

[This question paper contains 7 printed pages]

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**ASME-24BC-CHEM-II
CHEMISTRY (PAPER-II)**

Time Allowed : 3 Hours

[Maximum Marks : 100]

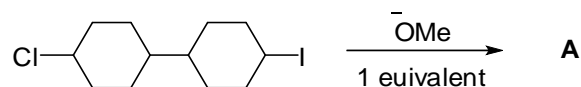
QUESTION PAPER SPECIFIC INSTRUCTIONS

Please read each of the following instruction carefully before attempting questions.

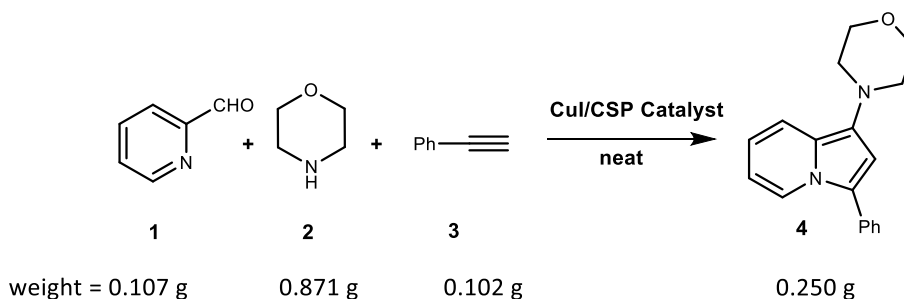
1. There are **EIGHT** questions printed in English.
 2. Candidate has to attempt **FIVE** questions in all.
 3. **Question No. 1 is compulsory**. Out of the remaining SEVEN questions, **FOUR** are to be attempted.
 4. All questions carry equal marks. The number of marks carried by a question / part is indicated against it.
 5. Write answers in legible handwriting. Each part of the questions must be answered in sequence and in the same continuation.
 6. Unless otherwise mentioned, symbols and notations carry their usual standard meanings.
 7. Assume suitable data, if considered necessary, and indicate the same clearly.
 8. Attempts of questions shall be counted in sequential order. Unless struck off, attempt of a question shall be counted even if attempted partly. Any page or portion of the page left blank in answer book must be clearly struck off.
 9. Re-evaluation / Re-checking of answer book of the candidate is not allowed.
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1. (a) Predict the product in the following elimination reaction:

2

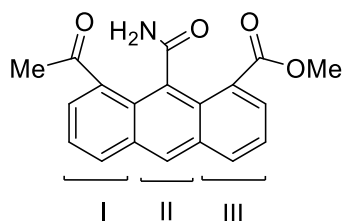


(b) Explain the basic concepts of green chemistry towards sustainable development. Calculate E-factor and atom economy of compound **4** in the following reaction. 5



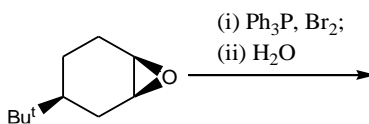
(c) Draw the conformational isomers of sodium 3-bromocyclohexylcarboxylate ($\text{BrC}_6\text{H}_{10}\text{COONa}$). The *trans* isomer readily eliminates bromide ion results in the formation of lactone while *cis* isomer is inert, explain? 5

(d) In the following compound which of the ring will readily undergo electrophilic reaction. 3



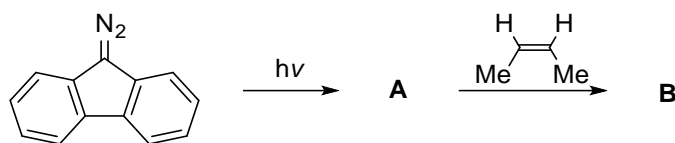
(e) Write structure of all possible stereoisomer of the product obtained on reduction of benzil with LiAlH_4 . 3

(f) Identify the major product with correct stereochemistry in the following reaction. 2



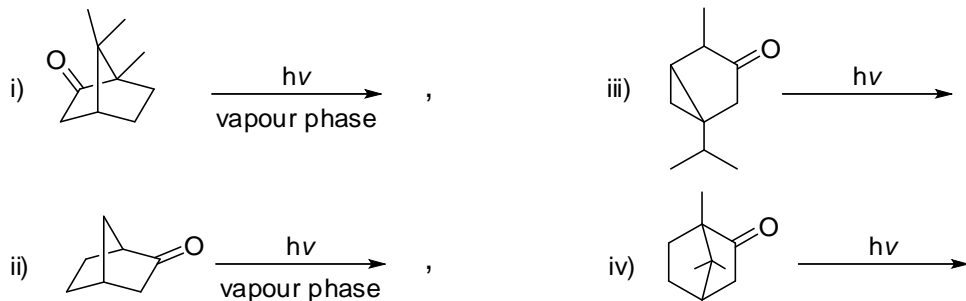
2. (a) Explain McLafferty rearrangement using carbonyl, alcohol compound as examples. How McLafferty rearrangement differs with ortho effect. 5

(b) Write the structure of reactive intermediate **A** involved in the following reaction and predict the structure of product **B** 4



(c) How will you differentiate a double doublet (non-first order spectra) having intensity ratio of 1:3:3:1 with a quartet? 3

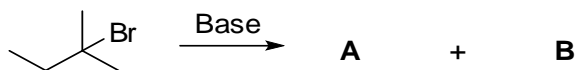
(d) Predict the possible products of the following reactions: 6



(e) What is internal standard and external standard in NMR and why it is required? 2

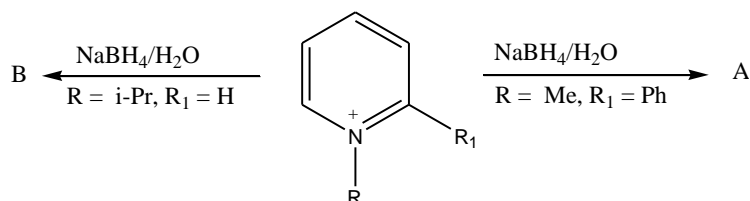
3. (a) Compound **A** with molecular formulae $C_9H_{10}O_2$ when treated with methanol in acidic condition gives **B** (ester of **A**). Compound **B** having molecular weight of 164 and show UV-VIS λ_{max} at 222 nm. Spectral data of compound **B** is: **IR** (ν , cm^{-1}) 2712-2891, 3020, 1743, 1601, 1498, 1455, 1242; 1H **NMR**: (δ , ppm) 7.3 (m, 5H), 4.1 (s, 3H), 2.95 (t, 2H, $J = 7.3$ Hz), 2.48 (t, 2H, $J = 7.3$ Hz). Identify compound **A** and **B** and assign all spectral data to correlate compound **B**. 12

(b) Predict the products **A** and **B** in the following reaction. What will be the % yield of product **A** and **B** under the reaction condition given in the following table? Give suitable rationale to your answer. 8

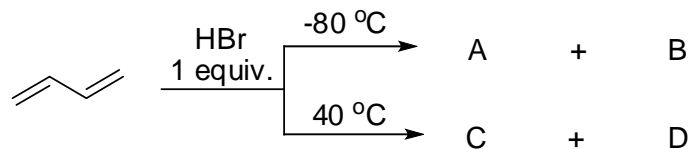


Base	% of A	% of B
EtO ⁻ K ⁺ /EtOH		
Me ₃ CO ⁻ K ⁺ /Me ₃ COH		
Et ₃ CO ⁻ K ⁺ /Et ₃ COH		

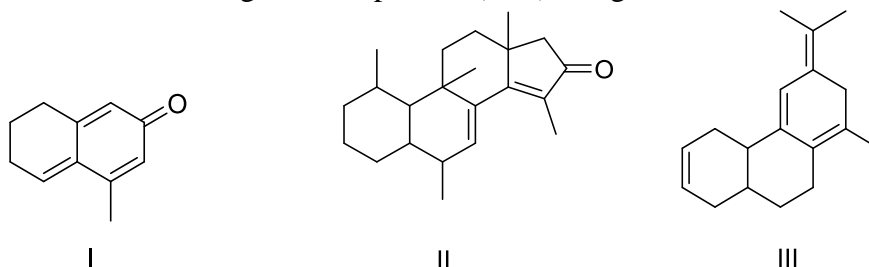
4. (a) Identify **A** and **B** in the following reaction. 4



(b) Predict the major and minor products using kinetic and thermodynamic approach of the following reaction. 6

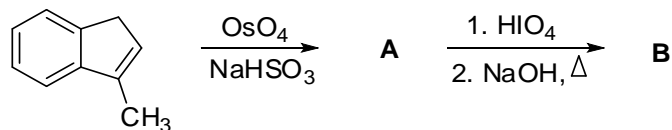


(c) Calculate the λ_{max} for the given compounds (I-III) using Woodward-Fisher rule. 6



Given λ_{max} : Cisoid = 253 nm; Transoid: 214 nm, Six-membered enone: 215 nm, Five-membered enone: 202 nm; ring residue: 5 nm; Alkyl substituent: 5nm; Exocyclic double bond: 5 nm, Double bond extended conjugation: 30 nm

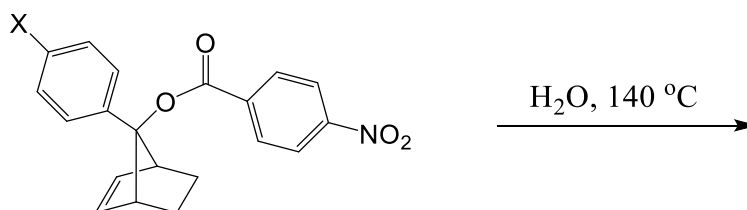
(d) Predict **A** and **B** in the following reaction: 4



5. (a) Irradiation of norbornene with benzophenone and acetophenone gives different products. Identify both the products and explain these results. 4

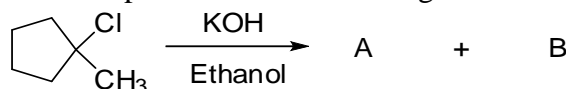
(b) Write down the structure of the compound with its stereochemistry that you will get on the reaction of maleic acid with OsO_4 followed by hydrolysis. 3

(c) Compound **A** on solvolysis gives one product with retention of configuration while compound **B** under identical conditions gives mixture of *anti* and *syn* product. Identify the products and propose suitable mechanism. 4



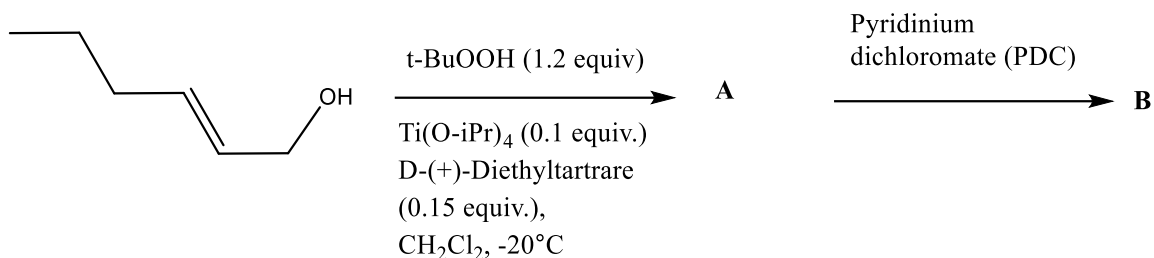
A; X = H
B; X = NMe₂

(d) Predict the major and minor product in the following reaction 3

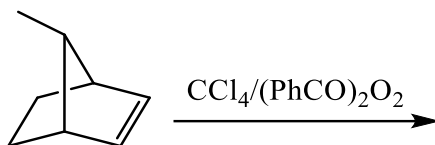


(e) Explain Merrifield solid phase synthesis. What are the advantages of this method? 3

(f) Identify products A and B in the following reaction. Write the absolute configuration of the product A. 3

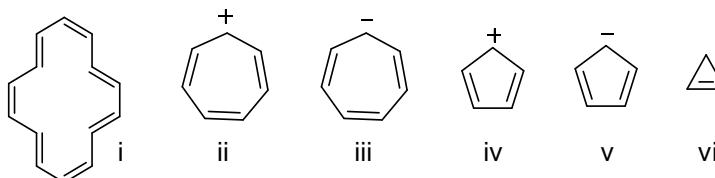


6. (a) Explain the formation of major product in the following reaction. 4

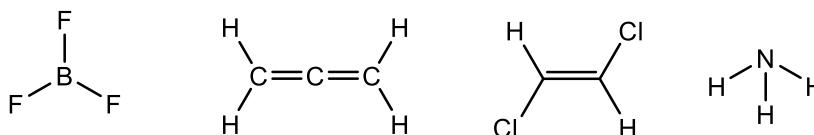


(b) Compound **A** on photolysis gives peaks at m/z 28, 44 and 76 in the mass spectrum. After a while, the peak at m/z 76 disappeared and new at m/z 152 started appearing. Identify peaks at these m/z values with the help of reaction mechanism? 6

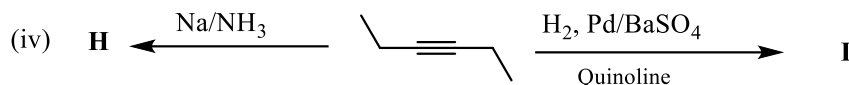
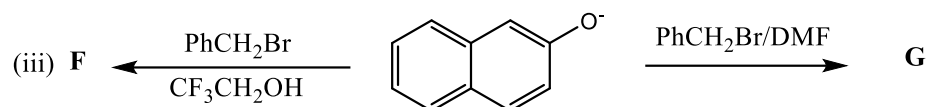
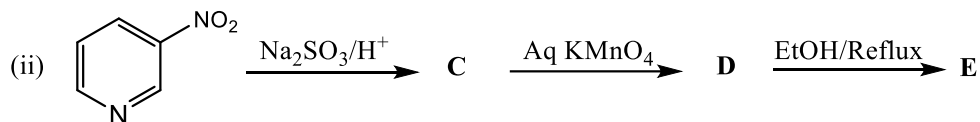
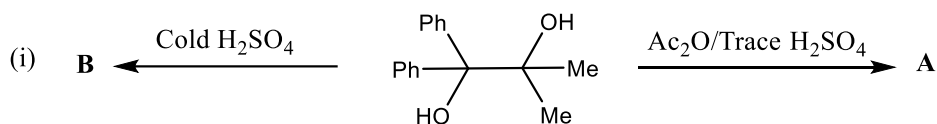
(c) What is Huckel rule of aromaticity? Explain which of the following compound are aromatic, non-aromatic or anti-aromatic 6



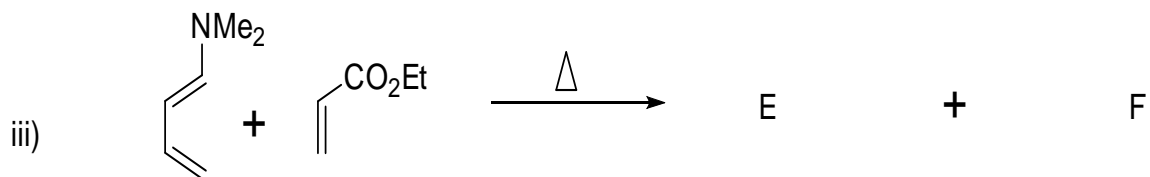
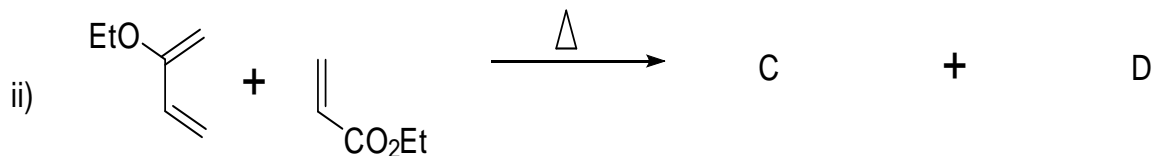
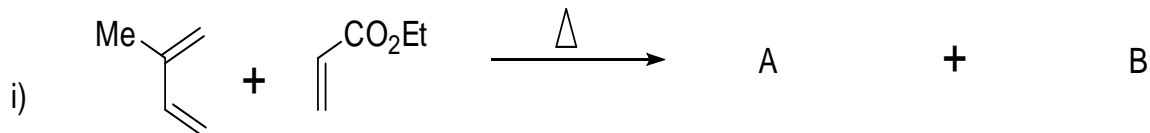
(d) Write down symmetry element(s) and point group and in the following compounds 4



7. Identify products in the following reactions and explain the mechanism of each of the reaction. 4 x 5

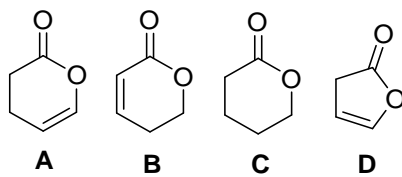


8. (a) What is Diels-Alder reaction? Predict the products **A**, **B**, **C**, **D**, **E**, and **F** and specify major and minor (both) products in each reaction of the following: 6



- (b) An organic compound (A) with molecular formula $\text{C}_7\text{H}_5\text{NO}_3$ which show $^1\text{H-NMR}$ peaks at 10.2 (s, 1H) and 8.4 (d, 2H) and 8.2 (d, 2H) is heated with acetic-n-hydride and aqueous sodium acetate. Identify the structure of the compound **A** and name of the reaction. Write the product formed in this reaction. 5

(c) Arrange the followings in the correct order of IR absorption of $C=O_{str}$ with suitable justification 5



(d) Identify compound **A-D** in the following reaction. 4

