

2016

CHEMISTRY

(Major)

Paper : 1.2

(Organic Chemistry)

Full Marks : 60

Time : 3 hours

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

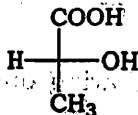
1. Answer the following questions (any seven) :

1×7=7

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



- (b) Convert the following Fischer formula into flying-wedge formula :



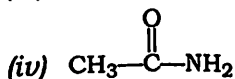
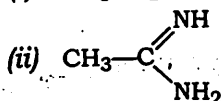
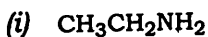
- (c) Arrange the following molecules in order of decreasing dipole moment :




(2)

(d) Acetyl acetone is highly stable in enol form. Explain.

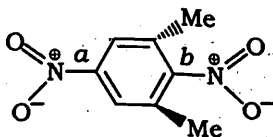
(e) Arrange the following compounds in order of their correct basicities :



(f) The molecule  does not exist. Explain.

(g) Between salicylic acid and *p*-hydroxy benzoic acid which is stronger? Explain in terms of H-bonding.

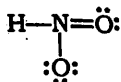
(h) The C—N bond *a* is shorter than *b* in the following compound. Explain :



2. Answer the following questions (any four) :

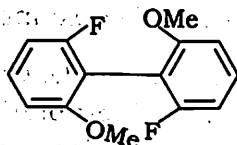
2×4=8

(a) Calculate the formal charge on each of the constituent atoms of



(3)

- (b) Between toluene and *tert*-butyl benzene, which one is more susceptible to electrophilic substitution reaction? Explain.
- (c) Explain whether [10] annulene is aromatic or not.
- (d) State and explain whether the following molecule will be optically active or not :



- (e) What product do you get when *trans*-butenedioic acid is treated with Br_2 ? Write equation as well.

3. Answer the following questions (any three) :

5×3=15

- (a) Draw the number of possible stereoisomers of the following molecule :



Also find the number of optical isomers

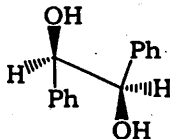
and *meso* forms.

3+2=5

- (b) Account for the fact that guanidine is a strong base. Which nitrogen of guanidine is more likely to be protonated? Explain. What are alternant and non-alternant hydrocarbons? Give example of each.

3+2=5

- (c) What is resolution of a racemic mixture? What are different methods of resolution of racemic mixture? How will you separate a racemic mixture of an alcohol? $1+1+3=5$
- (d) Explain the cause of optical activity of biphenyls giving suitable substituents. Are there any compounds to show atropisomerism? Give example. $4+1=5$
- (e) Designate the following flying-wedge formula with *R,S*-notations and convert into Fischer projection. What do you understand by stereomutation? $3+2=5$

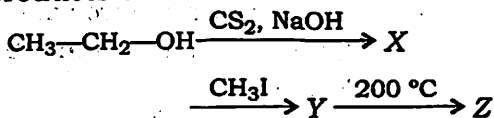


4. Answer the following questions [either (i) and (ii) or (iii) and (iv) from (a), (b) and (c)] : $10 \times 3 = 30$
- (a) (i) Draw the orbital picture of different states of nitrene. How can nitrenes be trapped for detection? Give one important reaction of nitrene as intermediate. $2+2+1=5$
- (ii) Explain with example, what you mean by kinetically controlled and thermodynamically controlled reactions. Draw the energy profile diagram. $3+2=5$

Or

- (iii) The *cis*-isomer of 4-*t*-butyl cyclohexyl bromide reacts with $\text{PhSNa}^{\ominus\oplus}$ in aqueous ethanol at a much faster rate than the *trans*-isomer. Explain. $2\frac{1}{2}+2\frac{1}{2}=5$

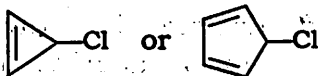
- (iv) Write the mechanism of the following reaction and obtain the products :



Also name the intermediate products. $3\frac{1}{2}+1\frac{1}{2}=5$

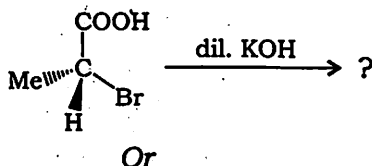
- (b) (i) The rate of bromine addition to styrene is greater than that to propene. Place a suitable explanation along with the reaction intermediate formed. $2\frac{1}{2}+2\frac{1}{2}=5$

- (ii) (1) Which of the following would undergo solvolysis in methanol more readily? Explain : 3

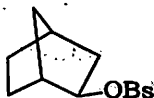


(6)

- (2) Find the stereochemistry of the product for the following reaction along with the mechanism : 2



- (iii) What are classical and non-classical carbocations? Give example. The rate of acetolysis of exo-norbornyl brosylate is many times faster than endoisomer. Explain : 3+2=5



exo-norbornyl brosylate

- (iv) Define carbon-free radicals. How are these detected? How can carbon-free radical be generated? 1+2+2=5

- (c) (i) How are the nucleophilic substitution reactions affected by the nature of leaving group and nucleophiles? Explain with examples. $2\frac{1}{2}+2\frac{1}{2}=5$
- (ii) Explain the criteria for showing optical activity. Draw an allene which displays chirality. 4+1=5

(7)

Or

- (iii) Define syn- and anti-elimination reactions. Why is anti-elimination preferred over syn-elimination? Give an example. $2+2+1=5$
- (iv) Draw the chair-conformations of *cis*- and *trans*-1-methyl-4-*t*-butyl cyclohexane and comment on their optical activities. $3+2=5$
