BINDURA UNIVERSITY OF SCIENCE EDUCATION
CHEMISTRY DEPARTMENT

MASTER OF SCIENCE DEGREE IN CHEMISTRY

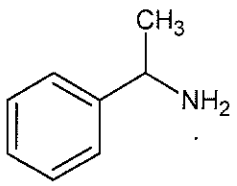
COURSE: MCH503: ORGANIC CHEMISTRY

3 HOURS JAN 2025

ANSWER ANY FOUR QUESTIONS. EACH QUESTION CARRIES 25 MARKS

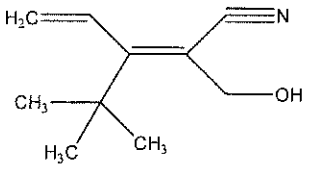
1. a) What do you understand by the phrase *meso-isomers*? **[2 marks]**

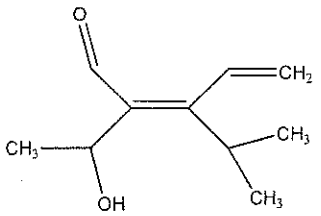
b) 1-phenylethylamine has the structure shown below.



Describe how you would resolve a racemic mixture of 1-phenylethylamine. **[10 marks]**

c) Use the Cahn-Ingold-Prelog priority rules to assign the following compounds as *Z* or *E* isomers.



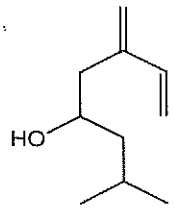


[4 marks]

d) Discuss prenylated alkaloids under the following headings;

(i) Structure **[2 marks]**
(ii) Detection methods **[5 marks]**
(iii) Application in education **[2 marks]**

2. a) Predict the normal C-13, DEPT-90, and DEPT-135 spectra of ipsenol, whose structure appears below. **[10 marks]**



b) Propose mechanisms to account for the formation of fragments corresponding to m/z 74, 71, 59 and 43 in the mass spectrum of methyl butyrate ($C_5H_{10}O_2$). **[5 marks]**

c) Explain why tetramethylsilane (TMS) is used as reference compound in both ^{1}H- and ^{13}C-NMR spectroscopy. **[5 Marks]**

d) Predict the chemical shifts in ^{13}C NMR spectra of the compound below; $H_2C{=}CHCO_2CH_2CH_3$ **[5 marks]**

3. Determine the structure of the compound $C_{10}H_{12}O_2$, given the information below;

^{13}C NMR (δ, ppm): 11, 22, 67, 128, 130, 131, 133, 167

^{1}H NMR: