MANONMANIAM SUNDARANAR UNIVERSITY TIRUNELVELI

Syllabus for B.Sc. Chemistry Major & Allied Chemistry (I & II Semesters)

(With effect from the academic year 2020-2021 onwards)

(I& II Semesters)

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.

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

SEM	Part	SUB. No	SUBJECT STATUS	SUBJECT TITLE	contact hrs /wk	L hrs /wk	P hrs /wk	Credits
I	I	1	Language	Tamil/Other Languages	6	6	0	4
	II	2	Language	Communicative English	6	6	0	4
	III	3	Core – Paper I	Physical Chemistry – I	4	4	0	4
	III	4	Major Practical - I	Inorganic Quantitative (Volumetric) Analysis - I	2	0	2	2
	III	5	Add on Major (Mandatory)	Professional English for Physical Sciences – I	4	4	0	4
	III	6	Allied Paper – I	Allied Chemistry – I	4	4	0	3
	III	7	Allied Practical-I	Allied Chemistry Practical- I	2	0	2	2
	IV	8	Common Paper	Environmental Studies	2	2	0	2
			SUB TOTAL		**30**	**26**	**4**	**25**
II	I	9	Language	Tamil/Other Languages	6	6	0	4
	II	10	Language	English	6	6	0	4
	III	11	Core – Paper II	Inorganic Chemistry – I	4	4	0	4
	III	12	Major Practical - II	Inorganic Quantitative (Volumetric) Analysis - II	2	0	2	2
	III	13	Add on Major (Mandatory)	Professional English for Physical Sciences-II	4	4	0	4
	III	14	Allied Paper – II	Allied Chemistry – II	4	4	0	3
	III	15	Allied Practical-II	Allied Chemistry Practical- II	2	0	2	2
	IV	16	Common Paper	Value Based Education /சமூகஒழுக்கங்களும் பண்பாட்டு விழுமியங்களும் / Social Harmony	2	2	0	2
			SUB TOTAL		**30**	**26**	**4**	**25**

4. 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**

5. 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 :

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

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

6. 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 – I PAPER-I

PHYSICAL CHEMISTRY –I

L	T	P	C
4	0	0	4

Objectives

To learn different states of matter

To understand the basic concepts of photo chemistry and nuclear chemistry

To study dilute solutions

UNIT I –GASEOUS STATE

Concept of ideal and real gases, gas laws postulates of kinetic theory of gases (no derivation)

Types of molecular velocities and their inter relations - mean, rms, most probable velocities - Calculation of most probable velocity, average velocity and root mean square velocity Maxwell's distribution of molecular velocities, statement of equation and explanation (no derivation) – graphic representation - effect of temperature on velocity distribution. Collision diameter - collision number - collision freqeuency - mean free path – Degrees of freedom of gaseous molecules - principle of equipartition of energy - heat capacity and molecular basis. Viscosity of gases and effect of temperature and pressure on coefficient of viscosity.

UNIT - II PHOTO CHEMISTRY

Difference between thermal and photochemical reactions, primary and secondary reactions - Laws of photochemistry – Beer Lambert law, Grotthus - Draper law, Stark-Einstein law - Quantum efficiency – experimental determination of quantum yield.

Energy transfer in photochemical reactions – Jablonski diagram - radiative and non radiative transition - internal conversion, intersystem crossing - qualitative description of fluorescence, phosphorescence - chemiluminescence, bioluminescence, thermoluminescence, photosensitization and quenching - photochemical reactions - kinetics of hydrogen-chlorine, reaction and decomposition of HI. Lasers – principle, types and uses.

UNIT - III NUCLEAR CHEMISTRY

Natural radioactivity - detection and measurement of radioactivity – Geiger Nuttal rule - rate of disintegration and half life period - average life period - nuclear stability, n/p ratio, magic

number, mass defect and binding energy - liquid drop model - shell model - isotopes, isobars, isotones and isomers. Artificial radioactivity - nuclear fission and nuclear fusion – mechanisms – applications - differences – Stellar energy - nuclear reactors - hazards of radiations - fertile and fissile isotopes. Applications of radioisotopes – C^{14} dating, rock dating, neutron activation analysis and isotope as tracers - study of reaction mechanism.

UNIT - IV SOLID STATE

Difference between crystalline and amorphous solids - isotropy and anisotropy - crystal lattices – Lattice energy –Born equation and its derivatives laws of crystallography - elements of symmetry of crystals - crystal systems - unit cell - space lattice - Bravais lattices - Miller indices - cubic and hexagonal packing – radius ratio rule – tetrahedral and octahedral voids

Bragg's equation, derivation and applications - determination of structure of crystals by X-ray diffraction methods - rotating crystal and powder method, structure of NaCl, KCl and ZnS. Imperfections in a crystal - Schottky defects, Frenkel defects, Nonstoichiometric defects - use of crystallographic data for the determination of Avogadro number and molecular mass

UNIT - V DILUTE SOLUTIONS

Colligative properties of dilute solutions: relative lowering of vapour pressure, elevation of boiling point, depression of freezing point and osmotic pressure,Ebullioscopic constant-Cryoscopic constant- Relation between colligative properties and Molecular mass –Osmosis-osmotic pressure-.laws of osmotic pressure -osmotic pressure and concentration of solute-Experimental methods for determining various colligative properties, degree of dissociation and association of solutes Abnormal molecular mass – Van't Hoff factor.

Reference books:

1. Principles of physical chemistry - Puri, Sharma and Pathania, Millennium Edition, Vishal Publishing Co
2. Text Book of physical chemistry - P.L. Soni - Sultan Chand.
3. Atkins' Physical chemistry, 9th Edition, Oxford University Press.
4. Advanced Physical Chemistry - Gurdeep Raj, Goel Publishing House.
5. Physical Chemistry, G.M.Barrow, Tata McGraw Hill.
6. Source book of Atomic Energy.Samuel Glastone, East west press

SEMESTER – I
PHYSICAL CHEMISTRY -I
(For those who joined in July 2020 onwards)

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

PART-A **10 × 1=10**

Answer all the Questions

Choose the Correct Answer

1. The energy of molecule per degree of freedom is given by

   a) ½ RT b) ½ kT c) 3/2 RT d) 3/2 kT

2. Which of the following relation is true for a ideal gas ?

   a) $C_P + C_V = R$ b) $C_P / C_V = R$ c) $C_P - C_V = R$ d) $C_P \times C_V = R$

3. The emission light from a chemical reaction is called ---------

   a) Bioluminescence b) Phosphorescence c) Chemiluminescence d) None of these

4. Phosphorescence light is emitted from --------- transition of excited species

   a) $S_1 \rightarrow S_0$ b) $S_1 \rightarrow T_1$ c) $T_2 \rightarrow T_1$ d) $T_1 \rightarrow S_0$

5. Which of the following is used as moderator in a nuclear reactor ?

   a) Petroleum b) Coal gas c) Coal d) Cadmium

6. The energy released in stars is called --------

   a) Stellar energy b) solar energy c) Electrical energy d) None of these

7. The number of atoms / ions per unit cell FCC arrangement is

   a) 3 b) 5 c) 4 d) 6

8. The number of kinds of space lattices are possible in a crystal is

   a) 28 b) 14 c) 140 d) 20

9. Which of following is called collegative properties ?

   a) lowering of vapour pressure b) Elevation of boiling points

c) Osmotic pressure d) All of these

10. Abnormal moleculer masses are obtained in which of the following ?

a) Association of molelcules b) Dissociation of molecules

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

Part B - (5 x 5 = 25 marks)

Answer ALL Questions, choosing either (a) or (b):

11.a) What are most probable, root mean square and average velocities? How are they inter related ?

OR

b) Write a note on principle of equipartition of energy

12.a) Compare thermal and photochemical reaction

OR

b) What is photosensitization ? Explain with example

13.a) Explain nuclear fission and fusion reaction with examples .

OR

b) Write applications of isotopes in medicinal field

14.a) Discuss the laws of crystallography

OR

b) Explain HCP and CCP arrangements .

15.a) Write a note on relative lowering of vapour pressure.

OR

b) Determine Osmatic pressure by Berkely and Hartely's method .

Part C - (5 x 8 = 40 marks)

Answer ALL Questions, Choosing either (a) or (b):

16.a) Derive the Maxwell distribution of molecular velocities

OR

b) i) What are C_P , C_V and γ ? Calculate C_P , C_V and γ values for mono atomic gas.

ii) Write a note on viscosity .

17.a) What is quantum yield ? How it is determined using chemical actinometer?

OR

b) Explain briefly i) Principle of Laser ii) Types of Laser

iii) Applications of Laser

18.a) Write notes on

i) Liquid drop model of nuclear reaction

ii) Nuclear isomerism

OR

b) i) Explain briefly nuclear reactor

ii) What are radiation hazards ?

19.a) What is lattice energy ? Derive Born-Lande equation.

OR

b) Whar are stoichiometric defects ? Explain its two types .

20.a) Derive the relation between elevation of boiling points and concentration. Using this determine the molecular weight of solute .

OR

b) i) What is osmosis ? Discuss its Laws .

ii) Write notes on Van't Hoff factor .

SEMESTER – I PAPER-II

ADD ON MAJOR (MANDATORY)

PROFESSIONAL ENGLISH FOR PHYSICAL SCIENCES-I

L	T	P	C
4	0	0	4

OBJECTIVES:

- To develop the language skills of students by offering adequate practice in professional contexts.
- To enhance the lexical, grammatical and socio-linguistic and communicative competence of first year physical sciences students
- To focus on developing students' knowledge of domain specific registers and the required language skills.
- To develop strategic competence that will help in efficient communication
- To sharpen students' critical thinking skills and make students culturally aware of the target situation.

LEARNING OUTCOMES:

- Recognise their own ability to improve their own competence in using the language
- Use language for speaking with confidence in an intelligible and acceptable manner
- Understand the importance of reading for life
- Read independently unfamiliar texts with comprehension
- Understand the importance of writing in academic life
- Write simple sentences without committing error of spelling or grammar

(Outcomes based on guidelines in UGC LOCF – Generic Elective)

NB: All four skills are taught based on texts/passages.

UNIT 1: COMMUNICATION

Listening: Listening to audio text and answering questions -Listening to Instructions, **Speaking**: Pair work and small group work,**Reading:** Comprehension passages –Differentiate between facts and opinion,**Writing:** Developing a story with pictures**,Vocabulary:** Register specific - Incorporated into the LSRW tasks

UNIT 2: DESCRIPTION

Listening: Listening to process description.-Drawing a flow chart, **Speaking:** Role play (formal context), **Reading:** Skimming/Scanning- Reading passages on products, equipment and gadgets. **Writing:** Process Description –Compare and Contrast, Paragraph-Sentence Definition and Extended definition-Free Writing. **Vocabulary:**Register specific -Incorporated into the LSRW tasks.

UNIT 3: NEGOTIATION STRATEGIES

Listening: Listening to interviews of specialists / Inventors in fields (Subject specific), **Speaking**: Brainstorming.(Mind mapping). Small group discussions (Subject- Specific) **Reading:** Longer Reading text, **Writing:** Essay Writing (250 words),**Vocabulary:** Register specific - Incorporated into the LSRW tasks

UNIT 4: PRESENTATION SKILLS

Listening: Listening to lectures, **Speaking:** Short talks, **Reading:** Reading Comprehension passages, **Writing:** Writing Recommendations,Interpreting Visuals inputs **Vocabulary:** Register specific -Incorporated into the LSRW tasks

UNIT 5: CRITICAL THINKING SKILLS

Listening: Listening comprehension- Listening for information, **Speaking**: Making presentations (with PPT- practice), **Reading**: Comprehension passages –Note making. Comprehension: Motivational article on Professional Competence, Professional Ethics and Life Skills) , **Writing:** Problem and Solution essay– Creative writing –Summary writing **Vocabulary:**Register specific - Incorporated into the LSRW tasks

SEMESTER –I

PROFESSIONAL ENGLISH FOR PHYSICAL SCIENCES-I
(For those who joined in July 2020 onwards)

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

PART A **Answer ALL Questions** **10 x 1 = 10 marks**

Choose the Correct Answer:

1. Who was the first Indian Scientist awarded the Noble Prize?

a. C.V.Raman b.J.J.Thomson c. S.Ramanujan d. Isac Newton

2.Who was the first Rocket Man of India?

a. Asoka b. Tipusultan c. Pandiya d. Narsima

3. Jean Chancel was the instrumental in creating the first match in Paris in

a. 1905 b. 1710 c. 1810 d. 1805

4. Which of the following light was emitted in earliest LED'S?

a. UV b. Visible c. X-ray d. Infrared

5. What are the Antonyms of the following words

i. Unimaginative ii. Instability

6. Which of the following light with stimulated emission ?

a. X-ray b. γ-ray c.Laser d. UV-ray

7. Which can be used as an alternative to petroleum?

a. Bio mass b. Naphthalene c. Paraffin d. None of these

8. Who invented Cosmic rays?

a. Victor Hess b. Marie Curie c. J.J.Thomas d. Rutherford

9. Earthquakes and Tsunamis are _____phenomena

a. Sub terrain b. Heat wave c. Flood d. Volcanic eruption

10. What are subatomic particles ?

a. Proton b.neutron c. electron d. All of these

Part B (5 x 5 = 25 marks)

Answer ALL the Questions, Choosing either (a) or (b):

11a. Match the following:

i. Crystal Dynamic - a frequency above the human ear's audibility

ii Hypersonic - the vibrational movement of atoms in the solid state

iii Ultrasonic - Speed of more than 5 Mach

iv Optics - concerned with the properties of sound

v Acoustics - studies the behaviour and properties of light

OR

b. Who found the saccharine? What do you know about the patenting of scientific products?

12a. Write notes on the use and their impact of the following

i Mobile Phone ii Microwave oven

OR

b. Write the sentences for the following with the articles.

i. Abacus ii Lathe iii Acoustics iv . Burette

13a. What are the goals of artificial intelligence

OR

b. Discuss about biofuels

14a. Write a note on gravity

OR

b. Draw the pie-chart of child Labour in different states of India.

15a. What is PYTHAGOREAN theorem? Write its uses.

OR

b. Write the great achievement of ISRO

Part C (5 x 8 = 40 marks)

Answer ALL the questions, Choosing either (a) or (b):

16a. i. Write a note on Raman effect

ii. What is HCQ ? Discuss it's uses.

OR

b. i. Briefly describe Marie Curie's contribution to the field of Science.

ii. Discuss about Vaseline importance.

17a. Write the definitions of the following

i. Barometer ii. Computer iii. Gobber gas plant iv. Microphone

OR

b. Explain briefly about LED'S

18a. Discuss the scientific importance of soap bubble

OR

b. Discuss the principle and achievements of Robotics

19a. What do you know about Kalpana Chawla and write her achievements in space.

OR

b. Explain discovery of Radio and its feature

20a. What are Satellites? Explain their uses in the form of power point.

OR

b. Wrtie an essay on BIG-BANG theory

B.Sc CHEMISTRY PRACTICALS

MAJOR PRACTICAL PAPER I

INORGANIC QUANTITATIVE (VOLUMETRIC) ANALYSIS -I

L	T	P	C
0	0	2	1

Objectives

1. To enable the students to acquire the quantitative skills in volumetric analysis.
2. At the end of the course, the students should be able to plan experimental projects and execute them.

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

Iodometry

7. Estimation of copper – Std. copper sulphate
8. Estimation of $K_2Cr_2O_7$ – Std. $K_2Cr_2O_7$

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)

Reference books:

1. G.H.Jeffery, J.Bassett, J.Mendham and R.C.Denny 'Vogel's Text book of Quantitative Chemical Analaysis' 5th Edition ELBS.
2. I.M.Kolthoff and E.A.Sanderson, Quantitative Chemical Analysis, S Chand
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)

SEMESTER I

ALLIED CHEMISTRY – I

L	T	P	C
4	0	0	3

Objectives

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 reactions

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.

SEMESTER- I

ALLIED CHEMISTRY - 1

(For those who joined in July 2020 onwards)

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

Part A - (10 x 1 = 10 marks)

Answer ALL Questions

Choose the Correct Answer

1. Which of the following has ionic bond ?

(a) NaCl (b) KCl (c) $CaCl_2$ (d) All the above

2. The hybridisation in $BeCl_2$ is

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

3. Free radicals are species with

(a) positive charge (b) negative charge (c) odd electron (d) neutral charge

4. Which one of the following is an electrophile?

(a) OH^- (b) NO_2^+ (c) NH_3 (d) H_2O

5. In phosphorescence, one of the following change takes place

(a) $S_1 \rightarrow S_0$ (b) $S_0 \rightarrow S_1$ (c) $T_1 \rightarrow S_0$ (d) $S_2 \rightarrow S_1$

6. Chlorophyll is an example for

(a) activator (b) photosensitizer (c) inhibitor (d) promoter

7. Which of the following is a natural polymer?

(a) Nylon (b) Polyester (c) Polythene (d) Silk

8. The monomer of PVC is

(a) Ethylene (b) Vinyl chloride (c) Styrene (d) Tetrafluoroehylene

9. A lubricant is capable of reducing

(a) density (b) Friction (c) viscosity (d)temperature

10. Chalk piece is manufactured from

(a) Soda ash (b) Soda lime (c) Plaster of Paris (d)Baking soda

Part B - (5 x 5 = 25 marks)

Answer ALL Questions, choosing either (a) or (b):

11. (a) What is hydrogen bond ? What are its types? Explain the types with examples.

OR

(b) Explain ionic bond with an example

12. (a) What is elimination reaction? Explain it with an example.

OR

(b)Distinguish between homolytic and heterolytic cleavage.

13. (a) State and explain Beer-Lambert's law.

OR

(b)Bring out the differences between thermal and photochemical reactions.

14. (a) Write the preparation and uses of Buna – N and Buna-S rubber.

OR

(b) Distinguish between thermoplastic and thermosetting plastic.

15. (a) What are the criteria of a good lubricating oil ?

OR

(b) Explain the preparation of sun screen and nail polish.

Part C - (5 x 8 = 40 marks)

Answer ALL Questions, Choosing either (a) or (b):

16.(a) Discuss VSEPR theory in the prediction of the shape of BF_3,NH_3 and PCl_5.

OR

(b) Explain i) Hund's rule ii) Pauli's exclusion principle and iii) Aufbau principle.

17.(a) What are carbanions ? Discuss their preparation and properties.

OR

(b)Explain the following with example.

(i) Addition reaction

(ii) Polymerisation reaction

(iii) Substitution reaction

18.(a) Define quantum yield. How is it experimentally determined?

OR

(b)Explain the following

(i) Fluorescence

(ii) Photosensitization

19.(a) Give the preparation and uses of PVC, Polystyrene, polyethylene and polypropylene

OR

(b) Give the preparation, properties and uses of Polyester and Nylon

20.(a) Give an account on solid lubricants and synthetic lubricating oils.

OR

(b)Outline the preparation of the following.

(i) Tooth paste

(ii) Boot polish

(iii) Moth ball.

Allied Chemistry Practical I

Inorganic Quantitative Analysis

L	T	P	C
0	0	2	1

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 II

INORGANIC CHEMISTRY – I

L	T	P	C
4	0	0	4

Objectives

To study the atomic structure from wave mechanical concept

To know the arrangement of elements in the periodic table and the periodic properties.

To understand the different kinds of chemical forces in molecules.

To know the nature of compounds formed by s- and p-block elements.

UNIT I –ATOMIC STRUCTURE

Atom models –Bohr's atom model –orbit and orbital-Dual nature of matter – deBroglie equation (verification not required) - Schrodinger wave equation and its applications (no derivation)- Eigen value and Eigen function-significance of Ψ and Ψ^2 –quantum numbers and their significance-principles governing the occupancy of electrons in various quantum levels, probability distribution of electron around the nucleus – radial probability distribution, Pauli's exclusion principle-Hund's rule, Aufbau principle, Stability of half-filled and fully filled orbitals

UNIT II – PERIODIC PROPERTIES

Long form of periodic table- classification as s, p, d and f block elements -periodicity in properties- variation of atomic and ionic radii, electron affinity, ionisation energy and electronegativity along periods and groups – various scales of electronegativity – Pauling, Mullikan and Allred Rochow's scale of electronegativity – factors affecting the magnitude of electronegativity – applications of electronegativity

UNIT III – CHEMICAL BONDING

Properties of ionic compounds- Lattice energy- definition- Born-Lande equation (derivation not required), factors affecting lattice energy, Born-Haber cycle-enthalpy of formation of ionic compound and stability. Covalent character in ionic compounds-polarization and Fajan's rule .

Valence bond theory – hybridization of atomic orbitals and geometry of molecules –sp, sp^2, sp^3, sp^3d, sp^3d^2 and sp^3d^3 hybridisation with examples. VSEPR theory- shapes of simple inorganic molecules – MO theory- applications of MOT to O_2, F_2, HF and CO- - Paramagnetism of O_2 , comparison of VBT and MOT.

UNIT IV – s-BLOCK ELEMENTS

Occurrence, General characters of s block elements , Position of Hydrogen in the periodic table, Chemistry of Li and Be- their anomalous behaviour and diagonal relationship, Hydrides (classification, general methods of preparation and salient features), hydration energies, solvation and complexation tendencies of alkali and alkaline-earth metals.

UNIT V – p-BLOCK ELEMENTS

Occurence , General characterstics of p block elements, Group study of 13-18 group elements-anamolous behaviour and diagonal relationship. Compounds such as hydrides-, halides, oxides and oxyacids-. Preparation, properties, bonding and structure of diborane, borazine and alkali metal borohydrides. Preparation, properties and technical applications of carbides and fluorocarbons. Silicones and silicates (structures only)-.Interhalogen compounds,

Reference Books

1. B. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry, Shoban Lal Nagin Chand and Co., Delhi, 1996.
2. P. L. Soni, Text Book of Inorganic Chemistry, 20th edition, 2001.
3. R. D Madan, Modern Inorganic Chemistry, S. Chand and company, 13th edition, 2005.
4. J. D. Lee, Concise Inorganic Chemistry, 5th ed., Blackwell Science, London, 1996.
5. F. A. Cotton, G. Wilkinson, C. Murillo and M. Bochman, Advanced Inorganic Chemistry, Wiley India, 6th edition, 2008.

SEMESTER- II

INORGANIC CHEMISTRY - I

(For those who joined in July 2020 onwards)

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

Part A (10 x 1 = 10 marks)

Answer ALL Questions

Choose the Correct Answer

1. de Broglie equation is _____.

a) $m\lambda = h/v$ b) $E = hv$ c) $\lambda = mv/h$ d) $E = h/mv$

2. The 'n' and 'l' values of 4d and 6f orbitals are _____.

a) 3,1 and 6,4 b) 4,2 and 6,3 c) 3,3 and 6,3 d) 4,3 and 6,4

3. Among the following, identify the species with sp^3 hybridization _____.

(i) BF_4^- (ii) NH_4^+ (iii) CH_4

a) i and ii b) ii and iii c) i, ii, and iii d) iii only

4. In NaCl crystal, the ions are held together by _____.

a) vanderwaals' attraction b) London forces c) Electrostatic repulsion d) electrostatic attraction

5. Shielding effect is not involved in _____.

a) diamagnetism b) effective nuclear charge c) lanthanide contraction d) Allred-Rochow scale

6. Which of the following has the highest electron affinity _____.

a) F b) Cl c) Br d) I

7. The strongest reducing among the following _____.

a) Na b) Be c) Li d) Mg

8. The formula of chrysoberyl _____.

a) $BeO_6.SiO_2$ b) $BeO.2Al_2O_3$ c) $BeO.Al_2O_3.6SiO_2$ d) $BeO.Al_2O_3$

9. Which of the following is called as "inorganic benzene" _____.

a) $B_3N_3H_6$ b) $B_3P_3H_6$ c) $B_3P_3H_{12}$ d) $B_3N_3H_{12}$

10. The most stable ion of the following _____.

a) Sn^{4+} b) Pb^{2+} c) Tl^{3+} d) Ar^{3+}

PART – B (5 × 5 = 25 Marks)

Answer ALL the questions, Choosing either (a) or (b):

11a) i) Give the expression of Schrodinger's time independent wave equation and define the terms involved.

ii) Sketch the radial probability distribution curves of 1s, 2s, and 3p orbitals.

OR

b) Discuss the physical significance of ψ and ψ^2

12a) Account for the following:

i) Electron affinities of halogens are high

ii) Radius of anion is larger than that of an atom

iii) Ionization energy increases along the period

OR

b) Discuss the features of long form of periodic table.

13a) Define lattice energy. Explain the various factors that affect lattice energy.

OR

b) Draw MO energy level of CO molecule and expalin.

14a) Describe complexes of alkali and alkaline earth metals

OR

b) Discuss the position of hydrogen in the periodic table.

15a) Write notes on fluorocarbons.

OR

b) What are silicones? Give their preparation and its applications

PART – C (5 × 8 = 40 Marks)

Answer ALL the questions, Choosing either (a) or (b):

16a) What you mean by Quantum numbers? Enumerate different types of quantum numbers.

OR

b) Explain giving examples, the factors governing special stability associated with half-filled and completely filled subshells.

17a) i. Explain the determination of electro negativity using Pauling's scale. (5)

ii. Calculate the % ionic character of a molecule composed of atoms A and B, if the electronegativity difference between the atom is 2.0 (3)

OR

b) i) Describe the factors that affect the electronegativity. (5)

ii) Explain how the atomic radius varies along the period and down the group.

18a) State Fajan's rule. Discuss how it is used to explain the covalent character in ionic compound.

OR

b) i. Give the postulates of VSEPR theory.

ii. Using VSEPR theory predict the structure of ClF_3 and SF_6.

19.a) i. What are Hydrides? Give the classification of hydrides.

OR

b) Discuss the diagonal relationship between Li and Be.

20a) Outline the general characteristics of P block elements

OR

b) i. Write the structure of diborane and explain the nature of bonding in it.

ii. Give any three chemical properties of borazole.

MAJOR PRACTICAL PAPER II

INORGANIC QUANTITATIVE(VOLUMETRIC) ANALYSIS -II

L	T	P	C
0	0	2	1

Objectives

1. To enable the students to acquire the quantitative skills in volumetric analysis.
2. At the end of the course, the students should be able to plan experimental projects and execute them.

Dichrometry

1.Estimation of ferrous iron – Std. ferrous ammonium sulphate

2.Estimation of $K_2Cr_2O_7$ – Std. $K_2Cr_2O_7$

Complexometry

3. Estimation of Zn – Std. $ZnSO_4$

4. Estimation of Mg– Std. $ZnSO_4$

5. Estimation of Pb – Std. $ZnSO_4$

6. Estimation of Cu – Std . $ZnSO_4$

7. Estimation of Ni - Std . $ZnSO_4$

8. Determine the Total hardness of water

Internal –50 marks

25 marks - Regularity

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

External -50 marks

10 marks – Record (atleast 4 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)

Reference books:

1. G.H.Jeffery, J.Bassett, J.Mendham and R.C.Denny 'Vogel's Text book of Quantitative Chemical Analaysis' 5th Edition ELBS.
2. I.M.Kolthoff and E.A.Sanderson, Quantitative Chemical Analysis, S Chand
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)

SEMESTER II

ALLIED CHEMISTRY - II

L	T	P	C
4	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.

SEMESTER- II

ALLIED CHEMISTRY - II

(For those who joined in July 2020 onwards)

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

Part A (10 x 1 = 10 marks)

Answer ALL Questions

Choose the Correct Answer

1. The $(4n + 2)$ π e^- system of aromatic system is

   a. Gilman's rule b. Huckel's rule c. Hoffmann's rule d. Saytzeff rule

2. Which of the following is/ are aromatics?

   a. Naphalene b. Cyclopropylium ion c. Anthracene d.All of these

3. Elements with same atomic numbers but different mass mass numbers are

   a. Isotopes b. Isobars c. Isotones d. Isotherms

4. Which one of the following isotope used in cancer treatment?

   a. ^{24}Na b. ^{31}P c. ^{60}Co d. ^{131}I

5. The basic units of proteins are

   a. Aminoacids b. Carbohydrates c.Dyes d. None of these

6. The nitrogeneous bases in DNA are

   a. Adenine b. Cytosine c. Thyamine d. All of these

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

   a. Producer gas b. Gobar gas c. LPG d. None of these

8. The components of Portland cement are

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

9. Which of the following is used to prevent bactrial infections?

a. Antibiotics B. Antimalarial c. Analgecis d. None of these

10. The best medicinal plant for Jaundice is

a. Tulasi b. Neem c. Keelanelli d. All of these

Part B **5 X 5 = 25 Marks**

Answer ALL the Questions, Choosing either (a) or (b):

11a. Name any five aromatic compounds and Give it No.of π-electrons.

(OR)

b. Draw the structures of the following compounds.

i. Cylopentadienyl ion ii. Cycloheptilium ion iii. Anthracene iv. Benzene

12a. Write note on nuclear stability.

(OR)

b. Discuss Group Displacement Law

13a. What are carbohydrates ? How are they classified

(OR)

b. Discuss the biological functions of proteins

14a. Explain the cleaning action of soap.

(OR)

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

15a. Discuss about air born diseases.

(OR)

b. Define antimalarials and antibiotics. Give examples.

Part C **5 X 8 = 40 Marks**

Answer ALL Questions, Choosing either (a) or (b):

16a. Explain benzenoid and non benzenoid compounds with examples.

OR

b. Discuss the preparation, properties and structure of naphthalene.

17a. What are nuclear Fission and fusion reaction ? How are they differed?

OR

b.Write notes on applications of radio isotope

18a. How will you classify the proteins?

OR

b. What are DNA and RNA ? Discuss the structure of DNA.

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. Discuss briefly

i. Water born & Hereditary diseases

OR

b. Write notes on

i. Tulasi ii. Keezhanalli

Allied Chemistry Practical II

INORGANIC QUALITATIVE ANALYSIS

L	T	P	C
0	0	2	1

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)