

2019/TDC/EVEN/CHMHC-201T/069

TDC (CBCS) Even Semester Exam., 2019

CHEMISTRY

(2nd Semester)

Course No. : CHMHCC-201T

(Organic Chemistry—I)

Full Marks : 50

Pass Marks : 20

Time : 3 hours

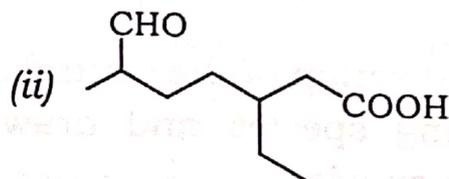
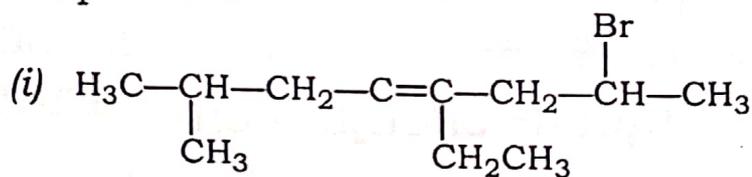
*The figures in the margin indicate full marks
for the questions*

Answer **five** questions, taking **one** from each Unit

UNIT—1

1. (a) Write the IUPAC name of the following compounds :

1×2=2



- (b) Explain why CH_4 is tetrahedral but C_2H_4 and $\text{H}-\text{C}\equiv\text{C}-\text{H}$ are planar.

2

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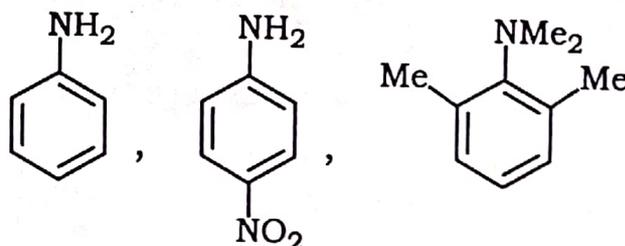
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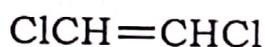
- (c) Arrange the following amines in terms of increasing base strength. Justify your answer :

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



- (d) The following compound has two isomers, one isomer has dipole moment $0D$ and other has a dipole moment $2.95D$. Propose structures for the two isomers that are consistent with these data and explain why :

$1\frac{1}{2}$

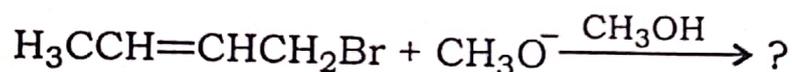


- (e) Give the products of the following reactions—

(i) under condition that favour an S_N2 reaction;

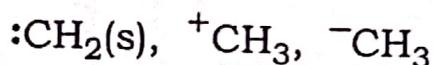
(ii) under condition that favour an S_N1 reaction :

$1 + 1 = 2$



2. (a) Give the hybridization of the central atom of the following species and draw the shape of these species :

3



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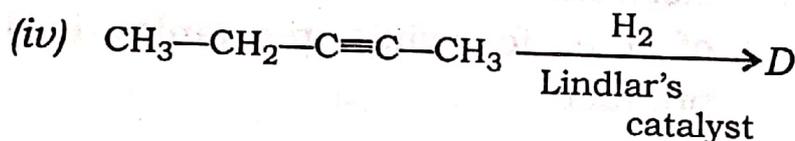
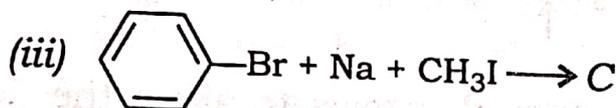
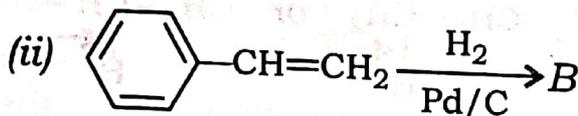
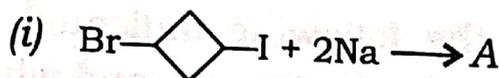
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UNIT-2

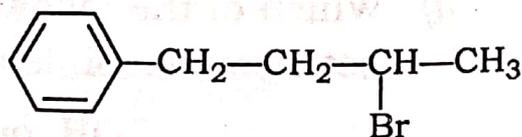
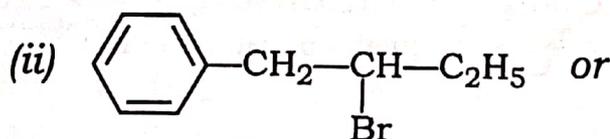
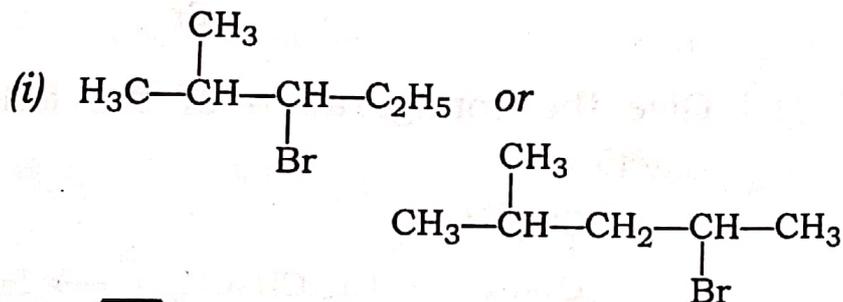
3. (a) Provide the major products of the following reactions :

1×4=4



(b) Which alkyl halide would you expect to be more reactive in an E2 reaction and why?

1½×2=3

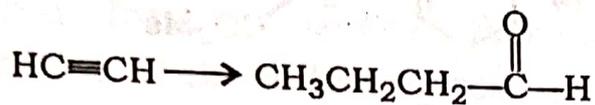


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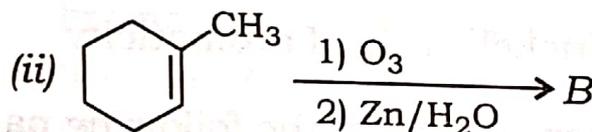
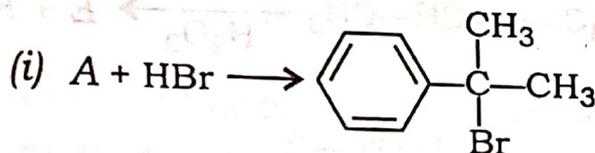
- (c) Carry out the following transformation with appropriate reagent/reaction condition(s) and provide mechanism of the reactions :

3



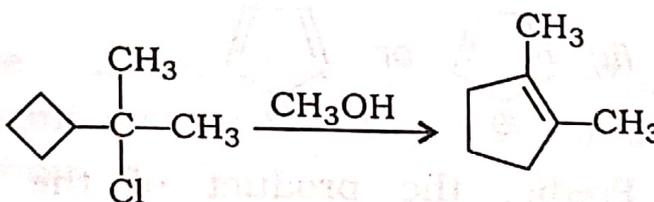
4. (a) Complete the following reactions and provide plausible mechanism :

2×2=4



- (b) Propose a mechanism for the following reaction :

1½

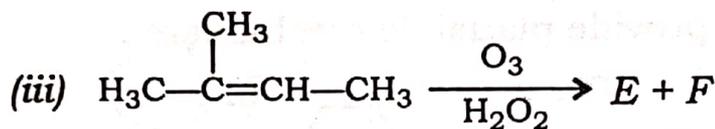
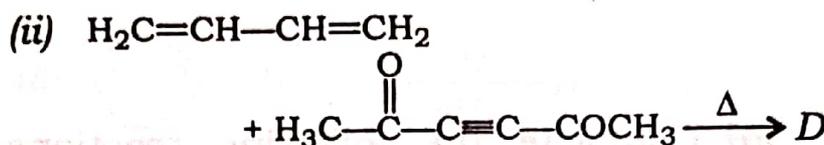
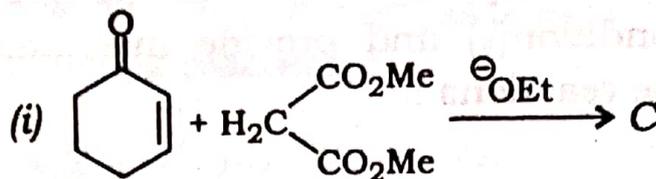


- (c) If 2-fluoropentane were to undergo *E1* reaction, would you expect the major product to be one predicted by Zaitsev's rule? Explain.

1½

(6)

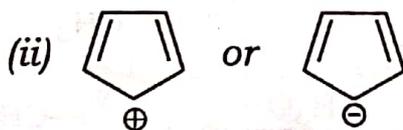
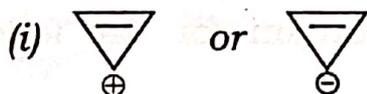
(d) Provide the product(s) of the following reactions : 1×3=3



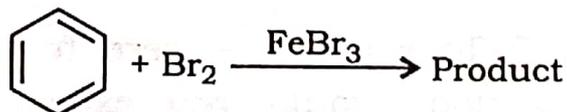
UNIT—3

5. (a) State Hückel's rule of aromaticity. 1½

(b) Which ion in each of the following pairs is more stable and why? (½+1)×2=3



(c) Predict the product of the following reaction and provide mechanism :



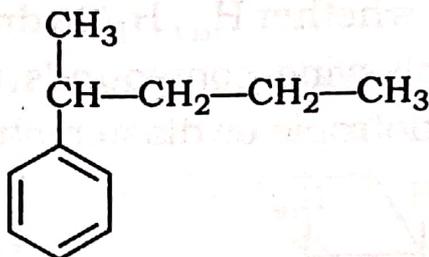
Why is hydrated FeBr₃ inactive as a Lewis acid catalyst? 2+1=3

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(d) Describe synthesis of anthracene from benzene. 2½

6. (a) How the following compound could be prepared from benzene? Provide the mechanism of the following reaction : 2½

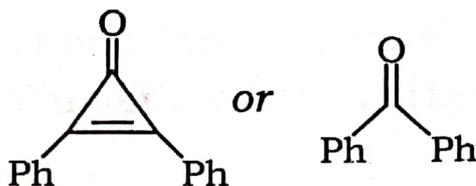


(b) When phenol is treated with Br₂, a mixture of monobromo, dibromo and tribromo phenol is obtained. Design a synthesis that would convert phenol primarily to *ortho*-bromo phenol. 2

(c) Starting from benzene, explain how you can synthesize 2-ethyl-naphthalene. 2

(d) Prove chemically that naphthalene contains two benzene ring fused in *ortho*-position. 2

(e) Which of the following compounds has greater dipole moment and why? ½+1=1½



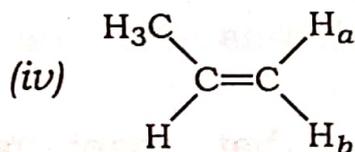
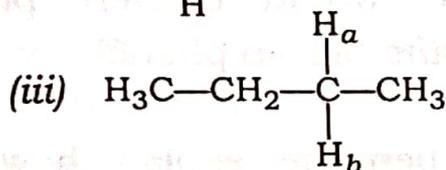
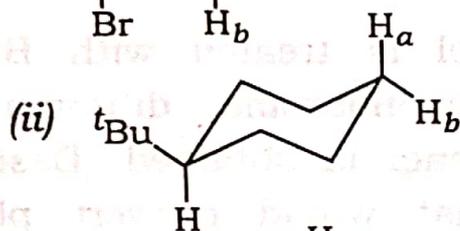
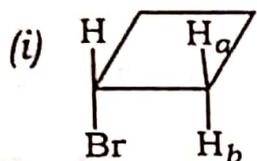
UNIT—4

7. (a) Draw Fischer projection of the following compound(s) : $1 \times 2 = 2$

(i) (2*S*, 3*R*)-3-chloro-2-pentanol

(ii) (*S*)-3-chloro-1-pentanol

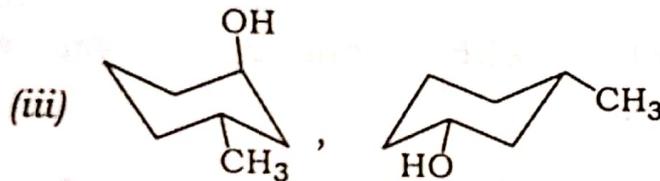
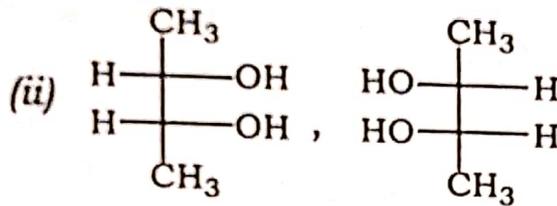
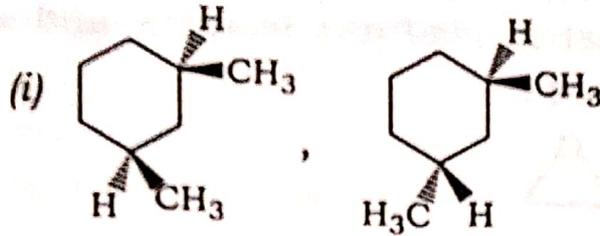
(b) Write whether H_a , H_b hydrogens in each of the following compounds are homotopic, enantiotopic or diastereotopic : $\frac{1}{2} \times 4 = 2$



(c) Discuss with an example, the resolution method through the formation of diastereomers. 3

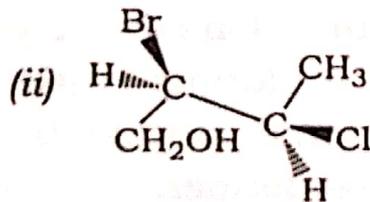
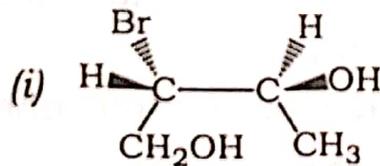
(d) Write the structure of *meso*-tartaric acid in Newman projection and Fischer projection. Show that it contains an S_2 axis. $1+1+1=3$

8. (a) Give the stereochemical relationship between the pair of compounds : $1 \times 3 = 3$

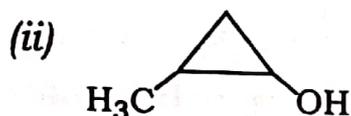
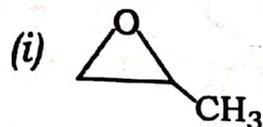


(b) Define optical rotation and specific rotation. $1+1=2$

(c) Convert the following perspective formula to Fischer projection : $1 \times 2 = 2$



- (d) Draw projections of the following compounds to show the presence of geometric *cis-trans* isomers and optical isomers : 1½×2=3



UNIT—5

9. (a) Explain with example, Baeyer strain theory. 2½
- (b) Explain why, in case of cyclohexane, chair conformer is more stable than boat conformer. 2½
- (c) Draw most stable conformation of the following compounds : 1×3=3
- (i) *cis*-1-*tert*-butyl-4-methyl
cyclohexane
- (ii) Butane-2,3-di-ol
(in Newman projection)
- (iii) *cis*-cyclohexane-1,3-diol
- (d) Explain why in 1-methyl-1-phenyl cyclohexane the conformer with axial phenyl and equatorial methyl is more stable than other conformer. 2

10. (a) Draw the most stable conformer of cyclopentane. Explain why planar conformation is not stable. $1+1\frac{1}{2}=2\frac{1}{2}$
- (b) Why does cyclobutane have less ring strain than cyclopropane? $1\frac{1}{2}$
- (c) Draw Newman projections of various conformations of *n*-butane and arrange them according to their decreasing stability. Also draw the potential energy diagram (energy vs. torsion angle) of *n*-butane. $1+2\frac{1}{2}=3\frac{1}{2}$
- (d) Draw two conformers of 1,2-*cis*-dimethyl cyclohexane. State which one is more stable and why. $1+1\frac{1}{2}=2\frac{1}{2}$
