MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVEI
UG – COURSES – AFFILIATED COLLEGES
B.Sc. Chemistry
(Choice Based Credit System)
(with effect from the academic year 2020-21 onwards)

1. Objectives

- To impart theoretical and practical skills that underpins the various branches of the Science of Chemistry
- To enable the students to have a thorough understanding and knowledge of different branches of Chemistry
- To make the students to develop the ability to think analytically and solve problems.
- To facilitate the students of B.Sc Chemistry to join PG courses which in turn offer them job opportunities and research pursuits.
- To apply the skills and knowledge gained through the subject to real life situations and face competitive examinations with confidence at National level.
- To create an awareness to ecofriendly microscale experiments in practical courses.

2. Eligibility for Admission

The minimum eligibility conditions for admission to the **B.Sc Chemistry** program are given below.

The candidates for admission into the first semester of the **B.Sc Chemistry** course will be required to have qualified the Higher Secondary examination conducted by the Board of Higher Secondary Education, Government of Tamil Nadu or any other Examinations accepted by the syndicate of the Manonmaniam Sundaranar University as equivalent there to in Science subject.

3. Duration of the Course

The students shall undergo the prescribed course of study for a period of not less than three academic years (Six semesters). The semester contains 90 working days.

4. Scheme of the Course

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SEM	Part	Sub. No	SUBJECT STATUS	SUBJECT TITLE	Contact hrs/wk	L Hrs /wk	P Hrs /wk	Credits
III	I	17	Language	Tamil/Other Languages	6	6	0	4
	II	18	Language	English	6	6	0	4
	III	19	Core – Paper V	Organic Chemistry – I	4	4	0	4
	III	20	Major Practical III	Inorganic Qualitative Analysis	2	0	2	2
	III	21	Allied – II	Allied Chemistry – I	4	4	0	3
	III	22	Allied Practical II	Allied Chemistry Practical- I	2	0	2	2
	III	23	Skilled Based-I Core	Agro Chemistry/Food Chemistry	4	4	0	4
	IV	24	Non-Major Elective - I	Food Science /Water Management	2	2	0	2
	IV	25	Common	Yoga	2	2	0	2
			SUBTOTAL		**30+2**	**26+2**	**4**	**27**
IV	I	26	Language	Tamil/Other Languages	6	6	0	4
	II	27	Language	English	6	6	0	4
	III	28	Core – Paper VI	Organic Chemistry – II	4	4	0	4
	III	29	Major Practical IV	Organic Preparation & Physical Constant Determination	2	0	2	2
	III	30	Allied – II	Allied Chemistry – II	4	4	0	3
	III	31	Allied Practical II	Allied Chemistry Practical- II	2	0	2	2
	III	32	Skilled Based II Core	Chemistry in medicine / Industrial Chemistry	4	4	0	4
	IV	33	Non-Major Elective – II	Dairy Chemistry / Applied Chemistry	2	2	0	2
	IV	34	Common	Computers for Digital Era	2	2	0	2
	V	35	Extension Activity	NCC/NSS/YRC/YWF	-	-	-	1
			SUBTOTAL		**30+2**	**26+2**	**4**	**28**

V	III	36	Core – Paper VII	Inorganic Chemistry- II	4	4	0	4
	III	37	Core – Paper VIII	Physical Chemistry – II	6	6	0	4
	III	38	Core - Paper-IX	Organic Chemistry – III	6	6	0	4
	III	39	Major Elective-I	Polymer Chemistry / Bio Inorganic Chemistry	4	4	0	4
	III	40	Major Practical V	Organic Analysis	8	0	8	4
	III	41	Major Practical VI	Gravimetric Estimation & Inorganic Preparation				
	IV	42	Skill Based Common	Personality Development / Effective Communication / Youth Leadership	2	2	0	2
			SUBTOTAL		**30**	**22**	**08**	**22**
VI	III	43	Core Paper - X	Inorganic Chemistry – III	5	5	0	4
	III	44	Core Paper - XI	Physical Chemistry – III	5	5	0	4
	III	45	Core Paper - XII	Organic Chemistry - IV	5	5	0	4
	III	46	Major Elective-II	Green Chemistry / Nano Chemistry	4	4	0	4
	III	47	Major Practical VII	Physical Chemistry Experiments	4	0	4	2
	III	48	Major Project	Major Project	07		07	7
SUBTOTAL					**30**	**19**	**11**	**25**
GRAND TOTAL					**180+4**	**143**	**37**	**152**

5. Elective Subject

One among the two given subjects will be selected.

6. Extension Program for the Department

Apart from the curriculum, to enrich the skill development of the students following courses in their premises are conducted.

Effective Communication

Personality development

Youth development.

7. Internal Assessment

There is a separate passing minimum for the external and overall components.

Distribution of marks between External and Internal Assessment is

- For Theory 75 : 25
- For Practical 50 : 50

Pass minimum of 40% for external and overall components.

Internal Marks for **Theory** shall be allotted in the following

The average of the best two from three compulsory tests. Each test is of one hour duration	20 Marks
Assignment	05 Marks
TOTAL	**25 Marks**

Distribution of marks between External and Internal Assessment for skill based elective - 75 : 25

The average of the best two from three compulsory tests. Each test is of one hour duration	20 Marks
Assignment	05 Marks
TOTAL	**25 Marks**

Internal Marks for **Practical** shall be allotted in the following manner

Experimental Work	25 Marks
Regularity	25 Marks
TOTAL	**50 Marks**

8. Grading System

The performance of the students is indicated by the seven point scale grading system as per the UGC norms given below.

Grade	Grade Point	Percentage of Marks	Performance
O	**9.5 and above**	**95 – 100**	**Outstanding**
E	**8.5 and above**	**85 – 94**	**Excellent**
D	**7.5 and above**	**75 – 84**	**Distinction**
A	**6.0 and above**	**60 – 74**	**Very Good**
B	**5.0 and above**	**50 – 59**	**Good**
C	**4.0 and above**	**40 – 49**	**Average**
RA	**0**	**Upto 39**	**Re-Appear**

The overall performance level of the candidates will be assessed by the following formulae :

$$\text{Cumulative weighted average of marks} = \frac{\sum(\text{Marks x Credits})}{\sum \text{Credits}}$$

$$\text{Cumulative weighted average Grade Points} = \frac{\sum(\text{Grade Point x Credits})}{\sum \text{Credits}}$$

9. Question Pattern

Section	Type of Question	No. of Question	Marks
Part A	Objective Type Questions (Two questions from each unit)	5 x 2 = 10	10 x 1 = 10
Part B	Internal Choice Questions (One question from each unit)	5 x 1 = 5	5 x 5 = 25
Part C	Internal Choice Questions (One question from each unit)	5 x 1 = 5	5 x 8 = 40
	TOTAL		75 marks

SEMESTER III PAPER- V

ORGANIC CHEMISTRY-I

L	T	P	C
4	0	0	4

Objectives

- To learn the naming of organic compounds
- To understand the basic concepts of organic chemistry
- To study hydrocarbons, halogen compounds, alcohols and ethers

UNIT- I CLASSIFICATION AND NOMENCLATURE

Classification of organic compounds - based on the nature of carbon skeleton – functional groups – classification of C and H atoms of organic compounds.(primary, secondary, tertiary)

IUPAC system of nomenclature of common organic compounds (upto C-10) – alkanes, alkenes, alkynes, cycloalkanes, bicycloalkanes with and without bridges and aromatic compounds.

Naming of organic compounds with one functional group - halogen compounds, alcohols , phenol, aldehydes, ketones, carboxylic acids and its derivatives, cyano compounds, amines and nitro compounds (Both aliphatic and aromatic)

Naming of compounds with two functional groups - naming of compounds with more than one carbon chain.

Naming of heterocyclic compounds containing one and two hetero atoms present in five and six membered rings. Structural isomerism – types with examples.
Arriving the structural formula from IUPAC name.

UNIT-II FUNDAMENTAL CONCEPTS

Hybridisation and geometry - Electronic effects - inductive effect, resonance effect – resonance structures–conditions for resonance –stability of resonance structures, hyper conjugation ,electromeric effect. Steric effect – steric overcrowding – steric inhibition– steric relief(with examples).

Dissociation of bonds – homolysis and heterolysis- radicals – carbocations – carbanions – electrophiles and nucleophiles Influence of electronic effets - dipole moment – relative strengths of acids and bases – stability of olefins – stability of radicals, carbocations and carbanions

UNIT-III HYDROCARBONS

Addition to unsymmetrical olefins (Markownikoff's rule and peroxide effect), hydroboration, ozonolysis, dihydroxylation with $KMnO_4$, allylic bromination by NBS (mechanisms not required). Classification of alkadienes, stability of conjugate dienes- Mechanism of 1, 2 and 1,4-addition- Diels-Alder reaction. Acidity of alkynes and formation of metal acetylides

UNIT -IV HALOGEN DERIVATIVES

Type of reactions - substitution, addition, elimination and polymerisation reactions -S_N1 and S_N2 mechanisms - E_1 and E_2 mechanisms- Hoffmann's and Saytzeffs rule-preparation, properties and uses of chloroform, carbon tetrachloride, vinyl chloride and allyl chloride- preparation and uses of westron, westrosol, freon and chloroprene

UNIT-V ALCOHOLS & ETHERS

Distinction between primary, secondary and tertiary alcohols – nitroglycerol, dynamite- estimation of hydroxyl groups- mechanism of dehydration of alcohols- preparation and properties of allyl alcohol Preparation and uses of oxirane and dioxan – Estimation of number of methoxy groups-Zeisel's method -Distinction between ethers and alcohols.

Reference Books :

1. K. S. Tewari and N. K. Vishnoi, A Text Book of Organic Chemistry, Vikas Publishing House Pvt Ltd.
2. Arun Bahl and B.S. Bahl, Advanced Organic Chemistry, S. Chand and Sons.
3. M.K. Jain and S. C. Sharma, Modern Organic Chemistry, Visal Publishing Co.
4. N. Tewari, Advanced Organic Reaction Mechanism, Third Edition 2011, Books & Allied (P) Ltd.
5. I. L. Finar, Organic Chemistry Volume I, ELBS, Longmans
6. Organic Chemistry – Bhupinder Mehta and Manju Mehta - PHI Learning Pvt Ltd

SEMESTER III- PAPER V

Organic Chemistry- I

MODEL QUESTION PAPERs

Part A

Answer all questions – 10 x1 = 10 marks

1. Which of the following is named as alkanal ?

a) alcohol b) aldehyde c) ketone d) carboxylic acid

2. The IUPAC name of $H_2C=CHCH_2CH_2(CH_3)_2$

a) 3-Methyl-4-pentene b) 4- Methyl-4-pentene c) 4- Methyl-1-pentene d) 4- Methyl-3-pentene

3. The nucleophilic reagent among the following is

a) SO_3 b)$AlCl_3$ c)BF_3 d) NH_3

4. The hybridisation of carbon atom in carbanions is

a)sp b)sp^2 c)sp^3 d)dsp^2

5. The most stable alkadiene is

a) 1,2-butadiene b)1,3-butadiene c)1,2-propadiene d)1,4-pentadienes

6. Ozonolysis of an alkene gives only acetaldehyde. The alkene is

a) 1-butene b) 2-butene c)1-propene d)1,3-butadiene

7. The least substituted alkene is the minor product in dehydrohalogenation of alkyl halides according to

a) Hofmann's rule b) Saytzeff rule c) Markovnikov's rule d) Van't Hoff rule

8. Freon -12 is used as

a) antibiotic b) insecticide c) anesthetic d) refrigerant

9. The intermediate in the acid catalysed dehydration of alcohols is

a) carbonium ions b) carbanions c) free radicals d) carbenes

10. Ethylene glycol when heated with conc. H_2SO_4 gives

a) dioxane b) ethanol c) ethylene d) ethane

Part B

Answer all questions – 5 x5 = 25 marks

11.a) Name the class of compounds to which the following compounds belong

a) $H_3CCH=CH_2$ b) H_3CCH_2OH c) HCOOH

or

b) Name the following alkyl groups

a) H_3C- b) H_3CCH_2 c) $(H_3C)_2CH$-

12. a)Discuss homolytic fission and heterolytic fission with suitable examples

or

b) Explain how inductive effect explain the basicity of organic compounds

13. a) Explain Diel's Alder reaction with two examples

or

b) Discuss the acidic nature of acetylides

14 . a) Write the preparation of vinyl and allyl chloride

or

b) Explain Saytzeff's rule with suitable example

15.a) Explain the Zeisel's method of estimation of the number of methoxy groups

or

b) Distinguish between ethers and alcohols

Part C

Answer all questions – 5 x8 = 40 marks

16. a) Write the IUPAC names of the following compounds

a) $H_3CCH(OH)CH_2CH_3$ b) H_3CCOCH_3 c) $H_2C=CHCH_3$ d) H_3CCOOH

or

b) Write the structural formulae for the following compounds

a) 2-Ethylbutane b) 1,4-Pentadiene c) 2-Propanol d) Pentanal

17 . a) Explain substitution and polymerization reactions with one example each.

or

b) Give the structure and stability of carbocation.

18. a) Explain the mechanisms of 1,2 and 1,4 additions of 1,3-butadiene

or

b) Write notes on allylic bromination and hydroboration

19. a) Write the mechanisms of S_N1 and S_N2 reactions

or

b) Give the preparations of Westron, Freon and Chloroprene

20. a) Distinguish between primary , secondary and tertiary alcohols by any two methods

or

b) Write notes on nitroglycerol

SEMESTER III

ALLIED CHEMISTRY – I

L	T	P	C
4	0	0	3

Objective

- To learn about atomic structure and bonding.
- To learn the principles of reactions of organic compounds.
- To study about photochemical reactions.
- To learn about the importance of polymers and polymer science.
- To study about lubricants and some cosmetics in the modern world.

Unit I – Inorganic chemistry

Atomic structure : electronic configuration - Aufbau principle - Pauli's exclusion principle- Hund's rule. Bonding : electrovalent, covalent, hydrogen bonds-orbital overlap - s-s, s-p. Hybridization and VESPR theory - CH_4, C_2H_4, C_2H_2- $BeCl_2$, BF_3, NH_3, H_2O, PCl_5, IF_5, IF_7.

Unit II - Organic chemistry – Principles of reaction:

Heterolytic and homolytic cleavage - nucleophiles and electrophiles-reaction intermediates – preparation and properties of carbonium ions, carbanions and free radicals -type of reactions - substitution, addition, elimination and polymerisation reactions.

Unit III-Physical chemistry – Photochemistry

Definition-comparision between thermal and photochemical reactions-Laws of photochemistry-Beer Lambert's law-Grothus Draper law-Einstein's law-Quantum yield-low and high quantum yield-determination of quantum yield-fluorescence, phosphorescence, thermoluminescence, chemiluminescence and bioluminescence-definition with examples-photosensitisation.

Unit IV-Polymer Chemistry

Definition- Monomers, Oligomers and Polymers - Classification of polymers- natural, synthetic- linear, cross linked and network- plastics, elastomers, fibres- homopolymers and co-polymers

Thermoplastics: polyethylene, polypropylene, polystyrene, polyacrylonitrile, poly vinyl chloride, nylon and polyester - Thermosetting Plastics : phenol formaldehyde and epoxide resin- Elastomers: natural rubber and synthetic rubber - Buna - N, Buna-S and neoprene.

Unit V-Applied Chemistry

Lubricants-classification-criteria of good lubricating oils-synthetic lubricating oils-poly glycols and poly alkene oxides-greases or semi solid lubricants-examples-solid lubricants-graphite

Prepration and uses of shampoo, nail polish, sun screens, tooth powder, tooth paste, boot polish, moth ball and chalk piece.

Reference Books

1. B. R. Puri, L. R. Sharma and K. C. Kalia, Principles of Inorganic Chemistry
2. P. L. Soni, Text Book of Inorganic Chemistry
3. K. S. Tewari and N. K. Vishnoi, A Text Book of Organic Chemistry.
4. Arun Bahl and B.S. Bahl, Advanced Organic Chemistry, S. Chand and Sons.
5. M.K. Jain and S. C. Sharma, Modern Organic Chemistry
6. K.K.Rohatgi Mukherjee, Fundamentals of photochemistry , Wiley Eastern Ltd.
7. B.R. Puri and L.R. Sharma, Principles of Physical Chemistry, Chand & Co.
8. Malcom P. Stevens, Polymer Chemistry – An Introduction
9. V.R. Gowariker, Polymer Science, Wiley Eastern, 1995.
10. Sawyer.W, Experimental cosmetics, Dover publishers, New york, 2000.

MODEL QUESTION PAPER

ALLIED CHEMISTRY-I

Part A 10 x1 = 10 marks

Answer all questions

1. The Shape of NH_3 molecule is

a) Pyramidal b) Tetrahedral c) Bent Shaped d) V-Shaped

2. Maximum electrons present in "s" orbital is

(a) 3 (b) 2 (c) 6 (d) 1.

3. ------- is an electrophile.

a) Br_2 b) H_2O c) NH_3 d) BF_3

4. Free radicals are species with

a) –ve Charge b) +ve Charge c) odd electron d) neutral

5. Photo Chemical reactions takes place in presence of ----------

a) heat b) light c) dark d) none

6. The intensity of light ---------- with increase in concentration of the solution

a) increases b) decreases c) both increase and decrease d) none

7. Nylon 6, 6 is a ----------

a) Copolymer b) homopolymer c) Monomer d) Condensation Polymer

8. Bakelite is a

a) Phenolic resin b) Elastomer c) Plastic d) Homopolymer

9. To improve the quality of Lubricants ---------- are added

a) additives b) oil c) Wax d) Solids

10. Shampoo contain ----------

a) Soap b) Sodium lauryl sulphate c) Dye d) Perfume.

Part – B **(5 x 5 = 25)**

11. a) Explain sp^3d hybridization with an example

(Or)

b) Write notes on hydrogen bonding.

12. a) Explain electrophiles and nucleophiles

(Or)

b) Explain carbonium ion and carbanion

13. a) State and explain Stark-Einsteins law of photo chemical equivalence

(Or)

b) Write a short note on (i) fluorescence (ii) Bioluminescence

14. a) What are polymers? Give its classification

(Or)

b) How will you prepare the following polymers? (i) Nylon 6,6 (ii) Nylon 6

15. a) Give the criteria of good lubricating oil

(Or)

b) Explain the preparation of the following products (i) Nail Polish (ii) Tooth Paste

Part – C (5 x 8 = 40)

16. a) Explain VSEPR theory

(Or)

b) Explain sp^3d and sp^3d^2 hybridization with an example

17. a)What is substitution reaction? Explain the types of substitution reactions

(Or)

b)Explain addition reactions.

18. a) What is photo sensitization? Explain in what way Chlorophyll acts as a photo sensitizer.

(Or)

b) Give the difference between fluorescence and phosphorescence

19. a) Write a short note on phenol formaldehyde resins.

(Or)

b) What are Elastomers? Mention any two elastomers, its preparation and uses.

20. a) How will you increase the performance of Good lubricating oil? Mention the additives and its function

(Or)

b) Explain the types of Greases.

SEMESTER - III

SKILL BASED COURSE - AGROCHEMISTRY

L	T	P	C
4	0	0	4

Objectives

- To learn about fertilizers and pesticides
- To study the origin, characterisation and testing of soils

UNIT – I

Fertilizers : Classification, macronutrients -role of nitrogen, potassium and phosphorus on plant growth – manufacture of urea, muriate potash and triple superphosphate. Complex fertilizers, mixed fertilizers & biofertilizers – their composition. Micronutrients – their role in plants. **Manures :** Bulky organic manures – Farm yard manure - oil cakes - blood meal – fish manures - Composting process – handling and storage

UNIT – II

Pesticides : Definition - Classification of Pesticides based on the use and chemical composition – examples - general methods of application – Benefits of pesticides - Potential hazards. Safety measures -first aid. **Insecticides :** Plant products – Nicotine, pyrethrin – Inorganic pesticides – borates. Organic pesticides – D.D.T. and BHC. **Fungicide :** Sulphur compounds, Copper compounds, Bordeaux mixture. **Herbicides :** Acaricides – Rodenticides. Attractants – Repellants.

UNIT –III

Soil: Origin of soil - definition of soil - rock system - weathering of rocks and minerals- main components of soil - organic, inorganic constituents - soil formation - factors favouring soil formation.

UNIT –IV

Characteristics of soil: Physical aspects - soil texture - pore space - bulk density, particle density - soil colour - surface area - soil colloids - plasticity, shrinkage - flocculation and deflocculation,soil air, soil temperature and their importance in plant growth. Acid, alkaline and saline soils – diagnosis - Methods of reclamation and after care

UNIT –V

Soil testing: concept and objectives – soil sampling , tools, collection, processing, dispatch of soil sample. Estimation of total organic compound, available nitrogen and phosphorus in the soil sample. Determination of pH, EC, moisture content, bulk density and particle density of the soil sample.

Reference books:

1. A text book of Soil Science – Daji.A, Asia Publishing House, Madras 1970.
2. Textbook of soil Chemical Analysis – Hesse,P.R.A John Murray Newyork,1971
3. Textbook of Soil Science - Biswas,T.D and Mukherjee,S.K.Second edition, Tata McGraw-Hill Education
4. Chemistry for Agriculture and Ecology-Y.Mido M.Satake, Discovery Publishing House.
5. Soil Fertility & Fertilisers – Samuel L.Tisdale,Werner L.Nelson, James D.Beaton, John L. Havlin. Fifth edition, Macmillan
6. Nature and properties of soils-Harry, O Buckman N Yle C. Brandy, Macmillan
7. Insecticides, Pesticides and Agro based Industries – R.C.Paliwal, K.Goel, R.K.Gupta, Small Business Publications

MODEL QUESTION PAPER

Semester III

Skill Based Course

AGROCHEMISTRY

Time: Three hours **Maximum : 75 marks**

Part A - (10 x 1 = 10 marks)
Answer ALL questions

Choose the Correct Answer

1. ------ is a micro nutrient

   a) Nitrogen b) Phosphorus c) Potassium d) Manganese

2. KCl is commercially known as

   a) Nitro Chalk b) Salt Petre c) Nitrolim d) Muriate of potash

3. DEET is a

   a) mosquito repellent b) mosquito attractant c) bio pesticide d) fungicide

4. Pyrithrine is a ---------- pesticide

   a) Organic b) Inorganic c) Bio d) None of these

5. The volcanic rock is

   a) Limestone b) Granite c) Marble d) Sandstone

6. Humus is present in ----------

   a) A-Horizon b) B-Horizon c) C-Horizon d) None

7. Organic matter imparts ---------- colour of the soil

   a) red b) yellow c) black d) white

8. Which one is dominating salt in alkali

   a) $CaCl_2$ b) $MgSO_4$ c) $NaHCO_3$ d) Na_2CO_3

9. The calcareousness in the field can be identified with

   a) dil.HCl b) dil. NaOH c) dil. KOH d) dil. $Ca(OH)_2$

10. Vertical section of soil is known as

a) Horizons b) Solum c) Profile d) None

Part B **5 x 5 = 25 marks**

Answer all questions

11. a)Give a brief account of bio fertilizers.

(Or)

b) Explain the following terms with suitable example (i) Oil cake (ii) blood meal

12. a) What are insect attractants and repellents ?

(Or)

b) What are the general methods of application of pesticides?

13. a)Write an essay on chemical weathering

(Or)

b) Write a short note on formation of metamorphic rocks

14. a)Describe the kinds of soil acidity

(Or)

b) List out the reasons for poor aeration in soils.

15. a)List out Do's and Don'ts of soil sampling.

(Or)

b)Write a short not on sample collection in a soil profile.

Part B **5 x 8 = 40 marks**

Answer all questions

16. a)What are manures? How are they classified? Give example for each.

(Or)

b)Describe the manufacture of (i) Urea (ii) Super Phosphate

17. a)How will you prepare the following? (i) Bordeaux Mixture (ii) 2,4 Dinitro-o-Cresol.

(Or)

b).Explain the various methods of application of pesticides.

18. a)Write a detailed essay on the formation of Igneous rocks with suitable examples.

(Or)

b)Discuss the soil forming minerals and give its classification.

19. a)Discuss the importance of soil air in relation to plant growth.

(Or)

b)Differentiate bulk density and particle density. What are the factors affecting bulk density of soils.

20. a)Discuss the modern approaches in soil fertility

(Or)

b)How will you interpret the soil test values for fertilizer recommendations

SEMESTER III

SKILL BASED COURSE - FOOD CHEMISTRY

L	T	P	C
4	0	0	4

Objectives:

- ✓ To acquire the basic knowledge of food chemistry

UNIT - I CONSTITUTION OF FOOD

Food - definition - classification of food - energy requirements of individuals - source, classification and function of carbohydrates, proteins, lipids, vitamins and minerals - calorific values of food - rice, wheat, milk, fish, vegetables, fruits and cereals.

UNIT - II FOOD ADDITIVES AND PRESERVATIVES

Food additives: Definition - permitted food additives, characteristics and their role: antioxidants, stabilizers, flavours, sweeteners, emulsifiers, thickeners, food colourants.

Preservatives: Definition – methods of food preservation - heat, cold, deep-freezing, radiation.

UNIT - III FOOD ADULTERATIONS

Definition - adulterant, adulteration - types of adulterants - common adulterants and their determination in milk, oils, ghee, honey, chilly powder, coriander powder, turmeric powder, coffee powder, tea dust, asafoetida - food poisoning and its prevention – Prevention of Food Adulteration Act- food laboratories and their functions.

UNIT - IV QUALITY STANDARDS

Quality control - specification and standards - FA, FDA, WHO standards - ISI specifications, packing and labeling of foods - Essential Commodities Act, Consumer Protection Act - AGMARK.

UNIT - V LABORATORY WORK

1. Determination of fat, protein and carbohydrate in food stuff.
2. Analysis of fats and oils - iodine value, acid value and RM value.
3. Estimation of glucose by Bertranel method
4. Analysis of starch in foods
5. Isolation of casein from milk

Reference books:

1. Sivasankar B, Food Processing and Preservation, Prentice Hall of India Pvt. Ltd, New Delhi, 2002.
2. Swaminathan M. Textbook on Food Chemistry, Printing and Publishing Co, Ltd, Bangalore 1993.
3. N. S. Gnanaprakasam, G. Ramamurthy, Organic Chemistry, Lab Manual, S. Viswanathan Printers and Publishers Ltd.
4. Food Science – III Edition – B. Sri Lakshmi, New Age International Publisher, 2005.
5. Fundamentals of Foods and Nutrition – Mudambi. R. Sumathi, and Rajagopal, M.V. Willey Eastern Ltd, Madras.

MODEL QUESTION PAPER

Semester III

Skill based course

FOOD CHEMISTRY

Time: Three hours **Maximum : 75 marks**

Part A - (10 x 1 = 10 marks)
Answer ALL questions

Choose the Correct Answer

1. Which one is table sugar among the following?
   a) glucose b) sucrose c) fructose d) lactose

2. Which protein is present in nail and hair?
   a) casein b) carotene c) keratin d) albumin

3. Pick out the acid food additive from the following
   a) glycerol b) picric acid c) sodium acetate d) citric acid

4. What is the expansion of ISI?
   a) Indian Standard Institution b) International Standard Institution
   c) International Sampling Institution d) None of these

5. The coffee powder is normally adulterated by adding
   a) chicory b) brick powder c) lead chromate d) crushed rock

6. The solution of Iodine with starch produces.
   a) red colour b) blue colour c) white colour d) no colour

7. In which situation, the consumer can protect or ban the products?
   a) the test report of the products meet with specification
   b) when the product affects the human health
   c) the label of the products is very attractive
   d) none of these

8. Which one is not a quality standard?
   a) FA b) WHO c) ISI d) ICMR

9. In the iodine value measurement, the solution was titrated against
   a) $Na_2S_2O_3$ b) NaOH c) $KMnO_4$ d) ferrous ammonium sulphate

10. In the estimation of glucose by Bertranel method, red precipitate is due to formation of
    a) cuprous oxide b) cupric oxide c) copper sulphate d) KI

Part B - (5 x 5 = 25 marks)

Answer all the questions, choosing either (a) or (b)

11. a) Define food. Give an account of classification of foods with examples according to nutritional point of view.

(OR)

b) Explain the types and functions of vitamins.

12. a) Define antioxidants. Mention its role in the food.

(OR)

b) Discuss the role of natural and artificial food colorants.

13. a) How is cow milk adulterated? How will you detect it?

(OR)

b) Discuss the food laboratories and their functions.

14. a) What is the expansion of WHO. Explain about it.

(OR)

b) Describe briefly about AGMARK.

15. a) How will you determine the fat and protein content in food stuffs?

(OR)

b) Explain the procedure for the analysis of starch in foods.

Part C - (5 x 8 = 40 marks)

Answer all the questions choosing either (a) or (b)

16. a) Describe the necessity of minerals and lipids as nutrients for the human health?

(OR)

b) Explain the sources and functions of the following
a) carbohydrates b) proteins

17. a) What are preservatives? Describe the method of preservation of food by heat, cold and deep freezing.

(OR)

b) Define food additives. Explain the role of the following food additives.
i) emulsifiers ii) flavours iii) stabilizers

18. a) What are the common food adulterants in edible oil and turmeric powder? Explain one method of detecting these adulterants.

(OR)

b) Explain briefly on natural food poisons with suitable illustrations.

19. a) Explain consumer protection act.

(OR)

b) What is meant by commodities act? Illustrate with suitable example the essential commodities act.

20. a) Discuss the principle and procedure for the estimation of glucose by Bertrands method.

(OR)

b) Describe the principle and methods of determination of iodine value and acid value of oil.

SEMESTER III NON-MAJOR ELECTIVE

FOOD SCIENCE

L	T	P	C
2	0	0	2

Objectives:

- ✓ To acquire the basic knowledge of food science

UNIT – I INTRODUCTION

Food : sources and classification – food as a source of energy - functions and biological importance of carbohydrates, protein, fat, vitamins and minerals - calorific value of food – energy requirements of individuals - balanced diet.

UNIT - II FOOD ADDITIVES

Definition, food colourants : natural and artificial - antioxidants, stabilizers, flavours, bleaching and maturing agents – leavening agents.

UNIT - III FOOD PRESERVATIVES

Definition - classification - methods of food preservation and processing by heat, cold, radiation, drying and deep freezing.

UNIT - IV FOOD ADULTERATION

Definition – types – detection and analysis of adulterants in foods: milk, chilli powder, coffee powder, turmeric powder, ghee, oil and pulses.

UNIT -V QUALITY STANDARDS

Quality control - specification and standards - FA, WHO standards – packing and labeling of foods, Essential Commodities Act - Consumer Protection Act - AGMARK.

Reference books:

1. Sivasankar B, Food Processing and Preservation, Prentice Hall of India Pvt. Ltd, New Delhi, 2002.
2. Swaminathan M. Textbook on Food Chemistry, Printing and Publishing Co, Ltd, Bangalore 1993.
3. Food Science – III Edition – Sri Lakshmi B, New Age International Publisher, 2005.
4. Fundamentals of Foods and Nutrition – Mudambi. R. Sumathi, and Rajagopal, M.V. - Willey Eastern Ltd, Madras.

MODEL QUESTION PAPER

Semester III
Non-Major elective

FOOD SCIENCE

Time: Three hours **Maximum : 75 marks**

Part A - (10 x 1 = 10 marks)
Answer ALL questions

Choose the Correct Answer

1. Which vitamins is high in milk?
   a) A b) D c) K d) B

2. Food rich in proteins are called
   a) energy yielding foods b) protective foods
   c) body building foods d) none of these

3. Which one is not a stabilizer?
   a) agar-agar b) starch c) glycerol d) polysaccharides

4. Pick out the leavening agent
   a) starch b) glucose c) yeast d) none of these

5. Which one of the following act as a preservative ?
   a) acetic acid b) cellulose c) glycerol d) starch

6. The function of preservative is
   a) increase the growth of pathogenic organism
   b) inhibits the growth of pathogenic organism
   c) (a) and (b)
   d) none of these

7. Which vitamin is high in fruits?
   a) C b) A c) D d) B

8. The capacity of food to supply the heat is called
   a) calorific value b) nutritive value c) biological value d) none of these

9. The chilli powder is normally adulterated by adding --------- powder.

a) husks b) crushed rock c) brick d) wheat

10. Goat meat is generally adulterated with
a) Pig meat b) Rabbit meat c) Fish meat d) Cow meat

Part B - (5 x 5 = 25 marks)

Answer all the questions, choosing either (a) or (b)

11. a) Define food. Explain food as a source of energy.

(OR)

b) What are minerals? Explain the functions of minerals.

12. a) Discuss the energy requirements of individuals.

(OR)

b) Discuss the nutritional value of carbohydrates and proteins.

13. a) Define food additives. What are the role of stabilizers and flavors in food ?

(OR)

b) What is antioxidant? Mention its role in the food.

14. a) Define and explain preservatives with examples.

(OR)

b) Discuss the preservation of food by deep-freezing method.

15. a) What is Adulteration? Explain the types of adulterants with examples.

(OR)

b) How is cow milk adulterated? Explain.

Part C - (5 x 8 = 40 marks)

Answer all the questions choosing either (a) or (b)

16. a) Explain the classification of food with examples.

(OR)

b) Explain the functions and biological importance of proteins and lipids.

17. a) What is calorific value of food? Explain the energy values of milk, cereals, egg and fish.

(OR)

b) Explain briefly the importance of balanced diet?

18. a) Define food colourants. Mention the role of natural and artificial food colorants in food.

(OR)

b) Explain the following

i) bleaching agent ii) maturing agent

iii) leavening agent

19. a) Explain the method of food preservation by low temperature and high temperature method.

(OR)

b) Discuss the preservation and processing of food by drying and radiation.

20. a) What are the adulterants used in edible oil and ghee ? How are they detected ?

(OR)

b) What are the adulterants in Turmeric powder and Chilli powder? How will you detect them?

SEMESTER III

NON-MAJOR ELECTIVE WATER MANAGEMENT

L	T	P	C
2	0	0	2

Objectives:

- To realize the importance of quality water in day to day life

UNIT I - WATER POLLUTION

Definition-sources of water pollution-types of water pollutants: sewage and domestic wastes, industrial effluents, agricultural discharges, detergents, disease causing agents and radioactive materials. Eutrophication and its effects.

UNIT II - WATER QUALITY PARAMETERS

Physical, chemical and biological water quality parameters-water quality standards for drinking water –BIS and WHO. Determination of pH, Total hardness, DO, BOD and COD.

UNIT III - WATER PURIFICATION

Purification of water for drinking purposes: Sedimentation, filtration and disinfection-Desalination: reverse osmosis-Purification of water for industrial purposes: water softening-permutit process and ion-exchange process.

UNIT IV - WASTE WATER TREATMENT

Elementary ideas of waste water treatment: pre-treatment-primary treatment-secondary treatment: aerobic and anaerobic processes –tertiary treatment: evaporation adsorption –chemical precipitation.

UNIT V - RESTORATION AND MANAGEMENT

Importance of lakes and rivers-stresses on the Indian rivers and their effects –A restoration case study: Ganga Action Plan: objectives implementation and drawbacks. Rain water harvesting – water recycling- The water Prevention and control of Pollution Act 1974.

Reference books :

1. A. K. De, Environmental Chemistry, Wiley Eastern Ltd., New Delhi.
2. B. K. Sharma, Environmental Chemistry, Goel Publishing House, Meerut.
3. R. K. Trivedy and P. K. Goel, Chemical and biological methods for water pollution studies, Environmental Publications, Karad, India.
4. BIS 1991, Specification for drinking water, Bureau of Indian Standards, New Delhi
5. WHO 1992, International standards for drinking water, World Health Organisation, Gene

MODEL QUESTION PAPER

Semester III
Non-Major elective

WATER MANAGEMENT

Time: Three hours **Maximum : 75 marks**

Part A - (10 x 1 = 10 marks)
Answer ALL questions

Choose the Correct Answer

1. Enrichment of water bodies by nutrients is
   a) sedimentation b) coagulation c) eutrophication d) adsorption

2. Excess of fluorine in drinking water causes
   a) fluorosis b) anemia c) kidney damage d) hypertension

3. The dissolved oxygen content in water is normally expressed in
   a) ppb b) ppm c) mg/cc d) g/lit

4. The range of pH for drinking water as prescribed by WHO is
   a) 6-8 b) 6.5-7.5 c) 7-8.5 d) 7.5-8.5

5. Reverse osmosis is done using
   a) activated charcoal b) semipermeable membrane
   c) ion exchange resin d) trickling filter

6. Disinfection in drinking water is carried out by using
   a) chlorine b) ozone c) UV rays d) all of these

7. Activated charcoal is used in the removal of
   a) pesticides b) bacteria c) oils &grease d) none of these

8. Floating solids in waste water are removed during
   a) preliminary process b) primary process c) secondary process d)tertiary process

9. Indian rivers are mostly polluted by
   a) domestic & municipal sewage b) industrial effluents
   c) agricultural run-off d) all of these

10. Pick out the west flowing river from the following
    a) Ganga b) Yamuna c) Narmatha d) Cauvery

Part B - (5 x 5 = 25 marks)

Answer all the questions, choosing either (a) or (b)

11. a) Give a brief account on disease causing agents and their effects

(OR).

Write a note on radioactive water pollutants

12. a) What are water quality parameters? List any four of them.

(OR)

b) How will you determine the DO content of water sample?

13. a) Write a short note on reverse osmosis.

(OR)

b) "Hard water is unsuitable for industrial purposes". Justify

14. a) Write a brief note on coagulation of impurities present in water.

(OR)

b) Give an account of neutralization processes in the treatment of waste water.

15. a) Explain the water prevention and control of pollution Act, 1974

(OR)

b) Write briefly on rain water harvesting

Part C - (5 x 8 = 40 marks)

Answer all the questions choosing either (a) or (b)

16. a) Define water pollution and write on any three sources of water pollution.

(OR)

b) What is eutrophication? Give its effects and suggest any three steps to control it.

17. a) How will you estimate the total hardness of water?

(OR)

b) Describe water quality standards prescribed by WHO.

18. a) Explain the various steps involved the purification of water for domestic purposes.

(OR)

b) Describe any two methods of softening hard water.

19. a) Discuss the adsorption and chemical precipitation methods involved in the treatment of Waste water.

(OR)

b) Write notes on i. trickling filters & ii. anaerobic digestion

20. a) Discuss the importance of lakes and rivers.

(OR)

b) What are the stresses on the Indian lakes and rivers? Explain their effect.

MAJOR PRACTICAL PAPER III

(III SEMESTER)

INORGANIC QUALITATIVE ANALYSIS

L	T	P	C
0	0	2	2

Objectives

- To enable the students to understand various procedures in salt analysis.
- To create an awareness on ecofriendly approach in salt analysis

Qualitative analysis of inorganic salt mixtures containing two acidic radicals (one should be an interfering radical) and two basic radicals

.Acidic radicals

Simple acidic radicals:

Carbonate, Nitrate, Sulphate and Chloride

Interfering acidic radicals:

Borate, Fluoride, Oxalate and Phosphate.

1. Basic radicals

Group I : Lead

Group II : Copper, Cadmium, Bismuth.

Group IV : Cobalt, Nickel, Manganese

Group V : Barium, Strontium

Group VI : Magnesium, Ammonium.

Internal – 50 marks

25 marks - Regularity

25 marks – Average of best four salt mixtures in regular class work

External -50 marks

10 marks – Record (atleast 4 salt mixtures)*

40 marks – Analysis (10 marks for each radical)

*Experiments done in the class alone should be recorded

(Students having a bonafide record only should be permitted to appear for the practical examination)

Reference books:

1. V.V. Ramanujam, Inorganic Semi Micro Qualitative Analysis, 3rd edition, The National Publishing Company, Chennai, 1974.
2. Vogel's Text Book of Inorganic Qualitative Analysis, 4th edition, ELBS, London, 1974.

Allied Chemistry Practical I

Inorganic Quantitative Analysis

L	T	P	C
0	0	2	2

Objective:

- To enable the students to acquire the quantitative skills in volumetric analysis.

Acidimetry and alkalimetry

1. Estimation of oxalic acid – Std. oxalic acid
2. Estimation of Na_2CO_3 – Std. Na_2CO_3
3. Estimation of hydrochloric acid – Std. oxalic acid

Permanganometry

4. Estimation of ferrous ammonium sulphate – Std. ferrous ammonium sulphate
5. Estimation of oxalic acid – Std. oxalic acid
6. Estimation of ferrous sulphate – Std. oxalic acid

Complexometry

7. Estimation of Zn – Std. $ZnSO_4$
8. Estimation of Mg – Std. $ZnSO_4$

Internal –50 marks

25 marks - Regularity

25 marks – Average of best six estimations in regular class work

External -50 marks

10 marks – Record (atleast six volumetric estimations)*

10 marks – Procedure

30 marks – Result

*Experiments done in the class alone should be recorded

(Students having a bonafide record only should be permitted to appear for the practical examination)

SEMESTER – IV PAPER-VI

ORGANIC CHEMISTRY- II

L	T	P	C
4	0	0	4

Objectives

- To learn about carbonyl compounds
- To understand the impotance of active methylene, organometallic and organosulphur compounds
- To study alicyclic compounds and tautomerism

UNIT - I ALDEHYDES AND KETONES

Structure and reactivity of carbonyl group – relative reactivities of aldehydes and ketones – mechanism of nucleophilic addition reaction (HCN, $NaHSO_3$, Grignard reagent) –mechanism of aldol condensation, crossed aldol condensation, Knoevenagal reaction. Study of the following reactions – Wolff-Kishner reduction, Wittig reaction, Meerwein Ponndorf Verley reduction. Preparation, properties and uses of chloral, acrolein, crotonaldehydeand succinaldehyde.

UNIT-II CARBOXYLIC ACIDS & ACID DERIVATIVES

Structure of carboxylic acid and carboxylate anion – relative strengths of monocarboxylic acids – effect of substituents on acidity – Hell – Volhard – Zelinsky reaction- action of heat on hydroxy acids- preparation, properties and uses of lactic acid and citric acid–dicarboxylic acids: action of heat on dicarboxylic acids - preparation, properties and uses of oxalic acid and succinic acid **Acid anhydrides** – Amides – Preparation, properties and structure of urea –Esters- mechanism of esterification and ester hydrolysis.

UNIT-III ORGANOMETALLIC COMPOUNDS AND ORGANO SULPHUR COMPOUNDS

Preparation, structure and synthetic uses of Grignard reagent-preparation and reactions of methyl lithium, diethyl zinc and tetraethyl lead-Reformatsky reaction

Preparation and properties of thioalcohols and thioethers – sulphonal-mustard gas and sulphones.

UNIT –IV REACTIVE METHYLENE COMPOUNDS & TAUTOMERISM

Reactivity of methylene groups – preparation and synthetic uses of diethyl malonate and ethyl acetoacetate. Tautomerism – definition – various types, keto – enol, amido – imido, nitro – acinitro and oxime – nitrosotautomerism.

UNIT-V ALICYCLIC COMPOUNDS

Nomenclature -general methods of preparation – spectroscopic properties – chemical properties – relative stabilities of cyclo alkanes – Baeyer's strain theory – Sachse-Mohr theory – Coulson and Moffit's concept – conformations of cyclohexane and monosubstitutedcyclohexanes - largering compounds – synthesis and structure of civetone and muscone (structure elucidation not necessary).

Reference Books

1. K.S. Tewari, N.K. Vishil, S.N. Mehotra – A text book of org. chem – 1st edition, Vikas Publishing House Pvt Ltd., 2001, New Delhi.
2. P.L. Soni, Text Book of Organic chemistry, Sultans chand, 1991, New Delhi,
3. Bahl and ArunBahl, Organic Chemistry, S. Chand and Sons, New Delhi, 2005.
4. M.K. Jain and S. C. Sharma, Modern Organic Chemistry
5. Organic Chemistry - R.T.Morrison and Boyd - Prentice Hall
6. Advanced General Organic Chemistry - SachinK.Ghosh - Books and Allied (P) Ltd
7. Organic Chemistry – Bhupinder Mehta and Manju Mehta - PHI Learning Pvt Ltd.

MODEL QUESTION PAPER

SEMESTER-IV ORGANIC CHEMISTRY – II

Time : 3 hours **Marks : 75**

Part A - (10x1=10 marks)

Answer ALL questions

Choose the Correct Answer

1) Carbonyl groups of aldehydes and ketones readily undergo

a) electrophilic substitution b) nucleophilic substitution

c) electrophilic addition d) nucleophilic addition

2. Which of the following does not have alpha hydrogen

a) HCHO b) CH_3CHO c) CH_3COCH_3 d) all of these

3. Malonic acid on heating gives

a) Formic acid b) acetic acid c) formaldehyde d) oxalic acid

4) Which of the following is least acidic?

a) acetic acid b) propionic acid c) butanoic acid d) fluoro acetic acid

5. Frankland reagent is

a) $(C_2H_5)_2Zn$ b) $(C_2H_5)_2Sn$ c) $(C_2H_5)_2ZnI$ d) $(C_2H_5)_2SnI$

6. Thioalcohols react with ketones to give

a) thioethers b) mercaptides c) sulphones d) mercaptols

7. The type of tautomerism exhibited by $RCONH_2$ and $RC(OH)=NH$ is

a) keto-enol b) amido-imdo c) nitro-acinitro d) oxime-nitroso

8. Malonic ester can be used to prepare

a) carboxylic acids b) ketoacids c) aminoacids d) all of these

9. Least stable cycloalkane is

a) cyclopropane b) cyclobutane c) cyclopentane d) cyclohexane

10. The number of bands in the NMR spectrum of cyclohexane is

a) 1 b) 2 c) 6 d) 12

Part B - (5x5=25)

Answer all questions

11.a) Give the mechanism of addition of HCN to carbonyl group (OR)

b) Write notes of Wolff Kishner reduction and MPV reduction

12. a) Explain Hell-Volhard-Zelinsky reaction with mechanism (OR)

b) Discuss the structure of urea

13. a) Give the preparation and properties of methyl lithium (OR)

b) Write notes on Reformatsky reactions

14. a) Explain keto-enol tautomerism with suitable examples (OR)

b) Methylene hydrogens in active methylene compounds are more reactive. Discuss

15. a) Explain Bayer's strain theory (OR)

b) Write any two methods of preparation of cycloalkanes

Part C - (5x8=40)

Answer all questions

16. a) Explain the following i) Knoevenagal reaction ii) Wittig reaction (OR)

b) Explain preparation and properties of i) acrolein ii) crotonaldehyde

17. a) Explain preparation and properties and uses of citric acid (OR)

b) Explain the following i) mechanism of ester hydrolysis ii) action of heat on dicarboxylic acid

18. a) Explain preparation and properties and uses of thio alcohols (OR)

b) Write any four synthetic applications of Grignard reagent

19 . a) Give the synthetic applications of malonic ester (OR)

b) Explain amido-imido and nito-acinitro tautomerism with suitable examples

20 a) Explain Sachse – Mohr theory (OR)

b) Coulson and Moffit's concept

SEMESTER IV

ALLIED CHEMISTRY - II

L	T	P	C
3	0	0	3

Objective

- ✓ To learn the chemistry of basic aromatic compounds.
- ✓ To understand the nuclear particles and few nuclear reactions
- ✓ To know about carbohydrates, amino acids, proteins and nucleic acid.
- ✓ To study about fuels, fertilizers, cement and glass.
- ✓ To know about some common diseases and the drugs used.

UNIT 1 ORGANIC CHEMISTRY

Aromatic compounds General characteristics of aromatic compounds - aromaticity – Huckel's rule with examples- non – benzenoid aromatic compounds (definition and examples only) Preparation, properties and structure of benzene, naphthalene and anthracene.

UNIT 2 PHYSICAL CHEMISTRY

Nuclear chemistry Nuclear stability – n/p ratio – packing fraction – mass defect – binding energy - isotopes, isobars, isotones with examples. Separation of isotopes by diffusion method – group displacement law - radioactive series - Nuclear fission, fusion - Application of radio isotopes (radio diagnosis and therapy, C-14 dating).

UNIT 3 BIO CHEMISTRY

Carbohydrates –definition and classification – artificial synthetic sweeteners. Amino acids - classification – amphoteric nature – isoelectric point. Proteins - classification according to composition, solubility and shape - colour reactions - biological action . Nucleic acids – purines, pyrimidines, nucleocides, nucleotides – DNA – structure of DNA – RNA - different types of RNA

UNIT 4 INDUSTRIAL CHEMISTRY

Fuel gases – Water gas, Producer gas, L.P.G, Gobar gas and Natural gas. Fertilizers – N.P.K and mixed fertilizers. Soaps and detergents – an elementary idea of soaps and detergents. Cleansing action of soaps and detergents. Cement and glass: Portland cement-manufacture only. Manufacture of glass- types and uses borosilicates -photochromic and safety glass.

UNIT-5: PHARMACEUTICAL CHEMISTRY

Common diseases – infective diseases – insect borne –air borne – water borne – hereditary diseases. Definition and examples of analgesics, antipyretics, sulpha drugs, antimalarials and, antibiotics. Diabetes – causes – hyper and hypoglycemic drugs. Indian medicinal plants – tulsi, neem, keezhanelli- their importance

Reference Books

1. Puri, Sharma & Kalia, Principles of Inorganic Chemistry, Milestone Publishers and Distributors, 2008.
2. P.L. Soni, Text book of Inorganic Chemistry, Sultan Chand and Sons, 2007.
3. Bahl and Arun Bahl, Organic Chemistry, S. Chand and Sons, New Delhi , 2005.
4. Morrison & Boyd, Organic Chemistry, VIth ed, Prentice Hall of India Pvt. Ltd., New Delhi, 1998.
5. P. L. Soni, Text book of Organic Chemistry, S. Chand and Company Ltd., New Delhi .
6. J. L. Jain, Sunjay Jain and Nitin Jain, Fundamentals of Biochemistry, S. Chand and Company Ltd.,New Delhi, 2005.
6. S. Lakshmi, Pharmaceutical Chemistry, S. Chand and Sons, New Delhi , 1995.

MODEL QUESTION PAPER

ALLIED CHEMISTRY -II

Time: Three hrs **Maximum Marks: 75**

PART - A

Answer ALL questions

Choose the correct answer **(10 x 1 = 10 marks)**

1. The number of π e^-s in cyclopentadienyl anion is

   a) 2 b) 3 c)4 d) 6

2. -------- is aromatic

   a) Pyrrole b) Propane c) Cyclohexane d) Cyclopentane

3. Nuclear fission reactions are

   a) Chain reactions b) Thermal reaction c) Very fast d) Destructive

4. -------- is used in carbon dating

   a) C-12 b) C-13 c) C-14 d) None

5. Collagen is a ---------- Protein

   a) fibrous b) Globular c) Storage d) Protective

6. Building blocks of amino acids are

   a) Oil b) Fat c) Carbohydrate d) Protein

7. Which one of the following gas is commercially used?

   a. Producer gas b. Gobar gas c. LPG d. None of these8. The components of Portland cement are

   a. Dicalcium silicate b. Tricalcium silicate c.Tricalcium aluminate d. All of these

9. Diabetes is controlled by

   a) Hepatitis B b) Insulin c) BCG d) Chloromycin

10. Malarial Parasite is

    a) Steptomyces b) Plasmodium c) Erythromyl d) Stephelococus

PART - B (5 x 5 = 25 marks)

11.a) Explain Huckel's rule of aromaticity with two examples.

(Or)

b) Give the preperations of (i) Bezene (ii) Nitro Bezene

12a) Give the differences between natural and artificial series

(Or)

b) Give the applications of radio isotopes in medicines.

13 a) What are amino acids? Give their classification based on biological importance

(Or)

b) Write a short note on proteins.

14.a)Explain the cleaning action of soap.

(OR)

b. What are glass? Give the preparation of any two classes?

15a) What are Hereditary diseases? Explain

(Or)

b) Explain a) Analgesics b) Antipyretics.

Part – C (5 x 8 = 40)

16a) Give the structural elucidation of naphthalene

(Or)

b) Elucidate the structure of anthracene.

17a) What is nuclear fission reaction? Give its application

(Or)

b) Give the difference between nuclear fission and fusion reactions.

18a) What are nucleic acids? Give the components of DNA

Or

b) Discuss the classification of amino acids with suitable example

19a. Write briefly the preparation and uses of i. Water gas ii. Producer gas iii. Gobar gas

OR

b. Explain preparation and uses of

i. Photochromatic & ii. Safety glass

20a) Define Antibiotics. Explain narrow spectrum antibiotic and broad spectrum antibiotic

(Or)

b) Define Diabates. Explain the types of Diabetes Mellitus.

* * *

SEMESTER IV

SKILL BASED CHEMISTRY

CHEMISTRY IN MEDICINE

L	T	P	C
4	0	0	4

Objectives

- ✓ To have knowledge of first aid and the important rules.
- ✓ To know the common chemicals in medicine
- ✓ To have awareness of common diseases
- ✓ To learn the diagnostic tests and to know the importance of vitamins.

Unit- I: FIRST AID

First Aid for accidents-important rules-first aid kit ,First aid for cuts, bruises, bleeding, fractures, burns, fainting and poisonous bites. Common poisons-Acid poisoning-antidote, Alkali poisoning-antidote, Poisoning by disinfectant- symptoms-antidote, Alkaloid poisoning-symptoms-antidote, alcohol poisoning-symptoms-antidote, Mercury poisoning-antidote and Salicylate poisoning-antidote.

Unit-II: CHEMICALS IN MEDICINE

(Preparations and chemical equations not required) Alum-properties and uses-Aluminium hydroxide gel-uses-Dried Aluminium hydroxide gel-uses-Aluminium acetate-uses-Ferrous fumarate-uses-Ferrric ammonium citrate-uses.Ferrous gluconate-uses,Ferrous sulphate. Biological importance of sodium, potassium, calcium ,Iodine and copper.

Unit-III: CAUSES AND TREATMENT OF SOME COMMON DISEASES:

Insect borne diseases – malaria and filariasis Prevention and treatment. Air borne diseases – diphtheria, whooping cough, influenza, measles, mumps, common cold, tuberculosis and leprosy- Prevention and treatment. Water borne – cholera, typhoid and diarrhoeal diseases - Prevention and treatment. Respiratory disorder – Prevention and treatment of asthma .Nervous disorder – epilepsy—Prevention and treatment - other diseases – Peptic ulcer- treatment.

Unit- IV: CLINICAL CHEMISTRY

Clinical chemistry – Composition of blood – blood grouping - determination of blood groups and matching – blood pressure – hypertension – determination. Determination of glucose in serum – Folin and Wu's method - determination of serum cholesterol – Sackett's method – tests for cholesterol. Estimation of glucose in urine – Diagnostic test for sugar in urine- Benedict's test-Clinistix-strip test Diagnostic test for salts in urine and serum. Detection of diabetes ,detection of anaemia. Estimation of hemoglobin(Hb concentration) – estimation of red blood cells Normal RBC count in adults.

Unit V : HEALTH CARE MEDICINES

Vitamins-Classification of Vitamins-Sources- deficiency diseases of Vitamins A, D, E, K, B_1, B_2, Bc, B_6, B_{12} and C –Therapeutic uses. Treatment of ulcers and skin diseases.

Books for Reference.

1. Practical Biochemistry – David Plummer – 2005, Tata McGraw-Hills Publishing Company.

2. Text Book of Pharmaceutical Chemistry – Jeyashree Gosh – 2003, S.Chand and Company, New Dehi.

3. Medicinal Chemistry – G.R.Chatwal, 2002, Himalaya Publishing House, New Delhi.

MODEL QUESTION PAPER

Time:3hrs **Chemistry in medicine** **Maxmarks:75**

Part-A **10x1=10marks**

(Answer all the questions)

Choose the correct answer

1.Hydrophobia is caused due to

a. snake bite b. dog bite c. submersion in water d. none

2.The anti dote for alkali poison is

a. emetic b. 5% sodium bicarbonate c. milk of magnesia d. orange juice

3.Which of the following is used as a haematinic

a. Aluminium gel b. ferrous fumarate c. potassium citrate d. calcium lactate

4.Hypokalemia is caused by deficiency of

a. Iodine b. Magnesium c. Potassium d. Calcium

5.Filariasis is caused by

a. air contaminants b. culex mosquitoes c. rats d. house fly

6.Enterovioform is used for the treatment of

a. jaundice b. plaque c. amoebic dysentery d. epilepsy

7.Anaemia is diagnosed by estimation of

a. blood iron content b. blood haemoglobin c. blood cyanocobalamin d. blood vitaminB_{12}

8.The metal atom present in haem is

a. Magnesium b. Cobalt c. Iron d. Manganese

9.Deficiency of Vitamin C causes_____

a. night blindness b.scurvy c. excess bleeding d. none

10.Riboflavin is found in _____

a. green leaves b. berry c. yeast d. carrot

Part-B **(5x5=25marks)**

(Answer all questions choosing either a or b)

11a.Explain the first aid treatment given to a victim of burns.

Or

b.What are the rules to be followed in giving first aid?

12a.Write notes on the biological function of sodium

Or

b.Give the importance of calcium in human system

13a..How is tuberculosis diagonised ?How can it be treated and prevented?

Or

b.How is cholera caused? How can it be prevented?

14a.Write the importance of Rh factor

Or

b.Explain low and high blood pressure

15a.Give an account of the sources and importance of vitamin A

Or

b.Describe the deficiency symptoms of vitamin C

Part_C **(5x8=40marks)**

(Answer all questions choosing either a or b)

16a.Discuss the different types of poisons and their antidotes.

Or

b.Discuss the precautions taken during first aid for victims with fractures

17a.Explain the uses of i. Aluminium gel ii. Ferrous sulphate iii. Ferrous gluconate and iv. Alum

Or

b.Discuss the biological role of Iodine in human system

18a.Write notes on insect borne diseases with suitable examples

Or

b.How is asthma caused? Discuss the prevention and treatment.

19a.How is glucose in serum determined by Folin and Wu's method

Or

b.Explain the diagnostic test for glucose in urine

20a.How are vitamins classified? Discuss the sources of vitamins A,B and C

Or

b.Explain the therapeutic uses of vitamins D, E and K

SEMESTER-IV

SKILL BASED CHEMISTRY

L	T	P	C
4	0	0	4

INDUSTRIAL CHEMISTRY

Objectives:

- ✓ To gain knowledge about systems of units and conversion factor
- ✓ To understand utilities in chemical industries
- ✓ To know the severity of corrosion and methods of preventing it
- ✓ To study the industrial process of silicate industry
- ✓ To acquire the knowledge about the unit process

UNIT I - UNITS AND DIMENSIONS, MATERIAL BALANCE

Fundamental and derived quantities – System of unit – significance of dimensional analysis – forces – weight – volume – pressure – work – energy – power. Basic chemical calculations: Atomic mass – Molar mass – concept of mole, gmol, comparison of liquid mixtures and gaseous mixtures, percentage of mass, volume and mol – ideal gas laws – Dalton's law, Amagat's law and Henry's law – density and pressure measurements.

Material balance without chemical reaction: Material balance equation – transient and steady state – simple material balance with and without recycle and bypass or chemical engineering operations such as evaporation, drying, filtration, extraction and crystallization.

UNIT II - FUELS AND FURNACES

Fuels – types of fuels – calorific values – ignition point – pyrometric effect – explosives range – Flue gas analysis by Orsat's method – explosives – classifications – low explosives – initiating explosives – high explosives – rocket propellants – nuclear fuels.

Furnaces – types of furnaces – Kilns – Blast furnace, reverberatory furnace – muffle furnace – electric furnace – regenerative furnace, open hearth furnace – Bessemer converter – vertical retort furnace.

UNIT III - CORROSION AND PROTECTIVE COATING

Introduction – severity of corrosion – chemical and electrochemical corrosion – mechanism – factors influencing corrosion – control of corrosion – cathodic and anodic protection.

Paints – characteristics of paint – constituents of paints - pigments – vehicles – thinners – driers – fillers – plasticizers – anti skinning agents – their function and properties.

Metallic coating – removal of surface contamination – removal of superficial corrosion products – polishing – galvanizing – tinning – electroplating.

UNIT IV - SILICATE INDUSTRY

Refractories – requirements of refractories – properties of refractories – solid refractories – fire clay refractories – magnesite refractories, dolomite bricks, graphite refractories, zirconia refractories, silicon carbide.

Abrasives – classifications – natural (diamond, corundum, emery, garnet, quartz and flint) and artificial (carborundum, alundum, boron carbide, metallic abrasives). Uses of abrasives – cement manufacture – setting and hardening of cements – gypsum – plaster of Paris – manufacture – setting and hardening – uses. White wares manufacture – types – glazing.

UNIT V - UNIT PROCESSES IN ORGANIC MANUFACTURE

Sulphonation – uses and applications of sulphonates and sulphates – sulphonating agents – sulphur trioxide – organic complexes – chemical and physical factors in sulphonation – commercial sulphonation of benzene – batch vs continuous sulphonation. Hydrolysis – hydrolyzing agents – mechanism of hydrolysis.

Oxidiation – types of oxidation reactions – oxidizing agents – permanganate and dichromate – liquid phase oxidation – vapour phase oxidation – commercial manufacture of acetic acid. Hydrogenation – catalysts for hydrogenation - hydrogenation of vegetable oils.

Reference books:

1. Industrial Chemistry, B. N. Chakrabarthy, Oxford & IBH Publishing Co. Pvt. Ltd. Calcutta.
2. Unit Operations I & II K. A. Gavhane, Nirali Prakashan, Pune.
3. Unit Processes in Organic Synthesis, P. H. Groggins, Tata McGraw-Hill Publishing Company limited, New Delhi.
4. Stoichiometry – B. Z. Bhatt and S. M. Vora.
5. Engineering Chemistry, Jain and Jain.

MODEL QUESTION

INDUSTRIAL CHEMISTRY

SEMESTER – IV

Time: 3hrs **Maximum – 75 marks**

Part – A (10 x 1 = 10 marks)

Answer ALL questions

Choose the correct answer

1. 1.5×10^{-2} N will be equal to

a. 15000 dyne b. 1500 dyne c. 150 dyne d. 15 dyne

2. The total pressure of a mixture of two gases is

a. the product of partial pressures

b. the sum of partial pressures

c. the ratio of partial pressures

d. the differences in partial pressures

3. A substance with high fuel value gives more of

a. CO_2 b. water vapour c. calories d. ash

4. A good fuel should possess

a. high ignition temperature b. moderate ignition temperature

c. high calorific values d. both b and c

5. More volatile layer is formed during chemical corrosion by

a. MoO_3 b. Fe_2O_3 c. MgO d. ZnO

6. Corrosion is an example of

a. oxidation b. reduction c. electrolysis d. erosion

7. The chemical used for setting cement is

a. gypsum b. epsum c. alumina d. $CaCo_3$

8. Type of cement used in atomic piles is

a. Portland cement b. barium cement

c. silicate cement d. water proof cement

9. Which of the following reagent will not give sulphonation reaction?

a. Conc. H_2SO_4 b. Dil. H_2SO_4 c. $ClSO_2OH$ d. Olium

10. The catalyst for the liquid phase oxidation of acetaldehyde with oxygen is

a. magnesium acetate b. manganese acetate

c. mercuric acetate d. sodium acetate

Part – B (5 x 5 = 25 marks)

Answer ALL questions choosing either (a) or (b)

11. a) Explain the term unit. Distinguish fundamental and derived units with suitable examples

(or)

b) What do you mean by the term partial pressure? Explain Dalton's law of partial pressure.

12. a) What is meant by calorific value of a fuel? Describe how the calorific value of a solid fuel determined.

(or)

b) Explain the Orsat's method of Flue gas analysis.

13. a) How are metals protected against corrosion by modifying the environment

(or)

b) Explain galvanic corrosion

14. a) What are abrasives? Write short note on any one natural and artificial abrasives

(or)

b) Write a note on the manufacture of white wares

15. a) What are sulphonates? How are they prepared? Mention their uses.

(or)

b) Discuss and compare the sulphonation of benzene by batch process and continuous sulphonation process

Part C (5 x 8 = 40 marks)

Answer ALL questions choosing either (a) or (b)

16. a) (i) What are methods of solving material balances without chemical reactions?

(ii) Explain the purpose of by-pass operation

(or)

b) (i) Give the rules of dimensional analysis with examples

(ii) State and explain Henry's law and Amagat's law

17. a) (i) What are explosives? Give the classification with suitable examples

(ii) Write a note on nuclear fuels

(or)

b) Write short notes on

(i)Blast and reverberatory furnace

(ii)Regenerative open hearth furnace

(ii) Muffle furnace

18. a) (i) What is meant by electrochemical corrosion? Explain its mechanism

(ii) Explain the term cathodic protection. Indicate how metal coatings can effectively prevent corrosion

(or)

b) (i) Write short notes on Galvanizing and Tinning in corrosion

(ii) Mention the constituents of paint and their function

19. a) Describe the manufacture, properties and uses of any four solid refractories

(or)

b) With the help of neat diagram describe the manufacture of Portland cement by wet process

20. a) Discuss the different types of oxidation reactions. Explain how the vapour phase oxidation is carried out .

(or)

b) Explain the hydrogenation of vegetable oils. Give the industrial importance of this process

SEMESTER-IV

NON MAJOR ELECTIVE- DAIRY CHEMISTRY

L	T	P	C
2	0	0	2

Objectives:

- ✓ To learn the composition and properties of milk
- ✓ To understand the chemical composition of milk and milk processing.
- ✓ To know the chemistry of cream and butter
- ✓ To study to fermented milk products
- ✓ To know the condensed milk and dairy detergents

UNIT-I PROPERTIES OF MILK

Definition, Composition, Milk lipids, Milk proteins, vitamins and minerals. Factors affecting the composition of milk - adulterants, preservatives, and neutralizer - examples and their detection.

UNIT-II PROCESSING OF MILK

Destruction of microorganisms in milk – physicochemical changes during processing – boiling, pasteurization – pasteurization types – bottle pasteurization –batch pasteurization – HTST (High Temperature Short Time) – vacuum pasteurization –(UHT) Ultra High Temperature Pasteurisation.

UNIT-III MILK PRODUCTS-I

Milk Products: Cream - definition, classification – manufacturing - chemistry of creaming process - physico–chemical properties – separation of cream , estimation of fat in cream , Butter - definition, classification, composition, theory of churning, desibutter, salted butter. Ghee - major constituents, common adulterants and their detection.

UNIT-IV MILK PRODUCTS-II

Fermented milk products - fermentation of milk - definition and conditions. Ice creams - definition, composition, types, manufacture of ice - cream, stabilizers, emulsifiers, and their role, milk powder - definition, process of making milk powder.

UNIT –V CONDENSED MILK AND DAIRY DETERGENTS

Condensed milk – definition, classification and differences between condensed milk and skim – condensed milk – sanitation - pasteurization – nutritive value of milk – difference between cow milk and bauffalo milk- milk enzymes. Dairy Detergents : Definition-characteristics-classification-washing procedure (modern method) sterilization-chloramin-T and hypochlorite solution.

Reference books :

1. Applied Chemistry-K.Bagavathi Sundari MJP Publishers Chennai. 2006.
2. Principles of dairy technology - Robert Jenness, Wiley, New York
3. Indian Dairy Products - Rangappa and Acharya, K.T. Asia Publishing House, Bombay, India.
4. Fundamentals of Dairy chemistry - Wond. F.P. Springer.
5. Outlines of Dairy Technology - Sukumar De. – Oxford University Press.
6. Applied chemistry for home science & allied science - T.Jacob, Mcmillan.

MODEL QUESTION PAPER

NON MAJOR CHEMISTRY - DAIRY CHEMISTRY

Time: 3 hours **Marks: 75**

Part-A - [10×1= 10]

Answer all questions

Choose the correct answer

1. The gross properties of milk include
   a.emulsionof fat globules b. suspension of casein micelles
   c. minerals d. All the above
2. Milk is commonly adulterated with
   a.water b.detergent c.urea d.All the above
3. The disease producing microorganisms present in milk are destroyed by
   a. Pasteurization b. Adding water c. Curdling d. None
4. The temperature at which milk must be cooled and stored in a closed container before and after pasteurization to maintain the quality and flavor is
   a. At 40°C b. below 40°F c. Above 40°F d. between 80° - 100°F
5. Homogenization of milk prevents the accumulation of --------- at the top of milk
   a. Microorganism b. minerals c. Fats d. All the above
6. Ghee is adulterated with
   a. Vegetable oil b. Talc c. Animal fats d.Both (a) and (c)
7. Fermentation of milk is carried out using
   a. Salmonella b. Fungi c. Virus d. lactic acid bacteria
8. In modern times, powdered milk is usually made by
   a. Spray drying b. Emulsification c. Homogenizing d. Creamig
9. The most heat-stable enzymes found in milk is
   a. Yersinia b.W. Malayi c. Lactoperoxidase d.Lactoferrin
10. The amount of cholesterol in buffalo milk isl
    a. Low b. High c. Nil d. Very high

Part -B [5×5= 25]

Answer all questions, choosing either (a) or (b)

11.a) Write a note on milk proteins

(OR)

b) What are factors affecting gross composition of milk?

12. a) What are physico-chemical changes taking place on boiling milk?

(OR)

b) Write a note on Ultra High Temperature Pasteurisation

13. a) Explain composition of creams

(OR)

b) Write methods of separation of creams.

14.a) What are composition of Ice Cream?

(OR)

b) What are principle involved in milk powder preparation?.

15. a) What are characteristics of Dairy detergent?

(OR)

b) Give any two differences between condensed milk and skimed milk

Part -C [5×8= 40]

Answer all questions, choosing either (a) or (b)

16. a) Write notes on

i. Milk vitamins ii. Milk minerals

(OR)

b) Explain the following

i.Milk adulterants and their detection ii. Milk lipids

17. a) Discuss the bottle pasteurization

(OR)

b) Explain the vacuum pasteurization in detail

18.a) Discuss the estimation of fat in cream

(OR)

b) What are the compositions of butter? How are they estimated?

19. a) Discuss the manufacture of ice-cream

(OR)

b)) Discuss the process of making of milk powder

20.a) Discuss in detail about milk enzymes

(OR)

b)Write about washing procedure involving dairy detergent

SEMESTER IV

NON-MAJOR ELECTIVE

APPLIED CHEMISTRY

L	T	P	C
2	0	0	2

Objectives:

- ✓ To acquire knowledge about the chemicals used in day to day life

UNIT I - SOAPS AND DETERGENTS

Soaps: Definition-classification-raw materials used in the manufacture of soap – manufacture of toilet soap.

Detergents: Definition –various types with examples- advantages of detergents over soaps – cleansing action of soap.

UNIT II- FERTILIZERS

Definition-characteristics of a good fertilizer- role of nitrogen, potassium and phosphorous in plant growth – natural fertilizers- chemical fertilizers: urea, muriate of potash and triple superphosphate - mixed fertilizers - biofertilizers – advantages of biofertilizers.

UNIT III - POLYMERS

Fibers: Classification –uses of terylene, nylon and orlon. **Resins:** Natural resins- synthetic resins-type-uses of fevicol, quick fix, araldite, glyptal and Bakelite. **Plastics**: classification-differences between thermoplasts and thermosets. Advantages of plastics-uses of polythene, PVC, polystyrene, Teflon and thermocole. **Rubber:** Types-defects in natural rubber-vulcanization-synthetic rubbers- uses of neoprene, thiocol, butyl rubber, silicone rubber and foam rubber.

UNIT IV - CHEMICALS IN PHARMACY

Definition and therapeutic uses of the following (an elementary study only)

Antiseptics: alum, boric acid **Mouth washes:** Hydrogen peroxide **Antacids:** Aluminium hydroxide **Analgesics:** Aspirin, paracetamol **Antibiotics:** Penicillins, tetracyclines **Haematinics:** Ferrous fumerate, ferrous gluconate **Laxatives:** Epsom salt, milk of magnesia

Sedatives: Diazepam

UNIT V - CHEMICALS IN DAY-TO-DAY LIFE

An outline of the preparation and uses of the following articles.

Tooth powder, tooth paste, writing inks, gum paste, boot polish, talcum powder, chalk crayons, agar battis, phenyl and moth balls.

Reference books:

1. B. K. Sharma, Industrial Chemistry, Goel Publishing House, Meerut.
2. Jeyashree Gosh, A text book of Pharmaceutical Chemistry, S. Chand and Company, NewDelhi.
3. B. N. Chakrabarty, Industrial Chemistry, Oxford and IBH Publishing Co. Pvt.Ltd., Calcutta.

MODEL QUESTION PAPER

Semester IV

Non-Major elective

APPLIED CHEMISTRY

Time: Three hours **Maximum : 75 marks**

Part A - (10 x 1 = 10 marks)
Answer ALL questions

Choose the Correct Answer

1. The skin conditioner in transparent soap is ----------
   a) Ethylene glycol b) Glycerol c) Sodium hydroxide d) Caustic Potash
2. ---------- is used for salting out of soap
   a) Potassium chloride b) Magnesium Chloride c) Sodium Chloride d) Calcium Chloride
3. The three important elements for plant growth are
   a) N, Ca, K b) P, Ca, K c) N, P, K d) N, P, Ca
4. Optimum PH of the soil must be
   a) 7 - 8 b) 9 - 10 c) 2 - 4 d) 1 – 2
5. ---------- is used as synthetic fibres
   a) Teflon b) Bakelite c) Nylon d) Polystyrene
6. The rubber used in making bed pillows, cushions is ----------
   a) Foam b) Silicone c) butyl d) neoprene
7. ---------- is low as mouthwash
   a) hydrogen peroxide b) aluminium hydroxide c) ferrous glucosate d) aluminium
8. ---------- is used as sedative
   a) Epsom salt b) Diazepam c) boric acid d) ferrous fumarate
9. ---------- is made from potato starch

a) Gum Paste b) Tooth Paste c) agerbattis d) mouth balls

10. ---------- is used for salting out of soap

a) boot polish b) Chalk Crayons c) Moth balls d) talcum powder

Part – B **(5 x 5 = 25)**

11. a) What are soaps? How are they classified ?

(Or)

b) Define detergets? What are the advantages of detergents over soaps.

12. a) What are fertilizers? Explain the characteristics of a good fertilizer

(Or)

b) What are Bio-Fertilizers? Explain its advantages.

13. a) What are the uses of (i) Polythene (ii) Silicone rubber

(Or)

b) Mention the uses of (i) PVC (ii) Bakelite

14. a) What are Laxatives? Give the use of milk of magnesia

(Or)

b) What are Antiseptics? Give the use of alum.

15.a) Give the preparation and use of Gum paste

(Or)

b) Give the preparation and use of Boot polish.

Part – C **(5 x 8 = 40)**

16. a)Explain the manufacture of soap

(Or)

b)Explain the cleansing action of soap.

17. a)How are the following prepared? (i) Urea (ii) Triple super phosphate

(Or)

b) Explain the role of nitrogen, Potassium and phosphorous in plant growth

18. a) Distinguish thermoplast and thermosets

(Or)

b) Explain vulcanization of rubber.

19. a) Wha t are antibiotics? What are the uses of penicillins and tetracyclines

(Or)

b) What are Anelgesics? What are the uses of Aspirin and paracetamol.

20. a) Give an outline of preparation and uses of the following articles

(i) Tooth Paste (ii) Writing Ink

(Or)

b) Give an outline of preparation and uses of the following articles

(i)Talcum Powder (ii) Moth balls.

MAJOR PRACTICAL PAPER IV

(IV SEMESTER)

ORGANIC PREPARATION & DETERMINATION OF PHYSICAL CONSTANTS

L	T	P	C
0	0	2	2

Objectives

- ✓ To make the students thorough in the preparation of organic compounds
- ✓ To Know about the determination of Physical constants

Organic preparation

- ✓ Preparation of salicylic acid from methyl salicylate (or) benzoic acid from ethylbenzoate
- ✓ Preparation of benzoic acid from benzamide
- ✓ Preparation of benzoquinone oxime from benzoquinone
- ✓ Preparation of benzoic acid from benzaldehyde
- ✓ Preparation of p-bromoacetanilide from acetanilide
- ✓ Preparation of 2-naphthyl benzoate from 2-naphthol
- ✓ Preparation of picric acid from phenol
- ✓ Preparation of methyl orange from sulphanilic acid
- ✓ Preparation of glucosazone from glucose

I Physical constant determination

(i) Determination of boiling point of organic liquid substances.

(ii) Determination of melting point of organic substances.

Internal – 50 marks

25 marks - Regularity

20 marks – Average of best (preparation-4) four experiments in regular class work

5 marks - Average of 2 physical constant determinations

External -50 marks

20 marks – Record (atleast four experiments preparation-3 and phy. cont. detmn.-2)*

20 marks – Procedure-5 and preparation-15)

10 marks – phy. cont. detmn

*Experiments done in the class alone should be recorded

(Students having a bonafide record only should be permitted to appear for the practical examination)

Reference books:

1. Sundaram, Krishnan, Raghavan, Practical Chemistry (Part III), S. Viswanathan Co. Pvt. 1996.

2. Vogel's Text Book of Quantitative Chemical Analysis. 5th Edi., ELBS/Longman England, 1989.

3. O.P. Pandey, D.N Bajpai, S. Gini, Practical Chemistry, for I, II & III BSc. Students. S.Chand & Company Ltd reprint 2009.

4. V.K.Ahluwalia, Sunitha Dhingra, Adarsh Gulate College Practical Chemistry, Universities Press (India) Pvt Ltd 2008 (reprint)

5. N.S. Gnanapragasam and G. Ramamurthy, Organic Chemistry – Lab manual, S.Viswanathan Co. Pvt., 1998.

6. J.N. Gurthu and R. Kapoor, Advanced Experimental Chemistry (Organic), S. Chand and Co., 1987.

Allied Chemistry Practical II

INORGANIC QUALITATIVE ANALYSIS

L	T	P	C
0	0	2	2

Inorganic simple salt containing one acidic radical (interfering radical) and one basic radical

1.Acidic radical

Interfering acidic radicals:

Borate, Fluoride, Oxalate and Phosphate.

2. Basic radicals

Group I : Lead

Group II : Copper, Cadmium

Group IV : Cobalt, Nickel

Group V : Barium, Strontium

Group VI : Ammonium.

Internal –50 marks

25 marks - Regularity

25 marks – Average of four experiments in regular class work

External -50 marks

10 marks – Record (atleast 4 experiments)*

10 marks – Procedure

30 marks – Result

*Experiments done in the class alone should be recorded

(Students having a bonafide record only should be permitted to appear for the practical examination)

SEMESTER – V PAPER VII

INORGANIC CHEMISTRY- II

L	T	P	C
4	0	0	4

Objectives

- ✓ To know the basic principles of metallurgy and the chemistry of d- Block elements
- ✓ To learn the chemistry of f- Block elements
- ✓ To understand the basic concepts of coordination chemistry and early theory
- ✓ To learn the basic analytical methods
- ✓ To study the chemistry of noble gases

UNIT-I NOBLE GASES

Occurrence - isolation of noble gases from the atmosphere - separation of the gases from one another - general physical properties - special properties of helium - isotopes of helium - uses of noble gases - importance of inert gases in theoritical chemistry - chemical properties - xenon chemistry: preparation and properties of fluorides, oxides and oxofluorides of xenon - xenates and perxenates - xenon fluoride complexes - structure and bonding in xenon compounds. Fluorides of Krypton and Radon - hydrates and clathrates of noble gases - uses of clathrate compunds.

UNIT II- CHEMISTRY OF d - BLOCK ELEMENTS

Occurence, General characteristics of d- Block elements – Group study of Titanium, Vanadium,Iron, Coinage and Zinc group metals. Important compounds of transition metals: Ziegler – Natta catalyst. Prussian blue, Sodium nitroprusside, Turnbull's blue, Nickel DMG complex, Wilkinson's Catalyst- $KMnO_4$ and $K_2Cr_2O_7$.

UNIT III- CHEMISTRY OF f- BLOCK ELEMENTS

Occurrence, General characteristics of f-block elements, Synthetic elements, comparative account of lanthanides and actinides – oxidation states, magnetic properties, colour and spectra – separation by ion exchange and solvent extraction methods – lanthanide contraction — preparation, properties and uses of ceric ammonium sulphate, thorium dioxide, thorium nitrate, uranium hexafluoride, uranylacetate.

UNIT IV- METALLURGY

Occurrence of metals- Ores and minerals in lithosphere -Mineral wealth of India- principles of metallurgy-concentration of ores – froth floatation, magnetic separation, calcination, roasting and smelting. Purification of metals – electrolysis, zone refining, van Arkel deBoer methods. Extraction of the following metals in pure form - Li, Be, Ti, V, Th and U

UNIT V: THEORY OF INORGANIC PRACTICALS

Qualitative Analysis: Applications of solubility product and common ion effect in the precipitation of cations – Interfering acid radicals and their elimination (oxalate, fluoride, borate, phosphate, chromate, arsenite and arsenate).

Titrimetry: Primary standard- Molarity, molality formality, normality, wt% ppm, milli equivalence and millimoles -problems Types of titrimetric reactions – acid-base, redox, Iodometric, Iodimetric, precipitation and complexometric titrations – Indicators.

Gravimetric analysis: Precipitation from homogeneous soloution- precipitants -conditions for precipitation – co-precipitation and post precipitation - washing of precipitates. Minimisation of errors.

Reference Books

1. Puri B.R., Sharma L.R., Kalia K.K., Principls of Inorganic Chemistry, 28th edition, Vallabh Publication, 2004, New Delhi.
2. R.D. Madan, Advanced Inorganic Chemistry, 2nd edition.S. Chand & Company, 2005, New Delhi.
3. Concise coordination chemistry – R. Gopalan, V. Ramalingam, Vikas publishing House, PVT LTD, 2001, New Delhi.
4. J.D.Lee, Concise Inorganic Chemistry, 5th edition, Oxford University Press, New Delhi 2008.
5. G.H. Jeffery, J. Bassett, J. Mendham, R.C. Denny, Vogel's Text book of Quantitative Chemical Analysis, 5th Edn., ELBS, 1989.
6. D.A. Skoog and D.M. West, Fundamentals of Analytical Chemistry, Holler Saunders College publishing, USA.VI Ed., 1998.

Inorganic Chemistry – II

Model question

PART – A (10 × 1 = 10 Marks)

Answer all the questions

1. General electronic configuration of noble gases
   (a) $ns^2\ p^6$ (b) $ns^2\ n\text{-}1p^6$ (c) $ns^1\ p^6$ (d) $ns^2\ p^3$.
2. Structure of XeF_5
   (a) Pentagonal planar (b) octahedral (c) tetrahedral (d) trigonal planar.
3. Ilmenite is the ore of ----
   (a) Sc (b) V (c) Zn (d) Ni.
4. Potassium ferrous ferrocyanide is known as ---
   (a) Prussian blue (b) Turnbull's blue (c) oxidizing agent (d) reducing agent.
5. Lanthanides and Actinides are known as ---
   (a) Alkali metal (b) transition elements (c) f-block elements (d) Alkali earth metal.
6. Common oxidation state of Lanthanides
   (a) +1 (b) +2 (c) +3 (d) +4.
7. Sulfide ores are concentrated by ---
   (a) Magnetic separation (b) froth floatation (c) oxidation (d) reduction.
8. Semiconductors are purified by ---
   (a) Zone refining (b) electrorefining (c) oxidation (d) reduction.
9. Interfering acid radicals is
   (a) Sulfate (b) fluoride (c) nitrate (d) chloride.
10. Primary standard is
    (a) $KMnO_4$ (b) oxalic acid (c) HCl (d) NaOH.

PART – B (5 × 5 = 25 Marks)

11. (a) What are the uses of noble gases? (or)
    (b) Write short note on clathrates of noble gases.
12. (a) How can we prepare Ziegler-Natta catalyst?. (or)

(b) Elucidate the place of d-block elements in periodic table.

13. (a) Compare lanthanides elements with actinides elements? (or)

(b) What is lanthanide contraction and explain with example?

14. (a) Compare ore with minerals with suitable example. (or)

(b) What are the basic principles of metallurgy?

15. (a) Write short notes on Indicators (or)

(b) How can we get good quality precipitation for gravimetric analysis?

PART – C (5 × 8 = 40 Marks)

16. (a) How can we isolate and separate noble gases from atmosphere? (or)

(b) Explain the preparation and properties of xenon fluorides and oxofluorides.

17. (a) Write preparation, properties and synthetic uses of Wilkinson's catalyst. (or)

(b) Discuss the preparation and oxidation ability of $KMnO_4$ and $K_2Cr_2O_7$ with suitable reactions.

18. (a) Explain the spectral and magnetic properties of f-block elements. (or)

(b) What are the applications of f-block elements?

19. (a) Write any five method of ore concentration with suitable diagram. (or)

(b) How can we extract Titanium from its ore?

20. (a) Write the applications of solubility product in the precipitation of cations. (or)

(b) Operating procedure and titration conditions of acid-base and iodometric titration.

SEMESTER – V PAPER-VIII

PHYSICAL CHEMISTRY –II

L	T	P	C
6	0	0	4

Objectives

- ✓ To learn about basic concepts and I and II law of thermodynamics
- ✓ To understand chemical equilibrium and phase equilibria
- ✓ To study about ionic equilibria and electrical conductance
- ✓ To learn about electromotive force

UNIT -I THERMODYNAMICS-I

Basic concepts - system, surroundings - types of systems - extensive and intensive properties - state functions and path functions - types of processes - . Exact and inexact differentials - Zeroth law of thermodynamics. Statements of first law - definition of internal energy and enthalpy - heat capacities at constant volume (C_v) and at constant pressure (C_p), relationship between C_p and C_v - calculation of work, heat, internal energy change and enthalpy change for the expansion of an ideal gas under reversible isothermal and adiabatic conditions. Joule-Thomson effect – Joule-Thomson coefficient and its significance - derivation of the expression for Joule-Thomson coefficient - inversion temperature. Kirchoff's equation and its applications - numerical problems.

UNIT II: THERMODYNAMICS-II

Introduction to second law of thermodynamics - statement of second law of thermodynamics.

Entropy: Definition –entropy a state function - -entropy change in reversible and irreversible processes - entropy as function of T and V - entropy as a function of T and P - entropy change in isothermal and adiabatic process - physical significance of entropy.

Free energy Definition:Work and free energy functions – general conditions of equilibrium and spontaneity –Gibbs Helmholtz equation

Partial molar properties: Partial molar free energy. Chemical potential –Gibbs Duhem equation-Clapeyron equation-Clapeyron-Clausius equation-Applications of Clapeyron-Clausius equation.

concept of fugacity and activity- activity coefficient- standard states.

Third law of thermodynamics: Nernst heat theorem- statement of III law and its applications.

UNIT III: CHEMICAL EQUILIBRIUM AND PHASE EQUILIBRIA

Chemical equilibrium: Law of mass action, equilibrium constants- K_p, and K_c Thermodynamic derivations- -Relations between K_p & K_c – Van't Hoff Reaction Isotherm and Isochore - Significance of Reaction Isotherm and Isochore - Application of law of mass action to homogenous and Heterogenous equilibrium-Le-Chatelier principle-application.

Phase equilibria : Phase rule - phase, component, degree of freedom - thermodynamic derivation of phase rule -Phase diagrams: , One-component system Water and sulphur systems.

Two component system: (i) Simple eutectic: Lead-silver system and potassium iodide-water system. (ii) Formation of compound with congruent melting point: Magnesium – zinc system and ferric chloride – water system.

UNIT-IV IONIC EQUILIBRIA AND ELECTRICAL CONDUCTANCE

Ionic Equilibria: The Ostwald's dilution law-experimental verification- pH scale-common ion effect- its applications-buffersolution-Calculation of pH of Buffer solution. Solubility product - Application of solubility product principle.

Electrical Conductance : Definitions of specific, equivalent and molar conductances – Relations between them – measurement of conductance and cell constant. Variation of conductance with dilution – Qualitative explanation– Strong and weak electrolytes. Migration of ions – Kohlrausch's law – applications –Applications of conductance measurements – Degree of dissociation of weak electrolytes –Determination of solubility of sparingly soluble salts – conductometric titrations- Theory of strong electrolytes – Debye – Huckel – Onsager theory-verification of Onsager equation – Wein and Debye –Falkenhagen effect.

UNIT V – ELECTRO MOTIVE FORCE(EMF) AND APPLICATIONS

Galvanic cells – Reversible and Irreversible cells – EMF and its measurement – Weston Standard cell – types of reversible single electrodes – standard Hydrogen electrode – calomel electrode –Derivation of Nernst equation both for emf of cells and single electrode potentials – Nernst theory for single electrode potential –standard reduction potentials – electro chemical series –significance.Application of emf measurements – Application of Gibbs –Helmholtz equation to galvanic cells – calculation of thermodyamic quantities – pH using hydrogen,

quinhydrone and glass electrodes – potentiometric titrations. Concentration cells – electrode concentration cells- electrolyte concentration cells- concentratoion cells with and without transference – LJP expression –polarization – over voltage- decomposition voltage.

Reference books :

1. B.R. Puri, L.R. Sharma & M.S. Pathania, Principles of Physical Chemistry, Vishal Publishing Co., Jalandhar.
2. P.L. Soni, O.P. Dharmarha & U.N. Dash, Text book of Physical Chemistry, 22ndEdn., Sultan Chand & Sons, New Delhi
3. Essentials of Physical Chemistry– B.S.Bahl, Arun Bahl, G.D.Tuli, Reprint 2006,S.Chand & Company Ltd., New Delhi-110055.
4. Physical Chemistry volumes I & II- S.Pahari, 2004, New Central Book Agency,Kolkotha.
5. Physical Chemistry-G.M.Barrow, 2005, Tata McGraw Hill Publishing Company,NewDelhi.
6. Physical Chemistry-G.K.Vemulapalli, 2004, Prentice Hall of India.

Model Questions

SEMESTER –V PAPER-VIII

PHYSICAL CHEMISTRY -II

PART-A

Answer all the Questions **(10 × 1=10)**

1. Which one of the following is an extensive property
   (a) Mars (b) viscosity (c) refractive index (d) heat capacity
2. The inversion temperature Ti =
   (a) 3a/Rb (b) 2a/Rb (c) 4a/3b (d) 2a/πb
3. $\Delta H_S \approx 21.Tb$ is known as
   (a) Entropy rule (b) Trouton's rule (c) both (a) and(b) (d) State function
4. In an isothermal process ---------- is constant
   (a) T (b) V (c) P (d) both (b) and (c)
5. The Van't Hoff isotherm is _____
   a.$\Delta G = -RTlnK$ b. $\Delta G = -RlnK$ c. $\Delta G = -lnKp$ d. none of these
6. Which of the following systems with degrees freedom is equal to one?
   (a) Water (b) Sulphur (c) KI – Water (d) both a and b
7. The amount of NaOH used for the preparation of 1 liter 0.1N solution is
   (a) 40 g (b) 20 g (c) 4g (d) 2 g
8. Which one of the following is a strong electrolytes
   (a) NaCl (b) NH_4OH (c) CH_3COOH (d) Na_2CO_3
9. Which of the following is the standard cell?
   (a) Daniel cell (b) Western-Cadmium cell (c) Laglange's cell (d) None of these
10. Which one of the following is a reference electrode?
    (a) Hydrogen electrode b) Zn-electrode c) Cu-electrode d)all these

PART-B

Answer all the Questions **(5 × 5=25)**

11. (a) Write notes an intensive and extensive property
    Or
    (a) Derive Kirchoff's equation
12. (a) State II laws of Thermodynamics in any three ways
    Or
    (b) Derive Gibbs Helmoltz equation
13. (a) Derive the relation between Kp & Kc
    Or
    (c) Explain the phase diagram of Pb and Ag system?

14. (a) Write a note on Kohlrauch's law.

Or

(d) Determine solubility and solubility product using conductance measurements.

15. (a) Discuss the types of electrode.

Or

(a) How will you determine the pH of the solution using glass electrode?

PART-C

Answer all the Questions **(5 × 8=40)**

16. (a) Derive the relationship between Cp and Cv

Or

(b)Derive the expression for Joule Thomson coefficient

17. (a) Explain the entropy change in a reversible and irreversible process

Or

(b) Derive the Gibb's Duhem equation..Give its significance

18. (a) Derive Van't Hoff equation

Or

(b) Explain the phase diagram of sulphur system.

19. (a) What is transport number?. Determine the transport number using moving boundary method.

Or

(a) Discuss the Debye-Huckel Onsager equation and its signifigance.

20. (a) Explain the determination of thermodynamic parameters for a chemical cell?

Or

(b) Write notes on concentration cell without transference and LJP.

SEMESTER V PAPER-IX

ORGANIC CHEMISTRY-III

L	T	P	C
6	0	0	4

Objectives

- ✓ To learn about stereochemistry
- ✓ To understand aromaticity
- ✓ To study dyes

UNIT - I OPTICAL ISOMERISM

Representation of molecules in saw horse, Fischer, flying-wedge and Newman formulae and their inter translations.

Symmetry elements - chirality – asymmetric molecules and molecular dissymmetry-pseudo asymmetry.Optical rotation – specific rotation –optical purity – racemisation (through cationic and anionic and radicalintermediates), resolution of acids, bases and alcohols via diastereomeric salt formation.

Optical isomers - enantiomers – diastereomers – epimers - notation of optical isomers - Cahn-Ingold-Prelog rules, R and S notations for optical isomers with one and two asymmetric carbon atoms - erythro and threo representations - D and L representations

Optical activity in compounds without asymmetric carbon atoms namely biphenyls, allenes and spiranes. Stereo selectivity – stereo specificity – partial asymmetric synthesis.

point,dipolemoment – chemical method – dehydration and cyclisation.

UNIT -II GEOMETRICAL & CONFORMATIONAL ISOMERISM

Geometrical isomerism – nomenclature of geometrical isomers – cis – trans ,E-Z notation and syn-anti for C=C,C=N compounds. Methods to assign configurations.

Stability of geometrical isomers and heats of hydrogenation. **Conformation:**Conformational nomenclature - eclipsed, staggered, gauche and anti; dihedral angle, torsion angle, energy barrier of rotation – potential energy diagram. Relative stability of conformers on the basis of steric effect, dipole-dipole interaction, H-bonding;Conformational analysis of ethane, propane, n-butane, haloethane, 1,2-dihaloethane, 1,2-glycol and 1,2-halohydrin, cyclopentane, cyclohexane and mono substituted cyclohexanes

UNIT - III AROMATICITY & AROMATIC SUBSTITUTION

Aromaticity – definition – Huckel's rule – consequence of aromaticity – stability, carbon-carbon bond lengths of benzene, resonance energy and participation of substitution vs addition – examples.Non-benzenoid aromatic compounds

Aromatic electrophilic substitution – general pattern of the mechanism, role of σ and π complexes, Mechanism of nitration, halogenation, sulphonation and Friedel-Crafts reaction. Activating and deactivating substituents, orientation in mono substituted benzenes, ortho/para ratio- Orientation- Korner's absolute method, dipole moment method – direct influence of substituents – rules of orientation - Aromatic Nucleophilic substitutions-unimolecular, bimolecular and benzyne mechanisms

UNIT – IV HETEROCYCLIC COMPOUNDS

Molecular orbital picture and aromatic characteristics of pyrrole,furan, thiophene and pyridine. Comparison of basicity of pyridine, piperidine and pyrrole.

Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution and mechanism of nucleophilic substitution reaction in pyridine derivatives.

Preparation and reactions of indole, quinoline and isoquinoline with special reference to Fisher indole synthesis, Skraup synthesis and Bischler-Nepieralski synthesis, mechanism of electrophilc substitution reactions of indole, quinoline and isoquinoline.

UNIT – V DYES & POLYNUCLEAR HYDROCARBONS

Dyes - theory of color and constitution - chromophore, auxochrome, classification according to application and structure - preparation and uses of azo dyes - methyl orange, triphenyl methane dyes -malachite green, indigo dyes - Indigotin, anthraquinone dyes - alizarin, phthalein dyes –Phenolphthalein-Synthesis reactions & Structure of Naphthalene & Anthracene

Reference Books

1. Textbook of Organic Chemistry - P.L.Soni - Sultan Chand
2. Advanced organic Chemistry - B.S.Bahl - S. Chand
3. Principles of Organic Chemistry - A.K.Bansal - New Age
4. A Textbook of Organic Chemistry - A.K.Bansal - New Age
5. Organic Chemistry - I.L.Finar - Volume I & II - Addision **Welsey**
6. Organic Chemistry - R.T.Morrison and Boyd - Prentice Hall
7. Stereochemistry of Organic Compounds - D.Nasipuri - New Age
8. Stereochemistry, Conformation and Mechanisms - Kalsi New Age
9. Advanced General Organic Chemistry - Sachin K.Ghosh - Books and Allied (P) Ltd
10. Textbook of Organic Chemistry - P.S.Kalsi – Macmillan
11. Organic Chemistry – Bhupinder Mehta and Manju Mehta - PHI Learning (P) Ltd.

MODEL QUESTION PAPER

SEMESTER-V ORGANIC CHEMISTRY – III

Time : 3 hours **Marks : 75**

Part A - (10x1=10 marks)

Answer ALL questions

Choose the Correct Answer

1) Cis-trans isomerism is shown by

a) But-1-ene b) But-2-ene c) Prop-1-ene d) Isobutene

2) 2,2'- dinitro biphenyls are optically active due to

a) Asymmetric carbon atom b) Asymmetric molecule c) Planarity d) Axis of symmetry

3) The electrophile in sulphonation of benzene is

a) H_2SO_4 b) HSO+ C) SO_3 d) HSO_4

4) In cholorobenzene, chlorine is

a) Activating and o-p directing b) Activating and m-directing

c) Deactivating and m –directing d) Deactivating and o-p directing

5) Electrophilic substitution takes place in anthracene at position

a) C_1 b) C_2 C) C_6 d) C_9 and C_{11}

6) Naphthalene on oxidation with acidic KMnO4 gives

a) Phthalic anhydride b) Phthalic acid c) Decaline d) Ketonic acid

7) The reagent used in chichibabin reaction

a) Sodamide b) Sodalime C) NaOH d) Ammonia

8) Pyrrole undergoes electophilic substitution at position

a) C3 b) C2 c) Both C2 and C3 d) None of these

9) Alizarin is a……dye

a) Azo b) Mordant c) Vat d) Nitro

10) A chromophore among the following is

a) –OH b) –NH2 c) –C=O d) –Cl

PART B (5x5=25)

Answer all questions (Choosing either a or b)

11. (a) Define the terms Chirality and Optical rotation (OR)

(b) Illustrate the following terms with an example (a) Enantiomers (b) Diastereomers

12. Define the terms a) Torsion angle b) Energy barrier of rotation (OR)

Discuss with suitable example the E,Z system of nomenclature of Geometrical isomers

13. Explain Benzyne mechanism with example (OR)

Define the terms a) Aromaticity b) Huckel's method

14. Compare the basic nature of pyrrole and pyridine (OR)

Explain Fischer indole synthesis

15. What are the requirements of dye? (OR)

Explain bathochromic shift hypsochromic shift

Part C - (5x8=40)

Answer all questions (Choosing either a or b)

16. (a) Write notes on i) Assymmetric synthesis ii) Resolution iii) Atropisomerism (OR)

(b) (i) Optical isomerism of Biphenyls (ii) Absolute and Relative Configuration of organic molecules

17.(a) Write notes on dipole-dipole interaction and H-bonding (OR)

(b) Discuss the conformational analysis of mono substituted cyclohexanes

8.(a) Explain the mechanism of Fridel-craft's alkylation and acylation (OR)

(b) Discuss the mechanism of Aromatic nucleophilic substitution

19.a) Explain i) Skraup synthesis ii) Bischler-Nepieralski synthesis (OR)

b) Compare the aromatic character of furan, pyrrole and thiophene

20. (a) Explain the theory of colour and constitution (OR)

(b) How are the following synthesized? I) Alizarin II) indigo

SEMESTER – V

MAJOR ELECTIVE I - POLYMER CHEMISTRY

L	T	P	C
4	0	0	4

Objectives:

- To know the concept of polymerization and types of polymers
- To understand the characteristics of polymers
- To acquire knowledge about the polymerization techniques and polymer processing
- To know the chemistry of individual polymers
- To have an idea about the recent advances in polymer sciences

UNIT I - INTRODUCTION TO POLYMERS

Definition - Monomer, polymer and polymerisation - classification of polymers on the basis of **(i) origin** - Natural, semi synthetic, synthetic, **(ii) Physical properties and applications** - Rubbers, plastic, fibres **(iii) Thermal response** - thermoplastics, thermosetting **(iv) Structure** - Homopolymers (linear, branched, cross link or network), Copolymers (Random, Alternate, Block, Graft) **(v) Crystallinity** - non-crystalline (amorphous), semi-crystalline **(vi) Mode of formation** - Addition, Condensation Polymerisation (definition and examples only) **(vii) Methods of polymerization** - Bulk, Solution, Suspension Polymerisation (definition and examples only)

Chemistry of polymerization: Chain polymerization, free radical, ionic, co-ordination, step polymerization, polyaddition and polycondensaion, miscellaneous ring opening and group transfer polymerizations.

UNIT II - CHARACTERISTICS OF POLYMERS

Glass transition temperature (Tg) - definition – Factors affecting Tg – relationships between Tg and molecular weight and melting point. Importance of Tg. Molecular weight of polymers. Number average, weight average (problems), sedimentation and viscosity average molecular weights. Molecular weights and degree of polymerization - chemical reaction - hydrolysis - hydrogenation - addition - substitution – cross-linking, vulcanisation and cyclisation

reactions. Polymer degradation - basic idea of thermal, photo and oxidative degradation of polymers.

UNIT III - POLYMERIZATION TECHNIQUES AND PROCESSING

Bulk, solution, suspension, emulsion, melt condensation and interfacial poly condensation polymerizations. polymer processing - calendaring - die-casting, rotational casting - compression moulding - injection moulding - blow moulding - extrusion moulding and reinforcing.

UNIT IV - CHEMISTRY OF SOME COMMERCIAL POLYMERS

Preparation, properties and uses of the following polymers. Thermoplastics, polyethylene, polypropylene, polystyrene, polyacrylonitrile, polyvinyl chloride, nylon, polyester.

Thermosetting plastics: Phenol formaldehyde resin, urea formaldehyde resin, melamine formaldehyde, epoxy resin, polycarbonate.

Elastomers: Natural rubber and synthetic rubber, Styrene and neoprene rubber.

UNIT V - ADVANCES IN POLYMER

Biopolymers - Biomedical polymers - contact lens, dental polymers, artificial heart, kidney, skin and blood cells - High temperature and fire resistant polymers - silicones - conducting polymers - (elementary idea) - polysulphur nitrile, polyphenylene, polypyrrole and polyacetylene. Polymer industry in India.

References books:

1. V.R. Gowarikar, N.V. Viswanathan and J. Sreedhar. Polymer Science, Wiley Eastern, 1995.
2. F.N. Billmeyer, Textbook of Polymer Science, Wiley Interscience, 1971.
3. Material Science II edition, P.K. Palanisamy SCITECH Publications India Pvt., Ltd., Chennai-600001.
4. Engineering Chemistry, V Srinivasan, S.D. Uma Maheshwari, M. Meena. SCITECH Publications India Pvt., Ltd., Chennai-600001.
5. Introduction to Organic Chemistry. John McMurry Brooks/cole Cenage Learning India Private Limited. First Reprint 2008.
6. Modern Chemistry, David. W. Oxtoby, H.P. Gills, Alan Campion Brooks/cole Cenage Learning India Private Limited. First Reprint 2008.

MODEL QUESTION

ELECTIVE I – POLYMER CHEMISTRY

SEMESTER V

Time: 3hrs **Maximum - 75 marks**

Part - A (10 x 1 = 10 marks)

Answer ALL questions

Choose the correct answer

1. An irreversible plastic is called
   b. Thermoplastic b. Thermosetting plastic
   c. Elastomers d. Hetropolymer

2. The size of the individual polymer molecule is of the order
   a. $10^{-1} – 10^{-3}$ cm b. $10^{-4} – 10^{-7}$ cm
   c. $10^{-4} – 10^{-7}$ mm d. $10^{3} – 10^{7}$ mm

3. Number average molecular weight and weight average molecular weights are equal when
   a. monomers have high molecular weight
   b. monomers have low molecular weight
   c. molecular mass of polymer is determined in non-aqueous phase
   d. all particles of polymer are identical in weight

4. The order of Tg value of polyethylene, nylon and rubber is
   a. nylon < rubber < poly ethylene
   b. rubber < poly ethylene < nylon
   c. nylon < polyethylene < rubber
   d. poly ethylene < rubber < nylon

5. Which of the following processes is used for coating wires with PVC?
   a. Extrusion moulding b. Compression moulding
   c. Injection moulding d. Die-casting

6. Which if the following is pearl polymerisation?

a. Bulk polymerisation b. solution polymerisation

c. suspension polymerisation d. emulsion polymerisation

7. The compound used in vulcanisation is

a. $SeCl_2$ b. $TiCl_4$

c. $CuSO_4$ d. $MnCl_2$

8. The polymer used in the manufacturing of toys is

a. HDPE b. LDPE

c. PVC d. PMMA

9. Chondroitin sulphate is a component of

a. artificial heart b. artificial kidney

c. artificial skin d. dental polymer

10. The superior contact lens is

a. hard lens b. gas permeable lens

c. soft lens d. silicone lens

Part – B (5 x 5 = 25 marks)

Answer ALL questions choosing either (a) or (b)

11. a) Write notes on tacticity of polymer.

(or)

b) Differentiate between thermoplastics and thermosetting plastics. Give examples.

12. a) What is Tg? What are the factors affecting Tg?

(or)

b) Explain the oxidation method of degradation of polymers.

13. a) What is meant by casting? 2How it is performed?

(or)

b) Explain solution polymerisation.

14. a) Discuss the preparation, properties and uses of polycarbonates.

(or)

b) What are the synthetic methods, properties and uses of PVC?

15. a) What are the uses of polymers in medicine and surgery?

(or)

b) Write the different types of silicones and their methods of preparation.

Part C (5 x 8 = 40 marks)

Answer ALL questions choosing either (a) or (b)

16. a) What is meant by copolymerization? Explain. Discuss the reaction mechanism.

(or)

b) When two molecules condense together some small molecules are eliminated-Explain this statement with an example from polymerisation. Give the reaction mechanism.

17. a) Define number average molecular weight and weight average molecular weight. Distinguish with an example. Give its practical significance of molecular mass determination.

(or)

b) How are the following synthesized?

i) DMT ii) Ethylene glycol iii) Acrylonitrile iv) Hexamethyl diamine v) Caprolectum

18. a) What are synthetic fibres? Give their preparation and properties.

(or)

b) How are the following prepared?

i) PE ii) PP iii) Polymethylmethacrylate

19. a) What is meant by epoxy resin? Write their preparation, properties and uses.

(or)

b) Explain the natural and synthetic rubber types. How are they prepared?

20. a) Discuss the optical, thermal and electrical properties of polymers

(or)

b) What are compression and injection moulding techniques? How are they performed? ExplaiN.

SEMESTER – V

MAJOR ELECTIVE - 1

Bioinoganic chemistry

L	T	P	C
4	0	0	4

Objectives

- To study the significance of metal ions' transport and storage,
- To study a few metallo enzymes,
- To study electron transfer proteins,
- To study oxygen transport and activation proteins,
- To study the fundamentals of supramolecular chemistry

Unit I Metal ions in biology

Metal ions in biology- Essential and trace elements in biological system – biological importance and toxicity of elements such as Fe , Cu , Zn , Co , Mo , W , V , Mn , and Cr in biological system and their vital role in the active site- Ion transport mechanism in cell membrane – Na and K pumps- Ionophores.

Unit II Metallo porphyrins

Chlorophyll – photosynthetic electron transport sequence – biological electron carriers : iron-sulphur proteins-ferredoxin, rubridoxin and cytochromes , cytochromes and blue copper proteins – oxygen carriers: haemoglobin and myoglobin dioxygen binding - co-operativity in haemoglobin - the Bohr effect -, Vitamin B12 and cytochrome P450-mechanism of action

Unit III Metallo enzymes

Role of Zinc in enzyme chemistry-Zinc finger, Zinc twist and zinc cluster Structure and functions of Metallo proteins and enzymes - superoxide dismutase, carbonic anhydrase carboxypeptidase A, Catalase, LADH, and Peroxidase.

Unit IV Metals and Health

Application of therapeutic chelating agents- Metal-based drugs cis-platin, carboplatin, platinum anti-cancer drugs, gadolinium MRI contrast agents, Gold and arithritic agents – auranofin,solganol,myochristin, Toxicity of metals–Cd,Hg and Cr-bio metyhylation of mercury

Unit V Supramolecular chemistry

Concepts of supramolecular chemistry. – Host-Guest concept- Various types of non-covalent interactions. Hydrogen bonds, C-H…X interactions, Halogen bonds. π – π interactions,non – bonded interactions. Various types of molecular recognition- Cations, Anions and Neutral guests – Supramolecular Devices and Sensors: Various types of supramolecular devices – an overview

Reference Books:

1. Lippard, S.J. & Berg, J.M., Principles of Bioinorganic Chemistry Panima Publishing Company 1994. Cotton, F.A., Wilkinson, G., & Gaus, P.L. Basic Inorganic Chemistry 3 rd Ed.; Wiley India,
2. Huheey, J. E.; Keiter, E.A. & Keiter, R.L. Inorganic Chemistry, Principles of Structure and Reactivity 4 th Ed., Harper Collins 1993, Pearson,2006.
3. Sharpe, A.G. Inorganic Chemistry, 4 th Indian Reprint (Pearson Education) 2005
4. Douglas, B. E.; McDaniel, D.H. & Alexander, J.J. Concepts and Models in Inorganic Chemistry3rd Ed., John Wiley and Sons, NY, 1994.
5. Greenwood, N.N. & Earnshaw, A. Chemistry of the Elements 2 nd Ed, Elsevier, 1997 (Ziegler Natta Catalyst and Equilibria in Grignard Solution).
6. JW Steed and JL Atwood Supramolecular Chemistry 2nd Ed. Wiley 2011
   P D Beer, P A Gale and D K Smith Supramolecular Chemistry OUP, 1999
   J-M Lehn Supramolecular Chemistry VCH, 1995
7. Lee, J.D. Concise Inorganic Chemistry 5 th Ed., John Wiley and sons 2008.
8. Powell, P. Principles of Organometallic Chemistry, Chapman and Hall, 1988.
9. Shriver, D.D., Atkins, P. and Langford, C.H., Inorganic Chemistry 2 nd Ed., Oxford University Press, 1994.
10. David E Fenton, Bio coordination chemistry, oxford science publications. 1995
11. Asim K. Das, Bioinorganic Chemistry, Books and allied (P) Ltd. 2007.

Bioinorganic Chemistry-Elective-I

Model question

PART – A (10 × 1 = 10 Marks)

Answer all the question

1. Metal present in hemocyanin
   (a) Fe (b) Zn (c) Cu (d) Mn.
2. Active site of carbonic anhydrases
   (a) Cu (b) Ni (c) Fe (d) Zn.
3. Simplest iron–sulfur protein
   (a) 2Fe-2S (b) 4Fe-4S (c) 3Fe-4S (d) 4Fe-3S.
4. Function of Myoglobin is
   (a) Electron carrier (b) O_2 carrier (c) O_2 storage (d) Electron storage.
5. Superoxide dismutase catalyzes the dismutation of
   (a) H_2O_2 (b) O_2 (c) H_2O (d) O_2^-.
6. The regulation of the transcription of DNA to RNA due to the
   (a) Zinc fingers (b) Zinc twist (c) Zinc cluster (d) None.
7. The major toxic effect of cis-platin is
   (a) Nephrotoxicity (b) Neurotoxicity (c) skin damage (d) heart failure.
8. Number of unpaired electrons present in Gd(III) is
   (a) 6 (b) 4 (c) 7 (d) 5.
9. Stability of the protein is due to the ---- interaction
   (a) Hydrogen bond (b) ionic bond (c) π -π (d) none.
10. Reversible host-guest interaction is useful for the fabrication --- devices.
    (a) Sensor (b) solar (c) mechanical (d) electrical.

PART – B (5 × 5 = 25 Marks)

11. (a) Give note on metal ions in biology.(or)
    (b) Write short note on Ionophores.
12. (a) Describe the structural chemistry of ferredoxin. (or)
    (b) Write the action mechanism of cytochrome P450

13. (a) What is Zinc fingers and Zinc twist? (or)

(b) Write the action and mechanism of carboxypeptidase

14. (a) Write short note on MRI contrast agents. (or)

(b) How can you account for the action of cis-platin on cancel cells?

15. (a) What is host-guest interaction? Explain with an example (or)

(b) Explain any three supramolecular devices.

PART– C (5 × 8 = 40 Marks)

16. (a) Explain the biological important and toxicity of Fe, Cu, Mo and Cr metals (or)

(b) How can you account for the ion transport in the cell membrane?

17. (a) Explain the various steps in photosynthetic process (or)

(b) Give detailed account for the dioxygen binding on hemoglobin.

18. (a) What are the various role of Zinc in biological system? (or)

(b) Explain the action of superoxide dismutase and carbonic anhydrase.

19. (a) What are the applications of the therapeutic chelating agents? (or)

(b) Write detailed account for the toxicity of metals.

20. (a) Explain the various types of non-covalent interactions. (or)

(c) Give detailed account for the molecular recognitions.

MAJOR PRACTICAL PAPER V

(V SEMESTER)

ORGANIC ANALYSIS

L	T	P	C
0	0	4	2

Objectives

- To enable the students to understand the various procedures in organic analysis
- To create an awareness on microscale experiments in organic chemistry practicals

1. **Organic analysis**

Qualitative analysis of the given organic compound

a. Test for aliphatic and aromatic nature of substances
b. Test for saturation and unsaturation
c. Identification of functional groups (carboxylic acids, phenols, aldehydes, ketones, esters, amines, amides, anilides, nitrocompounds and carbohydrates)
d. Preparation of solid derivative to confirm the presence of functional group

Internal – 50 marks

25 marks - Regularity

25 marks – Average of best four experiments in regular class work

External -50 marks

20 marks – Record (atleast five experiments in organic analysis)*

10 marks – procedure for any two functionl groups asked by the examiner

20 marks – Analysis

*Experiments done in the class alone should be recorded

(Students having a bonafide record only should be permitted to appear for the practical examination)

MAJOR PRACTICAL PAPER VI

(V SEMESTER)

GRAVIMETRIC ESTIMATION & INORGANIC PREPARATIONS

L	T	P	C
0	0	4	2

Objectives

- ✓ To enable the students to understand the various techniques in gravimetric estimations
- ✓ To make the students thorough in preparations of organic compounds

Gravimetric Estimation

1. Estimation of lead as lead chromate
2. Estimation of barium as barium chromate
3. Estimation of nickel as nickel dimethylglyoximate
4. Estimation of zinc as zinc oxinate
5. Estimation of copper as copper thiocyanate

Inorganic preparation

1. Preparation of potash alum
2. Preparation of chrome alum
3. Preparation of Prussian blue
4. Preparation of sodium ferrioxalate
5. Preparation of tetrammine copper(II) sulphate
6. Preparation of tristhiourea copper(I)chloridedihydrate
7. Preparation of potassium trisoxalatoferrate(III)
8. Preparation of hexathiourea lead(II) nitrate

Internal – 50 marks

25 marks - Regularity

25 marks – Average of best (estimation-3 and preparation-3) six experiments in regular class work

External -50 marks

10 marks – Record (atleast 3 estimations and 3 preparations)*

10 marks – Procedure

30 marks – Result (Estimation -20 and preparation-10)

*Experiments done in the class alone should be recorded

(Students having a bonafide record only should be permitted to appear for the practical examination)

Reference books:

1. N.S. Gnanapragasam and G. Ramamurthy, Organic Chemistry – Lab manual, S. Viswanathan Co. Pvt., 1998.

2. J.N. Gurthu and R. Kapoor, Advanced Experimental Chemistry (Organic), S. Chand and Co., 1987.

3. B.S. Furniss, A.J. Hannaford, P.W. G. Smith and A.R. Tatchell, Vogel's Text Book of Practical Organic Chemistry. 5th Edn., Pearson Education, 2005.

4. O.P. Pandey, D.N Bajpai, S. Gini, Practical Chemistry, for I, II & III BSc. Students. S.Chand & Company Ltd reprint 2009.

5. P.R.Singh, D.C.Gupta, K.S.Bajpal Experimental Organic Chemistry Vol.I and II, 1980.

6. V.K.Ahluwalia, Sunitha Dhingra, Adarsh Gulate College Practical Chemistry, Universities Press (India) Pvt Ltd 2008 (reprint)

7. Sundaram, Krishnan, Raghavan, Practical Chemistry (Part III), S. Viswanathan Co. Pvt., 1996.

8. Vogel's Text Book of Quantitative Chemical Analysis. 5th Edi., ELBS/Longman England, 1989.

SEMESTER – VI PAPER – X

INORGANIC CHEMISTRY – III

L	T	P	C
5	0	0	4

Objectives

- ✓ To study the theories in coordination chemistry
- ✓ To study the chemistry of metal carbonyls
- ✓ To understand the role of metal ions in biological systems
- ✓ To study the basic principles of photoinorganic chemistry

UNIT - I COORDINATION CHEMISTRY-I

Introduction: IUPAC nomenclature, Ligands- monodentate, bidentate, and polydentate ligands; coordination sphere; coordination number; nomenclature of mononuclear and dinuclear complexes. Structural and stereoisomerism in tetrahedral, square planar and octahedral complexes.Valance Bond theory – applications of valance bond theory to tetrahedral, square planar and octahedral complexes- Merits and limitations of VB theory.

UNIT – II CO-ORDINATION CHEMISTRY II

Crystal field theory - splitting of d-orbitals in octahedral and tetrahedral complexes - factors affecting the magnitude of crystal field splitting - effects of crystal field splitting - spectrochemical series - applications of CFT - magnetic properties and spectra of transition metal complexes - crystal field stabilization energy and their uses - limitations of CFT - effective atomic number rule - stability of complexes - step-wise and overall stability constants - factors affecting the stability of complexes - determination of stability constants.

UNIT – III CO-ORDINATION CHEMISTRY III

Labile and inert complexes - ligand substitution reactions in octahadral complexes: aquation, base hydrolysis and anation reactions - substitution reactions in square planner complexes - Trans effect - theories of trans effect - mechanism of substitution reactions - redox reactions: inner-sphere and outer-sphere electron transfer reactions.

UNIT - IV ORGANOMETALLIC CHEMISTRY

Introduction–History, Nomenclature of organometallic compounds, EAN rule and 18 electron rule. Structure and nature of M-L bond in metal carbonyls - metal nitrosyls. preparation of organo metallic compounds of Mg, Zn, Li, Cu, P, B, Ti, Fe and Co

Wilkinson's catalyst and alkene hydrogenation, hydroformylation, Mansanto acetic acid process, Ziegler – Natta catalyst and polymerization of olefins.

UNIT - V INORGANIC PHOTOCHEMISTRY

Electronic transitions in metal complexes : selection rules - metal-centered and charge-transfer transitions - properties of excited states - bimolecular quenching and energy transfer - photochemical pathways : substitutional, reduction-oxidation and isomerisation processes - photosubsitution reactions of Cr(III) complexes - Adamson's rules - photoredox reactions of Co(III) complexes - photoismerisation in Pt(II) complexes. Photochemical conversion and storage of solar energy : photolytic cleavage of water into H_2 and O_2 - photoelectrochemical devices : photogalvanic cells and semiconductor based photovoltaic cells.

Reference books :

1. J.D. Lee, *Concise Inorganic Chemistry* 5th Ed., Blackwell Science Ltd.,
2. James E. Huheey, Elien A. Keiter and Richard L. Keiter, *Inorganic Chemistry : Principles Structure and Reactivity*, 4th Ed., Harper College Publisher.
3. F. Albert Cotton, Geoffrey Wilkinson, Carlos A. Marilo and Manfred Bochman, *Advanced Inorganic Chemistry*, 6th Ed., Wiley Interscience Publication.
4. Fred Basolo and Ralph G. Pearson, *Mechanisms of Inorganic Reactions : A study of metal complexes in solution*, 2nd Ed., John wiley and sons, Inc.,
5. David E. Fenton, *Biocoordination Chemistry*, Ist Ed., Oxford Science Publications.
6. Ivano Bertini, Harry B Gray, Stephen J Lippard, Joan Selverstone Valentine, *Bioinorganic Chemistry*, 1st Ed., Viva Books Pvt. Ltd.,
7. J.K. Rohatgi - Mukherjee, *Fundamentals of Photochemistry* - Wiley Eastern Revised Ed.,
8. *Journal of Chemical Education,* Vol.60, No.10, October 1983.
9. A.W. Adamson and P.D. Fleischauer, (Editors) *Concepts of Inorganic photochemistry,* John wiley and sons, New York, 1975.

Inorganic Chemistry – III

Model question

Part – A (10 × 1 = 10 Marks)

Answer all the question

1. Ligands are----
   (a) only anionic (b) neutral or anionic (c) only neutral (d) only cationic.
2. Coordination numbers are also called
   (a) Primary valency (b) secondary valency (c) oxidation number (d) tertiary valency.
3. Degenerated states present in d orbital
   (a) 2 (b) 3 (c) 5 (d) 0.
4. Hybridization present in tetrahedral complex is----
   (a) sp (b) sp^2 (c) sp^3 (d)sp^3d.
5. Complexes reacts rapidly are called----
   (a) unstable (b) labile (c) stable (d) robust.
6. Substitution by water is ---
   (a) anation (b) aquation (c) hydrolysis (d) None.
7. EAN of the $[Cu(CN)4]^{3-}$
   (a) 8 (b) 60 (c) 36 (d) 86.
8. Catalyst for hydroformylation is
   (a) $(Ph_3P)_3RhCl$ (b) Ni (c) $Co_2(CO)_8$ (d) Zn/Cu oxide.
9. Intense pink color of permanganate ion is due to--- transition.
   (a) d-d (b) charge transfer (c) n-n (d) n-π.
10. Natural light harvesting complex is
    (a) Iron complex (b) chlorophyll (c) hemoglobin (d) blue copper protein.

Part – B (5 × 5 = 25 Marks)

11. (a) What are the rules for the naming of mononuclear complexes? (or)
    (b) What are the merits and demerits of VB theory?
12. (a) What are the limitation of CFT? (or)
    (b) What is stepwise and overall stability constant?

13. (a) What is trans effect explain with suitable examples (or)

(b) Write the mechanism of substitution reactions?

14. (a) How can we prepare Wilkinson's catalyst? And give its uses. (or)

(b) What is Mansanto acetic acid process? And explain its uses.

15. (a) What are the properties of exited state? (or)

(b) Describe the photoisomerisation in Pt(II) complex with an example?

Part – C (5 × 8 = 40 Marks)

16. (a) Explain the structural and stereoisomer of square planar complexes? (or)

(b) What is valance bond theory? And explain its uses.

17. (a) What are the factors affecting the CFSE? (or)

(b) Explain the CFSE of octahedral complex and give uses of CFSE.

18. (a) What way inner sphere mechanism differs from outer sphere mechanism? And explain with suitable examples. (or)

(b) Explain the substitution reaction in square planner complexes.

19. (a) How can we analyze the stability of carbonyl compound using EAN rule with suitable examples? (or)

(b) Explain the formation of polymer by Ziegler-Natta catalyst with mechanism.

20. (a) Explain the photochemical pathway of redox reaction in inorganic complex. (or)

(b) Give detailed account for the working of semiconductor based photovoltaic cells.

SEMESTER – VI PAPER XI

Paper-XI Physical chemistry –III

L	T	P	C
5	0	0	4

Objectives

- To learn about basic concepts in spectroscopy
- To study about the various types spectroscopy
- To learn the symmetry of the molecules.
- To know the kinetics of the reactions
- To study the surface phenonmena and solution characteristics

UNIT – I SPECTROSCOPY- I

Introduction - various types of molecular spectra - electronic, vibrational and rotational energy levels - Born-Oppenheimer approximation.

Rotation spectra of diatomic molecules - determination of bond length and moment of inertia from rotational spectra - numerical problems - selection rule, effect of isotopic substitution.

UV-visible spectroscopy: theory - types of transitions in molecules - selection rules for electronic spectra - factors affecting absorption maximum and intensity – applications.

IR spectroscopy : theory - stretching and bending vibrations - factors affecting vibrational frequencies - important spectral regions for the characterization of functional groups - finger print region - determination of force constant - qualitative relation of force constant to bond energies - selection rules - modes of vibrations in polyatomic molecules - vibrational modes of H_2O and CO_2 – applications - numerical problems.

UNIT - II SPECTROSCOPY -II

Raman spectroscopy: Principle - Rayleigh and Raman scattering - Stokes and Anti-stokes lines - differences between IR and Raman spectroscopy - mutual exclusion principle – selection rule - applications.

NMR spectroscopy: Theory of NMR, modes of nuclear spin-relaxation process - shielding effect, hyperfine splitting, coupling constants, - chemical shift - factors affecting chemical shift - internal standard, δ and τ scale - applications of NMR and limitations of NMR.

ESR spectroscopy: principle - energy level splitting - presentation of ESR spectrum for methyl and benzene radicals, deuterium - applications-Zerofield splitting &Kramer's degeneracy –fine structure

UNIT III GROUP THEORY

Concept of symmetry in chemistry - symmetry operations and symmetry elements - rotational axis of symmetry and types of rotational axes - planes of symmetry and types of planes - improper rotational axis of symmetry - identity element - groups and their basic properties – Abelian and cyclic groups - classification of molecules into point groups - the symmetry operations of a molecule form a group – $H_2O$and NH_3point groups - group multiplication tables.

UNIT IV CHEMICAL KINETICS

Rate of reaction-Measuring rates of reaction-expressing reaction rates- factors influencing rate-rate constant-Rate laws, Stoichiometry, order and molecularity of reactions-First order, second order, third order and zero order reactions and example. Characteristics of I,II,III and Zero order reactions. Determination of order of reactions-expression for rate constant of first and second order reaction-derivation. Effect of temperature on rate constant. The activation energy - determination of Arrhenius frequency factor and energy of activation-The collision theory of reaction rates and its limitation. Lindemann theory of unimolecular reactions-The theory of Absolute reaction rates. Comparison of the collision theory with the Absolute reaction rate theory.

UNIT V SURFACE CHEMISTRY AND SOLUTIONS

Surface Chemistry: Adsorption - physisorption and chemisorption - adsorption of gases by solids - adsorption isotherms - Freundlich adsorption isotherm - derivation of Langmuir adsorption isotherm, statement and explanation of BET isotherm - applications of adsorption - determination of surface area – adsorption indicators.

Solution : Solutions of liquid in liquid– Binary liquid mixture - Ideal and non ideal solutions – Raoult's law. - deviation from ideal behavior – pressure – composition and temperature – Composition diagrams for completely miscible binary solutions-Fractional distillation –Azeotropic distillation—nature of azeotropic mixtures-partially miscible liquids—consolute temperature- critical solution temperature-system with upper CST, lower CST and upper and lower CST –Liquid crystals, Nematic,Semetic and cholestic types and their applications

Reference books :

1. Principles of Physical Chemistry - B.R. Puri and Sharma - Shobanlal Nagin Chand & Co.,
2. Text Book of Physical Chemistry - P.L. Soni - Sultan Chand.
3. Elements of PhysiCal chemistry - Glasstone and Lewis - Macmillan.
4. Physical chemistry - G.W. Castellan - Narosa publishing house.
5. Universal General Chemistry, C.N.R. Rao, Macmillan.
6. Group theory and its Chemical Applications - P.K.Bhattacharya - Himalaya publishing House.
7. Chemical Kinetics-K. J. Laidler, Tata McGraw Hill Publishing Company, NewDelhi

Model Question

Physical Chemistry - III

PART-A

Answer all the Questions **(10 × 1=10)**

1. Which of the following molecule is / are micro wave active?
   a) CO b) NO c) HCl d) All of these
2. UV-visible spectroscopy is also known as ----------spectroscopy

   a) Vibrational b) Electronic c) Dipole d) Optical

3. Howmany lines for acetone in NMR spectra is ----------
   a) 3 b) 0 c) 2 d) 1
4. Microwave radiation used in ---------- spectroscopy
   a) Rotaional b) ESR c Vibrational d. Both a and b
5. The point group of H_2O molecule is

   a) D_3h b) C_2v c)C_3v d) D_2h

6. The principal axis of NH_3 molecule is

a)C_4 b) C_i c) C_3 d)C_2

7.Hydrolysis of methyl acetate in aqueous is an example for ----------reaction

a) First order b) Pseudo first order c)fractional order d) Third order

8.Decomposition of HI on gold surface is an example for -------reaction

a) First order b) Zero order c) fractional order d) Second order

9.Which of the following adsorption isotherm is applicable for multilayer formation?

a) Freundlich b) Langmuir c) BET d) None of these

10.The specied law for ideal solution is

a) Roault's law b) Boyle's law c) Henry's law d) Faraday's law

PART-B

Answer all the Questions **(5 × 5=25)**

11.a) Explain Frack-Condon Principle

Or

b.Write notes on stokes and anti stokes lines Fra

12.a) Discuss the factors affecting chemical shift.

Or

b.Explain the ESR spectrum of methyl radical

13 a) Discuss briefly symmetry elements and symmetry operations.

Or

b)Explain Abelian group with example.

14.a) Derive Arrhenius equation. Write its significance.

Or

b) Write notes on Lindeman's theory.

15a) Discuss the differences between physisorption and chemisorption

Or

b)What is CST? Explain the system with upper CST.

PART-C

Answer all the Questions **(5 × 8=40)**

16a) Explain the rotational spectrum of diatomic molecule.

Or

b)Discuss the vibrational spectrum of simple harmonic oscillator.

17a)Explain the applications of NMR spectra

Or

b) Discuss the principle of ESR spectra.Explain ESR spectra of 1,4-semibenzoquinone radicals and Deutrium.

18a) Deduce the symmetry elements of BF_3 and SO_2

Or

b)Discuss the point group of H_2O and NH_3

19a) Derive the expression for rate constants of first and second order reaction.

Or

b)Discuss the absolute reaction rate theory

20a) Derive Langmuir adsorption isotherm and discuss its importance.

Or

b)Explain azeotropic distillation with suitable examples.

SEMESTER-V PAPER-XII

ORGANIC CHEMISTRY-IV

L	T	P	C
5	0	0	4

Objectives

- To learn about natural products
- To understand chemistry of aromatic compounds
- To study spectroscopy

UNIT-I CARBOHYDARATES

Classification-Monosaccharides- constitution of glucose and fructose. Reactions of glucose and fructose – Osazone formation, Mutarotation and its mechanism, cyclic structure, pyronose and furanose forms. Epimerisation-Chain lengthening and shortening of aldoses. Interconversions of aldoses and ketoses.

Disaccharides- sucrose- reactions and structure.

Polysaccharides – starch and cellulose (elucidation of structure not necessary).

UNIT-II PHENOLS, AROMATIC ALDEHYDES, KETONES AND ACIDS

Phenols: Acidic character of phenols- effect of substituents on acidity of phenols - Mechanisms of Kolbe's reaction and Riemer-Tiemen reaction. Preparation of cresols, catechol, resorcinol, quinol and euginol. **Aldehydes and ketones :**Preparation and uses of cinnamaldehyde. Coumarin, vanillin, Michler's ketone, p-benzoquinone-Quinone mono oxime tautomerism. Mechanism of Cannizaro reaction, benzoin condensation, Perkin reaction, Claisen reaction, Knovenagel reaction,Gattermann aldehyde synthesis and Houben –Hoesch synthesis. **Aromatic acids:** Ortho effect, preparation of mandelic acid, cinnamic acid and anthranilic acid. Preparation and uses of benzene-1,2- dicarboxylic acid, benzene-1,3- dicarboxylic acid and 1,4-dicarboxylic acid.

UNIT III REARRANGEMENTS

Rearrangement to electron-deficient carbon – 1,2 shift (Wagner-Meerwein rearrangement, pinacol rearrangement,Wolff rearrangement in Arndt-Eistert synthesis, benzil-benzilic acid rearrangement).

Aromatic rearrangements from oxygen to ring carbon (Fries rearrangement, Claisen rearrangement and benzidine rearrangement).

Rearrangement to electron-deficient nitrogen (Beckmann rearrangement, Schmidt rearrangement, Hofmann rearrangement, Curtius rearrangement).

Rearrangement to electron-deficient oxygen (Baeyer-Villiger oxidation, hydroperoxide rearrangement,cumene hydroperoxide-phenol rearrangement), Dakin reaction.

UNIT IV TERPENOIDS AND ALKALOIDS

Terpenes and terpenoids - classification - isoprene rule.

Elucidation of structure and synthesis of citral , limonene, menthol, α-terpineol and camphor.

Alkaloids: Introduction, classification and general methods for the determination of structure.

Structural elucidation and synthesis of conine,piperine and nicotine

UNIT-V ORGANIC SPECTROSCOPY

UV spectroscopy - chromophore – auxochrome – blue shift, red shift – hypochromic shift, hyperchromic shift – applications for studying functional groups,cis-trans isomerism and nature of double bonds- Woodward-Fischer rules as applied to conjugated enes and alpha and beta unsaturated ketones.

IR spectroscopy–characteristics of IR absorption frequencies – intermolecular and intramolecular hydrogen bonding – functional group detection.

NMR Spectroscopy - interpretation of NMR spectra of simple organic compounds such as acetone, anisole, benzaldehyde, isobutene, mesitylene, 1-chloropropane, ethyl methyl ketone, benzyl alcohol, and propionic acid.

Reference Books

1. K.S. Tewari, N.K. Vishil, S.N. Mehotra – A text book of org. chem – 1st edition, Vikas Publishing House Pvt Ltd., 2001, New Delhi.

2. P.L. Soni, Text Book of Organic chemistry, Sultans Chand, 1991, New Delhi,

3. Bahl and Arun Bahl, Organic Chemistry, S. Chand and Sons, New Delhi, 2005.

4. Gurdeep Chatwal, Reaction mechanisms and reagents in organic chemistry

5. O. P. Agarwal, Chemistry of Organic Natural Products, Vol 1 and 2, Goel Pub. House,2002.

6. Gurdeep Chatwal, Chemistry of Organic Natural Products, Vol 1 and 2, Goel Pub. House,2002

7. Y.R. Sharma, O.P. Vig, Elementary organic absorption spectroscopy – 1st edition, Goel Pulishers, 1997, Meerut

8. R. T. Morrison and R. N. Boyd, Organic Chemistry, 6th Edition, PHI Limited, New Delhi, 1992.

9. Jerry March, Advanced Organic Chemistry, 4th Edition, John Wiley and Sons, New York,1992.

10. S. H. Pine, Organic Chemistry, 5th Edition, McGraw Hill International Edition, Chemistry Series, New York, 1987.

MODEL QUESTION PAPER

SEMESTER-VI ORGANIC CHEMISTRY – IV

Time : 3 hours **Marks : 75**

Part A - (10x1=10 marks)

Answer ALL questions

Choose the Correct Answer

1) Glucose on reduction with sodium and ethanol gives

a) Sorbitol b) Maninitol c) Gluconic acid d)Sorbitol and Mannitol

2) Sorbitol and Mannitol are

a) Meso forms b) Epimers c) Enantiomers d) Pentoses

3) Nitrophenols are……than phenols

a) More basicb) More acidic C) Less acidic d) None

4) The Knovenagel reaction between benzaldehyde and malonic ester gives

a) Cinnamyl alcohol b) Cinnamic acid c) Benzoic acid d) Phthalic acid

5) Benzamide undergoes Hoffmann rearrangement to give

a) Benzoic acid b) Methyl amine c) Aniline d) N-Methyl aniline

6) Which among the following is intermolecular rearrangement

a) Fries rearrangement b) Benzidine rearrangement c) Hoffmann rearrangement d) None

7) Citral on oxidation gives

a) Citric acid b) Dipentene c) Geranic acid d) Gereneal

8) Ascorbic acid is usually known as

a) Vitamin-A b) Vitamin-C c) Vitamin-K d) Vitamin-E

9) In UV Spectroscopy increase in λmax is known as

a) Blue shift b) Red shift c) Hypsochromic shift d) Hyperchromic shift

10) The number of signals obtained in the NMR spectra of acetone is

a) 3 b) 6 c) 1 d) 2

Part B (5x5=25)

Answer all questions

11 a) Give any three tests to distinguish between Glucose and Fructose (OR)

b) Write a note on Starch

12 a) What happens when salicylaldehyde is subjected to Perkin's Reaction? (OR)

b) What is Houben-Hoesch synthesis?

13 a) Give one thermal rearrangement. Mention its type (OR)

b) Give any one rearrangement in which 1:2 shift occurs

14 a) What are Terpenoids? How are they classified? (OR)

b) How will explain Hofmann Exhaustive Methylation by taking conine as an example

15 a) Write in detail the applications of UV spectroscopy (OR)

b) Explain how hydrogen bond is detected by IR spectroscopy

Part C (5x8=40)

Answer all questions

16 a) Discss the constitution of fructose (OR)

b) How are the following conversions effected?

i) glucose to fructose ii) fructose to glucose

17 a) Give the mechanism of the following

i) Benzoin condensation ii) Riemer-Timer reaction (OR)

b) How are the following prepared?

i) Cinnamaldehyde ii) Benzophenone iii) Anthranilic acid iv) Rescorcinol

18 a) Discuss the mechanism of the following

i) Benzil-benzilic acid rearrangement ii) Pinacole-Pinacolone rearrangement (OR)

b) Explain the mechanism of the following

i) Hofmann rearrangement ii) Beckmann rearrangement

19 a) How will you elucidate the structure of Nicotine (OR)

b) Discuss the determination of structure of citral.

20 a) Write notes on

i) Chromophore ii) Auxochrome iii) Red shift iv) Blue shift (OR)

b) Draw and explain the NMR spectra of the following

i) Anisole ii) Benzaldehyde iii) Ethyl methyl ketone iv) Propionic acid

SEMESTER VI

MAJOR ELECTIVE-II

GREEN CHEMISTRY

L	T	P	C
4	0	0	4

Objectives

- To introduce the basics and need for Green Chemistry
- To understand the principles and designing a green synthesis of selected compounds
- To make the students familiar with the usage of green solvents and green catalysts in chemical reactions.
- To learn the principles of the microwave and ultrasound assisted reactions.

UNIT- I Introduction to green chemistry

Definition – need for green chemistry – scope of green chemistry.

Concept of atom economy – yield – mass intensity and atom economy.

Calculation of atom economy, mass intensity, mass productivity and carbon efficiency.

Different types of reactions and atom economy - addition, substitution, elimination and rearrangements.

Concept of selectivity – enantioselectivity, chemoselectivity, regioselectivity and diasterioselectivity.

UNIT- II Green solvent

Super critical fluids – Introduction – extraction of super critical fluids – solvents of super critical fluid– advantages and applications.Carbondioxide as a super critical fluid – features of technique for using super critical carbondioxide - advantages and applications.Chemical reactions in supercritical water and Near – Critical Water (NCW)- Region. Extracting natural products, dry cleaning, supercritical polymerization, hydrogenation and hydroformylationlonic liquid as green solvent : Introduction – synthesis of ionic liquids - acidic ionic liquid and neutral ionic liquids – applications in organic synthesis. Green reagents : Dimethyl carbonate and Polymer supported reagents.

UNIT- III Green catalyst

Catalysis over view : acid catalyst - basic catalyst – oxidation catalyst – polymer supported catalyst- photosensitized super acid catalyst and Tetra Amido Macrocylic Ligand (TAML) catalyst.

Biocatalyst : microbial oxidation, microbial reduction, enzyme catalyzed hydrolytic process, per fluorinated catalyst and modified biocatalyst.

Development of mesoporous supports by liquid crystal templating – neutral templating methods-heterogeneous catalyst – solid supported catalyst.

UNIT- IV Green synthesis

Green synthesis of the following compounds -Adipic acid, Catechol, Benzoyl bromide, Acetaldehyde, Citral, Ibruprofen and Paracetamol

Microwave assisted reactions in water – Hoffmann Elimination, Hydrolysis of benzyl chloride and methyl benzoate – oxidation of toluene and alcohols

Microwave assisted reactions in organic solvents – Esterification, Fries rearrangement, Clasien Rearrangement, Diels-Alder Reaction and Decarboxylation. Ultra sound assisted reactions – Esterification, Saponification, alkylation , oxidation, reduction, coupling reactions and Cannizaro reactions.

UNIT -V Green reactions invloving basic principle of green chemistry.

Twleve principle of green chemistry – choice of starting materials – biomimitic, multifunctional reagents – materials reagents.

Combinatorial green chemistry – green chemistry in sustainable developments.

Importance of Green chemistry in day to day life, versatile bleaching agents and analgeric drugs.

References

1. V.K.Ahluwallia &M.R Kidwai "New Trends in Green Chemistry", Anamalaya Publishers (2005)

2. P.T.Anaster &J.K.Warnerr " Oxford Green Chemistry,Theory and Practical",University Press(1998)

3. A.S. Matlack,'' Introduction to Green Chemistry"-Marcel Deckkar (2001)

4. V.K.Ahhluwallia, "Green Chemistry Environnmentally Benign Reaction"Ane Books Pvt.Ltd. New Delhi (2009)

5 Rashmi Sannghi &MM Srivastava, "Green Chemistry Environment Friendly Alternatives." Narosa Publishing House Pvt Ltd, New Delhi (2009)

MODEL QUESTION PAPER

Major Elective –GREEN CHEMISTRY.

Maximum -75 marks

PART- A (10x1 =10 marks)

Time – Three hours
Answer ALL questions

Choose the correct answer

1. Find the term missing in Risk = Hazard x----------

(a) exposure (b) bengin (c) reactivity (d) rate

2. Division of the total mass of a chemical reaction by the mass of product gives

(a) mass intensity (b) mass productivity (c) carbon efficiency (d) yield

3. Solvent which do not pollute the environment is known as

(a) pure solvent (b) green solvent (c) good solvent (d) poor solvent

4. Select the coolant in refrigerator

(a) CFC (b) CCl_4 (c) $CHCl_3$ (d) HCHO

5. Select the greenest solvent

(a) formaldehyde (b) benzene (c) water (d) ethanol

6. Example of green chemistry

(a) carpet (b) bioplastics (c) sublimation (d) rubber

7. Production of fructose from glucose is catalysed by enzyme

(a) glucose isomerase (b) fructose isomerase (c) sucrose isomerase (d) invertase

8.Select the catalyst used in the synthesis of polymer from soyabean oil

(a)TAML (b) Al_2O_3 (c) Si_2O_3 (d) $CaCo_3$

9. Hydrolysis of benzyl chloride gives

(a) benzyl alcohol (b) benzal alcohol (c) phenol (d) butyl alcohol

10.Oxidation of toluene with potassium permanganate gives

(a) phthalic acid (b) benzoic acid (c) tolueic acid (d) phenol

PART- B (5x5=25 marks)

Answer all the questions choosing either (a) or (b)

11. (a) Define atom economy? Calculate the atom economy of the following reaction.

$$CH_3CH_2COOCH_2CH_3+CH_3NH_2 \longrightarrow CH_3CH_2CONHCH_3 + C_2H_5OH$$

(OR)

(b) What is yield? Find the yield of the following reaction.

$$C_2H_5OH + CH_3COOH \longrightarrow CH_3COOC_2H_5 + H_2O$$

12 (a) Draw the phase diagram of CO_2 and explain its super critical state.

(OR)

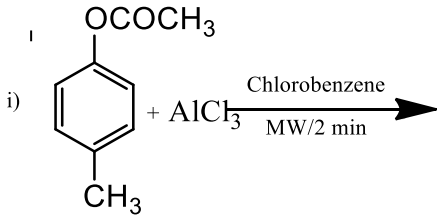
(b) Discuss super critical polymerisation with examples.

13 (a) Discuss the role of biocatalyst in green chemistry.

(OR)

(b) Explain acid and basic green catalyst with examples.

14 (a) Complete the following reaction.

i) 

ii) $C_6H_5CONHC_6H_5 \xrightarrow[MW/\ 12\ sec]{20\ \%\ H_2SO_4}$

(OR)

(b) Explain saponication and esterification reactions carried out using ultrasound technique.

15 (a) Discuss the role of green chemistry in sustainable developments.

(OR)

(b) Explain the term biomimitic in green chemistry.

PART –C (5x8=40 marks)

Answer all questions choosing either (a) or (b)

16 (a) (i)Explain the term yield, mass intensity and mass productivity.

(ii) Calculate the atomic economy of an addition and elimination reaction.

(OR)

(b) Explain the following terms with suitable example.

(i) enantioselectivity (ii) chemoseletivity.

17 (a) Explain the various organic reactions in

(i)Super Critical Water (ii) Near Critical Water Region

(OR)

(b) Discuss the role of ionic liquid as green solvent in organic reaction.

18 (a) What is TAML? Give its structure, properties and applications.

(OR)

(b)(i) Explain the role of polymer supported catalyst.

(ii)Discuss neutral templating method of preparing mesoporous silica.

19 (a) Give the green synthesis of the following compound.

(i) Ibuprofen (ii) Paracetamol

(OR)

(b) Explain the following reaction assisted by microwaves.

(i) Hoffman elimination (ii) Claisen rearrangement

20 (a) Discuss the twelve principles of green chemistry with suitable example.

(OR)

(b) Explain the important role of green chemistry in day to day life.

SEMESTER VI

MAJOR ELECTIVE-II

NANO CHEMISTRY

L	T	P	C
4	0	0	4

Objectives

- To give an insight into the basics of nanochemistry.
- To understand the difference between bulk material and nanomaterial and learn the synthesis, application and fabrication of nanostructure.
- To study the importance of nanocatalyst, nanocomposites and fibers.
- To make the students familiar with the characterization and applications of nanomaterials.

UNIT- I Introduction to Nano chemistry.

Definition: nanoscience – nanotechnology – nanochemistry – significance of nanoscale - factors responsible for special properties of nanomaterials.

Nanomaterials: Different types of nanomaterials and structures- quantum wells – quantum wires – quantum dots – nanoclusters – nanocrystals – nanowires and nanotubes.

Feynman's Prophecy– manufacturing of nanomateris - top-down and bottom-up approaches.

UNIT-II Synthesis of nano particles.

Introduction – orientation of nanoparticles – synthesis of nanoparticles.

Physical methods: laser ablation, physical vapour deposition (PVD) and solvated metal atom dispersion (SMAD).

Chemical methods: thermolysis, sonochemical method, reduction methods, phase-transfer processes and biosynthesis of nanoparticles.

Synthesis of nanosized semiconductors: precipitation methods and thermal decomposition of complex precursors.

Synthesis of ceramics: physical methods, gas condensation method, laser method, chemical methods and sol-gel synthesis.

UNIT –III Nanocatalyst and carbon based nanomaterials

Inroduction – fundamentals of catalysis – adsorption of a molecule on a catalyst surface, adsorption theory- Langmuir adsorption isotherm.

Surface reactions – synthesis – synthesis requirements, example of a conventional synthetic technique, non traditional methods for preparing nanocatalyst.

Characterization of nanocatalyst : overview - bulk characterization technique and surface characterization technique

Carbon nanomaterials : structure and properties of graphite, diamond and fullerenes.

UNIT-IV Nanocomposites and fibers.

Introduction - Background - types of composite materials - The nano perspective.

Physical and chemical properties of materials – mechanical properties, thermal properties, electronic properties and chemical properties.

Natural nanocomposities - Skin of the sea cucumber and hard natural nanocomposites.

Carbon fibers and nanotubes – Types of fibers, Whiskers and nanotubes – synthesis of fibers and nanotubes - chemical modification and applications of carbon nanotube.

Metal and Ceramic nanocomposites - Metal nanocomposites, inorganic nanofibers and concrete.

Clay nanocomposite materials -polypropylene clay nanocomposite , mont morillonite clay nanocomposite and halloysite nanotube claycomposites.

UNIT-V Characterization and applications of nanomaterials.

Types of characterization methods – Electron probe method- Scanning electron microscopy – Transmission electron microscopy,

Spectroscopyic Methods, - UV – Visible adsorption and emission spectroscopy, Infra Red and Raman spectroscopy and X-ray diffraction methods.

Current applications: sunscreens and cosmetics – nano medicine, drug delivery and cancer drugs – food and drinks, textiles, chemical industry and electronic devices.

Short term applications - paints – fuel cells – displays – batteries – fuel additives and catalysts.

Long term applications- composites – lubricants – magnetic materials – medical implants – machinable ceramics – water purification and military battle suits.

References

1. Geoffrey A. Ozin and Andre C. Arsenault, “Nanochemistry: A chemical approach to nanomaterials”, RSC publishing, (2005), U.K.
2. Hari Singh Nalwa, “Nanostructured Materials and Nanotechnology”, Academic Press, New York,(2002).
3. C.N.R. Rao, A. Muller and A.K. Cheetham, “The Chemistry of Nanomaterials, Volume I & II”, Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim, (2004).
4. Kenneth J. Klabunde, “Nanoscale Materials in Chemistry”, Wiley-Interscience”, New York,(2001).
5. Gabor L.Hornyak, Harry F. Tibbals, Joydeep Dutta and John J Moore . “Inroduction to Nanoscience and Nanotechnology” CRC Press ,Taylor and Francis group London Newyork.

MODEL QUESTION PAPER

MAJOR ELECTIVE- NANO CHEMISTRY

Time - Three hours **Maximum – 75 marks**

PART-A (10x1 =10 marks)

Answer ALL questions

Choose the correct answer

1. Zeolite is an example of

   (a) nanotube (b) nanowires (c) nanocrystals (d) nanoporous solid

2. Nanocluster is a collection of atoms or molecules of about ---------- units.

   (a) 50 (b) 25 (c) 75 (d) 100

3. Gold nanoparticles are prepared by sonication of chloro auric acid in the presence of

   (a) benzene (b) alcohol (c) ether (d) none

4. Platinum nanoparticles are mainly used in

   (a) industries (b) biomedical (c) hydrogen storage (d) magnetic field

5. Heterogeneous material with superior properties in which one phase is dispersed within another is

   (a) nanocrystal (b) nanocomposite (c) nanoparticle (d) none

6. Spider silk is ------- times tougher than steel of the same mass

   (a) 5 (b) 10 (c) 15 (d) 20

7. Nanoscale material within which the motion of electrons is confined in the x,y and z direction is

   (a) quantum wells (b) quantum dots (c) quantum wires (d) none

8. IR spectroscopy methods rely on -------vibrations

   (a) asymmetrical (b) symmetrical (c) non symmetrical (d) none

9. Hydrogenation reaction requires the ---------form of catalyst

   (a) oxide (b) metal (c) halide (d) nitride

10. Gold nano particle is -------charged

    (a) positive (b) negative (c) neutral (d) none

PART-B (5 x 5 = 25 marks)

Answer ALL questions choosing either (a) or (b)

11 . (a) Discuss the term quantum wells and quantum dots.

(OR)

(b) Explain the various factors responsible for special properties of nanomaterials.

12. (a) How will you synthesis nanoparticle by physical vapour deposition method.

(OR)

(b) Explain the synthesis of ceramics by sol-gel method.

13. (a) Explain surface reactions with suitable examples.

(OR)

(b) Discuss the synthesis and properties of fullerenes.

14. (a) Write notes on metal nanocomposites.

(OR)

(b) Explain the different types of clay nanocomposites.

15. (a) What is TEM? Explain the different types of images produced by TEM.

(OR)

(b) Write the applications of nanoparticles in medicine and cosmetics.

PART C (5x8=40 marks)

Answer ALL questions choosing either (a) or (b)

16. (a) (i) State Feynman's Prophecy

(ii) Explain the top-down and bottom-up approach of manufacturing of nanomaterials

(OR)

(b) Explain the term (i) nanocrysatal (ii) nanoclusters

17. (a) (i) Discuss the biosynthesis of nanoparticles.

(ii) Explain the synthesis of nanomaterials by phase –transfer processes.

(OR)

(b) Explain the precipitation method and thermal decomposition method of synthesis of nano sized semiconductors.

18 (a).(i) State the important principles of adsorption theory.

(ii) Derive Langmuir adsorption isotherm and explain.

(OR)

(b). Discuss the different methods of Bulk characterization technique.

19 (a). Discuss the physical and chemical properties of nanocomposite.

(OR)

(b) Explain the synthesis, properties and applications of carbon nanotube.

20 (a) Explain the various components and working of Scanning Electron Microscopy.

(OR)

(b). Write the applications of nanoparticles in fuel cells, fuel additives and batteries.

MAJOR PRACTICAL PAPER VII

(VI SEMESTER)

PHYSICAL CHEMISTRY EXPERIMENTS

L	T	P	C
0	0	4	2

Objectives

- To enable the students to understand the principles of physical chemistry experiments

1. Determination of molar mass of the given substance by Rast macro method
2. Determination of molecular weight of the given substance by Transition temperature method
3. Determination of solubility of a substance at different temperatures and calculation of heat of solution
4. Study of adsorption of oxalic acid on charcoal and verification of Freundlich isotherm
5. Study of phase equilibrium – Simple eutectic
6. Estimation of HCl by conductometric method using standard oxalic acid (to be prepared) and link NaOH
7. Estimation of $MgSO_4$ by conductometric method using standard $MgSO_4$ (to be prepared) and link $BaCl_2$
8. Estimation of Fe(II) by potentiometric method using standard ferrous ammonium sulphate (to be prepared) and link $KMnO_4$
9. Estimation of $KMnO_4$ by potentiometric method using standard $K_2Cr_2O_7$ (to be prepared) and link ferrous ammonium sulphate
10. Determination of equivalent conductance of weak electrolyte and calculation of dissociation constant
11. Comparison of the strengths of acids by studying the kinetics of ester hydrolysis

12. Determination of CST of phenol-water system. Study of the effect of impurity on CST and determination of the strength of unknown

Internal – 50 marks

25 marks - Regularity

25 marks – Average of best six experiments in regular class work

External -75 marks

10 marks – Record (atleast six experiments)*

10 marks – Procedure (5+5)

30 marks – Experiment

*Experiments done in the class alone should be recorded

(Students having a bonafide record only should be permitted to appear for the practical examination)

Reference books:

1. J.N. Gurthu and R. Kapoor, Advanced Experimental Chemistry, S. Chand and Co., 1987.
2. Sundaram, Krishnan, Raghavan, Practical Chemistry (Part II), S. Viswanathan Co. Pvt., 1996.
3. David P. Shoemaker, Carl W. Garland, Joseph W. Nibler, Experiments in Physical Chemistry, 5th Edi., McGraw- Hill Book company, 1989.
4. Alexander Findlay and J.A. Kitcher. Practical Physical Chemistry, Longmans
5. Y.B. Yadav, Practical Physical Chemistry, Goel publishing house

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1. Sundaram, Krishnan, Raghavan, Practical Chemistry (Part III), S. Viswanathan Co. Pvt., 1996.
2. Vogel's Text Book of Quantitative Chemical Analysis. 5th Edi., ELBS/Longman England, 1989.
3. O.P. Pandey, D.N Bajpai, S. Gini, Practical Chemistry, for I, II & III BSc. Students. S.Chand & Company Ltd reprint 2009.
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7. B.S. Furniss, A.J. Hannaford, P.W. G. Smith and A.R. Tatchell, Vogel's Text Book of Practical Organic Chemistry. 5th Edn., Pearson Education, 2005.
8. O.P. Pandey, D.N Bajpai, S. Gini, Practical Chemistry, for I, II & III BSc. Students. S.Chand & Company Ltd reprint 2009.
9. P.R.Singh, D.C.Gupta, K.S.Bajpal Experimental Organic Chemistry Vol.I and II, 1980.