Roll No. .....

Total No. of Questions : 9] [Total No. of Printed Pages : 7

(2032)

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

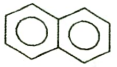
1. (a) How we can synthesize Napthalene by :

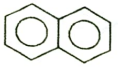
(i) Haworth synthesis

(ii) Diels-Alder reaction

(b) Why Electrophilic substitution reactions of Napthalene occurs at α-position than β-position ?

(c) Complete the following :

(i)  $+ \xrightarrow[423K]{H_2|Pt} A$

(ii)  $+ O_3 \xrightarrow[196K]{CH_2Cl_2} A$ 5,3,2

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 :

(i) $2\ \underset{\underset{CH}{|||}}{\overset{CH}{}} + NH_3 \xrightarrow{\Delta} A$

(ii) Pyrrole $+ \xrightarrow[\text{red P}]{HI} B$

(iii) Thiophene $\xrightarrow[NH_3(liq.)]{Na} C$ 3,4,3

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

(b) Why Pyridine is weaker base than aliphatic 3° amines ?

(c) Complete the following :

(i) Furan $+ NH_3 \xrightarrow[753-763K]{\text{Steam } Al_2O_3} A$

(ii) Quinoline $+ \xrightarrow[CH_3COOH]{H_2-Pt} B$

(iii) Indole $+ SO_3 \xrightarrow[393K]{(Pyridine)} C$ 4,3,3

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 :

(i) N_2O

(ii) CH_4

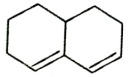
(iii) O_2

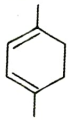
3,4,3

6. (a) Discuss the types of fundamental vibrations ? What are the different types of Bending vibrations ?

(b) Calculate λ_{max} for :

(i) 

(ii) 

(iii) 

(c) Give 3 applications of UV spectroscopy. 4,3,3

Section–D

7. (a) Write short notes on :

(i) Origin of signals

(ii) Chemical shift

(iii) Homotopic protons

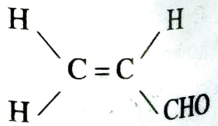
(b) What is spin-spin splitting ? What are the rules of spin-spin splitting of proton signals ?

(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 :

(i) 

(ii) 

(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 π electrons in Napthalene is .....6..... . 4

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

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

(iv) Red shift is also known as ..... shift whereas blue shift is known as ..... 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 Napthalene and Anthracene obey Huckel's Rule. (True/False)

1×10=10

House Examination, Dec., 202

Class-B: Sc. 3rd Year.

Subject (Course Code): Chemistry (CHEM-301TH)

Course: Polynuclear Hydrocarbons, Dyes, Heterocyclic Compounds & Spectroscopy

Max. Marks: 15 **Time Allowed: 1½ Hrs.**

Note: Attempt three questions in all selecting at least one from each section. Section-C is compulsory.

Section-A

Q 1 a) Discuss various types of transitions observed in UV-Visible spectroscopy.

b) Define *Chromophores* and *Auxochromes* along with suitable examples.

Or

a) Out of *cis-Stilbene* & *trans-Stilbene*, which one absorbs at longer wavelength & why?

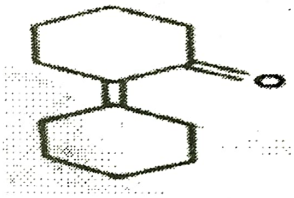
b) Discuss the effect of solvent on electronic transitions. **(3,2)**

Section-B

Q 2 Calculate 'λ_{max}' value for any two of the following compounds:

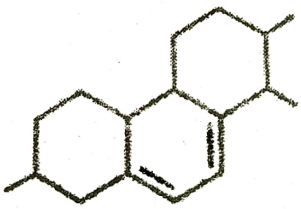
a)

b)

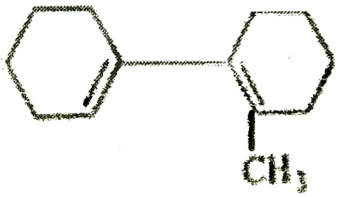


Or

a)



b)



(2½x2=5)

Section-C

Q 3 a) What is Bathochromic shift?

b) What is Hypsochromic shift?

c) What are Forbidden transitions? Give an example.

d) Define 'λ_{max}'.

e) 'λ_{max}' value for Six membered 'α-β unsaturated ketone' is .....nm. **(1 x 5 =5)**