

Roll No.

Total No. of Questions : 9]
(2035)

[Total No. of Printed Pages : 8

UG (CBCS) IIIrd Year Annual Examination

2695

B.Sc. CHEMISTRY

(Polynuclear Hydrocarbons, Dyes, Heterocyclic
Compounds and Spectroscopy)

(UV, IR, NMR)

(DSE-2A)

Paper : CHEM 301 TH

Time : 3 Hours]

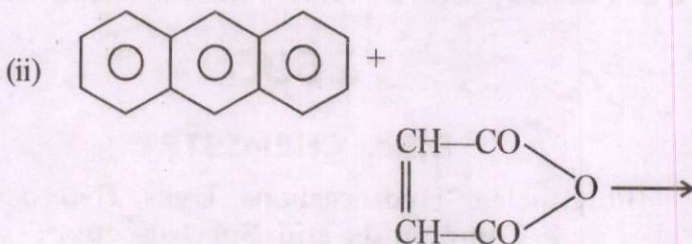
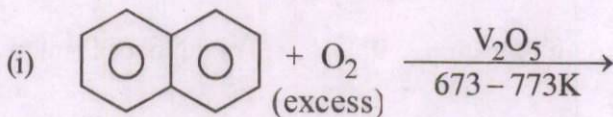
[Maximum Marks : 50

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

Section-A

1. (a) Explain mechanism of substitution and addition reactions of anthracene. Explain why positions 9 and 10 of anthracene are more reactive than other positions ? [5]
- (b) Explain orbital structure of naphthalene with diagram. [2]

(c) Complete the following reactions : [3]



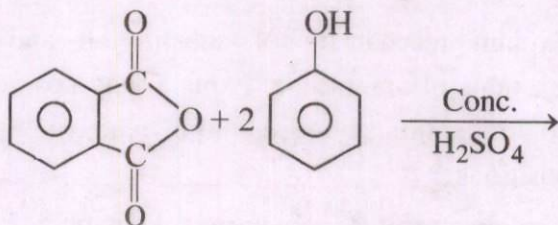
2. (a) How will you prepare phenanthrene by Haworth synthesis ? [3]

(b) Explain synthesis of :

(i) Malachite green

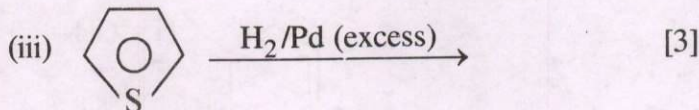
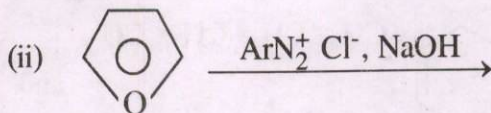
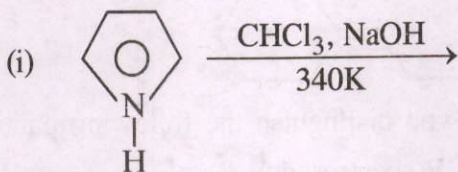
(ii) Fluorescein [5]

(c) Complete the reaction. Name the product formed : [2]



Section-B

3. (a) Explain mechanism and orientation of electrophilic substitution reactions of pyridine. What are the reasons responsible for low reactivity of pyridine towards electrophilic substitution reactions ? [5]
- (b) Explain the following :
- (i) Pyridine is a weaker base than trimethylamine.
- (ii) Pyrrole is more reactive than benzene. [5]
4. (a) Discuss skraup synthesis of quinoline. [4]
- (b) Complete the following reactions :



- (c) Why electrophilic substitution in pyrrole takes place at 2-position whereas in pyridine at 3-position ? [3]

Section-C

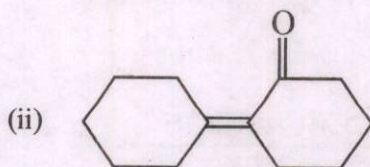
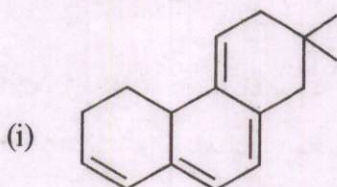
5. (a) Explain the following terms :

(i) Chromophore

(ii) Hypsochromic shift.

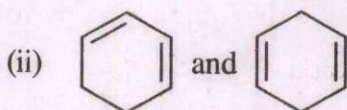
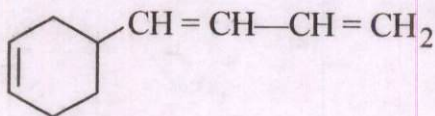
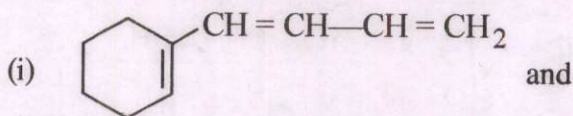
[3]

(b) Calculate λ_{\max} for :



[3]

(c) How can you distinguish the following pair with the help of UV-spectroscopy ?



[4]

6. (a) Explain the principle of IR spectroscopy. Discuss its application in organic chemistry. [4]
- (b) Giving a suitable example, explain the concept of Fermi resonance. [3]
- (c) Deduce the number of fundamental vibrations possible for each of the following molecules :
- (i) Water
 - (ii) Carbon dioxide
 - (iii) Benzene. [3]

Section-D

7. (a) Write short notes on the following :
- (i) Chemical shift
 - (ii) Coupling constant [3]
- (b) How will you distinguish between the following pairs of compounds on the basis of PMR spectroscopy ?
- (i) $\text{CH}_3\text{CH}_2\text{CHO}$ and CH_3COCH_3
 - (ii) 1-bromopropane and 2-bromopropane. [3]

- (c) Predict the number of signals, their relative intensities, their positions and multiplicity in the PMR spectra of Ethanol. [4]
8. (a) Discuss the applications of PMR spectroscopy. [5]
- (b) Do all protons of $\text{CH}_3\text{CH}_2\text{CH}_2 - \text{Br}$ give the same ^1H NMR (PMR) signal ? If no, why ? [3]
- (c) What is $(n + 1)$ rule ? [2]

Section-E

(Compulsory Question)

9. Do as directed :

(A) Fill in the blanks :

- (i) Alizarin is an dye. [1]
- (ii) Resonance energy of benzene is than that of Furan, pyrrole and thiophene. [1]
- (iii) Red shift is also known as shift whereas Blue shift is also known as shift. [1]
- (iv) Deshielding shifts the absorption in NMR spectrum. [1]

(B) Multiple Choice Questions (Choose the correct option) :

(v) Which of the following compounds undergoes Diels-Alder reaction ?

(a) Naphthalene

(b) Benzene

(c) Anthracene

(d) All of these [1]

(vi) Which of the following transitions are shown by saturated aldehydes and ketones ?

(a) $n \rightarrow \sigma^*$

(b) $\pi \rightarrow \pi^*$

(c) $n \rightarrow \pi^*$

(d) All of these [1]

(vii) In Fourier Transformation (FT) NMR spectrometers :

(a) Radio frequency is varied

(b) Magnetic field is constant

(c) Both of these

(d) None of these [1]

(C) Choose True or False statements :

(viii) Azo dyes do not impart fast colour to the fabric. [1]

(ix) Piperidine is an aromatic heterocyclic compound. [1]

(x) All the hydrogen nuclei have same value of chemical shift. [1]