

2016

CHEMISTRY

( Major )

Paper : 2.2

( Organic Chemistry )

Full Marks : 60

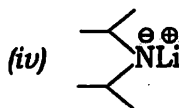
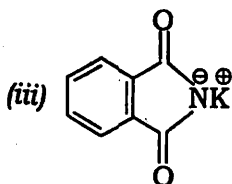
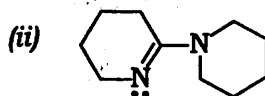
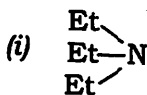
Time : 3 hours

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

1. Answer the following questions : 1×7=7

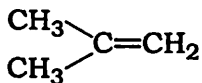
(a) Give an example of a molecule having prochiral centre.

(b) Which of the following is the strongest base?

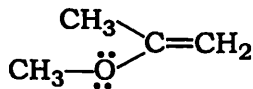


(c) Name a cracking catalyst used in petroleum industry.

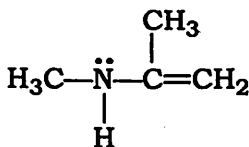
- (d) Arrange the following alkenes in decreasing order of reactivity with HBr :



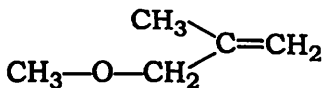
(P)



(Q)

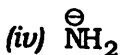
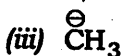
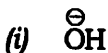


(R)

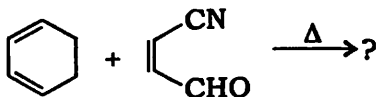


(S)

- (e) Consider the species and arrange these nucleophilic species in their decreasing order of nucleophilicity :



- (f) Find the product of the following reaction :



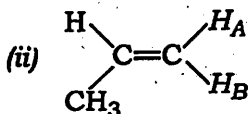
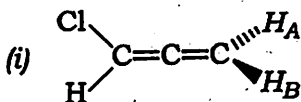
- (g) In the following pairs of halogen compounds, which would undergo  $S_N2$  reaction faster?



2. Answer the following questions : 2×4=8

- (a) What would be the preferred conformation of *trans*-1,2-dibromocyclohexane? If the conformation is considered in solution, is there any change in conformation with the change of solvent polarity?

- (b) Identify the topicity of  $H_A$  and  $H_B$  in the following molecules :

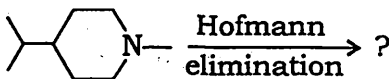


- (c) Between *p*-chlorophenol and *p*-fluorophenol, which one is a stronger acid and why?
- (d) Cyclohexane molecule shows different numbers of homotopic hydrogens at low temperature and at room temperature. Explain.

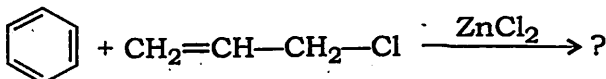
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Or

- (i) Hofmann elimination reaction (exhaustive methylation followed by heating with AgOH) will often remove an amine molecule, so what is the product of the following compound? 1



- (ii) In the given reaction, what is the product? 1



3. Answer any *three* questions : 5×3=15

- (a) Discuss the S<sub>N</sub>2 reaction mechanism of substitution in alkyl halides. Why does S<sub>N</sub>2 reaction take place with stereochemical inversion? 3+2=5

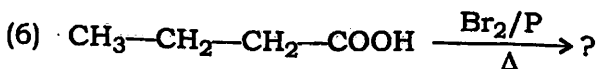
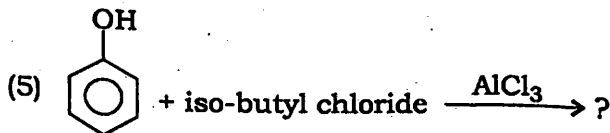
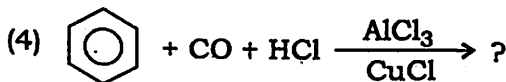
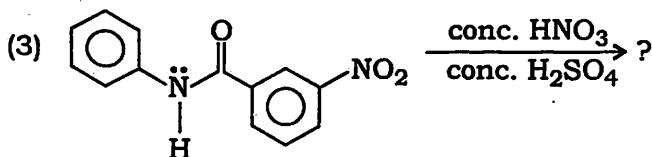
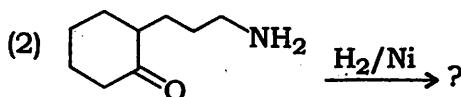
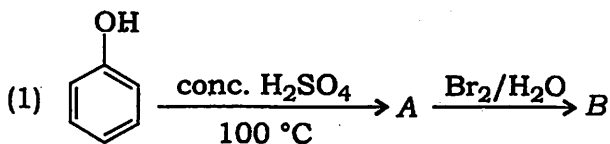
- (b) (i) How will you prepare methyl alcohol from formaldehyde by Cannizzaro reaction? Write the mechanism. 1+3=4

- (ii) The BP of acetone is 329 K while that of propanal is 322 K although both have the same molecular mass. Why? 1

- (c) What are different criteria on which ligands are classified as 'enantiotopic' and 'diastereotopic'? Explain by giving suitable examples. 5
- (d) What is Reimer-Tiemann reaction? Give its mechanism. 5
- (e) What is Knoevenagel reaction? Discuss its mechanism. 1+4=5
4. Answer any *three* questions : 10×3=30
- (a) (i) How will you synthesize naphthalene from benzene by Haworth synthesis? 3
- (ii) How will you explain that methyl benzene on oxidation gives benzoic acid while 2-methyl naphthalene on oxidation gives 2-methyl 1,4 naphthaquinone? 2
- (iii) What is pinacol-pinacolone rearrangement? 1+4=5
- (b) (i) Convert picryl chloride to picric acid. Explain the mechanism of the reaction showing the formation of a  $\pi$ -complex. 1+4=5
- (ii) Give an example of  $S_N1$  mechanism operating in an aromatic substrate. Also give two evidences in support of the formation of aryl cations as intermediate. 3

(iii) Illustrate two methods for trapping benzyne intermediate. 2

(c) (i) Identify the products in the following reactions : 1×6=6

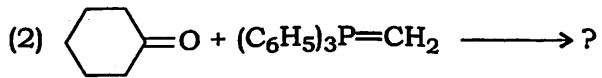
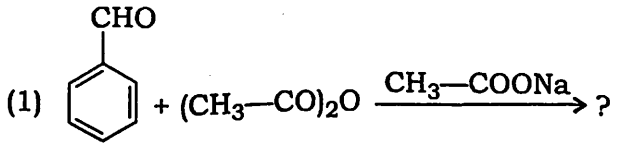


- (ii) How will you distinguish between benzoic acid and cinnamic acid? 2
- (iii) Most of the carboxylic acids exist as dimers. Explain. 2
- (d) (i) Why do a primary and a secondary nitro compound behave as an acid in the presence of strong alkali, whereas tertiary nitro compounds do not? Explain it with reactions. 3
- (ii) What products are obtained when nitrobenzene is reduced under different conditions? Give necessary reactions. 3
- (iii) Alkoxy group is *o-p*-directing even though oxygen is more electronegative than carbon. Explain. 2
- (iv) How will you explain that electrophilic substitution in anthracene takes place almost exclusively at 9 or 10 position? 2
- (e) (i) Explain why aniline is a poorer base than cyclohexyl amine. What happens when—
- (1) aniline is heated with a mixture of chloroform and sodium hydroxide;
  - (2) aniline is heated with CS<sub>2</sub> in the presence of a base;

( 8 )

(3) aniline is treated with sodium nitrite and HCl and the product is boiled with ethanol? 2+1+1+2=6

(ii) Complete the following reactions indicating against each the name of the reaction : 2+2=4



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