.

PART- A

01. Answer all parts

1.1 Define the term logP and state its significance. ***(06 marks)***

1.2 Which of the following solvents is the most suitable for determining partition coefficients for drug transport across biological membranes? Give reasons for your answer. ***(06 marks)***

1.2.1 Liquid paraffin

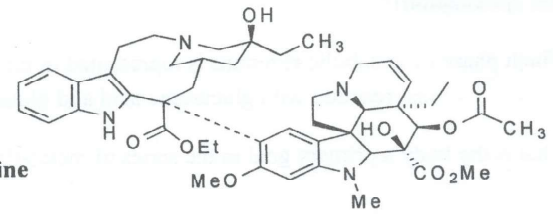
1.2.2 Butanol

1.2.3 Heptane

1.2.4 Octanol

1.3 Vincristine ($C_{47}H_{62}N_4O_9$;logP 6.05) is a *vinca* alkaloid which is used to treat leukaemia and lymphomas.

Vincristine



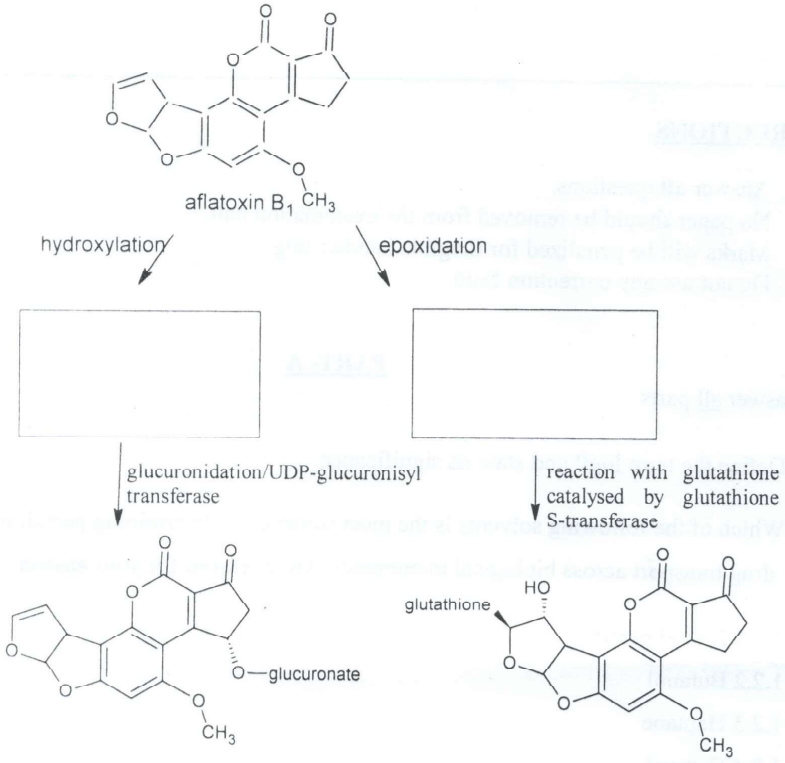
1.3.1 State the number of hydrogen bond donors and hydrogen bond acceptors associated with this drug. ***(05 marks)***

1.3.2 Considering the Lipinki's Rule, explain why this drug experiences oral bioavailability problems. ***(05 marks)***

1.3.3 Explain how this problem is overcome in treating cancer patients. ***(05 marks)***

Index No: .....

1.4 Hydrophobic molecules that are foreign to the body are usually metabolized along two pathways. One of the most potent carcinogens, aflatoxin B1, a fungal toxin, is processed in these two pathways. Unfortunately, one pathway creates the lethal form of aflatoxin B1 that leads to its carcinogenic properties.



1.4.1 Draw the structure of the intermediate metabolic products in the two boxes shown.

(08 marks)

1.4.2 What type of enzyme probably catalyzes the first set of reactions (hydroxylation and epoxidation)?

(08 marks)

1.4.3 Which phase of metabolic reactions is represented in the second set of transformations (reaction with glucuronic acid and glutathione)?

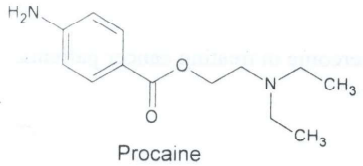
(08 marks)

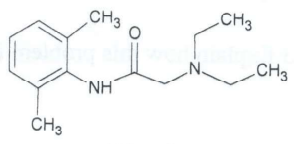
1.4.4 What is the body's primary goal in the series of metabolic reactions shown above?

(08 marks)

1.5 "Lidocaine is longer lasting local anaesthetic than procaine".
Explain this statement giving reasons.

(15 marks)

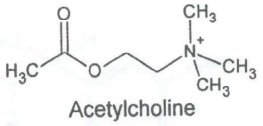

Procaine


Lidocaine

Index No: .....

1.6

1.6.1 Acetylcholine is one of the many neurotransmitters in the autonomic nervous system (ANS) and is prone to hydrolysis by plasma esterases. This methyl ester was replaced by a bulky cyclohexyl ester expecting that it would probably be resistant to hydrolysis. However, the cyclohexyl ester derivative was found to be biologically inactive as it did not bind to the target receptor. Explain this observation. ***(13 marks)***

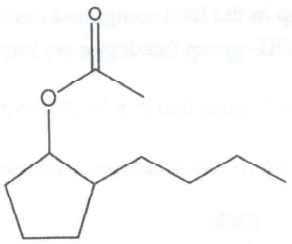


Acetylcholine

1.6.2 Write down the structure of an analogue of acetylcholine having similar biological activity to acetylcholine, but with a longer half-life. Justify your answer. ***(13 marks)***

02. Answer <u>all</u> parts

2.1 Carryout retrosynthetic analysis to design a synthesis for the following molecule using cyclopntanone and any other necessary conditions. ***(15 marks)***



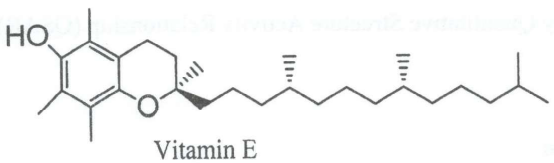
2.2 What is meant by the following in combinatorial synthesis? Give one example for each.

2.2.1. bead ***(05 marks)***

2.2.2. linker ***(05 marks)***

2.3 Write down the possible different combinations of esters ($A_{1-n}B_{1-n}$) when 3 different acid chlorides (A_{1-n}) react with 3 different alcohols (B_{1-n}) during combinatorial synthesis. ***(05 marks)***

2.4 Vitamin E is a fat soluble vitamin essential for muscle development.



Vitamin E

2.4.1 How many stereoisomers are possible in vitamin E? ***(05 marks)***

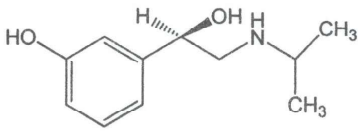
2.4.2 How does vitamin E derived from soybeans differ from its synthetic analogue? ***(05 marks)***

Index No: .....

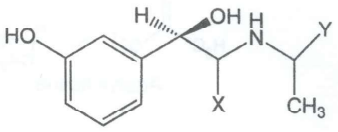
2.4.3. What additional experiment would clarify the difference between soybean vitamin E and synthetic vitamin E? ***(05 marks)***

2.4.4. Being a pharmacist how do you advise people about taking the synthetic versus plant derived vitamin E? ***(05 marks)***

2.5. The lead compound shown below is an adrenergic agonist. The analogues (i, ii, iii, iv) synthesized on addition and removal of certain groups to its chemical structure showed following changes in biological activity in determining the structure of the unknown target.



Lead compund



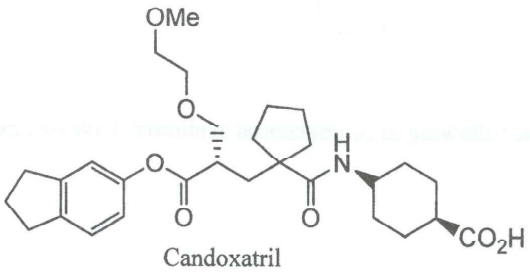
Analogues (i) X= H, Y= H
(ii) X=H, Y= Cyclopentyl
(iii) X=CH_3, Y=H
(iv) X=OH, Y= H

2.5.1 The removal of the Me- group in the lead compound (analogue i) reduced the activity whereas the addition of a cyclopentyl- group (analogue ii) dramatically improved its activity.

2.5.2 The addition of a CH_3- group in the lead compound (analogue iii) reduced the activity whereas the addition of an OH- group (analogue iv) improved its activity.

What are the most likely conclusions that can be drawn from above SAR? ***(15 marks)***

2.6. Candoxatril is an ester prodrug for candoxatrilat which inhibits protease enzymes.



Candoxatril

2.6.1 Write down the chemical structures of the drug and the by- product(s) it would liberate on activation. ***(05 marks)***

2.6.2 Give reason(s) why the parent drug cannot be administered orally. ***(05 marks)***

2.7 What is meant by Quantitative Structure Activity Relationship (QSAR) and state the aim of its application? ***(05 marks)***

2.7.1 Write down

2.7.1.1 the **Hansch equation** for large ranges of lipophilicity and state what each term in the equation represents. ***(10 marks)***

2.7.1.2 the **modified Hansch equation** for general anesthetics and represent it graphically. ***(10 marks)***

Index No: .....

PART- B

03. Answer all parts

3.1 State the significant events of the pre-christian era of pharmacognosy. ***(30 marks)***

3.2 Discuss briefly the formulations available in Ayurveda system of medicine. ***(50 marks)***

3.3 List **five (05)** complementary and alternative types of medicines practiced in Sri Lanka. ***(20 marks)***

04. Answer all parts

4.1 Briefly discuss the principal stages of medicinal cod liver oil production. ***(50 marks)***

4.2

4.2.1 Name the gelatinizing and adhesive substances available in gelatin. ***(10 marks)***

4.2.2 List **four (04)** amino acids available in gelatin. ***(10 marks)***

4.3 What are the adulterants used to adulterate the following authentic drugs?

4.3.1 Bee's honey

4.3.2 Senna (*Cassia angustifolia*)

4.3.3 *Digitalis purpurea*

4.3.4 Peanut oil

4.3.5 Linseed oil

4.3.6 Yellow bees wax ***(30 marks)***

05. Write short notes on following.

5.1 Classification methods of crude drugs. ***(25 marks)***

5.2 Different sources of crude drugs. ***(25 marks)***

5.3 Use of gradient extraction technique in Soxhlet extraction method. ***(25 marks)***

5.4 Measures used in quality control of crude drugs. ***(25 marks)***

PART- C

06.

6.1 Name **one** morphological trait that you would look for to establish the plants belong to the following plant families.

6.1.1 Euphorbiaceae

6.1.2 Fabaceae

6.1.3 Acantheceae

6.1.4 Araceae

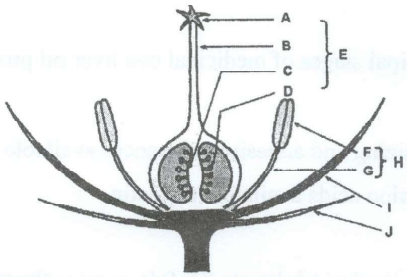
6.1.5 Rutaceae ***(10 marks)***

Index No: .....

6.2 Sequentially, list **five** most important steps of collecting and processing a plant sample for a herbarium specimen. ***(10 marks)***

6.3 Give **two** reasons why scientific names are preferred over local or common names when naming plants. ***(04 marks)***

6.4 Use the diagram given below to answer the following questions.



6.4.1 Label A to J in the above diagram. ***(10 marks)***

6.4.2 Give the main function of each A, F, I and J. ***(04 marks)***

6.4.3 Is this a complete flower or an incomplete flower? ***(02 marks)***

6.5 Distinguish between

6.5.1 unisexual and bisexual flowers.

6.5.2 sepals and petals.

6.5.3 legume pod and sillique pod.

6.5.4 determinate inflorescence and indeterminate inflorescence.

6.5.5 reticulate venation and parallel venation.

(20 marks)

6.6 Draw diagrams to illustrate the following.

6.6.1 Androecium

6.6.2 Gynacium

6.6.3 Odd-Pinnate leaf

6.6.4 Even-Pinnate leaf

(20marks)

6.7 List **five** medicinally important plants in family Poaceae. ***(10marks)***

6.8 Give **five** fruit types with example for each. ***(10marks)***

@@@@@@@@@@@@@@@@@@@@