2019

CHEMISTRY

(Honours)

Paper : CEMH-DC-T1

(Organic Chemistry)

[CBCS]

Full Marks : 25 Time : Two Hours

The figures in the margin indicate full marks.

1. Answer any *five* questions from the following : 5×1=5

(a) In the following groups :

$-OCOCH_3$(I), $-OCH_3$(II), $-OSO_2CH_3$(III); $-OSO_2CF_3$(IV)

The order of leaving group ability is —

(i) $I > II > III > IV$

(ii) $IV > III > I > II$

(iii) $III > II > I > IV$

(iv) $II > III > IV > I$

P.T.O.

(b) The number of racemic forms of molecules having 'n' different chiral carbon centre is —

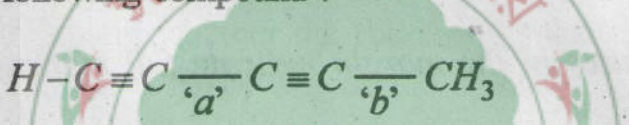
(i) $2n$

(ii) 2^n

(iii) $2^{(n-1)}$

(iv) $2^{(n+1)}$

(c) Compare the bond lengths 'a' & 'b' in the following compound :



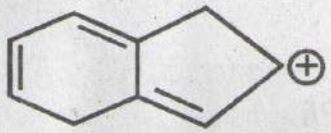
(i) $a = b$

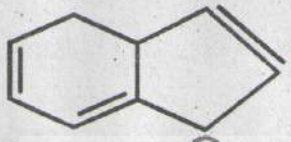
(ii) $a > b$

(iii) $b > a$

(iv) $a >>> b$

(d) Which carbocation is the most stabilised?

(i) 

(ii) 

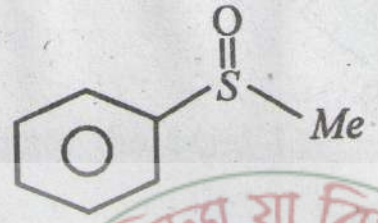
(iii) 

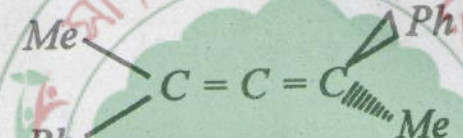
(iv) 

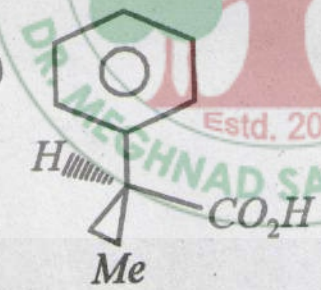
P.T.O.

(e) Among the following, which optically active compound exists as a non-resolvable (dl)-pair?

(i) 

(ii) 

(iii) 

(iv) 

(f) The dipole moments of halocompounds are in the order :

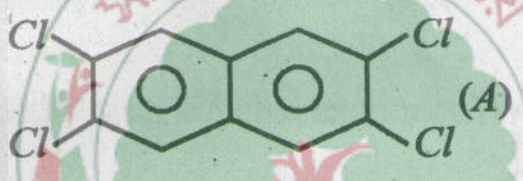
(i) $CHCl_3 \rangle CCl_4 \rangle CH_2Cl_2 \rangle cis\text{-}\ Cl-CH=CH-Cl$

(ii) $cis\text{-}\ Cl-CH=CH-Cl \rangle CHCl_3 \rangle CCl_4 \rangle CH_2Cl_2$

(iii) $cis\text{-}\ Cl-CH=CH-Cl \rangle CH_2Cl_2 \rangle CHCl_3 \rangle CCl_4$

(iv) $CHCl_3 \rangle CH_2Cl_2 \rangle CCl_4 \rangle cis\text{-}\ Cl-CH=CH-Cl$

(g) The total number of 'plane of symmetry' present in the given compound (A) is —



(A)

(i) Four

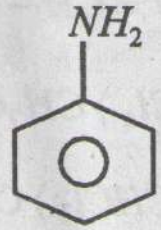
(ii) Three

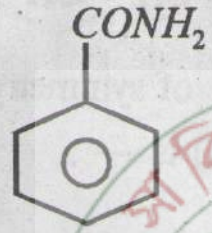
(iii) Two

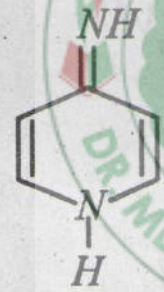
(iv) One

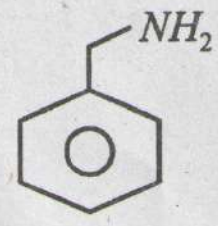
P.T.O.

(h) Among the following compounds which one is the most reactive towards dilute *HCl*?

(i) 

(ii) 

(iii) 

(iv) 

2. Answer any *four* questions : 4×2=8

(a) Explain the order of nucleophilicity of the following nucleophiles applying *FMO* approach;
$HO^{\ominus}$, $CH_3^{\ominus}$, $NH_2^{\ominus}$.

(b) How many different stereoisomers are possible for the following compound? Draw their structures with suitable descriptors.

$$Cl-CH=CH-CH(Cl)-CH=CH-Cl$$

(c) A compound containing 'pseudo-asymmetric center' may be optically active or inactive — Justify with suitable examples.

(d) How the following hydroquinone can act as radical inhibitor? Justify.

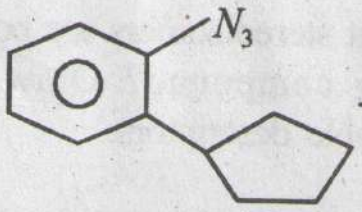
(e) Write down the final product in the following reaction :

$$Me_3C-CH_2-Br \xrightarrow[heat]{HO^{\ominus}/H_2O} ?$$

P.T.O.

(f) Oxalic acid has zero dipole moment in the gas phase — Explain.

(g) Predict the major products in the following reaction with mechanism :



→ A tricyclic product.

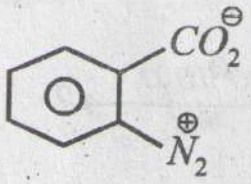
(h) Cyclooctatetraene undergoes electrophilic attack by proton very easily — Explain.

3. Answer any *two* questions : 6×2=12

(a) (i) Between ethylene and 1, 3-butadiene – which one is more reactive towards electrophile? Explain in the light of FMO approach. 2

(ii) Between CH_3CN and CH_3NC— which one is more polar and why? 3

(iii) What happens when :

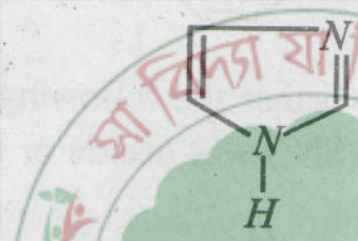


→ ? 1

(b) (i) Applying FMO approach prove that benzene is more stable than 1, 3, 5-hexatriene. 3

(ii) From the symmetry operation point of view what is the basic difference between asymmetric and disymmetric molecules? 1

(iii) In the following compound which '*N*' atom is more basic and why?



2

(c) (i) Among the following two ionic species which one is more stable and why?

2

(ii) Write down the most stable cannonical form of acyl cation with explanation. 1

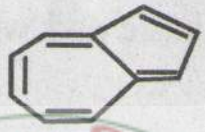
(iii) A sample of 2-methyl-1-butanol has an observed specific rotation $[\alpha]_D^{25} = (+)1.151°$. Calculate the enantiomeric excess of the sample.

P.T.O.

What is the actual stereoisomeric composition of the mixture?

(The specific rotation of the pure enantiomer is (+) 5.756°). 3

(d) (i) Why the following molecule is highly polar in nature?



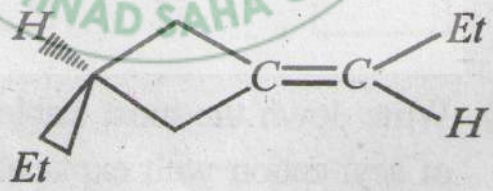
1

(ii) Explain whether the following substitution reactions (SN^2) will occurs or not? 2

$$CH_3-CN+I^{\ominus} \longrightarrow CH_3-I+{}^{\ominus}CN$$

$$CH_3-N_3+I^{\ominus} \longrightarrow CH_3-I+N_3^{\ominus}$$

(iii) Consider the following molecule —



Point out the stereoisomers. How many of them are planar or nonplanar? How can you verify that they are stereoisomers? 3
