



Viswambhara Educational Society

VAAGDEVI DEGREE & P.G.COLLEGE

Kishanapura, Hanamkonda, T.S

(Approved by A.I.C.T.E., New Delhi, Affiliated to Kakatiya University & TSCHE)



DEPARTMENT OF CHEMISTRY

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16	M.SC CHEMISTRY	ISOLATION AND PURIFICATION OF NATURAL PRODUCTS AND ADVANCED ORGANIC PREPARATIONS	21


Dr A. Sheshachalam
PRINCIPAL
Vaagdevi Degree & P.G. College,
Kishanapura, Hanamkonda

KAKATIYA UNIVERSITY, WARANGAL - 506 009
B.Sc. PROGRAMME
Under CBCS System
Scheme wef A.Y: 2019-20

FIRST YEAR

SEMESTER - I

Code	Course category	Title of the Paper	No. of Credits	Hrs PW	Max. Marks			Total Marks
					Interna l Exam	End Exam	Lab	
BS101	AECC-1	Environmental Science	2	2	10	40	-	50
BS102	FL-1A	English	4	4	20	80	-	100
BS103	SL-1A	Second Language	4	4	20	80	-	100
BS104	DSC-1A	Optional - I	4	4	20	80	25	125
		Optional – I Lab	1	3				
BS105	DSC-2A	Optional– II	4	4	20	80	25	125
		Optional – II LAB	1	3				
BS106	DSC-3A	Optional – III	4	4	20	80	25	125
		Optional – III LAB	1	3				
		TOTAL:	25	-	110	440	75	625

SEMESTER – II

Code	Course category	Title of the Paper	No. of Credits	Hrs PW	Max. Marks			Total Marks
					Interna l Exam	End Exam	Lab	
BS201	AECC-2	Basic Computer Skills (Taught by: Computer Science)	2	2	10	40	-	50
BS202	FL-2B	English	4	4	20	80	-	100
BS203	SL-2B	Second Language	4	4	20	80	-	100
BS204	DSC-1B	Optional - I	4	4	20	80	25	125
		Optional – I Lab	1	3				
BS205	DSC-2B	Optional – II	4	4	20	80	25	125
		Optional – II Lab	1	3				
BS206	DSC-3B	Optional – III	4	4	20	80	25	125
		Optional – III LAB	1	3				
		TOTAL :	25	-	110	440	75	625

KAKATIYA UNIVERSITY, WARANGAL - 506 009

B.Sc. PROGRAMME
Under CBCS System
Scheme wef A.Y: 2020-21

SECOND YEAR**SEMESTER - III**

Code	Course category	Title of the Paper	No. of Credits	Hrs PW	Max. Marks			Total Marks
					Interna l Exam	End Exam	Lab	
BS 301	SEC-1	Fundamentals of Nano Technology (Taught by : Physics)	2	2	10	40	-	50
BS 302	SEC-2	Bio Statistics (Taught by : Statistics)	2	2	10	40	-	50
BS 303	FL-3 A	English	3	3	15	60	-	75
BS 304	SL-3 B	Second Language	3	3	15	60	-	75
BS 305	DSC-1C	Optional - I	4	4	20	80	25	125
		Optional – I Lab	1	3				
BS 306	DSC-2C	Optional – II	4	4	20	80	25	125
		Optional– II Lab	1	3				
BS 307	DSC-3C	Optional – III	4	4	20	80	25	125
		Optional – III Lab	1	3				
		TOTAL:	25	-	110	440	75	625

SEMESTER - IV

Code	Course category	Title of the Paper	No. of Credits	Hrs PW	Max. Marks			Total Marks
					Interna l Exam	End Exam	Lab	
BS401	SEC-3	Fundamentals of Python (Taught by: Computer Science)	2	2	10	40	-	50
BS402	SEC-4	Remedial Methods of Pollution – Drinking Water & Soil Fertility (Taught by: Chemistry)	2	2	10	40	-	50
BS403	FL-4 A	English	3	3	15	60	-	75
BS404	SL-4 B	Second Language	3	3	15	60	-	75
BS405	DSC-1D	Optional - I	4	4	20	80	25	125
		Optional – I Lab	1	3				
BS406	DSC-2D	Optional – II	4	4	20	80	25	125
		Optional – II Lab	1	3				
BS407	DSC-3D	Optional – III	4	4	20	80	25	125
		Optional– III Lab	1	3				
		TOTAL :	25	-	110	440	75	625

KAKATIYA UNIVERSITY, WARANGAL - 506 009

B.Sc. PROGRAMME Under CBCS System Scheme wef A.Y: 2021-2022

THIRD YEAR

SEMESTER - V

Code	Course Type	Title of the Paper	No. of Credits	Hrs PW	Max. Marks			Total Marks
					Internal Exam	End Exam	Lab	
BS 501	FL-5 A	English	3	3	15	60	-	75
BS 502	SL-5 B	Second Language	3	3	15	60	-	75
BS 503	G.E.	Water Resources Management (Taught by: Any Science Dept.)	4	4	20	80	-	100
BS 504	DSE-1E	Optional – I	4	4	20	80	25	125
		Optional – I Lab	1	3				
BS 505	DSE-2E	Optional – II	4	4	20	80	25	125
		Optional – II Lab	1	3				
BS506	DSE-3E	Optional – III	4	4	20	80	25	125
		Optional – III Lab	1	3				
		TOTAL:	25	-	110	440	75	625

SEMESTER - VI

Code	Course Type	Title of the Paper	No. of Credits	Hrs PW	Max. Marks			Total Marks
					Internal Exam	End Exam	Lab	
BS 601	FL-6A	English	3	3	15	60	-	75
BS 602	SL-6 B	Second Language	3	3	15	60	-	75
BS 603	P.W / Optional	Optional: Public Health & Hygiene (Taught by: Zoology / Botany / Biotechnology / Micro Biology)	4	4	20	80	-	100
BS 604	DSE-1F	Optional - I	4	4	20	80	25	125
		Optional – I Lab	1	3				
BS 605	DSE-2F	Optional – II	4	4	20	80	25	125
		Optional – II Lab	1	3				
BS 606	DSE-3F	Optional – III	4	4	20	80	25	125
		Optional – III Lab	1	3				
		TOTAL:	25	-	110	440	75	625

5. Inorganic Chemistry Principles of structure and reactivity by James E. Huhey, E.A. Keiter and R.L. Keiter 4th edn.
6. Chemistry of the elements by N.N. Greenwood and A. Earnshaw Pergamon Press 1989.
7. Inorganic Chemistry by Shriver and Atkins 3rd edn Oxford Press 1999.
9. Textbook of Inorganic Chemistry by R Gopalan.

Unit- II

1. Organic Chemistry by Morrison and Boyd.
2. Organic Chemistry by Graham Solomons.
3. Organic Chemistry by Bruice Yuranis Powla.
4. Organic Chemistry by L. G. Wade Jr.
5. Organic Chemistry by M. Jones, Jr
6. Organic Chemistry by John McMurry.
7. Organic Chemistry by Soni.
8. General Organic chemistry by Sachin Kumar Ghosh.
9. Organic Chemistry by C N pillai

Unit III

1. Principles of physical chemistry by Prutton and Marron.
2. Text Book of Physical Chemistry by Soni and Dharmahara..
3. Text Book of Physical Chemistry by Puri and Sharma.
4. Text Book of Physical Chemistry by K. L. Kapoor.
5. Physical Chemistry through problems by S.K. Dogra.
6. Text Book of Physical Chemistry by R.P. Verma.
7. Elements of Physical Chemistry by Lewis Glasstone.

Unit IV

1. Qualitative analysis by Welcher and Hahn.
2. Vogel's Qualitative Inorganic Analysis by Svehla.
3. Text Book of Organic Chemistry by Morrison And Boyd.
4. Text Book of Organic Chemistry by Graham Solomons.
5. Text Book of Organic Chemistry by Bruice Yuranis Powla.
6. Text Book of Organic Chemistry by Soni.
7. Text Book of Physical Chemistry by Soni And Dharmahara..
8. Text Book of Physical Chemistry by Puri And Sharma.
9. Text Book of Physical Chemistry by K. L. Kapoor.

Laboratory Course

45h (3 h / week)

Paper I - Qualitative Analysis - Semi micro analysis of mixtures

Analysis of two anions (one simple, one interfering) and two cations in the given mixture.

Anions: CO_3^{2-} , SO_3^{2-} , S^{2-} , Cl^- , Br^- , I^- , CH_3COO^- , NO_3^- , PO_4^{3-} , BO_3^{3-} , SO_4^{2-} . .

Cations: Hg_2^{2+} , Ag^+ , Pb^{2+}

Hg^{2+} , Pb^{2+} , Bi^{3+} , Cd^{2+} , Cu^{2+} , $\text{As}^{3+/5+}$, $\text{Sb}^{3+/5+}$, $\text{Sn}^{2+/4+}$

Al^{3+} , Cr^{3+} , Fe^{3+}

Zn^{2+} , Ni^{2+} , Co^{2+} , Mn^{2+}

Ba^{2+} , Sr^{2+} , Ca^{2+}

Mg^{2+} , NH_4^+

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26/06/19

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26/6/19

g. h. p
26/6/19

J. h. p
26/6

References

General reference: B.Sc I Year Chemistry : Semester II, Telugu Academy publication, Hyd
Unit I

1. Principles of Inorganic Chemistry by Puri, Sharma and Kalia Vishal Publications 1996.
2. Concise Inorganic Chemistry by J.D. Lee 3rd edn.
3. Basic Inorganic Chemistry by F.A. Cotton, G. Wilkinson and Paul.L. Gaus 3rd edn Wiley Publishers 2001.
4. Chemistry of the elements by N.N. Greenwood and A. Earnshaw Pergamon Press 1989.
5. Inorganic Chemistry by Shriver and Atkins 3rd edn Oxford Press 1999.
6. Inorganic Chemistry Principles of structure and reactivity by James E. Huhey, E.A. Keiter and R.L. Keiter 4th Edn.
7. Textbook of inorganic chemistry by R Gopalan.

Unit II

1. Organic Chemistry by Morrison and Boyd.
2. Organic Chemistry by Graham Solomons.
3. Organic Chemistry by Bruce Yuranis Powla.
4. Organic Chemistry by L. G. Wade Jr.
5. Organic Chemistry by M. Jones, Jr
6. Organic Chemistry by John McMurry.
7. Organic Chemistry by Soni.
8. General Organic chemistry by Sachin Kumar Ghosh.
9. Organic Chemistry by C N pillai

Unit III

1. Physical chemistry by P W Atkins
2. Principles of physical chemistry by Prutton and Marron.
3. Text Book of Physical Chemistry by Soni and Dharmahara.
4. Text Book of Physical Chemistry by Puri and Sharma
5. Text Book of Physical Chemistry by K. L. Kapoor
6. Physical Chemistry through problems by S.K. Dogra.
7. Elements of Physical Chemistry by Lewis and Glasstone.
8. Material science by Kakani & Kakani

Unit IV

1. Vogel's Text Book of Quantitative Analysis by G.H. Jeffery, J. Bassett, J. Mendham and R.C. Denney 5th edn Addison Wesley Longman Inc. 1999.
2. Quantitative Analysis by Day and Underwood Prentice Hall (India) VI Edn..
3. Nano: The Essentials by T. Pradeep, McGraw-Hill Education.
4. Chemistry of nanomaterials: Synthesis, Properties and applications by CNR Rao et.al.
5. Nanostructured Materials and Nanotechnology, edited by Hari Singh Nalwa, Academic Press
6. Practical chemistry by V K Ahluwalia, Sunitha Dhingra and Adarsh Gulati.

Laboratory Course

45hrs (3 h / week)

Paper II- Quantitative Analysis

Acid - Base titrations

1. Estimation of Carbonate in Washing Soda.
2. Estimation of Bicarbonate in Baking Soda.
3. Estimation of Carbonate and Bicarbonate in the Mixture.

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B.Sc., III YEAR CHEMISTRY

SEMESTER-V

LABORATORY COURSE

Paper –V: Experiments in Physical Chemistry-I

(01 Credit)

45 Hrs (03 Hrs/week)

1. Distribution law

- Determination of molecular status and partition coefficient of benzoic acid in Toluene and water.
- Determination of distribution coefficient of acetic acid between n-butanol and water.

2. Electrochemistry

- Determination of cell constant of conductivity cell.
- Verification of Ostwald's dilution law- Determination of dissociation constant (K_a) of acetic acid by conductivity measurements.

3. Colorimetry

- Verification of Beer's - Lamberts law for KMnO_4
- Determination of the concentration of the given KMnO_4 solution.

4. Adsorption

- Adsorption of acetic acid on animal charcoal- Verification of Freundlich adsorption isotherm.

5. Physical constants

- Surface tension and b) Viscosity of liquids. (Demonstration Experiment)

Reference books:

- Senior Practical Physical Chemistry, B. D Khosla, V. C. Garg , Adarsh Gulati Published by R. Chand & Co.
- Practical Physical Chemistry, B. Vishwanathan and P.S. Raghavan. Viva Books.
- Practicals in Physical Chemistry by P.S. Sindhu ISBN-10: 1-4039-2916-5/1403929165 ISBN-13: 978-1-4039-2916-7/9781403929167.







B.Sc., III YEAR CHEMISTRY

SEMESTER-VI

LABORATORY COURSE

Paper –V: Experiments in Physical Chemistry-II

(01 Credit)

45 Hrs (03 Hrs/week)

1. Kinetics

- a) Determination of specific reaction rate of the hydrolysis of methyl acetate catalyzed by hydrogen ion at room temperature.
- b) Determination rate of decomposition of hydrogen peroxide catalyzed by FeCl_3 .

2. Electrochemistry

A. Potentiometry:

- a) Determination of redox potential of $\text{Fe}^{2+}/\text{Fe}^{3+}$ by potentiometric titration of ferrous ammonium sulphate vs potassium dichromate.
- b) Precipitation titration of KCl vs AgNO_3 –Determination of given concentration of silver nitrate.

B. pH metry:

- a) pH metric titration of strong acid (HCl) vs strong base- Determination of the concentration of given acid.
- b) pH metric titration of strong acid (acetic acid) with strong base (NaOH)- Determination of acid dissociation constant (K_a) of weak acid.

3. Conductometry:

- a) Determination of overall order: Saponification of ethyl acetate with NaOH by conductance measurement

Reference books:

- 1. Senior practical physical chemistry, B.D.Khosla, V.C.Garg, Adarsh Guati.
- 2. Advanced Practical Physical chemistry, J.B.Yadav.
- 3. Practical Physical chemistry, B.Vishvanathan and P.S.Raghavan.
- 4. Practical Physical chemistry, P.S. Sindhu.





M.Sc. CHEMISTRY CBCS PATTERN IN SEMESTER SYSTEM

DEPARTMENT OF CHEMISTRY KAKATIYA UNIVERSITY WARANGAL – 506 009

Department of Chemistry, Kakatiya University introduces Choice Based Credit System (CBCS) for M.Sc. (2 Year course) chemistry for the students admitted in M.Sc. Chemistry course from 2016-17 academic year onwards.

Scheme for CBCS, the workload for each paper, distribution of marks, the number of credits and scheme of examination are attached herewith.

Internal Assessment examination will be conducted twice in every Semester. The main examination (theory and practical) will be conducted at the end of each semester.

One open elective in III semester and one is in IV semester are offered by Department of Chemistry for all the PG-students.

Students joined in M.Sc. Chemistry should choose one open elective offered by Department of chemistry or any other Department of Kakatiya University.

The syllabi of theory and practical papers of I, II III, and IV semesters are enclosed. The syllabi of open elective offered in IV semester will be kept available for the next academic year.

A handwritten signature in black ink, appearing to read 'Gade Dayakar'.

– Prof. Gade Dayakar
Chairperson

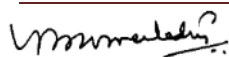
Board of Studies in Chemistry

DEPARTMENT OF CHEMISTRY - KAKATIYA UNIVERSITY
[with effect from the academic year 2016-17 Under CBCS system]
Semester –I

Curriculum						Scheme of Examination		
S. No	Paper Code	Paper no.	Title of the paper	Instruction Hrs/ Week	No. of Credits	Marks		Total marks
						External	Internal	
1	ICHT1	Paper-I	Inorganic Chemistry	4	4	80	20	100
2	ICHT2	Paper-II	Organic Chemistry	4	4	80	20	100
3	ICHT3	Paper-III	Physical Chemistry	4	4	80	20	100
4	ICHT4	Paper- IV	Applied Chemistry	4	4	80	20	100
5	1CHP1	Paper-V	Inorganic Practicals	6	3	75	----	75
6	1CHP2	Paper-VI	Organic Practicals	6	3	75	----	75
7	1CHP3	Paper-VII	Physical Practicals	6	3	75	----	75
8	----	----	Seminar	----	1	----	----	25
	Total	----	----	34	26	----	----	650

Semester –II

Curriculum						Scheme of Examination		
S. No	Paper Code	Paper no.	Title of the paper	Instruction Hrs/ Week	No. of Credits	Marks		Total marks
						External	Internal	
1	2CHT5	Paper-I	Inorganic Chemistry	4	4	80	20	100
2	2CHT6	Paper-II	Organic Chemistry	4	4	80	20	100
3	2CHT7	Paper-III	Physical Chemistry	4	4	80	20	100
4	2CHT8	Paper- IV	Spectroscopy	4	4	80	20	100
5	2CHP4	Paper-V	Inorganic Practicals	6	3	75	----	75
6	2CHP5	Paper-VI	Organic Practicals	6	3	75	----	75
7	2CHP6	Paoer-VII	Physical Practicals	6	3	75	----	75
8	----	----	Seminar	----	1	----	----	25
	Total	----	----	34	26	----	----	650



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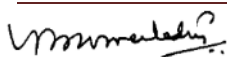
Prof. Gade Dayakar, Chairperson, BOS in Chemistry, KU,

IV Semester-Organic chemistry

Curriculum						Scheme of Examination		
S. No	Paper Code	Paper no.	Title of the paper	Instruction Hrs/ Week	No. of Credits	Marks		Total marks
						External	Internal	
1	4CHT17	Paper-I	Analytical and Physical Chemistry	4	4	80	20	100
2	4CHT18	Paper-II	Synthetic Organic Chemistry-II	4	4	80	20	100
3	4CHT21	Paper-III	General Organic Chemistry-II	4	4	80	20	100
4	4CHT22A / 4CHT22B	Paper- IVA / Paper- IVB	Natural products (Elective-I) / Medicinal chemistry (Elective-II)	4	4	80	20	100
5	4CHP15	Paper-V	Estimations and Principles of chromatography	9	4	100	----	100
6	4CHP16	Paper-VI	Isolation and purification of natural products and Advanced organic preparations					
7	4CHOE	Paper-VII	Open elective	4	4	80	20	100
		Seminar		----	1	25	----	25
	Total			38	29			725

IV Semester- Physical chemistry

Curriculum						Scheme of Examination		
S. No	Paper Code	Paper no.	Title of the paper	Instruction Hrs/ Week	No. of Credits	Marks		Total marks
						External	Internal	
1	4CHT17	Paper-I	Analytical and Physical Chemistry	4	4	80	20	100
2	4CHT18	Paper-II	Synthetic Organic Chemistry-II	4	4	80	20	100
3	4CHT23	Paper-III	Catalysis	4	4	80	20	100
4	4CHT24A / 4CHT24B	Paper- IVA / Paper- IVB	Nanomaterials, Macromolecules and Data analysis (Elective-I) / Supramolecular, Material Sciences, Lasers and Computational Chemistry (Elective-II)	4	4	80	20	100
	4CHP17	Paper-V	Practicals -Kinetics	9	4	100	----	100
7	4CHP16	Paper-VI	Practicals-Instrumentation	9	4	100		100
8	4CHOE	Paper-VII	Open elective	4	4	80	20	100
		Seminar		----	1	25	----	25
	Total			38	29			725



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Prof. Gade Dayakar, Chairperson, BOS in Chemistry, KU,

Paper – V INORGANIC CHEMISTRY - PRACTICALS (1CHP1)
(6 Hours per week)

1. a) Determination of total, permanent and temporary hardness of water
 b) Determination of COD of water
 c) Back titration of Ni^{+2} by EDTA
 d) Back titration of Al^{+3} by EDTA
 e) Substitution titration of Ca^{+2} by EDTA
2. One component gravimetric estimations
 i) Estimation of Zn^{2+}
 ii) Estimation of Ba^{2+} (as BaSO_4)
3. Preparation of the following complexes and their characterization by metal estimation and conductance measurement
 i) $[\text{Cu}(\text{NH}_3)_4]\text{SO}_4$ ii) $\text{Hg}[\text{Co}(\text{SCN})_4]$ iii) $\text{K}_3[\text{Fe}(\text{C}_2\text{O}_4)_3]$
 iv) $[\text{Ni}(\text{en})_3]\text{S}_2\text{O}_3$ v) $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2$ vi) $[\text{Mn}(\text{acac})_3]$

Scheme of valuation

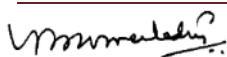
Marks: 75

Time: 4Hrs

Standardization	– 18
Estimation of sample	– 30
Preparation of sample	– 12
Viva, Record and samples	– 15

Recommended Books:

1. Vogel's Text Book of quantitative chemical analysis (6th edition)
2. Analytical chemistry- Gary D. Christian (6th edition)



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Prof. Gade Dayakar, Chairperson, BOS in Chemistry, KU,

PAPER- VI: ORGANIC CHEMISTRY - PRACTICALS (1CHP2)

(6 Hours per week)

- I. Some important techniques in practical organic chemistry:** Recrystallization, mixed melting point, drying of solvents and steam distillation.
- II. Preparation of**
- i) Methyl orange ii) Coumarin
 - iii) Pyrazolone iv) Azalactone
- III. Preparation of**
- i) Benzanilide by Beckmann's rearrangement:
 - (a) Preparation of benzophenone oxime
 - (b) Beckmann's rearrangement to benzanilide
 - ii) Benzilic acid from benzoin:
 - (a) Benzil from benzoin
 - (b) Benzilic acid from benzil
 - iii) Anthranilic acid from phthalic anhydride:
 - (a) Phthalimide from Phthalic anhydride
 - (b) Hoffmann's rearrangement to anthranilic acid
 - iv) m-Nitroaniline from Nitrobenzene:
 - (a) m-Dinitrobenzene from Nitrobenzene
 - (b) m-Nitroaniline from m-Dinitrobenzene

Scheme of valuation

Marks: 75

Time: 4Hrs

Single step preparation and Recrystallization	– 20
Two step preparation and Recrystallization	– 40
Viva, Record and Samples	– 15

Recommended books:

- 1) Vogel's textbook of practical organic chemistry – Arthur Israel Vogel, B. S. Furniss
- 2) Practical Organic Chemistry – Frederick George Mann and Bernard Charles Saunders
- 3) Advanced Practical Organic Chemistry – N K Vishnoi
- 4) Laboratory Manual of Organic Chemistry - R. K. Bansal



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Prof. Gade Dayakar, Chairperson, BOS in Chemistry, KU,

Paper – VII PHYSICAL CHEMISTRY PRACTICALS (1CHP3)**(6 Hours per week)****1. Kinetics:**

- (i) Acid catalyzed Acetone – Iodine reaction.
(Comparison of rate constants at different acid concentrations)
- (ii) Acid catalyzed hydrolysis of methyl acetate.
(Comparison of rate constants at different acid concentrations)
- (iii) Persulphate – Iodide reaction.
(Comparison of rate constants at different iodide concentrations)

2. Polarimetry:

- (i) Specific rotation of sucrose and glucose.
- (ii) Acid catalysed inversion of sucrose-Pseudo first order rate constants.
(Comparison of rate constants at different acid concentrations)

3. Conductometry: Titrations of

- a. (i) Strong acid and weak acid with Strong base.
 - (ii) Mixture of strong and weak acids with Strong base.
 - (iii) Strong acid and weak acid with Weak base.
 - (iv) Salt with Strong base.
 - b. Verification of Ostwald's dilution law and determination of K_a .
 - c. Solubility product of AgCl.
4. a. Density and viscosity of liquids.
- b. Determination of molecular weights of polyethylene glycol or polyvinyl alcohol.
5. Determination of heat of solution of benzoic acid by solubility method.

Scheme of valuation

Marks: 75

Time: 4Hrs

Experiments (2)	30 + 30	60
Principle record and viva	—	15

Recommended books:

1. Practical Physical Chemistry by A. Findlay, Longman-London.
2. Practical Physical Chemistry by B. Vishwanathan and P.S. Raghavan,
3. Practical Physical Chemistry by B.D.Khosla and V.C. Garg.
4. Systematic Experimental Physical Chemistry -S.W. Raj Bhoj and Dr. T.K. Chondhekar



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Prof. Gade Dayakar, Chairperson, BOS in Chemistry, KU,

Paper – V INORGANIC CHEMISTRY PRACTICALS (2CHP4)

I. Estimations:

1. Glucose by using Fehling's solution
2. Vitamin – C
3. Calcium in Milk
4. Iodine value of Oil
5. Chlorine in Bleaching Powder

II. Analysis of Binary Mixtures:

1. Determination of Cu^{2+} and Ni^{2+}
2. Determination of Fe^{3+} and Al^{3+}
3. Determination of Cu^{2+} and Zn^{2+}
4. Determination of Ca^{2+} and Mg^{2+}
5. Determination of Ferrocyanide & Ferricyanide

Scheme of valuation

Marks: 75

Time: 4Hrs

Standardization	—	24
Estimation of sample	—	36
Viva, Record and samples	—	15

Recommended Books:

1. A Text Book of quantitative inorganic analysis (3rd and 6th editions)



Dean



Prof. Gade Dayakar, Chairperson, BOS in Chemistry, KU,

Paper – VII PHYSICAL CHEMISTRY - PRACTICALS (2CHP6)

1. Potentiometry:

a. Acid –base titrations:

- (i) Strong acid with strong base.
- (ii) Weak acid with strong base and determination of P^{ka} of weak acid.
- (iii) Mixture of acids with strong base.

b. Redox titrations:

- (i) Ferrous ion with $KMnO_4$ or $K_2Cr_2O_7$
- (ii) Ferrous ion with Ce^{+4}

c. Precipitation titrations:

- (i) KCl or KI with $AgNO_3$
- (ii) Mixture of ($KCl + KI$) with $AgNO_3$

2. Colorimetry:

Verification of Lambert-Beer's law and determination of molar extinction coefficient of $KMnO_4$, $CuSO_4$, $K_2Cr_2O_7$, $Cu (NH_4)_6 SO_4$

- 3. Verification of Freundlich adsorption isotherm-Acetic acid-activated charcoal system
- 4. Distribution of Iodine between CCl_4 and aqueous KI . (determination of unknown concentration of KI)
- 5. Determination of partial molar volume of methanol in aqueous methanol.

Scheme of valuation

Marks: 75

Time: 4Hrs

Experiments (2)	–	30+30	–	60
Viva, Record and samples			–	15

Recommended Books:

- 1. Practical Physical Chemistry -A. Findlay, Longman-London.
- 2. Practical Physical Chemistry -B. Vishwanathan and P.S. Raghavan,
- 3. Practical Physical Chemistry - B.D.Khosla and V.C. Garg. R.Chand & Co. Delhi.
- 4. Systematic Experimental Physical Chemistry by S.W. Raj Bhoj and Dr. T.K. Chondhekar, Anjali Publications, Aurangabad.



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Prof. Gade Dayakar, Chairperson, BOS in Chemistry, KU,

III Semester –Inorganic Chemistry Practicals (Specialization)

Paper-V Preparation of Complexes and their characterization by

Physiochemical techniques (3CHP7) (Marks 100, 9 Hours per week)

1. $[\text{Cu}(\text{NH}_3)_4]\text{SO}_4 \cdot \text{H}_2\text{O}$
2. $[\text{Ni}(\text{DMG})_2]$
3. $[\text{Mn}(\text{acac})_2]$
4. $\text{Na}[\text{Cr}(\text{NH}_3)_2(\text{SCN})_4]$
5. Prussian blue, Turnbull's blue
6. $[\text{Co}(\text{NO}_2)(\text{NH}_3)_5]^{2+}$ and $[\text{Co}(\text{ONO})(\text{NH}_3)_5]^{2+}$

Paper-VI Analysis of Ternary mixtures and Complex materials (3CHP8)

(Marks 100, 9 Hours per week)

- I. Analysis of Ternary mixtures
 1. Ag^+ , Cu^{2+} , and Ni^{2+}
 2. Cu^{2+} , Ni^{2+} and Zn^{2+}
 3. Fe^{3+} , Mg^{2+} , and Ca^{2+}
- II. Analysis of Complex materials
 1. Brass
 2. Devarda's alloy
 3. Cement

Recommended Books:

1. Vogel's Text Book of Quantitative Chemical Analysis, 6th Edition.
2. Comprehensive experimental chemistry- V.K. Ahluwalia, New publication
3. Analytical Chemistry- Theory and Practice-R.M. Verma, CBS Publishers

Scheme of Valuation

Marks 100	Time: 4Hours
Experiments (2)	80 Marks
Record/ Sample & Viva	20 Marks



Dean



Prof. Gade Dayakar, Chairperson, BOS in Chemistry, KU,

III Semester -Organic Chemistry practicals (Specialization)

Paper-V Preparation of organic compounds and Spectral analysis (3CHP9)

(Marks 100, 9 Hours per week)

(A) Two step preparation:

1. o-chlorobenzoic acid from anthranilic acid
2. p-Bromoaniline from acetanilide
3. p-Nitroaniline from acetanilide
4. Tribromobenzene from aniline: (a) Aniline to tribromoaniline (b) tribromoaniline to tribromo benzene
5. Preparation of 2,4-DNP: (a) Chlorobenzene to 2,4-dinitrochlorobenzene (b) Preparation of 2,4-DNP from 2,4-dinitrochlorobenzene
6. Preparation of Iosin: (a) Fluorosin from phthalic anhydride (b) Iosin from fluorosin.

(B) Spectroscopic identification of some organic compounds:

A set of spectral analytical data for at least 20 compounds will be analyzed by each student and two out of the same compounds will be chosen for the examination from which the student will analyze and identify one compound.

Scheme of Valuation

Marks 100	Time: 4Hours
Experiments (2)	80 Marks
Record/ Sample & Viva	20 Marks

Paper-VI: Organic mixture analysis (with two component mixture) (3CHP10)

(Marks 100, 9 Hours per week)

Organic mixture analysis (With two component mixture): Separation of the two component mixture of organic compounds in a systematic procedure and systematic identification of each of the component organic compounds by using: Preliminary examination, identification of extra elements, common functional group tests, specific functional group tests, preparation of at least two rational derivatives and finally identifying the given compounds by checking the melting points of its derivatives with those in literature.



Dean



Prof. Gade Dayakar, Chairperson, BOS in Chemistry, KU,

III Semester-Physical Chemistry (Specialization)
PAPER-IV Group Theory & Spectroscopy (3CHT16)
 (Marks 100, Total Hours 60)

Unit-I Group Theory:

Symmetry operations forming a group. Matrix representation of symmetry operations and point groups, isomorphism, Reducible and irreducible representation. The great orthogonality theorem (without proof) and its properties for reducible and irreducible representation. Relation between reducible and irreducible representation. Character tables – construction of character tables for C_{2v} and C_{3v} groups- Direct product rule, Group theoretical approach for UV transitions in ethylene and formaldehyde. IR and Raman active modes of water molecule.

Unit-II Diffraction Studies:

X-Ray diffraction : Bragg condition . Miller indices. Experimental methods of x - ray diffraction Laue method and Debye - Scherrer method. Primitive and non primitive unit cell. Index reflection. Identification of unit cells from systematic absences in diffraction pattern for cubic crystals. Structure factor and its relation to intensity and electron density. Description of the procedure for an X- ray structure analysis . Typical examples.

Electron diffraction: Scattering intensity versus scattering angle. Wilson equation. Measurement technique. Elucidation of structure of simple gas phase molecules.

Neutron diffraction : Scattering of neutrons, magnetic scattering, Elucidation of structure of magnetically ordered unit cell. Application and limitations.

Unit-III Spectroscopy –I:

Photoelectron spectroscopy : Basic principles, photo-electric effect, ionization process, Koopmans theorem, PES of Simple molecules , XPES , Chemical shift applications and ESCA.

Photo acoustic spectroscopy : Basic Principles of PAS-PAS of gases and condensed systems chemical and surface applications.

Electron-Spin resonance spectroscopy: Zero-field splitting- kramer's degeneracy – McConnell relationship , double resonance technique (ENDOR). ESR spectra of transition metal complexes

ORD and CD Spectroscopy : Basic concepts of optical rotatory dispersion (ORD) and circular dichroism (CD), Deduction of absolute configuration–Cotton effect–Octant rule for ketones. Applications of ORD and CD spectroscopy.



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Prof. Gade Dayakar, Chairperson, BOS in Chemistry, KU,

III Semester Physical Chemistry-Practicals (Specialization)

Paper-V –Kinetics (3CHP11)

(Marks 100, 9 Hours per week)

1. Persulphate -Iodide reaction –Determination of
 - a. Order b. Solvent Effect c. Salt effect d. Temperature effect
 - e. Catalytic effect using Ferric in presence of Copper.

III Semester Physical Chemistry-Practicals (Specialization)

Paper-VI Instrumentation (3CHP12) (Marks 100, 9 Hours per week)

I. Potentiometry / P^H Metry

1. Titration involving dibasic and tribasic acids.
2. Redox reactions and mixture of metal ions.
 - a. ($V^{5+} + Mn^{7+}$) by Fe^{2+}
 - b. ($V^{5+} + Ce^{4+}$) by Fe^{2+}
3. Single Electrode potential
4. Precipitation titration
 - a. KCl Vs $AgNO_3$ b. $(KCl + KI)$ Vs $AgNO_3$
 - c. $(KCl + KBr + KI)$ Vs $AgNO_3$
5. Isoelectric point of Glycine.
6. Verification of Gibbs- Helmholtz equation.
7. P^{Ka} of Chloro acetic acid.

II. Colorimetry:

1. Estimation of Cu^{2+} by EDTA (Mono and bivariation methods)
2. Estimation of Ni^{2+} by EDTA (Mono and bivariation methods)
3. Estimation of Fe^{2+} by complexing with (1,10 phenanthroline)
4. Determination of Cu^{2+} and Fe^{3+} in the given mixture by EDTA



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Prof. Gade Dayakar, Chairperson, BOS in Chemistry, KU,

IV Semester-Inorganic Chemistry practicals (Specialization)

Paper-V Ion exchange and Solvent Extraction Methods (4CHP13)

(Marks 100, 9 Hours per week)

Ion exchange and Solvent Extraction Methods

I. Ion exchange Methods

1. Determination of capacity of an anion exchange resin
2. Determination of capacity of a cation exchange resin
3. Separation and determination of Zinc and Magnesium using a cation exchange resin
4. Separation and determination of Chloride and Bromide using an anion exchange resin
5. Determination of the total cation concentration in a water sample.

II. Solvent Extraction Methods

1. Determination of Ni as anion NiDMG complex
2. Determination of Chloride ion and Iodide ion by AgNO_3
3. Determination of Pb as Pb-dithiazone complex

Paper-VI Instrumental Methods (4CHP14)

(Marks 100, 9 Hours per week)

III. Analysis of Ternary mixtures

4. Ag^+ , Cu^{2+} , and Ni^{2+}
5. Cu^{2+} , Ni^{2+} and Zn^{2+}
6. Fe^{3+} , Mg^{2+} , and Ca^{2+}

IV. Analysis of Complex materials

4. Brass
5. Devarda's alloy
6. Cement

Recommended Books:

4. Vogel's Text Book of Quantitative Chemical Analysis, 6th Edition.
5. Comprehensive experimental chemistry- V.K. Ahluwalia, New publication
6. Analytical Chemistry- Theory and Practice-R.M. Verma, CBS Publishers

Scheme of Valuation

Marks 100	Time: 4Hours
Experiments (2)	80 Marks
Record/ Sample & Viva	20 Marks



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Prof. Gade Dayakar, Chairperson, BOS in Chemistry, KU,

Paper-V-Organic Chemistry practicals (4CHP15)

(Marks 100, 9 Hours per week)

(A) Estimations:

- 1) Estimation of acetone /ethyl methyl ketone
- 2) Estimation of aspirin
- 3) Estimation of acid value
- 4) Estimation of amino acid
- 5) Estimation of unsaturation
- 6) Estimation of glucose

(B) Principles of chromatography:

Determination of RF value – Ascending and descending techniques – Circular paper chromatography – Selection of solvents in paper chromatography – Location of spots in paper chromatography

Experiments in chromatography:

- (a) Separation of leaf pigments – chlorophyll-‘a’ & ‘b’ xanthophylls
- (b) Separation of amino acids by paper chromatography
- (c) Determination of RF value of glycine by ascending paper chromatography
- (d) Determination of various impurities by thin layer chromatography
- (e) Purification of commercial anthracene by column chromatography using benzene

Paper-VI Organic chemistry practicals (4CHP16)

(Marks 100, 9 Hours per week)

(A) Isolation and purification of the following natural products:

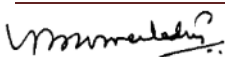
- 1) Caffeine 2) Embelin 3) Piperine 4) Lycopine 5) Nicotine 6) Rutin
- 7) Lachnolic acid 8) Mangiferin

(B) Advanced organic preparations:

- 1) 2-methyl indole
- 2) 2,5-dihydroxyacetophenone (Fries reaction)
- 3) Photoreduction of benzophenone
- 4) Glucose to glucose penta acetate
- 5) Ammonium thiocyanate to urea
- 6) 1,2,3,4-Tetrahydrocarbazole.
- 7) Antipyrin
- 8) Benzocaine
- 9) Benzimidazole
- 10) Paracetamol

Scheme of Valuation

Marks 100	Time: 4Hours
Experiments (2)	80 Marks
Record/ Sample & Viva	20 Marks



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Prof. Gade Dayakar, Chairperson, BOS in Chemistry, KU,

IV Semester-Physical chemistry Practicals

Paper-V Kinetics experiments (4CHP17) (Marks 100, 9 Hours per week)

- 1. Kinetics of**
- Actone- Iodine reaction: Determination of
 - Order
 - Acid effect
 - Solvent effect
 - Temperature effect.
 - Inversion of sucrose-Effect of acidity functions.

Paper-VI Instrumentation (4CHP18)

(Marks 100, 9 Hours per week)

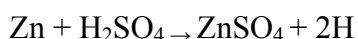
Instrumentation:

I. Conductometry:

- Mixture of acids and CuSO_4 vs NaOH
- Dibasic acids Vs NaOH
- Mixture of chloroacetic acids vs NaOH
- Replacement Reactions
- Determination of p^{K_a} of chloroacetic acid
- Verification of Onsagers equations with KCl
- Determination of composition of complex (Cu(II) Vs EDTA)
- Kinetics of Saponification of ethylacetate.

II. Potentiometry / P^H Metry:

- Determination of dissociation constants of monoacidic / dibasic acids by Albert-Serjeant method.
- Determination of dissociation constant of acetic acid in DMSO , acetone and dioxane.
- Determination of thermodynamic constants, ΔG , ΔS and ΔH for the following reaction by e.m.f. method.



III. Polarography:

- Estimation of Pb^{2+} , Cd^{2+} and Ni^{2+} separately and in a complex.

Scheme of Valuation

Marks 100	Time: 4 Hours
Experiments (2)	80 marks
Record/Samples & Viva	20 marks



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2. Textbook of organic chemistry by Graham Solomons, Wiley (2015)
3. Textbook of organic chemistry by Sony, Sultan Chand & Sons; 29th edition (2012)
4. Textbook of organic chemistry by Bruice Yuranis Powla, (2012)
5. General Organic chemistry by Sachin Kumar Ghosh, New Age Publishers Pvt Ltd (2008)

Laboratory Course

Paperill (Organic Synthesis)

45h (Jh/week)

1. Synthesis of Organic compounds:

Acetylation: Acetylation of salicylic acid, Benzoylation of Aniline.

Aromatic electrophilic substitution: Nitration: Preparation of nitro benzene and m-dinitro benzene.

Halogenation: Preparation of p-bromo acetanilide, Preparation of 2,4,6-tribromophenol

Oxidation: Preparation of benzoic acid from benzyl chloride.

Esterification: Preparation of n-butyl acetate from acetic acid.

Methylation: Preparation of - naphthyl methyl ether.

Condensation: Preparation of benzilidene aniline and Benzaldehyde and aniline. Diazotisation:

Azocoupling of-Naphthol.

2. Micro, wave assisted synthesis of Aspirin-DEMO (demonstration only)

*p, m -> electrophilic
o -> " " " "*

11/09/2020

01/09/2020

01/09/2020

Unit-U

1. Textbook of organic chemistry by Soni, Sultan Chand & Sons; Twenty Ninth edition (2012)
2. General Organic chemistry by Sachin Kumar Ghosh, New Age Publishers Pvt Ltd (2008)
3. Textbook of organic chemistry by Morrison and Boyd, Person (2009)
4. Textbook of organic chemistry by Graham Solomons, Wiley (2015)
5. Textbook of organic chemistry by Bruce Yuranis Powla, (2012)
6. Textbook of organic chemistry by CN Pillai CRC Press (2012)
8. Organic Chemistry by L.G. Wade Jr.
9. Organic Chemistry by M. Jones, Jr
10. Organic Chemistry by John McMurry.

Unit III

1. Principles of physical chemistry by Prutton - d Marron. The Macmillan Company; 4th edn. (1970)
2. Textbook of Physical Chemistry by Soni and Dharmahara, Sulthan Chand & sons. (2011)
3. Textbook of Physical Chemistry by Puri and Sharma, S. Naginchand and Co. (2017)
4. Textbook of Physical Chemistry by K.L. Kapoor. (2012)
5. Physical Chemistry through problems by S.K. Dogra. (2015)
6. Textbook of Physical Chemistry by R.P. Verma.
7. Elements of Physical Chemistry by Lewis Glasstone, Macmillan (1966)
8. Industrial Electrochemistry, D. Pletcher, Chapman & Hall, London, 1990

Unit IV

1. Principles of Inorganic Chemistry by Puri, Sharma and Ka Jia Visha J Publications (1996).
2. Concise Inorganic Chemistry by J.D. Lee 3rd edn. Van Nostrand Reinhold Company (1977)
3. Basic Inorganic Chemistry by F.A. Cotton, G. Wilkinson and Paul J.L. Gaus 3rd edn Wiley Publishers (2001).
4. Inorganic Chemistry Principles of structure and reactivity by James E. Huhey, E.A. Keiter and R.L. Keiter 4th edn. (2006)
5. Textbook of organic chemistry by Morrison and Boyd, Person (2009)
6. Textbook of organic chemistry by Graham Solomons, Wiley (2015)
7. Fundamentals of organic synthesis and retrosynthetic analysis by Ratna Kumar Kar, CBA, (2014)
8. Organic synthesis by Dr. Jagadamba Singh and Dr. L.D.S. Yadav, Pragati Prakashan, 2010
7. Stereochemistry of organic compounds by D. Nasipuri, New Academic Science Limited, 2012
8. Organic chemistry by Clayden, Greeves, Warren and Wothers, Oxford University Press, 2001
9. Fundamentals of Asymmetric Synthesis by G.L. David Krupadanam, Universities Press 2014

Laboratory Course

Paper IV-

Qualitative Analysis of Organic Compounds:

45 hrs (3h/week)

Qualitative analysis: Identification of organic compounds through the functional group analysis - ignition test, determination of melting points/boiling points, solubility test, functional group tests and preparation of suitable derivatives of the following: Carboxylic acids, phenols, amines, urea, thiourea, carbohydrates, aldehydes, ketones, amides, nitro hydrocarbons, ester and naphthalene.

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Kanpur
01/09/2020

officer
01/09/2020