

Total No. of Questions : 9]  
(2041)

[Total No. of Printed Pages : 7

**UG (CBCS) IIIrd Year (Annual)  
Examination**

**2518**

**B.Sc. CHEMISTRY**

(Polynuclear Hydrocarbons, Dyes, Heterocyclic  
Compounds and Spectroscopy)

(UV, IR, NMR)

(DSE-2A)

**Paper : CHEM 301 TH**

**Time : 3 Hours]**

**[Maximum Marks : 50**

*Note :- Attempt five questions in all, selecting at least one question from each Section. Question No. 9 is compulsory. All questions carry equal marks.*

**Section-A**

1. (a) Give reactions involved in any *one* of the following methods for preparation of naphthalene :

(i) Fittig synthesis

**CH-350**

( 1 )

**Turn Over**

(ii) Haworth synthesis

(iii) Diels–Alder reaction

(b) Write short note on electrophilic substitution reaction, mechanism in naphthalene. Give reason why such substitution occurs readily at  $\alpha$ -position than at  $\beta$ -position.

5,5

2. (a) How will you prepare anthracene from the following? (Attempt any *two*)

(i) Phthalic anhydride and benzene

(ii) Benzyl chloride

(iii) 1, 4-Naphthaquinone and 1, 3-Butadiene

(b) Explain why positions 9 and 10 of anthracene are more reactive than other positions towards substitution and addition reactions.

## Section-B

3. (a) Discuss molecular orbital structure and the aromatic character of any *one* of the following :
- (i) Furan
  - (ii) Pyrrole or
  - (iii) Pyridine
- (b) Give ring expansion reaction in which pyrrole is converted into pyridine.
- (c) What happens when : (attempt any *three*)
- (i) Furan react with  $\text{SO}_3$  in pyridine.
  - (ii) Thiophene react with fuming nitric acid in acetic anhydride
  - (iii) Pyrrole react with  $\text{H}_2$  in presence of Ni
  - (iv) Pyridine react with n-butyl lithium.
  - (v) Pyridine react with sulphuric acid at 623 K.

4. (a) Write chemical equations for chlorination, nitration and sulphonation of Indole.

(b) What product is expected when quinoline undergo reduction by : (Attempt any *two*)

(i)  $H_2$ —Pt in  $CH_3COOH$

(ii)  $LiAlH_4$  or Na—Liq.  $NH_3$

(iii)  $H_2$ —Ni or  $HCl$ —Sn

6,4

### Section—C

5. (a) What is principle of UV-spectroscopy ? Discuss

briefly the various types of electronic transitions.

(b) Define any *two* of the following :

(i) Chromophores

(ii) Auxochromes

(iii) Bathochromic shift

(iv) Hypsochromic shift

(c) What is exocyclic double bond ? Draw a molecule having such bond.

4,4,2

**CH-350**

( 4 )

6. (a) What is principle of IR spectroscopy ?
- (b) What do you understand by fingerprint region in IR spectrum ?
- (c) The stretching frequency of C—C single bond is  $1200\text{ cm}^{-1}$  whereas of C=C double bond is around  $1650\text{ cm}^{-1}$ . Give reason for this difference.

3,3,4

#### Section-D

7. (a) Write short notes on any one of the following :
- (i) Equivalent and non-equivalent protons.
  - (ii) Chemicals shift
  - (iii) Spin-spin coupling
- (b) Explain the expected characteristic spectra ( $^1\text{H-NMR}$ ) of any one :
- (i) Ethyl bromide
  - (ii) 1, 1-Dibromoethane
  - (iii) Methanol

5,5

8. (a) Discuss briefly the principle of proton magnetic resonance (PMR).
- (b) Explain the inductive and resonance effect on chemical shift value. <https://www.hpboardonline.com>
- (c) Write *two* characteristic features of TMS indicator. 4,4,2

### Section-E

9. Do as directed :

- (i) Naphthalene is .....  
(Aromatic/Antiaromatic)
- (ii) Nitration of pyrrole gives .....
- (iii)  $\sigma \rightarrow \sigma^*$  transition of an electron require more energy than for  $\pi \rightarrow \pi^*$  transition.  
(True/False)
- (iv) Due to conjugation ..... shift is observed in the  $\lambda_{\max}$  value. (Red/Blue)
- (v) Ethanol has ..... types of magnetically equivalent protons. (1, 2 or 3)

- (vi) In chloroform ( $\text{CHCl}_3$ ) the proton is .....  
(Shielded/Deshielded)
- (vii) Pyrrole is slightly acidic in behaviour.  
(True/False)
- (viii) Indole has condensed structure of carbocyclic  
and ..... ring. (Pyrrole/Pyridine)
- (ix) Vibrational transition are mainly caused by  
..... radiations. (Microwaves/Infrared)
- (x) Tetra methylsilane is commonly used indicator  
in PMR spectroscopy. (True/False)
- $1 \times 10 = 10$

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