MARATHA VIDYA PRASARAK SAMAJ'S
Shrimati Vimlaben Khimji Tejookaya
ARTS, SCIENCE AND COMMERCE COLLEGE
(S.V.K.T. College)
Lam Road, Deolali Camp, Naka No. 6, Nashik - 422 401. (M.S) INDIA
NAAC Re-Accredited "A" Grade with CGPA 3.10
HONOURED WITH "CHHATRAPATI SHIVAJI MAHARAJ VANASHREE PURASKAR-2017"

Dr. Vijay J. Medhane
M.Sc., Ph.D.
Principal

Affiliated to Savitribai Phule Pune University
Id No. PU/NS/ASC/029 (1984)

College Code No.: 0168
Center Code No.: 0168

Junior College Index No.
J-13.07.007

DVV: Clarification

1.4.2

1.4. 2 Feedback process of the institution may be classified as follows:

As per the DVV suggested input for the feedback process is**: feedbacks are collected**. But once we are making an appeal for the option **All of the above** that is: Feedbacks collected, analysed and Action taken.

All the duly signed, necessary and supporting documents including minutes and action taken reports are attached with this for your perusal please.

Attachments

1. Letter of communication with SPPU university dated: 12/7/2017
2. Report of S.Y. B.sc Syllabus Restructuring submitted to SPPU university Dated: 11/3/2020
3. Universities action proof in evaluation Pattern of S.Y.B.SC Chemistry
4. Minutes of College IQAC Meeting
5. Report of College SOP for Feedback Process at institution level.

ATTESTED
PRINCIPAL
Smt. Vimlaben Khimji Tejookaya, Arts, Science & Commerce College
Deolali-Camp (Nashik

PRINCIPAL
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Ref No-276/2017-18 Date-12/7/2017

To,
The Dean,
Science and Technology,
Savitribai Phule Pune University,
Pune-7

Subject: About evaluation of SYBSc Chemistry theory answer papers.....

Respected Sir,

In 2008 pattern of Chemistry syllabus, there was separate theory paper, each carrying 40 marks for university examination. But in 2013 pattern, there are two sections for each paper, carrying 20 marks each and both sections are to be solved in separate answerbooks. Both sections are assesed and moderated seperately and then marks of both sections are collected togather. Because of separate assesment and moderation of each section, suffers the student result of chemistry subject directly. Due to this, students those secure 12, 13, 14 or 15 marks out of 40 are getting failed, because there is no alternative to reassess the papers, this is main drawback in answer paper assessment system. Alternatively for other subject papers, student getting 12, 13, 14 or 15 marks are moderated and such papers have chance to get 16 marks in moderation.

To overcome this difficulty, both sections of each paper should be solved in one answer papers so that it can be asseesed by one examiner and then moderated if required.

Kindly consider above request and do the needful.

Thanking You,

Sincerely Your's
1. Prof. D. S. Shinde (Head)
2. Prof. P. D. Dhondge
3. Prof. R. S. Pagar
4. Prof. K. R. Labhade
5. Dr. K. R. Wagh

ATTESTED

PRINCIPAL
Smt. Vimlaben Khimji Tejookaya,
Arts, Science & Commerce College,
Deolali Camp, (Nasik).

Respectfully forwarded through,
The Principal,
S.V.K.T. College, Deolali Camp

Copy to :
1. The Chairman, B.O.S. in Chemistry, Savitribai Phule Pune University, Pune-7
2. The C. O. E., Savitribai Phule Pune University, Pune-7

O/C

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Ref. No. | 111 | 2 | 2019-2020

Date - 11 | 3 | 2020

To,
Deputy Registrar,
Academic Section,
Savitribai Phule Pune University,
Ganeshkhind , Pune

Subject: Submission of report of workshop on "Revision of S.Y.B. Sc. Chemistry syllabus (Choice Based Credit System) …

Respected Sir,

As per the directives of Dean, Faculty of Science and Technology, SPPU, Pune and the Board of Studies (BOS) in Chemistry, one day workshop on "Revision of S.Y.B.Sc. Chemistry Syllabus (CBCS)" was organized by department of Chemistry S.V.K.T. Arts, Science and Commerce College, Deolali camp, Nashik on 25 February, 2020.

We are submitting detailed report of workshop along with suggestion obtained from various faculty members and other related documents for your information and necessary action. Please accept it.

With regards,

Sincerely Yours,

Dr. V.J.Medhane
(Principal)

Savitribai Phule Pune University
Academic Department
Date 13 MAR 2020
Signature 13/3/2020

To,
Dr. Kabhade
14/3

Report on

Revision of S.Y.B. Sc. Chemistry syllabus (Choice Based Credit System)

As per the directives of Dean, Faculty of Science and Technology, SPPU, Pune, the Board of Studies (BOS) in Chemistry, one day workshop on "Revision of S.Y.B.Sc. Chemistry Syllabus (CBCS)" was organized by department of Chemistry S.V.K.T. Arts, Science and Commerce College, Deolali camp, Nashik on 25 February, 2020.

Workshop was conducted in three sessions; inaugural session was chaired by Prin. Dr. V.B. Gaikwad, Member of management council, SPPU, Pune. Prof. Dr. A.S. Kumbhar, Chairman, Board of studies in Chemistry, SPPU, Pune, Dr. Latesh Nikam, Member, BOS in Chemistry, SPPU, Pune and Dr. D.D. Patil, Chairman sub-committee S.Y.B.Sc. Syllabus revision (Principal, B.S.T. Arts, Commerce and Science College, Sangamner, Ahmednagar) were parent as chief guests for the programme. All the speakers express their views about current S.Y.B. Sc. syllabus and draft syllabus and also explain the need of Choice Based Credit System (CBCS). Other BOS members Dr. J.S. Aher, and Vijay Naukudkar were actively participated in workshop. Principal Dr. V.J. Medhane gives some valuable suggestion for syllabus framing. Dr. K.R. Labhade (Coordinator of the workshop) discussed the programme schedule and appealed participants to come with good suggestions.

In second session participants were divided in to four groups for group discussion.

Physical Chemistry

Total 15 teachers were involved in group discussion and syllabus revision of physical Chemistry. This group worked under the chairmanship of Prof. D.D. Jadhav (K.T.H.M. College, Nashik).

Inorganic Chemistry

Total 10 teachers were involved in Syllabus revision of Inorganic Chemistry. This group worked under the chairmanship of Dr. Avinash Kumbhar (SPPU, Pune).

Organic Chemistry

This group worked under the chairmanship of Dr. Amol Kategaonkar. Total 18 teachers were involved in this group.

Analytical Chemistry

This group worked under the chairmanship of Dr. R.P. Patil (Bhonsala Military College, Nashik) and total 15 teachers were involved in group discussion.

In final Session Chairman of each group discussed their suggestions and reply the questions raised by the participants. Total 63 participants (including 6 faculty members from host College) and four resource persons were participated in workshop.

Dr. V.J. Medhane
Principal

S.V.K.T. Arts, Science & Commerce College Deolali Camp. Dist.Nasik

PRINCIPAL
Smt. Vimlaben Khimji Tejookaya
Arts, Science & Commerce College,
Deolali Camp, Tal. & Dist. Nashik

Maratha Vidya Prasarak Samaj's
S.V.K.T. Arts, Science and Commerce College, Deolali Camp
One day workshop on
Revision of S.Y.B.Sc. Chemistry Syllabus (CBCS)
Date: 25 February, 2020

General Suggestions

Suggestion 1

While framing S.Y.B.Sc. Syllabus, instead of making Physical Chemistry, Organic Chemistry, Inorganic Chemistry and Analytical Chemistry as a separate courses, there should be Physical and Analytical Chemistry combine course and organic and Inorganic Chemistry combine Course in both semesters

Semester III	CH-301 Physical and Analytical Chemistry	2 Credit
	CH-302 Organic and Inorganic Chemistry	2 Credit
Semester IV	CH-401 Physical and Analytical Chemistry	2 Credit
	CH-402 Organic and Inorganic Chemistry	2 Credit

Reason/Justification

1) If above suggestion is implemented, then student can learn all the four subject throughout the year. This continuity in study is definitely beneficial for students.
2) Students those are weak in Physical Chemistry can take advantage of analytical chemistry for their passing. Or vice versa
   Similarly students those ae weak in organic chemistry can take advantage of Inorganic chemistry for their passing. Or vice versa

Suggestion 2

If suggestion 1 is not feasible, then Organic Chemistry course and Physical Chemistry course must be shifted to semester III and Inorganic Chemistry course and Analytical Chemistry course must be shifted to semester IV

Semester III	CH-301 Physical Chemistry	2 Credit
	CH-302 Organic Chemistry	2 Credit
Semester IV	CH-401 Inorganic Chemistry	2 Credit
	CH-402 Analytical Chemistry	2 Credit

Reason/Justification

1) Student studies Physical Chemistry course and Organic Chemistry course in Semester-I (F.Y.B.Sc. first term). In Draft Syllabus these courses are in Semester IV (S.Y.B.Sc. second term). Thus student are not in touch with these courses for one year (i.e semester II and Semester III).
2) If above suggestion is implemented then this one year period can be reduced to sixth months
3) As these courses are consider difficult than Inorganic Chemistry and Analytical Chemistry, students can get one extra chance for clearing these courses.

Suggestion 3

Practical examination should be annual and not semester wise

Reason/Justification

1) Due to less time span it become difficult to complete allotted number of practical in semester pattern.
2) By applying annual pattern for practical students and teachers can get extra time to complete allotted number of practical.

Subject wise Suggestions

Physical Chemistry

In S.Y.B.Sc. Syllabus revision workshop, total 15 teacher involved in group discussion and syllabus revision of physical Chemistry. This group worked under the chairmanship of Prof. D.D. Jadhav (K.T.H.M. College, Nashik). Considering draft syllabus this group suggested following changes.

Theory

Chapter 1 Solutions

Lever rule, solvent extraction should be eliminated.

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Smt. Vimlaben Khimji Tejookaya. Arts Science & Commerce College Deolali-Camp (Nashik

Chapter 2 Phase Equilibrium

Derivation of Clausius-Clapeyron equation and its importance in phase equillibria, congruent and incongruent melting point (lead-silver, $FeCl_3$-H_2O and Na-K only) should be eliminated.

Chapter 3 Surface Chemistry

No. Change

Chapter 4 Chemical Kinetics

Theories of reaction rates: collision theory and activated complex theory of bimolecular reactions, comparisons of the two theories should be eliminated.

Chapter wise number of lectures should not be changed.

Justification/reason

The contents of the chapters as mentioned above are suggested to eliminate since time duration is quiteless and it is difficult to cover all these in the given schedule and course will become lengthy.

Practical

The course is well designed, so no change is suggested

Subject wise Suggestions

Inorganic Chemistry

Total 10 teachers were involved in Syllabus revision of Inorganic Chemistry. This group worked under the chairmanship of Dr. K.H. Kapadnis (L.V.H. College, Nashik). Considering draft syllabus this group suggested following changes.

Theory

Chapter 1 Molecular Orbital Theory of diatomic molecules

Assumptions of MOT should be included. Relationship with number of antibonding electrons on bond order and nonexistence of He_2 and Be_2 molecule should be included.

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Chapter 2 Chemistry of d-block

No Change

Chapter 3 Introduction to Coordination Chemistry

No. Change

Chapter 4 Chemistry of Carbonyl Complexes

Introduction to catalysis, Classification of catalysis with examples should be included

Other suggestions

***** Chapter related to Detailed Chemistry of main group element and their application should be included.**

***** Inorganic Chemistry references should be added with page number.**

Practical

I) Investigation by colourimetrically

Instead of two experiments only one experiment out of three mentioned in draft syllabus should be included

II) Inorganic Synthesis

Instead of two experiments only one experiment out of three mentioned in draft syllabus should be included

III) Identification of metal by paper chromatography should be eliminated and Inorganic Qualitative Analysis (Binary mixture) should be included **(any three Mixtures)**

Justification

Paper chromatography is already included in F.Y.B.Sc. Syllabus

Subject wise Suggestions

Organic Chemistry

In Syllabus revision of Inorganic Chemistry total 18 teachers are involved. This group worked under the chairmanship of Dr. Amol Kategaonkar. Considering draft syllabus this group suggested following changes.

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Deolali-Camp (Nashik

Theory

Chapter 1 Aromatic Hydrocarbons

Allotted three lectures should be increased to five

Chapter 2 Alkyl and Aryl Halides

Allotted five lectures should be increased to eight

Chapter 3 Alcohols, Phenols and Ethers (Up to 5 Carbons)

Allotted six lectures should be increased to seven

Chapter 4 Aldehydes and ketones (aliphatic and aromatic)

No Change

Chapter 5 Carboxylic acids and their derivatives

Allotted five lectures should be increased to six

Chapter 6 Introduction of Biomolecules

Carbohydrates, Amino Acids, Peptides and Proteins.

This chapter should be eliminated from syllabus and new chapter Amines and Diazonium salt (5L) should be added.

Practical

III) Estimation (Any Two)

Experiments mentioned in draft should be replace with following experiments

1) Determination of molecular weight of monobasic/dibasic acid

2) Estimation of acetamide

3) Estimation of ethyl benzoate

Industrial tour should be added in syllabus

Subject wise Suggestions

Analytical Chemistry

In S.Y.B.Sc. Syllabus revision workshop, total 15 teacher involved in group discussion and syllabus revision of physical Chemistry. This group worked under the chairmanship of Dr. R.P. Patil (Bhonsala Military College, Nashik). Considering draft syllabus this group suggested following changes.

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Theory

Chapter 1 Errors inQuantitativeAnalysis

Distribution of random errors should be eliminated and minimization of errors should be included

Chapter 2 Potentiometry

This chapter should be deleted as pH metry is included in F.Y.B.Sc. theory as well as practical syllabus. pH metry is advanced form than potentiometry.

Chapter 3 Conductometry

No. Change

Chapter 4 Chromatography

Allotted six lectures should be increased to eight lectures.

Chapter 5 Volumetric Analysis

Allotted twelve lectures should be increased to sixteen lectures as topic is lengthy.

Other Suggestion

Change the sequence of the chapter as Errors in qualitative analysis, Volumetric analysis, Chromatography and conductometry

Practical

Separation of Co^{++} /Ni^{++} by column chromatography should be included

Dr. K.R. Labhade
Coordinator

Prof. D. S. Shinde
Head,
Department of Chemistry

Dr. V.J. Medhane
Principal

PRINCIPAL
Smt. Vimlaben Khimji Tajookaya
Arts, Science & Commerce College,
Deolali Camp, Tal. & Dist. Nashik

S.V.K.T. Arts Science & Commerce College
Deolali Camp, Dist.Nashik

S. Y. B. Sc.

Semester IV

CH-401 (Physical Chemistry) Credit 2 : [36 L of 50 Min]

Suggestions :

1) As per Universty draft this course is given in semester IV however it will be better to have this course in semester III. Instead of CH- 401, it has to be CH-301.
2) **Chapter 1. Solutions** : The following contents has to be eliminatedviz : Lever Rule, Solvent extraction.
3) **Chapter 2. Phase Equillibria:**The following contents has to be eliminated viz : Derivation of Clausius - Clapeyron equation and its importance in phase equillibria, congruent and incongruent melting points (lead – silver, $FECl_3$ – H_2O and Na – K only).
4) **Chapter 3:Surface Chemistry:** No change.
5) **Chapter 4:Chemical Kinetics :**The following contents has to be eliminated viz : Theories of reaction rates : Collision theory and Activated complex theory of bimolecular reactions, Comparison of the two theories.
6) The number of lectures as given chapterwise should not be changed.

Justification:

The contents of the chapters as mentioned above are suggested to eliminate since time duration is quite less and it is difficult to cover all these in the given schedule and the course will become lengthy.

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Ch-403 (Practical) Credit : 2 [72 L of 50 Min]

Section A : Physical Chemistry :

The course is well designed so no change is suggested.

The following members participated and suggested the above changes.

Sr No.	Name of the Participant	Name of the College	Signature
1	Prof. D. D. Jadhav	K.T.H.M.CollegeNashik	
2	Prof. T. R. Hiray	K A A N M S College Satana	
3	Dr S K Kushare	K S K W College Cidco, Nashik	
4	Prof S M Page	ASC College Dindori	
5	Prof B BBacchav	S P H College Nampur	
6	Dr P S Pawar	M. S. G. College Malegaon Camp.	
7	Dr N B Wadwale	M. S. G. College Malegaon Camp.	
8	Miss M. S. Nikam	SSSVPMS ASC College Ravalgaon	
9	Prof ArchanaKote	KKW College Nashik	
10	MrsV S Raut	KVN Naik College Nasik	
11	Prof V A Bhalerao	ASC College Lasalgaon	
12	Dr A M Patil	SNJB's ASC College Chandwad	
13	FauziyaParveen	ASC Collge Malegaon City	
14	Pawar C.B.	Asc college ozar Mig	
15.	Dhondge P.D.	SVKT College, Deolal Camp	

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ATTESTED

PRINCIPAL
Smt. Vimlaben Khimji Tejookaya. Arts, Science & Commerce College
Deolali-Camp (Nashik

Savitribai Phule Pune University
(SPPU) CBCS-2019
Pattern S. Y. B. Sc.
Semester III
CH-301 (Inorganic Chemistry) Credit : 2[36 L of 50 min]
Draft-1

1. Molecular Orbital Theory of diatomic molecules [14 L]

Suggestion: Assumptions of MOT,

Limitations of Valence Bond theory(VBT), Need of Molecular orbital theory (MOT), Features of MOT, Sigma and pi bond, Molecular orbital Method, LCAO principle and method, s-s combinations of orbitals, s-p combinations of orbitals, p-p combinations of orbitals, p-d combinations of orbitals, d-d combinations, Non-bonding combinations of orbitals, Rules for linear combination of atomic orbitals.

Examples of molecular orbital treatment for homo-nuclear diatomic molecules: (Explain each molecule with respect to MO energy level diagram, bond order and magnetic behavior) H_2^+ molecule ion, H_2 molecule, He_2^+ molecule ion, He_2 molecule, Li_2 molecule, Be_2 molecule, B_2 molecule, C_2 molecule, N_2 molecule, O_2 molecule, O_2^+, O_2^- and O^{2-} molecule ion, F_2 molecule, Ne_2 molecule.

Suggestion: Relationship with number of antibonding electrons on bond order, Non existence of He_2 and Be_2 molecules

Hetero-nuclear diatomic molecules: Examples of molecular orbital treatment for hetero-nuclear diatomic molecules, NO molecule, CO molecule, HF molecule.

2. Chemistry d-block [6 L]

Introduction, electronic configuration, size of atoms and ions, density, melting points and boiling points, reactivity, oxidation state, catalytic properties, colour and magnetic properties of complexes.

3. Introduction to Coordination chemistry [10 L]

General account and meaning of the terms involved in coordination chemistry: Coordinate bond, central metal atom or ions, ligand, double salt, coordination compound, coordination number, charge on the complex ion, oxidation number of central metal ion, first and second coordination sphere, Ligands: Definition, Classification, Chelates and chelating agents, IUPAC nomenclature of coordination compounds, Different geometries of coordination compounds with C.N.= 2, 4 and 6 with examples of each geometry. Stability of coordination complexes, Isomerism: Polymerization isomerism, Ionization isomerism, Hydrate isomerism, Linkage isomerism, Coordination isomerism, Coordination position isomerism, Geometric isomerism or stereoisomerism, Optical isomerism, Werner Theory of coordination compounds, Sedgwick and Paull theory and EAN rule, Problems.

4. Chemistry of Carbonyls Complexes **[6 L]**

Suggestion: Introduction to catalysis, classification of catalysis with examples. Definition, bonding in carbonyl complexes, 18 electron rule, M-M bonds in carbonyl complexes, geometries of coordination complexes, synthesis of carbonyl complexes: direct reaction, reductive carboxylation, photolysis, thermolysis, homogeneous catalysis: hydro-formylation by Cobalt carbonyl complex, Wacker's process and Monsanto acetic acid process.

5. Detailed Chemistry of main group elements and their applications

Note: Inorganic Chemistry references should be added with page number.

CH-303 : Practical : Credit : 2 [72 L of 50 min]

Section A : Inorganic Chemistry I: Inorganic

Investigation by calorimetrically (any two)

1) Study of formation of Fe(III)-Thiocyanate complex and thereby verify Le-Chatelier's principle and study effect of Fe(III) and thiocyanate concentration on complex formation.
2) Determination of M: L ratio in Fe(III) – salicylic acid or 5-sulfosalicylic acid complex.
3) Verification Beers law using different conc. of $KMnO_4$and find out unknown conc. of $KMnO_4$ by calibration curve method.

Suggestions: only one out of three practicals

II: Inorganic Synthesis (any two)

4) Synthesis of laboratory reagent and purity - sodium cobaltinitrate
5) Synthesis and purity of $K_3[Al(OX)_3]$
6) Green Chemistry synthesis of $[Fe(acac)_3]$ and its purity.

Suggestions : only one out of two practical's

III: Identification of metal by paper chromatography **any two** mixture containing **two** / three metal ions Ni, Cu, Al, Fe, Co, Mn, etc.

Suggestions: Remove all sections as this practical is already included in F.Y.B.Sc practical's instead of that inorganic qualitative analysis should be added (any two mixtures)

S.V.K.T. Arts Science & Commerce College Deolali Camp, Dist.Nashik

ATTESTED
PRINCIPAL
Smt. Vimlaben Khimji Tejookaya Arts Science & Commerce College
Deolali-Camp (Nashik

S.N	Name of the teacher	Name of the college	signature
1	Dr. A.S. Kumbhar	SPPU, Pune	
2	Dr. K.H. Kupadnis	LVH College Nashik	
3	Prof. V.V. Kadam	M.S.G. College, Malegaon camp	
4	D.G. Bahram	K.T.H.M. College Nashik	
5	K.V. Chavan	ASC College Omar (Mlg)	
6	Dr. D.T. Tayde	M.J.M. ACS College Karanjali	
7	Ms. P.D. Garud	G.M.D. Arts, B.W. Comm. & Sci College, Sinnar	
8	Mr. R.K. Sonawane	Swami Muktanand College of Sci, Yeola.	
9	Mr. P.B. Koli	ACS College Nandgaon	
10	Prof D.S. Shinde	SVKT College Deolali Camp	

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CH-402 (Organic Chemistry) Credit : 2 [36 L of 50 min]

Functional group approach for the following (preparations & reactions) to be studied in context to their structure.

1. **Aromatic Hydrocarbons**
   Preparation (Case benzene): from phenol, by decarboxylation, from acetylene, from benzene sulphonic acid. *Reactions* (Case benzene): Electrophilic substitution: nitration, halogenation and sulphonation. Friedel-Craft's reaction (alkylation and acylation) (upto 4 carbons on benzene). Side chain oxidation of alkyl benzenes (upto 4 carbons on benzene). **[5L]**

2. **Alkyl and Aryl Halides**
   Alkyl Halides (Upto 5 Carbons) Types of Nucleophilic Substitution (SN^1, SN^2 and SN^i) reactions. *Preparation:* from alkenes *and* alcohols. *Reactions:* hydrolysis, nitrite & nitro formation, nitrile & isonitrile formation. Williamson's ether synthesis: Elimination vs. substitution.
   Aryl Halides *Preparation:* (Chloro, bromo and iodo-benzene case): from phenol, Sandmeyer & Gattermann reactions. *Reactions (Chlorobenzene):* Aromatic nucleophilic substitution (replacement by –OH group) and effect of nitro substituent. Benzyne Mechanism: KNH_2/NH_3 (or $NaNH_2/NH_3$). Reactivity and Relative strength of C-Halogen bond in alkyl, allyl, benzyl, vinyl and aryl halides. **[8L]**

3. **Alcohols, Phenols and Ethers** (Upto 5 Carbons)
   Alcohols: *Preparation:* Preparation of 1°, 2° and 3° alcohols: using Grignard reagent, Ester hydrolysis, Reduction of aldehydes, ketones, carboxylic acid and esters. *Reactions:* With sodium, HX (Lucas test), esterification, oxidation (with PCC, alc. $KMnO_4$, acidic dichromate, conc. HNO_3). Oppeneauer oxidation *Diols:* (Upto 6 Carbons) oxidation of diols. Pinacol-Pinacolone rearrangement.
   Phenols: (Phenol case) *Preparation:* Cumen ehydroperoxide method, from diazonium salts. *Reactions:* Electrophilic substitution: Nitration, halogenation and sulphonation. Reimer- Tiemann Reaction, Gattermann-Koch Reaction, Houben–Hoesch Condensation, Schotten – Baumann Reaction.
   Ethers (aliphatic and aromatic): Cleavage of ethers with HI. **[7L]**

4. **Aldehydes and ketones (aliphatic and aromatic):** (Formaldehyde, acetaldehyde, acetone and benzaldehyde)
   Preparation: from acid chlorides and from nitriles.
   Reactions – Reaction with HCN, ROH, $NaHSO_3$, NH_2-G derivatives. Iodoform test. Aldol Condensation, Cannizzaro's reaction, Wittig reaction, Benzoin condensation. Clemenson reduction and Wolff Kishner reduction. Meerwein-Pondorff Verley reduction. **[5L]**

5. **Carboxylic acids and their derivatives**
   Carboxylic acids (aliphatic and aromatic)
   Preparation: Acidic and Alkaline hydrolysis of esters. *Reactions:* Hell – Vohlard - Zelinsky Reaction.
   Carboxylic acid derivatives (aliphatic): (Upto 5 carbons)
   Preparation: Acid chlorides, Anhydrides, Esters and Amides from acids and

their interconversion. Reaction: Comparative study of nucleophilicity of acyl derivatives. Reformatsky Reaction, Perkin condensation. **[6L]**

6. Amines and Diazonium Salts

Amines (Aliphatic and Aromatic)

Preparation from alkyl halides, Gabriel's Phthalimide synthesis, Hofmann Bromamide reaction.

Reactions: Hofmann vs. Saytzeff elimination, Electrophilic substitution (Case Aniline): nitration, bromination, sulphonation.

Diazonium salts: Preparation from aromatic amines. **[5 L]**

Reference Books:

1. Lee, J.D. *Concise Inorganic Chemistry* ELBS, 1991.
2. Cotton, F.A., Wilkinson, G. & Gaus, P.L. *Basic Inorganic Chemistry*, 3rd ed., Wiley.
3. Douglas, B.E., McDaniel, D.H. & Alexander, J.J. *Concepts and Models in Inorganic Chemistry*, John Wiley & Sons.
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5. Graham Solomon, T.W., Fryhle, C.B. & Dnyder, S.A. *Organic Chemistry,* John Wiley & Sons (2014).
6. Mc Murry, J.E. *Fundamentals of Organic Chemistry*, 7th Ed. Cengage Learning India Edition, 2013.
7. Sykes, P. *A Guidebook to Mechanism in Organic Chemistry,* Orient Longman, NewDelhi (1988).
8. Finar, I.L. *Organic Chemistry* (Vol. I & II), E.L.B.S.
9. Morrison, R.T. & Boyd, R.N. *Organic Chemistry*, Pearson, 2010.
10. Bahl, A. &Bahl, B.S. *Advanced Organic Chemistry,* S. Chand, 2010.
11. Barrow, G.M. *Physical Chemistry* Tata McGraw□Hill (2007).
12. Castellan, G.W. *Physical Chemistry* 4th Ed. Narosa (2004).
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14. Mahan, B.H. *University Chemistry* 3rd Ed. Narosa (1998).
15. Petrucci, R.H. *General Chemistry* 5th Ed. Macmillan Publishing Co.: New York (1985).
16. Douglas A Skoog, Donald M West, F James Holler, Stainly R Crounch, *Fundamentals of Analytical Chemistry*, 9th edition
17. *Atkins' Physical Chemistry,* 10th edition (2014), Oxford University Press
18. Thomas Engel, Philip Reid; *Physical Chemistry*, Pearson Education (2006)
19. J. N. Gurtu, A. Gurtu; *Advanced Physical Chemistry,* Pragati Edition
20. Nelson, D. L. & Cox, M. M. *Lehninger's Principles of Biochemistry 7th Ed.,* W. H. Freeman.
21. Berg, J.M., Tymoczko, J.L. & Stryer, L. *Biochemistry*, W.H. Freeman, 2002.

CH-403 (Practical) Credit : 2 [72 L of 50 min]

Section B: **Organic Chemistry Practical**

I. Systematic Qualitative Organic Analysis of Organic Compounds possessing Mono-functional groups (-COOH, phenolic, aldehydic, ketonic, amide, nitro, amines) (**Any two** practical containing Solid-Solid for Complete analysis)

And

II Organic Preparations (Any two)

1. Preparation of Benzoic acid from Ethyl benzoate.
2. Preparation of p-nitro acetanilide from acetanilide.
3. Preparation of Quinone from Hydroquinone.

III Estimation (Any two)

1. Determination of Molecular Weight of monobasic/dibasic acid.
2. Estimation of acetamide
3. Estimation of ethyl benzoate.

IV Industrial Tour

References

1. Advanced Experimental Chemistry, Vol-I, J. N. Gurtu and R. Kapoor, S. Chand and Company.
2. Vogel's Textbook of Quantitative Chemical Analysis
3. Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis by V. K. Ahluwalia, R. Aggarwal

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Suggestion:

Organic Chemistry Theory and Practical Paper should be shifted to semester III from semester IV

Reasons:

1. At first year organic chemistry paper theory and practical is taught in semester Ist. If it is taught at Second Year IV Semester, there will be one year gap while learning the difficult course according students.
2. As per CBCS pattern students allowed to reappear for Mid Term Exam for that semester only.
3. Learning of Organic Chemistry in odd semester (Semester I and III) will become beneficial for students.

Princ. Dr. V.J. Medhane

1) Dr. Amol H. Kategaonkar
2) Vijaykumar-M. Gosh
2A) Vivek Vijay Patil
3) Dr. Awane Valmik Sopan
4) Dr. D.D. Lokhande
5) T.C. Gaikwad
6) R.H Waghchaure
7) Mr. R.A. Shinde
8) Dr. D.S. Gholekar
9) A.M. Bhagare
10) A.V. Kordel
11. Dr. M.P. Dushing
12) ~~E.C.~~ A.V. Nerkar
13) Sachin C. Ahire
14) Deokar Sanita. C
15) Rajashree Prajapati
16) ~~X~~

for Gholekar DS.

25.2.2020

25/2/2020

R. Prajapati

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S.V.K.T. Arts Science & Commerce College Deolali Camp Dist. Nashik

16. Dr Vijay J. Naukudkar

17. Dr. K.R. Labhade

18. Dr. Balasaheb P. Pagare

Revision of S.Y. B.Sc. Chemistry Syllabus
Nashik District.
Date 25 Feb 2020

Class S. Y. B. Sc. 2020 Pattern
Analytical Chemistry 403 2 Credit
[36 Lecturers of 50 min each]

Errors in Quantitative Analysis **(6)**

Introduction to Error, Accuracy, Precision, Methods of expressing accuracy and precision, Classifications of errors, Significant figures, Distribution of random errors, Mean and Standard deviations, Reliability of results, Numerical.

- **Suggestions:**
  1. **Add minimization of Errors**
  2. **Delete Distribution of Random Errors**

Potentiometry **(6)**

Introduction, General Principal, Electrochemical Cell, Reference Electrodes, Liquid Junctions & Potentials, Determination of Concentration from potential measurement, Potentiometric Titrations, Numericals based on potentiometry.

- **Suggestions:**
  1. **Delete the Chapter since pH metry is covered in F.Y. B.Sc. in theory as well as practical.**
  2. **pH merty is advanced form of the potentiometry**

Conductometry **(6)**

Introduction, electrolytic conductance, specific and equivalent conductance, Variation of equivalent conductance with concentrations, Kohlrashch's law and its applications, conductivity cell, conductivity meter, Whetstone meter bridge, conductometric titrations, Numericals based on conducometry.

Chromatography **(6)**

Introduction and Classifications of Chromatographic methods, Theory principle of column chromatography, Ion exchange Chromatography, preparation of column, applications column chromatography. 1. Separation of metal ion on anion exchange chromatography, Separation of amino acid, purification of water.

- **Suggestions:**
  1. **Lecturers allotted to the topic is 6 lecturers should be increased by two lecturers i.e. 8 Lectures**

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Volumetric Analysis **(12)**

Introduction to volumetric analysis Calibration of apparatus, Standard solutions, Equivalent weights in different type of reactions, Classification of volumetric analysis,

1. Neutralization titration, Theory of indicators, neutralization curves for strong acid strong base, weak acid strong base, weak base strong acid.
2. Complexometric type titration
3. Redox titration
4. Precipitation titration

- **Suggestions:**

  1. **Since topic is very lengthy lecturers should increased from 12 to 16 lecturers.**

➢ Suggestions:

1. **Change sequence of the chapter as. Errors in Quantitative Analysis, Volumetric Analysis, Chromatography and Conductometry**

References:

1. Instrumental methods of chemical analysis- Willard Merritt Dean Settle
2. Basic Concept of Analytical Chemistry- S. M. Khopkar
3. Analytical Chemistry- Garry D Christian
4. Introduction to Instrumental Analysis- R. D. Brown
5. Fundamentals of Analytical Chemistry- Skoog
6. Instrumental methods of chemical analysis- Chatwal Anand

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CH-303: Practical 2 Credit [72 L of 50 min]

Section B: Analytical Chemistry (Any 5)

1) Estimation of Vinegar / Aspirin
2) pH-metry- Choice of Indicator
3) Volumetrically Titration on Using Best Indicator
4) Ion Exchange Chromatography
5) Hardness of Water by EDTA-Part –A
6) Determination of TDS by Conductometry-Part-B

➢ **Suggestions:**

1. **Add Separation of Co^{++}/Ni^{++} by Column Chromatography.**

Sr. No	Name of participant	Name of the College	Sign
1	**Dr. Y. R. Baste**	KSKW Arts, Sci and Com College, Cidco Nashik	
2	**Dr. R. P. Patil**	Bhosala Military College, Nashik,	
3	**Mrs T.S. Joshi**	KKwagh ACS & CS College, Nashik	
4	**Dr. S. B. Ghoderao**	Bytco College Nashik Road	
5	**Dr. S. D. Thakare**	KRA College, Deola	
6	**Dr. S. S. Gaikwad**	KTHM College, Nashik	
7	**Dr. G.R. Jadhav**	KTHM College, Nashik	
8	**Mr. V.D. Jadhav**	KTHM College, Nashik	
9	**Mr. M.K. Jopale**	ACS College, Tryambakeshwar, Nashik	
10	**Mr. B. N. Shelke**	ASC College, Ozar Mig	
11	**Mr. R. M. Nikam**	MJM ACS College Karanjali, Peth	

Dr. Latesh Nikam B. G. College Sangvi

Prof. V. J. Medhane SVKT College, Deolali Camp

Prof. A. S. Kumbhar SPPU, Pune.

Prof. D. D. Patil SMBST College Sangamner

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Total No. of Questions : 6]

SEAT No. :

P1018

[Total No. of Pages : 3

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S.Y. B.Sc.

CHEMISTRY

CH - 221 : Physical and Analytical Chemistry

(2013 Pattern) (Paper-III) (Semester-II)

Time : 2 Hours] *[Max. Marks : 40*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicates full marks.***
4) ***Use of calculator is allowed.***
5) ***Answer to both sections should be written in seperate answer books.***

SECTION-I

(Physical Chemistry)

Q1) Answer the following: **[5]**

a) Define Helmholtz free energy.

b) Write equilibrium constant expression for the reaction

$$CO_{(g)} + H_2O_{(g)} \rightleftharpoons CO_{2(g)} + H_{2(g)}$$

c) What are Azeotropes?

d) Define the term mole fraction.

e) What do you mean by the term ideal solution?

Q2) a) Answer Any Two of the following: **[6]**

i) Derive Gibbs Helmholtz equation.

ii) Discuss with the help of neat diagram the effect of temperature on solubilities of triethylamine with water.

iii) Discuss with the help of neat diagram the distillation of non-ideal binary miscible liquid system with minimum boiling point.

P.T.O.

b) Attempt Any Two of the following: **[4]**

i) Derive $\left[\frac{\partial(A/T)}{\partial T}\right]_v = -\frac{E}{T^2}$.

ii) State different forms of Clapeyron equation.

iii) State Henry's law and give its equation.

Q3) Solve Any Two of the following: **[5]**

a) Two moles of an ideal gas are compressed isothermally and reversibly at 90°C from a pressure of 1.0×10^{-5} pascal to 3.0×10^{-5} pascal. Find free energy change.

($R = 8.314\ JK^{-1}\ mole^{-1}$).

b) Ether boils at 34.5°C at pressure of one atm. At which temperature will it boil at a pressure of 750 mm. Molar heat of vapourization of ether is 6542 J.

($R = 8.314\ JK^{-1}\ mole^{-1}$).

c) A mixture of 'A' and 'B' is prepared in 1:1 ratio by weight. Calculate mole fraction of 'A' and 'B' in the above mixture.

(Molecular weight of A = 95, B = 18).

SECTION-II

(Analytical Chemistry)

Q4) Answer the following: **[5]**

a) Define the term end point of titration.

b) Give the names of primary standard substances used in acid-base titration.

c) Define the term polyacidic base.

d) Define the term reducing agent.

e) What is meant by precipitation titration.

Q5) a) Answer Any Two of the following: **[6]**

i) Explain the titration curve between strong acid-weak base.

ii) Discuss titration curve between Fe^{2+} & Ce^{4+}.

iii) Describe the estimation of Cu in crystalline $CuSO_4$ using iodometric titration.

b) Attempt Any Two of the following: **[4]**

i) How will you calibrate pipette.

ii) Explain the term available chlorine in bleaching powder.

iii) How will you prepare 0.1 N sodium thiosulphate solution? What precaution to be taken for its preservation?

Q6) Solve Any Two of the following: **[5]**

a) Calculate the strength of HCl if 15 ml of it required to neutralize 25 ml of 0.1 N NaOH.

(equivalent weight of HCl = 36.5).

b) Calculate pOH of the solution after adding 35 ml 0.1 M NaOH to 25 ml 0.1 M HCl.

c) Calculate E_{cell} for a redox titration in which concentration of Ce^{4+} and Ce^{3+} is 0.011 M and 0.04 M respectively.

$\left(E^{\circ}_{(Ce^{4+}/Ce^{3+})} = 1.62V\right)$.

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Total No. of Questions : 6]

SEAT No. :

P670

[Total No. of Pages : 3

[5315] - 205

S.Y. B.Sc.

CHEMISTRY

CH-221: Physical and Analytical chemistry

(2013 Pattern) (Semester II) (Paper-I)

Time : 2 Hours] *[Max. Marks : 40*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of calculator is allowed.***
5) ***Answer to both sections should be written on same answer book.***

SECTION - I

[Physical Chemistry]

Q1) Answer the following: **[5]**

a) Define standered free energy of formation.

b) What is relation between kp and kc?

c) Define molality.

d) What are Azeotropes?

e) What are conjugate solutions?

Q2) a) Attempt any two of the following: **[6]**

i) Derive an expression for free energy change of a chemical reaction.

ii) State Henry's law and give its applications.

iii) Write note on fractionating column.

P.T.O.

b) Attempt any two of the following: **[4]**

i) Derive $\left[\frac{\partial G}{\partial T}\right]_P = -S$

ii) What is chemical equilibrium? Give its types.

iii) Define ideal and non-ideal solutions.

Q3) Solve any two of the following: **[5]**

a) For a reaction $\Delta G = -91630$ Joule at 25°C and 1 pascal pressure. Find out the temperature coefficient at 25°C, if the heat of reaction is -105060 Joule/deg.

b) The vapour pressure of water is 2.5×10^5 pascal at 27 °C and 7.5×10^5 pascal at 37 °C. calculate molar heat of vapourization of water.

[R= 8.314 J/K/mole].

c) The mixture of immiscible liquid and water boils at 98°C at 755 mm Hg. The vapour pressure of water at this temperature is 712 mm Hg. Find the weight composition of the distillate.

[Given : Mol. wt. of immiscible liquid = 204]

SECTION - II

[Analytical Chemistry]

Q4) Answer the following: **[5]**

a) Give any two examples of primary standard substance.

b) What is parts per thousand?

c) Define Reducing agent.

d) What is universal indicator?

e) Define Equivalence point.

Q5) a) Answer <u>any two</u> of the following. **[6]**

i) What is calibration? How will you calibrate volumetric flask?

ii) What is Titration? Explain the titration curve for a strong acid and a weak base.

iii) What is Redox indicator? How will you prepare 0.1M. potassium dichromate.

(Mol.wt.of potossium dichromate =294.19 gm).

b) Answer <u>any two</u> of the following: **[4]**

i) Discuss titration curve between Fe^{+2} and Ce^{+4}.

ii) Give the pH transition range and colour in acid form and base form for.

a) Cresol red b) phenolphthalein

iii) What is principle of conductometry? what are types of conductometric titrations?

Q6) Solve any two of the following: **[5]**

a) How many ml of 0.1N Hcl are required to neutralise 100 ml of 0.5N NaOH?

b) What is the normality of solution, when 1000 ml 0.25 N NaoH mixed with 50 ml of 0.1N NaoH?

c) What is the pH of the solution which contains 5% millimoles of sodium formate and 5.8 millimoles of formic acid in 100ml solution. [$Ka=1.7\times10^{-4}$].

◈ ◈ ◈

Savitribai Phule Pune University [SPPU]

B.Sc. (Chemistry)

(Three Years Integrated Degree Program)

Choice Based Credit System [CBCS]

2019 Pattern

Second Year Bachelors of Science

(S. Y. B. Sc.)

From Academic Year

2020-21

Board of Studies in Chemistry

Savitribai Phule Pune University [SPPU]

Pune-411007

Structure of S. Y. B. Sc. Chemistry

(According to CBCS – 2019 Pattern of SPPU)

Semester	Course	Discipline Specific Core (DSCC)*
III	Theory	**CH-301** : Physical and Analytical Chemistry (2 credit, 36 L)
	Theory	**CH-302** : Inorganic and Organic Chemistry (2 credit, 36 L)
	Practical	**CH-303** : Chemistry Practical - III (2 credit, 72 L)
IV	Theory	**CH-401** : Physical and Analytical Chemistry (2 credit, 36 L)
	Theory	**CH-402** : Inorganic and Organic Chemistry (2 credit, 36 L)
	Practical	**CH-403** : Chemistry Practical - IV (2 credit, 72 L)

***Important Notice:**

i. Each lecture (L) will be of 50 minutes.

ii. Each practical of 4 hours and 12 practical sessions per semester

iii. 12 weeks for teaching 03 weeks for evaluation of students (theory as well as practical).

iv. For details refer UG rules and regulations (CBCS for Science program under Science & Technology) published on SPPU website.

Evaluation Pattern (As per CBCS rules, SPPU 2019 Pattern)

1. Each theory and practical course carry 50 marks equivalent to 2 credits.
2. Each course will be evaluated with Continuous Assessment (CA) and University Assessment (UA) mechanism.
3. Continuous assessment shall be of 15 marks (30%) while university Evaluation shall be of 35 marks (70%).
4. To pass each course, a student has to secure 40% mark in continuous assessment as well as university assessment i.e. 6 marks in continuous assessment and 14 marks in university assessment for the respective course.
5. For Continuous Assessment (internal assessment) minimum two tests per paper must be organized, of which one must be written test of 10 marks.
6. Method of assessment for internal exams: Viva-Voce, Project, survey, field visits, tutorials, assignments, group discussion, etc. (on approval of the head of centre).

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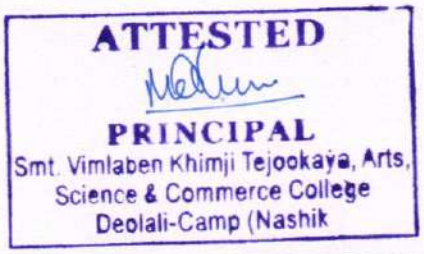
Theory - University Assessment Question Paper Pattern

(According to CBCS - 2019 Pattern of SPPU)

Note that in theory question paper weightage will be given to each topics equivalent to number of lectures assigned in the syllabus.

Total Marks: 35			**Duration: 2 Hours**	
Note: i) Question -1 will be compulsory (5 marks). ii) Solve any three questions from question 2- 5. iii) Questions 2 to 5 carry equal marks (10 each).				
Q-1		Solve any five of the following (a) (b) (c) (d) (e) (f)	a) four tricky questions and b)two question on problem type (if applicable).	5 marks
Q-2	(A) (B)	Describe type of question(s) i) ii) Short question, but tricky		6 mark 4 mark
Q-3	(A) (B)	Explain type of question(s) i) ii) Problem based question if applicable. Justification type of question		6 mark 4 mark
Q-4	(A) (B)	Discuss type of question(s) i) ii) Problem based question if applicable. Justification type of question		6 mark 4 mark
Q-5	 (A) (B) (C)	Attempt any two of the following Questions A, B, C, - will be Explain, Derivation, Discuss, Notes, etc. type of long questions		10 mark



S. Y. B. Sc. Chemistry Syllabus

(CBCS - 2019 Semester Pattern)

From Academic Year 2020-21

Equivalence with Previous Syllabus (2013 Pattern)

New Course (2019 Pattern)	Old Course (2013 Pattern)
CH-301 : Physical and Analytical Chemistry	**CH-211** : Physical and Analytical Chemistry
CH-302 : Inorganic and Organic Chemistry	**CH-212** : Organic and Inorganic Chemistry
CH-303 : Chemistry Practical - III	**CH-223** : Chemistry Practical
CH-401 : Physical and Analytical Chemistry	**CH-221** : Physical and Analytical Chemistry
CH-402 : Inorganic and Organic Chemistry	**CH-222** : Organic and Inorganic Chemistry
CH-403 : Chemistry Practical - IV	**CH-223** : Chemistry Practical

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Preamble:

The syllabus of Chemistry for second year has been redesigned for Choice based Credit System (CBCS: 2019 pattern) to be implemented form 2020-21.

In CBCS pattern semester system has been adopted for FY, SY and TY which includes Discipline Specific Core Course (DSCC) at F Y level, Ability Enhancement Compulsory Course (AECC), Discipline Specific Elective Course (DSEC) and Skill Enhancement Course (SEC). A DSCC course has been introduced at FY level and AECC courses at SY level along with DSEC. At TY level DSEC and SEC courses has been introduced.

Syllabus for Specific Core Courses of Chemistry (2 Theory and 1 Practical) subject for F. Y. B. Sc. is to be implemented from the year 2019-20. Syllabus for S. Y. and T. Y. B. Sc. will be implemented from the year 2020-21 and 2021-22 respectively as per structure approved.

Learning Outcome:

1. To understand basic concept/principles of Physical, Analytical, Organic and Inorganic chemistry.
2. To impart practical skills and learn basics behind experiments.
3. To prepare background for advanced and applied studies in chemistry.

Overall Syllabus

SEMESTER-III			
Sr. No.	**Course Code**	**Course Name**	**Credits and No of Lect.**
1	CH-301	Physical and Analytical Chemistry	Credit -2, 36 L
2	CH-302	Inorganic and organic Chemistry	Credit -2, 36 L
3	CH-303	Practical Chemistry-III	Credit -2, 72 L
SEMESTER-IV			
4	CH-401	Physical and Analytical Chemistry	Credit -2, 36 L
5	CH-402	Inorganic and organic Chemistry	Credit -2, 36 L
6	CH-403	Practical Chemistry-IV	Credit -2, 72 L

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The detailed Semester and Course wise of Syllabus is as follows:

SEMESTER-III

CH-301: Physical and Analytical Chemistry [Credit -2, 36 L]

Chapter No.	Chapter	No of Lectures
1	Chemical Kinetics	12
2	Surface Chemistry	06
3	Errors in Quantitative Analysis	05
4	Volumetric analysis	13

[12 L]

1. Chemical Kinetics:

Introduction to kinetics, the rates of chemical reactions – definition of rates, rate laws and rate constants, reaction order and molecularity, determination of rate law, factors affecting reaction rates, integrated rate laws – zeroth-order reactions, first-order reactions, second-order reactions (with equal and unequal initial concentration of reactants), half-life period, methods for determination order of a reactions, Arrhenius equation- temperature dependence of reaction rates, interpretation of Arrhenius parameters, reaction dynamics - collision theory and transition-state theory of bimolecular reactions, comparison of the two theories, Problems.

*(**Ref. No: 1**- 725-728, 731-733, 741-742, 780-784, 792-794, **Ref. No: 2**- 1033- 1067)*

Learning Outcome:

After studying the Chemical Kinetics student will able to-

1. Define / Explain concept of kinetics, terms used, rate laws, molecularity, order.
2. Explain factors affecting rate of reaction.
3. Explain / discuss / derive integrated rate laws, characteristics, expression for half-life and examples of zero order, first order, and second order reactions.
4. Determination of order of reaction by integrated rate equation method, graphical method, half-life method and differential method.
5. Explain / discuss the term energy of activation with the help of energy diagram.
6. Explanation for temperature coefficient and effect of temperature on rate constant k.
7. Derivation of Arrhenius equation and evaluation of energy of activation graphically.
8. Derivations of collision theory and transition state theory of bimolecular reaction and comparison.
9. Solve / discuss the problem based applying theory and equations.

[6L]

2. Surface Chemistry

Introduction to surface chemistry - some basic terms related to surface chemistry adsorption, adsorption materials, factors affecting adsorption, characteristics of adsorption, types of adsorption, classification of adsorption isotherms, Langmuir adsorption isotherm, Freundlich's adsorption isotherm, BET theory (only introduction), application of adsorption, problems. *(**Ref. No:1**- 824-826, 832-837, **Ref. No: 2**- 1251-1264; **Ref. No: 3**- 932-938)*

Learning Outcomes

- Define / explain adsorption, classification of given processes into physical and chemical adsorption.
- Discuss factors influencing adsorption, its characteristics, differentiates types as physisorption and Chemisorption
- Classification of Adsorption Isotherms, to derive isotherms.
- Explanation of adsorption results in the light of Langmuir adsorption isotherm, Freundlich's adsorption Isotherm and BET theory.
- Apply adsorption process to real life problem.
- Solve / discuss problems using theory.

Reference Books (Physical Chemistry)

1. Atkins' Physical Chemistry by Peter Atkins, Julio de Paula, James Keeler -11th edition
2. Principles of physical chemistry by B.R. Puri, L.R. Sharma, M.S. Pathania
3. Essentials of Physical chemistry by BahlTuli-Revised Multicolour Edition 2009, S. Chand and Company Ltd.
4. Physical-Chemistry-4th Edition - Gilbert W. CastellanNarosa (2004).
5. Principles of ChemicalKinetics-2rdEdition- James E. House
6. Barrow, G.M. Physical Chemistry Tata McGraw-Hill (2007).
7. Principles of Physical Chemistry, Fourth Edition by S.H. Marron and C. F. Pruton
8. Kotz, J.C., Treichel, P.M. & Townsend, J.R. General Chemistry, Cengage Learning India Pvt. Ltd.: New Delhi (2009).
9. Mahan, B.H. University Chemistry, 3rd Ed. Narosa (1998).
10. Petrucci, R.H. General Chemistry, 5th Ed., Macmillan Publishing Co. New York, 1985).
11. Physical Chemistry by Thomas Engel, Philip Reid, Warren Hehre.

[5 L]

3. Errors in Quantitative Analysis

Introduction to errors, limitations of analytical methods, classifications of errors, accuracy, precision, minimization of errors, significant figures and computation, methods of

expressing accuracy and precision: mean and standard deviations, reliability of results and numerical. *(**Ref-1:** 127-138, supplementary references- **Ref-2:** 62-75, **Ref-3:** 82-121)*

Learning Outcomes

- Define, explain and compare meaning of accuracy and precision.
- Apply the methods of expressing the errors in analysis from results.
- Explain / discuss different terms related to errors in quantitative analysis.
- Apply statistical methods to express his / her analytical results in laboratory.
- Solve problems applying equations.

4. Volumetric Analysis **[13 L]**

Introduction to volumetric analysis, classification of reactions in volumetric analysis, standard solutions, equivalents, normalities, and oxidation numbers, preparation of standard solutions, primary and secondary standards. **Types of Volumetric Analysis methods: 1. Neutralization titrations**: Theory of indicators, neutralization curves for strong acid strong base, weak acid strong base, weak base strong acid. Preparation of approximate 0.1 M HCl and standardization against anhydrous sodium carbonate, determination of Na_2CO_3 content in washing soda. **2. Complexometric Titrations:** Definition of complexing agent and complexometric titration, EDTA-as complexing agent (structure of EDTA and metal ion-EDTA complex), Types of EDTA titration (direct and back titration), pH adjustment and amount of indicator in EDTA titration, metal ion indicators (general properties, solochrome black – T, Patton and Reeder's indicator only), standard EDTA solution, determination of Ca(II) and Mg(II), total hardness of water. **3. Redox Titrations:** Definition of oxidizing agent, reducing agent, redox titration, $K_2Cr_2O_7$ and $KMnO_4$ as oxidizing agents, 1,10-phenanthroline as indicator in reduction titration, diphenyl amine as oxidation indicator, $KMnO_4$ as self-indicator, Standard $KMnO_4$ solution and standardization with sodium oxalate, Determination of H_2O_2. **4. Precipitation titrations:** precipitation reactions, determination of end point (formation of coloured ppt, formation of soluble coloured compound, adsorption indicator), standard $AgNO_3$ soln., standardization of $AgNO_3$ soln. – potassium chromate indicator- Mohr's titration, determination of chloride and bromide, determination of iodide. Problems based on analysis.

*(**Ref-1:** Pages-257-275, 286, 295, 309 -322, 328-332, 340-351, 364-372.; supplementary reference **Ref-2:** 382-302, 322-334, 366-374, 437-452)*

Learning Outcome:

After studying the Volumetric Analysis student will able to-

1. Explain / define different terms in volumetric analysis such as units of concentration, indicator, equivalence point, end point, standard solutions, primary and secondary standards, complexing agent, precipitating agent, oxidizing agent, reducing agent, redox indicators, acid base indicators, metallochome indicators, etc.
2. Perform calculations involved in volumetric analysis.
3. Explain why indicator show colour change and pH range of colour change.
4. To prepare standard solution and **b.** perform standardization of solutions.
5. To construct acid – base titration curves and performs choice of indicator for particular titration.
6. Explain / discuss acid-base titrations, complexometric titration / precipitation titration / redox titration.
7. Apply volumetric methods of analysis to real problem in analytical chemistry / industry.

Reference Books: (Analytical Chemistry)

1. Vogel's Textbook of quantitative Chemical Analysis, 5th Ed. G. H. Jeffry, J. Basset, J. Mendham, R. C. Denney, Longman Scientific and Technical, 1989.
2. Analytical Chemistry, G. D. Christian, P. K. Dasgupta, K. A. Schug, 7th Ed, Wily, 2004.
3. Fundamentals of Analytical Chemistry- Skoog, west, Holler, Crouch, 9th Ed. Brooks / Cole, 2014/2004.
4. Basic Concept of Analytical Chemistry- S. M. Khopkar
5. Instrumental methods of chemical analysis- Chatwal Anand
6. Analytical Chemistry, G.R. Chatwal, Sham Anand.

CH-302: Inorganic and Organic Chemistry [2Credit, 36 L]

Chapter No.	Chapter	No of Lectures
1	Molecular Orbital Theory of Covalent Bonding	13
2	Introduction to Coordination chemistry	05
3	Aromatic hydrocarbons	05
4	Alkyl and Aryl Halides	07
5	Alcohols, Phenols and Ethers	06

1. Molecular Orbital Theory of Covalent Bonding [13 L]

Introduction to Molecular Orbital Method (MOT) and postulates of MO theory, LCAO approximation, s-s combination of orbitals, s-p combination of orbitals, p-p combination of orbitals, p-d combination of orbitals, d-d combination of orbitals, non-bonding combination of orbitals, Rules for linear combination of atomic orbitals, example of molecular orbital treatment for homonuclear diatomic molecules: Explain following molecules with respect to MO energy level diagram, bond order and magnetism: H_2^+ *molecule ion,* H_2 *molecule,* He_2^+ *molecule ion,* He_2 *molecule,* Li_2 *molecule,* Be_2 *molecule,* B_2 *molecule,* C_2 *molecule,* N_2 *molecule,* O_2 *molecule,* O_2^- *and* O_2^{2-} *ion,* F_2 *molecule,* Heteronuclear diatomic molecules: *NO, CO, HF.*

*(**Ref.-1:**89-112, **Ref-4:** 278-292, **Ref-5:** 33-38)*

Learning Outcome:

After studying the Molecular Orbital Theory student will able to-

1. Define terms related to molecular orbital theory (AO, MO, sigma bond, pi bond, bond order, magnetic property of molecules, etc).
2. Explain and apply LCAO principle for the formation of MO's from AO's.
3. Explain formation of different types of MO's from AO's.
4. Distinguish between atomic and molecular orbitals, bonding, anti-bonding and non-bonding molecular orbitals.
5. Draw and explain MO energy level diagrams for homo and hetero diatomic molecules. Explain bond order and magnetic property of molecule.
6. Explain formation and stability of molecule on the basis of bond order.
7. Apply MOT to explain bonding in diatomic molecules other than explained in syllabus.

2. Introduction to Coordination Compounds **[5 L]**

Double salt and coordination compound, basic definitions: *coordinate bond, ligand, types of ligands, chelate, central metal ion, charge on complex ion, calculation of oxidation state of central metal ion, metal ligand ratio*; Werner's work and theory, Effective atomic number, equilibrium constant ***(Ref-6: 138-140)***, *chelate effect, IUPAC nomenclature.*

*(**Ref.-1:** 194-200, 222-224; **Ref-4:** 483-492)*

Learning Outcome:

After studying the Introduction to Coordination Compounds student will able to-

1. Define different terms related to the coordination chemistry (double salt, coordination compounds, coordinate bond, ligand, central metal ion, complex ion, coordination number, magnetic moment, crystal field stabilization energy, types of ligand, chelate effect, etc.)
2. Explain Werner's theory of coordination compounds. Differentiate between primary and secondary valency. Correlate coordination number and structure of complex ion.
3. Apply IUPAC nomenclature to coordination compound.

Reference Books: (Inorganic Chemistry)

1. Concise Inorganic Chemistry, J. D. Lee, 5th Ed (1996) Blackwell Science
2. Inorganic Chemistry, James E. House, Academic Press (Elsevier), 2008
3. Inorganic Chemistry by Miessler and Tarr, Third Ed. (2010), Pearson.
4. Principles of Inorganic Chemistry, Brian W. Pfennig, Wiley (2015)
5. Inorganic Chemistry, Catherine Housecroft, Alan G. Sharpe, Pearson Prentis Hall, 2008.
6. Basics Inorganic Chemistry, Cotton and Wilkinson

3. Aromatic Hydrocarbons: **[5 L]**

Introduction and IUPAC nomenclature, preparation (Case benzene): from phenol, by decarboxylation, from acetylene, from benzene sulphonic acid. *Reactions* (Case benzene): Electrophilic substitution: nitration, halogenation and sulphonation. Friedel-Craft's reaction (alkylation and acylation) (up to 4 carbons on benzene). Side chain oxidation of alkyl benzenes (up to 4 carbons on benzene).

*(**Ref-1:** 493-513)*

Learning Outcome:

After studying the aromatic hydrocarbons student will able to-

1. Identify and draw the structures aromatic hydrocarbons from their names or from structure name can be assigned.

2. Explain / discuss synthesis of aromatic hydrocarbons.
3. Give the mechanism of reactions involved.
4. Explain /Discuss important reactions of aromatic hydrocarbon.
5. To correlate reagent and reactions.

4. Alkyl and Aryl Halides: **[7 L]**

Alkyl Halides (up to 5 Carbons): Introduction and IUPAC nomenclature, Types of Nucleophilic Substitution (SN^1, SN^2 and SNi) reactions. *Preparation:* from alkenes *and* alcohols. *Reactions:* hydrolysis, nitrite & nitro formation, nitrile & isonitrile formation. Williamson's ether synthesis: Elimination vs. substitution.

Aryl Halides: Introduction and IUPAC nomenclature, *Preparation:* (Chloro, bromo and iodo-benzene case): from phenol, Sandmeyer and Gattermann reactions. *Reactions (Chlorobenzene):* Aromatic nucleophilic substitution (replacement by –OH group) and effect of nitro substituent. Benzyne Mechanism: KNH_2/NH_3 (or $NaNH_2/NH_3$). Reactivity and Relative strength of C-Halogen bond in alkyl, allyl, benzyl, vinyl and aryl halides.

***(Ref.-1:** 165-211 and 943-967)*

Learning Outcome:

After studying the Alkyl and Aryl Halides student will able to-

1. Identify and draw the structures alkyl / aryl halides from their names or from structure name can be assigned.
2. Explain / discuss synthesis of alkyl / aryl halides.
3. Write / discuss the mechanism of Nucleophilic Substitution (SN^1, SN^2 and SNi) reactions.
4. Explain /Discuss important reactions of alkyl / aryl halides.
5. To correlate reagent and reactions.
6. Give synthesis of expected alkyl / aryl halides.

5. Alcohols, Phenols and Ethers (Up to 5 Carbons): **[6 L]**

Alcohols: Introduction and IUPAC nomenclature, *Preparation:* Preparation of 1o, 2o and 3o alcohols: using Grignard reagent, ester hydrolysis, reduction of aldehydes, ketones, carboxylic acid and esters. *Reactions:* with sodium, HX (Lucas test), esterification, oxidation (with PCC, alc. KMnO4, acidic dichromate, conc. HNO_3). Oppeneauer oxidation *Diols:* (Up to 6 Carbons) oxidation of diols. Pinacol-Pinacolone rearrangement.

Phenols (Phenol case): Introduction and IUPAC nomenclature, *Preparation:* Cumene hydroperoxide method, from diazonium salts. *Reactions:* Electrophilic substitution: Nitration, halogenation and sulphonation. Reimer-Tiemann Reaction, Gattermann Reaction, Houben–Hoesch Condensation, Schotten–Baumann Reaction. **Ethers (aliphatic and aromatic):** Cleavage of ethers with HI.

(***Ref-1:*** *213-244 and 889-912)*

Learning Outcome:

After studying the Alcohols and Phenols student will able to-

1. Identify and draw the structures alcohols / phenols from their names or from structure name can be assigned.
2. Able to differentiate between alcohols and phenols
3. Explain / discuss synthesis of alcohols / phenols.
4. Write / discuss the mechanism of various reactions involved.
5. Explain /Discuss important reactions of alcohols / phenols.
6. To correlate reagent and reactions of alcohols / phenols
7. Give synthesis of expected alcohols / phenols.

References: (Organic Chemistry)

1. Morrison, R.T. & Boyd, R.N. *Organic Chemistry*, Prentice Hall of India, Sixth Edition, **2002**, 283-308.

Other Reference Books for All Chapters:

2. Jonathan Clayden, Nick Greeves, Stuart Warren, Peter Wothers *Organic Chemistry* - Oxford University Press, USA, 2nd Ed.
3. Bahl, A. and Bahl, B.S. *Advanced Organic Chemistry,* S. Chand, **2010**.
4. Graham Solomon, T.W., Fryhle, C.B. & Dnyder, S.A. *Organic Chemistry,* John Wiley and Sons (2014).
5. Mc Murry, J.E. *Fundamentals of Organic Chemistry*, 7th Ed. Cengage Learning India Edition, 2013.
6. Sykes, P. *A Guidebook to Mechanism in Organic Chemistry,* Orient Longman, New Delhi (1988).
7. Finar, I. L. *Organic Chemistry* (Vol. I and II), E.L.B.S.

CH-303: Practical Chemistry-III [2 credit, 72* L]

* 72 L distributed as 58 L for performing practicals and 14 L for internal evaluation.

For practicals, see the manual prepared by BOS of Chemistry. The examination will be held according to this manual.

Instructions

1. **Use molar concentrations for volumetric /estimations/synthesis experiments.**
2. **Use optimum concentrations and volumes**
3. **Two burette method should be used for volumetric analysis (Homogeneous mixtures)**
4. **Use of Microscale technique is recommended wherever possible**

A. Chemical Kinetics: (Any Three)

1. To Study the Acid catalysed hydrolysis of an ester (methyl Acetate) and determine the rate constant (k). (first order reaction)
2. To study the kinetics of saponification reaction between sodium hydroxide and ethyl acetate.
3. To compare the relative strength of HCl and H_2SO_4 or HNO_3 by studying the kinetics of hydrolysis of methyl acetate.
4. Energy of activation of the reaction between $K_2S_2O_8$ and KI with unequal initial concentration.

   OR

   4. To determine the order of the reaction with respect to $K_2S_2O_8$ by fractional life method following the kinetics of per sulphate-iodide reaction.

References:

i) Systematic experimental physical chemistry, S. W. Rajbhoj, T. K. Chondekar, Anjali publication.

ii) Practical Physical Chemistry, Vishwanathan and Raghwan , Viva book.

iii) Practical Chemistry, O. P. Pandey, D. N. Bajpai Dr. S. Giri, S Chand Publication

iv) Experiments in Chemistry, D. V. Jahagirdar, Himalaya Publication.

B. Inorganic quantitative / qualitative analysis (Any two)

1. Estimation of Fe(III) from given solution by converting it to Fe(II) using Zn metal and then by titrating with standard solution of $K_2Cr_2O_7$-A Green Approach (Ref.-1,3).

2. Determination of $BaCO_3$ content in a given sample by precise determination of volume of CO_2 (Ref-2).
3. Separation and Identification of metal ions by Paper Chromatography (Ref.,4,5)

References:

1. Iron Analysis by Redox Titration A General Chemistry Experiment, ***Journal of Chemical Education***, Volume 65, Number 2, February 1988.183.
2. A Precise Method for Determining the CO_2 Content of Carbonate Materials, ***Journal of Chemical Education***, Vol. 75, No. 12, December 1998.
3. Vogel's Textbook Quantitative Chemical Analysis, 3rd and 6th Ed.
4. Advanced Practical Chemistry, Jagdamba Sing et al, Pragati Prakashan, Merrut.
5. Practical Chemistry, Panday, Bajpai, Giri, S.Chand and Co.

C. Organic Qualitative Analysis (Two mixtures: solid-solid type)

1. **Separation of Two Components** from given binary mixture of organic compounds containing mono-functional group (Ex. - carboxylic acid, phenols, amines, amide, nitro, etc.) and systematic identification of each component qualitatively.

D. Organic Preparations (Any two)

1. Preparation of benzoic acid from ethyl benzoate (Identification and confirmatory Test of –COOH group, M.P and purity by TLC)
2. Acetylation of primary amine (Green approach)
3. Base catalyzed Aldol condensation (Green approach)
4. Preparation of Quinone from hydroquinone (Confirm the conversion by absence of phenolic –OH group in product, M.P and purity by TLC)

E. pH Metry (Compulsory)

4. To determine equivalence point of neutralisation of acetic acid by pH-metric titration with NaOH and to find best indicator for the titration.

F. Volumetric Analysis (Any two)

1. Estimation of Aspirin from a given tablet and find errors in quantitative analysis. (***Standardization of acid must be performed with standard Na2CO3 solution, prepared from dried anhydrous AR grade Na_2CO_3***)
2. Determination of acetic acid in commercial vinegar by titrating with standard NaOH. Express your results as average ± standard deviation. (***Standardization of base must be performed with standard KHP***)

3. Determination of Hardness of water from given sample by complexometric titration (Using E.D.T.A.) method and total dissolve solids by conductometry. Express your results as average ± standard deviation. (***Standardization of Na_2EDTA must be performed with standard Zn(II) solution***)

Reference:

1. Vogel's Textbook Quantitative Chemical Analysis, 3rd and 5th Ed.
2. Experiments in chemistry, D. V. Jahagirdar, Himalaya Publication.

Examination Pattern: At the time of examination student will have to perform one experiment. In case of organic qualitative analysis, after separation of binary mixture any one component has to be analysed according to OQA scheme. Distribution of 35 marks: 30 marks for experimental performance and 5 mark for oral.

To cope up with NACC criterion and to motivate and inculcate research culture among the students, interested students can be assigned mini-scale project. Project should be based either on applications of chemistry in day to day life or application or novel / applied synthesis / demonstrating principles of chemistry. The project work is equivalent to three experiments. ***Student performing project can be exempted from 3 experiments from two semester. (*from three different sections of two semester) and project will be evaluated by external examiner. Project being choice based activity; student will not get any exemption in external examination***. Systematic project report (Name page, certificate, introduction/theory, importance of project, learning outcome, requirements, safety precautions, procedure, observations, calculations, results and conclusions) be submitted separately in binding form duly certified by mentor teacher and HOD.

Illustrative list of some projects is given below for your perusal.

1. Synthesis of soap from different types of oils with respect to i) percent yield ii cost of obtaining 50 g soap (students will learn saponification or alkaline hydrolysis of oils – a chemical reaction for the synthesis of day to day life product, which oil is better for soap making).
2. Synthesis of biodegradable plastic (Principles demonstrated: Chemical reactions for mores safe products and to mitigate environmental pollution).
3. Synthesis of azo dyes and effect substituents of benzene ring on colour of azo dye (Principle demonstrated -Inductive effect a visible demonstration, strategy to charge the colour of dye, chemical reactions for industries).

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4. Quality of Consumer products: identification reactions and Purity of $NaHCO_3$ (eating soda) of different brands by thermal decomposition. (Application of analytical chemistry and simple decomposition reaction for the determination of purity of consumer product)
5. Determination pH, surface tension, CMC and washing action of detergent of different brands for comparing their quality. (Application of chemistry principles in determination of quality of consumer product)
6. Removal of dyes / nitrophenols / by Fenton's process or by adsorption on activated charcoal. (Applications of principles of chemistry in mitigation of environmental pollution, an industrial application of chemistry).
7. Study of deionization water using cation and anion exchange resins / zeolites. Amount of zeolites / resin required for the softening of water. (Day to day life application of chemistry, student can apply their knowledge and can construct their own deionizer).
8. Preparation shampoo. Ingredients required, their proportion, mixing and testing.
9. Eudiometer: Determination of oxidation state, equivalent wt. and determine stoichiometry of the reaction between i) iron metal and HCl. Fe can have oxidation state +2 or +3. ii) Zn and HCl iii) Al and HCl. What happens with HNO_3? Why similar method cannot used to investigate reaction between HNO_3 and these metals?
10. Study stoichiometry of simple chemical reactions thereby determination of equivalent wt. of one of the reactant: i) $FeSO_47H_2O$ and $KMnO_4$ (determine equivalent wt. of $KMnO_4$) ii) Mn(II) and $KMnO_4$ (determine equivalent wt. of $KMnO_4$).Explain the concept of variable oxidation state and variable equivalent wt. for same substance i.e. mol. wt. is constant. (Known Fe^{2+} oxidizes to Fe^{3+} only).
11. Synthesis /isolation of essences, purity by TLC/ B.P. (at least two).
12. Synthesis and estimation of purity of aspirin (medicinal compound) by green chemistry route.
13. Compare the paracetamol content in tablet of different brands (at least three different brands).
14. Compare the vitamin-c content in tablet of different brands. (at least three different brands).
15. Determination of Avagdro Number (N) by various technics such as Brownian Moment, Electrodeposition, number of molecules in monolayer etc.
16. Hess Law verification
17 Determination of Farday constant and Avagadro number
18 To determine thermodynamic values of various compounds

19 To determine density of various substances

20 Preparation of Nylon and study its properties

21 Microscale techniques in Chemistry

References:

1. A laboratory manual for general, organic and biological chemistry, 3rd Ed. Pearson.
2. Safety-Scale Laboratory Experiments for Chemistry for Today: General, Organic and Biochemistry Seventh Edition, Spencer L. Seager, Michael R. Slabaugh, Cengage Learning, 2010
3. Laboratory Manual for Principles of General Chemistry, Bearen, 8th Ed. Wiley.
4. Green Chemistry Laboratory Manual for General Chemistry, Sally A. Henrie, CRC Press Taylor & Francis Group, and Informa Business. 2015
5. Experiments in General Chemistry, G. S. Weiss T. G. Greco L. H. Rickard, Ninth Edition, Pearson Education Limited, 2014.
6. Mini-scale and micro-scale organic chemistry laboratory experiments 7th Ed. Schoffstall, Gaddis, Mc-Graw-Hill Higher Education, 2004.
7. Journal of Chemical Education, ACS, (search relevant topics).

II. Students short activity (for both semesters)

These are the extra-time activities for the students which can be performed with the permission of mentor. Mentor can arrange a demonstration on these activities to explain basic principles of chemistry. **Teacher can design many such activities to explain theory that you taught in the class.** Systematic report of activity performed be written in journal. Sample list of small activities is given below. These short activities can be considered for internal evaluation. Some activities are given below.

1. Amphoteric nature of $Al(OH)_3$ (Principle demonstrated-demonstration of amphoteric nature substance and why $Al(OH)_3$ is used in antacid preparations)
2. Enzyme deactivation by Hg^{2+} (Principle demonstrated–catalyst deactivation and toxicity effect of Hg^{2+})
3. Adsorption of dyes on activated charcoal (Principle demonstrated and application- surface adsorption for removal of dyes from effluents)
4. Detection of adulteration in milk / chilli powder / turmeric power / food colours
5. Use of EXCEL in drawing of graphs and calculations.
6. Catalysis by Mn(II) in $KMnO_4$–Oxalic acid titration. (Principle, demonstrated - Homogeneous catalysis)

7. Identification of type of salt (strong acid – strong base, strong acid – weak base, weak acid – strong base) by hydrolysis reactions and indicators. (Principle demonstrated – hydrolysis reaction of salts, it really takes place)
8. Identification of inorganic ions in soft drinks / tooth paste, form of iodide in table salt / waste water / bore well water.
9. Spectrochemical series using $CuSO_4$ solution and i) NaCl, ii) KBr, iii) Ammonia, iv) ethylene diamine, v) salicylic acid [correlate colour with wavelength and predict ligand strength]
10. Green Chemistry principles in Organic Chemistry.

References: Journal of Chemical Education, ACS, (search relevant topics).

Learning Outcome- Practical Chemistry-III

1. Verify theoretical principles experimentally.
2. Interpret the experimental data on the basis of theoretical principles.
3. Correlate theory to experiments. Understand/verify theoretical principles by experiment observations; explain practical output / data with the help of theory.
4. Understand systematic methods of identification of substance by chemical methods.
5. Write balanced equation for the chemical reactions performed in the laboratory.
6. Perform organic and inorganic synthesis and is able to follow the progress of the chemical reaction by suitable method (colour change, ppt. formation, TLC).
7. Set up the apparatus / prepare the solutions - properly for the designed experiments.
8. Perform the quantitative chemical analysis of substances explain principles behind it.
9. Systematic working skill in laboratory will be imparted in student.

Important Notes:

i) Wherever feasible develop and practice micro or semi-micro methods from known / recommended procedures and the reference books. This is to i) minimize the cost of experiment, ii) reduce wastage of chemicals iii) reduce environmental pollution.

ii) Mentor should promote students to ***complete the Journal on the same day before leaving of the lab***. Ensure that the original data is retained and used by the candidate. Students may adjust the data from their lab work to reach close to theoretical values. If journal is completed before leaving the lab it will not encourage students to "adjust" the facts from their lab work. **(Ref-Journal of Chemical Education, Min J. Yang and George F. Atkinson, Designing New Undergraduate Experiments, Vol. 75, No. 7, July 1998).**

Internal Evaluation Strategy for practical (Both semester):

During start of the practical course methodology of internal evaluation should be discussed with students. Internal evaluation is a continuous assessment (CA). Hence during each practical, internal evaluation must be done with different tools. **Guidelines for internal evaluation:** To each practical 15 marks can be assigned which can be distributed as follows:

Overall performance and timely arrival	Interaction	Accuracy of results	Journal /Lab report	Post laboratory quiz / assignment / oral
4	2	2	5	2

At the end of semester, average of 12 experiments can be assigned as internal marks out of 15. Systematic record of internal evaluation must be maintained which is duly sign by mentor and student. If student is absent with prior-intimation her/his absentee will be considered but student will have to complete the experiment in the same week or in with the permission of mentor. Mentor or practical in-charge should arrange the practical for such students. Students performing projects (one mini project equivalent to three practical session) / student activities (4 to 6 activities equivalent to three practical session) can be assigned up to 3 marks out of 15.

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SEMSER-IV

CH-401: Physical and Analytical Chemistry [Credit: 2, 36 L]

Chapter No	Chapter	No of Lectures
1	Phase Equilibrium	09
2	Ideal and Real Solutions	09
3	Conductometry	06
4	Colorimetry	06
5	Column Chromatography	06

1. Phase equilibrium **[9L]**

Introduction; definitions of phase, components and degrees of freedom of a system; stability of phases, criteria of phase equilibrium. Gibbs phase rule and its thermodynamic derivation, phase diagrams of one- component systems- water, carbon dioxide and sulphur systems, problems. *(**Ref. No: 1**, Page No- 119 - 126, **Ref. No: 2**, Page No – 661-675,**Ref. No:4**, Page No 344- 354).*

Learning Outcomes

- Define the terms in phase equilibria such as- system, phase in system, components in system, degree of freedom, one / two component system, phase rule, etc.
- Explain meaning and Types of equilibrium such as true or static, metastable and unstable equilibrium.
- Discuss meaning of phase, component and degree of freedom.
- Derive of phase rule.
- Explain of one component system with respect to: Description of the curve, Phase rule relationship and typical features for i) Water system ii) Carbon dioxide system iii) Sulphur system
- **Reference Books (Physical Chemistry)**

1. Atkins' Physical Chemistry by Peter Atkins, Julio de Paula, James Keeler -11th edition
2. Principles of Physical chemistry by B.R. **Puri**, L.R. **Sharma**, M.S. Pathania
3. Essentials of Physical chemistry by Bahl Tuli-Revised Multicolour Edition 2009, S. Chand and Company Ltd.
4. Principles of Physical Chemistry, Fourth Edition by S.H. Marron and C. F. Pruton
5. Physical-Chemistry-4th Edition - Gilbert W. Castellan Narosa (2004).
6. Principles of Chemical Kinetics- 2rdEdition- James E. House.

7. Barrow, G.M. Physical Chemistry Tata McGraw-Hill (2007).
8. Kotz, J.C., Treichel, P.M. & Townsend, J.R. General Chemistry, Cengage Learning India Pvt. Ltd.: New Delhi (2009).
9. Mahan, B.H. University Chemistry, 3rd Ed. Narosa (1998).
10. Petrucci, R.H. General Chemistry, 5th Ed., Macmillan Publishing Co.: New York (1985).
11. Physical Chemistry by Thomas Engel, Philip Reid, Warren Hehre.

2. Ideal and real solutions **[9L]**

Introduction, chemical potential of liquids - ideal solutions, ideal dilute solutions - Raoult's and Henry's Law, liquid mixtures, phase diagram of binary systems : liquids - vapour pressure diagrams, temperature composition diagrams, liquid-liquid phase diagrams, solubility of partially miscible liquids-critical solution temperature, effect of impurity on partially miscible liquids, Problems. (***Ref. No:*** *1, Page Nos- 150-153, 155-157, 166 – 175,* ***Ref. No: 2****, Page No. - 750-775, 696-705****Ref. No:4****, Page No. 261-292, 298- 302).*

Learning Outcomes

- Define various terms, laws, differentiate ideal and no-ideal solutions.
- Discuss / explain thermodynamic aspects of Ideal solutions-Gibbs free energy change, Volume change, Enthalpy change and entropy change of mixing of Ideal solution.
- Differentiate between ideal and non-ideal solutions and can apply Raoult's law.
- Interpretation of i) vapour pressure–composition diagram ii) temperature- composition diagram.
- Explain distillation of liquid solutions from temperature – composition diagram.
- Explain / discuss azeotropes, Lever rule, Henrys law and its application.
- Discuss / explain solubility of partially miscible liquids- systems with upper critical. Solution temperature, lower critical solution temperature and having both UCST and LCST.
- Explain / discuss concept of distribution of solute amongst pair of immiscible solvents.
- Derive distribution law and its thermodynamic proof.
- Apply solvent extraction to separate the components of from mixture interest.
- Solve problem by applying theory.

3. Conductometry **[6 L]**

Introduction, Electrolytic Conductance, Resistance, conductance, Ohm's law, cell constant, specific and equivalent conductance, molar conductance, variation of equivalent and specific conductance with concentrations, Kohlrausch's law and its applications, conductivity cell, conductivity meter, Whetstone Bridge, determination of cell constant,

conductometric titrations (strong acid-strong base, strong acid-weak base, weak acid strong base) and Numericals. ***Ref-1:*** *398-402, 414-423, 433-434,* ***Ref-2:*** *519-527,* ***SupplementaryRef-3:*** *746-756,* ***Ref-4:*** *528-532.*

Learning Outcomes

- Explain / define different terms in conductometry such as electrolytic conductance, resistance, conductance, Ohm's law, cell constant, specific and equivalent conductance, molar conductance, Kohlrausch's law, etc.
- Discuss / explain Kohlrausch's law and its Applications, Conductivity Cell, Conductivity Meter, Whetstone Bridge.
- Explain / discuss conductometric titrations.
- Apply conductometric methods of analysis to real problem in analytical laboratory.
- Solve problems based on theory / equations.
- Correlate different terms with each other and derive equations for their correlations.

4. Colorimetry: **[6 L]**

Introduction, interaction of electromagnetic radiation with matter, essential terms: radiant power, transmittance, absorbance, molar, Lamberts Law, Beer's Law, Lambert-Beer's Law, molar absorptivity, deviations from Beer's Law, Colorimeter**:** *Principle, Construction and components, Working*. Applications–unknown conc. By calibration curve method, Determination of unknown concentration of Fe(III) by thiocynate method, Numericals. (***Ref-2:*** *645-651, 658-661, 690,* ***Ref-3:*** *97, 100, 159-172,* ***Ref-4:*** *144-153, 157-160,* ***Ref-6-****Relevent pages).*

Learning Outcomes

- Explain / define different terms in Colorimetry such as radiant power, transmittance, absorbance, molar, Lamberts Law, Beer's Law, molar absorptivity
- Discuss / explain / derive Beer's law of absorptivity.
- Explain construction and working of colorimeter.
- Apply colorimetric methods of analysis to real problem in analytical laboratory.
- Solve problems based on theory / equations.
- Correlate different terms with each other and derive equations for their correlations.

5. Column Chromatography **[6 L]**

Introduction, Principle of Column Chromatography, **Ion Exchange Chromatography:** Ion exchange resins, action of ion exchange resin (Ion exchange equilibria, Ion exchange capacity), Experimental technique, Application: i) Separation of

Metal ions / non-metal ions on Ion Exchange Chromatography (*Zn(II) and Mg(II), Cl^- and Br^-),* ii) Purification of water, (***Ref-2:*** *186-192, 205-209*) **Adsorption Chromatography – Liquid solid chromatography**: Introduction, the technique of conventional chromatography, column packing materials, Selection of solvent for adsorption chromatography, Adsorption column preparation and loading, Application – Purification of anthracene (***Ref-5:*** *209-215, 221*), Size Exclusion Chromatography*(Supplementary -* ***Ref-4:*** *pages 111-153, 212-215,* ***Ref-6-****Relevent pages)*

Learning Outcomes

- Explain / define different terms in column chromatography such as stationary phase, mobile phase, elution, adsorption, ion exchange resin, adsorbate, etc.
- Explain properties of adsorbents, ion exchange resins, etc.
- Discuss / explain separation of ionic substances using resins.
- Discuss / explain separation of substances using silica gel / alumina.
- Apply column chromatographic process for real analysis in analytical laboratory.

References (Analytical Chemistry)

1. Principles of Physical Chemistry, S.H. Marron and C. F. Pruton4th ed., Oxford and IBH publishing company / CBS, new Delhi.
2. Vogel's Textbook of quantitative Chemical Analysis, 5th Ed. G. H. Jeffry, J. Basset, J. Mendham, R. C. Denney, Longman Scientific and Technical, 1989.
4. Basic Concept of Analytical Chemistry- S. M. Khopkar
5. Vogel's Text Book of Practical Organic Chemistry, Furniss, Hannaford, Smith, Tatchel, 5th Ed., Longman Scientific and Technical, 2004.
6. Analytical Chemistry, G.R. Chatwal, Sham Anand.

CH-402: Inorganic and Organic Chemistry [2 credit, 36L]

Chapter No.	Chapter	No of Lectures
1	Isomerism in coordination complexes	02
2	Valance Bond Theory of Coordination Compounds	04
3	Crystal field Theory	12
4	Aldehydes and ketones	05
5	Carboxylic acids and their derivatives	05
6	Amines and Diazonium Salts	04
7	Stereochemistry of Cyclohexane	04

1. Isomerism in coordination complexes [2 L]

Introduction, polymerization isomerism, ionization isomerism, hydrates isomerism, linkage isomerism, coordination isomerism, coordination position isomerism, geometric isomerism, optical isomerism.

(Ref-1: 232-236)

Learning Outcome:

After studying the aromatic hydrocarbons student will able to-

1. Isomerism in coordination complexes
2. Explain different types of isomerism in coordination complexes.

2. Valance Bond Theory of Coordination Compounds [4 L]

Aspects and assumptions of VBT, applications of VBT on the basis of hybridization to explain the structure and bonding in $[Ag(NH_3)_2]^+$, $[Ni(Cl_4)]^{2-}$, $[Ni(CN)_4]^{2-}$, $[Cr(H_2O_6)]^{3+}$, $[Fe(CN)_6]^{3-}$ (Inner orbital complex) and $[FeF_6]^{3-}$(outer orbital complex). Use of observed magnetic moment in deciding the geometry in complexes with C.N.4, limitations of VBT.

(**Ref-2:** 592-597, **Ref-3:**350-351).

Learning Outcome:

After studying the aromatic hydrocarbons student will able to-

1. Apply principles of VBT to explain bonding in coordination compound of different geometries.
2. Correlate no of unpaired electrons and orbitals used for bonding.
2. Identify / explain / discuss inner and outer orbital complexes.
4. Explain / discuss limitation of VBT.

3. Crystal Field Theory **[12 L]**

Shapes of d-orbitals, Crystal field Theory (CFT): Assumptions, Application of CFT to i) Octahedral complexes (*splitting of 'd' orbitals in Oh ligand field, effect of weak and strong ligand fields, colour absorbed and spectrochemical series, crystal splitting energy, Crystal field stabilization energy and factors affecting it, tetragonal distortion in Cu(II) complexes*) ii) Square planar complexes and iii) Tetrahedral complexes; spin only magnetic moment of Oh and Td complexes.

(Ref-1:194-225).

Learning Outcome:

After studying the aromatic hydrocarbons student will able to-

1. Explain principle of CFT.
2. Apply crystal field theory to different type of complexes (Td, Oh, Sq. Pl complexes)
3. Explain: i) strong field and weak field ligand approach in Oh complexes ii) Magnetic properties of coordination compounds on the basis of weak and strong ligand field ligand concept. iii) Origin of colour of coordination complex.
4. Calculate field stabilization energy and magnetic moment for various complexes.
5. To identify Td and Sq. Pl complexes on the basis of magnetic properties / unpaired electrons.
6. Explain spectrochemical series, tetragonal distortion / Jahn-Teller effect in Cu(II) Oh complexes only.

Reference Books: (Inorganic Chemistry)

1. Concise inorganic chemistry, J. D. Lee, 5th Ed (1996), Blackwell Science
2. Inorganic Chemistry, James E. House, Academic Press (Elsevier), 2008
3. Inorganic Chemistry by Miessler and Tarr, Third Ed. (2010), Pearson.

4. Aldehydes and Ketones (aliphatic and aromatic) **[5 L]**

(Formaldehyde, acetaldehyde, acetone and benzaldehyde)

Introduction and IUPAC nomenclature, *Preparation:* from acid chlorides and from nitriles. *Reactions* – Reaction with HCN, ROH, $NaHSO_3$, NH_2-G derivatives. Iodoform test, Aldol Condensation, Cannizzaro's reaction, Wittig reaction, Benzoin condensation, Clemenson reduction and Wolff Kishner reduction. Meerwein-Pondorff Verley reduction.

(***Ref-1:*** *657-700 and 797-816*)

Learning Outcome:

After studying the aldehydes and ketones student will able to-

1. Identify and draw the structures aldehydes and ketones from their names or from structure name can be assigned.
2. Explain / discuss synthesis of aldehydes and ketones.
3. Write / discuss the mechanism reactions aldehydes and ketones.
4. Explain /Discuss important reactions of aldehydes and ketones.
5. To correlate reagent and reactions of aldehydes and ketones
6. Give synthesis of expected aldehydes and ketones.
7. Perform inter conversion of functional groups.

5. Carboxylic acids and their derivatives **[5 L]**

Carboxylic acids (aliphatic and aromatic): Introduction and IUPAC nomenclature, *Preparation:* Acidic and Alkaline hydrolysis of esters. *Reactions:* Hell–Vohlard - Zelinsky Reaction.

Carboxylic acid derivatives (aliphatic): (up to 5 carbons) *Preparation:* Acid chlorides, Anhydrides, Esters and Amides from acids and their inter conversion. Reaction: Comparative study of nucleophilicity of acyl derivatives. Reformatsky Reaction, Perkin condensation. *(**Ref-1:** 713-745 and 753-785).*

Learning Outcome:

After studying the carboxylic acids and their derivatives student will able to-

1. Identify and draw the structures carboxylic acids and their derivatives from their names or from structure name can be assigned.
2. Explain / discuss synthesis of carboxylic acids and their derivatives.
3. Write / discuss the mechanism reactions carboxylic acids and their derivatives.
4. Explain /Discuss important reactions of carboxylic acids and their derivatives.
5. Correlate reagent and reactions of carboxylic acids and their derivatives
6. Give synthesis of expected carboxylic acids and their derivatives.
7. Perform inter conversion of functional groups.

6. Amines and Diazonium Salts: **[4 L]**

Amines (Aliphatic and Aromatic): Introduction and IUPAC nomenclature, *Preparation* from alkyl halides, Gabriel's Phthalimide synthesis, Hofmann Bromamide reaction. *Reactions:* Hofmann vs. Saytzeff elimination, Electrophilic substitution (Case Aniline): nitration, bromination, sulphonation.

Diazonium salts: Preparation from aromatic amines. (*Ref-1:* 821-877)

Learning Outcome:

After studying the amines and diazonium Salts student will able to-

1. Identify and draw the structures amines from their names or from structure name can be assigned.
2. Explain / discuss synthesis of carboxylic amines.
3. Write / discuss the mechanism reactions carboxylic amines.
4. Explain /Discuss important reactions of carboxylic amines.
5. To correlate reagent and reactions of carboxylic amines.
6. Give synthesis diazonium salt from amines and reactions of diazonium salt.
7. Perform inter conversion of functional groups.

7. Stereochemistry of Cyclohexane: [4 L]

Bayer's strain theory, heat of combustion of cycloalkanes, structure of cyclohexane, axial and equatorial H atoms, conformations of cycloalkane, stability of conformations of cyclohexane, methyl and t-butyl monosubstituted cyclohexane, 1,1 and 1,2 dimethyl cyclohexane and their stability.

*(**Ref-1:** 283-308).*

Learning Outcome:

After studying the aromatic hydrocarbons student will able to-

1. Draw the structures of different conformations of cyclohexane.
2. Define terms such as axial hydrogen, equatorial hydrogen, confirmation, substituted cyclohexane, etc.
3. Convert one conformation of cyclohexane to another conformation and should able to identify governing structural changes.
4. Explain / discuss stability with respect to potential energy of different conformations of cyclohexane.
5. Draw structures of different conformations of methyl / t-butyl monosubstituted cyclohexane (axial, equatorial) and 1, 2 dimethyl cyclohexane.
6. Identify cis- and trans-isomers of 1, 2 dimethyl substituted cyclohexane and able to compare their stability.

Reference Books: (Organic Chemistry)

1. Morrison, R.T. and Boyd, R.N. *Organic Chemistry*, Prentice Hall of India, Sixth Edition, 2002, 283-308.

Other Reference Books for all chapters:

2. Jonathan Clayden, Nick Greeves, Stuart Warren, Peter Wothers, ***Organic Chemistry***- Oxford University Press, USA, 2nd Ed.
3. Bahl, A. and Bahl, B.S. *Advanced Organic Chemistry,* S. Chand, 2010.
4. Graham Solomon, T. W., Fryhle, C. B. and Dnyder, S. A. ***Organic Chemistry***, John Wiley and Sons (2014).
5. Mc Murry, J.E. ***Fundamentals of Organic Chemistry***, 7th Ed. Cengage Learning India Edition, 2013.
6. Sykes, P. ***A Guidebook to Mechanism in Organic Chemistry***, Orient Longman, New Delhi (1988).
7. Finar, I.L. *Organic Chemistry* (Vol. I & II), E.L.B.S.

CH-403: Practical Chemistry-IV [2 credit, 72* L]

* 72 L will be distributed as 58 L performing practical and 14 L for internal evaluation.

Instructions:

1. **Use molar concentrations for volumetric /estimations/synthesis experiments.**
2. **Use optimum concentrations and volumes**
3. **Two burette method should be used for volumetric analysis (Homogeneous Mixtures)**
4. **Use of Microscale technique is recommended wherever possible.**

A. Conductometry (Compulsory)

a) To determine the cell constant of the given cell using 0.01 M KCl solution and determine dissociation constant of a given monobasic weak acid.

b) To investigate the conductometric titration of any one of the following a) Strong acid against strong base b) Strong base against weak acid. (***standardization of base must be performed with KHP***)

B. Chromatography (compulsory)

1. Separation of binary mixture of cations by Column Chromatography by ion exchange resins / cellulose (any one mixture) (Co + Al, Cu + Mg, Zn+Mg). Separation of cations must be confirmed by qualitative test

References:

i. Vogel's Textbook Quantitative Chemical Analysis, 3rd, 6th Ed.

ii) Experiments in chemistry, D. V. Jahagirdar, Himalaya publication.

C. Ideal and Real solutions (Any two)

1. To study the variation of mutual solubility temperature with % concentration for the phenol - water system
2. To study the effect of added electrolyte on the critical solution temperature of phenol-water system and to determine the concentration of the given solution of electrolyte.
3. To obtain the temperature-composition phase diagram for a two component liquid system with maximum (or minimum) boiling point and to determine the maximum (or minimum) boiling point and composition.

D. Adsorption (Compulsory)

1. To verify the Freundlich and Langmuir adsorption isotherm for adsorption of acetic acid on activated charcoal.

References:

i) Systematic experimental physical chemistry, S. W. Rajbhoj, T. K. Chondekar, Anjali publication.

ii) Practical Physical Chemistry, Vishwanathan and Raghwan , Viva book.

iii) Practical Chemistry, O. P. Pandey, D. N. Bajpai Dr. S. Giri, S Chand Publication

E. Synthesis of Coordination compounds (any two)

1. Synthesis of sodium cobaltinitrite (a laboratory chemical) from Co(II) salt and $NaNO_2$ salts. Comment on colour and magnetic properties of the complex. (Ref.-1, 2)
2. Synthesis of potassium Tris(oxalate)aluminium(III) using Al metal powder(Scrap aluminium). Comment on colour and magnetic properties of the complex. (Ref-2, 3, 4)
3. Synthesis of Tris(acetylacetone)iron(III) by green chemistry method by reaction between $Fe(OH)_3$ and acac. Comment on colour and magnetic properties of the complex. (Ref.- 5,6).
4. Synthesis of Tris(ethylenediamine)nickel(II) from Ni(II) salt, ethylediamine and sodium thiosulfate. Comment on colour and magnetic properties of the complex. (Ref.-7)

F. Inorganic colorimetric investigations (Any two)

1. Prepare standard solutions of $KMnO_4$ / $CuSO_4$, record their absorbance and Verify Beer's Law and determine unknown concentration. **(Compulsory)**
2. Prepare solution of Fe(III) and $SCN^-$of in different molar proportion, record their absorbance and calculate equilibrium constant of $[Fe(SCN)]^{2+}$ complex (Ref.-9,10)
3. Prepare solution of Fe(III)/Cu(II) and salicylic acid in different molar proportion and determine metal ligand ratio in Fe(III) or Cu(II)–Salicylic acid complex. (Ref.-11, 12, 13)

References

1. Handbook of Preparative Inorganic Chemistry, Volume 2, Second Edition, Edited By Georg Braue R, Academic Press, New York, London, 1965. (Page-1541)
2. Practical Chemistry, Panday, Bjpai, Giri, S.Chand and Co.
3. McNeese, T.J.; Wierda, D.A. Synthesis of Potassium Tris(oxalato)aluminate(III) Trihydrate. ***Journal of Chemical Education***,1983, 60(11), 1001.
4. Inorganic Syntheses Vol -1 by H S Booth. First Ed, 1939. (page-36).
5. Novel Synthesis of Tris(acetylacetonato)-iron(III), ***Journal of Chem. Soc. Dalton Trans.*** 1983
6. Metal Acetylacetonate Synthesis Experiments: Which Is Greener?, ***Journal of Chemical Education,*** 2011, 88, 947–953, dx.doi.org/10.1021/ed100174f

7. Experimental Inorganic/Physical Chemistry: An Investigative, Integrated Approach to Practical Project Work, Mounir A . Malati, Woodhead Publishing Limited, 1999.
8. Vogel's Textbook Quantitative Chemical Analysis, 6th Ed.
9. Colorimetric Determination of the Iron(III)-Thiocyanate Reaction Equilibrium Constant with Calibration and Equilibrium Solutions Prepared in a Cuvette by Sequential Additions of One Reagent to the Other, ***Journal of Chemical Education***, Vol.88 No.3 March 2011.
10. Experiments in chemistry, D. V. Jahagirdar, Himalaya publication.
11. A spectrophotometric study of complex formation between Fe(III) and salicylic acid, Kinya Ogawa, Nobuko Tobe, Bulletin of chemical society of Japan, 39, 227-232, 1966.
12. Salicylate determination by complexation with Fe(III) and optical absorbance spectroscopy
13. Determination of Equilibrium Constants of Metal Complexes from Spectrophotometric Measurements: An Undergraduate Laboratory Experiment, ***Journal of Chemical Education***, Vol. 76, No. 9, September 1999.

G. Organic Estimations (any two)

1. **Determination of molecular weight:** Determination of molecular weight of organic acid by titration against standardized NaOH - a) monobasic acid or b) dibasic acid
2. **Estimation of amides:** Determine the amount of acetamide in given solution by volumetric method. (Standardization of acid must be performed)
3. **Estimation of Ethyl benzoate:** To determine the amount of ethyl benzoate in given solution volumetrically. (Standardization of acid must be performed).

References:

i) Vogel's textbook of practical organic chemistry
ii) Comprehensive Practical Organic Chemistry by V.K. Ahluwalia and Renu Aggarwal

Examination Pattern: At the time of examination student has to perform one experiment either from inorganic sections or organic section. 50% students must be assigned inorganic chemistry and 50% organic chemistry experiment. In case of organic qualitative analysis, after separation of binary mixture any one compound has to be analysed. Distribution of or 35 marks: 30 marks for experimental performance and 5 mark for oral.

Section - C: Industrial Visit

Visit any Chemical / Pharmaceutical / Polymer / Research Institutes / Sugar Factories / waste water treatment plant, etc. and submit report.

Learning Outcomes

1. Verify theoretical principles experimentally

2. Interpret the experimental data on the basis of theoretical principles.
3. Correlate the theory to the experiments. Understand / verify theoretical principles by experiment or explain practical output with the help of theory.
4. Understand systematic methods of identification of substance by chemical methods.
5. Write balanced equation for all the chemical reactions performed in the laboratory.
6. Perform organic and inorganic synthesis and able to follow the progress of the chemical reaction.
7. Set up the apparatus properly for the designed experiments.
8. Perform the quantitative chemical analysis of substances and able to explain principles behind it.

ATTESTED
PRINCIPAL
Smt. Vimlaben Khimji Tejookaya, Arts, Science & Commerce College
Deolali-Camp (Nashik

MVP Samaj's

Smt. Vimlaben Khimji Tejookaya Arts, Science and Commerce College, Deolali Camp, Nashik

Minutes of the Meeting-3

A meeting of IQAC was held on 10th Jan.2020 in IQAC Room to deliberate on following agenda.

Date: -10th Jan.2020

Time: - 10.30 am

Venue: -Office of the Principal

Following Members were present:

1	**Chairperson**	**Sign**
	Prin. Dr. V. J. Medhane	
3	**Teachers to Represent all Levels**	
	Dr.S.B.Singh	
	Dr.K.R.Labhade	
	Mr.M.G.Thakare	
	Mr. D.T. Jadhav	
	Dr.S.L.Erande	
	Dr. K.H.Rakibe	
	Capt. P.C.Gangurde	
	Mr. S.S.Kawale	
4	**Senior Administrative Officers**	
	Dr. V.D. Kapadi [Faculty In Charge- Arts]	
	Dr.S.L.Bhoj [Faculty In Charge- Commerce]	
	Mr. D.S.Shinde [Faculty In Charge- Science]	
	Mr. S.S.Murkute, Librarian	

ATTESTED
PRINCIPAL
Smt. Vimlaben Khimji Tejookaya, Arts, Science & Commerce College Deolali-Camp (Nashik

S.V.K.T. COLLEGE DEOLALI CAMP ★ IQAC ★ INTERNAL QUALITY ASSURANCE CELL

	Dr. S.B. Andhale , CEO	
	Shri. Ravindra Godse, Registrar	
5	**One Nominee Each from Local Society, Alumni, Student**	
	Ms. Godse Asha Chandrabhan (Social worker)	
	Mr. Miss. Gaikwad Harshada (Student)	
6	**Nominee Each from Employers /Industrialists/Stakeholders** Mr. Maharaj Birmane	
7	**Coordinator of the IQAC**	
	Mr. A.S.Kale	

Leave of absence was granted to Mr. Sachinji Pingle, Director, Maratha Vidya Prasarak Samaj , Nashik, Mr. Kahnderao Medhe (Alumni), Mr. S.D.Jadhav, Phy. Director .

- **Agenda: 1**

To review and confirm minutes of last meeting.

Mr. A. S.Kale, IQAC Co-ordinator read out the minutes of meeting held on 7th Sep.2018. The minutes were approved after reviewing.

- **Agenda :- 2**

Planning and execution of seminars and workshops under Quality Improvement Program.

The Coordinators and committees were appointed for the successful organization of seminars/ Conference and workshop sanctioned by SPPU

Proposed by :D.S.Shinde

Seconded by: S.S.Kawale

- **Agenda : 3 Conducting Academic Administrative Audit (AAA)**

AAA committee was directed to look after the preparation of conducting AAA of 2019-20 in the month of April 2020. It was decided to invite external experts for AAA.

Proposed by. Dr. V.J.Medhane

Seconded by: A.S.Kale

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PRINCIPAL
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➢ **Agenda :- 4**

To deliberate and finalise AQAR of 2018-19.

Resolution:-

The content of AQAR of 2018-19 of the college was presented in the meeting. After thorough deliberation some changes were suggested by the IQC coordinator and was put before College Development committee for its approval. Further it was decided to submit it to the NAAC by the end of the academic year through online mode.

➢ **Agenda :- 5**

Organise syllabus revision workshop of S.Y.Bsc. Chemistry, CBCS pattern.

Mr. D.S. Shinde, Head of the Chemistry department was instructed to prepare the program for organisation of workshop for the revision of the syllabus of S.Y.Bsc. Chemistry, CBCS pattern.

Proposed by ; Dr. V.J.Medhane

Seconded by: Mr. A.S. Kale

➢ **Agenda :- 6**

Organisation of Annual Prize Distributions Program and Sports Week

Like every year, on the occasion of birth anniversary of Swami Vivekananda, it was decided that in the last week of the January various competitions were to be organised. Accordingly, all members of Arts circle, Literary Association, Student Welfare Cell and Director of Physical Education were instructed to chalk out the program for it and prepare committees accordingly. Principal Dr.Vijay Medhane also asked for suggesting appropriate chief guest for the Annual Prize Distribution Ceremony.

Proposed by- Dr.V.D..Kapadi

Seconded by – Mr. D S. Shinde

➢ **Agenda:- 5**

Any other issues raised on the spot

Mr. Miss. Gaikwad Harshada, University Representative of the college suggested need of the organisation of workshop of women self-defence.

ATTESTED
PRINCIPAL
Smt. Vimlaben Khimji Tejookaya, Arts, Science & Commerce College Deolali-Camp (Nashik

S.V.K.T. COLLEGE DEOLALI CAMP ★ INTERNAL QUALITY ASSURANCE CELL ★ IQAC

All the members unanimously agreed on the issue and the department of Physical Education and Student Welfare were instructed to look into the matter.

Vote of thanks was proposed by A.S.Kale

A.S.Kale
Coordinator
IQAC

S.V.K.T. COLLEGE DEOLALI CAMP ★ INTERNAL QUALITY ASSURANCE CELL ★
IQAC

Dr.V.J.Medhane
PRINCIPAL
Smt.Vimlaben Khimji Tejookaya,
Arts,Science & Commerce College
Deolali Camp, (Nasik)

S.V.K.T. Arts Science & Commerce College
Deolali Camp Dist Nashik

ATTESTED
PRINCIPAL
Smt. Vimlaben Khimji Tejookaya, Arts,
Science & Commerce College
Deolali-Camp (Nashik

10/03/2010

MVP Samaj's

Smt. Vimlaben Khimji Tejookaya Arts, Science and Commerce College, Deolali Camp, Nashik

Meeting-4

All the members of IQAC are hereby informed that a meeting has been arranged **on Saturday 20th April.2020 in IQAC room at 11.30.am** to deliberate on the following issues mentioned in agenda. Kindly remain present for the same

- **Agenda of the meeting: -**
  1. **Review and confirmation of the minutes of last meeting**
  2. **Preparation of reports of the activities conducted during the academic year**
  3. **Smooth conduct of annual exams**
  4. **Filling up of feed backs from stake holders**
  5. **Filling up of self-appraisals by the teachers**
  6. **Conduct of Academic Administrative Audit (AAA)**
  7. **Annual stock check**
  8. **Finalization of college magazine**
  9. **Any other issues raised on the spot**

A.S.Kale
Coordinator
IQAC

S.V.K.T. COLLEGE DEOLALI CAMP IQAC CELL

Dr.V.J.Medhane
PRINCIPAL
Smt.Vimlaben Khimji Tejookaya,
Arts,Science & Commerce College
Deolali Camp. (Nasik)

S.V.K.T. Arts Science & Commerce College Deolali Camp, Dist Nashik

ATTESTED
PRINCIPAL
Smt. Vimlaben Khimji Tejookaya, Arts, Science & Commerce College Deolali-Camp (Nashik

MVP Samaj's

Smt. Vimlaben Khimji Tejookaya Arts, Science and Commerce College, Deolali Camp, Nashik

Minutes of the Meeting-4

A meeting of IQAC was held on 20th April.2020 in IQAC Room to deliberate on following agenda.

Date: -20th April 2020

Time: - 1.30 am

Venue: -IQAC

Following members were present for the meeting

1	**Chairperson**	**Sign**
	Prin. Dr. V. J. Medhane	
2	**Management Representative**	
	Hon. Shri. Sachin Pingle Director, Maratha Vidya Prasarak Samaj , Nashik	
3	**Teachers to Represent all Levels**	
	Dr.S.B.Singh	
	Dr.K.R.Labhade	
	Mr.M.G.Thakare	
	Mr. D.T. Jadhav	
	Dr. K.H.Rakibe	
	Capt. P.C.Gangurde	
	Mr. S.S.Kawale	
4	**Senior Administrative Officers**	
	Dr. V.D. Kapadi [Faculty In Charge- Arts]	
	Dr.S.L.Bhoj [Faculty In Charge- Commerce]	
	Mr. D.S.Shinde [Faculty In Charge- Science]	

ATTESTED
PRINCIPAL
Smt. Vimlaben Khimji Tejookaya, Arts, Science & Commerce College Deolali-Camp (Nashik

S.V.K.T. COLLEGE DEOLALI CAMP ★ IQAC ★ INTERNAL QUALITY ASSURANCE CELL

	Mr. S.S.Murkute, Librarian	
	Dr. S.B. Andhale , CEO	
	Mr. S.D.Jadhav, Phy. Director	
	Shri. Ravindra Godse, Registrar	
5	**One Nominee Each From Local Society, Alumni, Student**	
6	**Nominee Each from Employers /Industrialists/Stakeholders**	
	Mr. Maharaj Birmane	
7	**Coordinator of the IQAC**	
	Mr. A.S.Kale	

Leave of absence was granted to the following members

Ms. Godse Asha Chandrabhan (Social worker)

Mr. Kahnderao Medhe (Alumni), Dr. S. L Erande and Miss. Gaikwad Harshada (UR),

- **Agenda-1**

  Review and confirmation of minutes of last meeting

  Minutes of the last meeting were reviewed by the members and confirmed.

- **Agenda-2**

  Preparation of reports of various activities conducted during the academic year

  All the committee members were instructed to prepare and submit reports of various activities conducted during the academic year with supporting documents to the IQAC in stipulated time.

  Proposed by: Principal Dr. V.J.Medhane

  Seconded by.: A.S.Kale

- **Agenda-3**

  Smooth Conduct of Annual Exams

  In order to conduct University exams smoothly, Dr.S.B.Andhale CEO was asked to organize a meeting under the chairmanship of the Principal. It was decided that the college should also appoint internal squad for it.

Proposed by: Mr. Bhoj S.L.

Seconded by: - Dr. V.D.Kapadi

ATTESTED
PRINCIPAL
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Deolali-Camp (Nashik

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➢

Agenda-4

Filling up of feed backs from stake holders

It was decided that the feedback committee should deliberate with faculty members about filling up the feedback from various stake holders of the institute in the given format by online mode, analyse it and upload it on the website of the college.

Proposed by: Dr. S.B.Singh

Seconded by: A.S.Kale

➢ **Agenda-5**

Filling up of self-appraisals by the teachers

Format of self-appraisal was prepared by IQAC and distributed to all heads of the department and suggested them to get filled up from every members of their department in stipulated time with supportive documents.

➢ **Agenda 6: Conduct of Academic Administrative Audit (AAA)**

The suggestion and recommendations made by the external committee for AAA were deliberated and analysed and AAA committee of the college was given the task to take steps towards the compliances.

➢ **Agenda-7**

Annual stock check

All the lab assistants and accountants were instructed to check the stock of chemicals, glass wares, journals, stationary etc. and asked to update dead stock register

➢ **Agenda-8**

Any other issues raised during the meeting.

Mr. D.S. Shinde suggested preparation of prospectus for the academic year 2019-20. Prospectus committee was directed to prepare the prospectus for the year 2020-21, get it checked from the IQAC and send it for printing.

A.S.Kale
Coordinator

S.V.K.T. COLLEGE DEOLALI CAMP ★ IQAC ★ INTERNAL QUALITY ASSURANCE CELL

Dr.V.J.Medhane
PRINCIPAL
Smt.Vimlaben Khimji Tejookaya,
Arts,Science & Commerce College
Deolali Camp. (Nasik)

S.V.K.T. Arts, Science & Commerce College Deolali Camp. Dist Nashik

ATTESTED
PRINCIPAL
Smt. Vimlaben Khimji Tejookaya, Arts,
Science & Commerce College
Deolali-Camp (Nashik

MARATHA VIDYA PRASARAK SAMAJ'S
Shrimati Vimlaben Khimji Tejookaya
ARTS, SCIENCE AND COMMERCE COLLEGE
(S.V.K.T. College)
Lam Road, Deolali Camp, Naka No. 6, Nashik - 422 401. (M.S) INDIA
NAAC Re-Accredited "A" Grade with CGPA 3.10
HONOURED WITH "CHHATRAPATI SHIVAJI MAHARAJ VANASHREE PURASKAR-2017"

Dr. Vijay J. Medhane
M.Sc., Ph.D.
Principal

Affiliated to Savitribai Phule Pune University
Id No. PU/NS/ASC/029 (1984)

College Code No.: 0168
Center Code No.: 0168

Junior College Index No.
J-13.07.007

SOP For Feedback Process
1.4.2

1. Please refer Point No 1.4.2 of DVV documents.
2. DVV suggested input for Feedback process reflects that feedback forms are only collected and no further course of action is followed, whereas once again it is hereby submitted that following is the SOP being followed in letter and spirit at this college-

Methodology for Obtaining Feedback

Feedback from students, parents, employers and alumni are obtained through both offline, online and informal methods

Analysis of the Feedback

All the feedback input is analysed, categorized and sent to IQAC for their actions at different levels e.g. Actions at college level or at the level of Parent Institute or University.

Actions Initiated on the Basis of Feedback Inputs

1. As per the feedback from science students proposal for TY. B.Sc. Zoology as a principal subject has been sent to IQAC for further action.
2. Students of FYB.Com requested for an additional division of English medium, and it has been granted to our college.
3. As per the need and request of the students, Language Lab has been upgraded.
4. Google suites and Google classrooms for online classes have been started.
5. As per the request of students for the short courses, proposal was submitted to the University and got the permission to run the following Course: -
   a. Bio Fertilizers and Bio pesticides production
   b. Banking & Finance
   c. Lab Assistant, Lab Technician and Blood Bank Assistant
6. Permission granted to organise S.Y. B.sc Syllabus Restructuring Workshop from SPPU university on 25/2/2020
7. Universities action proof in evaluation Pattern of S.Y.B.SC Chemistry
8. As per the demand of Students and Farmers, a proposal is submitted to Board of Studies of SPPU for course in Mushroom cultivation.

ATTESTED
PRINCIPAL
Smt. Vimlaben Khimji Tejookaya, Arts, Science & Commerce College
Deolali-Camp (Nashik

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