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कार्यालय प्राचार्य, शासकीय कमलाराजा कन्या स्नातकोत्तर स्वशासी महाविद्यालय, ग्वालियर

दिनांक 28 जून, 2016

Chemistry विभाग

अध्ययन मंडल की बैठक का कार्यवाही विवरण

नवीन सत्र 2016–17 हेतु Chemistry विषय से सम्बंधित अध्ययन मण्डल की बैठक आज दिनांक 28 जून, 2016 को प्रातः 11:00 बजे Chemistry विभाग में आयोजित की गई, जिसमें निम्नानुसार उपस्थिति रही –

1. डॉ. Dr. Prabha Mehta 28.6.16
2. डॉ. Dr. C.S. Goswami. 28/6/16
3. डॉ. Dr. Manorama Sharma. 28/6/16
4. डॉ. Dr. Veena Singh. 28/06/16
5. डॉ. Dr. Pratima Jain 28.06.16
6. डॉ. Dr. Kiran Burman. 28.06.16
7. डॉ. Dr. Anil Sharma. 28.6.16
8. डॉ. Dr. Vinita Agarwal. 28/6/16
9. डॉ. Dr. Anand Singh 28.6.16
10. डॉ. Dr. R.B Rajpuriya 28/06/16
11. डॉ. Dr S N Dubey (Sub. Specialist) 28.6.16
12. डॉ. Ku. Neelam Choubey : Neelam 28/06/16

अध्ययनमंडल की बैठक की कार्यवाही निम्नानुसार रही --

1. Chemistry विषय के स्नातक स्तर के प्रथम, द्वितीय, तृतीय, चतुर्थ, पंचम एवं षष्ठ सेमेस्टर के पाठ्यक्रम अंक योजना सहित सत्र 2016–2017, 2017–2018 एवं 2018–2019 हेतु अध्ययनमंडल द्वारा मान्य किया जाता है।

2. Chemistry विषय के स्नातकोत्तर स्तर के प्रथम, द्वितीय, तृतीय, एवं चतुर्थ, सेमेस्टर के पाठ्यक्रम अंक योजना सहित सत्र 2015–2016 एवं 2016–2017 हेतु अध्ययनमंडल द्वारा मान्य/अथवा आंशिक संशोधन के साथ मान्य किया जाता है।

3. Chemistry विषय की सत्र 2016–2017 में होने वाली परीक्षाओं हेतु संलग्न परीक्षकों की सूची को अध्ययनमंडल द्वारा मान्य किया जाता है।

4. विभाग में सत्र 2016–2017 में यदि कोई शोध संगोष्ठी/कार्यशाला/अधिवेशन/अध्ययन भ्रमण आदि के आयोजन का प्रस्ताव है तो उसका विवरण एवं अनुशंसा———

अध्ययनमंडल की बैठक की कार्यवाही निम्नानुसार रही :-

1. —Chemistry——————विषय के स्नातक स्तर के प्रथम, द्वितीय, तृतीय, चतुर्थ, पंचम एवं षष्ठ सेमेस्टर के पाठ्यक्रम अंक योजना सहित सत्र 2016–2017, 2017–2018 एवं 2018–2019 हेतु अध्ययनमंडल द्वारा मान्य किया जाता है।

2. Chemistry——————विषय के स्नातकोत्तर स्तर के प्रथम, द्वितीय, तृतीय, एवं चतुर्थ, सेमेस्टर के पाठ्यक्रम अंक योजना सहित सत्र 2015–2016 एवं 2016–2017 हेतु अध्ययनमंडल द्वारा मान्य/अथवा आंशिक संशोधन के साथ मान्य किया जाता है।

3. ——Chemistry——————विषय की सत्र 2016–2017 में होने वाली परीक्षाओं हेतु संलग्न परीक्षकों की सूची को अध्ययनमंडल द्वारा मान्य किया जाता है।

4. विभाग में सत्र 2016–2017 में यदि कोई शोध संगोष्ठी/कार्यशाला/अधिवेशन/अध्ययन भ्रमण आदि के आयोजन का प्रस्ताव है तो उसका विवरण एवं अनुशंसा——————

Paper enclosed

[signatures with dates: 28/6/16, 28/6/16, 28.6.16, 28.06.16, 28/6/16, Neelam]

अध्ययनमंडल की बैठक की कार्यवाही निम्नानुसार रही :-

1. Chemistry ——— विषय के स्नातक स्तर के प्रथम, द्वितीय, तृतीय, चतुर्थ, पंचम एवं षष्ठ सेमेस्टर के पाठ्यक्रम अंक योजना सहित सत्र 2016–2017, 2017–2018 एवं 2018–2019 हेतु अध्ययनमंडल द्वारा मान्य किया जाता है।

2. Chemistry ——— विषय के स्नातकोत्तर स्तर के प्रथम, द्वितीय, तृतीय, एवं चतुर्थ, सेमेस्टर के पाठ्यक्रम अंक योजना सहित सत्र 2015–2016 एवं 2016–2017 हेतु अध्ययनमंडल द्वारा मान्य/अथवा आंशिक संशोधन के साथ मान्य किया जाता है।

3. Chemistry ——— विषय की सत्र 2016–2017 में होने वाली परीक्षाओं हेतु संलग्न परीक्षकों की सूची को अध्ययनमंडल द्वारा मान्य किया जाता है।

4. विभाग में सत्र 2016–2017 में यदि कोई शोध संगोष्ठी/कार्यशाला/अधिवेशन/अध्ययन भ्रमण आदि के आयोजन का प्रस्ताव है तो उसका विवरण एवं अनुशंसा———

Paper enclosed

28/6/16 28/6/16 28/6/16

24.06.16 24/6/16 Qeelam

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कार्यालय प्राचार्य, शासकीय कमलाराजा कन्या स्नातकोत्तर स्वशासी महाविद्यालय, ग्वालियर

क्र0 380/अका.प्र./2016 ग्वालियर दिनांक 20 जून, 2016

प्रति,

समस्त विभागाध्यक्ष/समन्वयक (स्ववित्तीय पाठ्यक्रम),
शा. के.आर.जी. स्नातकोत्तर स्वशासी, महाविद्यालय,
ग्वालियर (म0प्र0)

विषय: अध्ययन मण्डल की बैठक दिनांक 28 जून, 2016 की तैयारी विषयक्।

उपरोक्त विषयान्तर्गत लेख है कि महाविद्यालय के समस्त अकादमिक विभागाध्यक्षों एवं समन्वयकों की बैठक दिनांक 16 जून, 2016 में लिये गये निर्णयानुसार महाविद्यालय में संचालित समस्त पाठ्यक्रमों से संबंधित अध्ययन मंडल की बैठक दिनांक 28 जून, 2016, मंगलवार प्रातः 11 बजे आयोजित की जानी है। अध्ययन मंडल की बैठक के संबंध में आवश्यक निर्देश निम्नानुसार है :

1. आपसे अनुरोध है कि आपके विषय के अध्ययन मंडल के समस्त सदस्यों को बैठक में उपस्थित होने के लिये आप निर्धारित दिनांक से पूर्व अवगत कराने की व्यवस्था करें। आमंत्रण पत्र का प्रारूप भी आपकी ओर प्रेषित किया जा रहा है।
2. अध्ययनमंडल के समक्ष प्रस्तुत किये जाने वाले पाठ्यक्रम की सी.डी. आपको उपलब्ध कराई गई है। आप पाठ्यक्रम की समीक्षा कर सुधार करने के उपरांत उसकी एक प्रति तैयार कर लें, जिस पर अध्ययन मंडल के सदस्यों द्वारा विमर्श उपरांत अनुशंसा की जायेगी। तदुपरांत उस मूल प्रति की दो छायाप्रतियां अकादमिक प्रकोष्ठ द्वारा तैयार की जायेगी।
3. अध्ययनमंडल द्वारा अनुशंसित पाठ्यक्रम का अकादमिक परिषद द्वारा दिनांक 30 जून, 2016 की बैठक में अनुमोदन किये जाने के पश्चात् स्वीकृत पाठ्यक्रम महाविद्यालय की वेबसाईट पर अपलोड किया जायेगा।
4. अध्ययनमंडल की बैठक की कार्यवाही का विवरण दर्ज करने हेतु आपको पत्रक उपलब्ध कराया जा रहा है, जिस पर कार्यवाही दर्ज कर पाठ्यक्रम की मूल प्रति, विषय विशेषज्ञों की सूची, विभाग का प्रस्ताव आदि अकादमिक प्रकोष्ठ को दिनांक 29 जून, 2016 तक अनिवार्य रूप से उपलब्ध कराना होगा।
5. यदि कोई बाह्य विशेषज्ञ स्वयं के वाहन अथवा टैक्सी से यात्रा करना चाहते हैं तो उसकी पूर्व अनुमति अद्योहस्ताक्षरकर्ता से प्राप्त किया जाना आवश्यक है।

20/06/16

(प्रो. सरोज मोदी)
PRINCIPAL
Govt. Kamla Raja Girls Post-Graduate
Autonomous College, Gwalior-474001

Proposal for ONE DAY National Seminar on Environmental Pollution : Challenges and Protection Through Green Chemistry

The environmental issues in India are growing rapidly. Industrial development and increasing population is straining the environment, infrastructure and country natural resorces. Rapid industrialization, deforestation, industrial pollution, urbanization are all further deteriorating the situation. On the other hand today's competitive world is least bothered about the harm caused to the environment by differect fectors.

Green Chemistry is considered an essential piece of comprehensive programme to protect environment and human health. ~~Basically Green chemistry is the considered as essential piece of~~ In its essence Green Chemistry is a science based, non regulatory and economically driven approach to achieving the goals of environmental protection and sustainable development.

The discussion about the environmentally free technologies and the clean technology pool is done as a tool to achieve the goals of Green Chemistry.

It is therefore the proposal of the present National seminar that academicians and professionals should seriously discuss how Green chemistry could ensure environmental concerns in the present day context and bring together all research and related activity helping towards this issue.

Dr. ANIL KUMAR SHARMA
Asstt. Professor
Deptt. of Chemistry
Govt. K.R.G. P.G. College,
GWALIOR

शासकीय कमला राजा कन्या स्नातकोत्तर स्वशासी महाविद्यालय, ग्वालियर (मध्य प्रदेश)

रसायनशास्त्र विषय के अध्ययनमंडल

द्वारा अनुमोदित रसायनशास्त्र विषय के

स्नातक (2016–2019) एवं स्नातकोत्तर (2016–2018) पाठ्यक्रम

अनुमोदन अकादमिक सत्र

2016–2017

प्रस्तुतकर्ता

स्नातकोत्तर एवं शोध अध्ययन केन्द्र

रसायनशास्त्र विभाग

प्राप्तकर्ता

अकादमिक प्रकोष्ठ

वेबसाइट : www.krgc.gwl.org ईमेल : krgc@rediffmail.com

दूरभाष : 0751 – 2625495, 0751 – 2438173, फैक्स : 0751 – 2625495

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 पाठयक्रम
केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म.प्र. के महामहिम राज्यपाल द्वारा अनुमोदित
सत्र 2014 – 15 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		**I**
Subject	**(English)**	**Chemistry**
	हिन्दी	रसायन शास्त्र
Paper		-
Max. Marks		**85 + CCE** (सतत समग्र मूल्यांकन) **15**

Unit		**Syllabus**	**Periods**
Unit-1	**English**	**A. Mathematical Concepts:** Logarithmic relations, (rules and types), use of log table and antilog table in calculations, curves sketching, straight line and linear graphs, calculation of slopes, Differentiation of functions like K_x, e^x, x^n, sinx, logx ; multiplication and division in differentiation, maxima and minima, partial differentiation and reciprocity relations. Integration of some useful/relevant functions; Factorials, Probability. **B. Gaseous States and Molecular Velocities:** Critical phenomenon : PV isotherms of ideal gases, Andrew's experiment, continuity of states, the isotherms of van der Waals equations, relationship between critical constants and van der Waals constants. Root mean square, average and most probable	**18 Lecs.**

		velocities. Qualitative discussion of the Maxwell's distribution of molecular velocities, collision numbers, mean free path and collision diameter.	
	हिन्दी	**अ. गणितीय अवधारणाएँ** – लघुगणकीय संबंध (लघुगणक के नियम तथा प्रकार), लघुगणक तालिका तथा प्रतिलघुगणक तालिका का गणना में अनुप्रयोग, वक्र आरेखन, सरल रेखा तथा रेखीय ग्राफ एवं ढाल की गणनाएँ K_x, e^x, x^n, sinx, logx जैसे फलनों का अवकलन, दो फलनों का गुणनफल तथा भाग का अवकलन, उच्चतम एंव निम्नतम, आंशिक अवकलन एवं अन्योन्यता संबंध। कुछ उपयोगी एवं संबद्ध फलनों का समाकलन, क्रमगुणित (फेक्टोरियल्स), प्रायिकता। **ब. गैसीय अवस्था तथा आणविक गतियाँ** – क्रांतिक परिघटनाएँ – वास्तविक गैसों के PV समतापीय वक्र, ऐन्ड्रूज का प्रयोग, अवस्था का सातत्य, वाण्डर वाल्स समीकरण के समतापी वक्र, वाण्डर वाल स्थिरांक एवं क्रांतिक स्थिरांक में संबंध। वर्गमाध्य मूल वेग, औसत वेग, प्रायिकतम वेग, आणविक वेगों के मैक्सवेल वितरण की गुणात्मक विवेचना, संघट्टन संख्या, माध्य मुक्त पथ, संघट्टन व्यास।	
UNIT-2	**English**	**A. Liquid State :** Intermolecular forces, structure of Liquids (a qualitative description) Liquid crystals:Difference between liquid crystal, solid and liquid. Classification, structure of nematic and cholestric phases. Thermography and seven segment cell. **B. Solid State:** Definition of space lattice, Unit cell, Laws of crystallography - (i) Law of constancy of interfacial angles (ii) Law of rationality of indices (iii) Laws of symmetry, Symmetry elements in crystals. Ionic solid structures, radius ratio, radius ratio effect and coordination number, limitations of radius rule, lattice defects.	**18 Lecs.**

	हिन्दी	**अ. द्रव अवस्था** – अंतरा अणुक बल, द्रवों की संरचना (गुणात्मक विवरण) द्रव क्रिस्टल : द्रव क्रिस्टल, ठोस एवं द्रव में अंतर, वर्गीकरण, नेमेटिक एवं कोलिस्ट्रिक प्रावस्थाओं की संरचना, उष्माग्राफी और सात खण्डीय सेल। **ब. ठोस अवस्था** – त्रिविम जालक तथा ईकाई सेल की परिभाषा क्रिस्टलोग्राफी के नियम (i) अंतराफलक कोणों की स्थिरता का नियम (ii) परिमेय घातांक का नियम (iii) सममिति का नियम। क्रिस्टल में सममिति तत्व। आयनिक ठोस संरचना, त्रिज्या अनुपात, त्रिज्या अनुपात प्रभाव और उप सहसंयोजक संख्या। त्रिज्या अनुपात की कमियाँ और जालक दोष।	
UNIT-3	**English**	**A. Elementary Quantum Mechanics:** Schrodinger wave equation, significance of ψ and ψ^2, radial and angular wave functions and probability distribution curves, effective nuclear charge. **B. Periodic Properties :** Definition, application and periodicity of Atomic and ionic radii, ionization energy, electron affinity and electronegativity. **C. Chemical Bonding:** Covalent bonding as applied to valence bond theory and its limitations, directional characteristic of covalent bond. Hybridization and shapes of simple molecules and ions, Valence Shell Electron Pair Repulsion (VSEPR) theory to NH_3 , SF_4 , ClF_3 , ICl_2 , H_2O.	**18 Lecs.**
	हिन्दी	**अ. प्रारंभिक क्वाण्टम यांत्रिकी** – श्रोडिंगर तरंग समीकरण ψ और ψ^2, का महत्व, रेडियल एवं कोणीय तरंग फलन और सम्भावित वितरण वक्र, प्रभावी नाभिकीय आवेश। **ब. आवर्ती गुण** – परमाणवीय एवं आयनिक त्रिज्या, आयनन उर्जा, इलेक्ट्रॉन बन्धुता एवं ऋण विधुतता की	

		परिभाषा, अनुप्रयोग तथा आवर्तीता। **स. रासायनिक बंध** – सहसंयोजकता, सहसंयोजकता बंध सिद्धांत और उसकी कमियाँ, सहसंयोजक बंध का दिशात्मक गुण, संकरण के विभिन्न प्रकार, सरल अणुओं एवं आयनों के आकार। संयोजकता कोश इलेक्ट्रॉन युग्म प्रतिकर्षण सिद्धांत – NH_3 , SF_4 , CIF_3 , ICI_2 , H_2O के लिए।	
UNIT-4	**English**	**A. s-Block Elements:** Comparative study, diagonal relationship, salient features of hydrides, solvation and complexation tendencies including their, function in bio systems an introduction to alkyls and aryl complexes. **B. p-Block Elements :** Comparative study (including diagonal relationship) of groups 13-17 elements, compounds like hydrides, oxides, oxyacids and halides of groups 13-16. Hydrides of boron-diborane and higher boranes. Borazine, borohydrides.	**18 Lecs.**
	हिन्दी	**अ. s-ब्लॉक तत्व** – तुलनात्मक अध्ययन, विकर्ण संबंध, हाइड्राइड के विशिष्ट गुण, विलायकन और संकुलन प्रवृत्ति तथा जैविक प्रणाली में इनके कार्य, एल्किल और एरिल संकुलो का परिचय। **ब. p-ब्लॉक तत्व** – समूह 13–17 के तत्वों का तुलनात्मक अध्ययन (विकर्ण संबंध भी) समूह 13–16 के तत्वों के यौगिक जैसे हाइड्राइड, आक्साइड, आक्सीएसिड्स और हैलाइड। बोरोन के हाइड्राइड डायबोरेन और उच्च बोरेन, बोराजीन, बोरोहाइड्राइड।	
UNIT-5	**English**	**A. Bond Parameters Bond lengths and bond angles, bond energy:** Localized and delocalized chemical bond, Vander Waal interactions, with reference to supra molecular chemistry, resonance, hyperconjugation, inductive and field effects, hydrogen bonding. **B. Types of Reagents:** Electrophiles and	**18 Lecs.**

		nucleophiles. Types of organic reactions. Energy consideration.Hemolytic and heterolytic cleavage Reactive intermediates-carbocations, carbanions, free radicals and carbenes\ benzynes. **C. Stereochemistry:** Concept of Stereoisomerism, types of Stereoisomerism, elements of symmetry Chiral and achiral compounds. Fischer projection formulae; optical isomerism of lactic and tartaric acids, enantiomerism and diastereoisomerism; configuration (relative and absolute); conformations of ethane and n-butane and cyclohexane. D, L-and R, S-notations of compounds containing chiral centers; projection formulae –Fischer, Newman and Sawhorse of compounds containing two adjacent chiral centers; meso and dl-isomers, erythro and threo isomers; racemization and resolution; geometrical isomers ; E and Z notations.	
	हिन्दी	**अ. आबंध के प्राचल बंध कोण, बंध ऊर्जा, बंध लंबाई** – स्थानित एवं विस्थानित रासायनिक बंध, रासायनिक बंध, वाण्डरवाल्स अंतर समिक्रिया आवेश स्थानांतरण, संकुल अनुनाद, अतिसंयुग्मन, ऐरोमेटिकता, प्रेरणिक एवं क्षेत्र प्रभाव हाइड्रोजन बंध। **ब. अभिकर्मकों के प्रकार** – अभिकर्मकों के प्रकार इलेक्ट्रॉन स्नेही, नाभिकीय स्नेही। कार्बनिक अभिक्रिया के प्रकार (ऊर्जा की धारणा सहित)। सक्रिय मध्यवर्ती उत्पाद (कार्बोकेटायन, कार्बएनआयन, मुक्त, मूलक, कार्बीन्स, उदाहरण सहित)। **स. त्रिविम रसायन** – त्रिविम समावयवता की अवधारणा, त्रिविम समावयवता के प्रकार, सममिति के तत्व, आणविक किरैलिटी, कीरल एवं अकीरल अणु, फिशर प्रोजेक्शन सूत्र लेक्टिक तथा टार्टरिक अम्लों की प्रकाशिक समावयवता, दर्पण प्रतिबिम्बरूपता तथा द्विस्टीरियोरूपता विन्यास (आपेक्षिक एवं निरपेक्ष विन्यास), संरूपण, ईथेन एन–ब्यूटेन तथा साइक्लोहेक्जेन के	

		संरूपण, कीरल केन्द्र वाले यौगिको के D तथा L, R तथा S नामकरण, प्रोजेक्शन सूत्र, दो निकटस्थ किराल केन्द्र वाले कार्बनिक योगिकों के लिए फिशर, न्यूमन तथा सॉहॉर्स, मेसो तथा dl –समावयी, इरीथ्रो एवं थ्रीयो समावयी, रेसिमिकरण एंव उनका वियोजन, ज्योमितीय समावयी, नामकरण की E एवं Z पद्धति।	

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, IL 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. 21. Inorganic Chemistry – J.D. Lee, John Wiley 22. Inorganic Chemistry – Cotton and Wilkinson, John Wiley 23. Inorganic Chemistry – Huheey, Harper Collins Pub. USA 24. Inorganic Polymer – G.R. Chhatwal, Himalaya Pub.House 25. मध्य प्रदेश हिन्दी ग्रन्थ अकादमी भोपाल द्वारा प्रकाशित रसायन विज्ञान की पाठ्यपुस्तक। 26. मध्य प्रदेश हिन्दी ग्रन्थ अकादमी भोपाल द्वारा प्रकाशित प्रायोगिक रसायन की पाठ्यपुस्तक।

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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 2016-17
Class : B.Sc. Semester I
Subject : Chemistry
Paper : Practical

Max Marks : 50

Duration of practical during the semester examination : 4 hours

Physical Chemistry

(A).Any one experiment **12 Marks**

1. Calibration of thermometer
2. Determination of melting point
3. Determination of boiling point
4. Preparation of solutions of various concentration, NaOH, HCl, H_2SO_4.

(B).Any one experiment **12 Marks**

1. Determination of surface tension/percentage composition of given organic mixture using surface tension method
2. Determination of viscosity / percentage composition of given organic mixture using viscosity method.

Organic chemistry **12 Marks**

1. Distillation
2. Crystallization
3. Decolourisation and crystallization using charcoal
4. Sublimation
5. Detection of elements and functional groups
6. Organic molecules through models with special reference to optical and Geometrical isomerism.

Viva : 6 marks
Records : 8 marks

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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 पाठयक्रम
केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म.प्र. के महामहिम राज्यपाल द्वारा अनुमोदित
सत्र 2014 – 15 से प्रभावशील

Practical

सत्र **2016-17**

Class : B.Sc. Semester I

Subject : रसायन शास्त्र

Paper Title : प्रायोगिक रसायन

कुल अंक – 50

भौतिक रसायन समय : 4 घंटे

(अ).कोई एक प्रयोग अंक 12

1. थर्मामीटर का केलीब्रेशन
2. गलनांक ज्ञात करना।
3. क्वथनांक ज्ञात करना।
4. विभिन्न सान्द्रता के विलयनों का बनाना NaOH, HCl, H_2SO_4.

(ब). कोई एक प्रयोग अंक 12

1. द्रव का पृष्ठ तनाव/प्रतिशत संघटन ज्ञात करना।
2. द्रव का श्यानता गुणांक /प्रतिशत संघटन ज्ञात करना।

कार्बनिक रसायन अंक 12

1. आसवन
2. क्रिस्टलीकरण
3. चारकोल का उपयोग कर विरंजनीकरण एवं क्रिस्टलीकरण
4. उर्ध्वपातन
5. तत्वों एवं कियात्मक समूहों का परीक्षण
6. मॉडल द्वारा कार्बनिक अणुओं में प्रकाशीय एवं ज्यामितिय समावयवता

मौखिकी अंक – 6

रिकार्ड अंक – 8

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 पाठयक्रम
केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म.प्र. के महामहिम राज्यपाल द्वारा अनुमोदित
सत्र 2014 – 15 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		**II**
Subject	**(English)**	**Chemistry**
	हिन्दी	रसायन शास्त्र
Paper		-
Max. Marks		**85 + CCE** (सतत समग्र मूल्यांकन) **15**

Unit		**Syllabus**	**Periods**
Unit-1	**English**	**Chemical Kinetics**: Chemical kinetics and its scope, rate of a reaction, factors influencing the rate of a reaction - concentration, temperature, pressure, solvent, light and catalyst. Dependence of rate on concentration, mathematical characteristics of simple chemical reactions-zero order, first order, second and pseudo order, half life and mean life. Determination of the order of reaction-differential method, integration method, method of half life period and isolation method. Study of chemical kinetics by polarimetry and spectrophotometery. **Theories of Chemical Kinetics**: effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy. Simple collision theory , transition state theory (equilibrium hypothesis).	**18 Lecs.**
	हिन्दी	**रासायनिक बलगतिकी** : रासायनिक बलगतिकी एवं	

		इसका कार्यक्षेत्र, अभिक्रिया की दर, अभिक्रिया दर को प्रभावित करने वाले कारक–सान्द्रण, ताप, दाब, विलायक, प्रकाश एवं उत्प्रेरक , अभिक्रिया दर की सान्द्रण पर निर्भरता, सरल रासायनिक अभिक्रियाओं के गणितीय अभिलक्षण–शून्य कोटि, प्रथम कोटि, द्वितीय कोटि तथा छद्म कोटि अर्द्ध आयु काल एवं माध्य काल, अभिक्रिया की कोटि का निर्धारण अवकलन विधि, समाकलन विधि, अर्घ आयु काल विधि, विलगित विधि। रासायनिक बलगतिकी का पोलेरीमापी तथा स्पेक्ट्रोफोटोमिती विधियो द्वारा अध्ययन। **रासायनिक बलगतिकी के सिद्धांत** – रासायनिक अभिक्रिया दर पर ताप का प्रभाव, आरहीनियस समीकरण, सक्रियण ऊर्जा की अवधारणा, सरल संघट्य सिद्धांत, संक्रमण अवस्था सिद्धांत (साम्य परिकल्पना)।	
UNIT-2	**English**	**A. Thermodynamics** – Definition of thermodynamic terms: System, surrounding, Types of systems, intensive and extensive properties State and path functions and their differential. Thermodynamic process. Concept of heat and work. **B. Molecular Orbital Theory**: homonuclear and heteronuclear (CO and NO) diatomic molecules. Multicenter bonding in electron deficient molecules, bond strength and bond energy, Calculation of percentage ionic character from dipole moment and electronegativity difference. **C. Ionic Solids:** semiconductors, lattice energy and Born-Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarizability of ions. Fajan's rule, Metallic bond, free electron, Valence bond and Band theories.	**18 Lecs.**
	हिन्दी	**अ. ऊष्मागतिकी** – ऊष्मागतिकी में प्रयुक्त होने वाले विभिन्न पदों की परिभाषाएं, ऊष्मागतिकी तंत्र, घिराव, तंत्र के प्रकार, विस्तीर्ण एवं गहन गुण, अवस्था तथा पथ फलन एवं उनके अवकल, ऊष्मागतिकी प्रकम, ऊष्मा एवं कार्य की अवधारणा। **ब. आणविक कक्षक सिद्धांत**– समनाभिकीय और विषम नाभिकीय (CO तथा NO) द्विपरमाणवीय अणुओं के लिए, इलेक्ट्रॉन अल्प अणुओं में बहुकेन्द्रीय बंध, बंध	

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		प्रबलता और बंध ऊर्जा, द्विध्रुव आघूर्ण और विद्युत ऋणात्मकता अंतर से आयनिक गुण प्रतिशतता की गणना। **स. आयनिक ठोस** – अर्धचालक, जालक ऊर्जा एवं बोर्न – हेबर चक्र विलायकन ऊर्जा और आयनिक ठोसों की विलेयता, आयनों की ध्रुवण क्षमता और ध्रुवणता। फजान के नियम धात्विक बंध, मुक्त इलेक्ट्रॉन, संयोजकता बंध और बैण्ड सिद्धांत।	
UNIT-3	**English**	**A. Acids and Bases-** Arrhenius, Bronsted-Lowry, Solvent system Lewis Concepts. **B. Chromatographic Techniques:** Definition, classifications and principle, Separation of inorganic ions, amino acids and carbohydrates (by paper chromatography and TLC methods).	**18 Lecs.**
	हिन्दी	**अ. अम्ल एवं क्षार** – आर्हीनियस, ब्रान्स्टेड –लॉरी, विलायक तंत्र तथा लुईस की धारणा। **ब. क्रोमेटोग्राफिक तकनीक** – परिभाषा, वर्गीकरण एवं सिद्धांत, अकार्बनिक आयनों, अमीनो अम्लों एवं कार्बोहाइड्रेटों का पृथक्करण। (पेपर एवं पतली परत क्रोमेटोग्राफी विधियों द्वारा)।	
UNIT-4	**English**	**Alkanes:** Methods of preparation (with special reference to Wurtz, Kolbe, Corey-House reactions and decarboxylation of carboxylic acids). Physical properties and chemical reactions of alkanes. Mechanism of free radical halogenation of alkanes. **Cycloalkanes** : methods of preparations, chemical reactions. Baeyer's strain theory and its limitations. Ring strain in cyclopropane and cyclobutanes. Theory of strainless ring.	**18 Lecs.**
	हिन्दी	एल्केन्स : बनाने की विधियाँ (विशेष संदर्भ – वुर्टज् , कोल्बे, कोरे – हाउस अभिक्रिया, कार्बोक्सिलिक अम्लों के डिकार्बोक्सिलिकरण के विशेष संदर्भ में) एल्केन्स के भौतिक गुण एवं रासायनिक अभिक्रियाएं, मुक्त मूलक हैलोजनीकरण की क्रियाविधि। **साइक्लो एल्केन** : बनाने की विधिया, रासायनिक अभिक्रियाएँ, बेयर का तनाव सिद्धांत एवं उसकी सीमाऐं,	

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		साइक्लोप्रोपेन एवं साइक्लोब्यूटेन में चक्र तनाव, तनावरहित चक्र का सिद्धांत।	
UNIT-5	**English**	**Dienes**: Methods of formation, classification of dienes, isolated, conjugated and cumulated dines. Butadiene; methods of formation, polymerization. Chemical reactions – 1, 2 and 1, 4 addition, Diels- Alder reaction. **Alkynes:** Methods of formation, Chemical reactions of alkynes, acidity of alkynes. Mechanism of electrophilic and nucleophilic addition reactions, hydroboration, oxidation and polymerization. **Alkyl Halides:** Nomenclature and classsification of alkyl halides, methods of formation, chemical reaction; mechanism of nucleophilic substitution reaction of alkyl halides, SN^1 and SN^2 reaction with energy profile diagrams.	**18 Lecs.**
	हिन्दी	**डाईन्स** : बनाने की विधियॉ, डाइन्स का वर्गीकरण, आइसोलेटेड , कांजुगेटेड और क्यूमुलेटेड डाईन्स, ब्यूटाडाइनय बनाने की विधियॉ, बहुलीकरण। रासायनिक अभिकियाएँ–1.2 एवं 1.4 योगात्मक अभिकियायें , डील्सएल्डर अभिकिया। **एल्काइन्स** : बनाने की विधियॉ, एल्काइन्स की रासायनिक अभिकियाएँ, एल्काइनस की अम्लीयता, इलेक्ट्रान स्नेही एवं नाभिकीय स्नेही योगात्मक अभिकिया की किया विधि, हाइड्रोबोरीकरण, ऑक्सीकरण एवं बहुलीकरण। **एल्किल हैलाइडस** : एल्किल हैलाइड्स का नामकरण एवं वर्गीकरण, बनाने की विधियां, रासायनिक अभिकियाऐं, ऐल्किल हेलाइड्स की नाभिकीय स्नेही प्रतिस्थापन अभिकियाओं की कियाविधि। SN^1 एवं SN^2 अभिकियाऐं ऊर्जा प्रोफाइल चित्र सहित।	

	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 Un iv er s i t y Press

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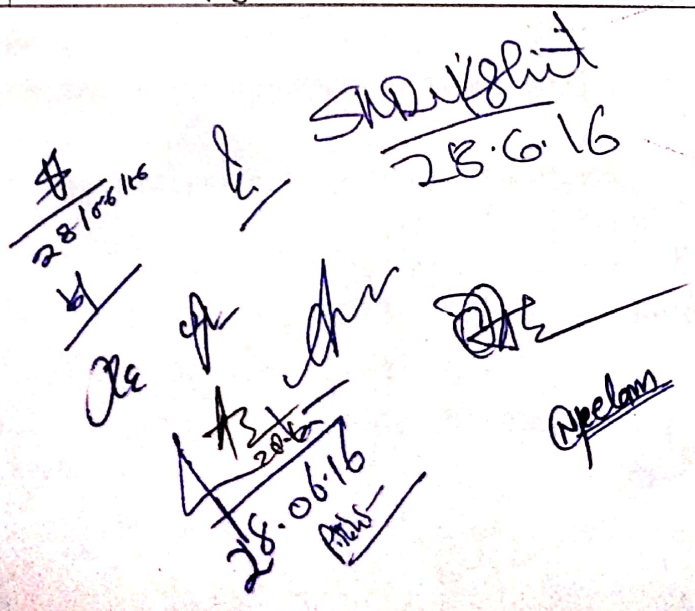
Recommended Books	4. Physical Chemistry, R.A. Alberty, Wiley Eastern Ltd. 5. Physical Chemistry Through problems, S.K. Dogra and S. Dogra, Wiley Eastern 6. Organic Chemistry, Morrison and Boyd, Prentice Hall. 7. Organic Chemistry, L.G. Wade Jr. Prentice Hall 8. Fundamentals of Organic Chemistry Solomons, John Wiley. 9. Organic Chemistry, Vol. I, IL IIL S.M. Mukherji, S.P. 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. 21. Inorganic Chemistry – J.D. Lee, John Wiley 22. Inorganic Chemistry – Cotton and Wilkinson, John Wiley 23. Inorganic Chemistry – Huheey, Harper Collins Pub. USA 24. Inorganic Polymer – G.R. Chhatwal, Himalaya Pub.House 25. मध्य प्रदेश हिन्दी ग्रन्थ अकादमी भोपाल द्वारा प्रकाशित रसायन विज्ञान की पाठ्यपुस्तक। 26. मध्य प्रदेश हिन्दी ग्रन्थ अकादमी भोपाल द्वारा प्रकाशित प्रायोगिक रसायन की पाठ्यपुस्तक।



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 2016-17
Class : B.Sc. Semester II
Subject : Chemistry
Paper : Practical

Max Marks : 50

Duration of practical during the entire semester : **90 hours**
Duration of practical during the semester examination: **4 hours**

Inorganic Chemistry
Inorganic mixture analysis 8 Marks
Mixture Analysis for 2 Cations and 2 Anions
Separation of cations by paper chromatography. 4 Marks

Physical Chemistry (Any one) 12 Marks
1. To determine the velocity constant (specific reaction rate) of hydrolysis of methyl acetate / ethyl acetate catalyzed by hydrogen ions at room temperature.
2. To study the effect of acid strength on the hydrolysis of an ester.
3. To compare the strength of HCl and H_2SO_4 by studying the kinetics of hydrolysis of ester.
4. kinetic studies of decomposition of iodided by H_2O_2 .(study of iodine clock reaction)

Organic Chemistry : (12 marks)
1. Detection of 2 elements (N, S and halogens) in same organic compound. 6 marks
2. Identification of 2 functional groups in multifunctional organic compound 6 marks

Viva : 6 marks
Records : 8 marks

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 पाठयक्रम
केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म.प्र. के महामहिम राज्यपाल द्वारा अनुमोदित
सत्र 2014 – 15 से प्रभावशील

Practical

सत्र 2016-17

Class : B.Sc. Semester II

Subject : रसायन शास्त्र

Paper Title : प्रायोगिक रसायन

कुल अंक – 50

पूर्ण सेमेस्टर हेतु प्रायोगिक कार्य अवधि कुल 90 घंटे

सेमेस्टर परीक्षा हेतु अवधि 4 घंटे

अकार्बनिक रसायन

मिश्रण विश्लेषण: 2 ऋणात्मक एवं 2 धनात्मक मूलकों का परीक्षण 8 अंक

पेपर क्रोमेटोग्राफी द्वारा केटायन का पृथक्करण 4 अंक

भौतिक रसायन (काई एक) 12 अंक

1. मिथाइल/इथाइल एसिटेट का हाइड्रोजन आयन उत्प्रेरण से जल अपघटन क्रिया का विशिष्ट क्रिया दर कमरे के तापमान पर ज्ञात करना।
2. एस्टर के जल अपघटन पर अम्ल की अम्लीयता के प्रभाव का अध्ययन करना।
3. एस्टर के जल अपघटन गतिकी से HCl एवं H_2SO_4 की सांद्रता की तुलना।
4. आयोडाइड का H_2O_2 द्वारा विघटन क्रिया की क्रियादर का गतिकी से अध्ययन। (आयोडीन क्लॉक क्रिया का अध्ययन)

कार्बनिक रसायन 12 अंक

तत्वों का परीक्षण दो तत्व (नाइट्रोजन सल्फर एवं हेलोजन) एक ही कार्बनिक यौगिक में 6 अंक

दो क्रियात्मक समूहों का परीक्षण एक ही बहुक्रियात्मक समूह वाले कार्बनिक यौगिक में 6 अंक

मौखिकी 06 अंक

रिकार्ड 08 अंक

28.06.16

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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 पाठयक्रम
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सत्र 2015 – 16 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		**III**
Subject	**(English)**	**Chemistry**
	हिन्दी	रसायन शास्त्र
Paper		-
Max. Marks		**85 + CCE** (सतत समग्र मूल्यांकन) **15**

Unit		**Syllabus**	**Periods**
Unit-1	**English**	**A. Arenes and Aromaticity:** Structure of benzene,molecular formula and Kekule structure. Stability and carbon-carbon bond lengths of benzene, resonance structure. MO picture. Aromaticity, the Huckel rule. Aromatic electrophilic substitution, General pattern of the mechanism- Mechanism of nitration, halogenation, sulphonation, mercuration and Friedel-Crafts reaction and energy profile diagram **B. Aryl Halides:** Methods of formation and reactions of aryl halides, Mechanism of nucleophilic aromatic substitution, synthesis and uses of DDT, BHC and Freon.	**18 Lecs.**
	हिन्दी	अ. एरीन्स एवं ऐरोमेटिसिटी – बेन्जीन की संरचना अणुसूत्र एवं केकुल संरचना। बेन्जीन का स्थायित्व एवं कार्बन–कार्बन बंध लम्बाई, अनुनाद संरचना आणविक	

		कक्षक चित्र। ऐरोमैटिकता, हकल का नियम, ऐरोमैटिक इलेक्ट्रान स्नेही, प्रतिस्थापन–अभिक्रिया की क्रियाविधि। नाइट्रीकरण, हैलोजनीकरण, सल्फोनीकरण, मरक्यूरीकरण एवं फ्रीडलक्राफ्ट अभिक्रिया की क्रिया विधि, उर्जा प्रोफाइल चित्र। **ब. एरिल हैलाइडस** : एरिल हेलाइड के बनाने की विधियाँ एवं उनकी अभिक्रियाएं , नाभिक स्नेही ऐरोमेटिक प्रतिस्थापन की क्रियाविधि, डीडीटी, बीएचसी एवं फ्रीऑन का संश्लेषण एवं उपयोग ।	
UNIT-2	**English**	**A. Alcohols:** Classification and nomenclature. **1. Monohydric alcohols:** nomenclature, methods of formation by reduction of aldehydes, ketones, carboxylic acid, and esters, acidic nature, reactions of alcohols. **2. Dihydric Alcohols:** Nomenclature, methods of formation, chemical reactions of vicinal glycols, oxidative cleavage [$Pb(OAc)_4$, and HIO_4] and pinacol-pinacolone rearrangement. **3.Trihydric alcohols** - nomenclature and methods of formation, chemical reaction of glycerol. **B. Phenols:** Nomenclature, structure and methods of formation, acidic character. Comparative acidic strength of alcohols and phenols, stabilization of phenoxide ion by resonance, acylation and carboxylation Mechanisms of Fries rearrangements, Gatterman synthesis, Hauben-Hoesch reaction, Lederer-Manasse reaction and Riemer-Tiemann reaction.	**18 Lecs.**
	हिन्दी	**अ. अल्कोहल** : वर्गीकरण एवं नामकरण। **1. मोनोहाइड्रिक अल्कोहल** : नामकरण, ऐल्डिहाइड, कीटोन , कार्बोक्सिलिक अम्ल एवं एस्टरों के अपचयन से बनाने की विधियाँ, अम्लीय प्रकृति एवं अल्कोहल की अभिक्रियायें। **2. डाइहाइड्रिक अल्कोहल** : नामकरण, निर्माण विधि,	

		विसिनल ग्लाइकॉल की रासायनिक अभिक्रियायें, ऑक्सीकरण विदलन [$Pb(OAc)_4$, and HIO_4] पिनाकोल एवं पिनाकोलॉन पुनर्विन्यास। **3.ट्राइहाइड्रिक अल्कोहल** : नामकरण, ग्लिसरॉल का निर्माण एवं रासायनिक अभिक्रियायें। **ब. फीनॉल** : नामकरण, संरचना तथा विरचन की विधियाँ, अम्लीय स्वभाव, फीनॉल तथा अल्कोहल की तुलनात्मक अम्लीयता, फिनॉक्साइड आयन का अनुनाद स्थायित्व, ऐसिलीकरण एवं कार्बोक्सिलीकरण, फ्राईसं पुनर्विन्यास, गाटरमैन संश्लेशण, हाउबने –हॉश अभिक्रिया, लैडरर–मानसे अभिक्रिया एवं राइमर–टीमान अभिक्रिया क्रियाविधि सहित।	
UNIT-3	**English**	**A. Chemistry of elements of I transition series:** Characteristics 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, coordination number and geometry. **B. Chemistry of elements of II and III transition series:** General characteristics comparative study of **II and III transition series** with 3d-analogues respect to ionic radii, oxidation states, magnetic behavior, spectral properties and stereochemistry.	**18 Lecs.**
	हिन्दी	**अ. प्रथम संक्रमण श्रेणी के तत्वों का रसायन** : d ब्लॉक तत्वों के लाक्षणिक गुण, प्रथम संक्रमण श्रेणी के तत्वों के गुण, द्विअंगी यौगिक जैसे – कार्बाइड, ऑक्साइड एवं सल्फाइड। संकुल यौगिकों के द्वारा ऑक्सीकरण अवस्था का आपेक्षिक स्थायित्व, उपसहसंयोजन अंक एवं ज्यामिति। **ब. द्वितीय एवं तृतीय संक्रमण श्रेणी के तत्वों का रसायन** : सामान्य गुण, द्वितीय एवं तृतीय संक्रमण श्रेणी के तत्वों के मुख्य गुणों की 3d श्रेणी के तत्वों से तुलना–	

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		आयनिक त्रिज्या, ऑक्सीकरण अवस्था, चुम्बकीय व्यवहार, स्पेक्ट्रल गुण एवं त्रिविम रसायन।	
UNIT-4	**English**	**A. Coordination Compounds:** IUPAC Nomenclature, Isomerism EAN Concept, Chelates, VBT of transition metal complexes, its limitations. Crystal field theory, Crystal Field Stabilization Energy, spectro chemical series, limitations of CFT. **B. Thermochemistry: Standard state, standard enthalpy of formation:** Hess's Law of heat summation and its application. Heat of reaction at constant pressure and at constant volume. Enthalpy of neutralization. **Second Law of Thermodynamics:** Need for the law, Different statements of the law, Carnot cycle and its efficiency. Carnot theorem. Thermodynamic scale of temperature.	**18 Lecs.**
	हिन्दी	**अ. उप–सहसंयोजक यौगिक** : संकुल यौगिकों का आई. यू.पी.ए.सी नामकरण, संकुल यौगिकों में समावयवता, प्रभावी परमाणु संख्या अवधारणा, कीलेट यौगिक, संक्रमण धातु संकुलों का संयोजकता बंध सिद्धांत एवं इसकी सीमाऐं। जालक क्षेत्र सिद्धांत , जालक क्षेत्र स्थायित्व ऊर्जा, स्पेक्ट्रो रसायन श्रंखला, जालक क्षेत्र सिद्धातं की सीमाऐं। **ब. ऊष्मा रसायन** : प्रामाणिक अवस्था, प्रामाणिक सम्भवन की एन्थैल्पी, हेस का ऊष्मा संकलन का नियम एवं इसके अनुप्रयोग , स्थिर आयतन और स्थिर दाब पर अभिक्रिया की ऊष्मा या एन्थैल्पी, उदासीनीकरण की एन्थैल्पी, । **ऊष्मागतिकी का द्वितीय नियम** : नियम की आवश्यकता, नियम के विभिन्न कथन, कार्नो चक्र, इसकी दक्षता एवं कार्नो प्रमेय, तापमान का ऊष्मागतिकी पैमाना ।	
UNIT-5	**English**	**A. Thermodynamics : Concept of entropy:** entropy as a state function, entropy as a function	**18 Lecs.**

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		of P & T, entropy change in physical change, Clausius inequality, entropy as criteria of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases. **B. Third Law of Thermodynamics:** 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 (A) as a thermodynamic quantities, A and G as a criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change, relative variation of G & A with P, V & T. **C. Buffers:** Mechanism of buffer action, Henderson-Hazel equation, Hydrolysis of salts.	
	हिन्दी	**अ. ऊष्मागतिकी : एन्ट्रॉपी की अवधारणा :** एन्ट्रॉपी–अवस्था फलन के रूप में, एन्ट्रॉपी T तथा P के अवस्था फलन के रूप में, भौतिक परिवर्तन में एन्ट्रॉपी परिवर्तन, क्लॉसियस असमता, एन्ट्रॉपी ऊष्मागतिक साम्य और स्वत: प्रवर्तिता की कसौटी के रूप में आदर्श गैसों में एन्ट्रॉपी परिवर्तन एवं गैसों को मिलाने की एन्ट्रॉपी। **ब. ऊष्मागतिकी का तृतीय नियम :** नर्नस्ट ऊष्मा प्रमेय कथन तथा अवशिष्ट एन्ट्रॉपी की अवधारणा, ऊष्माधारिता आँकड़ों से परम एन्ट्रॉपी का निर्धारण या परिकलन, गिब्ज तथा हेल्महोल्ट्ज फलन, गिब्ज फलन (G) तथा (A) हेल्महोल्ट्ज फलन, फलन ऊष्मागतिक राशियों के रूप में । तथा G ऊष्मागतिक साम्य और स्वत: प्रवर्तिता की कसौटी के रूप में, एन्ट्रॉपी परिवर्तन की तुलना में इनके लाभ, G एवं A का P, V एवं T के सापेक्ष परिवर्तन। **स. बफर्स :** बफर क्रिया की क्रियाविधि, हेण्डरसन–हेजल समीकरण, लवणों का जल अपघटन।	

1. Physical Chemistry-Puri, Sharma and Pathania, Vikas

Recommended Books	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. 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. 21. Inorganic Chemistry – J.D. Lee, John Wiley 22. Inorganic Chemistry – Cotton and Wilkinson, John Wiley 23. Inorganic Chemistry – Huheey, Harper Collins Pub. USA 24. Inorganic Polymer – G.R. Chhatwal, Himalaya Pub.House 25. मध्य प्रदेश हिन्दी ग्रन्थ अकादमी भोपाल द्वारा प्रकाशित रसायन विज्ञान की पाठ्यपुस्तक। 26. मध्य प्रदेश हिन्दी ग्रन्थ अकादमी भोपाल द्वारा प्रकाशित प्रायोगिक रसायन की पाठ्यपुस्तक।

28/6/16 28.06.16

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 2016-17
Class : B.Sc. Semester III
Subject : Chemistry
Paper : Practical

M.M. 50 **Time : 6 hours**

Inorganic Chemistry **18 marks**

1. Calibration of the fractional weights, pipettes and burettes.
2. Preparation of standard solutions. Dilution of 0.1 M to 0.01 M Solutions.

Quantitative analysis - Volumetric analysis.

(a) Determination of acetic acid in commercial vinegar using NaOH.
(b) Determination of alkali content- antacid tablet using HCl.
(c) Estimation of calcium content in chalk as calcium oxalate by permagnatometry.
(d) Estimation of hardness of water by EDTA.

Complex Compound Preparation:

1. Diaquabis(methyl acetoacetato) nickel(II)
2. Diaquabis (nethyl acetoacetato) cobalt (II)
3. Bis(methl acetoacetato) copper (II) monohydrate
4. Potassium chlorochromate (IV)
5. Tetraamminecopper(II) sulphate monohydrate
6. Hexaamminenickel(II) chloride

Organic Chemistry Laboratory Techniques 18 marks

A. Thin layer chromatography

Determination of Rf values and identification of organic compounds.
(a) Separation of green leaf pigments (spinach leaves may be used)
(b) Preparation and separation of 2, 4- dinitrophenylhydrazones of acetone, 2-butanone, hexane-2 and 3-one using toluene and light petroleum (40:6).
(c) Separation of a mixture of dyes using cyclohexane and ethylacetate.(8:5:1.5).

B. Paper chromatography : Ascending and Circular

Determination of R_f values and identification of organic compounds.

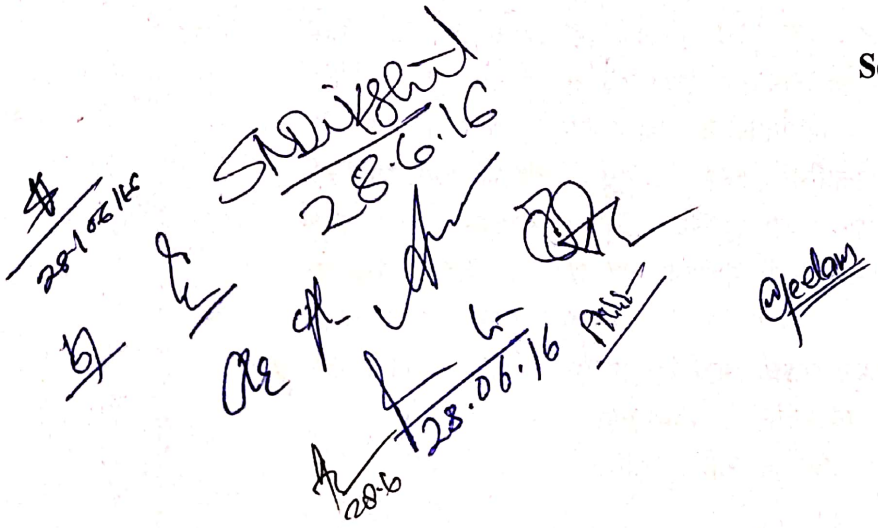
(a) Separation of a mixture of phenylalanine and glycine, alanine and aspartic acid. Spray reagent ninhydrin.

(b) Separation of mixture of DL-alanine, glycine and L-lucine using n-butanol: acetic acid : water (4:1:5). Spray reagent ninydrin.

(c) Separation of monosaccharides- a mixture of D-galactose and D-fructose using n-butanol : acetone : water (4:1:5). Spray reagent-aniline hydrogen pthalate.

Viva 6 marks

Sessional 8 marks



		classification, minimization of errors, precision and accuracy, gravimetric estimation - concept, method and precautions, gravimetric estimation of barium and copper. **Inorganic Polymers:** Introduction and scope of inorganic polymers, special characteristics, classification and their applications. Structure and nature of bonding in Silicones and triphosphonitrilic chloride.	
	हिन्दी	**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। **विश्लेषणात्मक रसायन** : त्रुटियां, उनका वर्गीकरण एवं न्यूनीकरण, यथार्थता एवं परिशुद्धता। भारात्मक आंकलन – धारणा, विधि एवं सावधानियाँ, बेरियम तथा कॉपर का भारात्मक आकलन। **अकार्बनिक बहुलक** : परिचय एवं क्षेत्र, विशेष लाक्षणिक गुण, वर्गीकरण तथा अनुप्रयोग। सिलिकॉन तथा ट्रायफास्फोनाइट्रिलिक क्लोराइड यौगिकों की संरचना तथा बंध की प्रकृति।	

Recommended	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.

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 पाठयक्रम
केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म.प्र. के महामहिम राज्यपाल द्वारा अनुमोदित

Practical

सत्र 2016-17

Class : B.Sc. Semester III

Subject : रसायन शास्त्र

Paper Title : प्रायोगिक रसायन

कुल अंक – 50

पूर्ण सेमेस्टर हेतु प्रायोगिक कार्य अवधि कुल **90 घंटे**

सेमेस्टर परीक्षा हेतु अवधि **4 घंटे**

अकार्बनिक रसायन विज्ञान 18 अंक

भिन्नात्मक (अंशात्मक) भारों, पिपेट एवं ब्यूरेट का मानकीकरण, मानक विलयनों को बनाना, **0.1 M** से **0.001 M** तक विलयनों का तनुकरण।

मात्रात्मक विश्लेशण – आयनमितीय मापन

(अ) **NaOH** का उपयोग करते हुए सिरके में एसिटिक अम्ल का निर्धारण।

(ब) **HCl** का उपयोग करते हुए प्रतिअम्ल गोली (दवाई) में क्षार का निर्धारण।

(स) परमैग्नोमिति द्वारा चॉक में कैल्सियम की मात्रा का कैल्सियम आक्जेलेट के रूप में आकलन।

(द) **EDTA** द्वारा पानी की कठोरता का आकलन।

संकुल यौगिक निर्माण

1. डाईएक्वाबिस (मेथिलएसिटोएसिटटो) निकल (**II**)
2. डाईएक्वाबिस (ऐथिलएसिटोएसिटटो) कोबाल्ट (**II**)
3. बिस (मेथिलएसिटोएसिटटो) कॉपर (**II**) मोनोहाइड्रेट
4. पौटेशियम क्लोरोक्रोमेट (**IV**)
5. टेट्राएम्मीन कॉपर (**II**) सल्फेट मोनोहाइड्रेट
6. हेक्साएम्मीननिकल (**II**) क्लोराइड

कार्बनिक रसायन विज्ञान प्रयोगशाला तकनीक 18 अंक

(अ) महीन परत क्रोमेटोग्राफी

Rf मान का निर्धारण व कार्बनिक पदार्थ की पहचान।

(अ) हरी पत्ती रंज का पृथक्करण (पालक पत्ती का उपयोग किया जा सकता है)।

(ब) टॉलुइन एवं हल्के पेट्रोलियम (40:6) का उपयोग करते हुए एसिटोन , 2–ब्यूटेनॉन, हेक्सेन –2 व 3–ऑन से 2, 4–डाइनाइट्रोफेनिलेहाइड्रेजोन का निर्माण व पृथक्करण।

(स) साइक्लोहेक्सेन ए इथिलएसिटेट (8:5:1.5) का प्रयोग करते हुए रंजकों के मिश्रण का पृथक्करण।

(ब) पेपर क्रोमेटोग्राफी : आरोही एवं वृत्ताकार

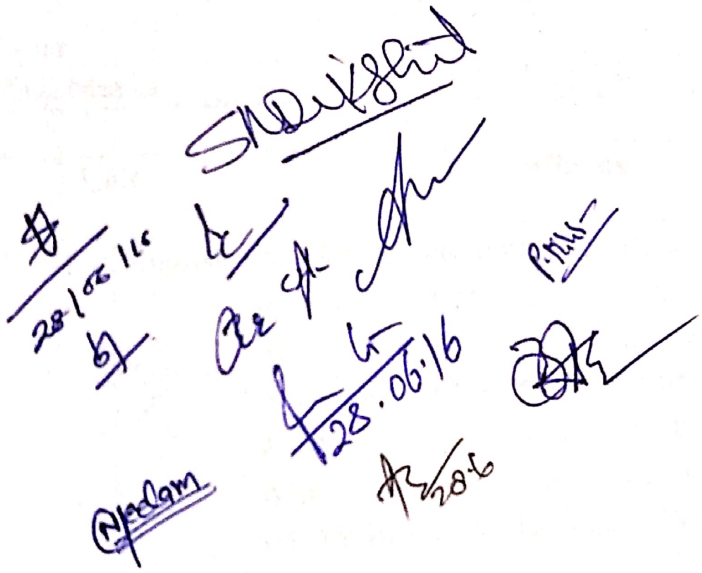
Rf मान का निर्धारण व अकार्बनिक पदार्थों की पहचान।

(अ) फेनिलएलेनिन एवं ग्लाइसिन, एलेनिन एवं एस्पार्टिक अम्ल, ल्युसिन एवं ग्लुमेटिक अम्ल मिश्रणों का पृथक्करण। स्प्रे अभिकर्मक निहाइड्रीन।

(ब) **n-** ब्यूटेनोल : एसिटिक अम्लः पानी (4:1:5) का उपयोग करते हुए **DL-** एलेनिन, ग्लाइसिन व **L-** ल्युसिन मिश्रण का पृथक्करण। स्प्रे अभिकर्मक निहाड्रीन।

(स) मोनेसेकेराइड का पृथक्करण – **D-**गैलेक्टोज एवं **D-**फ्रक्टोज मिश्रण का **n-** ब्यूटेनोल : एसिटोन : पानी (4:1:5) का उपयोग करते हुए पृथक्करण। स्प्रे एनिलीन हाइड्रोजन थैलेट।

मौखिकी 06 अंक
रिकार्ड 08 अंक



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 पाठयक्रम
केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म.प्र. के महामहिम राज्यपाल द्वारा अनुमोदित
सत्र 2015 – 16 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		**IV**
Subject	**(English)**	**Chemistry**
	हिन्दी	रसायन शास्त्र
Paper		-
Max. Marks		**85 + CCE (सतत समग्र मूल्यांकन) 15**

Unit		Syllabus	Periods
Unit-I	**English**	**A. 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 equilibria, simple eutectic system: Bi-Cd; Pb-Ag system, Desilverisation of lead. **B. Solid solution:** Systems in which compound formation with congruent melting point (Zn-Mg) and incongruent melting point, ($NaCl$-H_2O) and ($CuSO_4$-H_2O) system, Freezing Mixtures: acetone-dry ice. **C. Liquid- Liquid mixtures:** Ideal liquid mixtures, Raoult's and Henry's law. Non-ideal system, azeotrops; HCl-H2O and ethanol water	**18 Lecs.**

		system. **D. 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.	
	हिन्दी	**अ. प्रावस्था साम्य** : कथन एवं विभिन्न पदों का अर्थ, प्रावस्था, घटक तथा स्वतंत्रता की कोटि, गिब्ज प्रावस्था नियम का ऊष्मागतिक व्युत्पन्न, एक घटक तंत्र–जल तंत्र, CO_2 तंत्र एवं सल्फर तंत्र ; दो घटक तंत्र –ठोस–द्रव साम्य; सरल गलन क्रांतिक तंत्र –बिस्मथ–कैडमियम तंत्र , सीसा–चाँदी तंत्र , सीसे का विरजतीकरण। **ब. ठोस विलयन** : तंत्र जिनमें सर्वागसम गलनांक वाले यौगिक बनते है (Zn-Mg), तथा जिसमें असर्वागसम गलनांक वाले यौगिक बनते है (NaCl- H_2O) एवं ($CuSO_4$-H_2O) तंत्र हिम मिश्रण–एसिटोन –शुष्क बर्फ। **स. द्रव–द्रव मिश्रण** : आदर्श द्रव मिश्रण, राउल्ट एवं हेनरी का नियम, अनादर्श तंत्र , स्थिर क्वथनांकी मिश्रण : HCl-H_2O तथा एथिल अल्कोहल–जल। **द. आंशिक मिश्रणीय द्रव** : फीनॉल–जल, ट्राइमेथिल ऐमीन–जल एवं निकोटिन–जल तंत्र , निम्न तथा उच्च संविलेय –संविलयन तापक्रम, अमिश्रणीय द्रव, भाप आसवन, नर्नस्ट का वितरण नियम : ऊष्मागतिक व्युत्पन्न, अनुप्रयोग।	
UNIT-2	**English**	**Electrochemistry** **A. Electrical transport:** conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, variation of specific conductance and equivalent conductance with dilution, Migration of ions and Kohlrausch -law, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes,	**18 Lecs.**

		Ostwald's dilution law, its uses and limitations. Debye-Huckel Onsager's equation for strong electrolytes (elementary treatment only). Transport number: Definition and determination by Hittorf method and moving boundary method. **B. Types of reversible electrodes:** Gas metal ion, metal-meal ion, metal-insoluble salt anion and redox electrodes. Electrode reactions, Nernst equation, derivation of cell EMF and single electrode potential, standard hydrogen electrode-reference electrodes-standard electrode, standard electrode potential. EMF of a cell and its measurements, computation of cell EMF, calculation of thermodynamic quantities of cell reaction (ΔG, ΔH, K). Solubility product and activity coefficient, potentiometric and conductometric titration. Definition of pH and pK, determination of pH using hydrogen, quinhydrone and glass electrodes by potentiometric methods.	
	हिन्दी	**विद्युतीय रसायन :** अ. विद्युतीय परिवहन : धातुओं और विद्युत अपघट्य के विलयनों में चालन, विशिष्ट चालकता तथा तुल्यांकी चालकता, विशिष्ट चालकता एवं तुल्यांकी चालकता पर तनुता का प्रभाव, आयनों का अभिगमन तथा कोलरॉश नियम, आरहीनियस का विद्युत अपघटनी वियोजन सिद्धांत एवं इसकी सीमाऐं , प्रबल तथा दुर्बल विद्युत अपघट्य, ओस्टवाल्ड का तनुता नियम, उपयोग तथा इसकी सीमायें ,प्रबल विद्युत अपघट्यों के लिए डिबाई – ह्यूकल–ओंसगर समीकरण (केवल प्राथमिक परिचय), अभिगनाकं ; परिभाषा, हिटार्फ एवं गतिमान सीमा विधि द्वारा इसका निर्धारण। **ब. उत्क्रमणीय इलेक्ट्रोड के प्रकार** : गैस–धातु आयन, धातु– धातु आयन, धातु–अविलेय लवण ऐनायन तथा रेडॉक्स इलेक्ट्रोडः इलेक्ट्रोड अभिक्रिया, नर्नस्ट समीकरण; सेल के विद्युत बाहक बल का व्युत्पन्न, एकल	

		इलेक्ट्रोड विभव; मानक हाइड्रोजन इलेक्ट्रोड, संदर्भ इलेक्ट्रोड, मानक इलेक्ट्रोड, मानक इलेक्ट्रोड विभव। सेल का विद्युत वाहक बल एवं उसका मापन, सेल EMF का परिकलन; सेल अभिक्रियाओं के ऊष्मागतिकीय परिमाण की गणना (ΔG, ΔH, K) विलेयता गुणनफल एवं सक्रियता गुणांक , विभवमितीय एवं चालकतामितीय अनुमापन। pH तथा pK की परिभाषा, विभवमापी विधि द्वारा हाइड्रोजन इलेक्ट्रोड , क्विनहाइड्रेाजन इलेक्ट्रोड एवं ग्लास इलेक्ट्रोड की सहायता से pH का निर्धारण।	
UNIT-3	**English**	**A. Aldehydes and Ketones :** Nomenclature and structure of the carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes and ketones from acid chlorides, synthesis of aldehydes and ketones using. 1,3 dithianes, 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 Knovenagel condensations. Condensation with ammonia and its derivatives. Wittig reaction, Mannich reaction, use of acetals as protecting group. Oxidation of aldehydes, Baeyer-villiger oxidation of ketones, Cannizaro reaction. Meerwein Pondroff- Verley, Clemmesen, Wolf Kishner, $LiAlH_4$ and $NaBH_4$ reduction. **B. Carboxylic acids:** Nomenclature, structure and bonding, physical properties, acidity of carboxylic acids, effects of substituents on acid strength. Preparation of carboxylic, reaction of carboxylic acids. Hell Volhard Zelinsky reaction. Synthesis of acid chlorides ester and amides reduction of carboxylic acids, mechanism of decarboxylation.	**18 Lecs.**
	हिन्दी	अ. ऐल्डिहाइड्स एवं कीटोन्स : नामकरण तथा	

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		कार्बोनिल समूह की संरचना, ऐल्डिहाइड्स एवं कीटोन्स बनाने की विधियां, एसिड क्लोराइड, 1. 3–डाइथायने, नाइट्राइल एवं कार्बोक्सिलिक अम्ल के विशेष संदर्भ में भौतिक गुण, कार्बोनिल समूह की नाभिकस्नेही योगात्मक अभिक्रियाओं की क्रियाविधि–बेन्जाइन, ऐल्डोल संघनन, पर्किन एवं नोवेन जल संघनन की प्रमुखता देते हुए, ऐल्डिहाइड्स एवं कीटोन्स की अमोनिया एवं उसके व्युत्पन्नों के साथ संघनन क्रियाऐं, विटिग, मानिश अभिक्रिया, एसिटल का रक्षात्मक समूह के रूप में प्रयोग, ऐल्डिहाइड्स का ऑक्सीकरण, कीटोन्स का बेयर विलिगर ऑक्सीकरण, केनिजारो अभिक्रिया, मीरवीन–पोण्डॉर्क– वर्ले, क्लेमेन्सन, वुल्फ किश्नर अपचयन, $LiAlH_4$ एवं $NaBH_4$ अपचयन **ब. कार्बोक्सिलिक अम्ल** : नामकरण, संरचना एवं आबंधन, भौतिक गुण, कार्बोक्सिलिक अम्लों की अम्लीयता, अम्ल की प्रबलता पर प्रतिस्थापियों का प्रभाव, कार्बोक्सिलिक अम्लों का विरचन, रासायनिक अभिक्रियाएँ, हैल–वोल्हार्ड–जैलिन्सकी अभिक्रिया, ऐसिड क्लोराइडों, एस्टर एवं एमाइड का संश्लेषण, कार्बोक्सिलिक अम्लों का अपचयन, विकार्बोक्सिलीकरण की क्रियाविधि।	
UNIT-4	**English**	**A. Carboxylic acids derivatives:** structure and nomenclature of acid chlorides, esters amides and acid anhydrides. Physical properties, interconversion of acid derivative by nucleophilic acyl substitution, preparation of carboxylic acid derivatives, chemical reactions. Mechanism of esterification and hydrolysis (acidic and basic). **B. Coordination Chemistry:** MOT (molecular orbital theory) diagram for tetrahedral, square planar and octahedral complexes. **C. Green Chemistry:** Principles, 12 tenets, their description with examples.	**18 Lecs.**
	हिन्दी	**अ. कार्बोक्सिलिक अम्ल व्युत्पन्न** : अम्ल क्लोराइड,	

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		एस्टर, एमाइड तथा अम्ल एनहाइड्राइड की संरचना तथा नामकरण, भौतिक गुण, अम्ल व्युत्पन्नों का नाभिकस्नेही ऐसिल प्रतिस्थापन द्वारा अंतरपरिवर्तन; कार्बोक्सिलिक अम्ल व्युत्पन्न बनाने की विधियाँ, रासायनिक अभिक्रियाएँ, एस्टरीकरण एवं जल अपघटन (अम्लीय तथा क्षारीय) की क्रियाविधि। **ब. उपसहसंयोजन रसायन** : आणविक कक्षक सिद्धांत , चतुष्फलकीय वर्गसमतलीय तथा अष्टफलकीय संकुलों के लिए आणविक कक्षक आरेख। **स. हरित रसायन** : परिचय, 12 अवधारणाऐं एवं उनका उदाहरण सहित वर्णन।	
UNIT-5	**English**	**A. Chemistry of Lanthanides:** Electronic structure, oxidation states, ionic radii and lanthanide contraction, complex formation, occurrence and isolation of lanthanide compounds. **B. Chemistry of Actinides:** General features and chemistry of actinides, chemistry of separation of Np, Pu and Am from U, Similarities between the later actindies and later lanthanides.	**18 Lecs.**
	हिन्दी	**अ. लैन्थेनाइड तत्वों का रसायन** : इलक्ट्रॉनिक संरचना, ऑक्सीकरण अवस्था, आयनिक त्रिज्या तथा **लैन्थने इड** संकुचन, संकुल निर्माण;लैन्थेनाइडों की प्राप्ति एवं पृथक्करण। **ब. ऐक्टिनाइड तत्वों का रसायन** : ऐक्टिनाइड के सामान्य गुण एवं रसायन, U से Np, Pu तथा Am के पृथक्करण का रसायन, पश्च ऐक्टिनाइड एवं पश्च लैन्थेनाइडों में समानताऐं।	

	1. Physical Chemistry-Puri, Sharma and Pathania, Vikas Publications, New Delhi 2. Physical Chemistry -G.M. Barrow, International Student Edition, McGraw Hill.

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Recommended Books	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. 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. 21. Inorganic Chemistry – J.D. Lee, John Wiley 22. Inorganic Chemistry – Cotton and Wilkinson, John Wiley 23. Inorganic Chemistry – Huheey, Harper Collins Pub. USA 24. Inorganic Polymer – G.R. Chhatwal, Himalaya Pub.House 25. मध्य प्रदेश हिन्दी ग्रन्थ अकादमी भोपाल द्वारा प्रकाशित रसायन विज्ञान की पाठ्यपुस्तक। 26. मध्य प्रदेश हिन्दी ग्रन्थ अकादमी भोपाल द्वारा प्रकाशित प्रायोगिक रसायन की पाठ्यपुस्तक।

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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 2016-17

Class : B.Sc. Semester IV
Subject : Chemistry
Paper : Practical

M.M. 50 **Time : 6 hours**

Organic Chemistry **12 Marks**

Qualitative analysis

Identification of an organic compound through the functional group analysis, determination of melting point and preparation of suitable derivatives.

Physical Chemistry **12 Marks**

A. Transition temperature

1. Determination of transition temperature of given substance by theromometric, dialometric method (e.g.) ($MnCl_2$, $4H_2O$/$SrBr_2$, $2H_2O$)

B. Phase equilbrium

1. To study the effect of solute (e.g. NaCl, succinic acid) on the critical solution temperature of two partially miscible liquid (e.g., phenol water system).
2. To construct the phase diagram of two component (e.g., diphenylamine benzopheone) by cooling curve method.

C. Thermochemistry

1. To determine the enthalpy of neutralization of weak acid/weak base versus strong acid/strong base and determine the enthalpy of ionization of the weak acid/base.

Inorganic chemistry-Quantitative Volumetric Analysis **12 Marks**

1. Estimation of ferrous and ferric by dichromate method.
2. Estimation of copper using thiosulphate.

Viva 6 Marks
Record 8 Marks

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 पाठयक्रम
केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म.प्र. के महामहिम राज्यपाल द्वारा अनुमोदित

Practical

सत्र 2016-17

Class : B.Sc. Semester IV

Subject : रसायन शास्त्र

Paper Title : प्रायोगिक रसायन

कुल अंक – 50

पूर्ण सेमेस्टर हेतु प्रायोगिक कार्य अवधि कुल **90 घंटे**

सेमेस्टर परीक्षा हेतु अवधि **4 घंटे**

कार्बनिक रसायन 12 अंक

मात्रात्मक विश्लेशण

क्रियात्मक समूह द्वारा कार्बनिक यौगिक का पहचान गलनांक का निर्धारण तथा उपयुक्त व्युत्पन्नों का निर्माण।

भौतिक रसायन 12 अंक

अ. संक्रमण तापमान

ऊष्मामिति तथा डायलोमिट्रिक विधि द्वारा दिये हुए पदार्थ का संक्रमण ताप ज्ञात करना। (उदाहरणार्थ MnCl2, 4H2O/SrBr, 2H2O)

ब. प्रावस्था साम्य

1. दो अंशतः मिश्रणीय द्रवों (उदाहरणार्थ : फिनोल –जल तंत्र) के क्रांतिक विलयन ताप पर विलयन (उदाहरणार्थ : NaCl तथा सक्सिनिक अम्ल) के प्रभाव का अध्ययन।
2. शीतलन वक्र विधि का उपयोग करते हुए द्विघटक (डाइफेनिलएमीन–बेंजोफिनोन) के लिए प्रावस्था आरेख का निर्माण।

स. ऊष्मा रसायन

1. दुर्बल अम्ल/दुर्बल क्षार विरूद्ध प्रबल अम्ल/प्रबल क्षार के लिए उदासीनीकरण ऊष्मा ज्ञात करना तथा दुर्बल अम्ल/क्षार के लिए आयनीकरण ऊष्मा ज्ञात करना।

अकार्बनिक रसायन–मात्रात्मक आयतनात्मक विश्लेशण 12 अंक

1. डाईक्रोमेट विधि का उपयोग करते हुए फैरस एवं फैरिक का आंकलन।
2. थायोसल्फेट का उपयोग करते हुए कॉपर का आंकलन।

मौखिकी 06 अंक

रिकार्ड 08 अंक

28.06.16

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 पाठयक्रम
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**	**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. 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,	**18 Lecs.**

		electrophilic aromatic substitution in aryl amines, reaction of amines with nitrous acid synthetic transformation of aryl diazonium salts, azo coupling.	
	हिन्दी	**नाइट्रोजन के कार्बनिक यौगिक** : नाइट्रोऐल्केन व नाइट्रो एरीन बनाने की विधियां, गुण एवं रासायनिक क्रियाऐं 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 स्थानातं रण उत्प्रेरकों 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 अभिक्रियाऐं एरिल एमीन में इलेक्ट्रॉन स्नेही ऐरोमेटिक प्रतिस्थापन, एमीन्स की नाइट्रस अम्ल के साथ अभिक्रिया, एरिल डाइएजोनियम लवण के संश्लेषणात्मक रूपांतरण, एजो युग्मन।	
UNIT-2	**English**	**Carbohydrates-I** Classification and nomenclature, monosaccharide, mechanism of osazone formation, chain lengthening and chain shortening of aldoses, epimerization, configuration of monosaccharide, erythro, threo diasterioisomers. 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. **Carbohydrates-II**	**18 Lecs.**

		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; थ्रियो एवं एरिथ्रो अप्रतिबिम्बी त्रिविम समावयवी; ग्लाइकोसाइड, ईथर एवं एस्टर का विरचन, मोनोसैकराइड की चक्रीय माप का निर्धारण, D (+) ग्लूकोस की चक्रीय संरचना, परिवर्ती घूर्णन की क्रियाविधि, राइबोस तथा डिऑक्सीराइबोस की संरचना। कार्बोहाइड्रेट **II** : डाइसैकेराइड एवं पॉलिसैकेराइड में ग्लाइकोसिडीक बंध का परिचय, अपचायक एवं अनअपचायक 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 λmax of enes, polyenes and α,β unsaturated carbonyl compounds.	**18 Lecs.**
	हिन्दी	**अ. प्रकाश रसायन** : विद्युत चुम्बकीय विकिरण, विकिरण के विभिन्न क्षेत्रों की परास, ऊर्जा, तरंग दैर्ध्य एवं आवृत्ति को व्यक्त करने के लिए विभिन्न इकाइया, पदार्थ तथा विकिरणों की पारस्परिक क्रिया, ऊष्मीय	

		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। **ब. पराबैंगनी स्पेक्ट्रमिकी** :– इलेक्ट्रोनिक उत्तोजन, प्रयुक्त उपकरण के संबंध में प्रारंभिक जानकारी, कार्बनिक यौगिकों की संरचना ज्ञात करने के अनुप्रयोग , ईन, पॉलीईन तथा α,β असंतृप्त कार्बोनिल यौगिकों के λmax के निर्धारण के लिए वुडवर्ड–फिशर नियम।	
UNIT-4	**English**	**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 Ca2+. **Bioinorganic Chemistry - II** Role of metal ions in biological process, nitrogen fixation, oxygen-uptake proteins, cytochromes and ferredoxins.	**18 Lecs.**
	हिन्दी	**जैव– अकार्बनिक रसायन I** : जैविक प्रक्रियाओं में आवश्यक एवं सूक्ष्म तत्व, धातु पॉरफाइरिन्स–हीमोग्लोबिन एवं मायोग्लोबिन के विशेष संदर्भ मे क्षार तथा क्षारीय मृदा धातु आयनों की जैविक भूमिका Ca^{2+} के विशेष संदर्भ में। **जैव–अकार्बनिक रसायन II** : जैविक प्रक्रियाओं में धातु आयनों की भूमिका, नाइट्रोजन स्थिरीकरण, ऑक्सीजन ग्राही प्रोटीन्स, सायटोक्रोम तथा फेरेडॉक्सिन्स।	
UNIT-5	**English**	**Hard and Soft Acids and Bases (HSAB)** Classification of acids and bases as hard and soft, Pearson's HSAB concept, symbiosis. **Analytical Chemistry:** Errors, their	**18 Lecs.**

Books	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. 21. Inorganic Chemistry – J.D. Lee, John Wiley 22. Inorganic Chemistry – Cotton and Wilkinson, John Wiley 23. Inorganic Chemistry – Huheey, Harper Collins Pub. USA 24. Inorganic Polymer – G.R. Chhatwal, Himalaya Pub.House 25. मध्य प्रदेश हिन्दी ग्रन्थ अकादमी भोपाल द्वारा प्रकाशित रसायन विज्ञान की पाठ्यपुस्तक। 26. मध्य प्रदेश हिन्दी ग्रन्थ अकादमी भोपाल द्वारा प्रकाशित प्रायोगिक रसायन की पाठ्यपुस्तक।

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 2016 -17
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-Dinitrobenezene
(iv). Picric acid

Viva 06 Marks
Sessional 08 Marks

अकार्बनिक रसायन विज्ञान 12 अंक

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

भारात्मक विश्लेशण 12 अंक

बेरियम का बेरियम सल्फेट के रूप में।

कार्बनिक रसायन 12 अंक

विरचन

(अ) एसिलीकरण (ब) बेंजॉयलीकरण
(स) उ.डाइनाइट्रोबेंजीन (ड) पिक्रिक अम्ल

मौखिकी 06 अंक
रिकार्ड 08 अंक

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 पाठयक्रम
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		**VI**
Subject	**(English)**	**Chemistry**
	हिन्दी	रसायन शास्त्र
Paper		-
Max. Marks		**85 + CCE** (सतत समग्र मूल्यांकन) **15**

Unit		**Syllabus**	**Periods**
Unit-1	**English**	**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). **B. Nucleic acids:** Introduction of nucleic acids and constituents of nucleic acid, Ribonucleosides, Ribonucleotides, double helical structure of DNA. **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.	**18 Lecs.**
	हिन्दी	**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) **ब. न्यूक्लिक अम्ल** : न्यूक्लिक अम्ल का परिचय; न्यूक्लिक अम्लों के अवयव, राइबोन्यूक्लिओसाइड्स एवं राइबोन्यूक्लिओटाइड्स, डीएनए की द्विकुण्डलित संरचना। **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।	
UNIT-2	**English**	**A. Organometallic Chemistry:** Synthesis; structure and bonding in metal carbonyl complexes, metal olefin complexes and metal alkyne complexes. Oxidative addition reactions. **B. Organometallic Compounds:** Organomagnesium Compound - Grignard Reagent and Organolithium Compounds, methods of preparation, structure and synthetic applications.	**18 Lecs.**
	हिन्दी	**अ. कार्ब–धात्विक रसायन** : धातु कार्बोनिल संकुलों का विरचन, संरचना एवं बंधन, धातु ओलेफिन तथा एल्काइन संकुल । ऑक्सीकारक योगात्मक अभिक्रियाऐं। **ब. कार्ब–धात्विक यौगिक:** कार्बमैग्नीशियम यौगिक–ग्रिगनार्ड अभिकर्मक एवं कार्बलिथियम यौगिक, विरचन, संरचना, सांश्लेषिक अनुप्रयोग ।	
UNIT-3	**English**	**A. Magnetic properties of transition metal complexes:** magnetic moment (spin only and with L-S coupling), orbital contribution magnetic moment. **B. Electronic spectra of transition metal**	**18 Lecs.**

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		complexes: 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. **C. Water Analysis:** Hardness, types of hardness, acidity and alkalinity, BOD, COD and DO.	
	हिन्दी	**अ. संक्रमण धातु संकुलों के चुम्बकीय गुण** : चुम्बकीय आघूर्ण (केवल चक्रण तथा L-S युग्मन) चुम्बकीय आघूर्ण में कक्षीय योगदान। **ब. संक्रमण धातु संकुलों का इलेक्ट्रॉनिक स्पेक्ट्रा** : स्पेक्ट्रोस्कोपिक मूल एवं उत्तेजित अवस्थाऐं इलेक्ट्रॉनिक संक्रमण के प्रकार, d-d इलेक्ट्रॉनिक संक्रमण के लिए वरण नियम, d^1 से d^9 अवस्थाओं के लिए ऑर्गेल ऊर्जा आरेख। **स. जल विश्लेषण** : जल की कठोरता और इसके प्रकार, जल की अम्लीयता एवं क्षारीयता, बी.ओ. डी., सी.ओ. डी. तथा डी.ओ. ।	
UNIT-4	**English**	**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. **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 functional groups. **C. Raman Spectroscopy:** concept of polarizability, pure rotational and pure vibrational Raman spectra of diatomic molecules. Selection rules, application of Raman spectrum.	**18 Lecs.**
	हिन्दी	**अ. अवरक्त स्पेक्ट्रम** :बॉर्न ओपनहेमर सन्निकटन का	

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		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 आवृत्तियॉ। **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 Lecs.**
	हिन्दी	**अ. नाभिकीय चुम्बकीय अनुनाद स्पेक्ट्रमिकी** : सिद्धांत तथा उपकरण, नाभिकीय चुम्बकीय अनुनाद सक्रिय नाभिक, रासायनिक विस्थापन, स्पिन–स्पिन युग्मन, इथेनॉल तथा इथेनल के स्पेक्ट्रम। **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।	

	1. Physical Chemistry-Puri, Sharma and Pathania, Vikas

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Recommended Books	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. 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. 21. Inorganic Chemistry – J.D. Lee, John Wiley 22. Inorganic Chemistry – Cotton and Wilkinson, John Wiley 23. Inorganic Chemistry – Huheey, Harper Collins Pub. USA 24. Inorganic Polymer – G.R. Chhatwal, Himalaya Pub.House 25. मध्य प्रदेश हिन्दी ग्रन्थ अकादमी भोपाल द्वारा प्रकाशित रसायन विज्ञान की पाठ्यपुस्तक। 26. मध्य प्रदेश हिन्दी ग्रन्थ अकादमी भोपाल द्वारा प्रकाशित प्रायोगिक रसायन की पाठ्यपुस्तक।

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Department of Higher Education, Govt. of M.P.

Single Paper Pattern Syllabus for U.G. Classes Under Semester System

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Practical

Session 2016 -17

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 द्विघटकीय मिश्रण : पृथक्करण, पहचान एवं व्युत्पन्न निर्माण।

भौतिक रसायन 12 अंक

(अ) जॉब विधि (ब) मोल अनुपात विधि

अकार्बनिक रसायन 12 अंक

(अ) निसारी विश्लेशण

विभिन्न जल नमूनों में धनायन व ऋणात्मक आयनों की पहचान।

(ब) जल विश्लेशण

जल के नमूने में घुलित ऑक्सीजन का पीपीएम में निर्धारण।

(स) जल की कठोरता का निर्धारण।

मौखिकी 06 अंक

रिकार्ड 08 अंक

Department of Higher Education, Govt. of M.P.

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As recommended by Central Board of Studies and approved by the Governor of M.P.
Session 2016 -17

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 पाठयक्रम
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।

M.A. M.Sc. CHEMISTRY Exam. Dec., 2014
First/Third Semester
Pages (5) to (8)

SS-173-A

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), dπ-pπ bond, Bent rule and energetic of hybridization, some simple reactions of covalently bonded molecules such as Atomic inversion , Berry pseudoration , Nucleophillc 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, Harpes & Row.
3. Chemistry of Elements, N.N. Greenwood and A. Earnshow , Pergamon.
4. Inorganic Electronic Spectroscopy, A.B.P. Lever . Elsevier.
5. Comprehensive Co-Ordination Chemistry eds., G. Wilkison, R.D. Gillars and J.A. Mc Cleverty, Pergamon.
6. Inorganic Chemistry . D.F Shriver & P.W. Atkins , Oxford University Press 3rd 1999.
7. Inorganic Chemistry by A.G Sharpe. Addition Wesley England 3rd 1992.
8. Inorganic Chemistry G.L.Misseler and D.A Tarr Pearson Education 2005

(2)

Ss-174-A

Paper-II
MCH-402: ORGANIC CHEMISTRY I

Unit-I

Nature of Bonding in Organic Molecules

Delocalized chemical bonding-conjugation, cross conjugation, resonance hyperconjugation, bonding in fullerences, tautomerism. Aromaticity in benzenoid and non-benzoid 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, inclusion 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 chirallity due to helical shape. Stereochemistry of the compounds containing 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, Curtir-Hammett principle. Potential energy diagrams, transition states and intermediates, methods of determining mechanisms, isotopes effects

Unit-V

Aliphatic Nucleophilic Substitution

The SN2, SN1 mixed SN1 and SN2 and SET mechanism. The neighboring group mechanism, neighboring group participation by p and s bonds, anchimeric assistance.

Classical and nonclassical carbocations, phenomium ions, norborynl 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. Sunderg, Plenum.
3. A Guide Book to Mechanism in Organic Chemistry, Peter Sykes, Longman.
4. Structure and Mechanism in Organic Chemistry, C.K. Ingold, Comell 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 & Professionsl.
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. Stereochemisty of Organic Compounds, P.S. Kalsi, New Age International.

Paper-III
MCH-403: PHYSICAL CHEMISTRY I

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.

UNIT III

Angular Momentum

Ordinary angular momentum, generalized angular momentum, eigenfucntions 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 function s for non-ideal solutions. Activity, activity coefficient, Debye Huckel theory for activity coefficient fo 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. Ensemble averaging, postulates 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 partition functions, Calculation of thermodynamic properties in terms of partition. 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. P.W. Atkins, ELBS.
2. Introduction to Quantum Chemistyry, A.K. Chandra, Tata Mc Grew Hill.
3. Quantum Chemistry, Ira N. Levine, Prentice Hall.
4. Coulson's Valence, R.Mc Weeny, ELBS.
5. Chemical Kinetics. K.J. Laidler, McGraw-Hill.
6. Kinetics and Mechanism of Chemical Transformation J.Rajaraman and J. Kuriacose, Mc Millan
7. Micelles, Theoretical and Applied Aspects. V. MOraoi, Plenum.
8. Modern Electrochemistry Vol. I and Vol II J.O.M. Bockris and A.K.N. Reddy, Planum.
9. Introduction to Polymer Science. V.R. Gowariker, N.V. Vishwanathan and J. Sridhar, Wiley Eastern.
10. Introduction to Quantum Chemistry-R.K. Prasad New Age Publication

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Ss. 175-C / 1 2013 2014

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

Unit-I
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Symmetry and Group theory in Chemistry

Symmetry elements and symmetry operation, definition of group, subgroup. Conjugacy relation and classes. Point symmetry group. Schonfilies symbols, representations of groups by matrices (representation for the C_n, C_{nv}, C_{nh}, D_{nh} group to be worked out explicity). 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 vibrations, 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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Photoelectron spectra of simple molecules, ESCA, chemical information from ESCA. Auger electron spectroscopy-basic idea.

Books suggested

1. Modern Spectroscopy, J.M. Hollas, John Viley.
2. Applied Electron Spectroscopy for chemical analysis d. H. Windawi and F.L. Ho, Wiley Interscience.
3. NMR, NQR, EPr and Mossbauer Spectroscopy in Inorganic Chemistry, R.V. Parish, Ellis Harwood.
4. Physical Methods in Chemistry, R.S. Drago, Saunders College.
5. Chemical Applications of Group Theory, F.A. Cotton.
6. Introduction to Molecular Spectroscopy, G.M. Barrow, Mc Graw Hill.
7. Basic Principles of Spectroscopy, R. Chang, Mc Graw Hill.
8. Theory and Application of UV Spectroscopy, H.H. Jaffe and M. Orchin. IBH-Oxford.
9. Introduction to Photoelectron Spectroscopy, P.K. Ghosh, John Wiley.
10. Introduction to Magnetic Resonance. A Carrington and A.D. Maclachalan, Harper & Row.

Paper-V
MCH-405 (a) : MATHEMATICS FOR CHEMISTS
(For students without Mathematics in B.Sc.)

Unit-I

Vectors
Vectors, dot, cross and triple products etc. gradient, divergence and curl, Vector Calculus.

Matrix Algebra
Addition and multiplication; inverse, adjoint and transpose of matrices

Unit-II

Differential Calculus
Functions. continuity and differentiability, rules for differentiation, applications of differential calculus including maxima and minima (examples related to maximally populated rotational energy levels, Bohr's radius and most probable velocity from Maxwell's distribution etc.).

Unit-III

Integral calculus
Basic rules for integration, integration by parts, partial fractions and substitution. Reduction formulae, applications of integral calculus.
Functions of several variables, partial differentiation, co-ordinate transformations (e.g. Cartesian to spherical polar).

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 means square deviation examples from the kinetic theory of gases etc., fitting (including least squares fit etc with a general polynomial fit.

Book Suggested

1. The chemistry Mathematics Book, E.Steiner, Oxford University Press.
2. Mathematics for chemistry, Doggett and Suiclific, 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.)

Unit-I

Cell Structure and Functions

Structure prokaryotic and eukaryotic cells, intracellular organelles and their functions, comparison of plant and animal cells. Ove4rview 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. Carbohydrates of glycoporteins and glycolipids. Role of sugars in biological recognition. Blood group substances. Ascorbic acid.

PRACTICAL

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(8)

Sc 175-E / 2

Lipid **Unit-III**

Fatty acids, essential fatty acids, structure and function of triacylglycerols, glycerophospholipids, sphingolipids, cholesterol, bile acids, prostaglandins. Liproproteins-compositiion 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-β-oxidation of fatty acids.

Amino-acids, Peptides and Proteins **Unit-IV**

Chemical and enzymatic hydrolysis of proteins to peptides, amino acid sequencing Secondary structure of proteins, force responsible for holding of secondary structures. α-helix, -b-sheets, super secondary structure, triple helix structure of collagen. Tertiary structure of protein-folding and domina 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).

Nucleic Acids **Unit-V**

Purine and pyrimidine bases of nucleic acids, base pairing via Hbounding. 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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Neelam

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(Duration: 6-8 hrs in each branch) M.Sc. I Sem.

Practical examination shall be conducted separately for each branch.

Inorganic Chemistry

M.M. : 66

Qualitative / Quantitave Analysis	30
Preparation	12
Record	08
Viva	10

Quantitative and Qualitative Analysis

a. Less common metal ions : Ti,Mo,W,Zr, Th,V,U (two metal ions in cationic/anionic forms).

b. Insoluble-Oxides, sulphates and halides.

c. Separation and determination of two metal ions Cu-Ni, Ni-Zn, Cu-Fe etc, involving volumetric and gravimetric methods.

Preparations

Preparation 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. $VO(acac)_2$

2. $TiO(C_9H_8NO)_2H_2O$

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3. Cis-K$[Cr(C_2O_4)_2(H_2O)_2]$
4. $Na[Cr(NH_3)_2(SCN)_4]$
5. $Ni(acac)_2$
6. $K_3[Fe(C_2O_4)_3]$
7. Prussian Blue, Turnbull's Blue.

Organic Chemistry [illegible]

Qualitative Analysis	24
Organic Synthesis	24
Record	08
Viva	10

Qualitative Analysis

Separation , purification and identification of compounds of ternary mixture (one liquid and one 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 cholesteryl acetate by column chromatography.Oxidation : Adipic acid by chromic acid oxidation of cyclohexanol.Grignard reaction :Synthesis of triphenylmethanol 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 errors, distribution curves, precision, accuracy and combination; statistical treatment of error analysis, student's 't' test, null hypothesis, rejection criteria. F&Q test; linear regression analysis, curve fitting. Calibration of volumetric apparatus, burette, pipette and standard flask .Adsorption to study surface tension-concentration relationship for solutions (Gibbs Equation) phase Equilibria.

i. Determination of congruent composition and temperature of a binary system (e.g. diphenylamine-benzophenone system).

ii. Determination of glass transition temperature of given salt (e.g. $CaCl_2$) conductometrically.

iii. To construct the phase diagram for three component system (e.g. chloroform-acetic acid-water).

Chemical Kinetics

i. Determination of the effect of (a) Change of temperature (b) change of concentration of reactant and catalyst and (c) Ionic strength of the media on the velocity constant of hydrolysis of an ester/ionic reaction.

CHEMISTRY - II SEM.

MCA/ M.Sc.....Exam May/June-2015

Second/Fourth Semester

Pages.....(01).....to.....(07).....

SS 267-B

Semester II

Paper – VI

MCH-406: Inorganic Chemistry II

Unit-1

Electronic Spectral Studies of Transition Metal Complexes:

Spectroscopic ground states, correlation, Orgel and Tanabe-Sugano diagrams for transition metal complexs (d^1-d^9 states). Selection rule for electronic scopy. Intensity of various type electronic transition. Calculation of Dq, B and β parameters, charge transfer spectra.

Unit-2

Magnetic Properties of Transition metal Complexes

Type of magnetic bodies, two sources of paramagnetism, orbital and spine effect, Curic equation and Curic – wies law, Determination of magnetic susceptibility. Quenching of orbital contribution, Anomalous magnetic moment. Spin-cross over and magnetic exchange coupling.

Unit-3

Metal π complexes

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

Unit-4

Metal Clusters

Higher boranes, carborens, metalloboranes and metallocarboranes compounds, dinuclear, trinuclear, tetranuclear, hexanuclear clusters with metal metal multiple bonds.

Unit-5

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; application of ORD and CD for the determination (i) absolute configuration of complexes and (ii) isomerism due to non planarity of chelate rings.

Book Suggested:

1. Advanced Inorganic Chemistry, F.A. Cotton and Wilkinson, John Wiley.
2. Inorganic Chemistry, J.E. Huey, Harps and Row.
3. Chemistry of the element, N.N. Greenwood and A. Ernshow, Pergamon.
4. Inorganic Electronic Spectroscopy, A.B.P. Lever, Elsevier.
5. Magnetiochemistry, R.1. Carlin, Springer verlag.
6. Comprehensive Coordiantion Chemistry eds., G. Wilkinson, R.D. Gillars and J.A Mc Cleverty, Pergamon.
7. Element of magnetochemistry, A Shyamal & R.L. Dutta.

SS-264-C
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M 14
M 15

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, Vilsmeir reactiion, Gatterman-Koch reaction

Aromatic Nucleophilci Substitution

The SNAr SN1, benzyne and SN1 mechanism, Reactivity effect of substrate structure, leaving group and attacking nucleophile. The Von Richte, 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 carboyxlic 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 bounds, 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 usaturated carbonyl compounds. Witting 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 E1 cB mechanisms and their spectrum. Orientation of the double bond. Reactitivty-effects of substrate structures, attacking base, the leavign group and the medium. Mechanism and orientation in pyrolytic elimination.

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Unit-V

Pericyelic Reactions

Molecular orbital symmetry, Frontier orbitals of ethylene, 1,3-butadiene, 1,3,5-hexatriene and allyl system. Classification of periycyclic reactions. Woodward-Hoffmann correlatino diagrams. FMO and PMO approach. Electrocyclic reactions-conrotatory and disrotatory motions, 4n 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 cheleotrpic reactions. Sigmatropic rearrangements-suprafacial and antarafacial shifts of H, sigmatropic involving carbon moieties, 3,3- and 5,5 sigmatropic rearrangements. Claise n, 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. Sunderg, Plenum.
14. A Guide Book to Mechanism in Organic Chemistry, Peter Sykes, Longman.
15. Structure and Mechanism in Organic Chemistry, C.K. Ingold, Comell 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 &* Professionsl.
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. Stereochemisty 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. Dyamic 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 fo fast reactions, study of fast reactions by flow method, relaxation method, flash photolysis ad the nuclear magnetic resonance method, dynamics

[redacted] 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, solublization, 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.

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

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. Kineties 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. 1 and Vol II J.O.M. Bockris and A.K.N. Reddy, Planum.
19. Introduction to Polymer Science, V.R. Gowarikar, N.V. Vishwanathan and J. Sridhar, Wiley Eastern.

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

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 Viley.
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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Paper-X

Ch-410: COMPUTERS FOR CHEMISTS

This is a theory cum-laboratory co use 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 Alogrithms 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 nd 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

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. S impson'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)

M.Sc. II Sem.

PRAVTICAL

(Duration: 6-8 hrs in each branch)

Practical examination shall be conducted separately for each branch.

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

Chromatography

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

Preparations

Preparations of sleeted inorganic compounds and their studies by I.R. electronic spectra, Mcssbauer, 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-$[Co(trien)(NO_2)_2]C1H_2O$
3. $Hg(Co(SCN)_4]$
4. $[Co(py)_2C1_2]$
5. $[Ni(NH_3)_6]C1_2$
6. $Ni(dmg)_2$
7. $[Cu(NH_3)_4]\ SO_4H_2O$

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

Organic Synthesis

Aldus condensation, dibenzal acetone from benzaldehyde, sandmeyer reasoned: P-chlorortoulene from p-toludiene. Acetioncetic ester condensation : synthesis of ethyl-n-butylacetoacetate bt A.E.E. condensation reaction : 4-chlorobenzaldehyde as substeate. friedel crafts reactio: b Benzoyl propaniac acid from succinic anhydrideand benaene. Anomatic electrophilic substnums synthesis of p nitroniline and p bromoaniline.The products may b characterised by specteal Technigues.

Quantitativa Analysis

Detrmination of the percentage or number ofhy droxyl group in an onganic compound by acetylation method. Estimation of amines pheno bromide solution/oracetylation method.Detenmination of iodine saponificatien values of an oil sample.

Physical Chemistry	**M.M.:68**
Conductometry	16
Potentiometry/pH metry	18
Polarimetry	16
Record	08
Viva voce	10

Conductomentry

1. Determination of the velocity constat, order of the reactiven cnergy of activation saponification of ethyl acetate by sodiuny hyd conductometrically.
2. Determination of solubility product of sparingly sllubly satrs (e.g) $pbSo_4$) condictometricall.
3. Determination of the strength of strong and weak acid in a given conductrometrically.
4. to study of the effect of solvent on the conductance of Ag No3/acetic acid to determine the degres of dissociation equilinrium constant in diffent solvents in their mixtures (DMSO DMF, dioxane, ater) and to test the validity of debye Hucket Onsager theory.

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

Potentiometry/pH metry

1. Determination of strengths of halides in a mixtuee poteiomeddtnically.
2. Determination of the valency of mercuous 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 compiox and toichiometry of the complex potentiometnically.
6. Acid-base tidtration in a non-aqueous media using a pHa
7. Determination of the activity and activity coeffcient of electrelytes.
8. Determination of the dissociantion coustant of acetic in DMSO, DMF,
9. Determination of the dissociation of the dissociation constant of monohasie/ dihaic anid by Albert-sberjeant method.
10. Dectrmination of thernaodynamic constants, Dg,D.S, and DH for the by c.m. f. method Zn+H2so4->ZnSo4+2H

Poaatarimetry

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

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

M.Sc. CHEMISTRY .....Exam. Dec.,2014
First/Third Semester
Pages.....01.....to.....10.....

SEMESTER III

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

Unit-I

Vibrational Spectroscopy

Symmetry and shapes of AB2 ,AB3,AB4,AB5 ,AB6, 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

Properties of paramagnetic compounds , The contact and Pseudo contact shifts ,factors affecting nuclear relaxation , contrast agents , shifts reagent , some applications including biochemical systems , an overview of NMR of metal nuclide with emphasis on ^{195}Pt and ^{119}Sn NMR.

Unit –IV

Mossbauer Spectroscopy

Basic principles, instrumentation, chemical shift , spectral display Application of the technique to the studies of (1) bonding and structure of Fe +2 and Fe +3 compounds including those of intermediate spin ,(2) Sn +2 and Sn +4 compounds nature of M-L bond , co-ordination number , structure and (3) detection of oxidation state and ineqivalent MB atoms.

Unit –V

Electronic Spectroscopy

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

BOOKS SUGGESTED

1. Physical Methods for Chemistry, R.S. Drago , Saunders Company.
2. Structural Methods in Inorganic Chemistry, E.A.V. Ebsworth , D.W.H. Rankin and S. Cradock, ELBS.
3. Infrared and Raman Spectral: Inorganic and Co-ordination Compounds K. Nakamato , Wiley.
4. Progress in Inorganic Chemistry vol. 8, ed. F.A. Cotton, vol. 15 ed. S.J. 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 adn 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

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 cyloaddition 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. Photodegration of

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

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, mygolobin, 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

Ss. 175-AA/2 = (4) 26.14

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 vitamines, coenzymes, prosthetic groups, apoenzymes. Structure and biological functions of coenzyme A, thiamine pyrophosphate, pyridoxal phosphate, NAD+, NADP+, FMN, FAD, lipoic 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, cyclodextrion-based enzyme models, clixarenes, ionospheres, micelles synthetic enzymes or synzymes.

Biotechnological Applications of Enzymes

large-scale prodcution 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 bidning 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, Elsever.
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.I. 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

Paper XIV: Elective Paper

Paper XV: Elective Paper

MCH-606 Analytical Chemistry 2984

SS-180-AA

7

Introduction

Role of analytical chemistry, Classification [illegible] methods [illegible] instrumental. Types of instrumental analysis. Selecting an analytical method. Neatness 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 dissolution and decompositions. Gravimetric techniques. Selecting and handling or 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 stuffs. Microscopic examination of foods for adulterants. Pesticide analysis in food prodcuts. 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 solids, conductivity, acidity, alakalinity, hardness, chloride, sulphate, fluoride, silica, phosphates adn different forms of nitrogen, Heavy metal pollution-public health significance of cadmium, chromium, copper, lead, zinc, managanese, mercurry 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 n the body.

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

Book Suggested

1. Analytical Chemistry, G.D. Christian, J.Wicy.
2. Fundamentals o analytical Chemistry. D.A. Skoog, D.M. West and F.J. Hooler, W.B. Saunders.
3. Analytical Chemistry-Principles. J.H. Kennedy. W.B. Saunders.
4. [illegible] Principles and Techniques. L.G. Hargis. Prentice Hall.

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2985

MCH-609: Medicinal Chemistry

Unit I

Structure and activity : Relationship between chemical structure and biological activity (SAR). Receptor Site Theory Approaches to drug design. Introduction to combinatorial synthesis in drug discovery. Factors affecting bioactivity. QSAR-Free-Wilson analysis, Hansch analysis, relationship between Free-Wilson analysis and Hansch analysis.

Unit II

Pharmacodynamics:
Introduction, elementary treatment of enzymes stimulation, enzyme inhibition, sulfonamides, membrane active drugs, drug metabolism, xenobiotics, biotransformation, significance of drug metabolism in medicinal chemistry.

Unit III

Antibiotics and antibacterials
Introduction, Antibiotic β-Lactam type : Penicillins, Cephalosporins, Antitubercular – Streptomycin, Broad spectrum antibiotics – Tetracyclines, Anticancer - Dactinomycin (Actinomycin D)

Unit IV

Antifungal – polyenes, Antibacterial – Ciprofloxacin, Norfloxacin, Antiviral – Acyclovir

Antimalarials : Chemotherapy of malaria. SAR. Chloroquine, Chloroguanide and Mefloquine

Unit V

Non-steroidal Anti-inflammatory Drugs : Diclofenac Sodium, Ibuprofen and Netopam

Antihistaminic and antiasthmatic agents : Terfenadine, Cinnarizine, Salbutamol and Beclomethasone dipropionate

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M.SC. III SEMESTER

PRACTICAL

(Duration: 6-8 hrs in each branch)

Examination shall be conducted separately for each branch.

INORGANIC CHEMISTRY **M.M.: 66**

Quantitative determinations of a three component

Chromatographic Separations

Record

Viva Voice

Quantitative determinations of a three component

One volumetrically and two gravimetrically

a) $Cu^{2+}, Ni^{2+}, Zn^{2+}$

b) Cu^{2+}, Ni^{2+}, Mg^{2+}

Chromatographic Separations

a) Cadmium and Zinc.

b) Zinc and Magnesium

c) Thins layer chromatography separation of Nickel, Manganese, Cobalt and Zinc. Determination of Rf values.

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

ORGANIC CHEMISTRY **M.M. 66**

Multi-step synthesis of organic compounds

Paper Chromatography

Record

Viva Voice

Multi-step synthesis of organic compounds

The exercise should illustrate the use of organic reagents and many purification of the products by chromatographic techniques. reaction Benzophenone .

Benzpinacol. Phase transfer catalyst. Alkylation of dithyl malonate or ethl 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) aqueors and (b) micellae media.

ii. Determination of stoichiometry and stability constant of Ferricisothicoyanation complexion 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.

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 carboynl carbon), coupling constants. Two dimension NMR spectroscopy-COSY, NOESY, DEPT, IONEPT, APT and INADEQUATE techniques.

SS 711 / 2 = M.15

Unit V

Mass Spectrometry

Introduction ion production EI, CI FD, ESI and FAB, factors affecting fragmentation, ion analysis, ion abundance Mass spectral fragmentation of organic compounds, common functional groups, molecular ion peak, metastable peak. Me Lafferty 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 Compnay.
14. Structural Methods in Inorganic Chemistry, E.A.V. Ebsworth, D.W.H. Rankin and S. Cradock, 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 adn 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 = M.15

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 detects and Frenkel defects. Thermodynamics of Schottky and Frenkel defect formation, colour centres, non-stoichiometry and defects.

SS 712 / 2 = M.Sc. (5)

Unit III

Electronic Properties and Band Theory

Metal,s insulators and semiconductors, electronic structure of solidsband 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 LC, 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 = M.Sc.

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 NOx. 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 ionospheres 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 macronutrients, soil pollution by fertilizers, plastic an metals. Methods of re-mediation of soil. Bhopal gas tragedy, Chernobyl, three mile island Minimtata Disease, Sevoso (Italy), London smog.

Books Suggested

1. Environmental Chemistry, Colin Baird, W.H. Freeman Co. New York, 1998.
2. Chemistry of Atmospheres, R.P. Wayne, Oxford.
3. Environment Chemistry, A.K. De, Wiley Eastern, 2004.
4. Environmental Chemistry, S.E. Manahan, Lewis Publishers.
5. Introduction to atmospheric Chemistry, P.V. Hobbs, Cambridge.

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MCH-605: Chemistry of Natural Products

Unit I

Terpenoids and Carotenoids
Calcifications, nomenclature, occurrence, isolation, general methods of structure determination, isoprene rule. Structure determination, stereochemistry, biosynthesis and synthesis of the following representative molecules : Citral, Geraniol a-Terpeneol, Menthol, Farnesol, Zingiberence, Santonin, Phytol, Abietic acid and b-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, (+)- Coniine, 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, Myrcetin, Quercetin 3-glucoside, Vitexin, Diadzein, Aureusin, Cyanidin-7arabinoside, Cyanidin, Hirsutidin, Biosynthesis of flavonoids: Acetate pathway and Shikimic acid pathway.

Prophyrins
Structure and synthesis of Haemoglobin and Chlorophyll.

Unit V

Prostaglandis
Occurrence, nomenclature, classification, biogenesis and physiological effects. Synthesis of PGE2 and PGF2a.

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. Banthrope adn J.B. Harborne, Longman, Esses.
2. Organic Chemistry : Vol. 2 1L. Finar, ELBS
3. Stereoselective Synthesis : A Practical Approach, M. Norgradi, 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, Ataaur Rahman and M.L. Choudhary, Harwood Academic Publishers.
8. Insecticides of Natural Origin, Sukh Dev, Harwood Academic Publishers.

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MCH-602 POLYMERS

SS-710

Unit-I

Basics

Importance 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 copolymerization. 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 resistance, Hardness and abrasion resistance.

Unit-IV

Inorganic Polymers

A general survey and scope of Inorganic Polymers special characteristics, classification, homo and hetero atomic polymers.

Structure, Properties and Applications of

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

Unit V

Structure, Properties and Application of

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

Books Suggested

1. Inorganic Chemistry, J.E. Huheey, Harper Row.
2. Developments in Inorganic polymer Chemistry, M.F. Lappert and G.J. Leigh.
3. Inorganic polymers- N.H. Ray.
4. Inorganic polymers, Graham and Stone.
5. Inorganic Rings and Cages : D.A. Armitage.
6. Textbook of Polymers Science, F.W. Billmeyer Jr. Wiley.
7. Contemporary Polymer Chemistry, H.R. Al cock and F.W. Lambe, Prentice Hall.

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M.Sc. IV Semester

Practical

(Duration: 6-8 hrs in each branch)

Practical examination shall be conducted separately for each branch.

INORGANIC CHEMISTRY	**M.M.: 66**
Preparation	12
Spectrophotometer determinations/Flame Photometric Determinations	36
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. Sysnthesis of trichlorodiphenylantimony (v) hydrate. Imorg Synth., 1985,23,194.
4. Sodium tetrathionate $Na_2S_4O_6$.
5. Metal complex of dimethl sulfoxide: $CaCl_2$.2DMSO J.Chem. Edue. 1982, 59,57.
6. Synthesis of metal acethylacctonate: lorg. Synths, 1957, 5. 130, 1963 4, 183.
7. Cis and Trans $[Co(en)_2Cl_2]^+$
8. Determination of Cr (III) complex. $[Cr(H_2O)_6]NO_3 3HO$ Inorg. Synths. 1972, 13, 184.
9. Preparation and use of Ferrocene. J. Chem. Edu. 1966, 43, 73; 1976, 53, 730.
10. Preparation of [Co(phenathroline-5, 6 quinone)].

Spectrophotometric Determination

a) Manganese/Chromium in steel sample.

b) Nikel by extractive spectropholometric method

c) Fluoride/nitrite/phosphate

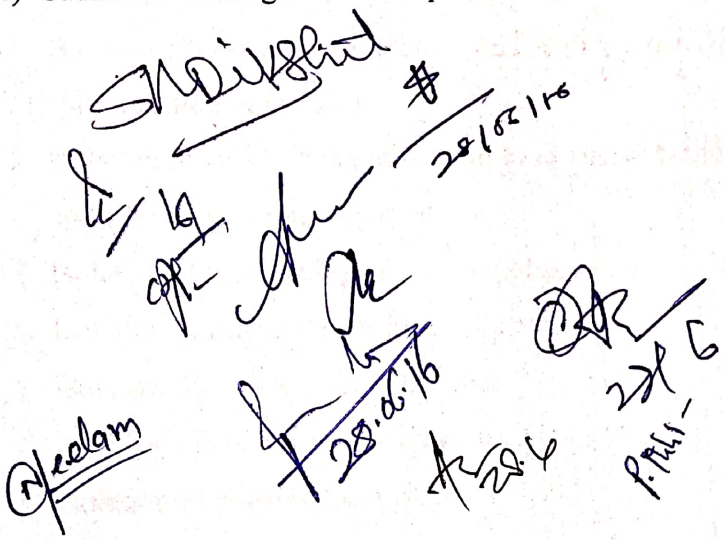
d) Copper-Ethylene diamine complex: Slope-ratio method

Flame photometric Determination

a) Sodium and Potassium when present together

b) Lithium/Calcium/barium/strontium

c) Cadmium and magnesium in tap water



ORGANIC CHEMISTRY	**M.M. [66]**
Extraction of organic compounds from natural sources	24
Spectrophotometric Determination	24
Record	08
Viva voice	10

Extraction of organic compounds from Natural Sources

1. Isolation of caffeine from tea leaves.
2. Isolation of casein from milk (the students are required to try same typical color reaction of protein)
3. Isolation of lactose from milk. (Purity of sugar should be checked by I.C. and PC and Rf values reported)
4. Isolation of nicotine dipiorate from tobacco.
5. Isolation of piperine from black pepper.
6. Isolation of lycopene from tamato.
7. Isolation of b-carotene from carrots.
8. Isolation of eugenol from clove.
9. Isolation of (+) limonene from clove.

Spectroscopy

Identification of organic compounds by the analysis of their spectral data (UV, IR, PMR, CMR, &MS) Spectrophotometric (UV/VIS) Estimations

1. Amino Acids
2. Proteins
3. Carbohydrates
4. Ascorbic Acid
5. Aspirin
6. Cafeeine

PHYSICAL CHEMISTRY	M.M.
[60]	
Thermodynamics	24
Paleography	24
Record	08
Viva Voice	10

Thermodynamics

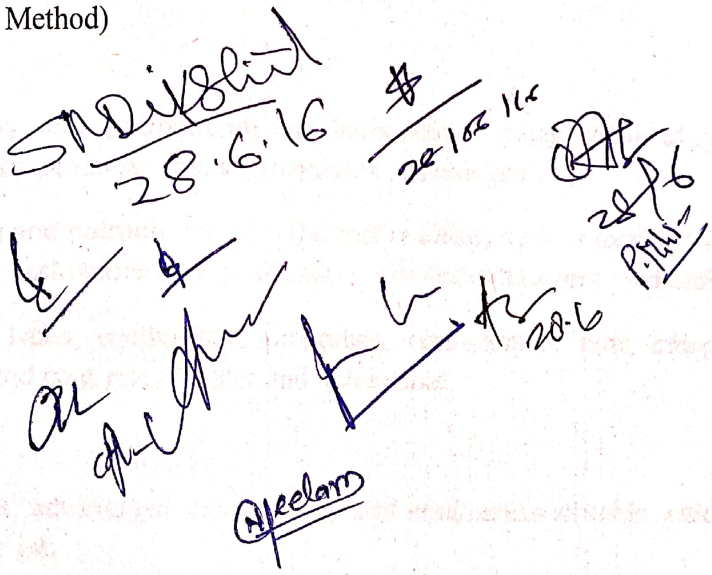
1- Determination of partial molar volume of solute (e.g. KCb) and solvent in a binary mixture.

2- Determination of the temperature dependence of the solubility of a compound in two solvents having similar intramuscular in (benzoic acid in water and in DMSO water mixture and the molar heat of solution).

Paleography

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)



JIWAJI UNIVERSITY, GWALIOR

INDUSTRIAL CHEMISTRY

B.Sc. I SEMESTER

Industrial Aspects of Physical, Organic and Inorganic Chemistry

UNIT-1

Dimensions and units- Basic chemical calculations , atomic weight , molecular weight , equivalent weight , mole , composition of liquid mixtures and gaseous mixtures.

Adsorptions- Introduction , adsorption of gases on solids , adsorption from solution , appalications of adsorption , adsorption isotherm.

Catalysts and catalysis- introduction of catalysts criteria or characterization of catalyst , types of catalysts , types of homogenous and hetterogenous catalysis , basic principle and mechanism of catalysis.

Factors affecting the performance of catalysis , introduction of phase transfer catalysis , enzyme catalyzed reactions , rate model , indusrially important reactions.

UNIT-2

Petroleum refining and petrochemicals- Introduction, composition of petroleum , clasification of refinery products , dye intermediates , natural gas.

Petroleum refining and petrochemicals- Thermal cracking, hydrocracking, fluid catalytic cracking, reforming, hydroforming , isomerisation , product of benzene and toulene.

Coal- Introduction, types, composition, properties, distillation of coal, caking and non caking coal, pulverized coal, role of sulfur and ash in coal

UNIT-3

Fuels-Types of fuels, advantages, disadvantages of combustion of fuels, calorific value , specifications for fuel oils.

Renewal of Natural Resources-Introduction, manufacture and industrial applications of cellulose and

Fermentation- Introduction, microorganism and their growth requirements general outline of the process. manufacture of beer wine and vinegar

UNIT 4

Basic metallurgical operations- Pulverization , Calcination , roasting , refining

Physico chemical principles of extraction of iron , copper , lead

Physico chemical principles of extraction of aluminum , magnesium , zinc

UNIT-5

Physico chemical principles of extraction of silver , sodium , chromium.

Inorganic materials of industrial importance-availability , forms , structures and modifications of silica , silicates , clays , mica , zeolite.

PRACTICALS

1 Simple laboratory techniques : crystallization , Fractional Crystallization , Distillation , Fractional Distillation , Boiling point diagram.

2 Extraction process , Phase Diagram , Partition Coefficient

3 Prepration of standard solutions Primary and secondary standards , Determination of H_2SO_4 and H_3PO_4 in mixtures.

4 Calibration of thermometers.

5 Acquantance with safety measures in a laboratory , hazards of chemicals

JIWAJI UNIVERSITY, GWALIOR

INDUSTRIAL CHEMISTRY

B.Sc. II SEMESTER

Unit Operation and Material Balance

Unit-1

Distillation-Introduction, Batch and continuous distillation, separation of azeotrops, plate columns and packed column.

Evaporation-Introduction, equipments-short tube(standard) evaporators, forced circulation evaporators, falling film evaporators climbing film(Upward flow) evaporators, wiped(agitated) film evaporators.

Filteration-Introduction, filter media and filter aids, equipments- plate and frame filter press, rotary drum filter, bag filter, centrifuge.

Unit-2

Extraction-Introduction, selection of solvents, equipments-spray column, packed column ,rotating disk column ,mixer settler.

Drying-Introduction, free moisture, bound moisture , drying curve, equipments-tray dryer ,rotary dryer ,flash dryer, fluid bed dryer, drum dryer, spray dryer.

Crystallization-Introduction, solubility. super saturation, nucleation, crystal growth crystallizer, evaporator crystallizer, draft tube crystallizer.

Unit-3

Heat Transfer- Heat exchangers-Cell and tube types, finned tube heat exchangers, plate heat exchangers, and refrigeration cycles.

Adsorption- Introduction, Equipments-Packed columns, spray column, bubble, packed bubble column, mechanically agitated contactors.

Mixing- Introduction, mixing of liquid-liquid, solid- solid, liquid-solid systems.

Fluid Flow- Fans, blowers, compressors, vaccum pumps, ejectors, centrifugal pump and heat pump.

Unit-4

Boilers - Types of boilers and their functioning.

Water - Specifications for industrial use, various water treatments.

Steam - Generation and use of steam.

Air-Specifications for industrial use, processing of air

Unit-5

Material balance without chemical reactions - Flow diagram for material balance, simple material balance with or without recycle or bypass for chemical engineering operations such as distillation, absorption, crystallization, evaporation and extraction.

Material balance involving chemical reactions - Concepts of limiting reactants, conversion, yield, liquid phase reaction, with or without recycle or bypass.

Energy balance - Heat capacity of pure gases and gaseous mixtures at constant pressures, sensible heat changes in liquids, enthalpy changes.

PRACTICALS

1. Depression and elevation in b.p / m.p of solids and liquids.
2. Chromatography – column , paper , thin chromatography
3. Ore analysis - Dolomite , limestone , calcite analysis of alloys such as Copper nickel
4. Determination of physical constants

   Refractive index , surface tension , effect of surfactants on surface tension , viscosity of fluids , polymer solution , effect of additives on viscosity , optical rotation.

5. Study experiments / demonstration experiments.

JIWAJI UNIVERSITY GWALIOR

INDUSTRIAL CHEMISTRY

B.Sc. III SEMESTER

Material Science, Measurement, Accuracy and Environmental Chemistry

UNIT – 1

Metals and alloys- Mechanical, chemical applications of important metals and their alloys iron Cupper, Aluminium , Lead , Nickel , Titanium.

Cement- Types of cements, composition, manufacturing process, setting of cement.

Ceramics - Introduction, types, manufacturing process, applications, refractories.

Glass- types, composition, manufacturing process, physical and chemical properties, appalication

Corrosion- types of corrosion relevant to chemical industry, mechanism and preventive methods.

UNIT-2

Temperature- Glass thermometers, bimetallic thermometers, pressure spring thermometers, vapour filled thermometers, resistance thermometers, radiation pyrometers.

Pressure - manometer , barometer , borden pressure gauge , bellow type , diaphragm type , pressure gauges , macleod gauges , pirani gauges .

UNIT – 3

Liquid level - Direct – indirect liquid level measurement , float type liquid level gauge ,ultrasonic level gauge , bubbler system.

Density measurement- Introduction and equipments to determine density (pykonometer , density bottle).

Viscosity measurement: Introduction, capillary viscometer (Ostwald U-tube and suspended level viscometer) , falling sphere viscometer.

UNIT – 4

Environmental segments and natural cycle- Atmosphere, hydrosphere, lithosphere, biosphere, hydrological cycle, oxygen cycle, nitrogen cycle.

Pollutants and their statutory limits ,pollution evaluation methods.

Air pollution- various pollutants – carbon monoxide, nitrogen oxide, hydrocarbons, sulphur dioxide, acid rain, radioactivity, Bhopal disaster.

UNIT – 5

Water pollution- organic pollutants – pesticides, organochlorine insecticides, detergents, radioactive materials, thermal pollution.

Radiation pollution, Green house effect.

Principles and equipments for Aerobic , anaerobic treatment, adsorption filtration ,sedimentation.

Solid waste management , industrial safety , electrostatic precipitation, mist eliminators.

Practicals

Unit process- one to two examples of each of the following unit processes

Nitration , Sulphonation , Friedal crafts reaction ,

Esterification ,Hydrolysis, Oxidation ,

Halogenation ,Chlorosulphonation ,

Reduction , Polymerization , reaction of diazonium salt.

Instrumental methods of analysis –Use of Colourimeter ,pH meter

,potentiometer ,Conductometer ,Refractometer ,Polarimeter

Material testing: Testing of alloys , identification of plastics /rubber ,,

estimation of yeild point ,Youngs Modulus ,flaredness ,

optical ,thermal , mechanical and electrical properties.

Volumetric analysis – Acidity and alkalinity of tap water.

JIWAJI UNIVERSITY, GWALIOR

INDUSTRIAL CHEMISTRY

B.Sc. IV SEMESTER

Unit Process in Organic Synthesis and Polymer Science-I

UNIT-1

Nitration- Introduction, nitrating agent and mechanism of nitration processes such as nitration of paraffinic hydrocarbons, benzene to nitro benzene and m-dinitro benzene, chlorobenzene into o- and p- nitrochlorobenzene , acetanilide to p- nitro acetanilide ., toulene , continous and batch nitration.

Halogenation-Introduction , mechanism , kinetics ,reagents ,halogenations of aromatic side chain and nuclear halogenations , commercial manufacture of chlorobenzene , chloral , monochloroacetic and chloromethane ,dichlorofluoromethane

Sulphonation- Introduction sulphonating agents , chemical and physical reactors in sulphonation , kinetics , mechanism ,commercial sulphonation of benzene ,naphthalene., alkyl benzene , batch and continous sulphonation

UNIT -2

Amination by reduction- introduction, method of reduction metal and acid catalytic , sulfide , electrolytic , metal and alkali sulphites ,metal hydrides , sodium metal , concentrated caustic aniline , m-nitro aniline ,p- amino phenol

Amination by aminolysis- introduction, aminating agents, factors affecting.

Oxidation- introduction, types , oxidising agents , kinetics and mechanism of oxidation of organic compounds ,liquid phase oxidation , vapour phase oxidation , commercial manufacturing of benzoic acid ,acetaldehyde , acetic acid

UNIT-3

Hydrogenation- introduction, kinetics, thermodynamics, catalysts, hydrogenation of vegetable oils, manufacture of methanol from carbon monoxide and hydrogen . hydrogenation of acids and esters to alcohols .

Alkylation- Introduction, types, alkylating agents, thermodynamics and mechanism, manufacture of alkyl benzene (for detergent manufacture) , ethyl benzene ,phenyl ethyl alcohal , N-alkyl anilines (mono and dimethyl and ethyl aniline)

Esterification- Introduction ,hydrodynamics ,kinetics ,esterification by organic acids , by addition of unsaturated compounds , esterification of carboxy acid derivatives, commercial ... dimethyl acetate . diacetyl phthalate , vinyl acetate . cellulose acetate.

Hydrolysis- introduction, hydrolysing agent, kinetics, thermodynamics and mechanism.

UNIT-4

Brief history of macromolecular science , general characteristics of polymers in comparison with common organic compounds , nomenclature ,distinct between plastics , elastomers and fibres

Natural polymers; cellulose, gums, resin and shellac

UNIT-5

Types of polymers: thermoplastics and thermosetting, functionality concept, concept of crosslinking linear branched and cross linked polymers.

Types of Polymerization: Addition, condensation, ionic, coordination polymerization, mechanism- initiation , propagation, and termination processes, initiator, inhibitors. Mechanism of ionic polymerization.

Method of polymerization: Bulk , suspension , emulsion , solution. Necessity of copolymers and copolymerization. Block and graft copolymers.

Practicals

1. Determination of flash point and ignition points of liquids
2. Water analysis – solid content, hardness and other tests as per industrial specification.
3. Flow measuring devices – floats
4. Monographs of representative raw materials such as salicylic acid , toluene , sodium carbonate , sodium hydroxide , carbon tetrachloride, benzoic acid
5. Limit test for heavy metals Pb ,As , Hg , Fe , and ash content
6. Determination of total hardness of tap water

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 techeniques.

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.

UNIT-4

Deailed study of the following thermosetting polymers with refrence to synthesis ,chemistry , properties and applications - phenol formaldehyde resins , amino resins ,Urea – formaldehyde resin , metamine formaldehyde resins ,polyurethanes.

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

Poly carbonates , silicones

astomers– poly isoprene, poly butadiene, neoprene

Deailed study of the following thermosetting polymers with refrence to synthesis, chemistry, properties and appalications –polyolefins – polyethylene, HDP, LDP, LLDP, polypropylene.

UNIT-5

Detailed study of the following thermosetting polymers with refrence to synthesis ,chemistry , properties and appalication – ethylene propylene copolymers.

Polyvinylchloride-Grades of PVC ,teflon

Polystyrene- homopolymers ,copolymers such as SBR , ABS, SAN.

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

Practicals

1. Determination of strength of $CuSO_4$ 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. Ahalysis 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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JIWAJI UNIVERSITY GWALIOR

INDUSTRIAL CHEMISTRY

VI SEMESTER

Industrial Chemical Analysis and Polymer Science- III

UNIT-1

Reliability of analytical data- Error in chemical analysis, classification of Errors ,determining the accuracy of methods , improving the accuracy of analysis , statistical analysis, rejection of results ,presentation of data

Sampling- Sampling procedures , sampling of bulk material, techniques of sampling solids ,liquids and gases ,collection and processing of data.

UNIT- 2

UV-Visible Spectroscopy- Theory, instrumentation, Woodward and Fieser Rules for calculating λ_{max}, applications

IR spectroscopy- Theory, instrumentation and applications.

Atomic Absorption Spectroscopy- Theory, instrumentation and applications.

Flame Photometry-: Theory, instrumentation factor affecting and applications.

UNIT-3

Chromatographic techniques- Introduction, principles, methods and applications of paper, TLC, column and ion chromatography.

Gas chromatography- Principles, instrumentation and applications

High Performance Liquid Chromatography- Principles, instrumentation and applications.

UNIT -4

Polyamines– Nylon-6 ,Nylon-66 other nylon polyethers and polyesters , terephthlates.

Molecular weight and molecular weight distribution- Number , weight , viscosity average, molecular weight of polymers, method of determining molecular weights ,practical significance of molecular weight , distribution size of polymers.

Introductory concept of kinetics of polymerization and Carothers relation.

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

UNIT-5

Viscosity, solubility, 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, thermoforming, 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 ($KMnO_4$) by colorimeter.
6. To determine the Max. Wavelength of given sample by colorimeter.
7. Separation of mixture by Thin Layer Chromatography.