Maharshi Dayanand University Rohtak

Ordinances, Syllabus and Courses of Reading for Chemistry M.Sc. (Previous) Examination

Session—1997-98

ORDINANCE - 'MASTER OF SCIENCE EXAMINATION'

1. The Master of Science Examination shall be held in two parts. Part-I Examination shall be held at the end of the first year and Part-II Examination at the end of the second year.

2. The Examination in Part-I and Part-II shall be held once a year ordinarily in the month of April on such dates as may be fixed by the Vice-Chancellor.

   A supplementary examination in Part-II of M.Sc. will be held in December for those candidates who have passed all the papers of Part-I examination but have got 'reappear' or have failed or want to improve their score in paper(s) of part-II examination. However, total number of chances will not exceed as given in the Ordinance.

3. The last date for the receipt of admission form and fee without late fee as fixed by the Vice-Chancellor shall be notified to the Heads of the University Teaching Departments and the Colleges concerned.

4. A candidate's admission form and fee may be accepted after the last date on payment of Rs. 105/- up to the date notified by the University.

   No late fee shall be charged if the admission form and fee are received within three working days of grace after the last date for the receipt of the same without late fee.

5. No one shall be eligible to join the first year (Part-I) class of M.Sc. Course unless he has passed one of the following examination:-

   a) B.Sc. (Hons.) examination of this University with atleast 45% marks in the aggregate in the subject offered for the M.Sc. Course.

   b) B.Sc. (Pass) examination with atleast 50% marks in the aggregate.

   c) An examination of any other university recognised by the University as equivalent to (a) or (b) above.

   Provided that:

   i) to be eligible to join M.Sc. Course in Physics, a candidate must have passed B.Sc. Examination with Physics and Mathematics as two of the main subjects;

ii) to be eligible to join M.Sc. Chemistry, a candidate must have passed B.Sc. Examination with Chemistry as one of the main subject.

Note: A Minimum of 25% of the total seats shall be filled in by the students who have passed the B.Sc. Examination with Chemistry, Physics and Mathematics. Any seat remaining unfilled out of this quota may be offered to other eligible candidates.

iii) to be eligible to join M.Sc. course in Bio-Science, a candidate must have passed B.Sc. Examination with Botony, Zoology, Bio-Sciences and any one of the subjects viz. Chemistry, Bio-Chemistry, Micro-Biology Fisheries and Geology.

Note: The candidates will be required to opt for Animal Sciences or Plant Sciences or Environmental Biology in M.Sc. final course which will be allowed after taking into consideration the performance of the candidate in M.Sc. previous examination. However, an indication to this effect will be required to be given by the candidate at the time of his admission.

iv) conditions for admission to M.Sc. Course in Mathematics shall be same as prescribed for admission viz. M.A. Course in this subject.

v) To be eligible to join M.Sc. Course in Geology, a candidate must have passed B.Sc. Examination with atleast 50% marks in the aggregate with Geology and any of two of the subjects viz. Physics, Mathematics, Chemistry Botony, Zoology, Bio-Science and Geography;

vi) to be eligible to join M.Sc. Course in Mathematical Statistics and Operations Research a candidate must have passed B.A./B.Sc. (Pass) Examination with atleast 50% marks in the aggregate with Mathematics or Statistics as one of the subjects or have passed B.A./B.Sc. (Hons.) Examination in Mathematics or Statistics with atleast 45% marks in Mathematics/Statistics.

There shall be a Project Report in M.Sc. Mathematical Statistics (Final) and that the project report shall be evaluated by the external examiner on five point grading. The last date for submission of Project Report will be two months after the theory papers which can be extended further by two months

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with the permission of the Vice-Chancellor.

Note : *A candidate who is placed under compartment in the qualifying Examination shall not be allowed to join M.Sc. Course. He/She will be eligible only after clearing the qualifying Examination.*

6.1 A candidate who has failed in one or more papers or fails to appear in the examination shall be allowed two additional subsequent chances only to pass the examination.

6.2 A candidate who fails to pass the M.Sc. examination within a period of four years of his admission to the course shall be deemed to be unfit for postgraduate studies in the subject concerned.

6.3 A person who has passed the M.Sc. (Previous) examination in the subject concerned from this University shall be eligible to join the M.Sc. final class. This is subject to Clause-6.2 above. However, the candidates who have passed atleast two theory papers out of four or five theory papers or atleast three theory papers out of six or seven theory papers of part-I examination of this University will be promoted to Part-II Class, provisionally.

7. M.Sc. Examination in Part-I/Part-II shall be open to a student who:-

   a) has passed the requisite qualifying Examination or is covered under Clause-6 and

   b) has his name submitted to the Controller of Examinations by the Head of the University Department/Principal of the College, he has most recently attended and produces the following certificates signed by him:-

   i) of possessing good character;

   ii) of having remained on the rolls of the Department/College, during the year preceding the Examination;

   iii) of having attended not less than 65% of full course of lectures and tutorial separately and 75% of practicals in each part (the course to be counted upto the last day when the classes break up for the preparatory holidays).

8. A candidate whether a regular student or an ex-student shall submit his admission application to the Registrar/Controller of Examinations duly signed by the Principal of the College/Head

of the University Department he has last attended.

9. Every candidate shall be examined according to the Scheme of examination and syllabus as approved by the Academic Council from time to time.

10. The amount of Examination fee to be paid by a candidate for each part shall be as follows:-

Regular student	Ex-student
Rs. 100/-	Rs. 110/-

Note:- *Plus Rs. 20/- per practical subject.*

A candidate who re-appears in one or more theory or practical papers for the purpose of passing the examination or a candidate who appears in one or more theory papers for the purpose of improvement of score of marks/result shall pay fee as for the whole examination.

11. The medium of instructions and examination shall be English.

12.1. The minimum number of marks required to pass the examination shall be as under:-

i) 33% in each paper (written and practical) separately;

ii) 40% in dissertation/Viva-voce where prescribed;

iii) 40% in the aggregate.

12.2 A candidate who has completed the prescribed course of instructions in a College/University Teaching Department for Previous/Final examination but has not appeared in it or have appeared fails may be allowed on the recommendation of the Principal of the College/Head of University Teaching Department concerned to appear in the subsequent years in the examination paper(s) as the cases may be without attending a fresh course of instructions while re-appearing in the examination, the candidate shall be exempted from re-appearing in the paper(s) and/or practical(s) in which he has obtained atleast 40% marks.

13. As soon as possible, after the termination of the examination the Registrar/Controller of Examinations shall publish the result of the Candidates and issue Detailed Marks Card.

14. The result of candidates who have passed M.Sc. examination shall be classified into divisions, as under and the division obtained by the candidate will be stated in his degree.

a)	Those who obtain 60% or more marks	First Division
b)	Those who obtain 50% or more but less than 60% marks	Second Division
c)	All below 50%	Third Division

15.1 A candidate who has passed M.Sc. Previous examination, with atleast 55% marks may offer dissertation wherever prescribed in the Scheme of examination for the course. The subject of dissertation shall to approved by the Head of Department concerned. A candidate shall submit to the Head of the University Department an application for the approval of the topic for the dissertation alongwith a synopsis within one month of his admission to M.Sc. (Final) examination.

Provided in the case of M.Sc. (Geology) exam. there shall be a dissertation based on days field work (surface maping) in the M.Sc. Previous. The work of dissertation will be done in the M.Sc. previous and viva-voce examination of dissertation will be held at the end of M.Sc. previous alongwith practical examination. Provided further that the condition of obtaining 55% marks in M.Sc. previous examination, for offering dissertation in M.Sc. final shall not be applicable in the case of students of M.Sc. (Geology) course.

15.2 Every candidate who offers dissertation shall be required to submit three copies of his dissertation alongwith a brief abstract of the same giving an account of the Investigation research conducted and its main findings (which will not exceed 500 words). The dissertation shall be examined by one external examiner only.

15.3 The last date for receipt of the dissertation in the office of the Controller of Examinations shall be one month before the commencement of the theory examination: Provided that in exceptional cases; the Vice-Chancellor shall have the power to extend, on the recommendation of the Head of the Department the last date for receipt of the dissertation upto three months. If a candidate fails to submit the dissertation even during the extended period he will be considered to have absented in the dissertation paper and his result shall be declared accordingly.

15.4 A candidate who has submitted a dissertation as part of his examination may withdraw the same before it has been

examined but once it is examined and the candidate obtains the minimum pass marks he shall not be permitted to withdraw it or submit another dissertation in lieu thereof. The marks obtained by him for the dissertation shall be taken into account when he appears in any future examination for the purpose of passing therein or for improving score of marks/result.

16. A candidate who has already passed the Master of Science examination from this University, in a subject in which different optional papers are permitted, may appear in one or more optional paper(s) of that subject at an subsequent examination when held as a regular student only. The examination fee shall be Rs. 35/- each paper.

Such a candidate shall in order to pass, be required to obtain atleast 40% marks in each paper in theory and practical separately.

17.1 A person who has passed the M.Sc. previous examinations of this University will be allowed to appear as an ex-student in the M.Sc. previous examinations for improvement alongwith M.Sc. final examinations respectively, only once, in one or more theory paper(s) within a period of 3 years of passing M.Sc. previous examination.

A person who has passed the M.Sc. examination of this University, and desirous of improving his score of marks will be allowed to appear as an ex-student in the M.Sc. final examinations, for improvement only once in one or more theory paper(s) within a period of two years of his passing the M.Sc. examination. In all a candidate will be allowed to avail one chance within the period specified above. Improvement in practical paper is not permissible.

The result of such a candidate shall be declared only if he improves his score of marks, by taking into account the marks obtained by him in the paper(s) in which he re-appeared and the marks obtained by him earlier in the remaining paper(s). The fact that the candidate has improved the division shall be mentioned in the Detail Marks Cards. If a candidate opts to appear in both previous and final examinations for the purpose of improvement but finds that he has improved the score of marks obtained by him in the previous examination, he may not appear in the final examination as the case may be and

inform the Controller of Examinations for the declaration of his result.

Provided further that the candidate will take the examination according to the syllabus in force for the regular students for that examination. Provided that the syllabus for the candidates for the special examination to be held in September/October shall be the same as was in force for the regular student in the last annual examination.

18. Notwithstanding the integrated nature of this course which is spread over more than one academic year, the Ordinance in force at the time a student joins the course shall held good only for the examination held during or at the end of the academic year and nothing in this ordinance shall be deemed to debar the University from amending the Ordinance and the amended Ordinance, if any, shall apply to all students whether old or new.

19. Candidate admitted to M.Sc. Course in 1990-91 or earlier shall be governed by the old rules. The new rules shall be applicable w.e.f. the admission of academic Session 1991-92.

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SCHEME OF EXAMINATION

M.Sc. Part-I (CHEMISTRY)

Theory :

		Max. Marks
Paper-I	Inorganic Chemistry	100
Paper-II	Physical Chemistry	100
Paper-III	Organic Chemistry	100
Paper-IV	General Spectroscopy	50
Qualifying	Mathematics for Chemists	50

Practicals

Paper-V	Inorganic Chemistry	50
Paper-VI	Physical Chemistry	50
Paper-VII	Organic Chemistry	50

M.Sc. Part-II (CHEMISTRY)

Paper-VIII	Inorganic/Physical/Org.Special	70
Paper-IX	-do-	70
Paper-X	-do-	70
Paper-XI	Inorganic Chemistry General	70
Paper-XII	Physical Chemistry General	70
Paper-XIII	Organic Chemistry General	70
Paper-XIV & XV,	Inorganic/Physical/Org.Chemistry	40(Each)
Paper-XVI (Each Branch)		70*

> This includes : 10% of 150 marks (total)
> Marks for Viva-voce, 10% for note book)

Note : *In M.Sc. Part-I : All the papers are compulsory; Mathematics paper is only qualifying and its marks are not to be added to division purpose.* *Total Marks : 500*

In M.Sc. Part-II : Paper No. VIII, IX & X are compulsory. The Inorganic Special Students will study papers XII, XIII only and so on. Total Marks : 500

Paper-I   Inorganic Chemistry   Max. Marks : 100

Time : 3 Hrs.

(Examiners will set 8 questions (two from each section) and the candidates will be required to attempt any five questions selecting atleast one from each section).

SECTION-A

Exhaustive treatment of hydrogen bonding, Vander Waal's bond and Vander Waal's radii,

Linnett's electron repulsion theory of covalent bonding (double quartet approach). Metallic bond.

Stability constants of Metal Complexes (excluding determination), factor affecting stability of complexes.

M.O. Theory as applied to polyatomic molecules including noble gas compounds but excluding coordination compounds.

SECTION-B

Polymorphiom of C,P and S; Synthesis, properties and structure of boranes, borazines, boron-phosphorus and boronarsenic compounds.

Carbides, phosphazones and S-N Compounds : their Synthesis properties and structures.

SECTION-C

Structural principles of silicates, zeolites and clays.
Silicones and flurocarbons.
Chemistry of artificial elements other than transuranic elements; super-heavy elements.*[Tc,Pm,At,Fr]
Reactions in non-aqueous solvents : HF, N_2O_4 and $POCl_3$

SECTION-D

General discussions of the Chemistry of d-block elements in various oxidation states viz. Ti, V, Cr, Nb, Ta, Mo, W.

General discussion of the Chemistry of Pt-metals. Polyacids of Mo and W.

Fluxional molecules.

Paper-II   Physical Chemistry   Max. Marks : 100

Time : 3 hrs.

Note :   Paper setter is required to set 8 questions (two from each section) and the students are required to attempt 5 questions in all selecting atleast one from each section).

SECTION-A

Thermodynamics-I

State function, consequence of energy as state function; First law of thermodynamics, reversible and irreversible processes, maximum work in reversible isothermal adiabatic and isothermal processes.

Thermochemical laws, Kirchoff's equation, Limitations of the first law of thermodynamics and the need of 2nd law. Carnot's cycle and entropy. Euler's theorm and entropy as a state function, entropy change in reversible and irreversible changes, variation of entropy with temperature, pressure and

volume, entropy as a measure of unavailable energy, entropy as a criteria of spontaneity of a process, Free energy functions (need and their physical significance) Gibbs-Helmholtz equation, free energy function as a criteria of spontaneity of a process; Partial molar quantities, chemical potential, Gibbs-Duhem equation, variation of chemical potential with temperature and Pressure, Clausius-Claperon equation; phase rule and its thermodynamic deviation. Phase diagram of two completely mixing component systems (experimental method and discussion).

Law of mass action and its thermodynamic derivation, reaction isotherm and reaction isochore.

SECTION-B

Thermodynamics-II

Nernst heat theorem, Nernst heat theorem as precursor of the third law of thermodynamics, third law of thermodynamics (and its limitations) and its use in the determination of absolute entropy from thermal data, unattainability of absolute zero.

Concept of fugacity, determination of fugacity of a real gas, nonideal solutions, Raoult's law and Henry's law, concept of activity and the choice of standard states, Activity coefficient, determination of the activity and activity coefficient of non-electrolytes, determination of the activity of one component from that of the other.

State of aggregation : Maxwell's law of distribution of velocity (Root Mean Square Velocity, most probably velocity and average velocity) Mean Free Path, number of collisions, Viscosity and conductivity of gases.

SECTION-C

Electrochemistry

Concept of mean activity, mean activity coefficient, mean molality of electrolytes, Rational and Practical activity coefficient.

Ion-Ion-interaction; The Debye-Huckel theory of ion-interactions (potential due to an ion in solution, derivation of Deby-Huckel limiting law of activity coefficient and its limitations, improvements in Debye Huckel law for appreciable concentration).

Influence of Ionic Atmosphere on Ionic Migration : Concentration dependence of the mobility of ions, electrophoretic effect, relaxation and electrophoretic components of drift velocity. The Debey-Huckel Onsager equation and its validity.

Ion Transport in solution : Ionic movements under influence of an electric field, mobility of ions, ionic drift velocities : relation with current density, The Einstein relation between the absolute mobility and diffusion coefficient, stoke-Einstein relation, Nernst-Einstein Equation, Walden rule. Total driving force for ionic transport, ionic drifts diffusion potential and Planck-Henderson equation for diffusion potential.

SECTION-D

Chemical Kinetics

Temperature dependence of reaction rate. Rate law for opposing reactions of first order and second order. Rate law for consecutive first order reactions. Collision theory of reaction rates. Limitations of Collision theory. The theory of absolute reaction rate (without derivation) Chain reactions (hydrogen-bromine reaction) general treatment of chain reactions,ortho-para hydrogen conversion, hydrogen-halogen reactions). Apparent activation energies of chain reactions, chain lengths, chain transfer inhibition. Rice-Herzfeed mechanism (Acetaldehyde decomposition reaction), Chain Branching and explosion reactions (hydrogen-oxygen reaction).

Surface Chemistry

Adsorption on solids from solution, Gibbs adsorption equation, B.E.T. equation (its derivation also) and its use in determination of surface area. Concept of micelles, critical micelle concentration (c.m.c.) determination of c.m.c. by conductivity and surface tension.

Books Recommended

1.	Thermodynamics for Chemistry	S.Glasston
2.	Thermodynamics	Rajaram & Gariacose
3.	Thermodynamics	I.M. Koltz & R.M. Rosenberg
4.	State of aggregation	Physical Chemistry by Castellan
5.	Chemical Kinetics	Laidler
6.	Surface Chemistry	Grogg and Singh
7.	Electrochemistry	J.O'M Bockris & AKON Reddy

Paper-III   Organic Chemistry   Max. Marks : 100
                                                       Time : 3 hrs.

SECTION-A

Bonding in Organic Molecules

(a) Conjugation, homoconjugation, aromaticity, homoaromaticity Prototropy anionotrophy, Ring-chain tautomarism, catenanes charge transfer complexes, inclusion molecules.

(b) Reactive Intermediates

Introduction to carbocations, carbenium and carbonium ions, carbanions, free radicals, radical cations, carbenes, arynes and nitrenes.

(c) Reaction Mechanism

Hammet equation, Taft equation substitution constants, reaction constants, Hard and soft bases, Energy profile diagrams, methods of determining reaction mechanism, Substitution reactions SN^1, SN^2, $SN^{1'}$, $SN^{1'}$, SN^2, Elimination reactions.

SECTION-B

(a) Stereochemistry-I

Optical isomerism, circular bifergence, plane of polarisation, priority rules to determine sign of optical rotation, diastoreoisomer Atomic symmetry, conformational asymmetry, molecular dissymmetry, plane, centre and n-fold alternating axis of symmetry, configuration, conformation and absolute configuration.

(b) Stereochemistry-II

Geometric isomerism in alkenes, oximes and benzylidene derivatives. Geometrical isomerism in ring compounds (three, four, five, six and seven membered rings, perhydro napthalene and phenantharene). Atropisomerism:

(biphenyls, allenes, Spiro cyclic compounds) and their absolute configuration.

SECTION-C

(a) Polycyclic aromatic hydrocarbones : Carcinogenesis, chrysene and Benz(e) anthrancene.

(b) Heterocyclic compounds :

Synthesis and reactions of quinoline, Isoquinoline, Indole and diazines (Pyridazine, pyrimidine & pyrazine)

(e) Synthetic Dyes

Azo dyes, Biphenyimethane, indigo, alizarin and phthalenes. Electronic theory of colour and constitution.

(d) Structure elucidation and synthesis of uric acid and caffeine.

SECTION-D

(a) Terpenes

General methods of isolation and structure elucidation, Geraniol, citral, Limonene and carvone.

(b) Alkaloids

General methods of isolation, structure elucidation and synthesis of piperine, nicotine and atropine.

(c) Anthocyanins

Cyanin, pelargonin, delphenin, malvin, flavone, chrysin, quercetin, daidzein and euxanthone.

(d) Disaccharides

Structure elucidation of maltose and sucrose. Polysacchrides: Starch and cellulose.

Note : The examiner will set 8 questions in all two from each Unit. The candidate will have to attempt five questions in all, selecting atleast one question from each unit.

Paper-IV   General Spectroscopy   Max. Marks : 50

                                                                Time : 3 hrs.

SECTION-A

Rotational Spectra; The rotation of molecules, rotational spectra of diatomic molecules, the spectrum of non-rigid rotator, the effect of isotopic substitutions, rotational spectra of linear and symmetric top polyatomic molecules.

Vibrational and Vibrational-Rotational Spectra

The vibrating diatomic molecule; Simple harmonic vibrations, harmonicity of vibrations, the diatomic vibrating rotator, the intersection of rotations and vibrations, the vibrations of polyatomic molecules, analysis by infrared technique.

SECTION-B

Electronics Spectra

Electronic Spectra of diatomic molecules, vibrational coarse structure, and rotational fine structure of electronic band, the Frank-Condon principle, intensity of vibrational-Electronic band disociation energy the Furtrat diagram.

SECTION-C

Dynamic and magnetic properties of atomic nuclei, nuclear resonance, relaxation processes, chemical effects in NMR e.g. chemical shift, Absorption intensities, Spin-spin coupling. Elementary idea of time dependents effects in NMR. Instrumentation line diagram.

Applications of UV,IR and NMR spectroscopy of simple organic molecules.

SECTION-D

Application of electronic, Rotational and Vibrational and NMR spectral techniques in structure elucidation of Inorganic compounds.

Books Recommended

1. Fundamentals of molecular spectroscopy.   C.N. Banwell

2. Basic Principles of Spectroscopy   R.Chang

Note :   Paper setter is required to set 8 questions (two from each section) and the examinee is required to attempt 5 questions selecting atleast 1 from each section.

MATHEMATICS FOR CHEMISTS

Max. Marks : 50

Time : 3 hrs.

Expansion of O^x,(1+x)n(n+or-integer,/x/1),Ln(1+x)(-1x1).Even and odd functions, Trigonometrical functions (sin, cos,tan and hyperbolic functions (of sine x,x & Tan x and the shapes of their graphs) concept, complex numbers and laws of Algebra, Aroand diagram of simple complex number of the type z=x+iy and the evaluation of modulus and argument of z.

Differentiation from Ist principles of x^a, (ax+b)p, logx, sin x, cos x, ex: Rules of differentiation; and their applications to simple functions of the form y=f(x); Implicit differentiation and parametric differentiation : partial differentization of Z=f(x,y); Concept of maxima and minima evaluation of simple functions of the type Y-f(x), Use of Newton's method of approximation to evaluate positive roots of simple equations (of order not greater than 3).

Integration x^a,(a+b)=-Sin x, cos x,tan x, Integration of curicular functions, integration by parts, concept of definite integrals, evaluation of definite integrals of the above mentioned functions; concept of mean values, root mean square value and their evaluation for such simple functions as cos^2, sin^2.

Matrices; Matrix addition, substraction and multiplication, (of maximum 3x3 matrices). Transpose of a matrix, Inverse matrix, solution of simple equations by matrices.

Scalar and Vector quantities, vector addition(11^{gm}) and law of addition, commutative and associative addition, components of vector in orthogonal cartesian co-ordinate and polar co-ordinate system; vector multiplication and their physical significances.

Note: 1. M.Sc. previous students are to be given training in basic Mathematics to the extent of 3 periods a week;

2. all students should qualify this course in Mathematics and the qualifying marks should be 45% and

3. marks as obtained by the students in this paper should not be taken into account for determining division in the examination.

Paper-V Inorganic Practical   Max. Marks : 50

Time : 8 hrs.

1. Quantitative analysis of three components mixture including alloys, minerals involving two separation and estimation of two components; cerric Nitrate titrations.   20

2. Qulitative analysis of a mixture containing four radicals from the following :

   Tl, W, Mo, Se, Te, UO_2^{2+}, Vanadyl, Ti, Be, NO_2^- NO_3^-, Br^-,I^-, PO_4^{3-}, Cl^-, F^-, BO_3^{3-}, $C_2O_4^{2-}$ CH_3COO^-, CO_3^{2-}, SO_3^{2-}, $S_2O_3^{2-}$ SO_3^{2-}, SO_4^{2-}, S^{2-} and silicate, and one insoluble :

   $PbSO_4$, $AgCl$, $CaSO_4$, $BaSO_4$, $SrSO_4$, SiO_2, Al_2O_3, CaF_2, Fe_2O_3.   20

3. Record file and viva-voce   10(5+5)

Paper-VI Physical Chemistry (Practical)

Max. Marks : 50

Time : 6 Hours.

1. **Viscosity**

   a) To determine percentage composition of liquid in the given binary mixture.

   b) Determination of molecular weight of a polymer.

2. **Surface Tension**

   To determine interfacial tension of the two immiscible liquids.

3. **Conductometry**

   a) Cell constant determination.
   b) Acid-base titrations (monobasic & dibasic acids)
   c) Precipitation titration (Ag No_3 vs KCI)
   d) Basicity of acids.

4. **Heat of Neutralisation**

   a) Determination of Heat of neutralisation

      i) HCl vs NaOH

ii) $CH_3 COOH$ vs NaOH

iii) $\begin{array}{l} COOH \\ | \\ COOH \end{array}$ vs NaOH

b) Determination of Heat of solution and heat of hydration of $BaCl_2$ & $CuSO_4$.

5. Colloids

Preparation of arseneous sulphide sol and determination of precipitation values of different electrolytes.

6. Chemical Kinetics

a) Hydrolysis of an ester in the presence of acid.

b) Comparison of relative strength of acids (HCl, H_2SO_4)

7. Distribution Law

a) Determination of partition coefficient of benzoic acid between benzene and water.

b) Determination of partition coefficient of iodine between carbontetrachloride and water.

c) Determination of equilibrium constant for $I_2+I=I_3$

B. Potentiometry

a) Acid-base titrations (HCl vs NaOH, COOH vs NaOH, $CH_3 COOH$ vs NaOH) COOH

b) Precipitation titration ($AgNo_3$ vs KCl)

c) Oxidation-reduction titration ($K_2Cr_2O_7$ vs Fe^{+2}ion)

9. PH-metry

Acid- base titration

i) HCl vs NaOH

ii) COOH vs NaOH

iii) $CH_3 COOH$ vs NaOH

10. Adsorption

a) To study the adsorption of Iodine on charcoal from aqueous solution.

b) To study the adsorption of oxalic acid on charcoal from aqueous solution.

11. Phase-diagram

To construct the phase-diagram for a binary system.

Note :   5 Marks are reserved for Laboratory Record and 5 for viva-voce.

Paper-VII   Organic Chemistry (Practical)

Max. Marks : 50

Time : 6 hrs.

Purification of organic compounds involving fractional crystalisation, fractional distilation, steam distilation, sub-limatation and extraction.

Systematic identification of pure organic compounds (Semimicroscale), separation and identification of simple binary mixtures having acidic, basic neutral components, derivatives.

Estimation of phenol and aniline; estimation of the molecular weight of an acid by titration and by the silver salt method.

Preparation of organic compounds involving two stages :

1.   P-Bromoacetaniline from aniline.

2.   s.-Tribromobenzene from aniline.

3.   2.5 Dihydroxyacetophenone from nydroquinone.

4.   2,4 Dinitropheny hydrazine from chlorobenzene.

5.   Anthranilic acid from phthalic anhydride.

6.   P-Chlorobenzene from P-toluidine.

7.   P-Aminoazobenzene from aniline.

8.   Preparation of Eosin from phthalic anhydride, testing for purity by T.L.C. for each compound.

Note :   Ten percent marks are reserved each for laboratory records and viva-voce.