



NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF APPLIED SCIENCE

DEPARTMENT OF APPLIED CHEMISTRY

ORGANIC CHEMISTRY

SCH 1116/1221

**FOR SBB(C), SBB(P),ESH(C),ESH(P),EFW,TXT,TCE STUDENTS
ONLY**

Supplementary Examination Paper

July 2016

This examination paper consists of 4 pages

Time Allowed: 3 hours

Total Marks: 100

Special Requirements: NONE

Examiner's Name: DR C T PAREKH

INSTRUCTIONS

- 1. Answer all questions from Section A and any three from Section B. Section A carries 40 marks and each question in Section B carries 20 marks.**
- 2. Show mechanism, chemical steps or synthesis by means of curved arrows.**

MARK ALLOCATION

QUESTION	MARKS
1.	40
2.	20
3.	20
4.	20
5.	20
TOTAL	100

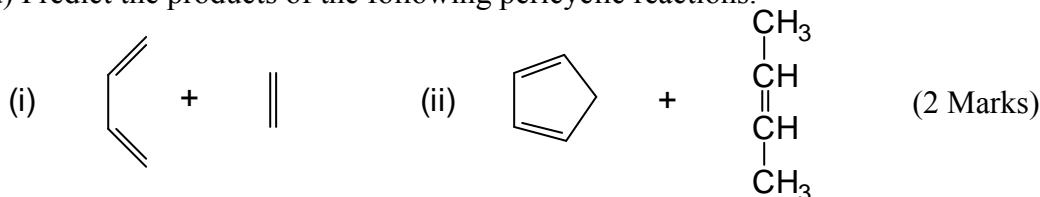
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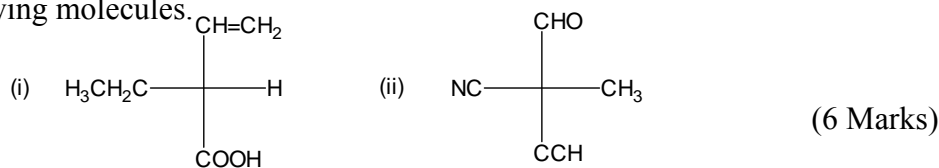
SECTION A :

1. (a) Write structural formulae for the following compounds.
(i) 3-hydroxy butanal
(ii) cis-1,3-dichlorocyclohexane (2 Marks)
- (b) The following names are incorrect. Draw the structure and provide proper IUPAC names.
(i) 5-ethyl-4-octane
(ii) 1,1-dimethylpentane
(iii) 5-ethyl-4-methylhexane (6 Marks)
- (c) Assign E and Z configuration to the following alkene. Indicate priority on the structure.
 $\text{CH}(\text{Br})\text{C}(\text{CH}_3)\text{CH}_2\text{CH}_3$ (6 Marks)

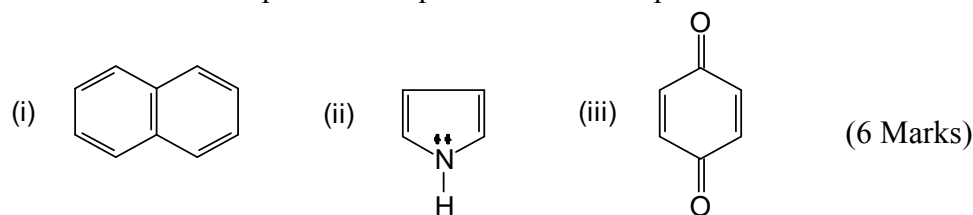
- (d) Predict the products of the following pericyclic reactions.



- (e) Show the steps to assign R or S configurations to each chiral centre in the following molecules.



- (f) Draw functional isomers and give IUPAC names of a compound with molecular formula $\text{C}_4\text{H}_9\text{OH}$. (4 Marks)
- (g) State whether the following compounds are aromatic or non-aromatic and also indicate the number of pi electrons present in the compound.



- (h) Give starting materials which would react under basic conditions to give following ethers.
(i) ethyl phenyl ether (ii) dibutyl ether (4 marks)
- (i) What Grignard reagents and what carbonyl compounds might you start with to synthesise the following alcohols. (Draw the structures and not the IUPAC names of the compounds).
(i) Butan-2-ol (ii) 2-methyl pentan-2-ol. (4 Marks)

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SECTION B

2. (a) The reaction between hex-3-ene and alkaline KMnO_4 produces dihydroxyhexane. This product is an optically active compound. Use Fischer projections to draw as many stereoisomers of the product as possible and label them as enantiomers, diastereoisomers and meso compound. (10 Marks)
- (b) What is the major monosubstitution product that you would expect to obtain from the Friedel-Crafts alkylation of benzene with chloropropane in the presence of aluminium chloride catalyst? Write reaction mechanism and explain the reason for the major product. (10 Marks)
3. (a) With an appropriate example (organic compound) of your choice explain the Sp^2 hybridisation. Draw orbital diagram, bonded structure and the shape of the molecule. (8 Marks)
- (b) With appropriate examples define:
- (i) enantiomers and (4 Marks)
 - (ii) plane of symmetry (4 Marks)
- (c) Draw the structures of the following compounds and indicate whether the compounds are chiral or achiral.
- (i) 3-chloropentane (2 Marks)
 - (ii) 2-chloro-2-methylpentane (2 Marks)
4. (a) With an appropriate example write reaction mechanisms for S_{N}^1 reactions. What is the effect of substrate on rate of reaction? (6 Marks)
- (b) Draw a chair conformation of cyclohexane and label all positions as axial and equatorial. (4 marks)
- (c) The structure of D-talose is as follows.
- $$\begin{array}{c} \text{CHO} \\ | \\ \text{HO}-\text{C}-\text{H} \\ | \\ \text{HO}-\text{C}-\text{H} \\ | \\ \text{HO}-\text{C}-\text{H} \\ | \\ \text{H}-\text{C}-\text{OH} \\ | \\ \text{CH}_2\text{OH} \\ \text{D-TALOSE} \end{array}$$
- (i) Draw Fischer projection for D-talose. (1 Marks)
 - (ii) Write the reaction mechanism to produce Haworth projection for D-talose. Indicate also the type of reaction which has taken place. (5 Marks)
 - (iii) Draw α and β anomers. (No chair conformations) (4 Marks)

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5. (a) When 2-bromobutane (alkyl halide) is reacted with potassium hydroxide in ethanol, various products are formed. Write the reaction mechanism and indicate the type of reaction that has taken place to form the products. (8 Marks)
- (b) Draw the structures and give IUPAC names of the following reactions. Indicate wherever necessary the major product. (No mechanism required).
- (i) nitration of chlorobenzene
 - (ii) reduction of nitrobenzene with tin and hydrochloric acid followed by reaction with nitrous acid in hydrochloric acid below 10°C . The product is then treated with (I) cuprous chloride and (II) acid. (8 Marks)
- (c) State four criteria which make benzene a very stable compound. (No descriptions required). (4 Marks)

*****END OF PAPER*****