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Total No. of Questions : 9]  
(2032)

[Total No. of Printed Pages : 7

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

**3218**

**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**

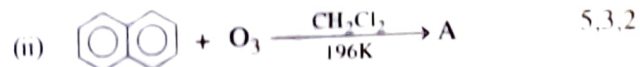
*Note :- Attempt five questions in all, selecting one question from each of the Sections A, B, C and D. Section E is compulsory.*

**Section-A**

1. (a) How we can synthesize Napthalene by :
- (i) Haworth synthesis
  - (ii) Diels-Alder reaction

(b) Why Electrophilic substitution reactions of Naphthalene occurs at  $\alpha$  position than  $\beta$  position ?

(c) Complete the following



2. (a) Discuss orbital structure of Anthracene.

(b) How Anthracene is prepared by :

(i) Diels-Alder Reaction

(ii) Elbs Reaction

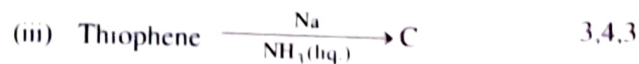
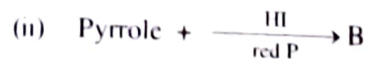
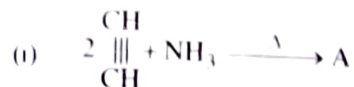
(c) Why substitution and addition reactions of phenanthrene occurs at position 9 and 10 ? 2.5.3

### Section-B

3. (a) Discuss orbital structure of Pyrrole ? Why pyrrole is more reactive than benzene ?

(b) Write the mechanism of Electrophilic substitutions reactions of Pyrrole ?

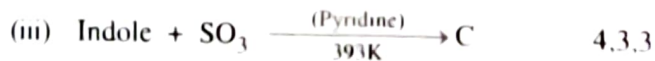
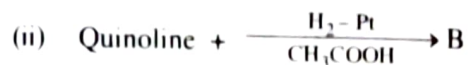
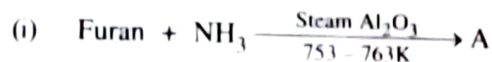
(c) Complete the following reactions






4. (a) Compare the basic strength of pyrrole, pyridine and piperidine.

(b) Why Pyridine is weaker base than aliphatic  $3^\circ$  amines ?

(c) Complete the following :



### Section-C

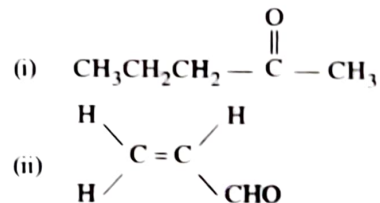
5. (a) What is Beer-Lambert's Law ? Give two limitations of it.
- (b) What are the different types of Electronic transitions in case of UV visible regions ?
- (c) Calculate the number of degrees of freedom in :
- $N_2O$
  - $CH_4$
  - $O_2$
- 3,4,3
6. (a) Discuss the types of fundamental vibrations ? What are the different types of Bending vibrations ?
- (b) Calculate  $\lambda_{max}$  for :
- 
  - 
  - 
- (c) Give 3 applications of UV spectroscopy. 4,3,3

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### Section-D

7. (a) Write short notes on :
- Origin of signals
  - Chemical shift
  - Homotopic protons
- (b) What is spin-spin splitting ? What are the rules of spin-spin splitting of proton signals ?
- (c) What are the factors that affect the value of chemical shift ? 3,5,2
8. (a) What is TMS ? Why TMS is used as the most common reference compound in  $^1H$  NMR (PMR) spectroscopy ?
- (b) How many proton (NMR) signals will be obtained in  $^1H$  NMR spectrum of :



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Turn Over

- (c) What is chemical shift ? What are the scales to express the chemical shift ? 4,3,3

### Section-E

#### (Compulsory Question)

9. Do as directed :

- (i) Number of  $\pi$  electrons in Naphthalene is

.....1.....

- (ii) Name of oldest Vat dye is .....

- (iii) Out of pyrrole, pyridine and piperidine the least basic is .....

- (iv) Red shift is also known as Bathochromic shift

whereas blue shift is known as hypsochromic shift.

- (v) The interaction of IR radiations with .....
- ..... gives the IR spectrum.

- (vi) IR spectra is also known as vibrational-rotational spectroscopy. (True/False)

- (vii) All the hydrogen nuclei have same value of chemical shift (True/False)

- (viii) Introduction of Conjugation in alkenes causes blue shift. (True/False)

- (ix) All heterocyclic compounds are aromatic (True/False)

- (x) Both Naphthalene and Anthracene obey Huckel's Rule. (True/False)
- 1×10=10