

B.Sc. 1st Semester (Honours) Examination, 2017 (CBCS)

Subject : Chemistry (Organic Chemistry-I)

Paper : CC-I (Theory)

Time: 2 Hours

Full Marks: 40

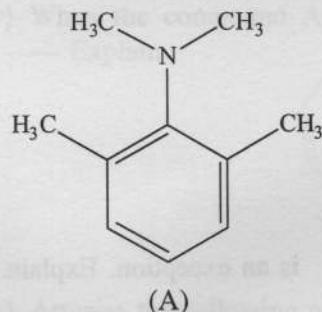
The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words  
as far as practicable.

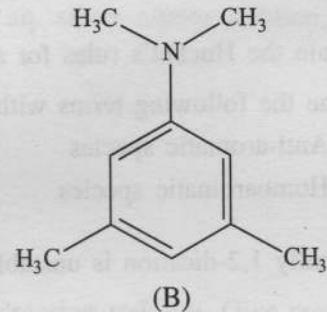
1. Answer *any five* questions from the following:

2×5=10

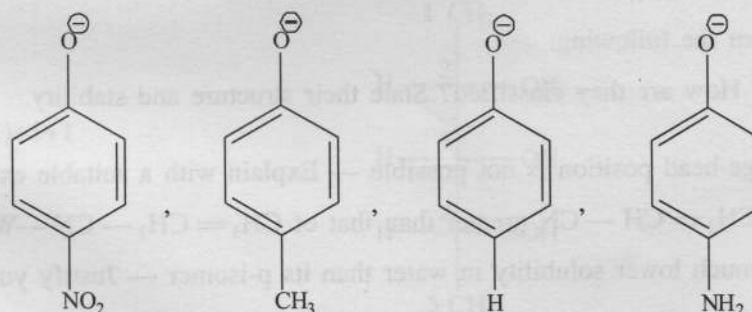
- (a) Draw the orbital picture of allene and state the hybridization of each carbon atom.  
(b) Draw the HOMO in the ground state for 1,3,5-hexatriene and indicate the nodes therein.  
(c) Which one of the following two isomeric anilines is stronger base and why?



and

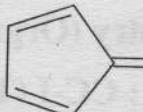
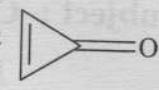


- (d) Arrange the alkenes in order of decreasing stability: 1-Pentene, (E)-2-Pentene, (Z)-2-Pentene  
(e) The trans-dichloroethylene has  $\text{C}_{2h}$  point group. Indicate the symmetry elements present in it.  
(f) Draw the structure of a stable free radical and a non-classical carbocation.  
(g) Chiral centres are stereogenic centres but the reverse is not always true. Explain.  
(h) Arrange the following phenoxide ions in order of increasing nucleophilicity:



2. Answer *any two* questions from the following:

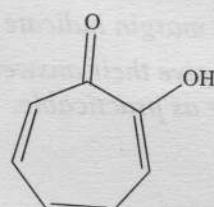
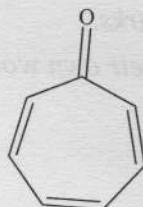
5×2=10

(a) (i) Compare C=O bond length in  & .

2

(ii) Compare the dipole moments of following compounds with reason:

2



(iii) Draw the structure for (E)-oxime of benzaldehyde.

1

(b) (i) Assuming *S-trans* geometry draw and designate the stereoisomers of 2,4-hexadiene.

3

(ii) What is meant by centre of symmetry?

1

(iii) Chiral molecules always contain chiral centre – true or false.

1

(c) (i) Explain the Huckel's rules for aromaticity.

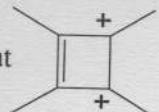
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(ii) Define the following terms with an example:

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(I) Anti-aromatic species

(II) Homoaromatic species

(d) (i) Normally 1,2-dication is unstable but  is an exception. Explain.

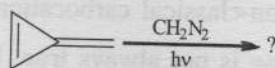
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(ii) 10-Annulene is not aromatic inspite of  $10\pi e$ , why?

1

(iii) Predict the product in the following reaction:

1



(iv) Indicate electrophilic centres in cyclohexenone.

1

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

10×2=20

(a) (i) What are carbenes? How are they classified? State their structure and stability.

1+1+(1.5+1.5)=5

(ii) Carbocation at bridge-head position is not possible — Explain with a suitable example.

2

(iii) Dipole moment of  $\text{CH}_2 = \text{CH} - \text{CN}$  greater than that of  $\text{CH}_3 = \text{CH}_2 - \text{CN}$  — Why?

1.5

(iv) *Q*-Nitrophenol has much lower solubility in water than its *p*-isomer — Justify your answer.

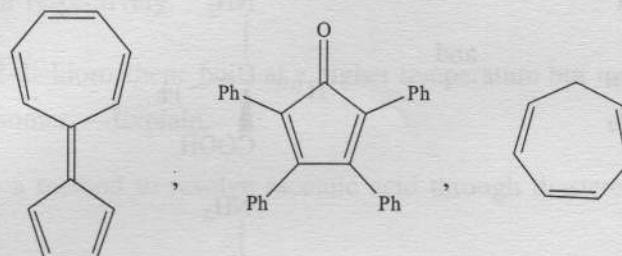
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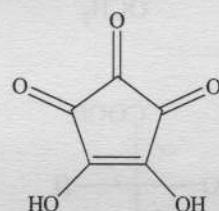
- (b) (i) Identify the following compounds as aromatic, non-aromatic or anti-aromatic. Give reason for each case.

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- (ii) Draw the 'Frost's circle, for cyclopropenyl cation.

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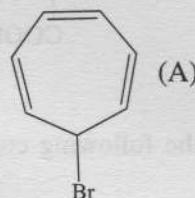


- (iii) Croconic acid is almost stronger as  $H_2SO_4$ . — Explain.

2

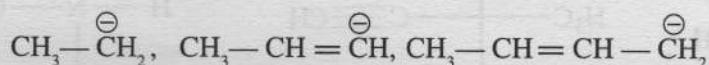
- (iv) When the compound A is treated with aq. silver nitrate solution, a white ppt is formed.  
— Explain.

1.5



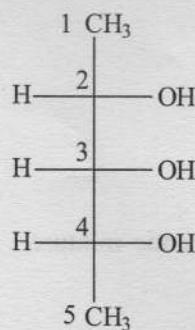
- (v) Arrange the following carbanion with increasing stability. Give reason for your choice.

1.5

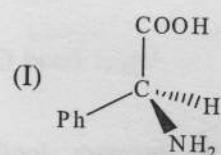


- (c) (i)  $C_3$  centre of the following compound is achirotopic but stereogenic. Justify.

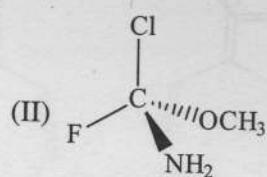
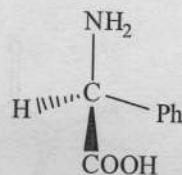
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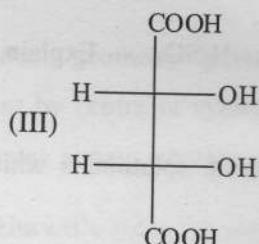
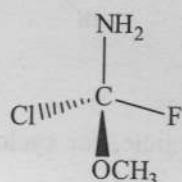
(ii) Assign the following pairs as enantiomers, diastereomers or homomers:



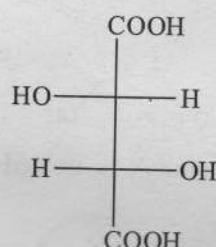
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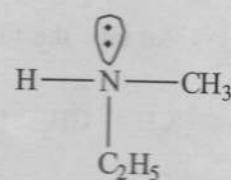
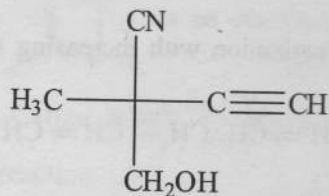
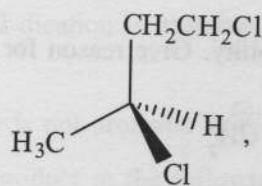
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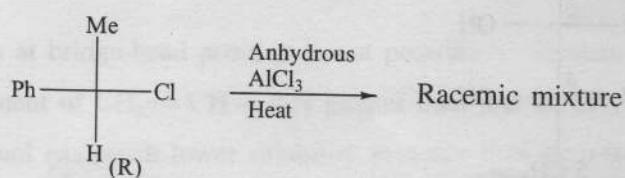


(iii) Determine the R/S configuration of the following compounds:



(iv) Draw the structure for 2-D-hydroxy-3-L-bromopentanoic acid.

(d) (i) Explain the following observation:



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- (ii) Draw the *erythro* form of 3-bromo-2-butanol in Fischer, Sawhorse and Newmann projection formula respectively. 3
- (iii) *Cis*-1,2-dichloroethene boils at a higher temperature but melts at a lower temperature than the trans-isomer. —Explain. 2
- (iv) Sketch a method to resolve racemic acid through diastereomerization. 2
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