FATIMA COLLEGE (AUTONOMOUS), MADURAI -18

DEPARTMENT OF CHEMISTRY – CBCS
COURSE PAPERS REVISED
DURING THE ACADEMIC YEAR- 2020-21
PROGRAMME CODE : UACH

Semester	Subject Code	Subject Title	Hours	Credits	Maximum Marks		
					Interm	Exter	Total
I	19C1CC1	Inorganic Chemistry –I	4	3	40	60	100
	19C1CC2	Organic Chemistry - I	5	4	40	60	100
	19C1CC3	Volumetric analysis-I	3	2	40	60	100
	19N1ACC1/ 19Z1ACC1	Allied Chemistry -I	3	3	40	60	100
	19N1ACC2/ 19Z1ACC2	Allied Chemistry Practicals -I	2	2	40	60	100

	19C1NME 1	Profitable home Industries	**2**	**2**	**40**	**60**	**100**
II	19C2CC4	Inorganic Chemistry –II	**4**	**3**	**40**	**60**	**100**
	19C2CC5	Organic Chemistry –II	**5**	**4**	**40**	**60**	**100**
	19C2CC6	Volumetric analysis-II	**3**	**2**	**40**	**60**	**100**
	19Z2ACC3/ 19N2ACC3	Allied Chemistry -II	**3**	**3**	**40**	**60**	**100**
	19Z2ACC4/ 19N2ACC4	Allied chemistry Practicals	**2**	**2**	**40**	**60**	**100**
	19C2NME2	Profitable home Industries	**2**	**2**	**40**	**60**	**100**
	19C3CC7	Organic & Inorganic Chemistry	**5**	**4**	**40**	**60**	**100**

III	19C3CC8	Physical chemistry-I	4	3	40	60	100
	19C3SB1	Agricultural chemistry	2	2	40	60	100
	19P3ACC1	Allied Chemistry –I	3	3	40	60	100
	19C3CC9	Inorganic Qualitative Analysis	3	2	40	60	100
	19P3ACC2	Allied Chemistry Practicals-I	2	2	40	60	100

	19C4CC10	Inorganic Chemistry-III	5	3	40	60	100
	19C4CC11	Physical chemistry-II	4	3	40	60	100
	19C4SB2	Natural & Synthetic dyes	2	2	40	60	100

IV	**19C4CC12**	Organic Qualitative analysis	**3**	**3**	**40**	**60**	**100**
	19P4ACC3	Allied Chemistry –I	**3**	**3**	**40**	**60**	**100**
	19P4ACC4	Allied Chemistry practicals-II	**3**	**3**	**40**	**60**	**100**
V	**C5CC11**	Organic chemistry -III	**6**	**4**	**25**	**75**	**100**
	C5CC12	Physical chemistry -III	**6**	**4**	**25**	**75**	**100**
	C5CC13	Inorganic practicals	**4**	**2**	**40**	**60**	**100**
	C5CC14	Organic preparation andestimation	**4**	**2**	**40**	**60**	**100**
	C5ME1	Spectroscopy	**5**	**5**	**25**	**75**	**100**
	C5ME2	Bio chemistry	**5**	**5**	**25**	**75**	**100**
	C5SB3	Medicinal chemistry	**2**	**2**	**50**	**50**	**100**
	C5SB4	Nano chemistry	**2**	**2**	**50**	**50**	**100**

VI	**C6CC15**	Organic chemistry –IV	**5**	**4**	**25**	**75**	**10**
	C6CC16	Physical chemistry-IV	**5**	**4**	**25**	**75**	**10**
	C6ME3	Advanced Organic chemistry	**5**	**5**	**25**	**75**	**10**
	C6ME4	Polymer chemistry	**5**	**5**	**25**	**75**	**10**
	C6ME5	Advanced Physical chemistry	**5**	**5**	**25**	**75**	**10**
	C6ME6	Advanced Inorganic chemistry	**5**	**5**	**25**	**75**	**10**
	C6SB5	Computers in chemistry	**2**	**2**	**50**	**50**	**10**
	C6SB6	Green chemistry	**2**	**2**	**50**	**50**	**10**
	C6CC17	Physical practicals	**6**	**3**	**40**	**60**	**10**
	C6CC18	Green chemistry practicals	**4**	**2**	**40**	**60**	**10**

OLD

5% deletion

FATIMA COLLEGE (AUTONOMOUS) MADURAI-18

DEPARTMENT OF CHEMISTRY

II B.Sc.CHEMISTRYSEMESTER –III

ORGANIC AND INORGANIC CHEMISTRY –C3CC6

(For those who joined in 2017 onwards)

4 Hrs/ week **3 Credits**

Objectives: This paper deals with the concept of aromaticity and detailed study of electrophilic and nucleophilic substitutions in aromatic compounds. The inorganic chemistry part of the paper deals with the general characteristics of, VII group elements,d- block elementsand Principles of Inorganic Qualitative and Quantitative Analysis.

I. (a) Aromatic hydrocarbons **(12hrs)**

(b) Electrophilic aromatic substitution

II. a) Nucleophilic Aromatic Substitutin

b) Phenols **(12Hrs)**

III. Chemistry of VII group elements **(12Hrs)**

IV. Chemistry of d-block elements **(12hrs)**

V. Theory behind the Practicals **(12 Hrs)**

I. (a) Aromatic hydrocarbon **(4Hrs)**

The Concept of aromaticity –Aromatic, Antiaromatic and non-aromatic compounds- Huckel's rule and applications of Huckel'srule,Structure of Benzene, Stability of Benzene ring - Heats of Hydrogenation and combustion, C-C Bond lengths, resonance structure of Benzene ,Molecular orbital picture of benzene and Nomenclature of Benzene derivatives.

(b). Electrophilic Aromatic Substitution **(8Hrs)**

Introduction, General mechanism of Nitration, SulphonationandDesulphonation, Halogenation, Friedal crafts alkylation and acylation. Limitations of Friedel-Crafts alkylation, Orientation effect of substituent groups on further electrophilic aromatic substitution, Classification of substituent groups, Effect of Activating groups, Effect of deactivating groups, Steric factors in Electrophilic Aromatic Substitution, Introduction of a third substituent into the benzene ring.

II. a) Nucleophilic Aromatic Substitutin (2 Hrs)

Activated Nucleophilic substitution, Benzyne mechanism and evidences in favour of benzyne mechanism

b) Phenols: (10Hrs)

Classification and Nomenclature, Preparation –General Physical properties,.Chemical properties– Acidic character of phenols, Electrophilic aromatic substitution reactions of phenol- Reaction with dilute nitric acid and con. Nitric acid, Sulphuric acid, Bromine, Nitrous acid, Alkyl halides and formaldehyde(LedererManasse Reaction), , Coupling reaction, Kolbe reaction, Reimer Tiemann reaction, Reactins of OH group similar to alcohols-reaction with sodium, Esterification- Fries rearrangement, Etherification-Claisen rearrangement and Tests for phenol.

III. Chemistry of VII Group elements (12Hrs)

5% deletion

Group discussion, anomalous behavior of F, ionic-, covalent-,bridging halides, reactivity of halogens - reduction of halogens by thiosulfate and application to iodo/iodimetry, Comparison of Acid strength of HX.

Halogen oxides: oxygen difluoride, dioxygendifluoride, dichlorine monoxide, chlorinedioxide, dichlorinehexoxide, dichlorineheptoxide; bromine dioxide, iodine pentoxide.

Oxoacids of halogens: hypohalous acid HOX, halous acid HXO_2, halic oxide HXO_3, perhalic acid HXO_4, strength of oxoacids.

Interhalogen compounds: ClF, ICl; ClF_3, BrF_3, IF_3, ClF_5, BrF_5, IF_5 - structure-VSEPR Model.

IV Chemistry of d-block elements (12Hrs)

First, second and third transition series - General characteristics – Metallic character, atomic and ionic radii – oxidation states, colour, complex formation,catalytic and magnetic properties-Non-stoichiometric compounds- Preparation, properties and uses of Importantcompounds of transitionmetals:Chromous Acetate, Potassium Ferocyanide, Potassium Ferricyanide, Prussian blue,Sodium nitro prusside, Nickel DMG complex, Wilkinson'sCatalyst, Hg_2Cl_2,$HgCl_2$,Hgl_2,$K_2Cr_2O_7$ and$KMnO_4$.

(V) Principles of Inorganic Qualitative and Quantitative Analysis: (12 Hrs)

Qualitative analysis: Basic principles of chemical analysis-solubility product-definition-application of solubility product, Reactions of dilute and concentrated acids-preparation of Na_2CO_3 extract- Tests for interfering and non-interfering acid radicals-CO_3^{2-} , halides, SO_4^{2-}, NO_3^-, PO_4^{3-}, BO_3^{3-}, $C_2O_4^{2-}$, Separation of Cations into groups and their reactions.

Quantitative Analysis: Introduction to Gravimetric analysis, Precipitation methods of Gravimetric analysis, Mechanism of precipitation-Desirable properties of Gravimetric precipitates, Factors affecting the solubilities of precipitates, common ion effect, adverse ion effect-coprecipitation, post precipitation, Digestion of the precipitate, Washing and Filtration, Drying or Ignition, Errors in Gravimetry and scope of the technique, Inorganic and Organic precipitating agents.

Text Books:

1. For Units I and II - M. K. Jain and S.C. Sharma- Modern Organic Chemistry, 4th(Reprint) Edn, Vishal Publishing Co., 2013.
2. For unit III, IV and V -B.R.Puri, L.R.Sharma&Kalia.- Principles of Inorganic chemistry –13thEdn, Vishal Publishing House.

Reference Books:

1. R.T.Morrison&R.N.Boyd, Organic chemistry 6thEdn, Prentice-hall of India private Ltd, 2005.
2. ArunBahl& B. S. Bahl, Advanced Organic chemistry, First Edition, Reprint, S.Chand& Co. 2005.
3.
4. SatyaPrakash, G.D.Tuli, S.K.Basu, R.D. Madan, Advanced Inorganic Chemistry Vol-I, Reprint, S.Chand& Co., 2016.
5. James.E.Huheey, Inorganic Chemistry, pearson publications, 4th edition, 2008.
6. F. A. Cotton, G. Wilkinson, C. Murillo and M. Bochman, *Advanced Inorganic Chemistry*, 6th ed., John Wiley, New York, 1999.

NEW

FATIMA COLLEGE (AUTONOMOUS), MADURAI -18

5%

DEPARTMENT OF CHEMISTRY

II B.Sc.CHEMISTRY SEMESTER –III

***For those who joined in* 2019** onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UACH	19C3CC7	ORGANIC & INORGANIC CHEMISTRY	UG-Core	5	4

COURSE DESCRIPTION

This paper deals with the concept of aromaticity and detailed study of electrophilic and nucleophilic substitutions in aromatic compounds. The inorganic chemistry part of the paper deals with the general characteristics of, VII group elements,d- block elementsandPrinciples of InorganicQualitative and Quantitative Analysis.

COURSE OBJECTIVES

In this course the students are able to gain knowledge about aromaticity and able to apply the concept to other organic compounds, and they are exposed to electrophilic and nucleophilicmechanisms. Students are able to appreciatechemistry behind practicals of qualitative and quantitative analysis.

COURSE OUTCOME:

After completion of the course the students should be able to:

CO 1 To interpret the concept of aromaticity and the main

properties ofaromatic compounds.

CO 2 To explore reactivity patterns of conjugated, aromatic molecules andto evaluate the kinetics and thermodynamics controlled reactions.

CO 3 Explain types of oxides and oxyacids, their structure and reactivity inhalogens

CO 4 Discuss the properties d block elements & triads of transitionelements.

CO 5 Recognize the role of oxidizing agents, reducing agents, group reagents andcomplexing agents, and inferences with theory behind practicals.

I. (a) Aromatic hydrocarbon (6Hrs)

The Concept of Aromaticity, Aromatic, Antiaromatic and non-aromatic compounds- Huckel's rule and applications of Huckel's rule,Structure of Benzene, Stability of Benzene ring - Heats of Hydrogenation and combustion, C-C Bond lengths, resonance structure of Benzene,Molecular orbital picture of benzene andNomenclature of Benzene derivatives.

(b). Electrophilic Aromatic Substitution (9Hrs)

Introduction,General mechanism of Nitration, SulphonationandDesulphonation, Halogenation, Friedal crafts alkylation and acylation.Limitations of Friedel-Crafts alkylation, Orientation effect of substituent groups on further electrophilic aromatic substitution, Classification of substituent groups, Effect of Activating groups, Effect of deactivating groups, Steric factors in Electrophilic Aromatic Substitution, Introduction of a third substituent into the benzene ring.

II.(a) Nucleophilic Aromatic Substitution (3Hrs)

Activated Nucleophilic substitution, Benzyne mechanism and evidences in favour of benzyne mechanism

(b) Phenols (12Hrs)

Classification and Nomenclature, Preparation –General Physical properties,.Chemical properties– Acidic character of

phenols, Electrophilic aromatic substitution reactions of phenol-Reaction with dilute nitric acid and con. Nitric acid, Sulphuric acid, Bromine, Nitrous acid, Alkyl halides and formaldehyde(LedererManasse Reaction), Coupling reaction, Kolbe reaction, Reimer Tiemann reaction, Reactins of OH group similar to alcohols-reaction with sodium, Esterification-Fries rearrangement, Etherification- Claisenrearrangementand Tests for phenol.

III. Chemistry of VII Group elements (15Hrs)

Group discussion, anomalous behavior of F, ionic-, covalent-,bridging halides, reactivity of halogens - reduction of halogens by thiosulfate and application to iodo/iodimetry, Comparison of Acid strength of HX.

Halogen oxides: oxygen difluoride, dioxygendifluoride, dichlorine monoxide,chlorinedioxide,dichlorinehexoxide,dichlorineheptoxide;bromine dioxide, iodine pentoxide.Oxoacids of halogens: hypohalous acid HOX, halous acid HXO_2, halic oxide HXO_3,perhalic acid HXO_4, strength of oxoacids.Interhalogen compounds: ClF, ICl; ClF_3 - structure-VSEPR Model.

IV Chemistry of d-block elements

(15Hrs)

First, second and third transition series - General characteristics – Metalliccharacter, atomic and ionic radii – oxidation states, colour, complex formation, catalytic and magnetic properties-Non-stoichiometric compounds- Preparation, properties and uses of Importantcompounds of transitionmetals:Chromous Acetate, Potassium Ferocyanide, Potassium Ferricyanide, Prussian blue,Sodium nitro prusside, Nickel DMG complex, Wilkinson'sCatalyst, Hg_2Cl_2,$HgCl_2$,Hgl_2,$K_2Cr_2O_7$ and$KMnO_4$.

(V) **Principles of Inorganic Qualitative and Quantitative Analysis (15 Hrs)**

Qualitative analysis: Basic principles of chemical analysis-solubility product-definition-application of solubility product, Reactions of dilute and concentrated acids-preparation of Na_2CO_3 extract- Tests for interfering and non-interfering acid radicals.

Quantitative Analysis: Introductionto Gravimetric analysis, Precipitation methods of Gravimetric analysis, Mechanism of precipitation-Desirable properties of Gravimetric precipitates, Factors affecting the solubilities of precipitates, common ion effect, adverse ion effect-coprecipitation, post precipitation, Digestion of the precipitate, Washing and Filtration, Drying or Ignition, Errors in Gravimetry and scope of the technique,Inorganic and Organic precipitating agents.

Text Books

1.For Units I and II - M. K. Jain and S.C. Sharma- Modern Organic Chemistry, 4th(Reprint) Edn, Vishal Publishing Co., 2013.

2.For unit III, IV and V -B.R.Puri, L.R.Sharma&Kalia.- Principles of Inorganic chemistry –32ndEdn, Milestone publishers, 2018.

Reference Books

1.R.T.Morrison&R.N.Boyd,Organic chemistry 6thEdn, Prentice-hall ofIndia private Ltd, 2005.

2.ArunBahl& B. S. Bahl, Advanced Organic chemistry, First Edition,Reprint, S.Chand& Co. 2005.

3.Jerry March, Advanced Organic Chemistry, 4th Edition, John Wiley, NewYork, 2005.

4.SatyaPrakash, G.D.Tuli, S.K.Basu, R.D. Madan, Advanced Inorganic Chemistry,Vol-I, Reprint, S.Chand& Co., 2016.

5.James E.Huheey, Inorganic Chemistry, Pearson publications, 4th edition,2008.

6.F. A. Cotton, G. Wilkinson, C. Murillo & M. Bochman, Advanced Inorganic Chemistry, 6thed., John Wiley, New York, 1991

FATIMA COLLEGE (AUTONOMOUS), MADURAI-625018

DEPARTMENT OF CHEMISTRY

II B.Sc CHEMISTRY-III SEMESTER

PHYSICAL CHEMISTRY - I - C3CC7

(For those who joined in June – 2009 onwards)

3 Hours / week **3 Credits**

Objective: This course provides a detailed study of Gaseous state, Solutions, Theory of dilute solutions and Radio activity.

UNIT I - Gaseous State **(9 hrs)**

UNITII - Solutions **(9 hrs)**

UNITIII -Theory of dilute solutions **(9 hrs)**

UNITIV - Radioactivity and nuclear transformation-I **(9 hrs)**

UNIT V - Radioactivity and nuclear transformation-II **(9 hrs)**

I-GASEOUS STATE **(9 hrs)**

Type of molecular velocities-average velocity-most probable velocity-RMS Velocity-Maxwell's distribution of molecular velocities-Effect of temperature on distribution of molecular velocities. Max wells distribution of molecular energies –collision diameter-collision number-mean free path-viscosity of gases-viscosity of gases-viscosity in terms of momentum transfer-calculation of collision diameter and mean free path from viscosity measurement.

Real gases: Effect of temperature on deviation from ideal behaviour-Boyle temperature-Limitations of vanderwaals equation-Dieterici equation-Berthelot's equation-clausius equation-Derivation of Boyle temp from vanderwaals equation.

II-SOLUTIONS: **(9 hrs)**

TYPE OF SOLUTIONS:

Solution of liquids in liquids - Ideal and Non-ideal solutions- Raoult's law-vapour pressure of ideal solutions-vapour pressure of non-ideal solutions. Type I, Type II and type III solutions. Vapour pressure-composition and boiling point-composition curves of completely miscible binary solutions –fractional distillation-Azeotropic distillation-

Distillation of immiscible liquids-steam distillation. Solubility of partially miscible liquid pairs - Phenol-water system, Triethylamine-water system, Nicotine-water system.Effect of impurity on CST. Solution of gases in liquids - Absorption co-efficient of gases-Factors influencing the solubility of a gas-Nature of gas and nature of solvent-effect of temperature- Effect of pressure-Henry's law-Henry's law and Raoults law.

III-THEORY OF DILUTE SOLUTIONS (9 hrs)

Colligative properties:

Relative lowering of vapourpressue-Ostwald walker's method-Osmosis and osmotic pressure-Berkley and Hartley's method-Laws of Osmotic pressure and vant-Hoff theory-Isotonic solutions-Calculation of molecular weight.

Ebullioscopy:- Derivation of molecular weight using V.P-B.pt. curve-calculation of m.wtLandsberger method of determination of molecular weight.

Cryoscopy: Derivation of molecular weight using V.P-F.pt. curve. Calculation of m.wt.determination of m.wts by Beckmann and Rast method –Abnormal behavior of electrolytes –reasons for abnormal behavior –Van't Hoff factor, i, degree of dissociation and association.

IV-RADIOACTIVITY AND NUCLEAR TRANSFORMATION-I (9 hrs)

Natural Radioactivity:α,β and γrays-Detection and measurement of radioactivity.

G.M counter & Wilson cloud chamber-Derivation of decay constant and half life period –Radioactive equilibrium-soddy-Fajan displacement law.

Theory of radioactivity: n/p ratio for stable and metastable nuclei-radioactive series-orbital electron capture-Internal Conversion-nuclear isomerism.

Nuclear Structure: Size of the nucleus- Nuclear forces-packing fraction-Mass defect-binding energy of the nucleus-Binding energy and stability of nuclei.

Nuclear models: Nuclear shell model-The liquid drop model-nuclear fission –calculation of energy released in nuclear fission, the fission chain reaction-Atom bomb and nuclear reactors.

V-RADIOACTIVITY AND NUCLEAR TRANSFORMATION -II (9 hrs)

Nuclear fusion: Stellar energy-Hydrogen bomb.

Nuclear fission: Calculation of energy released in nuclear fission,

chain reaction,atom bomb

Artificial Radioactivity: Definition-different types of nuclear reactions with example-induced radioactivity.

Application of radioactivity-Medicines, Agriculture & Industry, As tracer elements in the elucidation of structure and investigation of reaction mechanism. Carbon dating. (self-study)

Text Books:

1. B.R.Puri, L.R. Sharma & M.S. Pathania, Principles of Physical Chemistry,"3rdEdn, Vishal Publishing House, 2010.
2. H.J. Arnicker, Essentials of Nuclear Chemistry, New Age International Pvt. Ltd., 2005.

30%

FATIMA COLLEGE (AUTONOMOUS) MADURAI-18

DEPARTMENT OF CHEMISTRY

II B.Sc.CHEMISTRY

SEMESTER –III

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	HRS/ WEEK	CREDITS
UACH	19C3CC8	PHYSICAL CHEMISTRY - I (Gaseous state, Solutions,dilute solutions,radio activity & Nuclear transformations and nuclear chemistry)	4	3

COURSE DESCRIPTION

This course provides a detailed study of Gaseous state, Solutions, Theory ofdilute solutions ,Radio activity and nuclear chemistry.

COURSE OBJECTIVES

- To focus on the basic concepts and laws of gases state, characteristicsof various types of solutions,and colligative properties
- To study the properties of radioactive raysand the importance of nuclear chemistry

COURSE OUTCOME:

After completion of the course the students should be able to:

CO 1 Gain a basic knowledge about the kinetic theory of gases, gaseous laws,types of velocities and properties of gases

CO 2 Distinguish between ideal and non-ideal solutions

CO 3 Derive the relationship between molar mass of a non-volatile solute and colligative properties

CO 4 calculate the mass defect,packing fraction and binding energy for any nuclei

CO 5 Predict the growing rate,mechanism and age of plants using radioactive elements

UNIT-I GASEOUS STATE (12 HRS.)

Kinetic theory of gases-gaseous laws-derivation of kinetic gas equation-Type of molecular velocities-average velocity-most probable velocity-RMS Velocity- Maxwell's distribution of molecular velocities-Effect of temperature on distribution of molecular velocities.Maxwells distribution of molecular energies – collision diameter-collision number-mean free path-viscosity of gases--viscosity in terms of momentum transfer-calculation of collision diameter and mean free path from viscosity measurement.

Real gases: Effect of temperature on deviation from ideal behaviour-Boyle temperature-Limitations of vanderwaals equation-Dieterici equation-Berthelot's equation-clausius equation

Self study : Derivation of Boyle temperature from vanderwaals equation.

UNIT-II SOLUTIONS: (12 HRS.)

Solution of liquids in liquids-Ideal and non-ideal solutions-Raoult's law- Vapour pressure-composition curve of ideal solutions-Vapour pressure- composition curve of non-ideal solutions- Type I, Type II and type III solutions. Vapour pressure-composition and boiling point-composition curves of completely miscible binary solutions –fractional distillation-Azeotropic distillation-Distillation of immiscible liquids-steam distillation. Solubility of partially miscible liquid pairs-Phenol-water

system,Triethylamine-water system,Nicotine-water system.Effect of impurities on Critical solution temperature. Solution of gases in liquids - Absorption co-efficient of gases-- Factors affecting the solubility of a gas in liquids-Nature of gas and solvent, and pressure -Henry's law

Self study : Relationship between Henry's law and Raoults law.

UNIT-III THEORY OF DILUTE SOLUTIONS(12HRS.)

Relative lowering of vapour pressure-Derivation of molecular weight of

anon-volatile solute from relative lowering of vapour pressure-

Determination ofrelative lowering of vapour pressure by Ostwald walker's

method

Osmotic pressure- -Laws of Osmotic pressure-derivation of molecular weight ofa non-volatile solute from osmotic pressure-

- Determination of osmotic pressure by Berkley and Hartley's method-Isotonic solutions-

Ebullioscopy:-Derivation of molecular weight of a non-volatile solute using vapour pressure-boiling point curve-Determination of boiling point elevation by Landsberg's method

Cryoscopy: Derivation of molecular weight of a non-volatile solute using vapour pressure-freezing point curve-

Determination of freezing point depression by Beckmann method and Rast method

Self study -Vant't-Hoff factor-degree of dissociation and degree of association

UNIT-IV NUCLEAR CHEMISTRY-II (12 *HRS.)*

Natural Radioactivity:-Properties of 〈,® and ©—rays-Detection and masurement ofradioactivity. G.M counter & Wilson cloud chamber-Derivation of decay constant and half life period – Radioactive equilibrium-Soddy-Fajan's group displacement law.

Theory of radioactivity: n/p ratio for stable and meta stable nuclei-radioactive series-orbital electron capture-Internal

15%

Conversion-nuclear isomerism.

Artificial Radioactivity: Definition-different types of nuclear reactions with example-induced radioactivity.

Application of radioactivity-Medicine,agriculture and industry, as tracer elements in the elucidation of structure and investigation of reaction mechanism,.

Self study - Carbon dating

UNIT-V NUCLEAR CHEMISTRY (12 HRS.)

15%

Nuclear Structure: Size of the nucleus- Nuclear forces-packing fraction-Mass defect-binding energy of the nucleus-Binding energy and stability of nuclei.

Nuclear models: Nuclear shell model-The liquid drop model

Nuclear fission: Calculation of energy released in nuclear fission, the fission chain reaction,atom bomb

Nuclear fusion: Stellar energy-Hydrogen bomb

self study -Nuclear reactors.

Text Books:

1.B.R.Puri, L.R. Sharma & M.S. Pathania, Principles of Physical Chemistry,"3rdEdn, Vishal Publishing House, 2010.

2.H.J. Arnicker, Essentials of Nuclear Chemistry, New Age International Pvt. Ltd. 2005.

Reference Books:

1.P.L.Soni, H.C. Sharma, Principles of Physical Chemistry, S.Chand &Sons, New Delhi, 1980

2.A.Singh& R. Singh, Text Book of Nuclear Chemistry, New Delhi, Campus Books International, 2006

3.Mahaling Ram Naresh, Basics of Nuclear Chemistry, New Delhi, Anmo Publications Pvt Ltd, 2

OLD

FATIMA COLLEGE (AUTONOMOUS) MADURAI-18

DEPARTMENT OF CHEMISTRY

SKILL BASED – II B.SC CHEMISTRY

AGRICULTURAL CHEMISTRY – C3SB1

(For Those Who Joined In 2016 Onwards)

2 hrs.per week **2 credits**

Objectives: The Course gives an introduction to soil and fertilizers and also gives the effect of pesticides.

Unit – I **6 Hrs**

Soils

Soils- Introduction, Composition of soil-Organic and inorganicconstitutents, soil acidity, Alkalinity, buffering of soils, Soil fertility,

Unit II **6 Hrs**

Fertilizers

Introduction, Use of fertilizers : urea, DAP, Super phosphate, Gypsum, NPK-mixed fertiizers, Optimal addition of Fertilizers to obtain estimated yields , Adverse effects of fertilizers

Unit III **6 Hrs**

Manures and Compost

Farmyard manure, Compost, Reinforcing manure, green manure crops, Biogas production from biogas plant

Unit IV **6 Hrs**

Pesticides

Pesticides –Introduction, classes of pesticides; Benefits and Adverse effects of pesticides, methods of pest control, methods of using pest control chemicals

Unit V **6 Hrs**

Practicals

Soil analysis – Determination of pH and estimation of Ca and Mg by complexometric titration

References

1.JeyashreeGhosh, Fundamental concepts of Applied Chemistry, S.Chand, 2006

2. B.A. Yagodin ,*Agricultural Chemistry*, Mir Publishers (Moscow), 1976.

NEW

FATIMA COLLEGE (AUTONOMOUS), MADURAI -18

5%

DEPARTMENT OF CHEMISTRY

II B.Sc CHMISTRY

SEMESTER -III

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UACH	19C3SB1	Agricultural chemistry	Skill based	2	2

COURSE DESCRIPTION

This course deals with the basic knowledge about the role of soils in the environment,their types and properties.This paper also provides a focus with special emphasis on importance of pesticides, organic manures,compost and fertilizers for better production of crops and also their impact

COURSE OBJECTIVES

- To focus on the basic knowledge about soils,the various types,offertilizers and manures
- TO study the methods of controlling pests

COURSE OUTCOME:

After completion of the course the students should be

able to: CO 1 Define the term soil

CO 2 describe the various types of fertilizers and their uses

CO 3 realise the requirements of manures and fertilizers for better production of various types of crops

CO 4 Examine the adverse effect of pesticides

CO 5 Calculate the amount of calcium and magnesium present in various

types of soils

UNIT I SOILS (6 HRS.)

Soils- Introduction, Composition of soil-Organic and inorganicconstitutents, soil acidity, Alkalinity, buffering of soils, Soil fertility.

UNIT –II FERTILIZERS (6 HRS.)

Introduction,Use of fertilizers : urea, DAP, Super phosphate, Gypsum, NPK-mixed fertiizers, Optimal addition of Fertilizers to obtain estimated yields , Adverse effects of fertilizers

UNIT –III MANURES AND COMPOST (6 HRS.)

Farmyard manure, Compost, Reinforcing manure, green manure crops,organic farming, Biogas production from biogas plant

1%

UNIT –IV PESTICIDES (6 HRS.)

Pesticides –Introduction, classes of pesticides; Benefits and Adverse effects ofpesticides, methods of pest control, methods of using pest control chemicals and natural pesticides

1%

UNIT –V PRACTICALS (6 HRS.)

Soil analysis – Determination of pH and estimation of Ca and Mg by complexometric titration and water analysis

3%

References

1.JeyashreeGhosh, Fundamental concepts of Applied Chemistry, S.Chand,2006

B.A. Yagodin ,Agricultural Chemistry, Mir Publishers (Moscow), 1976.

OLD

FATIMA COLLEGE (AUTONOMOUS), MADURAI-18

DEPARTMENT OF CHEMISTRY

II UG CHEMISTRY (SEMESTER –III)

INORGANIC QUALITATIVE ANALYSIS-C3CC10

(For those who joined in 2017 onwards)

5% deletion

3 hrs/ week **credits : 2**

COURSE OBJECTIVE: This paper Involves the analysis of inorganic mixtures an acid and basic radicals qualitatively.

Interfering Acid radicals

- Phosphate
- Borate
- Oxalate

Non interfering acid radicals

- Chloride
- Bromide
- Iodide
- Carbonate
- Sulphate
- Nitrate

Basic radicals

Group I : Mercury, Silver and Lead

Group II : Bismuth , copper, cadmium, arsenic and antimony

5% deletion

Group III : Manganese, Iron and chromium.

Group IV : Manganese, Cobalt, Nickel and Zinc

Group V : Calcium, Strontium and Barium

Group VI : Ammonium and Magnesium

Reference Book

V.Venkateswaran, R.veeraswamy&A.R.Kulandaivelu,Basic Principles of practical chemistry, 3rd Edn, 1992.

FATIMA COLLEGE (AUTONOMOUS), MADURAI-18

DEPARTMENT OF CHEMISTRY

II UG CHEMISTRY-III SEMESTER

5%

INORGANIC QUALITATIVE ANALYSIS-19C3CC9

(For those who joined in 2019 onwards)

3hrs/ week **credits : 2**

COURSE OBJECTIVE: This paper Involves the analysis of inorganic mixtures an acid and basic radicals qualitatively.

Course Outcomes

After completion of the course the students should be able to:

- Get the knowledge of procedure for group separation and group analysis
- Identify various ions present in mixture of salt
- Recognize the role of oxidizing agents, reducing agents, group reagents and

complexing agents.

- Analyse the experimental observations and inferences with theory behind practicals.

Interfering Acid radicals

- Phosphate
- Borate
- Oxalate
- Fluoride

Non interfering acid radicals

- Chloride
- Bromide
- Iodide

- Carbonate
- Sulphate
- Nitrate

Basic radicals

Group I : Lead

Group II : Bismuth , copper,

cadmium,

Group III : Manganese, Iron and

chromium.

Group IV : Manganese, Cobalt, Nickel

and Zinc

Group V : Calcium, Strontium and

Barium

Group VI : Ammonium and Magnesium

Reference Book

V.Venkateswaran, R.veeraswamy&A.R.Kulandaivelu,Basic Principles ofpractical chemistry, 3rd Edn, 1992.

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FATIMA COLLEGE (AUTONOMOUS) MADURAI-18

DEPARTMENT OF CHEMISTRY

II B.Sc. Chemistry -IV SEMESTER

I

INORGANIC CHEMISTRY - III – C4CC8

5% deletion

(For those who joined in June- 2008 onwards)

4 Hours / week Credits-3

Objective: This course provides an extensive study of coordination complexes, including their spectral and magnetic properties and 'F' block elements.

I	Theories of Coordination – I	(12 hrs)
II	Theories of Coordination – II	(12 hrs)
III	Mechanism in coordination complexes	(12 hrs)
IV	Organometallic Chemistry	(12 hrs)
V	F' Block Elements	(12 hrs)

I THEORIES OF COORDINATION:I (12 hrs)

a) Introduction – types of ligands, nomenclature, preparation and detection of complexes.

b) Werner's theory – basis for isomerism in complexes, merits & demerits, types of isomerism & Geometry. Effective atomic number rule.

II THEORIES OF COORDINATION:II (12 hrs)

a).Valence bond theory – Introduction, Hybridisation,sp^3, dsp^2, dsp^3, d^2sp^3, & sp^3d^2, merits & demerits.

b).Crystal Field theory – Introduction, crystal field splitting in octahedral, tetrahedral & square planar arrangement of ligands. Spectro chemical series, ligand field effect and colour, crystal field stabilization energy and its application. Tetrahedral Vs Octahedral Complexes.John-Teller distortion and its consequences.

c).M.O.Theory – M.O. Theory as applied to octahedral complexes, Pi- bonding and M.O. theory, Merits.

III. MECHANISM IN COORDINATION COMPLEXES : (12 hrs)

a) Kinetics of complexes – stability – Kinetic and thermodynamic stability – Factors affecting stability and lability. Stepwise and over all stability constants (determination not required)

b) Mechanism of hydrolysis reactions in octahedral complexes.

c) Mechanism of ligand substitution reaction in square planar complexes, Trans effect, trans effect in synthesis, Mechanism of trans effect.

d) Spectroscopic states: L-S coupling & J-J coupling schemes, derivation of spectro0scopic states for free C-atom and free Ti^{3+} ion.

5% deletion

IV.ORGANOMETALLIC CHEMISTRY: (12 hrs)

Preparation and structure of metal carbonyls – $Ni(CO)_4$, $Fe(CO)_5$, $V(CO)_6$, $Mn_2(CO)_{10}$, $Co_2(CO)_8$ $Fe_2(CO)_9$ metal nitrosyls, Ferrocene (structure based on VBT) and cyclobutadiene complexes.

V. 'F' BLOCK ELEMENTS: (12 hrs)

a) The lanthanide series electronic conf. Oxidation states, spectral and magnetic properties of ce^{3+} and yb^{3+} , causes and consequences of lanthanide contraction - separation of lanthanides by fractional crystallization, solvent extraction, by ppn., by change in oxidation state and Ion exchange chromatography.

b) Actinides

Extraction of Uranium from pitchblende and thorium from monazite.

Text Book:

1. Selected topics in Inorganic Chemistry - Madan, Malik &Tuli.
2. B.R.Puri, L.R.Sharma&Kalia.- Principles of Inorganic chemistry, Vishal Publishing House, –13thEdn,, 2009.

Reference Book :

1. James.E.Huheey, Inorganic Chemistry, pearson publications, 4thEdn, 2008.

FATIMA COLLEGE (AUTONOMOUS),MADURAI -18

DEPARTMENT OF CHEMISTRY

II B.Sc. Chemistry

SEMESTER –IV

For those who joined in 2019 onwards

5%

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS /WEEK	CREDITS
UACH	19C4CC10	Inorganic Chemistry-III (Coordination Chemistry)	UG core	5	4

COURSE DESCRIPTION: The Course enables the students to gain knowledge on the chemistry of coordination compounds, carbonyl compounds and "F' block elements.

COURSE OBJECTIVES: This course provides an extensive study of coordination complexes, including their spectral and magnetic properties and 'F' block elements

COURSE OUTCOMES

After successful completion of the course, the students will be able to

CO 1 Know the structure and bonding of important coordination compounds

CO 2 Apply the rules to calculate the magnetic properties of complexes and how magnetic moments can be employed for the interpretation of their structure

CO 3 Get an overview about the reaction mechanism of metal complexes

CO 4 Import the skills to elucidate the structure and mode of bonding in

organometallic compounds

CO 5 Gain knowledge about the chemistry of Lanthanides and Actinides

UNITS

UNIT –I Theories of Coordination – I **(15HRS.)**

a). Introduction – classification of ligands, nomenclature, preparation of complexes and detection of complexes using solubility,colour change,conductance measurements and visible absorption studies. Basis for isomerism in complexes and different types of isomerism.

b). Werner's theory –merits & demerits.Sidgwick's electronic concept of effective atomic number and EAN rule as applied to carbonyls

Self Study:Chemical test for distinguishing *cis-trans* isomers.

UNIT –II Theories of Coordination – II **(15HRS.)**

a).Valence bond theory – Introduction, Hybridisation,sp^3, dsp^2, dsp^3, d^2sp^3, & sp^3d^2, merits & demerits.

b).Crystal Field theory – Introduction, crystal field splitting in octahedral, tetrahedral & square planar arrangement of ligands. Spectro chemical series, ligand field effect and colour, crystal field stabilization energy , factors affecting the magnitude of Δ_0 and its application.Distortion of octahedral complexes and John-Teller theorem. Limitations of CFT.

c).M.O.Theory – M.O. Theory as applied to octahedral complexes, Pi- bondingand M.O. theory, Merits.

Self Study: Structure of Spinels

UNIT –III Mechanism in coordination complexes **(15 HRS.)**

a).Kinetics of complexes – stability – Kinetic and thermodynamic stability – Factors affecting stability and lability Stepwise and over all stability constants (determination not required)

b) Mechanism of hydrolysis reactions in octahedral complexes.

c) Mechanism of ligand substitution reaction in square planar complexes, Trans effect, trans effect in synthesis, Mechanism of trans effect.

d) Spectroscopic states:L-S coupling & J-J coupling schemes, derivation of spectroscopic states for free C-atom.

Self Study: Mechanism of trans effect.

UNIT –IV Organometallic Chemistry **(15HRS.)**

Preparation and structure of metal carbonyls – $Ni(CO)_4$, $Fe(CO)_5$, $[V(CO)_6]$ & $Mn_2(CO)_{10}$. Metal nitrosyls – sodium nitroprusside and nitoso ferrous sulphate.Ferrocene (structure based on VBT).

Self Study: $Co_2(CO)_8$ and $Fe_2(CO)_9$

UNIT –V :'F' Block Elements **(15 HRS.)**

a). The lanthanide series electronic configuration, Oxidation states, spectral and magnetic properties of ce^{3+} and yb^{3+} , causes and consequences of lanthanide contraction - separation of lanthanides by fractional crystallization, solvent extraction, precipitation, change in oxidation state and Ion exchange chromatography.

b). Actinides The actinide series and electronic configuration.Extraction of Uranium from pitchblende.

Self Study: Extraction of thorium from monazite

REFERENCES:

1. R.D.Madan, Wahid U.Malik&G.D.Tuli, -*Selected topics in Inorganic Chemistry* - S.Chand& Company LTD. 2010 - For Units I, II and III

2.B.R.Puri,L.R.Sharma&K.C.Kalia."*Principles ofInorganic Chemistry"*Milestone Publishers, 2014, For Unit IV.

3.James E HuheeyInorganic Chemistry, II Edn.,.Published by Dorling Kindersley (India) Pvt.Ltd. 2009 - For Unit III - (d)