

[This question paper contains 6 printed pages.]

(25)

Your Roll No. 2022

Sr. No. of Question Paper : 1170

A

Unique Paper Code : 32177904

Name of the Paper : Analytical Methods in
Chemistry

Name of the Course : B.Sc. (Hons) Chemistry

Semester : VI

Duration : 3.5 Hours

Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any six QUESTIONS in all.
3. All questions carry equal marks.
4. The questions should be answered in accordance with the number in the question paper.
5. Use of scientific calculator and log tables is permitted.

P.T.O.

1.
 - (a) Discuss the various equilibrium processes in the solvent extraction of metal ion from an aqueous phase by solvation.
 - (b) A mixture of CaO and CaCO_3 is analyzed by TGA. The result indicates that mass of the sample decreases from 250.6 mg to 190.8 mg between 600-900°C. Calculate the percentage of Calcium Carbonate in the mixture.
 - (c) Define chromatography. Define the following terms used in chromatographic analysis :
 - (i) retardation factor
 - (ii) retention volume
 - (d) Draw the block diagram of thermobalance and name its different component. (4,4,2.5,2)
2.
 - (a) Define accuracy and precision. What is the relation between standard deviation and precision? What is the relation between standard deviation and accuracy?
 - (b) Name any three-indicator electrode used for pH metric titrations. Give the systematic diagram of any one indicator electrode.

- (c) How does a double beam spectrophotometer differ from a single beam spectrophotometer? Draw a systematic diagram for a double beam instrument and give its working principles. (4,4,4.5)
3. (a) Distinguish between the following pairs :
- (i) Hydrogen and Deuterium discharge lamp
 - (ii) Filters and Grating as wavelength selector
- (b) Describe the term chemical interference. Explain the different methods of removal of chemical interference in Flame Atomic Absorption spectroscopy.
- (c) What is the principle involved in solvent extraction? Give its significance and conditions under which it is applicable. Also explain how solvent extraction obeys Gibb's phase rule. (4,4,4.5)
4. (a) Suggest the effect on plate height (H) if each of the following changes were incorporated into a column chromatographic experiment :
- (i) An increase in flow rate
 - (ii) An increase in the diameter of the column

(iii) An increase in the column length

(iv) An increase in the temperature of the column

(b) What are the various methods which is used for the determination of pKa values? Discuss one method in detail.

(c) Explain the various processes that occur when a sample is injected into the flame in atomic absorption spectroscopy. (4,4,4.5)

5. (a) The peak absorbance of 4.15×10^{-3} M KMnO_4 at 555 nm in a 2.000 cm pathlength cell is 6.46.

(i) Find the molar absorptivity and percent transmittance of this solution.

(ii) What would be the absorbance if the pathlength were 0.200 cm?

(b) What is the purpose of flame in flame emission spectroscopy? Why we get line spectra in FES whereas band in UV-Vis spectroscopy?

(c) What is meant by term confidence limit? How is it determined? What is its significance?

(4,4,4.5)

6. (a) Explain the working of Hollow Cathode Lamp with the help of a suitable diagram.
- (b) Define gross sample and grab sample with suitable examples. Explain different steps involve during sampling.
- (c) Draw and explain the conductometric titration curve of :
- (i) CH_3COOH vs NaOH .
- (ii) HCl vs NaOH (4,4,4.5)
7. (a) Explain the principle and working of FES (Flame Emission spectrometer) instrument with the help of a suitable diagram. Give its applications.
- (b) In a chromatography method, the retention volume of solute (V_R) is found to be 68.4 mL for a column with the $V_M = 18.6$ mL and $V_S = 14.5$ mL, where V_M and V_S are the volumes of mobile and stationary phase respectively. Calculate the retention factor and the partition coefficient for this solute.
- (c) State Nernst distribution law. A substance X is extracted from its aqueous solution ($V_w = 50$ mL) with an organic solvent ($V_o = 20$ mL). Calculate distribution ratio (D) when extraction (E) percentage is 99.5. (4,4,4.5)

8. (a) Derive the mathematical relation of Beer-Lambert law. What are the limitations of the law?
- (b) Sketch out the electromagnetic spectrum. State fundamental law of spectroscopy.
- (c) Write detailed note on classification of electroanalytical methods. Discuss applications of conductometric and potentiometric titrations.
- (4,4,4.5)
9. (a) Distinguish between the following (**any two**):
- (i) Distribution Coefficient (K_D) and Distribution Ratio (D)
 - (ii) Standard Deviation and Standard Deviation of mean
 - (iii) F-test and t-test
- (b) Explain how the composition of the flame affects the production of gaseous atoms using suitable example.
- (c) Explain how crucible geometry affects the thermogravimetric curve. What is null point balance?
- (4,4,4.5)

[This question paper contains 8 printed pages.]

(26)

Your Roll No. 2022

Sr. No. of Question Paper : 1107 A

Unique Paper Code : 32171601

Name of the Paper : Inorganic Chemistry IV:
Organometallic Chemistry
and Bio-inorganic Chemistry

Name of the Course : B.Sc. (Hons.) Chemistry

Semester : VI

Duration : 3 hours 30 minutes Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **six** questions out of nine.
3. **All** questions carry equal marks (12.5).

1. (i) What are Metalloenzymes and Metal Activated Enzymes? Give the name and the mechanism of action of the enzyme transporting CO_2 from the tissues to the lungs.

P.T.O.

- (ii) What are interfering anions? How do they interfere in the cation analysis? Why do they interfere only after the second group cation analysis and not before?
- (iii) Predict whether the following compounds obey EAN rule or not.
- (a) $[\text{Fe}(\text{CO})_2(\eta^5\text{-C}_5\text{H}_5)(\eta^1\text{-C}_5\text{H}_5)]$
- (b) $[\text{Fe}(\text{CO})_2(\text{NO})_2]$ (5,5,2.5)
2. (i) The Heam group in Haemoglobin cannot function as an oxygen carrier in the absence of the globin chain. Explain. Give the Hill's equation for the oxygenation of Haemoglobin.
- (ii) What is Zeise's salt? Discuss the bonding in Zeise's salt on the basis of Dewar-Chatt-Duncanson model and IR studies. How is M-C bonding in Zeise's salt different from that in metal carbonyl complexes?
- (iii) Explain the steps involved in the identification of NO_2^- and NO_3^- ions when present together in a salt mixture. (5,5,2.5)

3. (i) A mixture of anions gives brown vapours with concentrated H_2SO_4 , which are intensified on adding copper turnings. A rod dipped in ammonia solution gives white dense fumes when brought near the mouth of the test tube. The sodium carbonate extract gives a white precipitate with silver nitrate after acidification, which is completely soluble in ammonium hydroxide solution. Explain with reactions how will you confirm the anions present.
- (ii) How are organometallic compounds classified on the basis of type of bonding? Explain giving examples.
- (iii) State what special features of Zn(II) make it an excellent biocatalyst? (5,5,2.5)
4. (i) State how does cis-platin block cell proliferation? Explain.
- (ii) What is Bohr Effect? Draw the oxygen saturation curves for haemoglobin and myoglobin. Why do their shapes differ?

- (iii) What is meant by the term hapticity? Give an example where the same ligand can show varying hapticity. (5,5,2.5)
5. (i) Give examples of metal containing biomolecules which perform the following functions. (Give the name of the metal and the biomolecule which contains the metal)
- (a) Oxygen storage
 - (b) Metal storage
 - (c) Electron carrier
 - (d) Photoredox
 - (e) Prevention of disease
- (ii) Ferrocene on acetylation with excess of reagent shows heteroannular substitution while on alkylation with excess of reagent shows homoannular substitution. Give reason.
- (iii) Which alkaline earth metal is also involved in the sodium - potassium pump? What is the source of energy for this pump? (5,5,2.5)

6. (i) Explain the functioning and mechanism of action of the enzymes: Carbonic anhydrase and Carboxypeptidase A?
- (ii) Define the following terms with reference to Catalysis :
- (a) Catalytic cycle
 - (b) Tolman catalytic loop
 - (c) Lifetime of a catalyst
 - (d) Turnover number
 - (e) Poison
- (iii) How will you detect potassium ion in presence of ammonium ions? (5,5,2.5)
7. (i) Name the metal with oxidation state involved in following biomolecules.
- (a) Ferritin
 - (b) Vitamin B12

(c) Haemoglobin

(d) Chlorophyll

(e) Transferrin

(ii) What is Ziegler Natta Catalyst? Explain the active form of this catalyst which is involved in the oligomerization of olefin.

(iii) Write the formulae and draw the structures of two organometallic compounds having multicentre bonding. What is the reason of their multicentre bonding? (5,5,2.5)

8. (i) An unknown salt A, when heated with NaOH solution, produced a pungent smelling gas B. B turned red litmus blue and gave dense white fumes of C when a glass rod dipped in HCl was held at the mouth of the test tube. A, on heating with concentrated sulphuric acid, gave a mixture of two odourless gases D and E. D burnt with a blue flame while E turned lime water milky. An aqueous solution of A gave a white precipitate with calcium chloride solution, the acid

extract of which discharged the colour of acidified potassium permanganate solution. Identify A, B, C, D and E giving the reactions involved.

- (ii) What do you mean by reductive carbonylation? Give a suitable example for this. The symmetric CO stretching frequencies in isoelectronic series of $[\text{V}(\text{CO})_6]^-$, $\text{Cr}(\text{CO})_6$ and $[\text{Mn}(\text{CO})_6]^+$ are 1860 cm^{-1} , 2000 cm^{-1} and 2090 cm^{-1} respectively. Explain these observations.
- (iii) In what form iron is stored in the human body? How is it taken from the storage site for the incorporation into haemoglobin? (5,5,2.5)

9. (i) Both carbon and oxygen have one lone pair of electron but in metal carbonyls, bonding is through carbon and not through oxygen. Explain with help of Molecular orbital diagram.
- (ii) Write the toxic effects of $\text{Pb}(\text{II})$. Give the reasons for its toxicity. How it can be treated?

- (iii) What is Wilkinson's catalyst. Explain its structure and oxidation state of the central metal ion.

(5,5,2.5)

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Sr. No. of Question

Unique Paper Code

Name of the Candidate

Name of the College

Semester

Duration : 3 hours

Instructions for

1. Write your Roll No. at the top of this question paper.
2. Attempt any five questions.
3. Each question carries 5 marks.
4. Preferably attempt the questions in the order given.
1. Attempt all questions.

[This question paper contains 9 printed pages.]

(27)

Your Roll No. 2022

Sr. No. of Question Paper : 1258

A

Unique Paper Code : 32177903

Name of the Paper : DSE – Applications of
Computers in Chemistry

Name of the Course : B.Sc. (Hons.) Chemistry

Semester : VI

Duration : 3 hours 30 min

Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **SIX** questions in all.
3. Each question carries **12.5** marks.
4. Preferably attempt all parts of a question together.

1. Attempt **all** parts of the question.

(a) Write the algebraic expression of any **three** of the following in BASIC :

$$(i) V = \frac{nRT}{P + \frac{an^2}{V^2}} - nb$$

P.T.O.

$$(ii) E_n = \frac{n^2 h^2}{8ml^2}$$

$$(iii) y = A \exp(-B^2/x)$$

$$(iv) y = |x|$$

$$(v) x = \frac{n(x_1^2 - x_2^2)}{2(a+b)x}$$

(b) Write the full form of any **four** of the following :

(i) GIGO

(ii) PDF

(iii) CPU

(iv) OCR

(v) USB

(vi) BASIC

(c) Differentiate between any **two** of the following with one example :

(i) Compiler and Interpreter

(ii) Virus and Bug

(iii) Hardware and software

(4.5,4,4)

2. (a) Select the graphics commands from the following :

- (i) CLS
- (ii) LINE
- (iii) LOCATE
- (iv) CIRCLE
- (v) PSET
- (vi) WINDOW
- (vii) DRAW
- (viii) VIEW
- (ix) INPUT

(b) Find the error, if any, in the following BASIC file names :

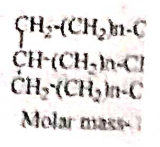
- (i) New-Raph.bas
- (ii) 123myfil.bas
- (iii) myfile.123
- (iv) SUM*.bas

(b)

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4

- (b) How will
- (c) What is significance of



- (a) One of the T-C- A-C DNA strands
- (b) What are proteins?
- (c) With the l

- (a) What is dt
- (b) Differentia
- (c) Name the

- (a) Discuss the catalyzed
 - (b) What are s
 - (c) Show step
- (4,4,4)

- Write short notes
- i) Enz
 - ii) Sec
 - iii) Col
 - iv) Lip

(c) Explain the use of any four of the following commands with one example each :

- (i) LEN(B\$)
- (ii) INT
- (iii) SCREEN 1
- (iv) LOCATE 18,60
- (v) REM (4.5,4,4)

3. (a) Convert the following :

- (i) $(281.125)_{10}$ to $(?)_2$
- (ii) $(111111.01)_2$ to $(?)_{10}$
- (iii) $(54.6)_{10}$ to $(?)_2$

(b) Explain the meaning of the following error messages :

- (i) WEND without WHILE
- (ii) Overflow
- (iii) Out of data
- (iv) Syntax error

(3,3,2,5)

1258

(c) Id
fo

- (i)
- (iv)
- (v)

4. (a) What is in BAS

(b) Find the BASIC

- (i) Y
- (ii) Fo
- (iii) Y=
- (iv) LET

(c) Write a prog of first ten

(c) Explain the use of any **four** of the following commands with one example each :

(i) LEN(B\$)

(ii) INT

(iii) SCREEN 1

(iv) LOCATE 18,60

(v) REM

(4.5,4,4)

3. (a) Convert the following :

(i) $(281.125)_{10}$ to $(?)_2$

(ii) $(111111.01)_2$ to $(?)_{10}$

(iii) $(54.6)_{10}$ to $(?)_2$

(b) Explain the meaning of the following error messages :

(i) WEND without WHILE

(ii) Overflow

(iii) Out of data

(iv) Syntax error

(c) Identify the error, if any, in any **four** of the following constants and correct them :

(i) 8,15,325.30

(ii) $6.022 \times E23$

(iii) "New Delhi-"110001

(iv) \$100.00

(v) "ABC123" (4.5,4,4)

4. (a) What is the use of DEF and GOSUB statements in BASIC? Explain with an example.

(b) Find the error and correct them in the following BASIC expressions :

(i) Y= "DATE"

(ii) For J=100 TO 50 STEP2

(iii) Y=2.54E-54

(iv) LET A/B=35

(c) Write a program in BASIC to find sum of squares of first ten odd numbers. (4.5,4,4)

5. (a) Write a program in BASIC to draw three concentric circles with centre (320,100) and radii 40, 60 and 80 pixels respectively, in high resolution mode.
- (b) Write a program in BASIC to find transpose of a 3×3 Matrix.
- (c) Write a program in BASIC to evaluate the following series :

$$\text{Cos}(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} \quad (4.5, 4, 4)$$

6. Find out the errors in the following programs :

(a) 10 REM "To Integrate A Given Function Using Simpson's Method"
 20 FNY (T) = 3 * X^3 + 4 * X^2
 30 INPUT "THE LOWER & UPPER LIMITS"; A, B
 40 INPUT "THE NUMBER OF INTERVALS", N
 50 H = (A-B)/N
 60 S=0 : X = A: M= 2
 70 FOR I = 1 TO N
 80 X = X + H
 90 S = S + M * FNY(X)
 100 IF M = 2 THEN M = 4 ELSE M = 2
 105 NEXT I
 110 S = H * (FNY(A) + S + FNY(B)) * (1/4)
 120 PRINT "THE INTERGRATION VALUE IS = "; S
 130 END

(b) 10 REM "To Evaluate Rms, Avg Speed And Most Probable Speed"
 20 INPUT "1 FOR VMP, 2 FOR VAVG, 3 FOR VRMS"; N
 30 T = 300: R = 8.314: M = 0.028: PI = 3.14

```

40 ON I GOTO 50, 80, 100
50 VMP = SQRT((2 * R * T) / M)
60 PRINT "VMP"; VMP
70 GOTO 130
80 VAVG = SQR(8 * R * T) / (π * M)
90 PRINT "VAVG"; VAVG
100 GOTO 130
110 VRMS = SQR(3 * R * T) / M
120 PRINT "VRMS"; VRMS
130 END

```

(c) 10 REM "To Plot pH Titration Curve For SA Vs SB"

```

20 SCREEN 2
30 COLOR 50, 0
40 VIEW (25, 20) - (300, 170), 2
50 WINDOW (0, 0) - (80, 14)
60 INPUT "NO. OF MOLES OF A & B"; A, B : VA = 40
70 FOR VB = 1 TO 80 STEP -1
80 H = (NA * VA - NB * VB) / (VA + VB)
90 IF H > 0 THEN PH = -LOG(H) / LOG(10) ELSE 140
100 PSET (VB, PH): CIRCLE (40, 7), 0.5
110 NEXT VB : END
120 PRINT "SOLUTION IS EITHER NEUTRAL OR BASIC";
130 END

```

(4.5, 4, 4)

7. Write the output of the following programs :

(a) 10 PRINT "THE REQUIRED SENTENCE TO FIND NO. OF WORDS IN IT"

```

20 PRINT
30 A$ = "A TEXTBOOK OF CHEMISTRY IS MISSING IN THE CUPBOARD"
40 LET L = LEN(A$)
50 LET COUNT = 1
60 FOR K = 1 TO L
70 IF MID$(A$, K, 1) = " " THEN COUNT = COUNT + 1
80 NEXT K
90 PRINT
100 PRINT "THE NUMBER OF WORDS IN : " A$; "IS" ; COUNT
110 END

```

```
(b) 10 SCREEN 1
    20 COLOR 1,0
    30 LINE (160, 30) - (250, 180), 1
    40 LINE - (70,180), 2
    50 LINE -(160, 30), 1
    60 END
```

```
(c) 10 DIM A(12)
    20 LET A (2) = 10
    30 FOR K = 1 TO 5

    40 LET A (2 * K +2) = K
    50 PRINT A(2*K);
    60 NEXT K
    70 END
```

(4.5,4,4)

8. (a) Explain the following in BASIC with an example :

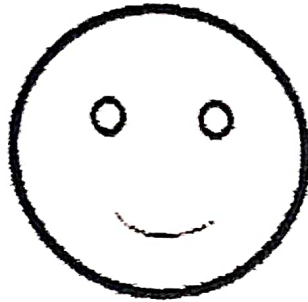
(i) SCREEN 2

(ii) VIEW

(iii) CHR\$

(iv) DRAW

(b) Write a Program in BASIC to draw following figure in the centre of the output screen :



(8,4.5)

9. (a) Explain Iteration Method for solving a polynomial equation. Write a program using Iteration method, to calculate the volume of van der Waals using BASIC.

Given: $a=0.4$, $b=0.427$, $P=80$, $T=298$

- (b) Write a program in BASIC to determine the Binomial Coefficient, ${}^n C_r$ using subroutine.

(8,4.5)

[This question paper contains 6 printed pages.]

(28)

Your Roll No. 2022

Sr. No. of Question Paper : 1521 A

Unique Paper Code : 32177908

Name of the Paper : DSE-8: Green Chemistry

Name of the Course : B.Sc. (H) Chemistry

Semester : VI

Duration : 3.5 Hours

Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any six questions. All parts of a question should be attempted together.
3. Each question carries 12.5 marks.

Deshbandhu College University
Kalkaji, New Delhi-19

1. (a) Fill in the blanks with appropriate word(s) :

(i) Rearrangement reactions are _____%
atom economical.

(ii) _____ is an example of a green solvent.

P.T.O.

(iii) Sonication uses _____ energy.

(iv) _____ is a non-renewable feedstock.

(v) PEG stands for _____ .

(vi) ISD in green chemistry stands for _____ .

(b) Define the following terms :

(i) Real time analysis

(ii) Depleting feedstock

(c) Complete the formula $\text{Risk} = f(\text{hazard}, \dots\dots\dots)$.

Deshbandhu College Library (6,2×3,0.5)
Kankaji, New Delhi-19

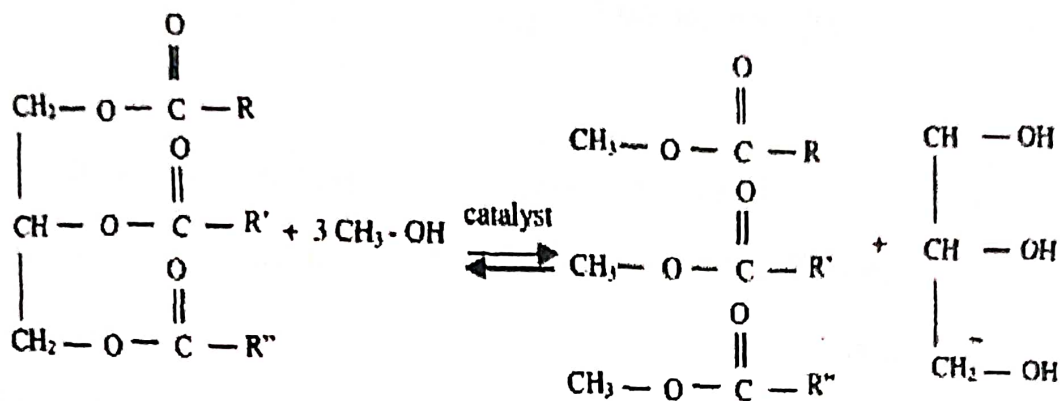
2. (a) Discuss any two Environmental laws.

(b) Name and elaborate the pollution prevention Act of 1990.

(c) Write down 12 Principles of Green Chemistry.
Explain the principle of catalysis and Inherent Safer Chemicals. (3,3,6.5)

3. (a) Define atom economy.

(b) Calculate atom economy of the following reaction :



Triacylglycerol

Methanol

Fatty acid methyl esters

Glycerol

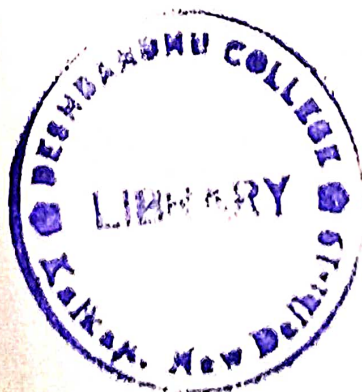
(Triglyceride)

(FAME)

R=CH₃

(c) Discuss the use of naturally occurring protein to stimulate plant growth and to improve crop quality. (2.5,6,4)

4. (a) Discuss two advantages of microwave assisted organic synthesis. Explain conversion of methyl benzoate to benzoic acid under microwave irradiation.



P.T.O.

- (b) What is Super-critical carbon dioxide? What are its advantages over conventional organic solvents? Why there is a need to replace PERC as a solvent for dry cleaning? (6.5,6)
5. (a) How will you prepare green plastic starting from com? Which green chemistry principle is involved in it?
- (b) Explain how cradle to cradle recycling concept is applied to carpets?
- (c) What is photocatalysis? How photocatalytic reactions are different from photochemical reaction? (4.5,4,4)
6. (a) Green Chemistry and sustainable development are inter-related. Explain.
- (b) Explain the green synthesis of:
- (i) Adipic acid and
 - (ii) catechol
 - (iii) Disodium iminodiacetate
- (3.5,9)



7. (a) Elaborate sonochemical Simmons-Smith reaction. What are its advantages over conventional method? Discuss how transfer of energy occurs in ultrasound assisted reactions?

(b) Discuss the advantages of combinatorial approach over conventional synthesis. (7.5,5)

8. (a) Name the Environmentally Advanced *Wood Preservative* discovered, which also won the Presidential Green Chemistry Challenge Award in 2002.

(b) Discuss the working of fluoros biphasic solvent.

(c) Why the selection of starting materials should be renewable rather than depleting? (4,4.5,4)

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9. (a) Write short notes on :

(i) Combinatorial Chemistry

(ii) Co-Crystal controlled solid state synthesis

(iii) Flixiborough Accident

(iv) Biomimicry and Green chemistry

(b) Define the term Environmental Impact Factor.

(3,3,3,3,0.5)



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Sr. No. of Questi

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Duration : 3.5 Hou

Instructions for C

1. Write your Rol
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[This question paper contains 8 printed pages.]

(29)

Your Roll No. 2022

Sr. No. of Question Paper : 1352

A

Unique Paper Code : 32171602

Name of the Paper : Organic Chemistry V :
Spectroscopy

Name of the Course : B.Sc. (Hons.) Chemistry

Semester : VI

Duration : 3.5 Hours

Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any six questions.
3. All questions carry equal marks.

1. (a) A and B are two isomers of C_3H_6O based upon peaks obtained in spectral data recorded in 1H NMR spectrophotometer: Identify A and B, give their IUPAC names and explain :

(i) A : 1H NMR, (in $CDCl_3$): $\delta 1.1(t, 3H)$, $\delta 2.1(m, 2H)$, $\delta 9.5(t, 1H)$

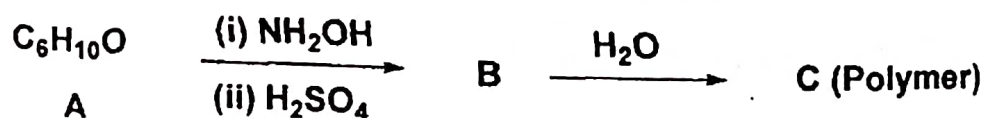
P.T.O.

IR (in Nujol) wave number: 2720cm^{-1} (doublet, m) and 1735cm^{-1} (s)

(ii) B: ^1H NMR, (in CDCl_3) $\delta 2.3$ (s,6H)

IR (in Nujol) : 1710 cm^{-1} (s)

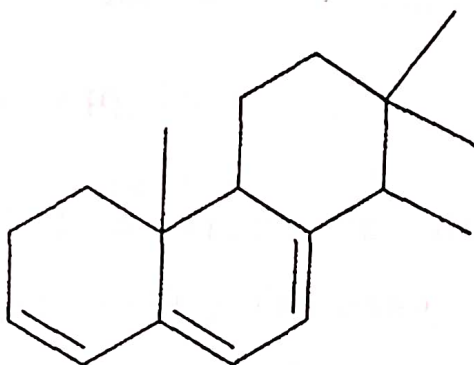
- (b) Compound A shows strong peak in IR spectrum at 1717 cm^{-1} and give positive test with DNP. on reaction with hydroxylamine and followed by a well known Beckmann rearrangement gives compound B. Compound B polymerizes to give polymer, C. Identify, give name and structural formula of the compounds A, B and C (polymer).



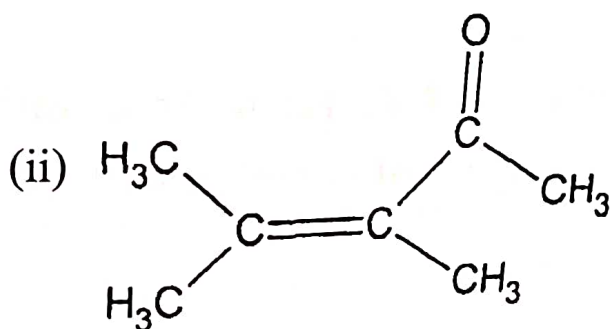
- (c) λ_{max} of Acetone in hexane is 279 nm while in water is 264.5 nm. Assign the given peak and explain by drawing transitions involved showing HOMO-LUMO. (4,4,4.5)
2. (a) Using N,N-Dimethylaniline writing all necessary conditions and reagents give synthesis of:
- (i) Methyl orange and
 - (ii) Malachite green

- (b) Give stereochemical structure of (-)-chloramphenicol, its IUPAC name, uses and the name of species from which it is isolated.
- (c) Calculate the λ max. for $\pi \rightarrow \pi^*$ in nm for the following compounds :

(i)



(ii)



Homoannular conjugated diene's base value = 253 nm

Heteroannular conjugated diene's base value = 215 nm

Increment for each substitution

Alkyl substituent or ring residue = 5 nm

Exocyclic double bond = 5 nm

Double bond extending conjugation = 30 nm

Acyclic enone base value = 215 nm

P.T.O.

α -Alkyl group or ring residue	= 10 nm
β -Alkyl group or ring residue	= 12 nm
γ -Alkyl group or ring residue	= 17 nm

for correction in solvent :

methanol/ethanol	= 0 nm
water	= +8 nm

Also calculate the λ max for both of the above compounds (i) and (ii) in water and ethanol using correction appropriately. (4,4,4.5)

3. (a) Give synthesis of Alizarin from anthraquinone. Give the structure of complex with Aluminium as mordant.
 - (b) Give the synthesis of Congo red dye. Mention the pH at which it gives the blue colour and red and explain with structure change.
 - (c) What is Leuco base in a triphenylmethane dyes? Explain with appropriate reaction. Give synthesis of crystal violet dye. (4,4,4.5)
4. (a) Calculate the frequency of C-H stretching vibration from the following data :

Force Constant $K = 5 \times 10^5 \text{ gm sec}^{-2}$

Mass of carbon atom = $20 \times 10^{-24} \text{ gm}$

Mass of hydrogen atom = $1.6 \times 10^{-24} \text{ gm}$

Velocity of the radiation $(c) = 2.998 \times 10^{10} \text{ cm sec}^{-1}$

(b) Attempt any **four** :

(i) What is the source of IR radiations in IR spectrophotometer

(ii) What are the Fundamental Vibrations?

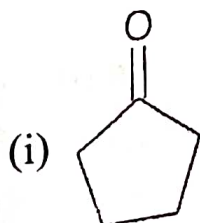
(iii) What are overtones in IR spectra?

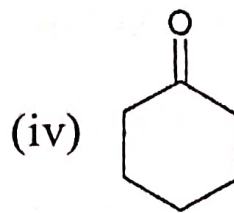
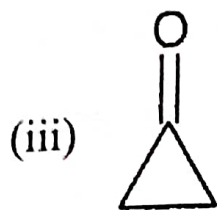
(iii) What is Fermi Resonance?

(iv) Differentiate acetamide and ethyl amine using IR spectroscopy.

(v) Differentiate in 1-Butyne and 2-Butyne using IR spectroscopy.

(c) Assign the appropriate C=O stretching frequency against the following structures. Justify the answer :





Stretch frequencies are

(a) 1745 cm^{-1}

(b) 1780 cm^{-1}

(c) 1815 cm^{-1}

(d) 1715 cm^{-1}

(4,4,4.5)

5. (a) Give the synthesis of Bakelite and its uses.

(b) Outline the synthesis of Nylon-6,6 and its uses.

(e) Write the mechanism involved when vinyl chloride in polymerised in presence of benzoyl peroxide?

(4,4,4.5)

6. (a) (i) Define chemical shift and coupling constant.

(ii) How will you differentiate in between cis and trans cinnamic acid ^1H NMR spectroscopy.

(b) Give expected number of signals by ^1H NMR spectra recorded in CDCl_3 in each of the following compounds :

- (i) 1,2-dichloroethane
 - (ii) Ethyl acetate
 - (iii) cyclohexane (at low temperature)
 - (iv) 2-chloroethanol
- (c) A compound with molecular weight 116 gave the following spectral information :

- (i) UV (in ethanol): $\lambda_{\max} = 283 \text{ nm}$ $\epsilon_{\max} = 22$
- (ii) IR (in Nujol): 3000-2500 (b), 1715 (s),
1342 cm^{-1} (w)
- (iii) NMR (in CDCl_3): δ 2.12 (s, 3H)
 δ 2.60 (t, 2H)
 δ 2.25 (t, 2H)
 δ 11.1 (t, 1H)

Find the structural formula of the compound.

(4,4,4.5)

7. (a) Give the Boots synthesis of Ibuprofen and its uses.
- (b) Give the synthesis of chloroquine from m-chloroaniline. Give its uses and side effects.

(c) Give the structure of the main alkaloid present in curcumin. Discuss the therapeutic uses of curcumin. (4,4,4.5)

8. (a) Give the synthesis and uses of Buna-S rubber.

(b) (i) What is Dacron? Write structures of its monomer(s).

(ii) Give name and structures of two biodegradable polymers.

(c) How do you prepare Polyurethane? Mention two uses. (4,4,4.5)

9. An organic compound with molecular formula C_4H_9NO gave the following spectral data :-

(i) UV (in Ethanol): λ_{max} : 220 nm, ϵ_{max} : 63

(ii) IR (in Nujol): 3500 cm^{-1} (m), 3402 cm^{-1} (m), 2960 cm^{-1} (w), 1682 cm^{-1} (s), 1610 cm^{-1} (s)

(iii) NMR (in $CDCl_3$): δ 1 (d, 6H), δ 2.1 (septet, 1H), δ 6.8 (br s, 2H)

Calculate DBE, assign spectral peaks appropriately in spectral data, give structural formula and the name of the compound. (12.5)

(1500)