*SH-II/CHEM/202/C-4/18*

# B.Sc. Semester-II (Honours) Examination, 2018

## CHEMISTRY

**Subject Code : 21402** **Course Code : SH/CHEM/202/C4**

**Course Title : Organic Chemistry-II**

**Time: 1 Hour 15 Minutes** **Full Marks: 25**

*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: 1×5=5

(a) Separate the following species into electrophiles and nucleophiles:

$CH_3OH$, $SO_3$, $NH_3$, $Br^+$

(b) List the following in order of decreasing acidity:

$CH_3CH{=}\overset{+}{N}H_2$, $CH_3CH_2\overset{+}{N}H_3$, $CH_3C{\equiv}\overset{+}{N}H$

(c) Write down the conjugate acid/conjugate base forms for the following:

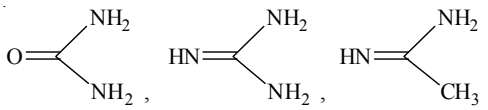
$\overset{-}{O}CH_3$, $\overset{+}{C}H_3$

(d) Define the term 'dihedral angle'.

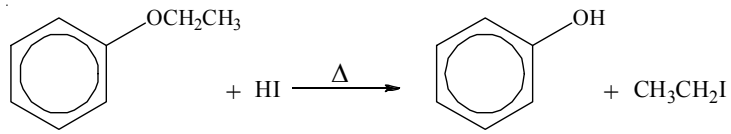
(e) Mention the solvent characters of the following:

HCOOH, $CCl_4$, $H_2O$, $CH_3CN$

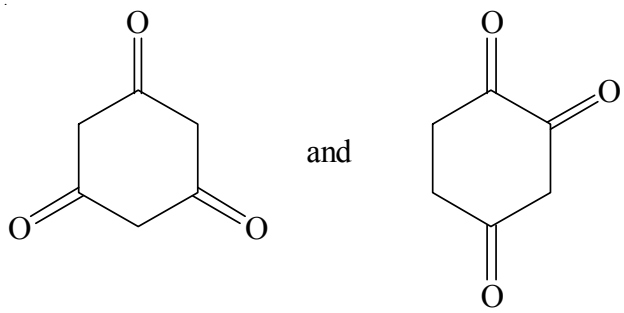
(f) Arrange the following in order of increasing basicity:



(g) Classify the following reaction as substitution, elimination or neither.

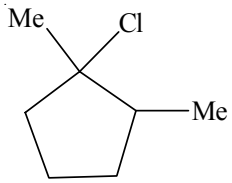


(h) Which one of the following has higher enol content? Give reason.



**2.** Answer *any two* questions: 5×2=10

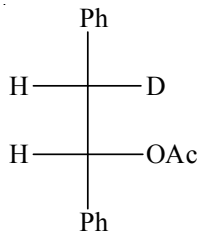
(a) (i) Assuming only $E^2$ elimination, write structures for all the possible elimination products of the following and indicate the major product. 2



(ii) Write the structure of a proton tautomer of each of the following:

$CH_3\,NH\,CH{=\!=}CH\,CH_3$, $CH_3NO_2$ 1

(iii) Predict the structure of Product(s) with mechanism when the following compound is heated. 2



(b) What is butane-gauche interaction? Draw the potential energy diagram of *n*-butane for rotation around C2—C3 bond showing the conformers in Newman projection formula. 5

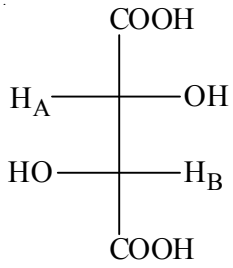
(c) (i) Name the fragments in the homolytic and heterolytic cleavage in ethane C—C bond. 3

(ii) Compare the extents of enol content of the following compound in water and in hexane solvents. 2

$CH_3COCH_2\,COO\,CH_2\,CH_3$

(d) (i) Draw an energy diagram for a one-step endergonic process. Label it with respect to the reactants, transition state, free energy of activation and standard free energy of reaction. 3

(ii) Find out the relationship (topicity) between $H_A$ and $H_B$ in the following compound. 2



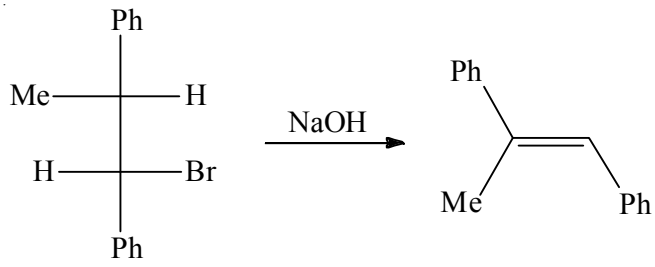

**3.** Answer *any one* question: 10×1=10

(a) (i) What is meant by nucleophilicity? Arrange the following anions in order of increasing nucleophilicity in polar aprotic solvent. Give reason. 1+2=3

$F^-$, $Br^-$, $Cl^-$, $I^-$

(ii) Draw one active and one meso isomer of $HOOC(CHOH)_3COOH$ in Fischer's Projection formula. Will the interchange of H and OH at C–3 of the active isomer you have drawn lead to another stereoisomer? 2½

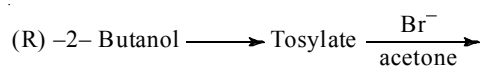
(iii) Propose a mechanism for the following reaction that explains how this product is generated. 2



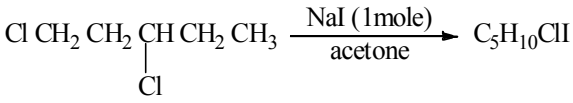

(iv) What is meant by atropisomerism? 1

(v) An alkane (Molecular Weight 72) formed only one monochloro substitution product. Suggest a structure for the alkane. 1½

(b) (i) Trace the following interconversions and assign R/S configuration to each stereogenic centre. Show appropriate reagents, catalysis and solvents. 4

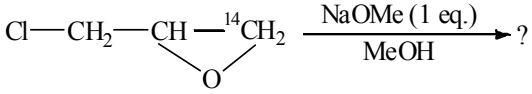


(ii) Identify the product in the following reaction and justify your answer. 2½




*Or*,

Predict the product(s) of the following reaction with plausible mechanism.




(iii) Write the enantiomeric forms of $CH_3CH = C = CHCH_3$. Give reason. 1½

(iv) What is meant by 'protonsponge'? Give one example. 1+1=2

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