

2023  
Chemistry  
B.Sc. Fifth Semester End Examination - 2023  
PAPER - CC12T

Full Marks : 40

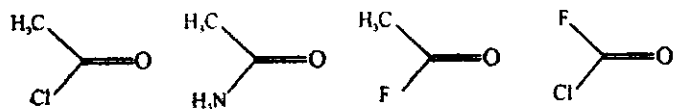
Time : 2 hours

*The figures in the right-hand margin indicate marks.  
Candidates are required to give their answers in their own  
words as far as practicable.  
Illustrate the answers wherever necessary.*

Group - A

A. Answer any five questions : 5×2=10

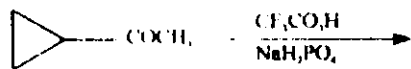
1. How will you distinguish between inter and intra-molecular hydrogen bonding on the basis of NMR spectroscopy?
2. Arrange the following carbonyl compound in order of increasing carbonyl stretching frequency.



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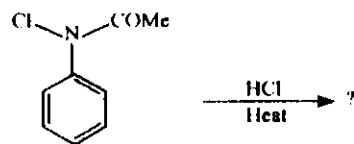
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3. Predict the product & give mechanism.

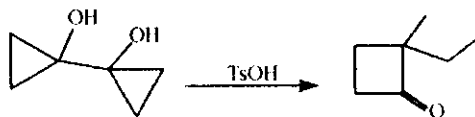


4. Explain the application of high dilution principle for the synthesis of medium sized rings.

5. Give the structure of main product of the following reaction and propose a mechanism.



6. Suggest a mechanism of the following reaction.



7. Why two equivalents of diazomethane is required in Arndt-Eistert synthesis. Explain with mechanism.

8. Tertiary amine of the type  $R^1R^2NCH_3$  can be prepared using formaldehyde and formic acid as the reagent. Explain.

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### Group - B

B. Answer any four from the following :  $4 \times 5 = 20$

9. What is auxochrome? Give some significant examples of it. Explain red shift and hypochromic shift graphically.

$1 + 1 + 1 \frac{1}{2} \times 2 = 5$

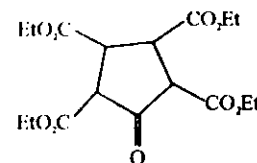
10. Write short notes on the following (any two)  $2 \frac{1}{2} \times 2 = 5$

(a) Fischer Hepp rearrangement.

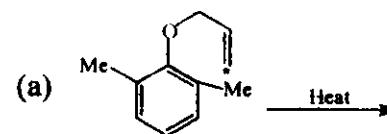
(b) Japp-Klingermann reaction.

11. (a) What do you mean by FGI, Synthone (SN) and Synthetic equivalent (SE). Give examples.

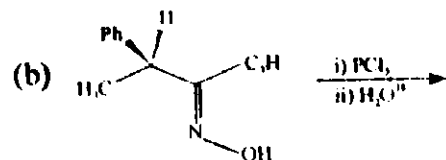
(b) Using retro-synthetic analysis, synthesize the following molecule.



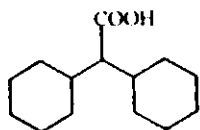
12. Give the product(s) with mechanism.  $2 \frac{1}{2} \times 5 = 5$



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13. (a) Give the retrosynthetic approach and forward synthesis for the following compound.



- (b) How will you distinguish cis and trans-stilbene by means of <sup>1</sup>H-NMR spectroscopy? 3+2=5
14. (a) A compound C<sub>9</sub>H<sub>10</sub>O<sub>2</sub> has strong infrared absorption at 1695 cm<sup>-1</sup>. The <sup>1</sup>H-NMR spectrum has five sets of lines: a singlet at δ9.8 (1H) ppm, a doublet at δ7.8 (2H), a doublet at δ7.0 (2H), a quartet at δ4.1 (2H), triplet at δ1.3 (3H). Suggest a structure for this compound.

- (b) Why IR is called rotational-vibrational spectroscopy? 3+2=5

### Group - C

C. Answer any one from the following : 1×10=10

15. (a) An organic compound A, C<sub>8</sub>H<sub>12</sub>O<sub>2</sub> on heating with Na/Xylene produces another compound B, C<sub>8</sub>H<sub>12</sub>O<sub>2</sub> along

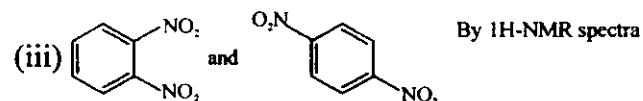
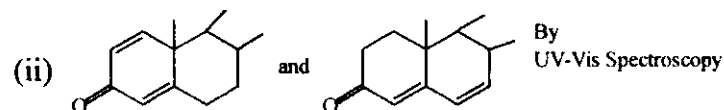
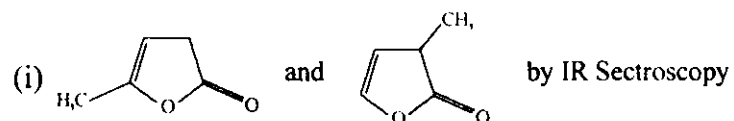
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with an alcohol C<sub>3</sub>H<sub>8</sub>O which does not give iodoform test. Oxidation of compound B with HNO<sub>3</sub>/CH<sub>3</sub>COOH generates a compound C, C<sub>6</sub>H<sub>10</sub>O<sub>2</sub> which shows one quartet and one triplet signal in <sup>1</sup>H-NMR spectrum and characteristic IR band at 1730 cm<sup>-1</sup>. Treatment of compound C with excess C<sub>2</sub>H<sub>5</sub>MgBr/H<sub>2</sub>O/H<sup>+</sup> give a compound D, C<sub>10</sub>H<sub>22</sub>O<sub>2</sub> which shows one quartet (8H), one triplet (12H) and a broad peak (2H) in <sup>1</sup>H-NMR spectrum and a broad IR band at 3350 cm<sup>-1</sup>. Heating compound D, with dil H<sub>2</sub>SO<sub>4</sub> affords E, C<sub>10</sub>H<sub>20</sub>O showing IR band at 1710 cm<sup>-1</sup>. Identify the compound A to E and explain the reactions.

- (b) Distinguish between the following pair of organic compounds as indicated (any three)



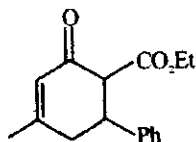
5+1+1+2=10

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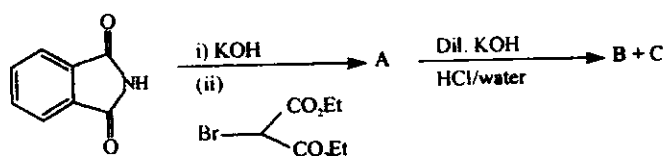
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16. (a) give the retrosynthetic pathway and its forward path for synthesis of the following.



- (b) Fill in the blanks



- (c) What is functional and fingerprint region in IR spectra?  
(d) Write down the product with mechanism.

