



UNIVERSITI KUALA LUMPUR
ROYAL COLLEGE OF MEDICINE PERAK

FINAL EXAMINATION
MARCH 2026 SEMESTER

COURSE CODE : RCB10803
COURSE NAME : PHARMACEUTICAL ORGANIC CHEMISTRY II
PROGRAMME NAME : BACHELOR IN PHARMACEUTICAL TECHNOLOGY (HONOURS)
DATE : 1 JULY 2026
TIME : 2.30 PM – 4.30 PM
DURATION : 2 HOURS

INSTRUCTIONS TO CANDIDATES

1. Please read **CAREFULLY** the instructions given in the question paper.
2. This question paper has information printed on both sides of the paper.
3. This question paper consists of **TWO (2)** sections; Section A and Section B.
4. Answer **ALL** questions in Section A. For Section B, answer **THREE (3)** questions **WITH AT LEAST ONE (1)** question from question 3 or question 4.
5. Please write your answers on the OMR answer script and answer booklet provided.
6. Answer all questions in English language **ONLY**.

THERE ARE 13 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

SECTION A (Total: 40 marks)

I) MULTIPLE CHOICE QUESTIONS (20 marks)

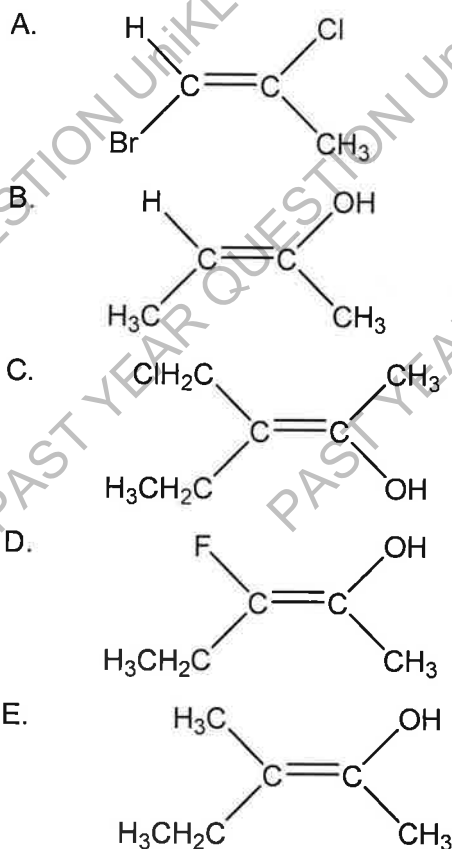
INSTRUCTION: Answer ALL questions.

Use the OMR sheet provided.

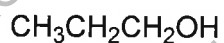
1. Identify the best nucleophile during a S_N2 reaction in aqueous solution.
- A. Cl^-
 - B. Br^-
 - C. I^-
 - D. F^-
 - E. H_2O
2. Identify the most reactive alkyl halide in a S_N2 reaction.
- A. CH_3Cl
 - B. $\text{CH}_3\text{CH}_2\text{Cl}$
 - C. $\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3-\text{CHCl} \end{array}$
 - D. $\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3-\text{CCl} \\ | \\ \text{CH}_3 \end{array}$
 - E. $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Cl}$
3. Identify the reaction in which an unsaturated compound becomes a saturated compound.
- A. Addition
 - B. Elimination
 - C. Substitution
 - D. Acid-base
 - E. Rearrangement

4. Identify the **CORRECT** description of stereochemistry.
- A. It describes the arrangement of atoms in space.
 - B. It explains the molecular interactions in chemical compounds.
 - C. It studies the energy of chemical compounds.
 - D. It is a study on carbon-containing compounds.
 - E. It describes the reaction between atoms.

5. Identify the compound that has a Z-isomer.

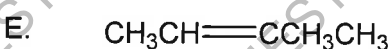
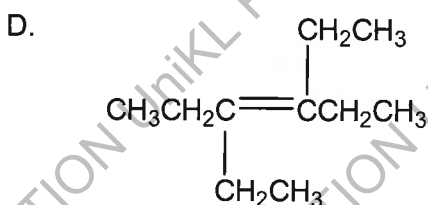
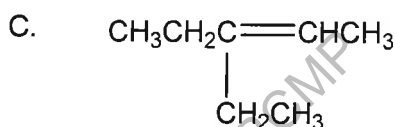
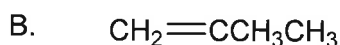
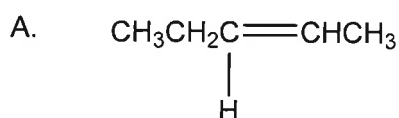


6. Identify the **CORRECT** isomerism that describes the compounds shown below.



- A. Conformational isomers
- B. Configurational isomers
- C. *Cis-trans* isomers
- D. Constitutional isomers
- E. Enantiomers

7. Identify the **CORRECT** compound that exists as *cis-trans* isomer.



8. Which of the following symbols represents light?



9. Identify the factors that can induce the formation of free radicals.

I. Thermal

II. Photochemical

III. Addition

IV. Substitution

A. I and II

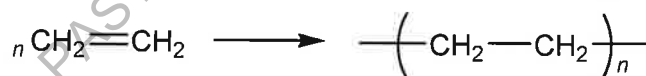
B. II and III

C. III and IV

D. I, II, and III

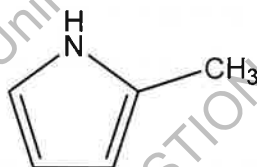
E. I, III, and IV

10. Which reagent is commonly used to facilitate peptide bond formation during chemical peptide synthesis?
- A. Sodium hydroxide (NaOH)
 - B. Hydrochloric acid (HCl)
 - C. Dicyclohexylcarbodiimide (DCC)
 - D. Potassium permanganate (KMnO₄)
 - E. Ethanol (C₂H₅OH)
11. Which organometallic reagent is the least reactive among the following?
- A. Organolithium (RLi)
 - B. Grignard reagent (RMgX)
 - C. Organocuprate (R₂CuLi)
 - D. Dialkylcopper lithium (R₂CuLi)
 - E. Alkylmagnesium bromide (R-MgBr)
12. Identify the type of polymerization involved based on the reaction shown below.

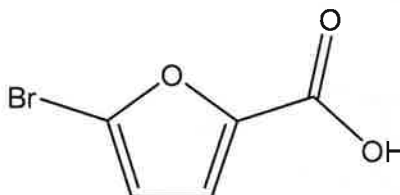


- A. Condensation polymerization
 - B. Addition polymerization
 - C. Substitution polymerization
 - D. Hydrolysis
 - E. Oxidation
13. Select the reagent needed to form an enolate in aldol addition.
- A. Acid
 - B. Base
 - C. Oxidizing reagent
 - D. Reducing reagent
 - E. Catalyst

14. A β -dicarbonyl compound is best described as ____.
- A. two carbonyl groups on the same carbon
 - B. two carbonyl groups separated by one carbon atom
 - C. two carbonyl groups separated by two carbon atoms
 - D. one carbonyl and one hydroxyl group
 - E. one carbonyl and one alkene group
15. Where does electrophilic substitution most likely occur in the following compound?

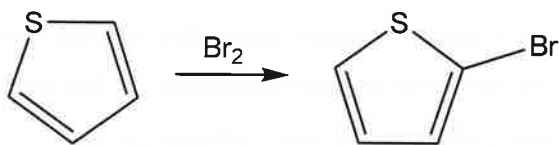


- A. At NH atom
 - B. At C2 atom
 - C. At C3 atom
 - D. At C4 atom
 - E. At C5 atom
16. Select the IUPAC name for the following compound.

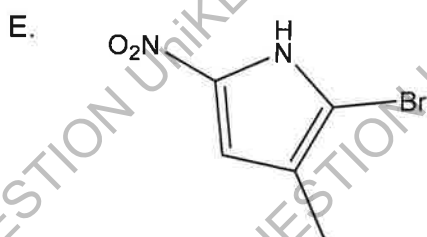
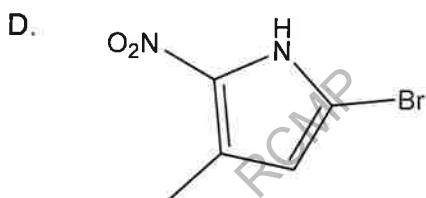
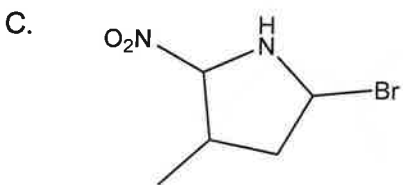
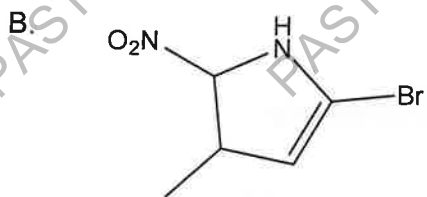
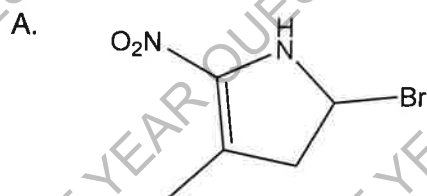


- A. 2-Bromofuran-3-carboxylic acid
- B. 4-Bromofuran-2-carboxylic acid
- C. 5-Bromofuran-2-carboxylic acid
- D. 5-Bromofuran-3-carboxylic acid
- E. 2-Bromofuran-1-carboxylic acid

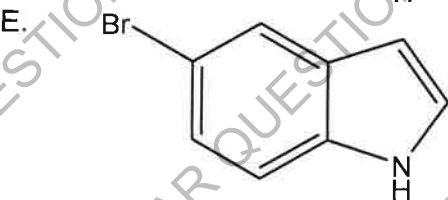
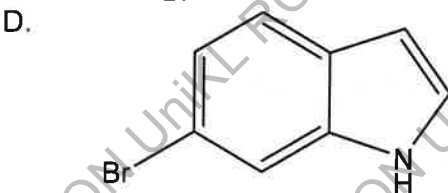
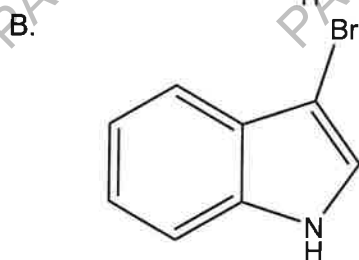
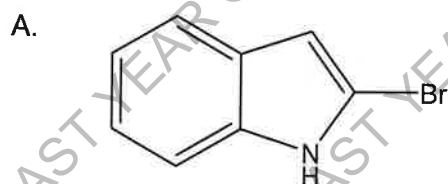
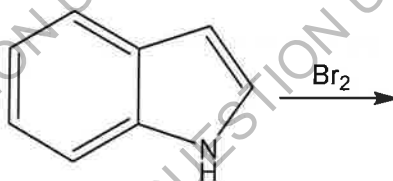
17. Identify the reaction shown below.



- A. Addition reaction
B. Elimination reaction
C. Free radical substitution
D. Nucleophilic aromatic substitution reaction
E. Electrophilic aromatic substitution reaction
18. Select the molecular structure for 5-bromo-3-methyl-2-nitropyrrole.



19. Select the correct IUPAC name of a heterocyclic compound in which an ethyl group is attached to the carbon adjacent to the sulfur atom in thiophene.
- A. 1-Ethylthiophene
B. 2-Ethylthiophene
C. 5-Ethylthiophene
D. Ethylthiophene
E. Thiophene-1-ethyl
20. Identify the major product formed in the following reaction.

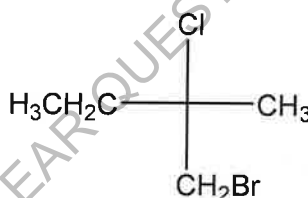


II) SHORT ANSWER QUESTIONS (20 marks)

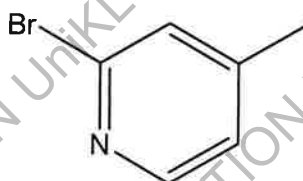
INSTRUCTION: Answer ALL questions in the answer booklet provided.

Each question carries TWO (2) marks.

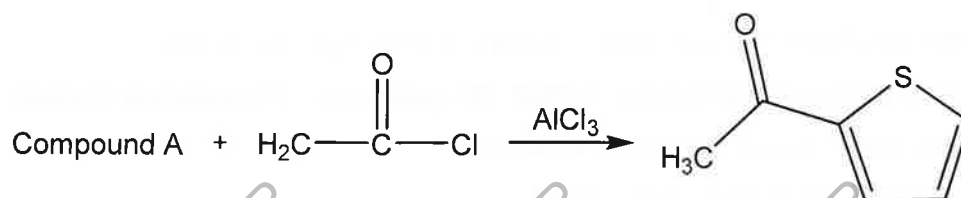
1. Describe Zaitsev's rule.
2. Describe the usage of levomethorphan and dextromethorphan.
3. Determine whether the following structure has *R*- or *S*-configuration.



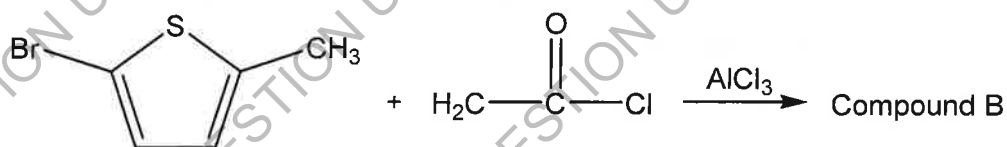
4. Describe keto-enol tautomerism.
5. Describe Claisen condensation.
6. Explain why pyridine is classified as a heterocyclic compound.
7. Write the IUPAC name for the following compound.



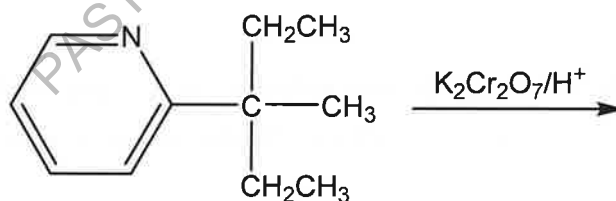
8. Draw compound A in the following reaction.



9. Draw the structure of compound B formed in the following reaction.



10. Predict the result of the following reaction.



SECTION B: MODIFIED ESSAY QUESTIONS (Total: 60 marks)

INSTRUCTION: This section consists of FOUR (4) questions.

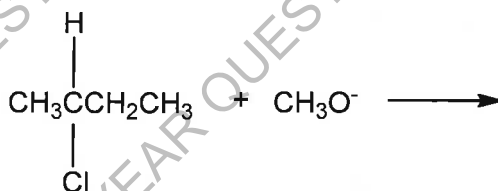
You are required to answer THREE (3) questions in the answer booklet provided.

Questions 1 and 2 are COMPULSORY.

Answer EITHER Question 3 OR 4.

Question 1

- (a) Draw the mechanism that forms the major and minor products for the following elimination reaction, *E2*.



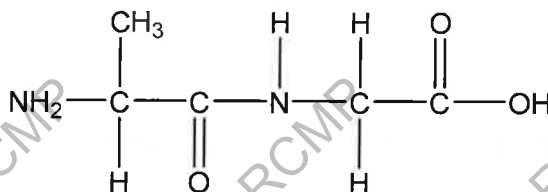
(10 marks)

- (b) Draw all the staggered and eclipsed conformers for 2-methylpropane, viewed along the C-1 — C-2 bond. Identify the **MOST** stable conformer.

(10 marks)

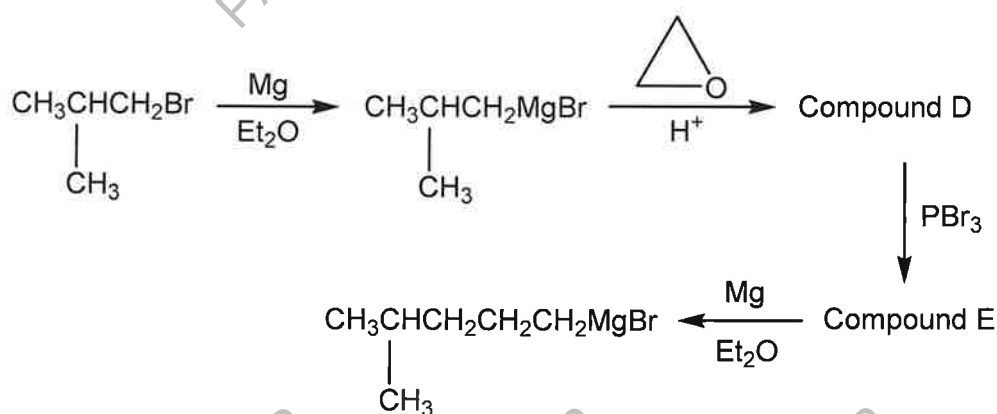
Question 2

- (a) Answer the question based on the following dipeptide.



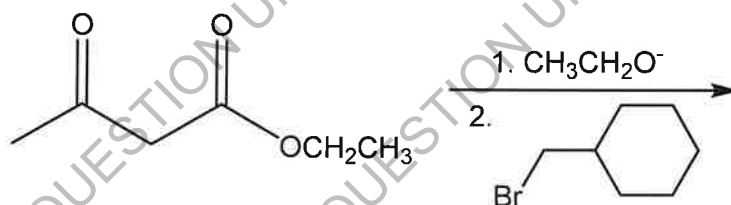
- i. Predict the structures of the **TWO (2)** amino acids that form this dipeptide. (4 marks)
- ii. State the by-product formed during peptide bond formation. (1 mark)
- iii. Identify the N-terminal and C-terminal amino acids based on the answer in (i). (2 marks)

- (b) Draw the structures of compounds D and E and state their respective IUPAC names based on the following reaction sequence.



(6 marks)

- (c) Draw the mechanism that forms the product for the following acetoacetic ester reaction.



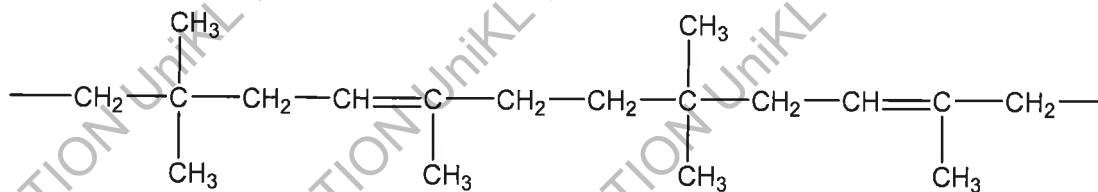
(7 marks)

Question 3

- (a) Draw the mechanism for the propagation steps for the monochlorination of methylcyclohexane.

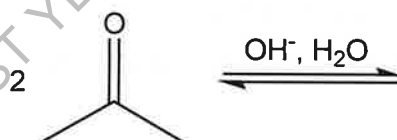
(8 marks)

- (b) Draw and name the monomers of the following repeating units.



(6 marks)

- (c) Draw the mechanism that forms the product for the aldol addition shown below.



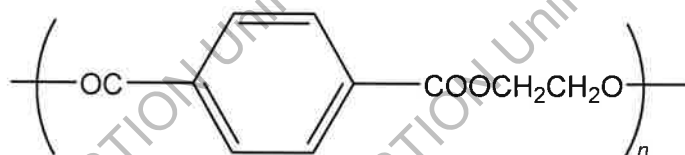
(6 marks)

Question 4

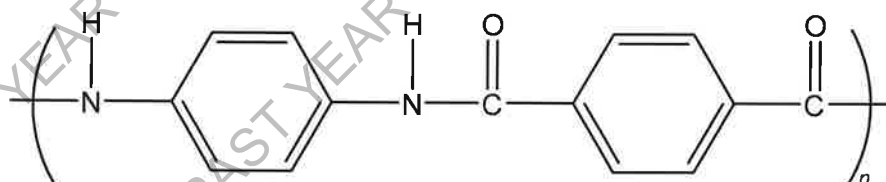
- (a) Draw the mechanism for the termination steps for the monochlorination of methylcyclohexane.

(8 marks)

- (b) Draw and name the structural formula of the monomers used to make polymers X and Y.



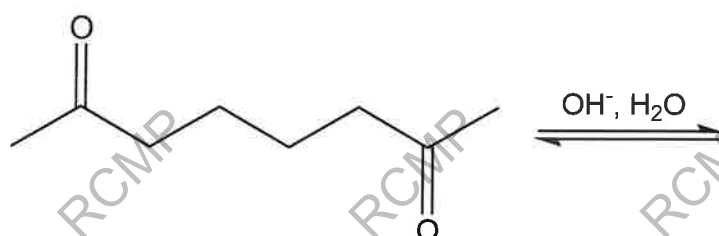
Polymer X



Polymer Y

(6 marks)

- (c) Draw the mechanism of the product that will be formed during the following intramolecular aldol addition reaction.



(6 marks)

END OF EXAMINATION PAPER