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(Pre-CBCS)

(5th Semester)

CHEMISTRY

FIFTH PAPER (CHEM–351)

(Organic Chemistry—II)

Full Marks : 55

Time : 2½ hours

(PART : A—OBJECTIVE)

(*Marks* : 20)

The figures in the margin indicate full marks for the questions

SECTION—A

(*Marks* : 5)

Tick (✓) the correct answer in the brackets provided : 1×5=5

1. The increasing order of acidity of the following compound is

(a) *m*-nitrophenol < *p*-nitrophenol < 2,4-dinitrophenol ( )

(b) 2,4-dinitrophenol < *p*-nitrophenol < *m*-nitrophenol ( )

(c) *p*-nitrophenol < 2,4-dinitrophenol < *m*-nitrophenol ( )

(d) *m*-nitrophenol < 2,4-dinitrophenol < *p*-nitrophenol ( )

2. The reaction between aldehyde and HCN to form cyanohydrin is an example of

(a) nucleophilic substitution ( )

(b) nucleophilic addition ( )

(c) addition-elimination ( )

(d) elimination ( )

3. Primary amine when treated with aldehyde gives

(a) alcohols ( )

(b) Schiff's base ( )

(c) 2°-amine ( )

(d) carbylamine ( )

4. Acetal is formed by the reaction between

(a) aldehyde and carboxylic acid ( )

(b) aldehyde and alcohol ( )

(c) ketone and alcohol ( )

(d) ketone and carboxylic acid ( )

5. The order of aromaticity of five-membered heterocycle is

(a) pyrrole < thiophene < furan ( )

(b) furan < pyrrole < thiophene ( )

(c) pyrrole < furan < thiophene ( )

(d) furan < thiophene < pyrrole ( )

SECTION—B

(*Marks* : 15)

Answer the following questions : 3×5=15

1. Draw the molecular orbital picture of benzene with proper labelling.

2. Complete the following reaction with suitable mechanism :

$$2HCHO \xrightarrow{50\%\ NaOH} ?$$

3. Describe nitrous acid test to distinguish between 1°, 2° and 3° amines.

4. Explain Mannich reaction taking suitable example.

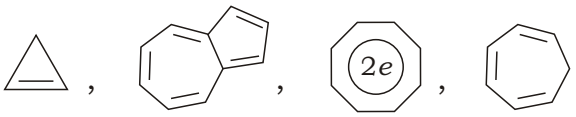
5. Electrophilic substitution of pyridine takes place primarily at C-3 than C-2 and C-4. Explain.

(PART : B—DESCRIPTIVE)

(*Marks* : 35)

The figures in the margin indicate full marks for the questions

1. *(a)* State Hückel's rule of aromaticity. Indicate whether the following compounds are aromatic or not : 1+4=5

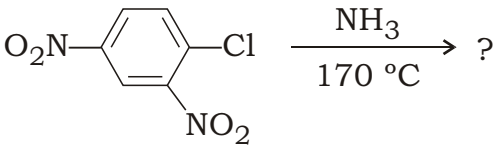


(b) "Phenols are more acidic than alcohols." Explain. 2

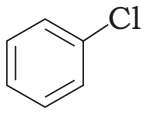
OR

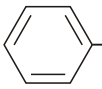
2. *(a)* Complete the following reactions (mechanisms not required) : 1×2=2

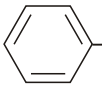
(i) 

(ii) 

(b) Complete the reactions with suitable mechanisms (any *two*) : 2½×2=5

(i)  + $NaNH_2$ $\xrightarrow{\text{liq. } NH_3}$?

(ii)  —OH + $CHCl_3$ $\xrightarrow{KOH}$?

(iii)  —OH + NaOH $\longrightarrow$? $\xrightarrow{CO_2,\ H^+}$?

3. *(a)* Complete the following reactions with suitable mechanisms (any *two*) : 2½×2=5

(i) $CH_3COCH_3 + NH_2OH \xrightarrow{H^+}$?

(ii) Ph—CHO + KCN $\xrightarrow{EtOH}$?

(iii) $CH_3COOH + C_2H_5OH \xrightarrow{H^+}$?

(b) "Aldehydes are more reactive than ketones towards nucleophile." Explain. 2

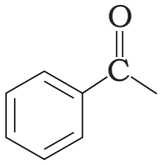
OR

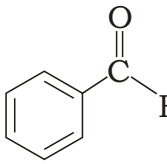
4. *(a)* Arrange the following in their increasing order of acidity and explain : 2

$HCOOH,\ CH_3COOH,\ ClCH_2COOH$

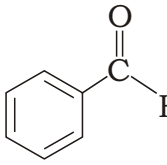
(b) Complete the following reactions (mechanisms not required) : 1×5=5

(i) $CH_3COCH_3 \xrightarrow[\text{conc. HCl}]{\text{Zn-Hg}} ?$

(ii)  $+ CH_3MgBr \longrightarrow ? \xrightarrow{H_2O/H^+} ?$

(iii)  $\xrightarrow{KMnO_4/H^+} ? \xrightarrow{SOCl_2} ?$

(iv) $CH_3COCH_3 + NH_2CONHNH_2 \longrightarrow ?$

(v)  $\xrightarrow{H_2O/H^+} ?$

5. *(a)* Arrange the following in their increasing order of basicity and explain : 3

CH_3NH_2, $(CH_3)_2NH$, $(CH_3)_3N$

(b) Differentiate between tautomerism and resonance. 2

(c) Complete the following reactions : 1×2=2

(i) $CH_3—NH_2 + CH_3COCl \longrightarrow ?$

(ii) $R—NH_2 + CHCl_3 \xrightarrow{KOH} ?$

OR

6. *(a)* How will you synthesize the following compounds from ethyl-acetoacetate? 2×2=4

(i) Butanoic acid

(ii) 2-Pentanone

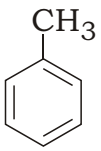
(b) What are active methylene compounds? Give examples. 1

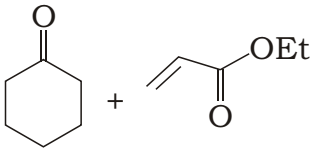
(c) Complete the following reactions : 1×2=2

(i) $CH_3—NH_2 + CS_2 \longrightarrow ? \xrightarrow{HgCl_2} ?$

(ii)  $—NH_2 + \text{aq. } Br_2 \longrightarrow ?$

7. *(a)* Complete the following reactions with suitable mechanisms (any *two*) : 2½×2=5

(i)  $+ CH_3COCl \xrightarrow{AlCl_3} ?$

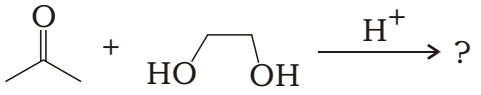
(ii)  $\xrightarrow[EtOH]{NaOEt} ?$

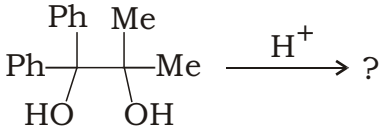
(iii)  $+ CH_3Br + PPh_3 \xrightarrow{BuLi} ?$

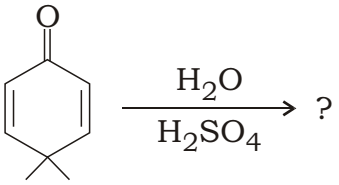
(b) Explain the $A_{AC}2$ mechanism for the hydrolysis of ester. 2

OR

8. *(a)* Complete the following reactions with suitable mechanisms (any *two*) : 2½×2=5

(i) 

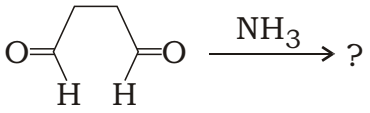
(ii) 

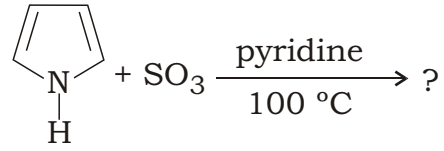
(iii) 

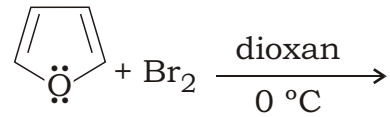
(b) How will you obtain benzilic acid from benzil? Give proper mechanism for the reaction. 2

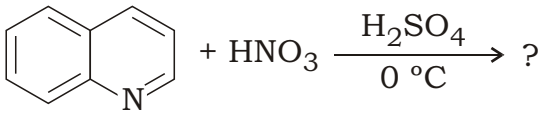
9. *(a)* How will you synthesize indole from Fischer indole method? Give chemical equations. 4

(b) Complete the following reactions (any *three*, mechanisms not required) : 1×3=3

(i) 

(ii) 

(iii) 

(iv) 

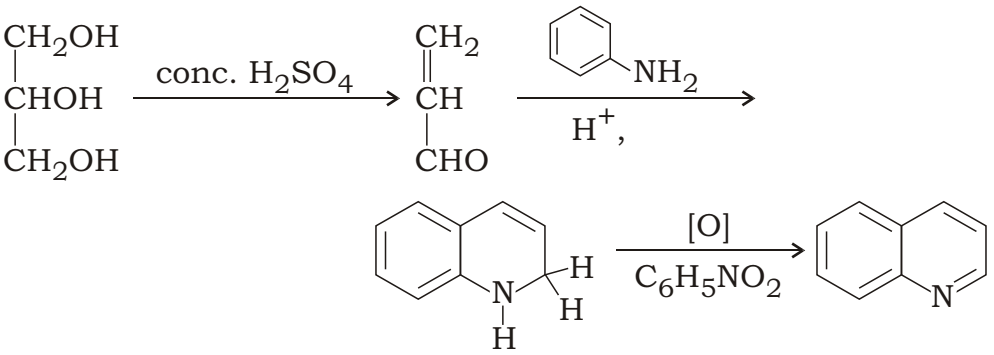
OR

10. *(a)* Compare the basicity of the following : 2×2=4

(i) Pyrrole vs. pyridine

(ii) Pyridine vs. piperidine

(b) Give the mechanism of the following transformation : 3



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