

Total No. of printed pages = 10

3 (Sem 1) CHM M2

2015

CHEMISTRY

(Major)

Paper : 1.2

Full Marks - 60

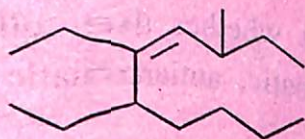
Time - Three hours

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

1. Answer the following questions (any seven) :

1×7=7

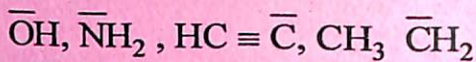
(a) Write the IUPAC name of the following compound :



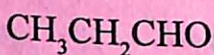
(b) Draw the structural formula of bicyclic [4.2.0] octane -3-01.

[Turn over

- (c) Arrange the following species in increasing order of basic strength :



- (d) Suggest an explanation for the difference in dipole moments for the following pairs :



$$\mu = 2.73 \text{ D}$$



$$\mu = 3.67 \text{ D}$$

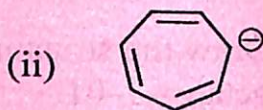
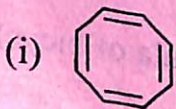
- (e) The C-N bond length in H_2NCONH_2 is 0.137 nm instead of normal C-N bond length (0.147 nm). Explain.

- (f) Draw and name the tautomeric forms of $\text{RCH}_2\text{-NO}_2$.

- (g) Arrange the following compounds in increasing order of nucleophilicity.

Ammonia, pyridine, aniline, potassium amide

- (h) Find whether the following molecules are aromatic, antiaromatic or non-aromatic.

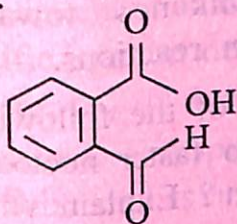


2. Answer the following questions (any *four*):

2×4=8

(a) What is the nature of CH_3CN ? Illustrate with a reaction. 1+1=2

(b) Show the tautomeric forms of the following compound: 1+1=2



Give an example of valence tautomerism.

(c) What are pseudoaromatic compounds? Give an example. 1+1=2

(d) Arrange the following intermolecular forces in increasing order of strength Dipole-dipole interaction, H-bonding force, London forces.

HCl boils at a much higher temperature than Argon. Which forces acting on it? Explain.

1+1=2

(e) Draw the following molecule:

(i) (E)-2-(But-2-enyl) benzene-1,3-dicarboxylic acid

(ii) 9-Oxa-6-aza spiro [4, 5] decane

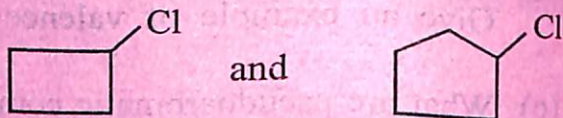
1+1=2

3. Answer the following questions (any *three*):
5×3=15

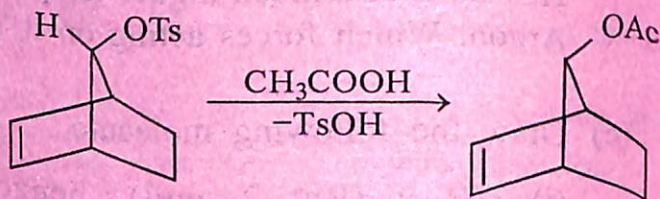
(a) (i) Between Furan and thiophene which one has higher resonance energy and why? 2

(ii) Explain why alkynes are less reactive than alkenes towards electrophilic addition reactions. 3

(b) (i) Which of the following molecules will undergo faster nucleophilic substitution reaction? Explain with reason. 3



(ii) What is neighbouring group participation? Following molecule gives 100% retention of configuration. Explain. 2



(c) (i) Although in ethyl methyl amine N is asymmetric still it is optically inactive. Explain. 2½

(ii) What is atropisomerism ? Give an example. $1+1\frac{1}{2}=2\frac{1}{2}$

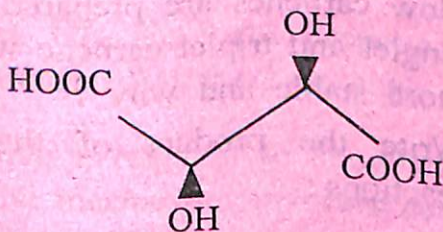
(d) (i) What do you mean by optical purity ? Illustrate. 2

(ii) Calculate the enantiomeric excess and specific rotation of a mixture containing 10g of (+) -2-butanol and 6g of (-) -2-butanol. The specific rotation of pure (+) -2-butanol is $+13.5^\circ$.

4. Answer the following questions :

[Either (i) or (ii) and (iii) or (iv) from (A), (B) and (C). $10 \times 3 = 30$

(A) (i) Assign R, S-notation to the following chiral molecule : 2

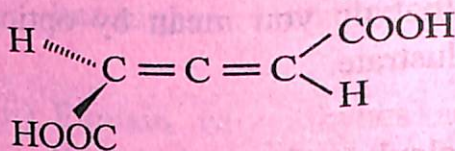


Give an example each of enantiotopic atoms and diastereotopic faces.

$2 \times 1\frac{1}{2} = 3$

Or

- (ii) Following allene is chiral although it has no chiral centre. Explain. 2



Draw the more stable cis-orientation of 1, 3-cyclohexanediol. Which conformer of cis-1, 3-cyclohexanediol is more stable? Explain with due reason.

1+2=3

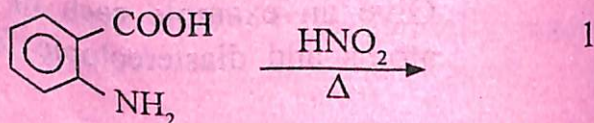
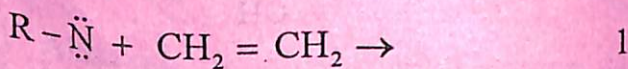
- (iii) What do you mean by kinetically controlled and thermodynamically controlled reaction? Draw the energy profile diagram for these two reactions.

2+3=5

Or

- (iv) How carbenes are prepared? Between singlet and triplet carbene which one is more stable and why? 1+2=3

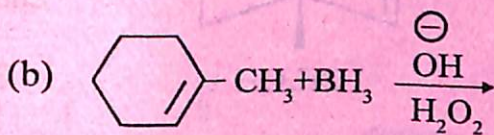
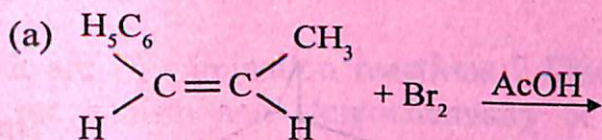
Write the product of the following reactions:



- (B) (i) What product will you obtain when trans-but-2-ene is treated with O_3 , O_4 and the product is hydrolysed? Find the stereochemistry of the reaction. 5

Or

- (ii) Find the major product of the following reactions : $2 \times 1\frac{1}{2} = 3$



Which one of the following alkenes will give optically active product with Br_2/CCl_4

- (a) 1-butene (b) propene (c) cis-2-butene (d) trans-2-butene. 2

- (iii) Give a reaction to show evidence that SN^1 mechanism involves carbocation as intermediate. $2\frac{1}{2}$

How does solvent polarity influence the rate of SN^1 and SN^2 reactions ?

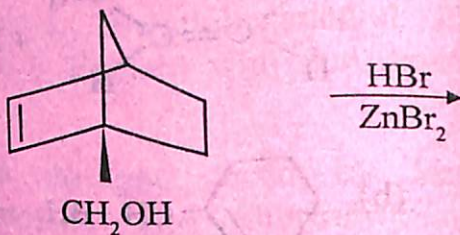
$$1\frac{1}{2} + 1 = 2\frac{1}{2}$$

Or

(iv) (R)-2-Butanol is found to have lost its optical activity after standing in acidic solution. Account for this observation.

3

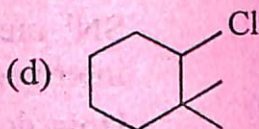
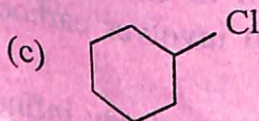
Find the product of the following reaction :



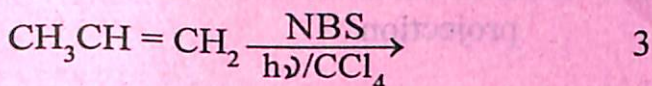
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Which one of the following will be most reactive in $\text{S}_\text{N}2$ reaction ?

1



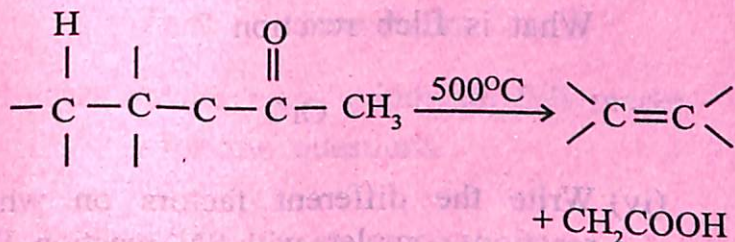
- (C) (i) Write the product and find a probable mechanism of the following reaction :



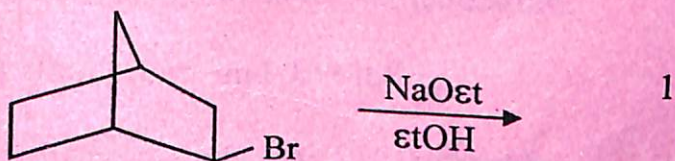
Give an example of nucleophilic addition reaction. 2

Or

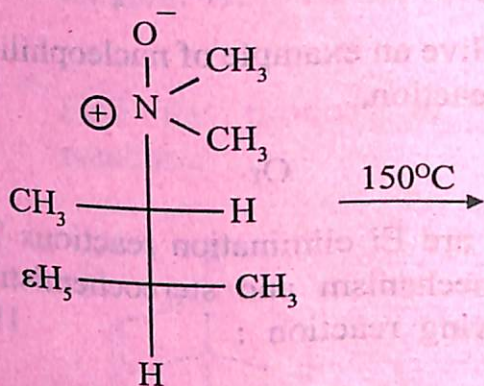
- (ii) What are E_i elimination reactions ? Discuss the mechanism and stereochemistry of the following reaction : 1½+2½=4



Predict the product of the following reaction. 1



- (iii) What is Cope reaction ? Find the product of the following reaction showing favourable conformation for elimination in Newmann projection. $1\frac{1}{2}+2\frac{1}{2}=4$



What is Elcb reaction ?

1

Or

- (iv) Write the different factors on which E1 reactions complete with SN^1 reaction. Illustrate your answer with examples. 5

Total No. of printed pages = 5

3 (Sem 1) ZOO M1

2015

ZOOLOGY

(Major)

Paper : 1.1

Full Marks – 60

Time – Three hours

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

1. Choose the correct answer : $1 \times 7 = 7$

(a) Systematics deals with

(i) Classification and Nomenclature.

(ii) Taxonomy and Evolution.

(iii) Identification and Classification.

(iv) Identification and Preservation.

[Turn over