



UNIVERSITI KUALA LUMPUR
ROYAL COLLEGE OF MEDICINE PERAK

FINAL EXAMINATION
MARCH 2026 SEMESTER

COURSE CODE : RPD11702
COURSE NAME : BASIC ORGANIC CHEMISTRY
PROGRAMME NAME : DIPLOMA IN PHARMACY
DATE : 24 JUNE 2026
TIME : 02.30 PM – 04.30 PM
DURATION : 2 HOURS

INSTRUCTIONS TO CANDIDATES

1. Please **CAREFULLY** read 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 where Question 1 and Question 2 are **COMPULSORY**, answer either 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 15 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

SECTION A (Total: 25 marks)

INSTRUCTION: Answer ALL questions.

Please use the objective answer sheet provided.

1. Which of the following is an organic compound?
 - A. NaCl
 - B. H_2SO_4
 - C. CH_4
 - D. CaCO_3

2. Which of the following is a saturated hydrocarbon?
 - A. Ethene
 - B. Ethyne
 - C. Propane
 - D. Benzene

3. Geometrical isomerism is commonly found in _____.
 - A. alkanes
 - B. alkenes
 - C. alcohols
 - D. aldehydes

4. Optical isomerism arises due to the presence of _____.
 - A. double bond
 - B. functional group
 - C. chiral carbon atom
 - D. branched chain

5. Which pair represents position isomers?
 - A. butane and 2-methylpropane
 - B. propan-1-ol and propan-2-ol
 - C. ethanol and dimethyl ether
 - D. pentane and hexane

6. Which of the following compounds can exhibit geometrical isomerism?
- A. $\text{CH}_2=\text{CH}_2$
 - B. $\text{CH}_3\text{CH}=\text{CHCH}_3$
 - C. $\text{CH}_3\text{CH}_2\text{CH}_3$
 - D. $\text{CH}\equiv\text{CH}$
7. What is the molecular formula of pentane?
- A. C_5H_{10}
 - B. C_5H_8
 - C. C_5H_{12}
 - D. C_5H_{14}
8. Select the **CORRECT** statement.
- A. Alkenes are highly soluble in water
 - B. Alkenes are non-polar compounds
 - C. Alkenes have very high boiling points
 - D. Alkenes conduct electricity in aqueous solution
9. The boiling point of haloalkanes generally increases with _____.
- A. decrease in molecular mass
 - B. increase in halogen size
 - C. decrease in intermolecular forces
 - D. increase in branching only
10. Which alkane has the highest boiling point?
- A. Pentane
 - B. 2-methylbutane
 - C. 2,2-dimethylpropane
 - D. All have the same boiling point
11. What is the major organic product formed when 2-bromopropane reacts with alcoholic KOH?
- A. Propane
 - B. Propene
 - C. Propanol
 - D. 1-bromopropane

12. Ozonolysis of 2-butene produces _____.
A. ethanal only
B. methanal only
C. ethanoic acid only
D. propanone only
13. What is the functional group of aldehydes?
A. -OH
B. -COOH
C. -CHO
D. -NH_2
14. Which factor gives alcohols a high boiling point?
A. Ionic bonding
B. Hydrogen bonding
C. Weak forces
D. Metallic bonding
15. Choose the IUPAC name of $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{COOH}$.
A. Butanoic acid
B. Pentanoic acid
C. Hexanoic acid
D. Propanoic acid
16. Which of the following is a secondary alcohol?
A. Methanol
B. Ethanol
C. 2-pentanol
D. 1-butanol
17. Which compound will be produced when a primary alcohol is oxidized?
A. Ketone
B. Aldehyde
C. Ester
D. Alkane

18. Why are tertiary alcohols resistant to oxidation?
- A. Lack of hydrogen on carbon bearing -OH
 - B. Presence of double bond
 - C. Low molecular weight
 - D. Strong ionic bond
19. Which compound will give a positive Tollens' test?
- A. Propanone
 - B. Ethanol
 - C. Ethanal
 - D. Butanol
20. Which compound pair forms methyl propanoate?
- A. Methanol + propanoic acid
 - B. Ethanol + propanoic acid
 - C. Methanol + ethanoic acid
 - D. Propanol + methanoic acid
21. What is the general formula for a primary amine?
- A. R-NH_2
 - B. R_2NH
 - C. R_3N
 - D. R-COOH
22. Which is the correct IUPAC name for CH_3NHCH_3 ?
- A. Dimethylamine
 - B. N-methylmethanamine
 - C. N-methylethanamine
 - D. Ethanamine
23. Phenol is commonly used in the manufacture of _____.
- A. fertilizers
 - B. antiseptics
 - C. cement
 - D. fuel gas

24. What does the prefix "ortho- (o-)" indicate in the naming of benzene and phenol derivatives?
- A. 1,2-position
 - B. 1,3-position
 - C. 1,4-position
 - D. 2,5-position
25. Which product is formed when benzene reacts with concentrated nitric acid in the presence of concentrated sulfuric acid?
- A. Phenol
 - B. Nitrobenzene
 - C. Benzoic acid
 - D. Cyclohexane

SECTION B (Total: 75 marks)

INSTRUCTION: This section consists of FOUR (4) short answer question (SAQ).

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

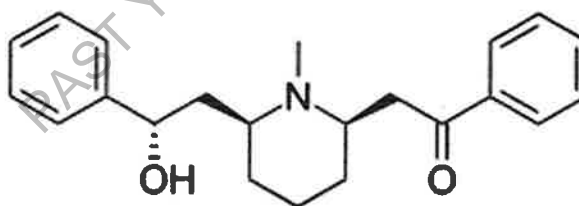
Question 1 and Question 2 are **COMPULSORY**.

Answer either Question 3 OR Question 4.

Question 1

- (a) Lobeline is an alkaloid that acts as a respiratory stimulant by stimulating chemoreceptors in the carotid body, leading to increased breathing rate and depth.

Redraw the structure of Lobeline, circle and name **FOUR (4)** functional groups that exist in Lobeline.



(4 marks)

- (b) i. Define geometrical isomerism.

(1 mark)

- ii. Draw and label the cis-trans isomers of 4-chloro-2-pentene.

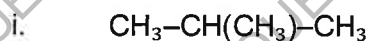
(4 marks)

- (c) State the solubility of butane in water.

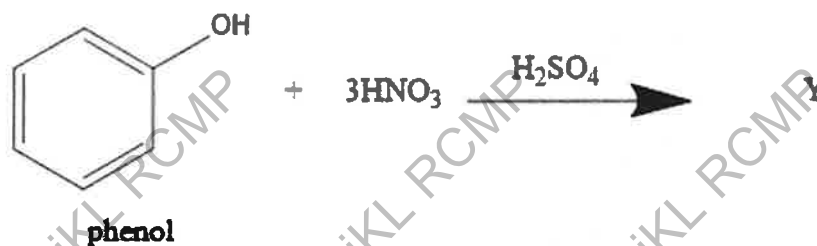
(1 mark)

- (d) Give the IUPAC name for the following compound.

(6 marks)



- (e) When phenol reacts with a nitrating mixture of concentrated nitric acid and concentrated sulfuric acid under heating, a compound Y is produced, as illustrated in the diagram below.



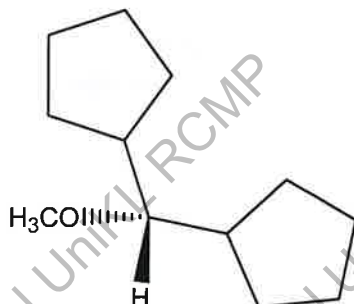
- i. Name and draw product Y. (2 marks)
- ii. Identify the side product formed from this reaction. (1 mark)
- (f) i. Draw the chemical reaction for sulfonation of phenol at low temperature. (3 marks)
- ii. Name the major product formed. (1 mark)
- (g) Describe the conditions required for the sulfonation of benzene. (2 marks)

Question 2

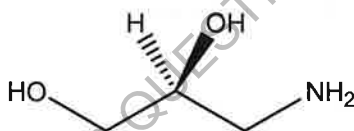
- (a) Identify each of the following molecules as chiral or achiral.

(2 marks)

i.



ii.



- (b) Indicate all the chirality centres in the compound below.



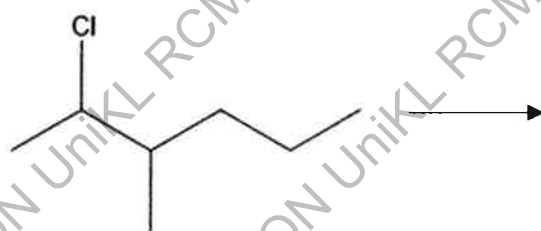
(2 marks)

- (c) Alkenes can be prepared by dehydrohalogenation of haloalkanes.

- i. Name the reagent required for the dehydrohalogenation of haloalkanes.

(1 mark)

- ii. Given the structure below, draw and name the major product (X) formed when it undergoes dehydrohalogenation of haloalkanes.



X

(2 marks)

- iii. Identify the rule used to determine the major product of the dehydration of alcohol.

(1 mark)

(d) Draw the structures of the following compounds.

(6 marks)

- i. 2-isopropyl-3,4-dimethyloctan-1-ol
- ii. 3-ethyl-5-methyl-2-heptanone
- iii. Butyl 4-methylpentanoate

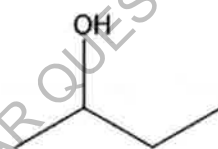
(e) Explain why alcohols have higher boiling points than alkanes.

(3 marks)

(f)



X



Y



Z

The figure above shows three types of alcohol (X, Y and Z).

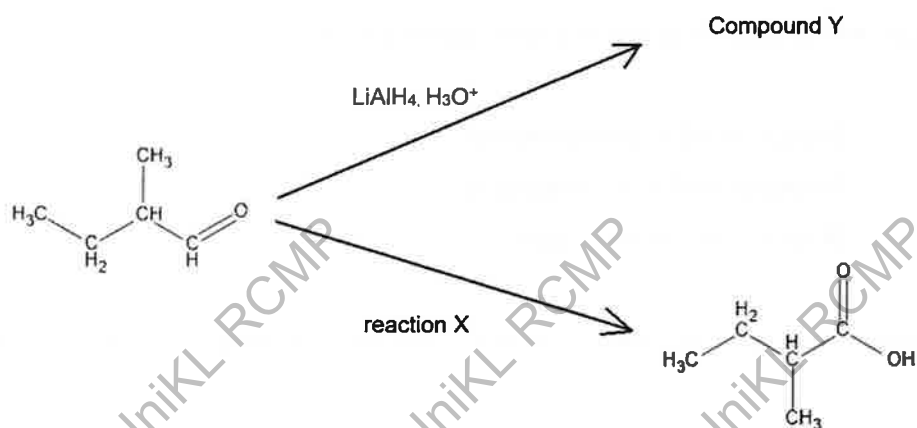
- i. Describe the results of the three types of alcohol shown above when they undergo the Lucas test.

(3 marks)

- ii. Name the reagent used in Lucas test.

(1 mark)

(g)



The figure above shows the reaction of ketone.

i. Name the reaction X.

(1 mark)

ii. State the reagents used for the reaction X.

(1 mark)

iii. Draw and name compound Y.

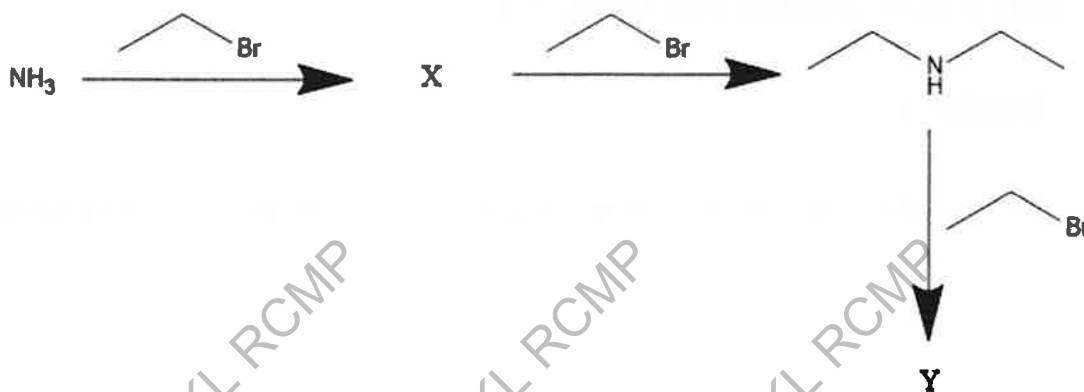
(2 marks)

Answer either Question 3 OR Question 4

Question 3

- (a) Explain the difference of the combustion of alkanes in limited oxygen and very limited oxygen. (2 marks)
- (b) Write a balanced chemical equation for the combustion in limited oxygen of the following alkane.
- i. Butane (2 marks)
- ii. Propane (2 marks)
- (c) i. Describe the dehydration of propanol to form alkene and state the conditions required. (3 marks)
- ii. Name the products formed from dehydration of propanol. (2 marks)
- (d) Draw the chemical reaction of 2-methylpentanoic acid with ammonia. (3 marks)
- (e) Identify the physical state of lower amines (C_1-C_3). (1 mark)

(f)



The figure above shows the ammonolysis reaction of an alkyl halide with ammonia. Draw the structure of X and Y.

(4 marks)

(g) Explain the role of LiAlH_4 in reduction of amide.

(3 marks)

(h) State the molecular formula of phenol.

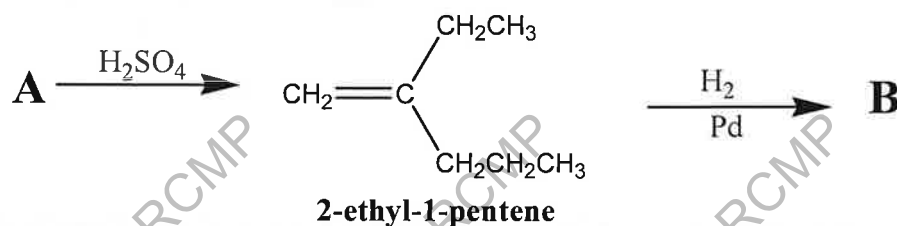
(1 mark)

(i) State **TWO (2)** physical properties of benzene.

(2 marks)

Question 4

- (a) Based on reaction scheme below, draw the structures of A and B.



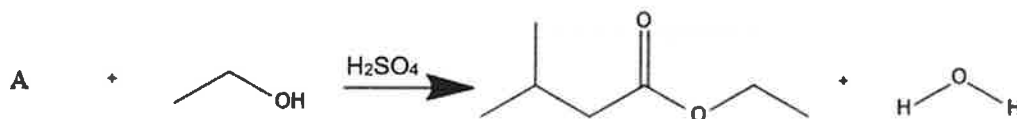
(4 marks)

- (b) Based on the reaction scheme below, name the chemical reaction corresponding to A.

(2 marks)

- (c) Draw the reactants (A, B and C) involved in each of the following esterification reaction in presence of acid catalyst.

i.



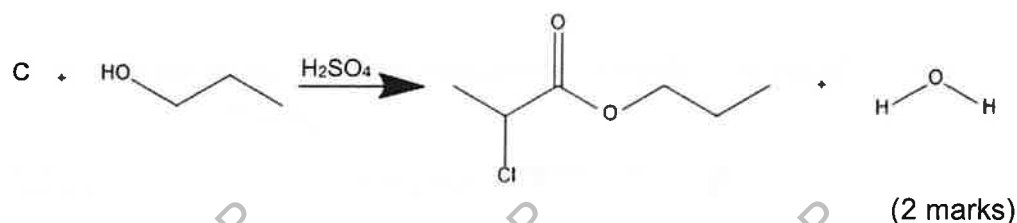
(2 marks)

ii.



(2 marks)

iii.



- (d) Compound X shows no colour change with chromic acid. Classify alcohol X. Justify your answer.

(2 marks)

- (e) State the class of the following amine:



(1 mark)

- (f) Explain what is ammonolysis of alkyl halides.

(2 marks)

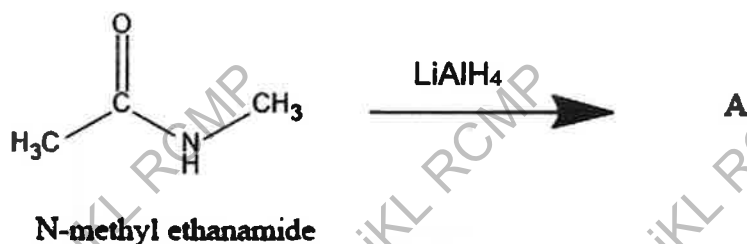
- (g) i. Describe the reaction of primary amine with alkyl halide.

(1 mark)

- ii. Write the products formed when methylamine reacts with iodomethane based on answer in (g) i.

(2 marks)

(h)



The diagram above shows the reduction reaction of *N*-methyl ethanamide. Draw and name the compound A.

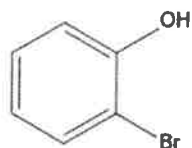
(2 marks)

- (i) Name the functional group present in phenol.

(1 mark)

(j) Name the following compounds.

i.



(1 mark)

ii.



(1 mark)

END OF EXAMINATION PAPER