



[This question paper contains 04 printed pages]

Roll Number: _____

HPAS Etc. Combined Competitive (Main) Examination, 2019

Chemistry-II

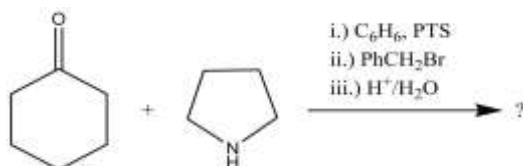
Time Allowed: 3 Hours

Maximum Marks: 100

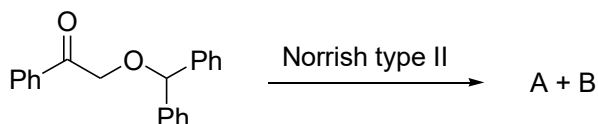
Note:

1. This question paper contains total eight questions. *Attempt any five questions including compulsory question No.1.*
2. Each question carries equal marks. Marks are divided and indicated against each part of the question. Write answer in legible handwriting. Each part of the question must be answered in sequence and in the same continuation.
3. Attempts of questions shall be counted in sequential order. Unless struck off, attempt of 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.
4. *Re-evaluation / Re-checking of answer book is not allowed.*

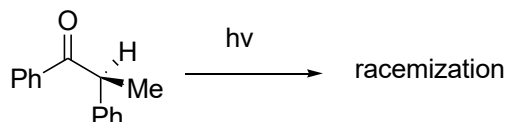
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1. (a) What do you mean by Inclusion compounds? With the help of suitable examples, justify the statement "Capability of a molecule to behave as guest depends upon shape and size of host compound not on electronic or chemical effects"? (6)
 - (b) Mesitylene forms picrate with 1, 3, 5-trinitrobenzene while benzene doesn't. Explain? (4)
 - (c) (i) Complete the following conversion with suitable mechanism: (4)



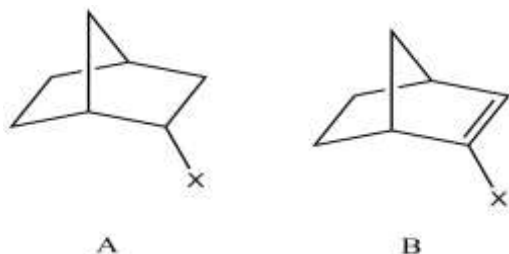
- (ii) Explain the Norrish type II products of compound given below: (3)



- (iii) Following ketone containing chiral centre undergo racemization on photolysis, why? (3)

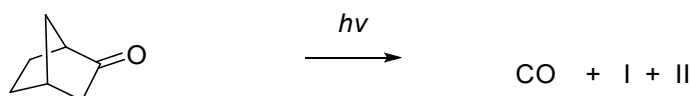


2. (a) Which out of the following compounds (A & B) will be more reactive towards Nucleophilic Substitution reaction: (6)

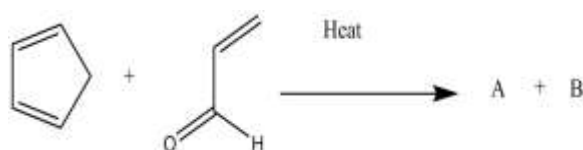


Also provide the most suitable justification?

- (b) What do you mean by Hammond's Principle? Justify your answer with help of Energy profile diagrams along with suitable example? (6)
- (c) What does Isotope effect refer to in context of mechanism prediction? (4)
- (d) Write the products of the following reaction and propose suitable mechanism for their formation: (4)



3. (a) (i) Discuss the regiochemistry involved in reaction as well as stereochemistry of product obtained in following reaction along with mechanism involved therein? (4)



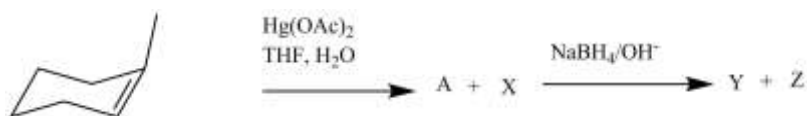
- (ii) Explain the following terms / concepts with suitable examples: (4)
- (a) Chemical shift in NMR spectra.
- (b) Spin-spin splitting.

- (b) Write the products of the following reaction with a suitable mechanism and also discuss the regiochemistry and stereochemistry involved therein? (7)

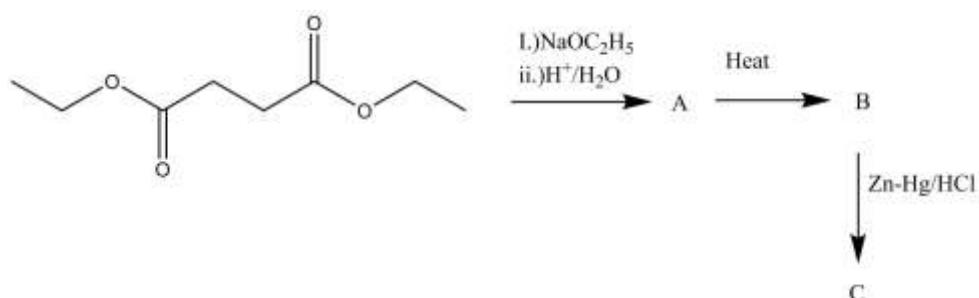


- (c) Elaborate the nature of bonding involved in cyclopropane? (5)

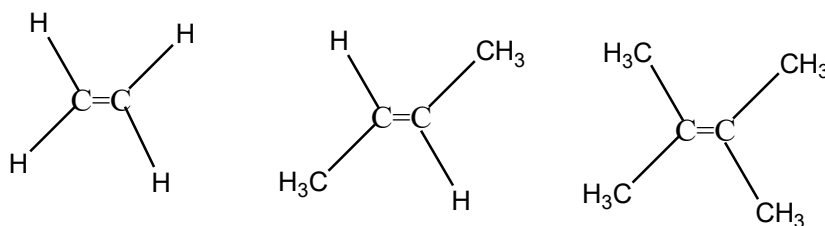
4. (a) Identify the product and suggest the mechanism for the following reaction: (8)



- (b) Complete the following reaction along with suitable mechanism and also place some light on regiochemistry involved in reaction? (8)



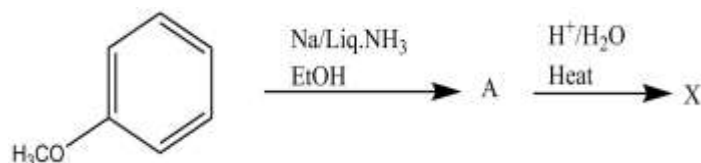
- (c) Arrange the following in order of increasing reactivity towards hydrogen halides. Justify your answer. (4)



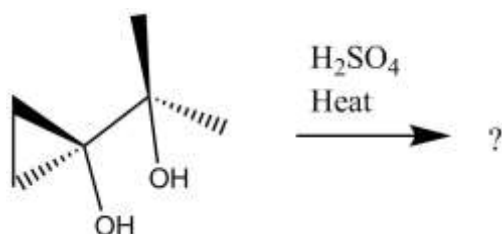
5. (a) Justify aromatic / anti-aromatic / non-aromatic nature of the following compounds on the basis of Perturbation Molecular Orbital Theory? (6)



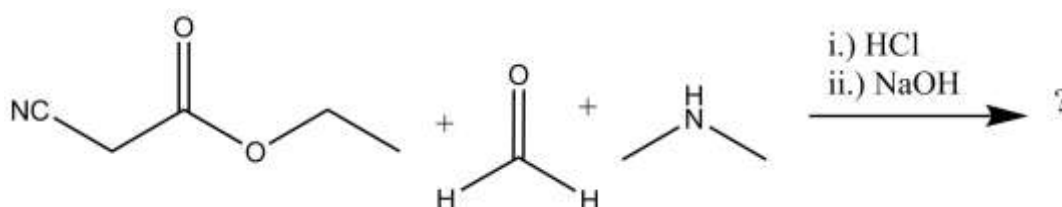
- (b) Identify A and X and suggest the mechanism for the following reaction: (7)



- (c) What products are formed in the following reaction and explain with justified mechanism: (7)



6. (a) Identify and propose the mechanism of the product obtained from the following reaction: (6)



- (b) Explain the following terms / rules / concepts along with suitable examples: (4)

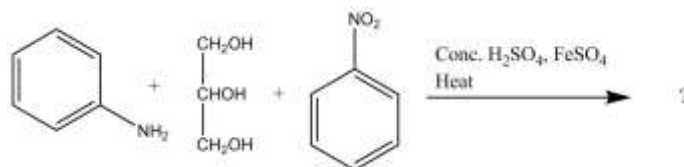
- (i) Bathochromic shift
- (ii) Solvent effect on λ_{\max}

- (c) (i) Provide the brief description about the following polymers (including properties and applications): (6)

- (a) Poly (Methyl Methacrylate)
- (b) Polytetrafluoroethylene
- (c) Silicone

- (ii) Calculate the molar mass of a polystyrene in benzene solutions at 25^oC.. (4)
 Given $K = 3.60 \times 10^{-2}$ dL/g, $a = 0.74$ and intrinsic viscosity $[\eta] = 180$ dL/g.

7. (a) (i) Find out the product of the following reaction along with suitable mechanism: (5)



- (ii) How many peaks in ¹HNMR will appear for the following compounds: (3)

- (a) CH₂=CH-CH₂OH
 (b) CH₃-CH(Cl)-CH₂Cl
 (c) N,N-dimethylformamide

- (b) Explain the following terms / rules / concepts along with suitable examples: (8)

- (a) Vibration Coupling
 (b) Selection rules in IR spectroscopy
 (c) Fermi Resonance
 (d) Fingerprint region

- (c) With the help of suitable example explain McLafferty rearrangement. (4)

8. (a) An organic compound of molecular weight 73 gave the following spectroscopic data on analysis: (8)

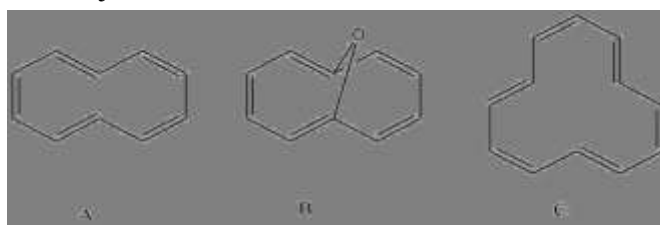
UV: λ_{max} 219 m μ (60)

IR: 3413 (m), 3236 (m), 3030-2899 (m), 1667 (s), 1634 (s) and 1460 cm⁻¹ (m)

PMR: 3.50 (very broad, singlet, 13.0 squares), 7.75 (quartet, 12.8 squares) and 8.90 τ (triplet, 19.7 squares)

Deduce the structure of the organic compound.

- (b) Find out aromatic / anti-aromatic / non-aromatic compounds among the following compounds with justification: (6)



- (c) Describe [3, 3] Sigmatropic Shift and discuss the stereochemistry involved in reaction as per Woodward- Hoffman rules. Also provide the two examples of named reactions involving this shift. (6)
