

गुवालियर, दिनांक 18 अगस्त, 2018

Chemistry & Ind. Chem. विभाग

अध्ययन मण्डल की बैठक का कार्यवाही विवरण

नवीन सत्र 2018-19 हेतु Chem. & Ind. Chem. विषय से सम्बंधित

अध्ययन मण्डल की बैठक आज दिनांक 18 अगस्त, 2018 को प्रातः 11:00 बजे

Chem. विभाग में आयोजित की गई, जिसमें निम्नानुसार उपस्थिति रही -

श्रेणी-1

1. डॉ. Mrs. Prabha Maheta

PMH/18.08.18

श्रेणी-2

2. डॉ. Mrs. C. S. Gorsewami

3. डॉ. Mrs. Veena Singh Sahni

18/08/18

4. डॉ. Mrs. Pratima Jain

18/08/18

5. डॉ. Mrs. Vineta Agrawal

18/8/18

6. डॉ. Mrs. Kiran Berman

18.08.18

7. डॉ. Mr. Anand Singh

18/8/18

8. डॉ. R. B. Raipurija - on deployment

9. डॉ. Mrs. Neelam Choubey (Guest faculty)

18.08.18

10. डॉ. Suraj Kadam (Guest faculty)

18.08.18

श्रेणी-3

11. डॉ. एम. एन. दीक्षित

18/8/18

12. डॉ. किशोर अरोरा

अध्ययनमंडल की बैठक की कार्यवाही निम्नानुसार रही -

1. रसायन विज्ञान विषय के स्नातक स्तर के प्रथम एवं द्वितीय वर्ष का पाठ्यक्रम अंक योजना सहित सत्र 2018-2019 हेतु अध्ययनमंडल द्वारा मान्य किया जाता है।
2. रसायन विज्ञान विषय के स्नातक स्तर के पंचम एवं षष्ठ सेमेस्टर का पाठ्यक्रम अंक योजना सहित सत्र 2018-2019 हेतु अध्ययनमंडल द्वारा मान्य किया जाता है।
3. रसायन विज्ञान विषय के स्नातकोत्तर स्तर के प्रथम, द्वितीय, तृतीय, एवं चतुर्थ, सेमेस्टर का पाठ्यक्रम अंक योजना सहित सत्र 2018-2019 हेतु अध्ययनमंडल द्वारा मान्य/अथवा आंशिक संशोधन के साथ मान्य किया जाता है।
4. रसायन विज्ञान विषय की सत्र 2018-2019 में होने वाली परीक्षाओं हेतु सलमान परीक्षकों की सूची को अध्ययनमंडल द्वारा मान्य किया जाता है।
5. विभाग में सत्र 2018-2019 में यदि कोई शोध संगोष्ठी/कार्यशाला/अधिवेशन/अध्ययन भ्रमण आदि के आयोजन का प्रस्ताव है तो उसका विवरण एवं अनुशांसा

1. Lecture series

2. workshops for U.G. and P.G. students

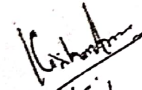
3. Educational tour for Industrial Vth sem. class


P.G. student

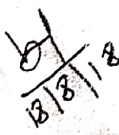
6. यदि विभाग में स्ववित्तीय योजना के तहत कोई पाठ्यक्रम/अतिरिक्त विषय/डिप्लोमा कोर्स/सर्टिफिकेट कोर्स प्रारंभ करने की योजना हो तो उसका विवरण एवं अनुशंसा।

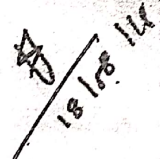
7. यदि अन्य कोई विषय हो तो उसका विवरण एवं अनुशंसा।

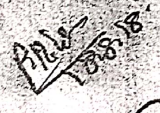
हस्ताक्षर अध्ययन मंडल अध्यक्ष एवं समस्त सदस्य


Dr. Kishor Anna

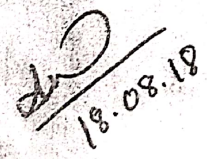

Anil Kumar
18/08/2018

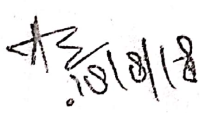

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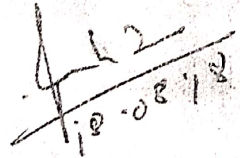

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Department of Higher Education, Govt. of M.P.
B.Sc. Under Graduate Annual Syllabus
 As recommended by Central Board of Studies and approved by the Governor of M.P.

उच्च शिक्षा विभाग, म.प्र. शासन
 बी.एससी. स्नातक कक्षाओं के लिए वार्षिक पाठ्यक्रम
 केन्द्रीय अध्ययन मंडल द्वारा अनुशंसित तथा म.प्र. के राज्यपाल द्वारा अनुमोदित
 Session/सत्र - 2017-18

Scheme of Marks Distribution

Maximum Marks - 100
 Theory -85
 CCE - 15

Paper wise marks distribution

| S.No. | Subject | Paper | Paper Name | Maximum Marks |
|-------|-----------|-------|---------------------|---------------|
| 1. | Chemistry | I | Physical Chemistry | 29 |
| 2. | Chemistry | II | Inorganic Chemistry | 28 |
| 3. | Chemistry | III | Organic Chemistry | 28 |

Section wise marks distribution

Maximum Marks - 29

| S.No. | Section | Total Number of Question | Marks |
|-------|---------|--|-----------------------|
| 1. | A | Objective Questions 05 Questions of multiple choice | 5X0.5 = 2.5 |
| 2. | B | Short Answer Questions 05 Questions with internal choice (one question from each unit) | 5X1.5 = 7.5 |
| 3. | c | Long Answer Questions 05 Questions with internal choice (one question from each unit) | 4X4 = 16. 1X3 = 03 |

Maximum Marks - 28

| S.No. | Section | Total Number of Question | Marks |
|-------|---------|--|----------------------|
| 1. | A | Objective Questions 05 Questions of multiple choice | 5X0.5 = 2.5 |
| 2. | B | Short Answer Questions 05 Questions with internal choice (one question from each unit) | 5X1.5 = 7.5 |
| 3. | c | Long Answer Questions 05 Questions with internal choice (one question from each unit) | 3X4 = 12 2X3 = 06 |

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Session / सत्र - 2017-18

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| Class | B.Sc. I Year |
| Subject | Chemistry |
| Paper | रसायन शास्त्र |
| Max. Marks | II Inorganic Chemistry (28 + CCE 05) = 33 |

| Unit | Syllabus | Periods |
|---------|--|-------------|
| UNIT I | <p>(English)</p> <p>A. Atomic Structure Dual Nature of matter idea of de Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals, Schrodinger wave equation, significance of ψ and ψ^2, quantum numbers, radial and angular wave functions and probability distribution curves, shapes of s, p, d orbitals. Aufbau and Pauli exclusion principles, Hund's multiplicity rule. Electronic configuration of the elements, effective nuclear charge.</p> <p>B. Periodic Properties Atomic and ionic radii, ionization energy, electron affinity and electronegativity-definition, methods of determination or evaluation. trends in periodic table and applications in predicting and explaining the chemical behavior.</p> <p>(हिन्दी)</p> <p>अ. परमाणु संरचना पदार्थ की दोहरी प्रकृति, तरंगीय गति के अभिलक्षण, डी-ब्रॉग्ली संबंध, अनिश्चितता का सिद्धांत, श्रोडिंगर तरंग समीकरण, ψ तथा ψ^2 का भौतिक महत्व, ऑर्बिटल तरंग-फलन तथा प्रायिकता वितरण परमाण्वीय ऑर्बिटलों की आकृति, क्वाण्टम संख्याएँ, हुण्ड का अधिकतम बहुलता का नियम, किसी इलेक्ट्रॉन निकाय की क्वाण्टम संख्याओं का निर्धारण, बहु इलेक्ट्रॉनीय परमाणुओं का ऊर्जा स्तर आरेख, ऑर्बिटलों एवं उपकोशों में इलेक्ट्रॉन क पूरण के नियम, तत्वों का इलेक्ट्रॉनिक विन्यास, पाउली का अपवर्जन नियम।</p> <p>ब. आवर्ती गुण तत्वों के गुणों में आवर्तिता, परमाणु त्रिज्या, आयनिक त्रिज्या, आयनन ऊर्जा या आयनन विभव, इलेक्ट्रॉन बन्धुता, इलेक्ट्रॉन बन्धुता पर प्रभाव डालने वाले कारक, विद्युत ऋणात्मकता।</p> | 12 Lecs. |
| UNIT II | <p>(English)</p> <p>Chemical Bonding-Part I (A) Covalent Bond-Valence bond theory and its limitations. directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions. Valence shell electron pair repulsion (VSEPR) theory to NH_3, H_2O, SF_4, ClF_3, and H_2O, MO theory, homonuclear and</p> | 12 Lecs. |

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| | | heteronuclear (CO and NO) ₄ diatomic molecules, multicenter bonding in electron deficient molecules, bond strength and bond energy | |
| | (हिन्दी) | अ. रासायनिक आबन्धन सह संयोजक बंध संयोजकता बंध सिद्धांत, सहसंयोजक बंध की दिशात्मक विशेषताएँ, संकरण के प्रकार, सरल अर्काबनिक अणुओं एवं आयनों का आकार, संयोजकता को इलेक्ट्रॉन युग्म सिद्धांत NH ₃ , H ₂ O, SF ₄ , ClF ₃ , and H ₂ O. MO सिद्धांत समनाभिकीय एवं विषम नाभिकीय अणुओं में बंधन इलेक्ट्रॉन, इलेक्ट्रॉन न्यून यौगिकों में बहु केन्द्रीय बंधन, बंध सामर्थ एवं बंध ऊर्जा, सहसंयोजक बंध का प्रतिशत आयनिक गुण। | |
| UNIT III | (English) | 1. Chemical Bonding – Part II (B) Ionic Solids-Ionic structures, radius ratio effect and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy and Born-Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarisability of ions. Fajan's rule. Metallic bond-free electron, valence bond and band theories. (C) Weak Interactions-Hydrogen bonding, van der waals forces 2. Chemistry of Noble Gases Chemical properties of the noble gases, chemistry of xenon, structure and bonding in xenon compounds. | 12 Lecs. |
| | (हिन्दी) | 1. रासायनिक आबन्धन – (B एवं C) आयनिक ठोस कुछ प्रारूपिक आयनिक संरचनाएँ, जालक त्रुटियाँ, अर्धचालक, जालक ऊर्जा, सोडियम क्लोराइड के निर्माण की और्जिकी तथा बॉर्न-हैबर चक्र, आयनिक ठोसों की विलेयता एवं विलायकन ऊर्जा, ध्रुवण क्षमता, आयनों की ध्रुवणीयता एवं फ़ायान्स के नियम, धात्विक बन्ध, स्वतन्त्र इलेक्ट्रॉन सिद्धांत या इलेक्ट्रॉन समुद्र मॉडल, संयोजकता बन्ध मॉडल, बैंड मॉडल। दुबल अन्यान्य क्रियाएँ, हाइड्रोजन बन्ध, हाइड्रोजन आबंधों के प्रकार, हाइड्रोजन बन्धन के सिद्धांत, वान्डर वाल्स बल। 2. उत्कृष्ट गैसों का रसायन उत्कृष्ट गैसों का रसायन, उत्कृष्ट गैसों के यौगिक, जीनों के प्रमुख यौगिक। | |
| UNIT IV | (English) | 1. S-Block Elements Comparative study Li and Mg, diagonal relationships, salient features of hydrides, solvation and complexation tendencies including their function in biosystems an introduction to alkyls and aryls. 2. p-Block Elements Part-I Comparative study Be and Al (including diagonal relationship) of groups 13-17 elements, compounds like hydrides, oxides, oxyacids and halides of groups 13-16. | 12 Lecs. |
| | (हिन्दी) | अ. s-ब्लॉक के तत्व समूह 1 के तत्व : क्षार धातुएँ, भौतिक गुणों में समानता तथा क्रमिक परिवर्तन, रासायनिक गुणों में समानता तथा क्रमण, लीथियम का असंगत व्यवहार, लीथियम व मैग्नीशियम में विकर्ण संबंध, जैव तन्त्रों में क्षार धातुओं के कार्य, समूह 2 के | |

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बी.एससी. स्नातक कक्षाओं के लिए पाठ्यक्रम
केन्द्रीय अध्ययन मंडल द्वारा अनुशंसित तथा म.प्र. के राज्यपाल द्वारा अनुमोदित
Session / सत्र - 2017-18

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| Class | B.Sc. I |
| Subject | Chemistry |
| | रसायन शास्त्र |
| Paper | III |
| | Organic Chemistry |
| Max. Marks | Theory 20 Marks CCE 5 Marks Total Marks 35 33 |

| Unit | Syllabus | Periods |
|--------|--|---------|
| Unit I | <p>English</p> <p>Structure and Bonding Hybridization, bond lengths and bond angles, bond energy, localized and delocalized chemical bond inclusion compounds, clathrates, charge transfer complexes, resonance, hyperconjugation, inductive, electromeric, mesomeric and steric effect. Mechanism of Organic Reactions homolytic and heterolytic bond fission. Types of reagents- electrophiles and nucleophiles. Types of organic reaction, energy consideration. Reactive intermediates (carbocations, carbanions, free radicals, carbenes, arynes and nitrenes with examples.) Methods of determination of reaction mechanism (active intermediate products) isotope effects, kinetic and stereochemical studies.)</p> <p>हिन्दी</p> <p>संरचना एवं आबन्धन संकरण, आबन्ध लम्बाई, आबन्ध कोण, आबन्ध ऊर्जा, स्थानित रासायनिक आबन्ध तथा अस्थानित रासायनिक आबन्ध, समावेशन यौगिक, क्लैथ्रेट, आवेश स्थानांतरण संकुल, अनुनाद, अति संयुग्मन, प्रेरणिक प्रभाव, इलेक्ट्रोमेरिक, मेसोमेरिक प्रभाव एवं त्रिविम प्रभाव कार्बनिक अभिक्रियाओं की क्रियाविधि समावेश एवं विषमावेश बन्ध विदलन, अभिकर्मकों के प्रकार, कार्बनिक अभिक्रियाओं के प्रकार, कार्बनिक अभिक्रियाओं में ऊर्जा</p> | 12 |

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| | | विचार, अभिक्रियाशील मध्यवर्ती- कार्बोकेटायन, कार्बोनियन, मुक्त मूलक, कार्बोन, ऐरीन तथा नाइट्रिन, अभिक्रियाओं की क्रियाविधि निर्धारण की विधियां, सक्रिय मध्यवर्ती, गतिक एवं त्रिविम रासायनिक अध्ययन । | |
| Unit II | English | Alkanes and cycloalkanes IUPAC nomenclature of branched and unbranched alkanes, classification of alkanes. Isomerism in alkanes, methods of formation (with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acids), physical properties and chemical reactions of alkanes, conformation of alkanes, Mechanism of free radical halogenation of alkanes, Cycloalkanes-nomenclature, methods of formation, chemical reaction, Baeyer strain theory and its limitation, Theory of strainless rings. The case of cyclopropane ring: Banana bonds, conformation of cycloalkanes. | 12 |
| | हिन्दी | आईयूपीएसी नामकरण - शाखायुक्त एवं शाखाविहिन एल्केन, एल्केन का वर्गीकरण, एल्केन में समावयवता, बनाने की विधियां, वुर्टज अभिक्रिया, कोल्बे अभिक्रिया, कोरे हाउस अभिक्रिया, कार्बोक्सीकरण अम्लों का विकार्बोक्सीकरण, एल्केनो के भौतिक एवं रासायनिक गुणधर्म, एल्केनों में संरूपण, एल्केनों में मुक्त मूलक हैलोजेनीकरण की क्रियाविधि, साइक्लोएल्केन नामकरण, बनाने की विधियां, रासायनिक अभिक्रिया, बेयर का तनाव सिद्धांत एवं उसकी सीमाएं, तनावरहित वलयों का सिद्धांत, साइक्लोप्रोपेन का उदाहरण: केला आबंध, साक्लोएल्केनो में संरूपण । | |
| Unit III | English | Alkenes, Cycloalkenes, Dienes Nomenclature of alkenes, methods of formation-Mechanism of dehydration of alcohols and dehydrohalogenation of alkyl halides, regioselectivity in alcohol dehydration. The Saytzeff rule. Hofmann elimination, physical properties and relative stabilities of alkenes. Chemical reactions of alkenes-mechanism involved in hydrogenation, electrophilic and free radical addition. Markownikoff's rule, hydroboration-oxidation, oxymercuration reduction. Epoxidation, ozonolysis. Polymerization of alkenes. Substitution at the allylic and vinylic positions. Industrial | 12 |

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| | | application of ethylene and propene. Methods of formation, conformation and chemical reactions of cycloalknes. Nomenclature and classification of dienes : isolated, conjugated and cumulated dienes. Structure of allenes and butadiene, methods of formation, polymerisation, Chemical reaction - 1, 2 and 1, 4 addition, Diels- Alder reaction | |
| | हिन्दी | एल्कीन का नामकरण, बनाने की विधियाँ - एल्कोहॉलों के निर्जलीकरण से, एल्किल हैलाइड के विहाइड्रोहैलोजेनीकरण से एल्कोहल के निर्जलीकरण में क्षेत्र वरणात्मकता, सेटजफ नियम, हाफमेन विलोपन, एल्कीनों के भौतिक गुणधर्म एवं आपेक्षिक स्थायित्व। एल्कीनों के गुणधर्म, एल्कीन के हाईड्रोजेनीकरण के इलेक्ट्रोफिलिक एवं मुक्त मूलक योग की क्रियाविधि, मार्कोनीकोफ नियम, हाइड्रोबोरेशन आक्सीकरण, ऑक्सीमरक्युरिकरण अपचयन, इपो आक्सीकरण, ओजोनीकरण। एल्कीन का बहुलीकरण, एलायलिक एवं विलायलिक प्रतिस्थापन, एथिनीन और प्रोपीन के औद्योगिक उपयोग। साइक्लोएल्कीन के बनाने की विधियाँ, संरूपण, रासायनिक अभिक्रियाएं। डाइन का नामकरण वर्गीकरण, विलगित, संयुग्मित तथा संचयी, डाईन्स के बनाने की विधि, एलीन्स एवं ब्यूटाडाइन की संरचना, बनाने की विधियाँ बहुलीकरण, रासायनिक गुण-1,2 तथा 1, 4 योग, डील्स ऐल्डर अभिक्रिया | |
| Unit IV | English | Alkynes and Alkyl Halides Nomenclature, structure and bonding in alkynes. Methods of formation. Chemical reactions, acidity of alkynes. Mechanism of electrophilic and nucleophilic addition reaction, hydroboration oxidation, metal-ammonia reduction, oxidation and polymerization Nomenclature and classification of alkyl halides, methods of formation; chemical reactions. Mechanisms of nucleophilic substitution reaction of alkyl halides, S _N ¹ and S _N ² reaction with energy profile diagrams, Elimination reaction Polyhalogen compounds: methods of preparation and properties of Chloroform and carbon tetrachloride. | 12 |
| | हिन्दी | एल्काईन एवं एल्किल हैलाइडरा एल्काईन का नामकरण, संरचना एवं बन्धन। एल्काईनों को बनाने की विधियाँ एल्काईनों की अम्लता एवं रासायनिक अभिक्रियाएं। योगात्मक अभिक्रियाओं की इलेक्ट्रॉनस्नेही एवं नाभिक्रस्नेही क्रियाविधि, हाइड्रोबोरेशन आक्सीकरण, धातु अमोनिया अपचयन, आक्सीकरण एवं बहुलीकरण | |

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Department of Higher Education, Govt. of M.P.
B.Sc. Under Graduate Annual Syllabus
As recommended by Central Board of Studies and approved by the Governor of M.P.

उच्च शिक्षा विभाग, म.प्र. शासन
बी.एससी. स्नातक कक्षाओं के लिए वार्षिक पाठ्यक्रम
केन्द्रीय अध्ययन मंडल द्वारा अनुशंसित तथा म.प्र. के राज्यपाल द्वारा अनुमोदित
Session / सत्र - 2018-19

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| Class | B.Sc. II Year |
| Subject | Chemistry रसायन शास्त्र |
| Paper | I |
| | Physical Chemistry |
| Max. Marks | 29 +CCE (05) |

| Unit | Syllabus | Period |
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| UNIT I | <p>A. Thermodynamics: Basic concepts of thermodynamics. First law, Second law of Thermodynamics: Need for the law, Different statements of the law, Carnot cycle and its efficiency. Carnot theorem. Thermodynamic scale of temperature. concept of Entropy: entropy as a state function. entropy as a function of P&T and T&V entropy change in physical change. Clausius inequality. entropy as criteria of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases. Nernst heat theorem. statement and concept of residual entropy. evaluation of absolute entropy from heat capacity data Gibbs and Helmholtz functions. Gibbs function (G) and Helmholtz function (H) as a thermodynamic quantities. A and G as a criteria for thermodynamic equilibrium and spontaneity their advantage over entropy change.</p> <p>B. Thermochemistry: Standard state, standard enthalpy of formation: Hess's Law of heat summation and its application. Enthalpy of neutralization.</p> | 12 Leccs. |
| | <p>(English)</p> | |
| | <p>अ. ऊष्मागतिकी: ऊष्मागतिकी की मूल अवधारणाएँ, प्रथम नियम, ऊष्मागतिकी का द्वितीय नियम: नियम की आवश्यकता, नियम के विभिन्न कथन, कार्नो चक्र, इसकी दक्षता एवं कार्नो प्रमेय, तापमान का ऊष्मागतिकी पैमाना। एण्ट्रॉपी की अवधारणा: एण्ट्रॉपी-अवस्था फलन के रूप में एण्ट्रॉपी T&P एवं T&V अवस्था फलन के रूप में, भौतिक परिवर्तन में एण्ट्रॉपी परिवर्तन, क्लॉसियस असमता एण्ट्रॉपी ऊष्मागतिक साम्य और स्वतः प्रवर्तित की कसौटी के रूप में. आदर्श गैसों में एण्ट्रॉपी परिवर्तन एवं गैसों को मिलाने की एण्ट्रॉपी, नर्नस्ट ऊष्मा प्रमेय कथन तथा अवशिष्ट एण्ट्रॉपी की अवधारणा, ऊष्माधारिता आँकड़ों से परम एण्ट्रॉपी का निर्धारण या परिकलन, गिब्स तथा हेल्महोल्ट्स फलन, गिब्स फलन (G) तथा (H) हेल्महोल्टज फलन, फलन ऊष्मागतिक राशियों के रूप में, (A) तथा (G) ऊष्मागतिक साम्य और स्वतः प्रवर्तित की कसौटी के रूप में, एण्ट्रॉपी परिवर्तन की तुलना में इनके लाभ। ब. ऊष्मा रसायन : प्रामाणिक अवस्था, प्रामाणिक सम्मवन की एन्थैल्पी, हेस का ऊष्मा संकलन का नियम एवं इसके अनुप्रयोग, उदासीनीकरण की एन्थैल्पी।</p> | |
| | <p>(हिन्दी)</p> | |

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| UNIT II | (English) | <p>Phase equilibrium: Statement and the meaning of terms: phase component and the degree of freedom, thermodynamic derivation of the Gibbs phase rule. one component system: water, CO₂ and S system. two component system: solid-liquid equilibrium, simple eutectic system: Bi-Cd; Pb-Ag system. Desilverisation of lead.</p> <p>Solid solution: Systems in which compound formation with congruent melting point (Zn-Mg) and incongruent melting point. (NaCl-H₂O) and (CuSO₄-H₂O) system. Freezing Mixtures: acetone-dry ice.</p> <p>Liquid-Liquid mixtures: Ideal liquid mixtures. Raoult's and Henry's law. Non-ideal system, azeotropes: HCl-H₂O and ethanol water system.</p> <p>Partial miscible liquids: Phenol-water, trimethylamine-water and nicotine-water system. Lower and upper consolute temperature. Immiscible Liquids, steam distillation. Nernst distribution law: thermodynamic derivation, applications.</p> | 1 Lec. |
| | (हिन्दी) | <p>प्राक्स्था साम्य : कथन एवं विभिन्न पदों का अर्थ, प्राक्स्था, घटक तथा स्वतंत्रता की कोटि, गिब्स प्राक्स्था नियम का ऊष्मागतिक व्युत्पन्न, एक घटक तंत्र-जल तंत्र, CO₂ एवं सल्फर तंत्र, दो घटक तंत्र-वोस-द्रव साम्य, सरल गलन क्रांतिक तंत्र-बिस्मथ-कैडमियम तंत्र, सीसा-चाँदी तंत्र, सीसे का विरजतीकरण।</p> <p>वोस विलयन : तंत्र जिनमें सर्वांगसम गलनांक वाले यौगिक बनते हैं: (Zn-Mg) तथा जिसमें असर्वांगसम गलनांक वाले यौगिक बनते हैं (NaCl-H₂O) एवं (CuSO₄-H₂O) तंत्र हिम मिश्रण-एसिटोन-शुष्क बर्फ।</p> <p>द्रव-द्रव मिश्रण : आदर्श द्रव मिश्रण, राउल्ट एवं हेनरी का नियम, अनादर्श तंत्र, स्थिर वक्रनांकी मिश्रण : HCl-H₂O तथा एथिल अल्कोहल-जल।</p> <p>आंशिक मिश्रणीय द्रव : फीनॉल-जल, ट्राइमेथिल ऐमीन-जल एवं निकोटिन-जल तंत्र, निम्न तथा उच्च सविलेय-सविलयन तापक्रम, अमिश्रणीय द्रव, भाप आसवन, नर्नस्ट का वितरण नियम : ऊष्मागतिक व्युत्पन्न, अनुप्रयोग।</p> | |
| UNIT III | (English) | <p>Electrochemistry I</p> <p>Electrical transport, conduction in metals and in electrolyte solutions. specific and equivalent conductivity, measurement of equivalent conductance, effect of dilution on conductivity, migration of ions and Kohlrausch law, Arrhenius theory of electrolyte dissociation and its limitations. Weak and strong electrolytes, Ostwald's dilution law, theory of strong electrolytes. DHO theory and equation. transport numbers, determination of transport numbers by Hittorf method and moving boundary method.</p> | 12 Lects. |
| | (हिन्दी) | <p>विद्युत रसायन-I</p> <p>विद्युतीय अभिगमन, धातुओं एवं विद्युत अपघटक विलयनों में चालन, विशिष्ट एवं तुल्यांकी चालकता, तुल्यांकी चालकता का मापन, चालकता का तनुता पर प्रभाव, आयनों का अभिगमन एवं कोहलरास नियम, आर्हेनीयस का विद्युत अपघटन का सिद्धांत एवं सीमाएँ, प्रबल एवं दुर्बल विद्युत अपघट्य, आष्टवाल्ड का तनुता नियम, प्रबल विद्युत अपघट्य का सिद्धांत, DHO सिद्धांत एवं समीकरण, अभिगमनांक, हीटार्फ एवं गतिमान सीमा विधि द्वारा इसका निर्धारण।</p> | |
| UNIT IV | (English) | <p>Electrochemistry II</p> <p>Types of reversible electrodes: Gas - metal ion, metal-metal ion, metal - insoluble salt anion and redox electrodes.</p> | 12 Lects. |

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| | <p>Electrodes reactions, Nerst equation, derivation of cell EMF and single electrode potential. standard hydrogen electrode, reference electrodes, standard electrode potential, electrochemical series and its significance.</p> <p>Electrolytic and Galvanic cells. reversible and irreversible cells, conventional representation of electrochemical cells.</p> <p>Concentration cell with and without transport, liquid junction potential, application of concentration cells, valancy of ions, solubility product and activity coefficient, potentiometric titration. Definition of pH and pK. determination of pH using hydrogen. quinhydrone and glass electrodes by potentiometric methods.</p> <p>Buffers: mechanism of buffer action, Henderson - Hazal equation, hydrolysis of salts.</p> |
| (हिन्दी) | <p>विद्युत रसायन -II</p> <p>उत्क्रमणीय इलेक्ट्रोडों के प्रकार : गैस-धातु आयन, धातु-धातु आयन, धातु अविलेय लवण, ऋणायन एवं रेडॉक्स, इलेक्ट्रोड। इलेक्ट्रोड अभिक्रियाएं नर्नस्ट, समीकरण, सेल वि.वा.ब. एवं एकल इलेक्ट्रोड विभव का निर्धारण, मानक हाइड्रोजन इलेक्ट्रोड, संदर्भ इलेक्ट्रोड मानक इलेक्ट्रोड विभव, विद्युत रसायन श्रेणी एवं उसका महत्व, विद्युतीय एवं गैल्वनी सेल: उत्क्रमणीय एवं अनुत्क्रमणीय सेल, वैद्युत रासायनिक सेल का परम्परागत प्रस्तुतीकरण।</p> <p>सान्द्रता सेल, अभिगमन एवं बिना अभिगमन के द्रव संधि विभव, सान्द्रता सेल के अनुप्रयोग, आयनों की संयोजकता, विलेयता गुणनफल एवं सक्रियता गुणांक, विभवमापी अनुमापन, pH एवं pK की परिभाषा, हाइड्रोजन, विचन हाइड्रोजन एवं कॉच इलेक्ट्रोडों के प्रयोग द्वारा pH का निर्धारण।</p> <p>बफर: बफर क्रिया की क्रियाविधि, हेन्डरसन हजल समीकरण। लवणों का जल अपघटन।</p> |
| UNIT V | <p>(English)</p> <p>Surface Chemistry: Adsorption, adsorption and absorption, types of adsorption. adsorption of gases and liquids in solid adsorbent. Freundlich and Langmuir adsorption isotherms, surface area and determination of surface area.</p> <p>Catalysis: characteristics of catalyzed reactions, classification of catalysis, application of catalysts, miscellaneous examples.</p> <p>(हिन्दी)</p> <p>अ. पृष्ठ रसायन : अधिशोषण, अधिशोषण एवं अवशोषण, अधिशोषण के प्रकार टोस अधिशोषकों पर गैसों तथा द्रवों का अधिशोषण, फ्रेण्डलिच तथा लेग्म्योर अधिशोषण समतापी प्रक्रम, पृष्ठ क्षेत्र एवं पृष्ठ क्षेत्र का निर्धारण।</p> <p>ब. उत्प्रेरण: उत्प्रेरित अभिक्रियाओं के अभिलक्षण, उत्प्रेरण का वर्गीकरण, उत्प्रेरक के अनुप्रयोग, विविध उदाहरण।</p> |

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Department of Higher Education, Govt. of M.P.
B.Sc. Under Graduate Annual Syllabus
 As recommended by Central Board of Studies and approved by the Governor of M.P.

उच्च शिक्षा विभाग, म.प्र. शासन
 बी.एससी. स्नातक कक्षाओं के लिए वार्षिक पाठ्यक्रम
 केन्द्रीय अध्ययन मंडल द्वारा अनुशंसित तथा म.प्र. के राज्यपाल द्वारा अनुमोदित
 Session/सत्र - 2018-19

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| Class | B.Sc. II Year |
| Subject | Chemistry |
| | रसायन शास्त्र |
| Paper | II |
| | Inorganic Chemistry |
| Max. Marks | (28 + CCE 05) = 33 |

| Unit | Syllabus | Pers |
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| UNIT I | (English) Chemistry of Elements of First Transition Series. Characteristic properties of d-block elements. Properties of the elements of the first transition series, their binary compounds such as Carbides, Oxides and Sulphides. Complexes illustrating relative stability of their oxidation states, co-ordination number and geometry. | 12 Leccs. |
| | (हिन्दी) प्रथम संक्रमण श्रेणी के तत्वों का रसायन डी-समूह के तत्वों की विशिष्टताएँ, प्रथम संक्रमण श्रेणी के तत्वों के गुण व उनके द्विअंगी यौगिकों जैसे कार्बाइड, ऑक्साइड व सल्फाइड एवं संकर यौगिक, ऑक्सीकरण अवस्था के स्थायित्व, सहसंयोजन संख्या एवं ज्यामिति का उदाहरण सहित अध्ययन। | |
| UNIT II | (English) Chemistry of Elements of Second and Third Transition Series. General characteristics, comparative treatment with their 3d-analogues in respect of ionic radii, oxidation states, magnetic behaviour, spectral properties and stereochemistry. | 12 Leccs. |
| | (हिन्दी) द्वितीय एवं तृतीय संक्रमण श्रेणी के तत्वों का रसायन सामान्य गुण एवं इनके आयनिक त्रिज्या, ऑक्सीकरण अवस्था, चुम्बकीय गुण एवं त्रिविम रसायन के 3-डी तत्वों से तुलनात्मक गुणों का अध्ययन। | |
| UNIT III | (English) A. Co-ordination Compounds Werner's co-ordination theory and its experimental verification, effective atomic number concept, chelates, nomenclature of co-ordination compounds, isomerism in co-ordination compounds, valence bond theory of transition metal complexes. B. Oxidation and Reduction Use of redox potential data : analysis of redox cycle, redox stability in water : Frost, Latimer and Pourbaix diagrams. Principles involved in the extraction of elements. | 1- Leccs. |

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| | (हिन्दी) | <p>अ. उप-सहसंयोजक यौगिक वर्नर का उपसहसंयोजक सिद्धांत एवं इसका प्रायोगिक सत्यापन, प्रभावी परमाणु संख्या अवधारणा, कीलेट, संकर यौगिकों का नामकरण, संकर यौगिकों में समावयवता, संक्रमण धातु संकुलों का संयोजकता बन्ध सिद्धांत।</p> <p>ब. ऑक्सीकरण एवं अपचयन रेडॉक्स विभव ऑक्झा का प्रयोग-रेडॉक्स चक्र का विश्लेषण, जल में रेडॉक्स स्थायित्व-फास्ट, लेटिमर एवं पोरबेक्स आरेख, तत्वों के निष्कर्षण में लागू होने वाले सिद्धांत।</p> | |
| UNIT IV | (English) | <p>A. Chemistry of Lanthanide Elements Electronic structure, oxidation states, ionic radii and lanthanide contraction, complex formation, occurrence and isolation, lanthanide compounds.</p> <p>B. Chemistry of Actinides General features and chemistry of actinides, chemistry of separation of Np, Pu and Am from U, similarities between the later actinides and the later lanthanides.</p> | 12 Lecs. |
| | (हिन्दी) | <p>अ. लैन्थेनाइड तत्वों का रसायन इलेक्ट्रॉनिक संरचना, ऑक्सीकरण अवस्थाएँ एवं आयनिक त्रिज्याएँ, लैन्थेनाइड संकुचन, संकुल निर्माण, प्राप्ति एवं पृथक्करण, लैन्थेनाइड यौगिक।</p> <p>ब. ऐक्टिनाइड तत्वों का रसायन सामान्य लक्षण एवं ऐक्टिनाइड तत्वों का रसायन, U, से Np, Pu तथा Am का पृथक्करण, पश्च ऐक्टिनाइड एवं पश्च लैन्थेनाइड में समानताएँ।</p> | |
| UNIT V | (English) | <p>A. Acids and Bases Arrhenius, Bronsted- Lowry, the Lux-Flood, solvent system and Lewis concepts of acids and bases.</p> <p>B. Non-aqueous Solvents Physical properties of a solvent, types of solvents and their general characteristics, reactions in non-aqueous solvents with reference to liquid NH₃ and liquid SO₂.</p> | 12 Lecs. |
| | (हिन्दी) | <p>अ. अम्ल एवं क्षारक अम्ल एवं क्षारकों का आरहीनियस, ब्रान्स्टेड-लॉरी, लक्स-फ्लड विलायक तन्त्र एवं लुईस की अभिधारणा।</p> <p>ब. अजलीय विलायक विलायक के भौतिक गुण, विलायकों के प्रकार एवं उनकी सामान्य विशिष्टताएँ, द्रव अमोनिया (NH₃) एवं द्रव (SO₂) के संदर्भ में अजलीय विलायकों में अभिक्रियाएँ।</p> | |

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Department of Higher Education, Govt. of M.P.
B.Sc. Undergraduate Annual Syllabus
As recommended by Central Board of Studies and approved by the Governor of M.P.

उच्च शिक्षा विभाग, म.प्र. शासन
 बी.एससी. स्नातक कक्षाओं के लिए पाठ्यक्रम
 केन्द्रीय अध्ययन मंडल द्वारा अनुशंसित तथा म.प्र. के राज्यपाल द्वारा अनुमोदित
 Session/सत्र - 2017-18

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| Class | B.Sc. II |
| Subject | Chemistry रसायन शास्त्र |
| Paper | III Organic Chemistry |
| Max. Marks | Theory 20 Marks CCE 5 Marks Total Marks 34 23 |

| Unit | Syllabus | Periods |
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| UNIT I | (English) Electromagnetic Spectrum: Absorption spectra Ultraviolet (UV) absorption spectroscopy- absorption laws(Beer Lambert Law), Molar absorptivity, Presentation and analysis of UV spectra, Types of electronic transitions, Effect of conjugation. Concept of chromophore and auxochrome. Bathochromic, hypsochromic, Hyperchromic and hypochromic shifts. UV spectra of conjugated enes and enones. Infra red (IR) absorption spectroscopy- Molecular vibrations, Hookes law, selection rules, intensity and position of IR bands, Measurement of IR spectrum, finger print region, characteristic absorption of various functional groups and interpretation of IR spectra of simple organic compounds. | 12 Lectures |
| इकाई - 1 | हिन्दी <u>विद्युत चुंबकीय स्पेक्ट्रम अवशोषण स्पेक्ट्रम</u> <u>परावैगनी (UV) अवशोषण स्पेक्ट्राभित्तीय -</u> अवशोषण के नियम (वियर एवं लेम्बर्ट नियम) आणविक अवशोषिता, परावैगनी स्पेक्ट्रा का प्रस्तुतिकरण एवं विश्लेषण , इलेक्ट्रानिक संक्रमण के प्रकार , संयुग्मन का प्रभाव । वर्णमूलक तथा वर्णवर्धक की संकल्पना , वर्णापकरण , वर्णोत्कर्ष , अतिवर्णक तथा अधोवर्णक विस्थापन। संयुग्मित डोइन तथा इनोन का परावैगनी स्पेक्ट्रा । <u>अवरक्त स्पेक्ट्राभित्तीय -</u> आणविक कंपन , हुक का नियम , वरण नियम, अवरक्त बैंड की स्थिति एवं तीव्रता अवरक्त स्पेक्ट्रा का मापन , फिंगरप्रिंट क्षेत्र, विभिन्न क्रियात्मक समूहों के के चारित्रिक अवशोषण तथा सरल कार्बनिक यौगिकों के अवरक्त स्पेक्ट्रा का निर्धारण । | |
| UNIT II | (English) A - Alcohols: Classification and nomenclature. Monohydric alcohols- Nomenclature, methods of formation , reduction of aldehydes, | |

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| | | <p>ketones, carboxylic acids and esters. Hydrogen bonding, acid nature and reactions of alcohols.</p> <p>Dihydric alcohols-nomenclature, methods of formation, chemical reactions of vicinal glycols, oxidative cleavage[Pb(OAc)₄ and HIO₄] and pinacol-pinacolone rearrangement. Trihydric alcohols-Nomenclature, methods of formation, Chemical reactions of glycerols,</p> <p>B. Phenols: Nomenclature, structure and bonding. Preparations of phenols, Physical properties and acidic character, comparative acidic strength of alcohols and phenols, resonance stabilization of phenoxide ions. Reactions of phenols- Electrophilic aromatic substitution, acylation and carboxylation. Mechanism of Fries rearrangement, Claisen rearrangement, Gattermann synthesis, Hauben-Hoesche reaction, Lederer Manasse reaction and Reimer Teiman reaction.</p> | |
| <p>इकाई - 2</p> | <p>हिन्दी</p> | <p>अ - ऐल्कोहल वर्गीकरण एवं नामकरण :</p> <p>मोनोहाइड्रिक ऐल्कोहल - नामकरण एल्डीहाइड, कीटोन , कार्बोक्सिलिक अम्ल एवं एस्टर के अपचयन द्वारा ऐल्कोहल के विरचन की विधिया, हाइड्रोजन बंध, अम्लीय गुण , ऐल्कोहल की अभिक्रियाएँ ।</p> <p>डाइहाइड्रिक ऐल्कोहल - नामकरण , विरचन की विधियां , विसिलन (Vicinal) ग्लाइकाल की रासायनिक अभिक्रियाएँ , आक्सीकारकीय विदलन [Pb(OAc)₄] एवं HIO₄] एवं पिनेकॉल - पिनाफोलोन पुर्नविन्यास.</p> <p>ट्राइहाइड्रिक ऐल्कोहल - नामकरण एवं विरचन की विधियां , ग्लिसराल की रासायनिक अभिक्रियाएँ ।</p> <p><u>ब - फीनोल -</u></p> <p>नामकरण , संरचना एवं आबंधन , विरचन की विधियां , भौतिक गुण एवं अम्लीय स्वभाव , फीनाक्साइड का अनुनादी स्थायित्व , ऐल्कोहल एवं फीनोल की तुलनात्मक अम्लीय सामर्थ्य , फीनोल की अभिक्रियाएँ इलेक्ट्रान स्नेही ऐरोमेटिक प्रतिस्थापन , ऐसीटिलीकरण , कार्बोक्सिलिकरण , फ्राइज पुर्नविन्यास , क्लेजन पुर्नविन्यास , गॉटरमान संश्लेषण , हाउबेन हॉश अभिक्रिया , लेडरर मनासे अभिक्रिया एवं राइमर - टाइमन अभिक्रियाओं की क्रियाविधि</p> | <p>12 Lectures</p> |
| <p>Unit III</p> | <p>English</p> | <p>Aldehydes and ketones: Nomenclature, structure of the carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of</p> | |

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| | | aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1,3dithianes, synthesis of ketones from nitriles and from carboxylic acids. Physical properties. Mechanism of nucleophilic additions to carbonyl group with particular emphasis on benzoin, aldol, Perkin and Knoevenagel condensations. Condensation with ammonia and its derivatives. Wittig and Mannich reaction. Use of acetals as protecting groups, Oxidation of aldehydes, Baeyer-Villiger oxidation of ketones, Cannizzaro reaction, MPV, Clemmensen, Wolf Kischner, LiAlH_4 and NaBH_4 reductions. Halogenation of enolizable ketones. An introduction to α , β unsaturated aldehydes and ketones. | |
| इकाई - 3 | हिन्दी | एल्डीहाइड एवं कीटोन नामकरण एवं कार्बोनिक समूह की संरचना, एल्डीहाइड एवं कीटोन का संश्लेषण विशेषतः - अम्ल क्लोराइड से एल्डीहाइड, 1,3 डाइथाएन्स से एल्डीहाइड एवं कीटोन, नाइट्रिल तथा कार्बोक्सिलिक अम्ल से कीटोन का संश्लेषण, भौतिक गुणधर्म। कार्बोनिल समूह में नाभिकस्नेही योग अभिक्रियाओं की क्रियाविधि - बेंजोइन, ऐल्डोल, परकिन एवं नोइवेनजेल संघनन की विशिष्ट संदर्भ में अमोनिया एवं इसके व्युत्पन्नों के साथ संघनन, विटिंग अभिक्रिया, मैनिश अभिक्रिया। अभिरक्षक समूह के रूप में ऐसिटिल का उपयोग एल्डीहाइड का उपचयन, कीटोन का बेयर-विलिजर उपचयन, केनिजारे अभिक्रिया, मीरवीन पौड्रोफ, क्लेमेशन बुल्फ - किशनर, LiAlH_4 एवं NaBH_4 उपचयन, इनोलीकरण कीटोन का हैलोजनीकरण α β असंतृप्त एल्डीहाइड एवं कीटोन का परिचयात्मक ज्ञान। | 12 Lectures |
| Unit IV | English | A Carboxylic Acids: Nomenclature, structure and bonding, physical properties and acidity of carboxylic acids, Effects of substituents on acid strength. Preparation of carboxylic acids and reactions of carboxylic acids. Hell-Volhard-Zelinsky reaction. Synthesis of acid chlorides, esters and amides. Reduction of carboxylic acids. Mechanism of decarboxylation. Methods of formation and chemical reactions of halo acids, hydroxyl acids, Malic, Tartaric and citric acids. Methods of formation and chemical reactions of unsaturated monocarboxylic acids. Dicarboxylic acids-Methods of formation and effect of heat and dehydrating agents. B Ether: Nomenclature of ethers and methods of their formation. Physical properties and chemical reactions. Cleavage and auto oxidation, Ziesels method. | 12 Lectures |
| इकाई - 4 | हिन्दी | अ - कार्बोक्सिलिक अम्ल नामकरण, संरचना एवं आबंधन, भौतिक गुणधर्म, कार्बोक्सिलिक अम्लों की अम्लीयता, अम्लीयता पर प्रतिस्थापी का प्रभाव, कार्बोक्सिलिक अम्ल की अभिक्रियाएँ, हेल - वोल्हार्ड- जेलींस्क अभिक्रिया, अम्ल क्लोराइड, एस्टर एवं ऐमाइड का विरचन, कार्बोक्सिलिक अम्ल का अपचयन, विकार्बोक्सिलिकरण की क्रियाविधि। हैलो अम्लों का विरचन एवं रासायनिक अभिक्रियाएँ, हाइड्रोक्सी अम्ल मैलिक, टारटरिक एवं सिट्रिक अम्ल। असंतृप्त मोनाकार्बोक्सिलिक अम्ल का विरचन एवं रासायनिक अभिक्रियाएँ। डाईकार्बोक्सिलिक अम्ल - विरचन की विधियाँ एवं ताप एवं निर्जलीकरण अभिकर्मकों का प्रभाव। ब - ईथर ईथर का नामकरण एवं विरचन की विधियाँ, भौतिक गुण, रासायनिक अभिक्रियाएँ, विदलन एवं स्वउपचयन, जीजल्स विधि। | |
| Unit V | English | Organic compounds of Nitrogen: Preparation of nitro-alkanes and nitro-arene. Chemical reactions of nitro-alkanes. Mechanism of | 12 Lectures |

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| | | <p>nucleophilic substitution in nitro-arenes and their reductions in neutral acidic and alkaline media. Halonitroarenes; reactivity, structure and nomenclature of amines, physical properties, stereochemistry of amines, separation of mixture primary, secondary and tertiary amines. Structural features effecting basicity of amines. Amine salts as phase transfer catalyst. Preparation of alkyl and aryl amine (reduction of nitro compounds, nitriles), reductive amination of aldehydic and ketonic compounds. Gabriel-Phthalamide reaction Hoffmann-Bromamide reaction. Reactions of Amines. Electrophilic aromatic substitution in aryl amines, reactions of amines with nitrous acids. Synthetic transformations of aryl diazonium salts, Azo coupling.</p> | |
| इकाई - 5 | हिन्दी | <p><u>नाइट्रोजन के कार्बनिक यौगिक :</u> नाइट्रोएल्केन तथा नाइट्रोऐरीन्स के बनाने की विधि । नाइट्रोएल्केन की रासायनिक अभिक्रियायें । नाइट्रोएल्केन में नाभिकस्नेही प्रतिस्थापन अभिक्रियाओं की क्रियाविधि तथा अन्तीय, उदात्तीय एवं क्षारीय माध्यम में अपचयन । हैलोनानाइट्रोऐरीन्स क्रियाशीलता । ऐमीन के नामकरण तथा संरचना । ऐमीन के भौतिक गुण तथा त्रिविम रसायन । प्राथमिक द्वितीयक एवं तृतीयक ऐमीन के मिश्रण का पृथक्करण । ऐमीनों की क्षारकता पर संरचना का प्रभाव । प्रावस्था रूपंतर उत्प्रेरकों के रूप में ऐमीन लवण । एल्काइल तथा ऐराइल ऐमीन के विरचन की विधि । (नाइट्रो एवं नाइट्रिल यौगिकों का अपचयन) ऐल्डीहाइड एवं कीटोनिक अवयवों का अपचयनी ऐमीनीकरण : ग्रैबियल थैलिमाइड अभिक्रिया , हाफमैन ब्रोमाइड अभिक्रिया । ऐमीन की अभिक्रियायें ऐरिल ऐमीन में इलेक्ट्रान स्नेही ऐरोमैटिक प्रतिस्थापन , ऐमीन की नाइट्रस अम्ल से अभिक्रिया । ऐरिल डाइजोनियम लवण के सारलौषिक रूपांतरण , ऐजो युग्मन ।</p> | |

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Department of Higher Education, Govt. of M.P.
B.Sc. Under Graduate Annual System Syllabus

As recommended by Central Board of studies and
approved by the Governor Madhya Pradesh
(Academic Session 2018-2019)

Class - B.Sc. II Year
Subject - Chemistry
Paper - Practical
Max. Marks : 50

Time : 6Hours

Inorganic Chemistry

12 Marks

- (i) Analysis of inorganic mixture containing five radicals with at least on interfering radical
- (ii) Determination of acetic acid in commercial vinegar using NaOH
- (iii) Redox titrations
- (iv) Estimation of hardness of water by EDTA.

Physical Chemistry

12 Marks

- (i) Determination of transition temperature of given substance by thermometric method.
- (ii) To determine the enthalpy of neutralization of strong acid, strong base.
- (iii) Verification of Beer's- Lambert law.
- (iv) To study the phase diagram of two component system by cooling curve method.

Organic Chemistry (Any two)

12 Marks

- (i) Identification of an organic compound through the functional group analysis, determination of melting point and preparation of suitable derivatives.
- (ii) Use of Paper chromatography / Thin layer chromatography: determination of R_f values, separation and identification of organic compounds.
 - a. Separation of green leaf pigments (spinach leave may be used)
 - b. Separation of dyes.

Viva - voce

6 Marks

Record

8 Marks

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उच्च शिक्षा विभाग, म.प्र. शासन
बी.एससी. स्नातक कक्षाओं के लिए वार्षिक पाठ्यक्रम

केन्द्रीय अध्ययन मंडल द्वारा अनुशंसित तथा म.प्र. के राज्यपाल द्वारा अनुमोदित
(शैक्षणिक सत्र 2018-19)

कक्षा - बी.एससी. द्वितीय
विषय - रसायन शास्त्र
पेपर - प्रायोगिक रसायन

अधिकतम अंक : 50

समय : 6 घंटे

अकार्बनिक रसायन

12 अंक

1. अकार्बनिक मिश्रण का विश्लेषण जिसमें पांच मूलक हो तथा कम से कम एक बाधाकारी मूलक हो
2. NaOH का उपयोग करते हुए सिरके में एसिटिक अम्ल का निर्धारण
3. रेडॉक्स अनुमापन
4. EDTA द्वारा जल की कठोरता का निर्धारण

भौतिक रसायन

12 अंक

1. उष्मागति तथा डायलमेट्रिक विधि द्वारा दिये हुए पदार्थ का संक्रमण ताप ज्ञात करना
2. प्रबल अम्ल / प्रबल क्षार के लिये उदासीनीकरण उष्मा ज्ञात करना
3. बीयर-लेम्बर्ड नियम का सत्यापन
4. शीतलन वक्र विधि द्वारा दो घटकीय तंत्र के प्रावस्था आरेख का अध्ययन

कार्बनिक रसायन

12 अंक

1. क्रियात्मक समूह द्वारा कार्बनिक योगिक की पहचान गलनांक का निर्धारण तथा उपयुक्त व्युत्पन्नो का निर्माण
2. पेपर क्रोमेटोग्राफी / महीन परत क्रोमेटोग्राफी R_f मान का निर्धारण व कार्बनिक पदार्थों की पृथक्करण एवं पहचान
अ. हरी पत्ती रंजक का पृथक्करण (पालक पत्ती का उपयोग किया जा सकता है)
ब. रंजको का पृथक्करण

मौखिकी

6 अंक

रिक्तार्द्ध

8 अंक

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शासकीय कमलाराजा कन्या स्नातकोत्तर स्वशासी महाविद्यालय ग्वालियर (म.प्र.)
उच्च शिक्षा विभाग म.प्र. शासन .

स्नातक स्तर पर सेमेस्टर पद्धति के अन्तर्गत एकल प्रश्न पत्र प्रणाली अनुसार पाठ्यक्रम
केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म.प्र. के महामहिम राज्यपाल द्वारा अनुमोदित
सत्र 2016 - 17 से प्रभावशील

Department of Higher Education, Govt. of M.P.
Single Paper Pattern Syllabus for U.G. Classes Under Semester System
As recommended by Central Board of Studies and approved by the Governor
of M.P.
Effective from Session 2016-17

| | | |
|------------|-----------------------------------|---------------|
| Class | B.Sc. | |
| Semester | V | |
| Subject | (English) | Chemistry |
| | हिन्दी | रसायन शास्त्र |
| Paper | - | |
| Max. Marks | 85 + CCE (सतत समग्र मूल्यांकन) 15 | |

| Unit | | Syllabus | Periods |
|--------|---------|---|----------|
| Unit-1 | English | <p>Organic Compounds of Nitrogen: preparation, properties and chemical reactions of nitroalkanes and nitroarenes. Mechanism of nucleophilic substitution in nitroarenes and their reduction in acidic neutral and alkaline media, picric acids.</p> <p>Halonitroarenes; structure and nomenclature, and their activity. Amines structure, and nomenclature, physical properties and stereochemistry, separation of mixture of primary, secondary and tertiary amines. Structural features affecting basicity of amines. Amine salts as phase transfer catalysts. Preparation of alkyl and aryl amines (reduction of nitro compounds, nitriles), reductive amination of aldehydic and ketonic compounds, Gabriel - phthalamide reaction, Hoffmann bromamide reaction, Reaction of amines,</p> | 18 Lecs. |

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| | | <p>electrophilic aromatic substitution in aryl amines, reaction of amines with nitrous acid synthetic transformation of aryl diazonium salts, azo coupling.</p> | |
| हिन्दी | | <p>नाइट्रोजन के कार्बनिक यौगिक : नाइट्रोऐल्केन व नाइट्रो एरीन बनाने की विधियां, गुण एवं रासायनिक क्रियाएं नाइट्रो एरीन में नाभिकस्नेही प्रतिस्थापन अभिक्रिया की क्रियाविधि तथा उनके अम्लीय, क्षारीय, उदासीन माध्यम में अपचयन, पिक्रिक अम्ल। हैलोनाइट्रोएरीन : क्रियाशीलता, संरचना एवं नामकरण। एमीन की संरचना एवं नामकरण, भौतिक गुण एवं त्रिविम रसायन। प्राथमिक, द्वितीयक एवं तृतीयक एमीन के मिश्रण का पृथक्करण। एमीन की क्षारकता को प्रभावित करने वाली संरचनात्मक विशेषताएं। एमीन लवण प्रावस्था स्थानांतरण उच्चरेखों के रूप में, एल्किल एवं एरिल एमीन बनाने की विधियां (नाइट्राइल एवं नाइट्रो यौगिकों का अपचयन), ऐल्डिहाइडों एवं कीटोनी यौगिकों का अपचयनात्मक एमीनीकरण, गेब्रिल-थैलेमाइड अभिक्रिया, हॉफमैन ब्रोमेमाइड अभिक्रिया, एमीन्स की अभिक्रियाएं एरिल एमीन में इलेक्ट्रॉन स्नेही ऐरोमेटिक प्रतिस्थापन, एमीन्स की नाइट्रस अम्ल के साथ अभिक्रिया, एरिल डाइएजोनियम लवण के संश्लेषणात्मक रूपांतरण, एजो युग्मन।</p> | |
| UNIT-2 | English | <p>Carbohydrates-I Classification and nomenclature, monosaccharide, mechanism of osazone formation, chain lengthening and chain shortening of aldoses, epimerization, configuration of monosaccharide, erythro, threo diastereoisomers. Formation of glycosides, ethers and esters, determination of ring size of monosaccharide, cyclic structure of D(+) glucose, mechanism of mutarotation. Structure of ribose and deoxyribose.</p> <p>Carbohydrates-II</p> | 18 Lecs. |

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| | | An introduction to glycosidic linkages in di and polysaccharides. Reducing and non-reducing sugars. | |
| | हिन्दी | कार्बोहाइड्रेट I : वर्गीकरण तथा नामकरण, मोनोसैकेराइड, ओसाजोन के विरचन की क्रियाविधि, ऐल्डोस में श्रृंखला आरोहण व श्रृंखला अवरोहण; एपीमरीकरण, मोनोसैकेराइडों का अभिविन्यास; थियो एवं एथिरो अप्रतिबिम्बी त्रिविम समावयवी; ग्लाइकोसाइड, ईथर एवं एस्टर का विरचन, मोनोसैकेराइड की चक्रीय रूप का निर्धारण, D (+) ग्लूकोस की चक्रीय संरचना, परिवर्तन घूर्णन की क्रियाविधि, राइबोस तथा डिऑक्सोराइबोस की संरचना। कार्बोहाइड्रेट II : डाइसैकेराइड एवं पॉलिसैकेराइड में ग्लाइकोसिडीक बंध का परिचय, अपचायक एवं अनापचायक शर्करा। | |
| UNIT-3 | English | (a) Photochemistry: Electromagnetic radiation, range of different regions of the spectrum, different expression units for energy, wavelength and frequency Interaction of radiation with matter. difference between thermal and photochemical process. Laws of photochemistry – Grotthus-Draper law, Stark-Einstein law, Beer-Lambert law. Electronic transitions, Jablonski diagram depicting various quantum yield. (b) UV Spectroscopy: Electronic excitation, elementary idea of instrument used, Application to organic molecules. Woodward- Fieser rule for determining λ_{max} of enes, polyenes and α, β unsaturated carbonyl compounds. | 18 Lec. |
| | हिन्दी | अ प्रकाश रसायन : विद्युत चुम्बकीय विकिरण, विकिरण के विभिन्न क्षेत्रों की परास, ऊर्जा, तरंग दैर्घ्य एवं आवृत्ति को व्यक्त करने के लिए विभिन्न इकाइया, पदार्थ तथा विकिरणों की पारस्परिक क्रिया, ऊष्मीय | |

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| | | <p>तथा प्रकाश रासायनिक अभिक्रियाओं में अंतर; प्रकाश रसायन के नियम; ग्रोथस-ड्रेपर नियम, स्टार्क-आइन्स्टाइन नियम, बीयर-लेम्बर्ट नियम; इलेक्ट्रॉनिक संक्रमण. उत्तेजित अवस्था में घटित होने वाले विभिन्न प्रक्रमों को दर्शाने वाला जेबलोन्स्की आरेख, क्वाण्टम लब्धि।</p> <p>व. पराबैंगनी स्पेक्ट्रमिकी :- इलेक्ट्रॉनिक उत्तेजन, प्रयुक्त उपकरण के संबंध में प्रारंभिक जानकारी, कार्बनिक यौगिकों की संरचना ज्ञात करने के अनुप्रयोग, ईन, पॉलीईन तथा α, β असंतृप्त कार्बोनिल यौगिकों के λ_{max} के निर्धारण के लिए वुडवर्ड-फिशर नियम।</p> | |
| UNIT-4 | English | <p>Bioinorganic Chemistry - I Essential and trace elements in biological processes, metalloporphyrins with special reference to haemoglobin and myoglobin, Biological role of alkali and alkaline earth metal ions with special reference to Ca^{2+}.</p> <p>Bioinorganic Chemistry - II Role of metal ions in biological process, nitrogen fixation, oxygen-uptake proteins, cytochromes and ferredoxins.</p> | 18 Leecs. |
| | हिन्दी | <p>जैव-अकार्बनिक रसायन I : जैविक प्रक्रियाओं में आवश्यक एवं सूक्ष्म तत्व, धातु पॉरफाइरिन्स-हीमोग्लोबिन एवं मायोग्लोबिन के विशेष संदर्भ में क्षार तथा क्षारीय मृदा धातु आयनों की जैविक भूमिका Ca^{2+} के विशेष संदर्भ में</p> <p>जैव-अकार्बनिक रसायन II : जैविक प्रक्रियाओं में धातु आयनों की भूमिका, नाइट्रोजन स्थिरीकरण, ऑक्सीजन गाड़ी प्रोटीन्स, सायटोक्रोम तथा फेरेडॉक्सिन्स।</p> | |
| UNIT-5 | English | <p>Hard and Soft Acids and Bases (HSAB) Classification of acids and bases as hard and soft, Pearson's HSAB concept, symbiosis.</p> <p>Analytical Chemistry: Errors, their</p> | 18 Leecs. |

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| | | <p>classification, minimization of errors, precision and accuracy, gravimetric estimation - concept, method and precautions, gravimetric estimation of barium and copper.</p> <p>Inorganic Polymers: Introduction and scope of inorganic polymers, special characteristics, classification and their applications. Structure and nature of bonding in Silicones and triphosphonitrilic chloride.</p> | |
| | हिन्दी | <p>कठोर एवं मृदु अम्ल एवं क्षार : अम्लों एवं क्षारों का कठोर एवं मृदु के रूप में वर्गीकरण, पीयरसन की कठोर एवं मृदु अम्ल एवं क्षार की धारणा, सहजीविता।</p> <p>विश्लेषणात्मक रसायन : त्रुटियां, उनका वर्गीकरण एवं न्यूनीकरण, यथार्थता एवं परिशुद्धता। भारात्मक आंकलन - धारणा, विधि एवं सावधानियाँ, बेरियम तथा कॉपर का भारात्मक आंकलन।</p> <p>अकार्बनिक बहुलक : परिचय एवं क्षेत्र, विशेष लाक्षणिक गुण, वर्गीकरण तथा अनुप्रयोग। सिलिकॉन तथा ट्रायफास्फोनाइट्रिलिक क्लोराइड यौगिकों की संरचना तथा बंध की प्रकृति।</p> | |

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| | <ol style="list-style-type: none"> 1. Physical Chemistry-Puri, Sharma and Pathania, Vikas Publications, New Delhi 2. Physical Chemistry -G.M. Barrow, International Student Edition, McGraw Hill. 3. The Elements of Physical Chemistry, P.W. Atkins, Oxford University Press. 4. Physical Chemistry, R.A. Alberty, Wiley Eastern Ltd. 5. Physical Chemistry Through problems, S.K. Dogra and S. Dogra, Wiley Eastern 6. Organic Chemistry, Morrison and Boyd, Prentice Hall. 7. Organic Chemistry, L.G. Wade Jr. Prentice Hall 8. Fundamentals of Organic Chemistry Solomons, John Wiley. 9. Organic Chemistry, Vol. I, IL IIL S.M. Mukherji, S.P. |
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Department of Higher Education, Govt. of M.P.

Single Paper Pattern Syllabus for U.G. Classes Under Semester System
As recommended by Central Board of Studies and approved by the Governor
of M.P.

Practical

Session 2018-19

Class : B.Sc. Semester V

Subject : Chemistry

Paper : Practical

M.M. 50

Time : 6 hours

Inorganic Chemistry

12 Marks

Analysis of inorganic mixture containing five radicals with at least one interfering radical or typical combination

Gravimetric analysis :

12 Marks

Barium as barium sulphate.

Organic Chemistry 12 Marks

Preparation:

- (i). Acetylation
- (ii). Benzoylation
- (iii). meta-Dinitrobenzene
- (iv). Picric acid

Viva 06 Marks

Sessional 08 Marks

अकार्बनिक रसायन विज्ञान

12 अंक

अकार्बनिक मिश्रण का विश्लेषण जिसमें पांच मूलक हो तथा कम से कम एक बाधाकारी मूलक हो अथवा प्रारूपिक संयोजन हो

मासत्मक विश्लेषण

12 अंक

बेरियम का बेरियम सल्फेट के रूप में।

कार्बनिक रसायन

12 अंक

विरचन

(अ) एसिलीकरण

(ब) बेंजॉयलीकरण

(स) उ.डाइनाइट्रोबेंजीन

(ड) पिक्रिक अम्ल

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शासकीय कमलाराजा कन्या स्नातकोत्तर स्वशासी महाविद्यालय ग्वालियर (म.प्र.)
उच्च शिक्षा विभाग म.प्र. शासन
स्नातक स्तर पर सेमेस्टर पद्धति के अन्तर्गत एकल प्रश्न पत्र प्रणाली अनुसार पाठ्यक्रम
केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म.प्र. के महामहिम राज्यपाल द्वारा अनुमोदित
सत्र 2017 - 18 से प्रभावशील

Department of Higher Education, Govt. of M.P.
Single Paper Pattern Syllabus for U.G. Classes Under Semester System
As recommended by Central Board of Studies and approved by the Governor
of M.P.
Effective from Session 2017-18

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| Class | | B.Sc. |
| Semester | | VI |
| Subject | (English) | Chemistry |
| | हिन्दी | रसायन शास्त्र |
| Paper | | - |
| Max. Marks | | 85 + CCE (सतत समग्र मूल्यांकन) 15 |
| Unit | | Syllabus |
| Unit-1 | English | <p>A. Amino acids: Classification, structure, stereochemistry of amino acids, acid base behaviour, isoelectric point, general methods of preparation and properties of α-amino acids. Proteins and peptides. Introduction to peptides linkage, end group analysis, classification, properties and structure of proteins (primary, secondary and tertiary).</p> <p>B. Nucleic acids: Introduction of nucleic acids and constituents of nucleic acid, Ribonucleosides, Ribonucleotides, double helical structure of DNA.</p> <p>C. Elementary idea of Fats, Oils & Detergents: Natural fats, edible and industrial oils of vegetable origin, common fatty acids, glycerides, hydrogenation of unsaturated oils, Saponification value, iodine value, acid value.</p> |
| | | Periods |
| | | 18 Lecs. |

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| हिन्दी | <p>अ. ऐमीनो अम्ल : वर्गीकरण, संरचना, ऐमीनों अम्लों में त्रिविम रसायन, अम्ल-क्षारक व्यवहार, समविभव बिन्दु, α - ऐमीनों अम्लों में विरचन की सामान्य विधियां एवं गुण। प्रोटीन तथा पेप्टाइड्स, पेप्टाइड बंध का परिचय, अंत्य समूह विश्लेषण, प्रोटीन का वर्गीकरण, गुण तथा संरचना (प्राथमिक, द्वितीयक एवं तृतीयक)</p> <p>ब. न्यूक्लिक अम्ल : न्यूक्लिक अम्ल का परिचय; न्यूक्लिक अम्लों के अवयव, राइबोन्यूक्लिओसाइड्स एवं राइबोन्यूक्लिओटाइड्स, डीएनए की द्विकुण्डलित संरचना।</p> <p>स. वसा, तेल एवं अपमार्जक का प्रारम्भिक परिचय : प्राकृतिक वसा; वानस्पतिक उत्पत्ति के खाद्य और औद्योगिक तेल. सामान्य वसीय अम्ल, ग्लिसराइड, असंतृप्त तेलों का हाइड्रोजनीकरण, साबुनीकरण मान, आयोडीन मान, अम्ल मान।</p> | 18 Lecs. | |
| UNIT-2 | English | <p>A. Organometallic Chemistry: Synthesis; structure and bonding in metal carbonyl complexes, metal olefin complexes and metal alkyne complexes. Oxidative addition reactions.</p> <p>B. Organometallic Compounds: Organomagnesium Compound - Grignard Reagent and Organolithium Compounds, methods of preparation, structure and synthetic applications.</p> | 18 Lecs. |
| हिन्दी | <p>अ. कार्ब-धात्विक रसायन : धातु कार्बोनिल संकुलों का विरचन, संरचना एवं बंधन, धातु ओलेफिन तथा एल्काइन संकुल । ऑक्सीकारक योगात्मक अभिक्रियाएँ।</p> <p>ब. कार्ब-धात्विक यौगिक: कार्बमैग्नीशियम यौगिक-ग्रिगनार्ड अभिकर्मक एवं कार्बलिथियम यौगिक, विरचन, संरचना, सांश्लेषिक अनुप्रयोग ।</p> | 18 Lecs. | |
| UNIT-3 | English | A. Magnetic properties of transition metal | 18 Lecs. |

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| | | <p>complexes: magnetic moment (spin only and with L-S coupling), orbital contribution magnetic moment.</p> <p>B. Electronic spectra of transition metal complexes:</p> <p>Spectroscopic ground and excited states, types of electronic transitions, selection rules for d-d transitions, Orgel-energy level diagram for d^1 to d^9 states.</p> <p>C. Water Analysis: Hardness, types of hardness, acidity and alkalinity, BOD, COD and DO.</p> | |
| | हिन्दी | <p>अ. संक्रमण धातु संकुलों के चुम्बकीय गुण : चुम्बकीय आघूर्ण (केवल चक्रण तथा L-S युग्मन) चुम्बकीय आघूर्ण में कक्षीय योगदान।</p> <p>ब. संक्रमण धातु संकुलों का इलेक्ट्रॉनिक स्पेक्ट्रा : स्पेक्ट्रोस्कोपिक मूल एवं उत्तेजित अवस्थाएँ इलेक्ट्रॉनिक संक्रमण के प्रकार, d-d इलेक्ट्रॉनिक संक्रमण के लिए वरण नियम, d^1 से d^9 अवस्थाओं के लिए ऑर्गेल ऊर्जा आरेख।</p> <p>स. जल विलक्षण : जल की कठोरता और इसके प्रकार जल की अम्लीयता एवं क्षारीयता. बी.ओ. डी., सी.ओ. डी. तथा डी.ओ.।</p> | |
| UNIT-4 | English | <p>A. Infrared spectroscopy : Statement of the Born- Oppenheimer approximation, rotational spectrum of diatomic molecules. Energy levels of a rigid rotator, selection rule, intensity of absorption bands, Maxwell- Boltzmann distribution and population of energy levels.</p> <p>B. Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, intensity and qualitative relation of force constant and bond energies, degree of freedom and modes of vibration, vibrational frequencies of different</p> | 18 Lec. |

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| | | functional groups. C. Raman Spectroscopy: concept of polarizability, pure rotational and pure vibrational Raman spectra of diatomic molecules. Selection rules, application of Raman spectrum. | |
| | हिन्दी | अ. अवरक्त स्पेक्ट्रम : बॉर्न ओपनहेमर सन्निकटन का कथन, द्विपरमाणविक अणुओं का घूर्णन स्पेक्ट्रम, दृढ़ घूर्णक के ऊर्जा स्तर, वरण नियम, अवशोषण की तीव्रता, मैक्सवेल बोल्ट्जमेन वितरण तथा ऊर्जा स्तरों की समष्टि। ब. सरल आवर्ती दोलित्र के ऊर्जा स्तर, वरण नियम, विशुद्ध कंपन स्पेक्ट्रम, तीव्रता, बल नियतांक एवं बंध ऊर्जा में गुणात्मक संबंध, स्वतंत्रता की कोटि तथा कंपन की विभिन्न विधाएँ, विभिन्न क्रियात्मक समूहों की कंपन आवृत्तियाँ। स. रमन स्पेक्ट्रमिकी : ध्रुवणता की धारणा, द्विपरमाणविक अणुओं के शुद्ध घूर्णन एवं शुद्ध कंपन रमन स्पेक्ट्रा, वरण नियम तथा रमन स्पेक्ट्रमिकी के अनुप्रयोग। | |
| UNIT-5 | English | A. NMR Spectroscopy Principle and Instrumentation, NMR active nucleus, chemical shift, spin-spin coupling, spectrum of ethanol and ethanal. B. Surface Phenomena and Catalysis: adsorption of gases and liquids on solid adsorbent, Freundlich and Langmuir adsorption isotherms, determination of surface area, characteristics and mechanism of heterogeneous catalysis. | 18 Lects. |
| | हिन्दी | अ. नाभिकीय चुम्बकीय अनुनाद स्पेक्ट्रमिकी : सिद्धांत तथा उपकरण; नाभिकीय चुम्बकीय अनुनाद सक्रिय नाभिक, रासायनिक विस्थापन, स्पिन-स्पिन युग्मन, इथेनॉल तथा इथेनल के स्पेक्ट्रम। | |

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| | ब. पृष्ठ रसायन तथा उत्प्रेरण : ठोस अधिशोषकों पर गैसों तथा द्रवों का अधिशोषण, फ्रेण्डलिच तथा लेंगेम्योर अधिशोषण समतापी प्रक्रम, पृष्ठ क्षेत्र का निर्धारण, विषमांगी उत्प्रेरण के लक्षण एवं क्रियाविधि। | |
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Recommended Books

1. Physical Chemistry-Puri, Sharma and Pathania, Vikas Publications, New Delhi
2. Physical Chemistry -G.M. Barrow, International Student Edition, McGraw Hill.
3. The Elements of Physical Chemistry, P.W. Atkins, Oxford University Press.
4. Physical Chemistry, R.A. Alberty, Wiley Eastern Ltd.
5. Physical Chemistry Through problems, S.K. Dogra and S. Dogra, Wiley Eastern
6. Organic Chemistry, Morrison and Boyd, Prentice Hall.
7. Organic Chemistry, L.G. Wade Jr. Prentice Hall
8. Fundamentals of Organic Chemistry Solomons, John Wiley.
9. Organic Chemistry, Vol. I, IIL IIL S.M. Mukherji, S.P. Singh and R.P. Kapoor,
10. Organic Chemistry, F.A. Carey, McGraw-Hill Inc.
11. Introduction to Organic Chemistry, Streitwiesser, Heathcock and Kosover, Macmillan.
12. Vogel's Qualitative & quantitative Analysis Vol- 1, 2, 3, ELBS.
13. Advanced Organic chemistry, I. L. Finar, ELBS.
14. Basic Concepts of Analytical chemistry, S M Khopker, New Age International Publishers.
15. Analytical Chemistry, R.M. Verma, CBS Publication.
16. Analytical Chemistry, Skoog & West, Wiley International.
17. Essentials of Physical Chemistry, B.S. Bahl, Arun Bahl & G.D. Tuli, S. Chand & Company Ltd.
18. Atomic structure and Molecular spectroscopy, Manas Chanda, New Age International Publishers.
19. Molecular Spectroscopy, Sukumar, MJP Publishers.
20. Organic Chemistry, Mac Murrey, Pearson Education.

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| | <p>21. Inorganic Chemistry – J.D. Lee, John Wiley</p> <p>22. Inorganic Chemistry – Cotton and Wilkinson, John Wiley</p> <p>23. Inorganic Chemistry – Huheey, Harper Collins Pub. USA</p> <p>24. Inorganic Polymer – G.R. Chhatwal, Himalaya Pub. House</p> <p>25. मध्य प्रदेश हिन्दी ग्रन्थ अकादमी भोपाल द्वारा प्रकाशित रसायन विज्ञान की पाठ्यपुस्तक।</p> <p>26. मध्य प्रदेश हिन्दी ग्रन्थ अकादमी भोपाल द्वारा प्रकाशित प्रायोगिक रसायन की पाठ्यपुस्तक।</p> |
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Department of Higher Education, Govt. of M.P.

Single Paper Pattern Syllabus for U.G. Classes Under Semester System
As recommended by Central Board of Studies and approved by the Governor
of M.P.

Practical

Session 2017-18

Class : B.Sc. Semester VI

Subject : Chemistry

Paper : Practical

M.M. 50

Time : 6 hours

Organic Chemistry

12 Marks

Binary mixture analysis containing two solids: Separation, identification and preparation of derivatives.

A. Physical Instrumentation

12 Marks

(i) Job's Method (ii) Mole-ratio method

B. Inorganic Chemistry

12 Marks

(i). Effluent Analysis

Identification of cations and anions in different water samples.

(ii). Water analysis

To determine the amount of dissolved oxygen in water samples in ppm units.

(iii) Determination of Hardness of Water

Viva 06 Marks

Sessional 08 Marks

कार्बनिक रसायन

12 अंक

दो ठोस युक्त द्विघटकाय मिश्रण : पृथक्करण, पहचान एवं व्युत्पन्न निर्माण।

भौतिक रसायन

12 अंक

(अ) जॉब विधि (ब) मोल अनुपात विधि

अकार्बनिक रसायन

12 अंक

(अ) निसारी विश्लेषण

विभिन्न जल नमूनों में धनायन व ऋणात्मक आयनों की पहचान।

(ब) जल विश्लेषण

जल के नमूने में घुलित ऑक्सीजन का पीपीएम में निर्धारण।

(स) जल की कठोरता का निर्धारण।

मौखिकी 06 अंक

रिकार्ड 08 अंक

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**Single Paper Pattern Syllabus for U.G. Classes Under Semester System
As recommended by Central Board of Studies and approved by the Governor
of M.P.**

Session 2017-18

शासकीय कमलाराजा कन्या स्नातकोत्तर स्वशासी महाविद्यालय ग्वालियर (म.प्र.)

उच्च शिक्षा विभाग म.प्र. शासन

स्नातक स्तर पर सेमेस्टर पद्धति के अन्तर्गत एकल प्रश्न पत्र प्रणाली अनुसार पाठ्यक्रम
केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म.प्र. के महामहिम राज्यपाल द्वारा अनुमोदित
सत्र 2016 - 17

Class : B.Sc. VI Semester (Project Work)

Project work for the students of VI Semester and its scheme will be completed as
per directives issued by Department of Higher Education, Government of M.P.

सेमेस्टर छः के विद्यार्थियों के लिए परियोजना कार्य तथा इसकी योजना उच्च शिक्षा विभाग,
मध्यप्रदेश शासन द्वारा जारी निर्देशानुसार पूर्ण किया जावेगा।

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M.A. M.Sc. CHEMISTRY Exam. Dec., 2014
First/Third Semester
Pages. (01) to. (08)
2017-18

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B.M

Paper-I
MCH-401 INORGANIC CHEMISTRY I

Unit-I

Stereochemistry and Bonding in Main Group Compounds
Valence shell electron pair repulsion (VSEPR) theory and its applications, Walsh diagram (triatomic and penta-atomic molecules), dn-p π bond, Bent rule and energetic of hybridization, some simple reactions of covalently bonded molecules such as Atomic inversion, Berry pseudorotation, Nucleophilic displacement, free radical mechanisms.

Unit-II

Metal- Ligand bonding
Limitation of crystal field theory, Jahn -Teller effect, molecular orbital theory for bonding in octahedral, tetrahedral and square planar complexes,

Unit-III

Metal- Ligand Equilibrium in Solution
Stepwise and overall formation constants and their relationship, trends in stepwise constant, factors affecting the stability of metal complexes with reference to the nature of metal ion and ligand, Chelate effect and its thermodynamic origin, determination of binary formation constants by pH metry and Spectrometry.

Unit-IV

Reaction Mechanism of Transition Metal Complexes-I
Energy Profile of a reaction, reactivity of metal complex, inert and labile complexes, Kinetic application of valence bond and crystal field theories, Kinetics of octahedral substitution, acid hydrolysis, factors affecting acid hydrolysis, base hydrolysis, conjugate base mechanism, direct and indirect evidences in favour of conjugate mechanism, anion reactions, reactions without metal ligand bond cleavage. Substitution reactions in square planar complexes, the trans effect, mechanism of substitution reaction.

Unit-V

Reaction Mechanism of Transition Metal Complexes-II and HSAB theory
Redox reaction, Electron transfer reaction, mechanism of one electron transfer reactions, outer and inner sphere type reactions, cross reactions and Marcus-Hush theory, HSAB principle, theoretical basis of hardness and softness; Lewis -acid base reactivity approximation; donor/acceptor numbers, E and C equation; applications of HSAB concept.

BOOKS SUGGESTED:

1. Advanced Inorganic Chemistry, F.A. Cotton F.A. Cotton and Wilkinson, John Wiley.
2. Inorganic Chemistry, J.E. Huhey, Harper & Row.
3. Chemistry of Elements, N.N. Greenwood and A. Earnshaw, Pergamon.
4. Inorganic Electronic Spectroscopy, A.S.P. Lever, Elsevier.
5. Comprehensive Co-Ordination Chemistry eds., G. Wilkinson, R.D. Gillies and I.A. Mc Cleverty, Pergamon
6. Inorganic Chemistry, D.F. Shriver & P.W. Atkins, Oxford University Press 1999.
7. Inorganic Chemistry, I.M. Sharma, Addison Wesley England 5th 1992

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Paper-II
NICH-402: ORGANIC CHEMISTRY I

Unit-I

Nature of Bonding in Organic Molecules

Delocalized bonding-conjugation, cross conjugation, resonance hyperconjugation, bonding in fullerenes, tautomerism. Aromaticity in benzenoid and non-benzenoid compounds, alternate and non-alternate hydrocarbons. Huckel's rule, energy level of π -molecular orbitals, annulenes, anti-aromaticity, homo-aromaticity, PMO approach. Bonds weaker than covalent-addition compounds, crown ether complexes and cryptands. molecules compounds, catenanes and rotaxanes

Unit-II

Stereochemistry

Strain due to unavoidable crowding Elements of symmetry, chirality, molecules with more than one chiral center, threo and erythro isomers, methods of resolution, optical purity, enantiotopic and diastereotopic atoms, groups and faces, stereospecific and stereoselective synthesis. Asymmetric synthesis. Optical activity in the absence of chiral carbon (biphenyls, allenes, and spirane chirality due to helical shape. Stereochemistry of the compounds containing a nitrogen, sulphur and phosphorus.

Unit-III

Conformational analysis and linear free energy relationship

Conformational analysis of cycloalkanes, decalines, effect of conformation on reactivity, conformation of sugars.

Generation structure stability and reactivity of carbocations, carbanions, free radicals, carbenes and nitrenes. The Hammett equation and linear free energy relationship, substituents and reaction constants, Taft equation.

Unit-IV

Reaction Mechanism - Structure and Reactivity

Type of mechanisms, types of reactions, thermodynamic and kinetic requirements, kinetic and thermodynamic control, Hammond's postulate, Curtin-Hammett principle. Potential energy diagrams, transition states and intermediates, methods of determining mechanisms, isotopic effects

Unit-V

Aliphatic Nucleophilic Substitution

The SN2, SN1 mixed SN1 and SN2 and SET mechanism. The neighboring group mechanism involving the group participation by a single bond, anchimeric assistance

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Classical and nonclassical carbocations, phenonium ions, norbornyl systems, common carbocation rearrangements. Application of NMR spectroscopy in the detection of carbocations. The SN1 mechanism. Nucleophilic substitution at an allylic, aliphatic trigonal and a vinylic carbon. Reactivity effects of substrate structure, attacking nucleophile, leaving group and reaction medium, phase transfer catalysis and ultrasound, ambident nucleophile, regioselectivity.

Book Suggested

1. Advanced Organic Chemistry-Reactions, Mechanism and Structure. Jerry March, John Wiley
2. Advanced Organic Chemistry, F.A. Carey and R.J. Sundberg, Plenum.
3. A Guide Book to Mechanism in Organic Chemistry, Peter Sykes, Longman.
4. Structure and Mechanism in Organic Chemistry, C.K. Ingold, Cornell University Press.
5. Organic Chemistry, R.T. Morrison and R.N. Boyd, Prentice-Hall.
6. Modern Organic Reactions, H.O. House, Benjamin.
7. Principles of Organic Synthesis, R.O.C. Norman and J.M. Coxon, Blackie Academic & Professionals.
8. Reaction Mechanism in Organic Chemistry, S.M. Mukherji and S.P. Singh, Macmillan.
9. Pericyclic Reactions, S.M. Mukherji, Macmillan, India
10. Stereochemistry of Organic Compounds, D.Nasipuri, New Age International.
11. Stereochemistry of Organic Compounds, P.S. Kalsi, New Age International.

Paper-III
MCH-403: PHYSICAL CHEMISTRY I

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Unit-I

Introduction to Exact Quantum Mechanical Results
Schrödinger equation and the postulates of quantum mechanics. Discussion of solutions of the Schrödinger equation to some model systems viz., particle in a box, the harmonic oscillator, the rigid rotor, the hydrogen atom and helium atom.

Unit-II

Approximate Methods
The variation theorem, linear variation principle. Perturbation theory (First order and nondegenerate). Applications of variation method and perturbation theory to the Helium atom.
Molecular Orbital Theory
Huckel theory of conjugated systems bond and charge density calculations. Applications to ethylene, butadiene, cyclopropenyl radical cyclobutadiene etc. Introduction to extended Huckel theory.

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UNIT III

Angular Momentum

Ordinary angular momentum, generalized angular momentum, eigenfunctions for angular momentum, eigenvalues of angular momentum operator using ladder operators addition of angular momenta, spin, antisymmetry and Pauli exclusion principle.

Unit-IV

Classical Thermodynamics

Brief resume of concepts of laws of thermodynamics, free energy, chemical potential and entropies. Partial molar free energy, partial molar volume and partial molar heat content and their significance. Determinations of these quantities. Concept of fugacity and determination of fugacity. Non-ideal systems: Excess functions for non-ideal solutions. Activity, activity coefficient. Debye-Huckel theory for activity coefficient for electrolytic solutions; determination of activity and activity coefficients; ionic strength. Application of phase rule to three component systems; second order phase transitions.

Unit-V

Statistical Thermodynamics

Concept of distribution, thermodynamic probability and most probable distribution. Maxwell-Boltzmann, partition functions of ensemble averaging. Canonical, grand canonical and micro-canonical ensembles, corresponding distribution laws (using Lagrange's method of undetermined multipliers). Partition functions-translation, rotational, vibrational and electronic. Calculation of thermodynamic properties in terms of partition functions. Application of partition functions. Fermi-Dirac Statistics, distribution law and applications to metal. Bose-Einstein statistics distribution Law and application to helium.

Books Suggested

1. Physical Chemistry F.W. Atkins, ELBS
2. Introduction to Quantum Chemistry, A.K. Chandra, Tata Mc Graw Hill.
3. Quantum Chemistry, by M. J. Wine, Prentice Hall.
4. Coulson's Valence, 3rd Ed. Weir y, ELBS.
5. Chemical Kinetics, R.J. Candler, McGraw-Hill.
6. Kinetics and Mechanism of Chemical Transformation: Rajaraman and J. Kurucova, Mc Miller.
7. Micelles, Theoretical and Applied Aspects, V. MOnzo, Plenum.
8. Modern Electrochemistry Vol. I and Vol II L.M. Bockris and A.K.N. Reddy, Plenum.
9. Introduction to Polymer Science, V.K. Gowarikar, M.V. Vishwanathan and J. Sridhar, Wiley Eastern.
10. Ion Exchange Membranes, J. K. Stille, New Age Publications.

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Paper-IV MCH-404: Group Theory & Spectroscopy I

Unit-I

Symmetry and Group theory in Chemistry

Symmetry elements and symmetry operation, definition of group, subgroup, Conjugacy relation and classes. Point symmetry group. Schoenflies symbols, representations of groups by matrices (representation for the C_n , C_{nv} , C_{nh} , D_{nh} group to be worked out explicitly). Character of a representation. The great orthogonality theorem. (without proof) and its importance. Character tables and their use; spectroscopy. Derivation of character table for C_{2v} and C_{3v} point group Symmetry aspects of molecular vibrations of H_2O molecule

Unit-II

Microwave Spectroscopy

Classification of molecules, rigid rotor model, effect of isotopic substitution on the transition frequencies, intensities. non-rigid rotor. Stark effect, nuclear and electron spin interaction and effect of external field. applications.

Unit-III

Infrared-Spectroscopy

Review of linear harmonic oscillator, vibrational energies of diatomic molecules, zero point energy, Force constant and bond strengths; anharmonicity, Morse potential energy diagram, vibration-rotation spectroscopy. P.Q.R. branches, Breakdown of Oppenheimer approximation; vibrations of polyatomic molecules. Selection rules, normal modes of vibration, group frequencies, overtones, hot bands, factors affecting the band positions and intensities, far IR region, metal ligand vibration, normal co-ordinate analysis.

Unit-IV

Raman Spectroscopy

Classical and quantum theories of Raman effect. Pure rotational, vibrational and vibrational-rotational Raman spectra, selection rules, mutual exclusion principle, Resonance Raman spectroscopy, coherent anti stokes Raman spectroscopy (CARS).

Unit-V

Electronic Spectroscopy

Molecular Spectroscopy

Energy levels, molecular orbitals, vibronic transitions; vibrational progressions and geometry of the excited states, Franck-Condon principle, electronic spectra of polyatomic molecules. Emission spectra; radio-active and non-radioactive decay, internal conversion, spectra of transition metal complexes, charge-transfer spectra.

Photoelectron Spectroscopy

Basic principles: photo-electric effect, ionization process, Koopman's theorem

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Unit-IV

Elementary Differential equations
First-order and first degree differential equations, homogenous, exact and linear equations. Applications to chemical kinetics, secular equilibria, quantum chemistry etc
second order differential equation and their solutions.

Unit-V

Permutation and Probability
Permutations and combinations, probability and probability theorems average, variance root mean square deviation examples from the kinetic theory of gases etc., fitting including least squares fitting with a general polynomial fit.

Book Suggested

1. The chemistry Mathematics Book, E. Steiner, Oxford University Press.
2. Mathematics for chemistry, Doggett and Suicific, Logman.
3. Mathematical for Physical chemistry: F. Daniels, Mc Graw Hill.
4. Chemical Mathematics D.M. Hirst, Longman.
5. Applied Mathematics for Physical Chemistry, J.R. Barante, Prentice Hall.
6. Basic Mathematics for Chemists, Tebbutt, Wiley.

Paper-V

CH-405 (b) BIOLOGY FOR CHEMISTS
(For students without Biology in B.Sc.)

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Unit-I

Cell Structure and Functions
Structure prokaryotic and eukaryotic cells, intracellular organelles and their functions, comparison of plant and animal cells. Overview and their functions, comparison of plant and animal cells. Overview of metabolic processes-catabolism and anabolism. ATP the biological energy currency. Origin of life-unique properties of carbon chemical evolution and rise of living systems. Introduction to bio-molecules, building blocks of bio-macromolecules.

Unit-II

Carbohydrates
Conformation of monosaccharides, structure and functions of important derivatives of mono-saccharides like glycosides, deoxy sugars, myoinositol, amino sugars. N-acetylmuramic acid, sialic acid disaccharides and polysaccharides. Structural polysaccharides cellulose and chitin. Storage polysaccharides-starch and glycogen. Structure and biological function of glucosaminoglycans of mucopolysaccharides. Carbohydrate metabolism in glycolysis. Role of oxygen in biological respiration. Blood group substances. Ascorbic acid

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Unit-III

Lipid
Fatty acids, essential fatty acids, structure and function of triacylglycerols, glycerophospholipids, sphingolipids, cholesterol, bile acids, prostaglandins. Lipoproteins-composition and function, role in atherosclerosis. Properties of lipid aggregates-micelles, bilayers, liposomes and their possible biological functions. Biological membranes. Fluid mosaic model of membrane structure. Lipid metabolism-oxidation of fatty acids.

Unit-IV

Amino-acids, Peptides and Proteins
Chemical and enzymatic hydrolysis of proteins to peptides, amino acid sequencing. Secondary structure of proteins. Force responsible for holding of secondary structures- α -helix, β -sheets, super secondary structure, triple helix structure of collagen. Tertiary structure of protein-folding and domain structure. Quaternary structure. Amino acid metabolism-degradation and biosynthesis of amino acids, sequence determination chemical/enzymatic/mass spectral, racemization/detection. Chemistry of oxytocin and tryptophan releasing hormone (TRH).

Unit-V

Nucleic Acids
Purine and pyrimidine bases of nucleic acids, base pairing via H-bonding. Structure of ribonucleic acids (RNA) and deoxyribonucleic acid (DNA), double helix model of DNA and forces responsible for holding it. Chemical and enzymatic hydrolysis of nucleic acids. The chemical basis for heredity, an overview of replication of DNA, transcription, translation and genetic code. Chemical synthesis of mono and trinucleoside

Book Suggested

1. Principles of Biochemistry, A.L. Lehninger, Worth Publishers.
2. Biochemistry, L. Stryer, W.H. Freeman,
3. Biochemistry, J. David Rawan, Neil Patterson.
4. Biochemistry, Voet and Voet, John Wiley.
5. Outlines of Biochemistry E.E. Conn and P.K. Stumpf, John Wiley.

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PRACTICAL

(Duration: 6-8 hrs in each branch)

Practical examination shall be conducted separately for each branch.

INORGANIC CHEMISTRY

M.M.: [66]

| | |
|-------------------------------------|----|
| Qualitative / Quantitative Analysis | 36 |
| Preparation | 12 |
| Record | 08 |
| Viva | 10 |

Quantitative and Qualitative Analysis

- Less common metal ions : Ti, Mo, W, Zr, Th, V, U, (two metal ions in cationic/anionic forms)
- Insoluble-Oxides, sulphates and halides.
- Separation and determination of two metal ions Cu-Ni, Ni-Zn, Cu-Fe etc, involving volumetric and gravimetric methods.

Preparations

Preparations of selected inorganic compounds and their studies by I.R. electronic spectra, Mossbauer, E.S.R and magnetic susceptibility handling of air and moisture sensitive compounds

- VO(acac)₂
- TiO(C₉H₈NO)₂H₂O
- Cis-K[Cr(C₂O₄)₂(H₂O)₂]
- Na[Cr(NH₃)₂(SCN)₄]
- Ni(acac)₂
- K₃[Fe(C₂O₄)₃]
- Prussian Blue, Turnbull's Blue.

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ORGANIC CHEMISTRY

M.M.66

Qualitative Analysis

24

Organic Synthesis

24

Record

08

Viva

10

Qualitative Analysis

Separation, Purification and identification of compounds of ~~binary~~ ^{ternary} mixture (One liquid and solid) using TLC and column chromatography, chemical tests, IR spectra to be used for functional group identification. ✓

Organic synthesis

Acetylation: Acetylation of Cholesterol and separation of cholesterol column chromatography. Oxidation: Adipic acid by chromic acid oxidation of cyclohexanol. Grignard reaction Synthesis from benzoic acid. The Products may be characterized by spectral techniques.

PHYSICAL CHEMISTRY

M.M.68

Error Analysis and statistical Data Analysis

16

Chemical Kinetics

18

Solution

16

Record

08

Viva Voice

10

Error Analysis and statistical Data Analysis

Errors and type of errors, minimization of distribution accuracy and combination, statistical treatment of error analysis null hypothesis, rejection criteria. F.&Q test; regression analysis curve fitting. Calibration of volumetric apparatus adsorption to study surface tension-concentration relationship for (Gibbs Equation) phase equilibria.

I. Determination of glass transition temperature of given self (e.g. CaCl_2)

conductometrically.

MCH-406: INORGANIC CHEMISTRY II

Unit-I

Electronic Spectral Studies of Transition Metal Complexes :

Spectroscopic ground states, correlation. Orgel and Tanabe-Sugano diagrams for transition metal complexes (d^1 - d^9 states), Selection rule for electronic spectroscopy. Intensity of various type electronic transitions. Calculations of $10Dq$, B and β parameters, charge transfer spectra.

Unit-II

Magnetic Properties of Transition Metal Complexes

Anomalous magnetic moments, Quenching of Orbital contribution. Orbital contribution to magnetic moment, magnetic exchange coupling and spin crossover.

Unit-III

Metal π -Complexes

Metal carbonyl, structure and bonding, vibrational spectra of metal carbonyls for bonding and structural elucidation, important reactions of metal carbonyls; preparation, bonding structure and important reaction of transition metal nitrosyl, dinitrogen and dioxygen complexes; tertiary phosphine as ligand.

Unit-IV

Metal Clusters

Higher boranes, carboranes, metalloboranes and metallo-carboranes compounds with metal metal multiple bonds.

Unit-V

Optical Rotatory Dispersion and Circular Dichroism

Linearly and circularly polarized lights; optical rotatory power and circular birefringence, ellipticity and circular dichroism; ORD and Cotton effect, Faraday and Kerr effects; Assignment of electronic transitions; applications of ORD and CD for the determination of (i) absolute configuration of complexes and (ii) isomerism due to non-planarity of chelate rings.

Books Suggested :

7. Advanced Inorganic Chemistry, F.A. Cotton and Wilkinson, John Wiley.
8. Inorganic Chemistry, J.E. Huhey, Harpes & Row.
9. Chemistry of the Elements. N.N. Greenwood and A. Earnshaw, Pergamon.
10. Inorganic Electronic Spectroscopy, A.B.F. Lever, Elsevier.
11. Magnetochemistry, R. I. Carlin, Springer Verlag.
12. Comprehensive Coordination Chemistry eds., G. Wilkinson, R.D. Gillars and J.A. Mc Cleverty, Pergamon.

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Paper-VII
MCH-407: ORGANIC CHEMISTRY II

Unit-I

Aromatic Electrophilic Substitution

The arenium ion mechanism, orientation and reactivity, energy profile diagrams. The ortho/para ratio, ipso attack, orientation in other ring systems. Quantitative treatment of reactivity in substrates and electrophiles. Diazonium coupling, Vilsmeier reaction, Gatterman-Koch reaction

Aromatic Nucleophilic Substitution

The S_NAr S_N1, benzyne and S_N1 mechanism, Reactivity effect of substrate structure, leaving group and attacking nucleophile. The Von Richter, Sommelet-Hauser, and Smiles rearrangements.

Unit-II

Free Radical Reactions

types of free radical reactions, free radical substitution mechanism, mechanism at an aromatic substrate, neighbouring group assistance. Reactivity for aliphatic and aromatic substrates at a bridgehead. Reactivity in the attacking radicals. The effect of solvents on reactivity. Allylic halogenation (NBS), oxidation of aldehydes to carboxylic acids. auto-oxidation, coupling of alkynes and arylation of aromatic compounds by diazonium salts. Sandmeyer reaction. Free radical rearrangement. Hunsdiecker reaction.

Unit III

Addition Reactions

Mechanistic and stereochemical aspects of addition reactions involving electrophiles, nucleophiles and free radicals, regio- and chemoselectivity, orientation and reactivity. Addition to cyclopropane ring. Hydrogenation of double and triple bonds, hydrogenation of aromatic rings. Hydroboration, Michael reaction, Sharpless asymmetric epoxidation.

Unit-IV

Addition to Carbon-Hetero Multiple bonds

Mechanism of metal hydride reduction of saturated and unsaturated carbonyl compounds, acid esters and nitriles. Addition of Grignard reagents, organozinc and organolithium reagents to carbonyl and unsaturated carbonyl compounds. Wittig reaction. Mechanism of condensation reactions involving enolates-Aldol, Knoevenagel, Claisen, Mannich, Benzoin, Perkin and Stobbe reactions. Hydrolysis of esters and amides, ammonolysis of esters.

Elimination Reactions

The E2, E1 and E1cB mechanisms and their spectrum. Orientation of the double bond. Reactivity-effects of substrate structures, attacking base, the leaving group and the medium. Mechanism and orientation in pyrolytic elimination.

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Unit-V

Pericyclic Reactions

Molecular orbital symmetry, Frontier orbitals of ethylene, 1,3-butadiene, 1,3,5-hexatriene and allyl system. Classification of pericyclic reactions. Woodward-Hoffmann correlation diagrams. FMO and PMO approach. Electrocyclic reactions-conrotatory and disrotatory motions, $4n$ and $4n+2$ and allyl systems. Cycloadditions-antarafacial and suprafacial additions, $4n$ and $4n+2$ systems, $2+2$ addition of ketenes, 1,3 dipolar cycloadditions and cheletropic reactions. Sigmatropic rearrangements-suprafacial and antarafacial shifts of H, sigmatropic involving carbon moieties, 3,3- and 5,5 sigmatropic rearrangements. Claisen, Cope and aza-Cope rearrangements. Fluxional tautomerism. Ene reaction.

Book Suggested

12. Advanced Organic Chemistry-Reactions, Mechanism and Structure, Jerry March, John Wiley
13. Advanced Organic Chemistry, F.A. Carey and R.J. Sundberg, Plenum.
14. A Guide Book to Mechanism in Organic Chemistry, Peter Sykes, Longman.
15. Structure and Mechanism in Organic Chemistry, C.K. Ingold, Cornell University Press.
16. Organic Chemistry, R.T. Morrison and R.N. Boyd, Prentice-Hall.
17. Modern Organic Reactions, H.O. House, Benjamin.
18. Principles of Organic Synthesis, R.O.C. Norman and J.M. Coxon, Blackie Academic & * Professionals.
19. Reaction Mechanism in Organic Chemistry, S.M. Mukherji and S.P. Singh, Macmillan.
20. Pericyclic Reactions, S.M. Mukherji, Macmillan, India
21. Stereochemistry of Organic Compounds, D. Nasipuri, New Age International.
22. Stereochemistry of Organic Compounds, P.S. Kalsi, New Age International.

Paper-VIII

MCH-408: PHYSICAL CHEMISTRY II

Unit-I

Chemical Dynamics

Methods of determining rate laws, collision theory of reaction rates, steric factor, activated complex theory. Arrhenius equation and the activated complex theory: ionic reactions, kinetic salt effects, steady state kinetics, kinetic and thermodynamic control of reactions, treatment of unimolecular reactions. Dynamic chain (hydrogen-bromine reaction, pyrolysis of acetaldehyde, decomposition of ethane), photochemical (hydrogen-bromine and hydrogen-chlorine reactions) and homogenous catalysis, kinetics of enzyme reactions, general features of fast reactions, study of fast reactions by flow method, relaxation method, flash photolysis and the nuclear magnetic resonance method, dynamics

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of unimolecular reaction (Lindemann Hinshelwood and Rice-Ramsperger-Kassel-Marcus (RRKM) theories for unimolecular reactions).

Unit-II

Surface Chemistry

Adsorption

Surface tension, capillary action, pressure difference across curved surface (Laplace equation), vapour pressure of droplets (Kelvin equation), Gibbs adsorption isotherm, estimation of surface area (BET equation), Surface films on liquids (Electro-kinetic phenomenon).

Micelles

Surface active agents, classification of surface active agents, micellization, hydrophobic interaction, critical micellar concentration (CMC), factors affecting the CMC of surfactants, counter ion binding to micelles, thermodynamics of micellization-phase separation and mass action models, solubilization, micro emulsion, reverse micelles.

Unit-III

Macromolecules

Polymer-definition, types of polymers, electrically conducting, fire resistant, liquid crystal polymers, kinetics of polymerization, mechanism of polymerization. Molecular mass, number and mass average molecular mass, molecular mass determination (Osmometry, viscometry, diffusion and light scattering methods), sedimentation, chain configuration of macromolecules, calculation of average dimension of various chain structures.

Unit-IV

Non Equilibrium Thermodynamics

Thermodynamic criteria for non-equilibrium states, entropy production and entropy flow, entropy balance equations for different irreversible processes (e.g., heat flow, chemical reaction etc.) transformations of the generalized fluxes and forces, non equilibrium stationary states, phenomenological equations, microscopic reversibility and Onsager's reciprocity relations, electrokinetic phenomena, diffusion, electric conduction.

Unit-V

Electrochemistry

Electrochemistry of solutions. Debye-Huckel-Onsager treatment and its extension, ion solvent interactions. Debye-Huckel-Jerum mode. Thermodynamics of electrified interface equations. Derivation of electro capillarity, Lippmann equations (surface excess), methods of determination. Structure of electrified interfaces.

Overpotentials, exchange current density, derivation of Butler Volmer equation, Tafel plot. Quantum aspects of charge transfer at electrodes-solution interfaces, quantization of charge transfer, tunneling. Semiconductor interfaces-theory of double layer at

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semiconductor, electrolyte solution interfaces, structure of double layer interfaces. Effect of light at semiconductor solution interface. Polarography theory, Ilkovic equation; half wave potential and its significance.

Books Suggested

11. Physical Chemistry, P.W. Atkins, ELBS.
12. Introduction to Quantum Chemistry, A.K. Chandra, Tata Mc Graw Hill.
13. Quantum Chemistry, Ira N. Levine, Prentice Hall.
14. Coulson's Valence, R. Mc Ween y, ELBS.
15. Chemical Kinetics. K.J. Laidler, McGraw-Hill.
16. Kinetics and Mechanism of Chemical Transformation J.Rajaraman and J. Kuriacose, Mc Millan.
17. Micelles. Theoretical and Applied Aspects, V. MOraoi, Plenum.
18. Modern Electrochemistry Vol. I and Vol II J.O.M. Bockris and A.K.N. Reddy, Plenum.
19. Introduction to Polymer Science. V.R. Gowariker, N.V. Vishwanathan and J. Sridhar, Wiley Eastern.

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Paper-IX

MCH-409: Spectroscopy II and Diffraction Methods

Unit-I

Nuclear Magnetic Resonance Spectroscopy

Nuclear spin, nuclear resonance, saturation, shielding of magnetic nuclei, chemical shift and its measurements, factors, influencing chemical shift, deshielding, spin-spin interactions, factors influencing coupling constant "J" Classification (AXB, AMX, ABC, A2B2 etc.). spin decoupling; basic ideas about instrument, NMR studies of nuclei other than protin-13C, 19F and 31P. FT NMR, advantages of FT NMR.

Unit II

Nuclear Quadrupole Resonance Spectroscopy

Quadrupole nuclei, quadrupole moments, electric field gradient, coupling constant, splitting. Applications.

Unit-III

Electron Spin Resonance Spectroscopy

Basic principles, zero field splitting and Kramer's degeneracy, factors affecting the 'g' value. Isotropic and anisotropic hyperfine coupling constants, spin Hamiltonian, spin densities and Mc Connell relationship, measurement techniques, applications.

Unit-IV

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X-ray Diffraction

Bragg condition, Miller indices, Laue Method, Bragg method, Debye Scherrer method of X-ray structural analysis of crystals, index reflections, identification of unit cells from systematic absences in diffraction pattern, Structure of simple lattices and X-ray intensities, structure factor and its relation to intensity and electron density, phase problem. Description of the procedure for an X-ray structure analysis, absolute configuration of molecules.

Unit-V

Electron Diffraction

Scattering intensity vs. scattering angle, Wierl equation, measurement technique, elucidation of structure of simple gas phase molecules. Low energy electron diffraction and structure of surfaces

Neutron Diffraction

Scattering of neutrons by solids measurement techniques. Elucidation of structure of magnetically ordered unit cells.

Books suggested

11. Modern Spectroscopy, J.M. Hollas, John Wiley.
12. Applied Electron Spectroscopy for chemical analysis d. H. Windawi and F.L. Ho, Wiley Interscience.
13. NMR, NQR, EPr and Mossbauer Spectroscopy in Inorganic Chemistry, R.V Parish, Ellis Harwood.
14. Physical Methods in Chemistry, R.S. Drago, Saunders College.
15. Chemical Applications of Group Theory, F.A. Cotton.
16. Introduction to Molecular Spectroscopy, G.M. Barrow, Mc Graw Hill.
17. Basic Principles of Spectroscopy, R. Chang, Mc Graw Hill.
18. Theory and Application of UV Spectroscopy, H.H. Jaffe and M. Orchin, IBH Oxford.
19. Introduction to Photoelectron Spectroscopy, P.K. Ghosh, John Wiley.
20. Introduction to Magnetic Resonance. A Carrington and A.D. MacLachalan, Harper & Row.

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Ch-410: COMPUTERS FOR CHEMISTS

This is a theory cum-laboratory course with more emphasis on laboratory work.

Unit-1

Introduction to computers and Computing

Basic structure and functioning of computer with a PC as illustrative example. Memory I/O devices. Secondary storage Computer languages. Operating systems with DOS as an example Introduction to UNIX and WINDOWS. Principles of programming Algorithms and flow-charts.

Unit-II

Computer Programming in FORTRAN/C/BASIC

(the language features are listed here with reference to FORTRAN. The instructor may choose another language such as BASIC or C the features may be replaced appropriately). Elements of the compute language. Constants and variables. Operations and symbols Expressions. Arithmetic assignment statement. Input and output Format statement. Termination statements. Branching statements as IF or GO TO statement. LOGICAL variables. Double precession variables. Subscripted variables and DIMENSION. DO statement FUNCTION AND SUBROUTINE. COMMON and DATA statement (Student learn the programming logic and these language feature by hands on experience on a personal computer from the beginning of this topic.)

Unit-III

Programming in Chemistry

Developing of small computer codes using any one of the languages

FORTRAN/C/BASIC involving simple formulae in Chemistry, such as Van der Waals equation. Chemical kinetics (determination of Rate constant) Radioactive decay (Half Life and Average Life). Determination Normality, Molarity and Molarity of solutions. Evaluation Electronegativity of atom and Lattice Energy from experimental determination of molecular weight and percentage of element organic compounds using data from experimental metal representation of

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molecules in terms of elementary structural features such as bond lengths, bond angles.

Unit-IV

Use of Computer programmes

Operation of PC. Data Processing. Running of standard Programs and Packages such as MS WORD, MS EXCEL -special emphasis on calculations and chart formations. X-Y plot. Simpson's Numerical Integration method. Programmes with data preferably from physical chemistry laboratory.

Unit V

Internet

Application of Internet for Chemistry with search engines, various types of files like PDF, JPG, RTF and Bitmap. Scanning, OMR, Web camera.

Book Suggested

- Fundamentals of Computer : V. Rajaraman (Prentice Hall)
- Computers in Chemistry : K.V. Raman (Tata Mc Graw Hill)
- Computer Programming in FORTRAN IV-V Rajaraman (Prentice Hall)

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PRAVITICAL

(Duration: 6-8 hrs in each branch)

Practical examination shall be conducted separately for each branch.

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| Inorganic Chemistry | M.M.66 |
| Chromatography | 24 + 4 = 28 |
| Preparation | 12 + 8 = 20 |
| Record | 08 = 08 |
| Viva | 10 = 10 |

Chromatography

Separation of cations and anions by paper Chromatography column Chromatography (ion exchange)

Preparations

Preparations of selected inorganic compounds and their studies by I.R. electronic spectra, Mossbauer, E.S.R. and magnetic susceptibility measurements. Handling of air and moisture sensitive compounds.

1. $[Co(NH_3)_6]Co(NO_2)_6$
2. $Cis-[Co(trien)(NO_2)_2]Cl \cdot H_2O$
3. $Hg[Co(SCN)_4]$
4. $[Co(py)_2Cl_2]$
5. $[Ni(NH_3)_6]Cl_2$
6. $Ni(dmg)_2$
7. $[Cu(NH_3)_4]SO_4 \cdot H_2O$

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| Organic Chemistry | M.M.:66 |
| Organic synthesis | 24 |
| Qualitative Analysis | 24 |
| Record | 08 |
| Viva | 10 |

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Organic Synthesis

Aldol condensation, dibenzal acetone from benzaldehyde, sandmeyer reaction: synthesis of p-chloroaniline from p-toluidine. Acetoacetic ester condensation: synthesis of ethyl-n-butylacetoacetate by A.E.E. condensation reaction: 4-chlorobenzaldehyde as substrate. Friedel-Crafts reaction: Benzoyl propanoic acid from succinic anhydride and benzene. Anomeric electrophilic substitution: synthesis of p-nitroaniline and p-bromoaniline. The products may be characterised by spectral techniques.

Quantitative Analysis

Determination of the percentage or number of hydroxyl group in an organic compound by acetylation method. Estimation of amines phenol bromide solution/or acetylation method. Determination of iodine saponification values of an oil sample.

Physical Chemistry

M.M.:68

Conductometry

16

Potentiometry/pHmetry

18

Polarimetry

16

Record

08

Viva voce

10

Conductometry

- Determination of the velocity constant, order of the reaction energy of activation saponification of ethyl acetate by sodium hydroxide conductometrically.
- Determination of solubility product of sparingly soluble salts (e.g. $PbSO_4$) conductometrically.
- Determination of the strength of strong and weak acid in a given conductometrically.
- to study of the effect of solvent on the conductance of $AgNO_3$ /acetic acid to determine the degree of dissociation equilibrium constant in different solvents in their mixtures (DMSO, DMF, dioxane, water) and to test the validity of Debye-Hückel-Onsager theory.

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5. Determination of the activity coefficient of zinc ions in the station 0.002M zinc sulphate using Debye Hucel's limiting law.

Potentiometry/pH metry

1. Determination of strengths of halides in a mixtuee poteiomeddtnically.
2. Determination of the valency of mercurous ions potentiometnically.
3. Determination of the strength strong and weak acids in a given mixmum using a potentiometer/pH meter.
4. Determination of temperature dependence EMF of a cell.
5. Determination of formation constant silver ammonia complox and toichiometry of the complex potentiometnically.
6. Acid-base tidtration in a non-aquous media using a pHa
7. Determination of the activity and activity coefficient of electrelytes.
8. Determination of the dissociation coustant of acetic in DMSO, DMF.
9. Determination of the dissociation constant of monohasie/dihaic anid by Albert-sberjeant method.
10. Dectrmination of thernaodynamic constants, $D_g, D.S,$ and DH for the by c.m. f. method $Zn+H_2so_4 \rightarrow ZnSO_4+2H$

Potentiometry

1. Determination of rate of constant for hydrotysts/inversion of sugar using a
2. Enzyme linetics-inversion of sucrease.

Elective papers for III sem (Any two)

1. MCH-603 : Organic synthesis
2. MCH-606 : Analytical Chemistry
3. MCH-609 : Medicinal Chemistry
4. MCH-608 : Electrochemistry
1. MCH-601 : Organotransition metal Chemistry
2. MCH-602 : Polymers
3. MCH-604 : Helenocyclic Chemistry
4. MCH-605 : Chemistry of Natural Prothucts
5. MCH-607 : Physical Organic Chemistry

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SEMESTER III

Paper-XI
MCH-501 : APPLICATION OF SPECTROSCOPY
(Inorganic Chemistry)

Unit-I

Vibrational Spectroscopy

Symmetry and shapes of AB_2 , AB_3 , AB_4 , AB_5 and AB_6 , mode of bonding of ambidentate ligands, nitrosyl, ethylenediamine and diketonato complexes, application of resonance Raman spectroscopy particularly for the study of active sites of metalloproteins.

Unit II

Electron Spin Resonance Spectroscopy

Hyperfine coupling, spin polarization for atoms and transition metal ions, spin-orbit coupling and significance of g-tensors, application to transition metal complexes (having one unpaired electron) including biological systems and to inorganic free radicals.

Unit III

Nuclear Magnetic Resonance of Paramagnetic Substances in Solution

The contact and Pseudo contact shifts, factors affecting nuclear relaxation, some applications including biochemical systems, an overview of EPR of metal ions with emphasis on ^{195}Pt and ^{119}Sn NMR.

Unit IV

Mössbauer Spectroscopy

Basic principles, spectral parameters and spectrum display. Application of the technique to the studies of (1) bonding and structures of Fe+2 and Fe+3 compounds (including those of intermediate spin), (2) Sn^{+2} and Sn^{+4} compounds nature of M-L bond, coordination number, structure and (3) detection of oxidation state and isomerism of Mn^{2+} atoms.

Unit V

Electronic Spectroscopy

Electronic Spectral Studies for d^1 - d^9 systems in octahedral, tetrahedral and square planar complexes.

Book Suggestion

- 1. Physical Methods for Chemistry, R. S. Drago, Butterworths, London.
- 2. Structural Methods in Inorganic Chemistry, G. B. Deacon, D. E. H. Radwin and S. Craddock, ELBS.
- 3. Infrared and Raman Spectral : Inorganic and Coordination Compounds K. Nakamoto, Wiley.
- 4. Progress in Inorganic Chemistry, vol. 8, ed. F. A. Cotton, vol. 15, ed. S. I. Lippard, Wiley.

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- 5. Transition Metal Chemistry ed. R.L. Carlin vol. 3 dekker.
- 6. Inorganic Electronic Spectroscopy, A.P.B. Lever, Elsevier.
- 7. NMR, NQR, EPR and Mossbauer Spectroscopy in Inorganic Chemistry, V. Parish, Ellis Haywood.
- 8. Practical NMR Spectroscopy, M.L. Martin, J.J. Deepish and G.J. Martin, Heyden
- 9. Spectrometric Identification of Organic Compounds, R.M. Silverstein, G.C. Bassler and T.C. Morrill, John Wiley.
- 10. Introduction to NMR spectroscopy, R.J. Abraham, J. Fisher and P. Loftus, Wiley
- 11. Application of Spectroscopy of Organic Compounds, J.R. Dyer Prentice Hall.
- 12. Spectroscopic Methods in Organic Chemistry D.H. Williams, I. Fleming, Tata McGraw-Hill.

Paper XII
MCH-502: PHOTOCHEMISTRY

S.S. 175 AA = 1 14

Unit-I

Photochemical Reactions

Interaction of electromagnetic radiation with matter, types of excitations, fate of excited molecule, quantum yield, transfer of excitation energy, actinometry.

Unit II

Determination of Reaction Mechanism

Classification, rate constants and life times of reactive energy state determination of rate constants of reactions. Effect of light intensity on the rate of photochemical reactions. Types of photochemical reactions-photo dissociation gas-phase photolysis.

Unit III

Photochemistry of Alkene

Intramolecular reactions of the olefinic bond-geometrical isomerism, cyclisation reactions, rearrangement of 1,4- and 1,5-dienes.

Photochemistry of Aromatic Compounds

Isomerisations, additions and substitutions.

Unit IV

Photochemistry of Carbonyl Compounds

Intramolecular reactions of carbonyl compounds-saturated, cyclic and acyclic, b.g unsaturated and a, b unsaturated compounds, cyclohexadienones. Intermolecular cycloaddition reactions-dimerisations and oxetane formation.

Unit V

Miscellaneous Photochemical Reactions.

Photo-Fries reactions of annelid's, Photo-Fries rearrangement, Barton reaction, Singlet molecular Oxygen reaction. Photochemical formation of smog, Photodegradation of

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polymers. Photochemistry of vision.

Books Suggested

1. Fundamentals of photochemistry, K.K. Rothagi-Mukheriji, Wiley-Eastern.
2. Essentials of Molecular Photochemistry, A Gilbert and J. Baggott, Blackwell Scientific Publication.
3. Molecular Photochemistry, N.J. Turro, W.A. Benjamin.
4. Introductory Photochemistry, A. Cox and t. Camp, McGraw Hill.
5. Photochemistry, R.P. Kundall and A. Gilbert. Thomson Nelson.
6. Organic Photochemistry, J. Coxon and B.halton, Cambridge University Press.

Paper-XIII
MCH-503: BIOCHEMISTRY

Sl 179-AD
1 214

Unit I

Metal Ions in Biological Systems

Bulk and trace metals with special reference to Na, K, Mg, Ca, Fe, Cu, Zn, Co. and K⁺/Na⁺ pump.

Bioenergetics and ATP Cycle.

DNA polymerisation, glucose storage, metal complexes in transmission of energy; chlorophyll's, photosystem I and photosystem II in cleavage of water.

Transport and Storage of Dioxygen

Heam proteins and oxygen uptake structure and function of haemoglobin's, myoglobin, haemocyanins and hemerythrin. model synthetic complexes of iron, cobalt and copper.

Unit II

Electron Transfer in Biology

Structure and function of metal of proteins in electron transport processes cytochrome's and ion-sulphure proteins, synthetic models.

Nitrogen fixation

Biological nitrogen fixation. and its mechanism, nitrogenase, Chemical nitrogen fixation

Unit III

Enzymes

Introduction and historical perspective, chemical and biological catalysis, remarkable properties of enzymes like catalytic power, specificity and regulation. Nomenclature and classification. extraction and purification. Fischer's lock and key and Koshalnd's induced fit hypothesis, concept and identification of active site by the use of inhibitors, affinity labeling and enzyme modification by site-directed mutagenesis. Enzyme kinetics, Michael's-Menten and Lineweaver Burk plots, reversible and irreversible inhibition.

Mechanism of Enzyme Action

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Transition-state theory, orientation and Steric effect, acid-base catalysis, covalent catalysis, strain or distortion. Examples of some typical enzyme mechanisms for chemotrypsin, ribonuclease, lysozyme and carboxypeptidase.

Kinds of Reactions Catalysed by Enzymes

Nucleophilic displacement on a phosphorus atom, multiple displacement reactions and the coupling of ATP cleavage to endergonic processes. Transfer of sulphate, addition and elimination reactions. enolic intermediates in Isomerisations reactions, b-Cleavage and condensation, some isomerization and rearrangement reactions. Enzyme catalyzed carboxylation and decarboxylation.

Unit IV

Co-Enzyme Chemistry

Cofactors as derived from vitamins, coenzymes, prosthetic groups, apoenzymes. Structure and biological functions of coenzyme A, thiamine pyrophosphate, pyridoxal phosphate, NAD⁺, NADP⁺, FMN, FAD, lipic acid, vitamin B12. Mechanisms of reactions catalyzed by the above cofactors. Enzyme Models
Host-guest chemistry, chiral recognition and catalysis, molecular recognition, molecular asymmetry and prochirality Biometric chemistry. crown ether, cryptates. Cyclodextrins, cyclodextrin-based enzyme models, clixarenes, ionospheres, micelles synthetic enzymes or synzymes.

Biotechnological Applications of Enzymes

large-scale production and purification of enzymes, techniques and methods of immobilization of enzymes, effect of immobilization on enzyme activity, application of immobilized enzymes, use of enzymes in food and drink industry-brewing and cheese-making, syrups from cron-starch, enzymes as targets for drug design. Clinical uses of enzymes, enzyme therapy, enzymes and recombinant DNA Technology.

Unit V

Biological Cell and its Constituents

Biological cell, structure and functions of proteins, enzymes, DNA and RNA in living systems. Helix coils transition.

Bioenergetics

Standard free energy change in biochemical reactions, exergonic, endergonic. Hydrolysis of ATP, synthesis of ATP from ADP.

Biopolymer Interactions

Forces involved in biopolymer interactions. Electrostatic charges and molecular expansion, hydrophobic forces, dispersion force interactions. Multiple equilibrium and various types of binding processes in biological systems. Hydrogen ion titration curves.

Cell Membrane and Transport of Ions

Structure and functions of cell membrane, ion transport through cell membrane, irreversible thermodynamic treatment of membrane transport. Nerve conduction.

Book Suggested

- 1 Principles of Bioinorganic Chemistry, S.J. Lippard and J.M. Berg, University Science Books.
- 2 Bioinorganic Chemistry, I. Bertini, H.B. Gray, S.J. Lippard and J.S. Valentine. University Science Books.

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3. Inorganic biochemistry vol. I and II ed. G.L. Eichhorn, Elsevier
4. Progress in Inorganic Chemistry, Vol 18 and 38 ed J.J. Lippard, Wiley.
5. Bioorganic Chemistry : A chemical Approach to Enzyme Action, Hermann Dugas and C. Penny, Springer Verlag.
6. Understanding Enzymes, Trevor Palmer, Prentice Hall.
7. Enzyme Chemistry : Impact and applications, Ed. Collin J suckling, chemistry
8. Enzyme Mechanisms Ed. M.L. Page and A. Williams, Royal Society of Chemistry.
9. Fundamentals of Enzymology, N.C. Price and L. Stevens. Oxford University Press.
10. Immobilized Enzymes : An Introduction and Applications in Biotechnology, Michael ID. Trevan, Hohn Wiley.
11. Enzymatic Reaction Mechanisms. C. Walsh. W.H. Freeman.
12. Enzyme Structure and Mechanism, A Fersht, W.H. Freeman
13. Biochemistry : The Chemical Reactions of Living Cells, D.E. Metzler, Academic Press.

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Paper -

MCH-606 Analytical Chemistry Paper IV

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7

and cleanliness. Laboratory operations and practices. Analytical balance. Techniques of weighing, errors. Volumetric glassware cleaning and calibration of glassware. Sample volumetric glassware cleaning and calibration of glassware. Sample preparation, dissolution and decompositions. Gravimetric techniques. Selecting and handling of reagents. Laboratory notebooks. Safety in the analytical laboratory

Errors and Evaluation
Definition of terms in mean and median. Precision-standard deviation, relative standard deviation. Accuracy-absolute error, relative error. Types of error in experimental data determinate (systematic), indeterminate (or random) and gross. Sources of error and the effects upon the analytical results. Methods for reporting analytical data. Statistical evaluation of data-indeterminate errors. The uses of statistics.

Unit II

Food analysis

Moisture, ash, crude protein, fat crude fiber, carbohydrates, calcium, potassium, sodium and phosphate. Food adulteration-common adulterants in food, contamination of foods

Units Microscopic examination of foods for adulterants. Pesticide analysis in food products. Extraction and purification of sample. HPLC. Gas chromatography for organophosphates. Thin-layer chromatography for identification of chlorinated pesticides in food products

Unit-III

Analysis of Water Pollution

Origin of Waste water, types, water pollutants and their effects. Sources of water pollution-domestic, industrial, agricultural soil and radioactive wastes as sources of pollution. Objectives of analysis-parameter for analysis-colour, turbidity, total solid-conductivity, acidity, alkalinity, hardness, chloride, sulphate, fluoride, silica, phosphates and different forms of nitrogen, Heavy metal pollution-public health significance of cadmium, chromium, copper, lead, zinc, manganese, mercury and arsenic. General survey of instrumental technique for the analysis of heavy metals in aqueous systems. Measurements of DO, BOD, and COD. Pesticides as water pollutants and analysis. Water pollution laws and standards

Unit-IV

Analysis of soil, Fuel, Body Fluids and Drugs

(a) Analysis of Soil, moisture pH total nitrogen, phosphorus, silica, lime, magnesia, manganese, sulphur and alkali salts
Fuel analysis - liquid and gas. Ultimate and proximate analysis-heating values-grading of coal. Liquid fuels-flash point, aniline point, octane number and carbon residue. Gaseous fuels-produced gas and water gas-calorific value

Unit V

(a) **Clinical Chemistry** Composition of blood-collection and preservation of samples. Clinical analysis. Serum electrolytes, blood glucose, blood urea nitrogen, uric acid, albumin, globulins, barbiturates, acid and alkaline phosphates. Immunoassay: principles of radio immunoassay (RIA) and applications. The blood gas analysis trace elements in the body.

(b) **Drug analysis**: Narcotics and dangerous drug. Classification of drugs. Screening by gas and thin-layer chromatography and spectrophotometric measurements.

Book Suggested

1. Analytical Chemistry, G.D. Christian, J. Wicy.
2. Fundamentals of analytical Chemistry, D.A. Skoog, D.M. West and F.J. Holler, W.B. Saunders.
3. Analytical Chemistry-Principles, J.H. Kennedy, W.B. Saunders.

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Benzpinacol Phase transfer catalyst. Alkylation of diethyl malonate or ethyl acetoacetate with an alkylhalide.

Paper Chromatography

Separation and identification of the sugars present in the given mixture of glucose, fructose and sucrose by paper chromatography and determination of Rf values.

PHYSICAL CHEMISTRY

M.M.: 68

| | |
|-------------------|----|
| Spectroscopy | 26 |
| Chemical Kinetics | 24 |
| Record | 08 |
| Viva Voice | 10 |

Spectroscopy

- i. Determination of Pka of indicator (e.g. methyl red) in (a) aqueous and (b) micellae media
- ii. Determination of stoichiometry and stability constant of Ferricisothiocyanate complex solution.
- iii. Determination of rate constant of alkaline bleaching of malachite green and effects of ionic strength on the rate of reaction.

Chemical Kinetics

- i. Determination of rate constant and formation constant of an intermediate complex in the reaction of Ce(IV) and Hypophosphorous acid at ambient temperature
- ii. Determination of energy and enthalpy of activation in the reaction of KMnO4 and benzyl alcohol in acid medium.
- iii. Kinetics of an enzyme catalyzed reaction.

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SEMESTER IV

Paper-XVI
MCH-504: APPLICATION OF SPECTROSCOPY
(Organic Chemistry)

Unit-I

Ultraviolet and Visible spectroscopy

Various electronic transitions (185-800 nm) Beer-Lambert law, effect of solvent on electronic transitions, ultraviolet bands for carbonyl compounds, unsaturated carbonyl compounds, dienes, conjugated polyenes, Fieser Woodward rules for conjugated dienes and carbonyl compounds, ultraviolet spectra of aromatic compounds. Steric effect in biphenyls.

Unit II

Infrared Spectroscopy

Characteristic vibrational frequencies of alkanes, alkenes, alkynes, aromatic compounds, alcohols, ether's, phenols and amines. Detailed study of vibrational frequencies of carbonyl compounds (ketone's, aldehyde's, esters, amides, acids, anhydride's, lactones, lactams and conjugated carbonyl compounds). Effect of hydrogen bonding and solvent effect on vibrational frequencies, overtones, combination bands and fermi resonance.

Optical Rotatory Dispersion (ORD) and Circular Dichromium (CD)
Definition, deduction of absolute configuration, octant rule for ketones.

Unit-III

Nuclear Magnetic Resonance Spectroscopy

General introduction and definition, chemical shift, spin-spin interaction, shielding mechanism, mechanism of measurement, chemical shift values and correlation for protons bonded to carbon (aliphatic, olefinic, aldehydic and aromatic) and other nuclei (alcohols, phenols, enols, carboxylic acids, amines, amides & mercapto), chemical exchange, effect of deuteration, complex spinspin interaction between two, three, four and five nuclei (first order spectra), Stereochemistry, hindered rotation, Karplus curve, variation of coupling constant with disordered angle. Simplification of complex spectranuclear magnetic double resonance. NMR shift reagents, solvent effects. Fourier transform technique, nuclear overhauser effect (NOE).

Unit-IV

Carbon-13 NMR Spectroscopy

General considerations, chemical shift (aliphatic olefinic, alkyne, aromatic, heteroaromatic and carbonyl carbon), coupling constants. Two dimension NMR spectroscopy-COSY, NOESY, DEPT, IONEPT, APT and INADEQUATE techniques

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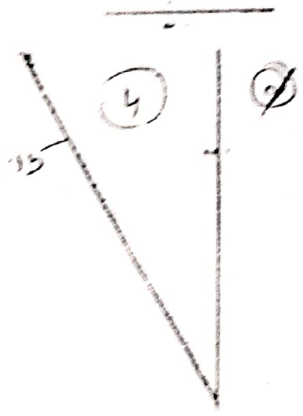
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Mass Spectrometry

Introduction ion production EI, CI FD, ESI and FAB, factors affecting fragmentation, ion abundance Mass spectral fragmentation of organic compounds, common functional groups, molecular ion peak, metastable peak, McLafferty rearrangement, Nitrogen rule, High resolution mass spectrometry, Example of mass spectral fragmentation of organic compounds with respect to their structure determination.

Book Suggested

13. Physical Methods for Chemistry, R.S. Drago, Saunders Company.
14. Structural Methods in Inorganic Chemistry, E.A.V. Ebsworth, D.W.H. Rankin and S. Craddock, ELBS.
15. Infrared and Raman Spectral : Inorganic and Coordination Compounds K. Nakamoto, Wiley.
16. Progress in Inorganic Chemistry vol., 8, ed., F.A. Cotton, vol., 15 ed. S.J. Lippard, Wiley.
17. Transition Metal Chemistry ed. R.L. Carlin vol. 3 dekker
18. Inorganic Electronic Spectroscopy, A.P.B. Lever, Elsevier.
19. NMR, NQR, EPR and Mossbauer Spectroscopy in Inorganic Chemistry. V. Parish, Ellis Haywood.
20. Practical NMR Spectroscopy, M.L. Martin, J.J. Deepish and G.J. Martin, Heyden
21. Spectrometric Identification of Organic Compounds, R.M. Silverstein, G.C. Bassler and T.C. Morrill, John Wiley.
22. Introduction to NMR spectroscopy, R.J. Abraham, J. Fisher and P. Loftus, Wiley.
23. Application of Spectroscopy of Organic Compounds, J.R. Dyer Prentice Hall
24. Spectroscopic Methods in Organic Chemistry D.H. Williams, I. Fleming, Tata McGraw-Hill.

Paper XVII
MCH-505: SOLID STATE CHEMISTRY

SS 712
1

Unit I

Solid State Reactions

General principles, experimental procedure, co-precipitation as a precursory to solid state reactions, kinetics of solid state reactions

Unit II
Crystal Defects and Non-Stoichiometry

Perfect and imperfect crystals, intrinsic and extrinsic defects-point defects, line and plane defects vacancies-Schottky defects and Frenkel defects. Thermodynamics of Schottky and Frenkel defect formation, colour centres, non-stoichiometry and defects.

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Unit III

Electronic Properties and Band Theory

Metals, insulators and semiconductors, electronic structure of solids band theory band structure of metals, insulators and semiconductors, Intrinsic and extrinsic semiconductors, doping semiconductors, p-n junctions, super conductors. Optical properties-Application of optical and electron microscopy. Magnetic Properties-Classification of materials : Effect of temperature calculation of magnetic moment, mechanism of ferro and anti ferromagnetic ordering super exchange.

Unit IV

Organic Solids

Electrically conducting solids. organic charge transfer complex, organic metals, new superconductors.

Unit V

Liquid Crystals

Types of liquid crystals: Nematic, Smectic, Ferroelectric, Antiferroelectric. Various theories of L.C. Liquid crystal display, New materials.

Books Suggested

- 1 Solid state chemistry and its applications, A.R. West. Peenum.
- 2 Principles of the Solid State, H.V. Keer, Wiley Eastern.
- 3 Solid State Chemistry, N.B. Hannay.
- 4 Solid State Chemistry, D.K. Chakrabarty, New Wiley Eastern.

Paper XVIII

MCH-506 : ENVIRONMENTAL CHEMISTRY

SS 713 / 1 = 1713

Unit-I

Atmosphere

Atmospheric layers, Vertical temperature profile, heat/radiation budget of the earth atmosphere systems. Properties of troposphere, thermodynamic derivation of lapse rate, temperature inversion. Calculation of Global mean temperature of the atmosphere Pressure variation in atmosphere and scale height. Biogeochemical cycles of carbon, nitrogen, sulphure, phosphorus oxygen. Residence times.

Atmospheric Chemistry

Sources of trace atmospheric constituents : nitrogen oxides, sulphure dioxide and other sulphure compounds, carbon oxides, chlorofluorocarbons and other halogen compounds, methane and other hydrocarbons.

Tropospheric Photochemistry

Mechanism of Photochemical decomposition of NO2 and formation of ozone. Formation of oxygen atoms, hydroxyl, hydroperoxy and organic radicals and hydrogen peroxide Reactions of hydroxyl radicals with methane and other organic compounds. Reaction of

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SS 712 / 2 = 356

Unit III
Electronic Properties and Band Theory

Metals, insulators and semiconductors, electronic structure of solids, band theory, band structure of metals, insulators and semiconductors, Intrinsic and extrinsic semiconductors, doping semiconductors, p-n junctions, super conductors. Optical properties-Application of optical and electron microscopy. Magnetic Properties- Classification of materials : Effect of temperature calculation of magnetic moment, mechanism of ferro and anti ferromagnetic ordering super exchange.

Unit IV
Organic Solids

Electrically conducting solids, organic charge transfer complex, organic metals, new superconductors.

Unit V
Liquid Crystals

Types of liquid crystals: Nematic, Smectic, Ferroelectric, Antiferroelectric, Various theories of L.C. Liquid crystal display, New materials.

Books Suggested

1. Solid state chemistry and its applications, A.R. West, Prentice.
2. Principles of the Solid State, H.V. Keer, Wiley Eastern.
3. Solid State Chemistry, N.B. Hannay.
4. Solid State Chemistry, D.K. Chakrabarty, New Wiley Eastern.

Paper XVIII

MCH-506 : ENVIRONMENTAL CHEMISTRY

SS 713 / 1 = 713

Unit-I

Atmosphere

Atmospheric layers, Vertical temperature profile, heat/radiation budget of the earth atmosphere systems. Properties of troposphere. thermodynamic derivation of lapse rate, temperature inversion. Calculation of Global mean temperature of the atmosphere. Pressure variation in atmosphere and scale height. Biogeochemical cycles of carbon, nitrogen, sulphure, phosphorus oxygen. Residence times.

Atmospheric Chemistry

Sources of trace atmospheric constituents : nitrogen oxides, sulphure dioxide and other sulphure compounds, carbon oxides, chlorofluorocarbons and other halogen compounds, methane and other hydrocarbons.

Tropospheric Photochemistry

Mechanism of Photochemical decomposition of NO2 and formation of ozone. Formation of oxygen atoms, hydroxyl, hydroperoxy and organic radicals and hydrogen peroxide. Reactions of hydroxyl radicals with methane and other organic compounds. Reaction of

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OH radicals with SO₂ and NO₂. Formation of Nitrate radical and its reactions. Photochemical smog meteorological conditions and chemistry of its formation.

Unit-II

Air Pollution

Air pollutants and their classifications. Aerosols-sources, size distribution and effect on visibility, climate and health.

Acid Rain

Definition, Acid rain precursors and their aqueous and gas phase atmospheric Oxidation reactions. Damaging effects on aquatic life, plants, buildings and health. Monitoring of SO₂ and NO_x. Acid rain control strategies.

Stratospheric Ozone Depletion

Mechanism of Ozone formation, Mechanism of catalytic Ozone depletion, Discovery of Antarctic Ozone hole and Role of chemistry and meteorology. Control Strategies.

Green House Effect

Terrestrial and solar radiation Spectra, Major green house gases and their sources and Global warming potentials. Climate change and consequences.

Urban Air Pollution

Exhaust emissions, damaging effects of carbon monoxide. Monitoring of CO. Control strategies.

Unit-III

Aquatic Chemistry and Water Pollution

Redox chemistry in natural waters. Dissolved oxygen, biological oxygen demand, chemical oxygen demand, determination of DO, BOD and COD. Aerobic and anaerobic reactions of organic sulphure and nitrogen compounds in water acid-base chemistry of fresh water and sea water. Aluminum, nitrate and fluoride in water. Petrification. Sources of water pollution. Treatment of waste and sewage. Purification of drinking water, techniques of purification and disinfection.

Unit IV

Environmental Toxicology

Toxic heavy metals : Mercury, lead, arsenic and cadmium. Causes of toxicity.

Bioaccumulation, sources of heavy metals. Chemical speciation of Hg, Pb, As, and Cd.

Biochemical and damaging effects.

Toxic Organic Compound : Pesticides, classification, properties and uses of organochlorine and ionospheric pesticides detection and damaging effects.

Polychlorinated biphenyls : Properties, use and environmental continuation and effects.

Polynuclear Aromatic Hydrocarbons : Source, structures and as pollutants.

Unit-V

Soil and Environmental Disasters

Soil composition, micro and macro nutrients, soil pollution by fertilizers, pesticides, heavy metals. Methods of re-remediation of soil. Bhopal gas tragedy, Chernobyl, three mile island, Minimata Disease, Seveso (Italy), London smog.

Books Suggested

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Paper XIV

IVth paper

SS. 716
7415

VCH-505: Chemistry of Natural Products

Unit I

Terpenoids and Carotenoids
Classification, nomenclature, occurrence, isolation, general methods of structure determination, isoprene rule. Structure determination, stereochemistry, biosynthesis and synthesis of the following representative molecules: Citral, Geraniol α -Terpineol, Menthol, Farnesol, Zingiberene, Santonin, Phytol, Abietic acid and β -Carotene.

Unit II

Alkaloids
Definition, nomenclature and physiological action, occurrence, isolation, general methods of structure elucidation, degradation, classification based on nitrogen heterocyclic ring, role of alkaloids in plants. Structure, stereochemistry, synthesis and biosynthesis of the following Ephedrine, (-)- Cocaine, Nicotine, Atropine, Quinine and Morphine.

Unit III

Steroids
Occurrence, nomenclature, basic skeleton, Diel's hydrocarbon and stereochemistry, Isolation, Structure determination and synthesis of Cholesterol, Bile acids, Androsterone, Testosterone, Estrone, Progesterone, Aldosterone, Biosynthesis of Steroids.

Unit IV

Plant Pigments
Occurrence, nomenclature and general methods of structure determination. Isolation and synthesis of Apigenin, Luteolin, Quercetin, Myricetin, Quercetin β -glucoside, Vitexin, Diadzein, Aureusin, Cyanidin-7-arabinoside, Cyanidin, Hirsutidin, Biosynthesis of flavonoids. Acetate pathway and Shikimic acid pathway.

Prophyrins

Structure and synthesis of Haemoglobin and Chlorophyll.

Unit V

Prostaglandins

Occurrence, nomenclature, classification, biogenesis and physiological effects. Synthesis of PGE₂ and PGF_{2a}.

Pyrethroids and Rotenones

Synthesis and reactions of Pyrethroids and Rotenones. (For structure elucidation, emphasis is to be placed on the use of spectral parameters wherever possible).

Books Suggested

1. Natural Products: Chemistry and Biological Significance, J. Mann, R.S. Davidson, J.B. Hobbs, D.V. Bantrop and J.B. Harborne, Longman, Essex.
2. Organic Chemistry: Vol. 2 I.L. Finar, ELBS
3. Stereoselective Synthesis: A Practical Approach, M. Norgredi, VCH.
4. Rodd's Chemistry of Carbon Compounds, Ed. S. Coffey, Elsevier.
5. Chemistry, Biological and Pharmacological Properties of Medicinal Plants from the Americas, Ed. Kurt Hostettmann, M.P. Gupta and A. Marston, Harwood Academic Publishers.
6. Introduction to Flavonoids, B.A. Bohm, Harwood Academic Publishers.
7. New Trends in Natural Product Chemistry, Ataur Rahman and M.K. Choudhary.

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Unit-I

SS-710

M-15-

Basics of polymers. Basic concepts : Monomers, repeat units, degree of polymerization. Linear, branched and network polymers. Classification of polymers. Polymerization : condensation, addition/radical chain-ionic and co-ordination and polymerization. Polymerization conditions and polymer reactions. Polymerization in homogeneous and heterogeneous systems.

Unit-II
Polymer Characterization

Polydispersion-average molecular weight concept. Number, weight and viscosity average molecular weights. Polydispersity an molecular weight distribution. The practical significance of molecular weight. Measurement of molecular-weights. End-group. Viscosity. Light scattering, osmotic and ultracentrifugation methods.

Unit-III

Analysis and testing of polymers
Chemical analysis of polymers, spectroscopic methods, X-ray diffraction study. Microscopy. Thermal analysis and physical testing-tensile strength. Fatigue, impact. Tear strength. Hardness and abrasion resistance.

Unit-IV

Inorganic Polymers

General survey and scope of Inorganic Polymers special characteristics, classification, and hetero atomic polymers.

Structure, Properties and Applications of

Polymers based on boron-borazines, boranes and carboranes.
Polymers based on Silicon, silicone's polymetalloxanes and polymetallosiloxanes, silazanes.

Unit V

Structure, Properties and Application of

Polymers based on Phosphorous-Phosphazenes, Polyphosphates
Polymers based on Sulphure-Tetrasulphur tetranitride and related compounds.
Co-ordination and metal chelate polymers.

Suggested

Inorganic Chemistry, J.E. Huheey, Harper Row.
Developments in Inorganic polymer Chemistry, M.F. Lappert and G.J. Leigh.
Inorganic polymers- N.H. Ray.
Inorganic polymers, Graham and Stone.
Inorganic Rings and Cages : D.A. Armitage.
Textbook of Polymers Science. F.W. Billmeyer Jr. Wiley.
Contemporary Polymer Chemistry, H.R. Alcock and F.W. Lamb, Prentice Hall.

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Practical

(Duration: 6-8 hrs in each branch)

Practical examination shall be conducted separately for each branch.

INORGANIC CHEMISTRY

M.M.: 66

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| Preparation | 12 |
| Spectrophotometer determinations/Flame Photometric | 36 |
| Determinations | |
| Record | 08 |
| Viva Voice | 10 |

Preparation:

Preparation of selected inorganic compounds and their studies by IR, electronic spectra and magnetic susceptibility measurement. Handling of air and moisture sensitive compounds involving vacuum lines. Selection can be made from the following:

1. Sodium amide. Inorg. Synth. 1946, 2, 128.
2. Atomic absorption analysis of Mg and Ca.
3. Synthesis of trichlorodiphenylantimony (v) hydrate. Inorg Synth., 1985, 23, 194.
4. Sodium tetrathionate $\text{Na}_2\text{S}_4\text{O}_6$.
5. Metal complex of dimethyl sulfoxide: $\text{CaCl}_2 \cdot 2\text{DMSO}$ J. Chem. Edu. 1982, 59, 57.
6. Synthesis of metal acetylacetonate: Inorg. Synth., 1957, 5, 130, 1963, 4, 183.
7. Cis and Trans $[\text{Co}(\text{en})_2\text{Cl}]^+$
8. Determination of Cr (III) complex. $[\text{Cr}(\text{H}_2\text{O})_6]^{3+} \cdot 3\text{H}_2\text{O}$ Inorg. Synth., 1972, 13, 184.
9. Preparation and use of Ferrocene. J. Chem. Edu. 1966, 43, 73; 1976, 53, 730.
10. Preparation of $[\text{Co}(\text{phenanthroline-5,6-quinone})]$

Spectrophotometric Determination



PHYSICAL CHEMISTRY

[60]

Thermodynamics

Polarography

Record

viva Voice

M.M.

24

24

08

10

Thermodynamics

- 1- Determination of partial molar volume of solute (e.g. KCl) and solvent in a binary mixture.
- 2- Determination of the temperature dependence of the solubility of a compound in two solvents having similar intramolecular H-bonding (benzoic acid in water and in DMSO water mixture and the molar heat of solution).

Polarography

- i. Identification and estimation of metal ions such as Cd^{+2} , Pb^{+2} , Zn^{+2} and etc. polarographically.
- ii. Study of metal ligand complex polarographically (using Lingame's Method)

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Department of Higher Education Madhyapradesh

Unified Syllabus

(3)

Class - B.Sc. 1st Year
Subject - Industrial Chemistry

Max. Marks : 50

PRACTICAL

- 1- Determination of M.P. and elevation in B.P. of solids and liquids.
- 2- Analysis of water : Alkalinity, Hardness, pH, Chloride, Sulphate.
- 3- Calibration of thermometers.
- 4- Preparation of standard solution : Primary and secondary standards.
- 5- Determination of Flash Point.
- 6- Chromatography : Paper, thin layer.
- 7- Determination of physical constants : Density, Refractive index, surface tension, viscosity.
- 8- Soil Analysis : Determination of pH, Mg, Silica, Alkalinity.

Division of marks for practical

| | |
|---------------|----------|
| Two practical | 30 |
| Viva | 10 |
| Seasonal | 10 |
| Total | 50 Marks |

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Unified Syllabus

Class - B.Sc. IIrd Year

Subject - Industrial Chemistry

Paper - First

Max. Marks : 42^{1/2}

Unit: - 1:- **Cement:** Types of cement, composition, manufacturing processes, setting of cement. **Ceramic:** Introduction, types, manufacturing processes, applications, refractory materials.
Polymeric materials: Introduction, Mechanism of polymerisation, plastic, Preparation, Properties and uses of polythene, PVC, Bakelite, Nylon 66, industrial applications.

Unit:-2:- **Glass:** Types, composition, manufacturing- physical and chemical properties, applications. **Corrosion:** Various types of corrosion relevant to chemical industry, mechanism, protection against corrosion.

Unit:-3:- **Nitration:** Introduction, nitrating agents, kinetics and mechanism of nitration processes such as nitration of :-

- 1:- Paraffinic hydrocarbon.
- 2:- Benzene to nitrobenzene and m-dinitrobenzene.
- 3:- Acetanilide.

Halogenation:- Introduction, kinetics of halogenation reactions, reagents for halogenation reactions, halogenation of aliphatic and aromatic hydrocarbons (Nuclear & side chain halogenation)
Halogenation of aliphatic hydrocarbons with special reference to energy profile diagram. Halogenations of aromatic hydrocarbons- types of reagents & their kinetics. Commercial manufacturing of dichlorobenzene.

Unit:-4 **Sulphonation:** Introduction sulphonating agents sulphonation of aliphatic and aromatic hydrocarbons, Mechanism of sulphonation reaction, reversibility of sulphonation concept of reversibility of sulphonation.

Unit:-5 **Industrial Pollution :** Introduction to industrial pollution with reference to water and air-Statutory limits of air and water pollutants.

- Books :-**
- 1:- Unit process of organic synthesis vol. 1&2 P.H.Gs
 - 2:- Industrial chemistry: - B.K.Sharma
 - 3:- Environmental chemistry: - B.K.Sharma
 - 4:- Environmental chemistry: - A.K.Day
 - 5:- Unit operations vol.1&2:- - K.A.Gauhane
 - 6:- Engineering Chemistry :- P.C. Jain & Monika Jain

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Department of Higher Education Madhyapradesh

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Unified Syllabus

Class - B.Sc. IInd. Year
Subject - Industrial Chemistry
Paper - Practical

Max. Marks : 50

PRACTICAL

- 1- Unit process :- Preparations using nitration, sulphonation, halogenation.
- 2- Instrumental Methods of Analysis related to :- colorimetry, potentiometry, conductivity.
- 3- Water Analysis :- Sampling, physical parameters such as - pH conductivity, turbidity, T.D.S, Hardness, COD, BOD.
- 4- Flash point and Ignition points of Oils & Lubricants.

Project Report :- Students are required to visit places of industrial interest.

Division of marks for practical

| | |
|---------------|----------|
| Two practical | 30 |
| Viva | 10 |
| Seasonal | 10 |
| Total | 50 Marks |

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JIWAJI UNIVERSITY GWALIOR

INDUSTRIAL CHEMISTRY

B.Sc. V SEMESTER

Chemical Process Economics, Industrial Organization and Polymer Science-II

UNIT-1

Financial management- Concept, definition, types of capital, method employed for the estimation of capital, working capital, factors affecting requirement of the working capital.

Cost accounting- Introduction, elements of cost accounting, types of cost, factors involved in project cost estimation

Sales and marketing management- Introduction, sales management, sales organization, function of sales department, selling concept vs marketing concept, marketing management and its functions

UNIT-2

Depreciation- Definition and concept, causes of depreciation, method of calculating depreciation such as straight line method, reducing balance method, repair provision method and annuity method.

Breakeven analysis-; Concept, importance and scope of breakeven analysis, calculation of breakeven point, breakeven chart.

Inventory control and management-; introduction, inventory classification, inventory management, functions of inventories.

Plant location- Concepts and factors governing plant location, rural vs urban sites.

UNIT-3

Material management- Introduction, function, objectives of material management, purchasing or procurement, purchase organization, buying techniques.

Management concept- Concept of scientific management in industry, function of management, decision making, planning, organizing, directing and control.

Industrial management: types of management, management development, management information system, application of management information system

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UNIT-4

Detailed study of the following thermosetting polymers with reference to synthesis, chemistry, properties and applications - phenol formaldehyde resins, amino resins, Urea-formaldehyde resin, melamine formaldehyde resins, polyurethanes.

Detailed study of the following thermosetting polymers with reference to synthesis, chemistry, properties and applications - Epoxy Resins, grades of epoxy resins, Curing process and its importance with mechanism.

Poly carbonates, silicones

Homomers- poly isoprene, poly butadiene, neoprene

Detailed study of the following thermosetting polymers with reference to synthesis, chemistry, properties and applications - polyolefins, polyethylene, HDPE, LDP, LLDPE, polypropylene.

UNIT-5

Detailed study of the following thermosetting polymers with reference to synthesis, chemistry, properties and application - ethylene propylene copolymers.

Polyvinylchloride-Grades of PVC, teflon

Polystyrene- homopolymers, copolymers such as SAN, ABS, SANI

Vinyl polymers_ Poly vinyl acetates and its modifications like PVA, PVAc and polyacetals.

Practicals

1. Determination of strength of CuSO₄ iodometrically in industrial sample using thio solution.
2. Preparation of Urea - Formaldehyde resin.
3. Preparation of Phenol - Formaldehyde resin
4. Separation of mixture by paper chromatography
5. Analysis of functional group present in industrial raw material
7. Purification of given sample by distillation.
8. Preparation of Rose water by steam distillation

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Industrial chemistry
Practical B.Sc.V Sem.

Max. Marks 50

- 1 One experiment from the following :
Industrial analysis : Analysis of common raw materials as per industrial specification such as phenol, formaldehyde, hydrogen peroxide, acetone, epoxide olefins etc.
- 2 One experiment from the following:
Synthesis of common industrial components involving two step reactions for example 4 -bromoaniline, 3 -nitro aniline, sulphaniamide, 4- aminobenzoic acid, 4 -nitro benzoic acid, dihalobenzenes, nitrohalobenzenes.
- 3 One experiment from the following ;
Analysis of intermediates : nitrate titrations, diazo coupling, titanous Chloride titrations estimation of Cu Ni Cr etc.
- 4 One experiment from the following :
Dyeing: Dyeing of the following dyes on cotton, wool and silk- direct, azoic, acid TPM- on silk, vat, reactive sulphar. Evaluation of the fadness properties of dyes with respect to light, washing and sublimation.
- 5 One experiment from the following :
Preparation of Methyl orange, methyl red orange red, II flourescein anthraquinone.
- 6 Project and record
At least 1 industrial visits are necessary to submit project report
- 7 Viva- voce.

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Glass state/Glass transition temperature, TGA, factors affecting GFT, Crystallization in polymers

UNIT 5

Viscosity stability, optical properties, electrical properties, thermal properties, mechanical properties of polymers

Degradation of polymers by thermal, oxidative, mechanical and chemical methods.

Polymer processing - compression moulding casting, extrusion, fibre spinning, injection moulding, thermofoming, Vulcanization of elastomers, polymer industries in India.

Practicals

1. Determination of saponification value of an oil or fat
2. Determination of iodine value of an acid / fat / ester.
3. To prepare cellulose from sugar cane waste / cotton clothes
4. To prepare soap from oil
5. To determine the concentration of given sample (K₂Cr₂O₇) by colorimeter.
6. To determine the flux / viscosity of given sample by colorimeter.
7. Separation of mixture by Thin Layer Chromatography.

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INDUSTRIAL CHEMISTRY

PRACTICALS - B.Sc. VI SEMESTER

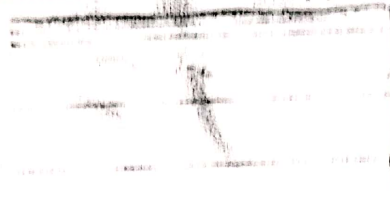
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1. Two experiment from the following:
General laboratory techniques for polymer synthesis: Bulk & emulsion (polystyrene), solution (polyacrylonitrile), suspension (polymethylmethacrylate).
2. Two experiments from the following:
Synthesis of resins and nylons: Phenol-formaldehyde resin (PFR/bakelite), urea-formaldehyde resin (UFR) and nylon 6,6, nylon 6,10 & hexamethylene diamine-adipic acid salt.
3. Any three experiments on instrumental methods of analysis focused on interpretation of data:
UV/Visible, Infrared and NMR spectroscopy and Gas chromatography.
4. Two experiments from the following:
Chromatography: paper, thin layer and ion-exchange chromatography.
6. One experiment from the following:
Isolation of natural polymers (cellulose etc.).
5. One experiment from polymer processing/plastic technology:
Die casting, film casting, compression moulding and fibre spinning etc.
6. Project and record
At least 01 industrial visit is necessary to submit the project report
8. Viva-Voice

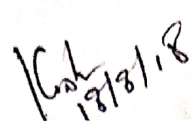
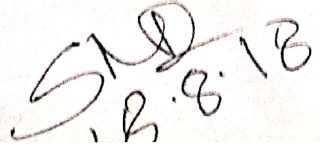
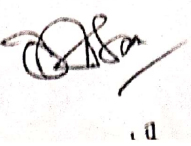
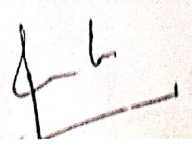
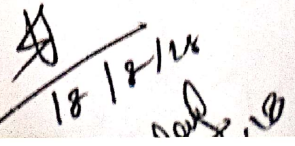
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Govt. KRG PG (Autonomous) College, Gwalior (M.P.)

List of Examiners for Chemistry / Industrial Chemistry



| Name of Professor | Name of College |
|----------------------------|---|
| 1. Dr. Deepak Pathak | Govt. College, Jaura, Morena |
| 2. Dr. SN Dikshit | SMS Govt. Science College, Gwalior |
| 3. Dr. AP Gupta | Govt. PG College, Pichore |
| 4. Dr. PD Shakya | Govt. SLP College, Gwalior |
| 5. Dr. MK Jain | Govt. PG College, Shivppuri |
| 6. Dr. Prabha Dikshit | ITM University, Gwalior |
| 7. Dr. AS GAhlaut | Govt. College, Binaganj, Guna |
| 8. Dr. Kiran Burman | Govt. KRG PG College, Gwalior |
| 9. Dr. Anil Kumar Sharma | Govt. College, Balaji Mihona |
| 10. Dr. Manorama Sharma | Govt. KRG PG College, Gwalior. |
| 11. Dr. DK Gupta (Inorg) | College of Excellence, Bhopal |
| 12. Dr. Seema Shrivastava | PGV College, Gwalior |
| 13. Dr. Sadhna Shrivastava | Govt. SLP College, Gwalior |
| 14. Dr. Sudhanshu Dwivedi | Govt. Benzeer College, Bhopal |
| 15. Dr. Neelima Shukla | SMS Govt. Science, Gwalior |
| 16. Dr. Manju Kaushik | Govt. VRG College, Gwalior |
| 17. Dr. VK Agnihotri | Govt. PG College, Bina |
| 18. Dr. Juhi Benagi | Holkar Science College, Indore |
| 19. Dr. Irfan Ahmad(Inorg) | Govt. Collge, Pandhurna |
| 20. Dr. Arpan Bhardwaj | Govt. Madhav Science College, Ujjain |
| 21. Dr. Renu Nayyar | Govt. VRG College, Gwalior |
| 22. Dr. BK Mehta (org) | SOS in Chemistry, Vikram University, Ujjain |
| 23. Dr. Prabha Mehta | Govt. KRG PG College, Gwalior |
| 24. Dr. ON Chaube | Govt. NMB College, HOshangabad |
| 25. Shri RB RAipuria | Govt. KRG PG College, Gwalior |
| 26. Dr. S Malathi | SMS Govt. Science College, Gwalior |

- 27. Dr. Veena Sindh Sahni
- 28. Dr. SK Upadhyay Jain College,
- 29. Dr. CS Goswami
- 30. Dr. MC Agrawal (Inorg)
- 31. Dr. Rashmi Ahuja
- 32. Dr. RK Bhatnagar
- 33. Dr. Anand Kumar Singh
- 34. Dr. Pratima Jain
- 35. Dr. RC Goyal (Inorg)
- 36. Dr. AK Shukla
- 37. Dr. GH Adalatwale
- 38. Smt. Laxmi Sharma
- 39. Dr. Swati Pendse
- 40. Dr. Swati Malhotra
- 41. Dr. Mohan Tejraj
- 42. Dr. Kishor Arora
- 43. Dr. Radha Tomar
- 44. Dr. Shubha Jain (Org)
- 45. Dr. AK Sharma
- 46. Dr. CP Shinde (Physical)
- 47. Dr. Shalini Saxena
- 48. Dr. Kumud Shrivastava
- 49. Dr. VK Seria (Org)
- 50. Dr. Rajeev Jain
- 51. Dr. KPS Chauhan (Org)
- 52. Dr. AK Halway
- 53. Dr. DS Chandel
- 54. Dr. SK Shrivastava (Org)
- 55. Dr. DD Agrawal
- 56. Dr. PK Gupta
- 57. Dr. RK Jain
- 58. Dr. Vinneta Agrawal
- 59. Dr. MK Singh (Physical)

- Govt. KRG PG College, Gwalior
Vidisha
- Govt. KRG PG College, Gwalior
Retd. Professor
- Retd. Professor
Govt. KRG PG College, Gwalior
- Govt. KRG PG College, Gwalior
Retd. Professor
- SMS Govt. Science College, Gwalior
Retd. Professor
- Govt. SLP College, Gwalior
PGV College, Gwalior
- Govt. SLP College, Gwalior
Govt. PG College, Sehore (Assta)
- Govt. PG College, Datia
SOS in Chemistry, Jiwaji University, Gwalior
- SOS in Chemistry, Vikram University, Ujjain
Davv, Indore
- Retd. Professor
Govt. MLB College, Bhopal
- Govt. MLB College, Bhopal
Govt. MGM College, Itarsi
- SOS in Chemistry, Jiwaji University, Gwalior
Retd. Professor
- SOS in Chemistry, Jiwaji University, Gwalior
Retd. Professor
- SOS in Chemistry, Jiwaji University, Gwalior
SOS in Chemistry, Jiwaji University, Gwalior
- Govt. College, Bhopal
Govt PG College, Chindwara
- Govt. KRG PG College, Gwalior
Govt. PG College, Dhaulbur. Raiasthan

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60. Dr. RN Yadav
61. Dr. AP Mishra (Inorg)
62. Dr. Archana K Asture
63. Dr. PS Keshwani
64. Dr. KP Sharma (Physical)
65. Dr. DS Agrawal (Commerce)
66. Dr. RK Bansal
67. Dr. RC Upadhyay
68. Dr. Anita Shinde
69. Dr. Rooplekha Vyas
70. Dr. Uma Sharma
71. Dr. Pratibha Sharma
72. Dr. GD Agrawal
73. Dr. Savita Dikshit
74. Dr. Anand Sharma
75. Dr. SH Raza
76. Dr. Suman Shrivastava
77. Dr. Sumanlata Shrivastava
78. Dr. Bindu Gandhi
79. Dr. Prabha Chauhan
80. Dr. RK Shukla (Physical)
81. Dr. Rajeev Shukla (Physical)
82. Dr. GP Dubey (Physical)
83. Dr. SS Nigam
84. Dr. Maneesha Saxena (Physical)
85. Dr. A Kasture
86. Dr. Savita Shrivastava
87. Dr. Sunita Bhargava
88. Dr. Chandana Jain
89. Dr. Prakash Yadav
90. Dr. JS Parihar
91. Dr. Magan Prasad
92. Dr. Soni Govt. College

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- Dr. HS Gaur University, Sagar
 Dr. HS Gaur University, Sagar
 Govt. PG College, Piperia
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 Retd. Professor
 Govt. MLB College, Gwalior
 Govt. KRG PG College, Gwalior
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 SOS in Chemistry, Vikram University, Ujjain
 DAVV, Indore
 Govt. College, Rajgargh
 MANIT, Bhopal
 Bhopal
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 Govt. PG College, Guna

- SMS Govt. Science College, Gwalior
 VSSD College, Kanpur, U.P.
 RBS College, Agra, U.P.
 Kurukshetra University, Kurukshetra

Govt. PG College, Dhaulpur, Rajasthan

- Govt. MVM College, Bhopal
 College of Life Sciences, Gwalior
 Boston College, Gwalior
 Bundelkhand University, Jhansi, U.P.
 Govt. Maharaja College, Chatarpur
 Govt. PG College, Bharatpur, Rajasthan
 Charkhari

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- 93. Dr. AC Pandey
- 94. Dr. VK Sharma
- 95. Dr. PD Shakya
- 96. Dr. Laxmi Barelia

Singh College Gwalior

Govt. PG College, ~~Mugawali~~ Ashoknagar

Retd. Professor

Govt. SLP College, Gwalior

Govt. MVM College, Gwalior

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