

**B. Sc. Part-III (Honours) Examination, 2021****Subject: Chemistry****Paper: X****(New Syllabus)****Time: 2 Hours****Full Marks: 50**

*The figures in the margin indicate full marks.  
Candidates are required to give their answers in their own words  
as far as practicable.*

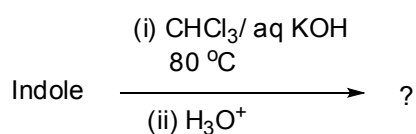
**Group A**

1. Answer *any three* questions from the following:

**3 × 5 = 15**

(a) Draw the structure of alizarin. Propose a synthesis of aspirin from benzene and other reagents of your choice. Write the uses of Paracetamol.

(b) Write the structure of pyrrole indicating the state of hybridisation of carbon and nitrogen atom. What happens when a mixture of p-toluidine and methyl vinyl ketone is heated in the presence of sulphuric acid? Explain with mechanism. Draw the structure of major product formed in the following reaction.



(c) Explain why the peptide C-N bond is shorter than the normal C-N bond? How could you identify the N-terminal amino acid of a peptide chain by Edman degradation method? What is the secondary structure of protein?

(d) Convert: D-fructose to D-glucose. What is mutarotation? Give the product of periodic acid oxidation of methyl-β-D-glucopyranoside.

(e) Designate the geometrical isomers of Citral-A in E/Z system of nomenclature. Propose a synthesis of Coniine mentioning a method of resolution.

2. Answer **any one** question from the following:

**1 × 10 = 10**

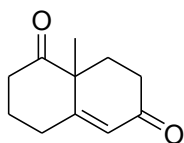
- (a) How would you explain the non reducing property of sucrose?  $\beta$ -anomer of D-glucopyranose undergoes oxidation with bromine water at a faster rate than  $\alpha$ -anomer—explain. What are the advantages of solid phase technique of protein synthesis? Give the reaction of alanine with ninhydrine.
- (b) Nerol undergoes acid catalyzed cyclization to afford  $\alpha$ -terpineol in faster rate than geraniol—explain. Why D(-) ephedrine is a weaker base than L(+) ephedrine? Write the structure of piperine with proper stereochemistry.

### Group- B

3. Answer **any three** questions from the following:

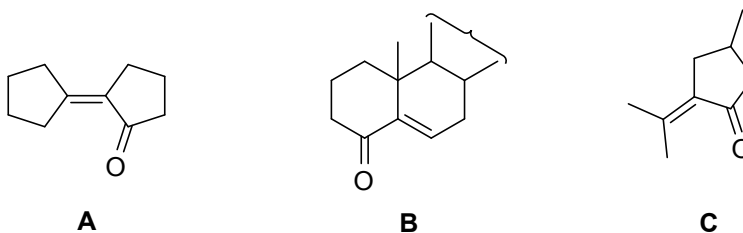
**3 × 5 = 15**

- (a) Outline a synthesis of the following compound by using Robinson annulation reaction.



What is umpolung reaction? Give example.

- (b) The observed  $\lambda_{\max}$  values for the following compounds are 242 nm, 254 nm, 259 nm. Match the value with justification.

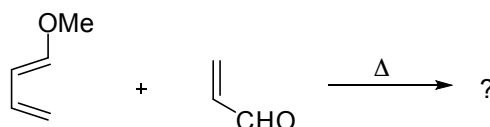
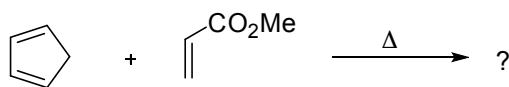


How many  $^1\text{H}$  NMR signals will be appeared for each of the following compounds?

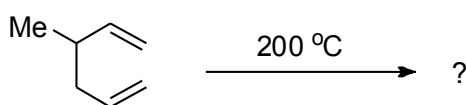


- (c) What is nucleotide? How does DNA differ from RNA? Thermal induced [2+2] cycloadditions are symmetry forbidden – Justify.

(d) Draw the structure of the major product formed in the following Diels-Alder reactions and justify your choice.



What product would be obtained in the following reaction? Briefly discuss.



(e) Suggest the functional group of which IR stretching frequencies are listed below.

(i) 3400 (broad); 1050 cm<sup>-1</sup>

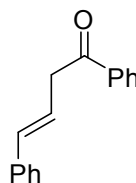
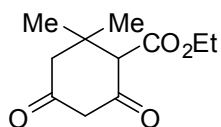
(ii) 3050, 1650 cm<sup>-1</sup>

Theoretical numbers of bands are seldom observed in IR spectroscopy – comment. What will be the chemical shift in ppm unit for a proton that shifted to 270 Hz downfield from the TMS in a 100 MHz NMR spectrometer?

4. Answer *any one* question from the following:

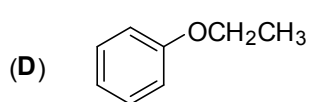
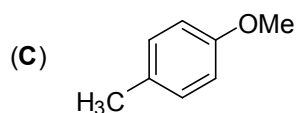
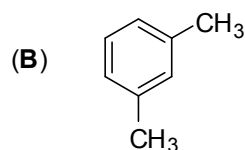
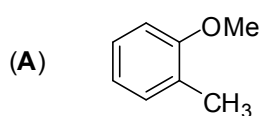
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(a) What is meant by illogical electrophile and illogical nucleophile? Give example for each. Show the retrosynthetic analysis for the following molecules and then provide their forward synthesis also.

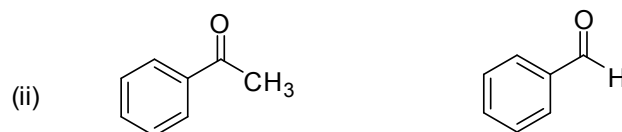
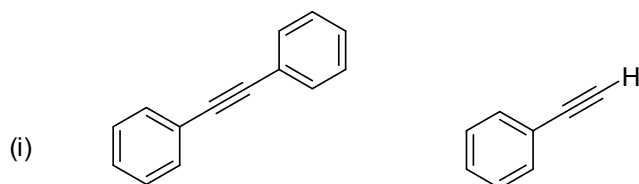


(b) Which of the following compounds (A to D) below most closely matches the  $^1\text{H}$  NMR data? Justify your choice.

$\delta$ -Value (ppm)	No. of protons	Splitting
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How could you distinguish the following pairs of molecules by IR spectroscopy?



Why is the Indigotin dark blue in colour?

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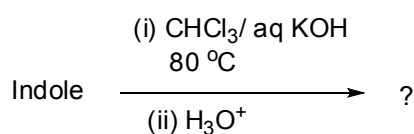
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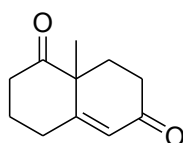
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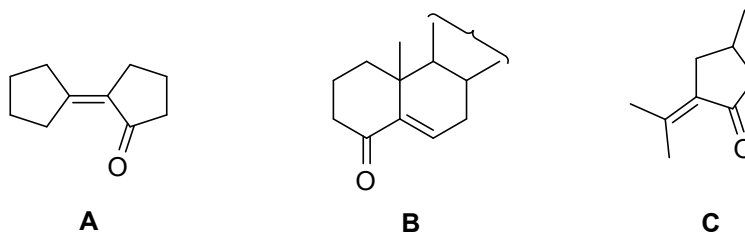
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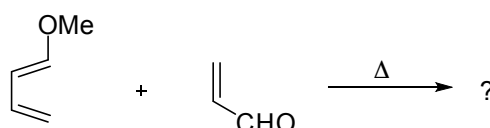
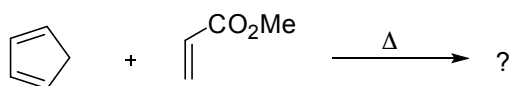


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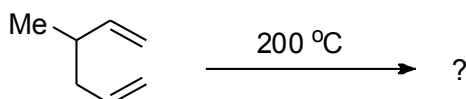


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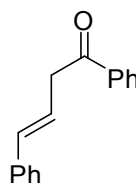
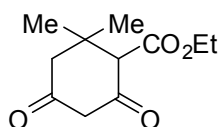
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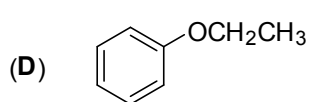
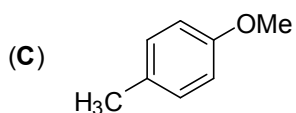
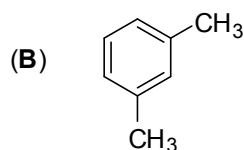
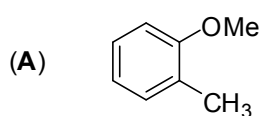
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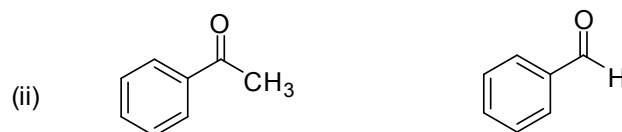
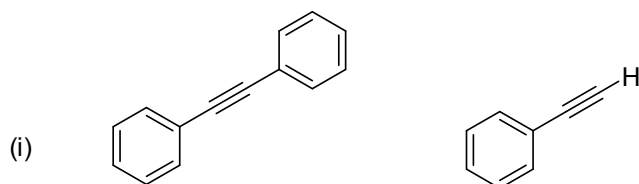


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