Total No. of printed pages = 6

63/2 (SEM-1) CHM 102

2021

(held in 2022)

CHEMISTRY

(Theory Paper)

Paper Code : CHM-102

(Organic Chemistry – I)

Full Marks – 80

Time – Three hours

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

1. Answer any *three* of the following questions : 5×3=15

(a) Explain non-aromatic and homoaromatic compound with suitable examples. 2½×2=5

(b) Explain why cycloheptatrienyl cation is more stable than cycloheptatrienyl anion. Mention their magnetic behavior. 4+1=5

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(c) Elimination reaction from *axial* *t*-butyl trimethylammonium cyclohexane is 100 times faster than its *equatorial* isomer. Explain why ? 5

(d) How HSAB concept can be applied in organic reaction ? Explain with suitable examples. 5

2. Answer any *three* of the following questions : 5×3=15

(a) Find the point group of the following molecules : 1×5=5

(i) Diborane

(ii) 1, 4-Diiodobenzene

(iii) Chrysene

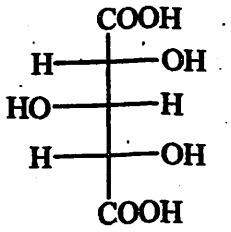
(iv) Naphthalene

(v) I, 4-Dibromo-2, 5-dichloro benzene.

(b) Explain enantiomeric and diastereomeric ligands and faces with suitable examples. 5

(c) What is optical purity ? How it is related to enantiomeric excess ? If the enantiomeric excess is 95%, how much of each enantiomer is present ? 2+3=5

(d) Explain pseudoasymmetric centre with an example. Explain the stereogenicity and chirotopicity of all the three carbon atoms in the following structure : 2+3=5



3. Designate the configurations of the following : 1×10=10

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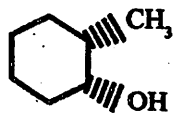

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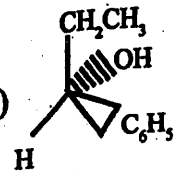

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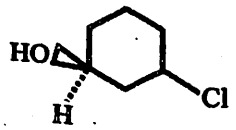

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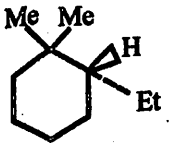

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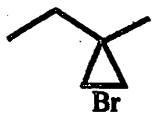

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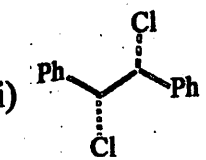

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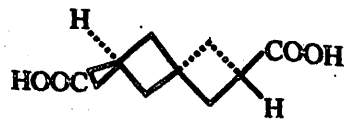
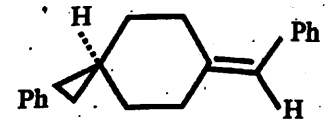
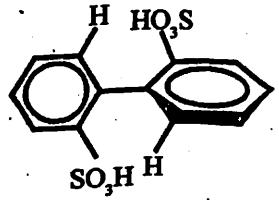
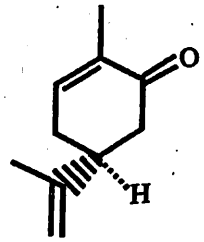


(viii) 

(ix) 

(x) 

4. Answer any *two* of the following questions : 5×2=10

(a) What is chemoselective reaction ? Explain stereospecific and stereoselective reactions. 1+4=5

(b) Explain regioselective addition of nucleophiles to unsymmetrical epoxides under acidic and basic conditions. 5

(c) Explain acetolysis of *anti-* and syn-7-norbornenyl tosylate and the saturated compound. 5

5. Answer any *six* of the following questions : 5×6=30

(a) Write the significances of reaction constant, ρ in Hammett equation. The $-NH_2$ group has a large negative value of σ_p and a zero value of σ_m. Explain why ? 2+3=5

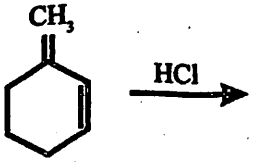
(b) Write the mathematical statement of Hammett equation and explain the terms. What are the physical significances of substituent constant, σ ? 2+3=5

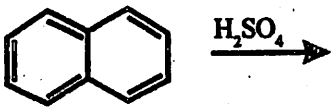
(c) Tertiary butyl bromide undergoes E_2 reaction with CH_3ONa but it is very difficult to undergo SN_2 reaction. Explain why ? Elimination reaction is more favoured at high temperature than nucleophilic substitution reaction. Explain why ? 3+2=5

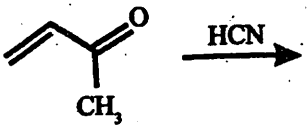
(d) Substitution reaction is more favoured at highly polar solvent than elimination reaction. Explain why ? 5

(e) Define partial rate factor. Calculate partial rate factor when toluene is nitrated, para, meta and ortho nitro toluene were formed in 40%, 3.2% and 57% yield respectively and relative reactivity of benzene to toluene was found to be 24.5. 2+3=5

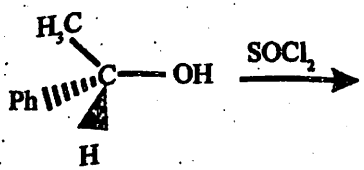
(f) Write kinetically controlled and thermodynamically controlled products of the following reactions. Write mechanism of the reaction also (any two): 2½×2=5

(i) 

(ii) 

(iii) 

(g) Write the products of the following reactions with mechanism. 2½×2=5

(i) 

(ii)