

पं. रविशंकर शुक्ल विश्वविद्यालय  
रायपुर ( छत्तीसगढ़ )



पाठ्यक्रम

बी.एस.सी. भाग-1 ( कोड-301 )

B. Sc. Part - I ( Code - 301 )

परीक्षा : 2015

कुलसचिव पं. रविशंकर शुक्ल विश्वविद्यालय  
रायपुर ( छत्तीसगढ़ ) की ओर से

## B. Sc. Part - I

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**PT. RAVISHANKAR SHUKLA UNIVERSITY RAIPUR (C.G.)**

**REVISED ORDINANCE NO. 21**

**BACHELOR OF SCIENCE**

1. The three year course has been broken up into three Parts. Part-I known as B.Sc. Part-I examination at the end of the first year, Part-II known as B.Sc. Part-II examination at the end of the second year and Part-III known as B.Sc. Part-III examination at the end of the third year.
2. A candidate who after passing (10+2) Higher Secondary or Intermediate examination of C.G. Board of Secondary Education Bhopal or any other Examination recognised by the University or C.G. Board of Secondary Education as equivalent thereto, has attended a regular course of study in an affiliated College or in the Teaching Department of the University for one academic year shall be eligible for appearing at the B.Sc. Part-I examination.
3. A candidate who, after passing the B.Sc.-I examination of the University or any other examination recognised by the University as equivalent thereto, has attended a regular course of study for one academic year in an affiliated college or in the Teaching Department of the University shall be eligible for appearing at the B.Sc. Part-II examination.
4. A candidate who, after passing the B.Sc. Part-II examination of the University, has completed a regular course of study for one academic year in an affiliated college or in the Teaching Department of the University shall be eligible for appearing at the B.Sc. Part-III examination.
5. Besides regular students, subject to their compliance with this Ordinance ex-student and non-collegiate candidates shall be permitted to offer only such subjects/papers as are taught to the regular student at any of the University Teaching Department or College.
6. Every candidate appearing in B.Sc. Part-I, Part-II and Part-III examination shall be examined in -
  - (i) Foundation Course :
  - (ii) Any one of the following combinations of three subjects :-
    1. Physics, Chemistry & Mathematics.
    2. Chemistry, Botany & Zoology.
    3. Chemistry, Physics & Geology.
    4. Chemistry, Botany & Geology.
    5. Chemistry, Zoology & Geology.
    6. Geology, Physics & Mathematics.
    7. Chemistry, Mathematics & Geology.
    8. Chemistry, Botany & Defence Studies.
    9. Chemistry, Zoology & Defence Studies
    10. Physics, Mathematics & Defence Studies.
    11. Chemistry, Geology & Defence Studies
    12. Physics, Mathematics & Statistics
    13. Physics, Chemistry & Statistics
    14. Chemistry, Mathematics & Statistics.
    15. Chemistry, Zoology & Anthropology.
    16. Chemistry, Botany & Anthropology.
    17. Chemistry, Geology & Anthropology.
    18. Chemistry, Mathematics & Statistics.

19. Chemistry, Anthropology & Defence Studies.
  20. Geology, Mathematics & Statistics.
  21. Mathematics, Defence Studies & Statistics
  22. Anthropology, Mathematics & Statistics
  23. Chemistry, Anthropology & Applied Statistics
  24. Zoology, Botany & Anthropology
  25. Physics, Mathematics & Electronics.
  26. Physics, Mathematics & Computer Application
  27. Chemistry, Mathematics & Computer Application
  28. Chemistry, Bio-Chemistry & Pharmacy
  29. Chemistry, Zoology & Fisheries.
  30. Chemistry, Zoology & Agriculture
  31. Chemistry, Zoology & Sericulture
  32. Chemistry, Botany & Environmental Biology
  33. Chemistry, Botany & Microbiology
  34. Chemistry, Zoology & Microbiology
  35. Chemistry, Industrial Chemistry & Mathematics
  36. Chemistry, Industrial Chemistry & Zoology
  37. Chemistry, Biochemistry, Botany
  38. Chemistry, Biochemistry, Zoology
  39. Chemistry, Biochemistry, Microbiology
  40. Chemistry, Biotechnology, Botany
  41. Chemistry, Biotechnology, Zoology
  42. Geology, Chemistry & Geography
  43. Geology, Mathematics & Geography
  44. Mathematics, Physics & Geography
  45. Chemistry, Botany & Geography
- (iii) Practical in case prescribed for core subjects.

7. Any candidate who has passed the B.Sc. examination of the University shall be allowed to present himself for examination in any of the additional subjects prescribed for the B.Sc. examination and not taken by him at the degree examination. Such candidate will have to first appear and pass the B.Sc. Part-I examination in the subjects which he proposes to offer and then the B.Sc. Part-II and Part-III examination in the same subject. Successful candidates will be given a certificate to that effect.
8. In order to pass at any part of the three year degree course examination an examinee must obtain not less than 33% of the total marks in each subject/ group of subjects. In subject/ group of subjects where both theory and practical examination are provided an examinee must pass in both theory and practical parts of the examination separately.
9. Candidate will have to pass separately at the Part-I, Part-II and Part-III examinations. No division shall be assigned on the result of the Part-I and Part-II examination. In determining the division of the final examination, total marks obtained by the examinees in their Part-I, Part-II and Part-III examination in the aggregate shall be taken in to account. Provided in case of candidate who has passed the examination through supplementary examination having failed in one subject/ group only, the total aggregate marks being carried over for determining the division shall include actual marks obtained in the subject/ group in which he appeared at the supplementary examination.

10. Successful examinee at the Part-III examination obtaining 60% or more marks shall be placed in the First Division, those obtaining less than 60% but not less than 45% marks in the Second Division and other successful examinees in the Third Division.

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In clause 6(ii) after serial No. 41, 42-45 inserted. Approved in 23<sup>rd</sup> Co-Ordination committee  
Dated 15-01-2014.

**SCHEME OF EXAMINATION**

Subject	Paper	Max. Marks	Total Marks	Min. Marks
Environmental Studies		75	100	33
Field Work		25		
<b>Foundation Course</b>				
Hindi Language	I	75	75	26
English Language	I	75	75	26
<b>नोट : प्रत्येक खंड में से 2 (दो) प्रश्न हल करने होंगे । सभी प्रश्न समान अंक के होंगे ।</b>				
Three Elective Subject :				
1. Physics	I	50	100	33
	I	50		
	Practical			
2. Chemistry	I	33	100	33
	I	33		
	III Practical	34		
3. Mathematics	I	50	150	50
	I	50		
	III	50		
4. Botany	I	50	100	33
	I	50		
	Practical			
5. Zoology	I	50	100	33
	I	50		
	Practical			
6. Geology	I	50	100	33
	I	50		
	Practical			
7. Statistics	I	50	100	33
	I	50		
	Practical			
8. Anthropology	I	50	100	33
	I	50		
	Practical			

Subject	Paper	Max. Marks	Total Marks	Min. Marks
9. Defence Studies	I	50	100	33
	I	50		
	Practical	50		
10. Micro Biology	I	50	100	33
	I	50		
	Practical	50		
11. Computer Science	I	50	100	33
	I	50		
	Practical	50		
12. Information Technology	I	50	100	33
	I	50		
	Practical	50		
13. Industrial Chemistry	I	34	100	33
	I	33		
	III	33		
	Practical	50		
14. Bio Chemistry	I	50	100	33
	I	50		
	Practical	50		
15. Bio Technology	I	50	100	33
	I	50		
	Practical	50		

### USE OF CALCULATORS

The Students of Degree/P.G. Classes will be permitted to use of Calculators in the examination hall from annual 1986 examination on the following conditions as per decision of the standing committee of the Academic Council at its meeting held on 31-1-1986.

1. Student will bring their own Calculators.
2. Calculators will not be provided either by the University or examination centres.
3. Calculators with, memory and following variables be permitted +, -, x, , square, reciprocal, exponentials log, square root, trigonometric functions, sine, cosine, tangent etc. factorial summation, xy, yx and in the light of objective approval of merits and demerits of the viva only will be allowed.

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Part - I

**SYLLABUS FOR ENVIRONMENTAL STUDIES AND HUMAN RIGHTS**

(Paper code-0828)

MM. 75

इन्वारमेंटल साईंसेस के पाठ्यक्रम को स्नातक स्तर भाग-एक की कक्षाओं में विश्वविद्यालय अनुदान आयोग के निर्देशानुसार अनिवार्य रूप से शिक्षा सत्र 2003-2004 (परीक्षा 2004) से प्रभावशील किया गया है। स्वशासी महाविद्यालयों द्वारा भी अनिवार्य रूप से अंगीकृत किया जाएगा।

भाग 1, 2 एवं 3 में से किसी भी वर्ष में पर्यावरण प्रश्न-पत्र उत्तीर्ण करना अनिवार्य है। तभी उपाधि प्रदाय योग्य होगी।

पाठ्यक्रम 100 अंकों का होगा, जिसमें से 75 अंक सैद्धांतिक प्रश्नों पर होंगे एवं 25 अंक क्षेत्रीय कार्य (Field Work) पर्यावरण पर होंगे।

सैद्धांतिक प्रश्नों पर अंक - 75 (सभी प्रश्न इकाई आधार पर रहेंगे जिसमें विकल्प रहेगा)

(अ) लघु प्रश्नोंत्तर - 25 अंक

(ब) निबंधात्मक - 50 अंक

Field Work - 25 अंकों का मूल्यांकन आंतरिक मूल्यांकन पद्धति से कर विश्वविद्यालय को प्रेषित किया जावेगा। अभिलेखों की प्रायोगिक उत्तर पुस्तिकाओं के समान संबंधित महाविद्यालयों द्वारा सुरक्षित रखेंगे।

उपरोक्त पाठ्यक्रम से संबंधित परीक्षा का आयोजन वार्षिक परीक्षा के साथ किया जाएगा।

पर्यावरण विज्ञान विषय अनिवार्य विषय है, जिसमें अनुत्तीर्ण होने पर स्नातक स्तर भाग-एक के छात्र/छात्राओं को एक अन्य विषय के साथ पूरक की पात्रता होगी। पर्यावरण विज्ञान के

सैद्धांतिक एवं फील्ड वर्क के संयुक्त रूप से 33% (तैंतीस प्रतिशत) अंक उत्तीर्ण होने के लिए अनिवार्य होंगे।

स्नातक स्तर भाग-एक के समस्त नियमित/भूतपूर्व/अमहाविद्यालयीन छात्र/छात्राओं को अपना फील्ड वर्क सैद्धांतिक परीक्षा की समाप्ति के पश्चात् 10 (दस) दिनों के भीतर संबंधित महाविद्यालय/परीक्षा केन्द्र में जमा करेंगे एवं महाविद्यालय के प्राचार्य/केन्द्र अधीक्षक, परीक्षकों की नियुक्ति के लिए अधिकृत रहेंगे तथा फील्ड वर्क जमा होने के सात दिनों के भीतर प्राप्त अंक विश्वविद्यालय को भेजेंगे।

## **UNIT-I THE MULTI DISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES**

### **Definition, Scope and Importance**

#### **Natural Resources:**

#### **Renewable and Nonrenewable Resources**

- (a) Forest resources: Use and over-exploitation, deforestation, Timber extraction, mining, dams and their effects on forests and tribal people and relevant forest Act.
- (b) Water resources: Use and over-utilization of surface and ground water, floods drought, conflicts over water, dams benefits and problems and relevant Act.
- (c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.
- (d) food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging , salinity.
- (e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources.
- (f) Land resources: Land as a resource, land degradation, man induced landslides soil erosion and desertification.

**(12 Lecture)**

## **UNIT-II ECOSYSTEM**

### **(a) Concept, Structure and Function of and ecosystem**

- Producers, consumers and decomposers.
- Energy flow in the ecosystem

- Ecological succession
- Food chains, food webs and ecological pyramids.
- Introduction, Types, Characteristics Features, Structure and Function of Forest, Grass, Desert and Aquatic Ecosystem.

**(b) Biodiversity and its Conservation**

- Introduction - Definition: genetic. species and ecosystem diversity
- Bio-geographical classification of India.
- Value of biodiversity: Consumptive use. productive use, social ethics, aesthetic and option values.
- Biodiversity at global, National and local levels.
- India as mega-diversity nation.
- Hot spots of biodiversity.
- Threats to biodiversity: habitat loss, poaching of wildlife, man-wild life conflict.
- Endangered and endemic species of India.
- Conservation of biodiversity: In situ and Ex-situ conservation of biodiversity.

**(12 Lecture)**

**UNIT- III**

**(a) Causes, effect and control measures of**

- Air water, soil, marine, noise, nuclear pollution and Human population.
- Solid waste management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution.
- Disaster Management : floods, earthquake, cyclone and landslides.

**(12 Lecture)**

**(b) Environmental Management**

- From Unsustainable to sustainable development.
- Urban problems related to energy.

- Water conservation, rain water harvesting, watershed management.
- Resettlement and rehabilitation of people, its problems and concerns.
- Environmental ethics: Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.
- Wasteland reclamation
- Environment protection Act: Issues involved in enforcement of environmental legislation.
- Role of Information Technology in Environment and Human Health.

#### **UNIT- IV**

General background and historical perspective- Historical development and concept of Human Rights, Meaning and definition of Human Rights, Kind and Classification of Human Rights.

Protection of Human Rights under the UNO Charter, protection of Human Rights under the Universal Declaration of Human Rights, 1948.

Convention on the Elimination of all forms of Discrimination against women.

Convention on the Rights of the Child, 1989.

#### **UNIT- V**

Impact of Human Rights norms in India, Human Rights under the Constitution of India, Fundamental Rights under the Constitution of India, Directive Principles of State policy under the Constitution of India, Enforcement of Human Rights in India.

Protection of Human Rights under the Human Rights Act, 1993- National Human Rights Commission, State Human Rights Commission and Human Rights court in India.

Fundamental Duties under the Constitution of India.

#### **Reference/ Books Recommended**

1. SK Kapoor- Human rights under International Law and Indian Law.
2. HO Agrawal- Internation Law and Human Rights
3. एस.के. कपूर – मानव अधिकार
4. जे.एन. पान्डेय – भारत का संविधान
5. एम.डी. चतुर्वेदी – भारत का संविधान
6. J.N.Pandey - Constitutional Law of India
7. Agarwal K.C. 2001 Environmental Biology, Nidi pub. Ltd. Bikaner

8. Bharucha Erach, the Biodiversity of India, Mapin pub. Ltd. Ahmedabad 380013, India, Email: mapin@icenet.net(R)
9. Bruinner R.C. 1989, Hazardous Waste Incineration. McGraw Hill Inc.480p
10. Clark R.S. Marine pollution, Clanderson press Oxford (TB)
11. Cuningham, W.P.Cooper. T.H.Gorhani, E & Hepworth. M.T,200
12. Dr. A.K.- Environmental Chemistry. Wiley Eastern Ltd.
13. Down to Earth, Center for Science and Environment (R)
14. Gloick, H.P. 1993 Water in crisis. pacific institute for studies in Deve. Environment & Security. Stockholm Eng. Institute. Oxford University, Press. m 473p.
15. Hawkins R.E. Encyclopedia of Indian Natural History, Bombay Natural History Society, Mumbai (R)
16. Heywood, V.H. & Watson, T.T.1995 Global Biodiversity Assessment, Cambridge Univ. Press 1140p
17. Jadhav H. & Bhosale, V.H. 1995 Environmental Protection and Law. Himalaya pub. House, Delhi 284p
18. Mckinney M.L.& School R.M.1996, environmental Science systems & solutions, web enhanced edition, 639p
19. Mhadkar A.K. Matter Hazardous, Techno-Science publication(TB)
20. Miller T.G.Jr. Environment Science, Wadsworth publication co. (TB)
21. Odum E.P.1971, Fundamentals of Ecology, W.B. Saunders Co. USA,574p
22. Rao M.N. & Datta, A.K. 1987, Waste water treatment. Oxford & IBH pub.co.pvt. Ltd 345p
23. Sharma B.K. 2001, Environmental chemistry, Goel pub. House, Meerut
24. Survey of the Environment, The Hidu(M)
25. Townsend C. Harper J. And Michael Begon, Essentials of Ecology, Blackwell Science(TB)
26. Trivedi R.K.Handbook of Environment Laws, Rules, Guidelines, Compliances and Standards, Vol land II, Environment Media(R)
27. Trivedi R.K. and P.K. Goel, Introduction to air pollution, Techno-Science publication (TB)
28. Wanger K.D.1998, Environmental Management. W.B. Saunders Co. Philadelphia, USA 499p

आधार पाठ्यक्रम

प्रश्न पत्र - प्रथम

हिन्दी भाषा

( पेपर संख्या 0791 )

पूर्णांक - 75

नोट :

1. प्रश्न पत्र 75 अंक का होगा ।
2. प्रश्न पत्र अनिवार्य होगा ।
4. इसके अंक श्रेणी निर्धारण के लिए जोड़े जावेंगे ।
5. प्रत्येक इकाई के अंक समान होंगे ।

पाठ्य विषय -

इकाई-1 पल्लवन, पत्राचार तथा अनुवाद एवं पारिभाषिक शब्दावली ।

इकाई-2 मुहावरे-लोकोक्तियाँ, शब्दशुद्धि, वाक्य शुद्धि, शब्द ज्ञान-पर्यायवाची, विलोम, अनेकार्थी, समश्रुत (समानोचरित) अनेक शब्दों के लिए एक शब्द ।

इकाई-3 देवनागरी लिपि की विशेषता, देवनागरी लिपि एवं वर्तनी का मानक रूप ।

इकाई-4 कम्प्यूटर में हिन्दी का अनुप्रयोग, हिन्दी में पदनाम ।

इकाई-5 हिन्दी अपठित, संक्षेपण, हिन्दी में संक्षिप्तीकरण ।

पाठ्य क्रम के लिए पुस्तकें -

1. भारतीयता के स्वर साधन धनंजय वर्मा - म. प्र. ग्रंथ अकादमी ।
2. नागरी लिपि और हिन्दी - अनंत चौधरी - ग्रंथ अकादमी पटना ।
3. कम्प्यूटर और हिन्दी - हरिमोहन - तक्षशिला प्रकाशन, दिल्ली ।

FOUNDATION COURSE

PAPER - II

ENGLISH LANGUAGE

M.M. 75

(paper code - 0792)

UNIT-1 Basic Language skills : Grammar and Usage.

Grammar and Vocabulary based on the prescribed text.

To be assessed by objective / multiple choice tests.

(Grammar - 20 Marks

Vocabulary - 15 Marks)

UNIT-2 Comprehension of an unseen passage.

05

This should imply not only (a) an understanding of the passage in question, but also

(b) a grasp of general language skills and issues with reference to words and usage

within the passage and (c) the Power of short independent composition based on themes and issues raised in the passage.

To be assessed by both objective multiple choice and short answer type tests.

**UNIT-3 Composition :** Paragraph writing 10

**UNIT-4 Letter writing** (The formal and one Informal) 10

Two letters to be attempted of 5 marks each. One formal and one informal.

**UNIT-5 Texts :** 15

Short prose pieces (Fiction and not fiction) short poems, the pieces should cover a range of authors, subjects and contexts. With poetry if may sometimes be advisable to include pieces from earlier periods, which are often simpler than modern examples. In all cases, the language should be accessible (with a minimum of explanation and reference to standard dictionaries) to the general body of students schooled in the medium of an Indian language.

Students should be able to grasp the contents of each piece; explain specific words, phrases and allusions; and comment on general points of narrative or argument. Formal Principles of Literary criticism should not be taken up at this stage.

To be assessed by five short answers of three marks each.

**BOOKS PRESCRIBED -**

English Language and Indian Culture - Published by M.P. Hindi Granth Academy Bhopal.

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## PHYSICS

### OBJECTIVES OF THE COURSE

The undergraduate training in Physics is aimed at providing the necessary inputs so as to set forth the task of bringing about new and innovative ideas/concepts so that the formulated model curricula in physics becomes in tune with the changing scenario and incorporate new and rapid advancements and multi disciplinary skills, societal relevance, global interface, self sustaining and supportive learning.

It is desired that under graduate i.e. B.Sc. level besides grasping the basic concepts of physics should in addition have broader vision. Therefore, they should be exposed to societal interface of physics and role of physics in the development of technologies.

### EXAMINATION SCHEME :

1. There shall be 2 theory papers of 3 hours duration each and one practical paper of 4 hours duration. Each paper shall carry 50 marks.
2. Numerical problems of at least 30% will compulsorily be asked in each theory paper.
3. In practical paper, each student has to perform two experiments, one from each group as listed in the list of experiments.
4. Practical examination will be of 4 hours duration-one experiment to be completed in 2 hours.

The distribution of practical marks will be as follows:

Experiment	:	15 + 15 = 30
Viva Voce	:	10
Internal assessment	:	10

5. The external examiner should ensure that atleast 16 experiments are in working order at the time of examination and submit a certificate to this effect.

### PAPER - I

#### MECHANICS, OSCILLATIONS AND PROPERTIES OF MATTER

(paper code - 0793)

- UNIT-1** Laws of motion, motion in a uniform field, components of velocity and acceleration in different coordinate systems. (Cartesian, Cylindrical and Spherical) uniformly rotating frame, centripetal acceleration, Coriolis force and its applications. Motion under a central force, Kepler's laws. Gravitational law and field.  
Potential due to a spherical body. System of particles, center of mass, equation of motion, conservation of linear & angular momentum, conservation of energy.
- UNIT-2** Rigid body motion, rotational motion, moments of inertia and their products, principal moments & axes, Introductory idea of Euler's equations. potential well and periodic oscillations, case of harmonic small oscillations, differential equation and its solution, kinetic and potential energy, examples of simple harmonic oscillations, spring and mass system, simple and compound pendulum, torsional pendulum.
- UNIT-3** Bifilar oscillations, helmholtz resonator, LC circuit, vibrations of a magnet, oscillations of two masses connected by a spring. Superposition of two simple harmonic motions of the same frequency, Lissajous figures, case of different frequencies. Damped harmonic oscillator, power dissipation, quality factor, examples, driven (forced)

harmonic oscillator, transient and steady states, power absorption, resonance.

**Note :** (The emphasis here should be on the mechanical aspects and not on the details of the apparatus mentioned, which are indicated as applications of principles involved)

**UNIT-4** E as an accelerating field, electron gun, case of discharge tube, linear accelerator, E as deflecting field- CRO sensitivity,

Transverse B field,  $180^\circ$  deflection, mass spectrograph, curvatures of tracks for energy determination, principle of a cyclotron. Mutually perpendicular E and B fields-velocity selector, its resolution. Parallel E and B fields, positive ray parabolas, discovery of isotopes, elements of mass spectrography, principle of magnetic focussing (lens.)

**UNIT-5** Elasticity, small deformations, Hooke's law elastic constants for an isotropic solid and relations between them beams supported at both the ends, cantilever, torsion of cylinder, bending moments and shearing forces. Kinematics of moving fluids, equations of continuity. Euler's equation, Bernoulli's theorem, viscous fluids, streamline and turbulent flow. Poiseuille's law. Capillary tube flow, Reynold's number, Stokes law, surface tension and surface energy, molecular interpretation of surface tension, pressure on a curved liquids surface, wetting.

**TEXT AND REFERENCE BOOKS :**

E M purcell, Ed Berkely physics course, vol. Mechanics (Mc. Gr. Hill) R P Feynman, R B lighton and M Sands, the feyman lectures in physics, vol I (B) publications, Bombay, Delhi, Calcutta, Madras

D P Khandelwal, Oscillations and waves (Himalaya Publishing House Bombay)

R. K. Ghosh, The Mathematics of waves and vibrations (Macmillan 1975) .

J.C. Upadhyaya- Mechanics (Hindi and English Edition.)

D.S. Mathur- Mechanics and properties of matter.

Brij lal and subramanium- Oscillations and waves.

Resnick and Halliday- Volume I

**PAPER - II**

**ELECTRICITY, MAGNETISM AND ELECTROMAGNETIC THEORY**

(paper code - 0794)

**UNIT-1** Functions of two and three variables, partial derivatives, geometrical interpretation of partial derivatives of functions of two variables. Total differential of a function of two and three variables. Repeated integrals of a function of more than one variable, definition of a double and triple integral. Scalars and vectors, dot and cross products, triple vector product, gradient of a scalar field and its geometrical interpretation, divergence and curl of a vector field, line, surface and volume integrals, flux of a vector field. Gauss's divergence theorem, Green's theorem and Stokes theorem.

**UNIT-2** Columbs law in vacuum expressed in Vector forms calculations of E for simple distributions of charges at rest, dipole and quadrupole fields.

Work done on a charge in a electrostatic field expressed as a line integral, conservative nature of the electrostatic field. Electric potential  $\phi, \vec{E} = -\vec{\nabla}\phi$ , torque on a dipole in a uniform electric field and its energy, flux of the electric field, Gauss's law and its application for finding E for symmetric charge distributions, Gussian pillbox ? Fields at the surface of a conductor screening of E field by a conductor, capacitors,

electrostatic field energy, force per unit area of the surface of a conductor in an electric field, conducting sphere in a uniform electric field, point charge in front of a grounded infinite conductor.

**UNIT-3** Dielectrics parallel plate capacitor with a dielectric, electric susceptibility, permittivity and dielectric constant, polarization and polarization vector, displacement vector  $\vec{D}$ , molecular interpretation of Clausius-Mossotti equation.

Steady current, current density  $J$ , non-steady currents and continuity equation, Kirchhoff's law and analysis of multiloop circuits, rise and decay of current in LR and CR circuits, decay constants, transients in LCR circuits, AC circuits, complex numbers and their applications in solving AC circuit problems, complex impedance and reactance, series and parallel resonance, Q factor, power consumed by an AC circuit, power factor, .

**UNIT-4** Force on a moving charge, Lorentz force equation and definition of  $B$ , force on a straight conductor carrying current in a uniform magnetic field, torque on a current loop, magnetic dipole moment, angular momentum and gyromagnetic ratio.

$\vec{\nabla} \cdot \vec{B} = 0$ ,  $\vec{\nabla} \times \vec{B} = \mu_0 \vec{J}$ . Biot and Savart's law, Ampere's law field due to a magnetic dipole, magnetization current, magnetization vector, magnetic permeability (Linear cases), interpretation of a bar magnet as a surface distribution of sinusoidal current.

**UNIT-5** Electromagnetic induction, Faraday's law, electromotive force,  $\epsilon = \int \vec{E} \cdot d\vec{r}$ , integral and differential forms of Faraday's law Mutual and self inductance, Transformers, energy in a static magnetic field. Maxwell's displacement current, Maxwells' equations, electromagnetic field energy density.

The wave equation satisfied by  $E$  and  $B$ , plane electromagnetic waves in vacuum, Poyning's vector.

**TEXT AND REFERENCE BOOK :**

Berkeley Physics Course, Electricity and Magnetism, Ed. E.M. Purcell (Mc Graw - Hill)  
Halliday and Resnik, Physics, Vol. 2

D J Griffith, Introduction to Electrodynamics (Prentice-Hall of India)

Raitz and Milford, Electricity and Magnetism (Addison-Wesley)

A S Mahajan and A A Rangwala, Electricity and Magnetism (Tata Mc Graw-hill)

A M Portis, Electromagnetic fields.

Pugh & Pugh, Principles of Electricity and Magnetism (Addison-Wesley)

Panofsky and Phillips, Classical Electricity and Magnetism, (India Book House)

S S Atwood, Electricity and Magnetism (Dover).

**PRACTICAL**

**Minimum 16 (Eight from each group)**

**EXPERMENTS OUT OF THE FOLLOWING OR SIMILAR EXPERIMENTS  
OF EQUAL STANDARD**

**GROUP - A**

- 1 Study of laws of parallel and perpendicular axes for moment of inertia.
- 2 Study of conservation of momentum in two dimensional oscillations.
- 3 Study of a compound pendulum.

4. Study of damping of a bar pendulum under various mechanics.
5. Study of oscillations under a bifilar suspension.
6. potential energy curves of a 1- Double system and oscillations in it for various amplitudes.
7. Study of oscillations of a mass under different combinations of springs.
8. Study of bending of a cantilever or a beam.
9. Study of torsion of wire (static and dynamic methods)
10. Study of flow of liquids through capillaries.
11. Determination of surface tension of a liquid by different methods.
12. Study of viscosity of a fluid by different methods.

**GROUP - B**

1. Characteristics of a ballistic galvanometer.
2. Setting up and using an electroscope or electrometer.
3. Use of a vibration magnetometer to study a field.
4. Study of B field due to a current.
5. Measurement of low resistance by Carey-Foster bridge or otherwise.
6. Measurement of inductance using impedance at different frequencies.
7. Study of decay of currents in LR and RC circuits.
8. Response curve for LCR circuit and resonance frequency and quality factor.
9. Sensitivity of a cathode-ray oscilloscope.
10. Characteristics of a choke.
11. Measurement of inductance.
12. Study of Lorentz force.
13. Study of discrete and continuous LC transmission lines.
14. Elementary Fortran programs, flowcharts and their interpretation.
15. To find the product of two matrices.
16. Numerical solution of equation of motion.
17. To find the roots of quadratic equation.

**TEXT AND REPERENCE BOOKS :**

B saraf et al Mechanical Systems (Vikas Publishing House, New Delhi)  
 D.P. Khandelwal, A Laboratory Manual of Physics for Undergraduate classes (Vani Publication House, New Delhi)  
 C G Lambe Elements of Statistics (Longmans Green and Co London New York, Toronto)  
 C Dixon, Numerical Analysis.  
 S Lipsdutz and A Poe, Schaum's Outline of theory and problems of programming with fortran (MC Graw-Hill Book Company, Singapore 1986)

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## CHEMISTRY

The new curriculum will comprise of Three papers of 33.33 and 34 marks each and practical work of 50 marks. The curriculum is to be completed in 180 working days as per the UGC norms & conforming to the directives of the Govt. of Chhattisgarh. The theory papers are of 60 hrs. each duration & the practical work of 180 hrs. duration.

### PAPER-I

#### INORGANIC CHEMISTRY

M.M. 33

(paper code - 0795)

##### UNIT-1 A ATOMIC STRUCTURE

Idea of de-Broglie matter-waves, Heisenberg Uncertainty principle, Schrodinger wave equation, significance of  $\psi$ , radial & angular wave functions and probability distribution curves, Atomic orbital and shapes of s, p, d orbital's, Aufbau and Pauli exclusion principles, Hund's Multiplicity rule, electronic configuration of the elements, effective nuclear charges.

##### B PERIODIC PROPERTIES

Ionization energy, electron gain enthalpy and electro negativity, trend in periodic table and applications in predicting and explaining the chemical behavior.

##### UNIT-2 CHEMICAL BONDING

Covalent Bond : Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization & shapes of simple inorganic molecules and ions. Valence shell electron pair repulsion (VSEPR) theory to  $\text{NH}_3, \text{H}_3\text{O}^+, \text{SF}_4, \text{ClF}_3, \text{ICl}_2$  and  $\text{H}_2\text{O}$ . M.O. Theory, homonuclear & heteronuclear bond strength & bond energy, percentage ionic character from dipole moment & electronegativity difference.

##### UNIT-3 CHEMICAL BONDING

Ionic Solids- Ionic structures, radius ratio & co-ordination number, limitation of radius, ratio rule, lattice defects, semiconductors, lattice energy Born- Haber cycle, Solvation energy and solubility of ionic solids, polarising power & polarisability of ions, Fajans rule, Metallic bond-free electron, Valence bond & band theories.

##### UNIT-4 A s-BLOCK ELEMENTS

Comparative study, salient features of hydrides, solvation & complexation tendencies including their function in biosystems and introduction to alkyl & aryls, Derivatives of alkali and alkaline earth metals.

##### B CHEMISTRY OF NOBLE GASES

Chemical properties of the noble gases, chemistry of xenon, structure binding in xenon compounds.

##### UNIT-5 A p-BLOCK ELEMENTS

Halides hydrides, oxides and oxyacids of Boron, Aluminum, Nitrogen and Phosphorus, boranes, borazines, fullerenes and silicates, interhalogens and pseudohalogens.

##### B. INORGANIC CHEMICAL ANALYSIS

Chemical principles involved in the detection of acids and basic radicals including interfering radicals.

**REFERENCE BOOKS :**

1. Basic Inorganic Chemistry, F.A Cotton, G. Wilkinson and P.L. Gaus, Wiley
2. Concise Inorganic Chemistry, J.D. Lee, ELBS
3. Concepts of models of Inorganic Chemistry, B. Douglas, D. Mc Daniel and J Alexander, John Wiley.
4. Inorganic Chemistry, D.E. Shriver, P.W. Atkins and C.H.L. Angford, Oxford.
5. Inorganic Chemistry, W.W. Porterfield, Addison- Wesley.
6. Inorganic Chemistry, A.G. Sharp, ELBS.
7. Inorganic Chemistry, G.L. Micssels and D.A. Tarr, Prentice Hall.
8. Advanced Inorganic Chemistry, Satya Prakash
9. Advanced Inorganic Chemistry, Agarwal & Agarwal
10. Advanced Inorganic Chemistry, Puri & Sharma, S. Naginchand
11. Inorganic Chemistry, Madan, S. Chand
12. Aadhunik Akarbmic Rasayan, R.K. Shrivastav & P.S. Jain, Goel Publication.
13. Uchchattar Akarbmic Rasayan, Satya Prakash & G.D. Tuli, Shyamal Prakashan.
14. Uchchattar Akarbmic Rasayan, Puri & Sharma
15. Akarbmic Rasayan, Bhagchandni, Sahitaya Publication.
16. Rasayan Vigyan, Bhatnagar, Arun Pablication.

**PAPER - II**

**ORGANIC CHEMISTRY**

**M.M. 33**

**(paper code - 0796 )**

**UNIT-I ELECTONIC STRUCTURE & BONDING**

A. Resonance, Hyperconjugation, Inductive and other field effects, Aromaticity, hydrogen bonding.

**B. MECHANISM OF ORGANIC REACTIONS**

Homolytic & heterolytic bond breaking, types of reagents-electrophiles & nucleophiles. Structure and reactivity of reaction intermediates-Carbocation, carbanions free radicals, carbenes and nitrenes.

**UNIT-2 STEREOCHEMISTRY OF ORGANIC COMPOUNDS**

A. Optical Isomerism - enantiomers, diastereomers, threo and erythro meso compound, resolution of enantiomers, inversion, retention and racemization, Relative and absolute configuration, Sequence rules, D and L and R & S systems of nomenclature.

B. Geometrical isomerism - Syn and anti forms, E & Z system of nomenclature, properties of cis-trans isomers.

**UNIT-3 ALIPHATIC AND AROMATIC RING COMPOUNDS**

A. Cycloalkanes- Nomenclature, methods of formation, chemical reactions, Baeyer's strain theory and its limitations. Ring strain in small rings (cyclopropane and cyclobutane), theory of strainless rings. The case of cyclopropane ring: banana bonds.

- B. Mono-nuclear and polynuclear aromatic ring. Structure of benzene & naphthalene. Molecular formula and Kekule structure. Aromatic electrophilic substitution. General pattern of the mechanism, role of  $\sigma$  and  $\pi$  complexes. Electrophilic substitution in naphthalene.

#### **UNIT-4 ALKENES, DIENES AND ALKYNES**

- A. Mechanism of dehydration of alcohols.
- B. Chemical reactions of alkenes- Mechanisms involved in electrophilic and free radical additions, hydroboration-oxidation, oxymercuration- reduction. epoxidation. Substitution at the allylic and vinylic positions of alkenes. Structure of allenes and butadiene, chemical reaction- 1,2 and 1,4 addition, Diel-Alder reaction.
- Chemical reactions of alkynes and acidity of alkynes. Electrophilic and nucleophilic addition reactions, hydroboration and oxidation with ozone and  $\text{KMnO}_4$ .

#### **UNIT-5 ARENES AND AROMATICITY**

##### **A. Alkyl halides and Aryl Halides**

Mechanism and stereochemistry of nucleophilic substitution reactions and alkyl halides and aryl halides with energy profile diagrams.  $\text{S}_{\text{N}}1$ ,  $\text{S}_{\text{N}}2$ ,  $\text{S}_{\text{N}}i$  mechanisms.

- B. Mechanisms and stereochemistry of elimination reaction and alkyl halides. Elimination Vs Substitution.

#### **REFERENCE BOOK :**

- 1 Organic Chemistry, Morrison and Boyd, Prentice- Hall
- 2 Organic Chemistry, L.G. Wade Jr, Prentice-Hall
- 3 Fundamentals of Organic Chemistry, Solomons, John Wiley
- 4 Organic Chemistry, Vol. I, II, III, S.M. Mukherjee, S.P. Singh and R.P. Kapoor, wiley-eastern (New-Age).
- 5 Organic Chemistry, F.A. Carey, MC Graw Hill
- 6 Introduction to Organic Chemistry, Struweiesser, Heathcock and Kosover, Macmillan.
- 7 Organic Chemistry, P.L.Soni.
- 8 Organic Chemistry, Bahi & Bahl
- 9 Organic Chemistry, Joginder Singh.
10. Carbanic Rasayan, Bashi & Bahi
11. Carbanic Rasayan, R.N. Singh, . S.M.I. Gupta, M.M. Bakodia & S.K. Wadhwa.
12. Carbanic Rasayan, Joginder Singh.
13. Carbanic Rasayan, P.L. Soni.
14. Corbanic Rasayan, Bhagchandani, Sahitya Bhawan Publication.
15. Rasayan Vigyan, Bhatnagar, Arun Prakashan.

PAPER - III  
PHYSICAL CHEMISTRY  
(paper code - 0797)

M.M.34

**UNIT-1 MATHEMATICAL CONCEPTS FOR CHEMIST AND COMPUTER**

- A. Logarithmic relations, curve sketching linear graphs, Properties of straight line, sloped and intercept, Differentiation of functions, Partial differentiation, Integration of some useful and relevant functions, Maxima and minima, Permutation and combination, Probability.
- B. General introduction to computers, components of computer, hardware and software, input and output devices; binary numbers, Introduction to computer languages, Programming, Operation systems.

**UNIT-2 A. MOLECULAR VELOCITIES :**

Root mean square velocity average and most probable velocities, Maxwell's law of distribution of molecular velocities of gases, (Graphical interpretation), effect of temperature on distribution of molecular velocities, collision frequency, mean free path, Joule- Thompson effect, Liquefaction of gases.

- B. Deviation from ideal behavior, Real gases, Vander Waal equation of state, Relationship, Vander waal constant and critical constants, Law of corresponding state.

**UNIT-3 A. LIQUID STATE**

Inter molecular forces, magnitude of intermolecular force, structure of liquids, Properties of liquids, viscosity and surface tension.

- B. Ideal and non ideal solutions, modes of representing concentration of solutions, activity and activity coefficient.

Dilute solution : Colligative Properties, Lowering of vapor pressure of solvent, Raoult's law, Osmosis, Van't Hoff Theory of dilute solutions, measurements of Osmotic pressure, relationship between lowering of vapour pressure and osmotic pressure. Elevation of boiling point, Depression in freezing point, abnormal molar masses, Degree of dissociation and association of solutes, Van't Hoff factor.

**UNIT-4 A. LIQUID CRYSTALS :**

Difference between liquid Crystal, solids and liquids, Classification, Structure of nematic and cholesteric phases, Thermography, Seven segment cell, applications of liquid Crystals.

**B. COLLOIDAL STATE :**

Classification, Optical, Kinetic, and Electrical Properties of colloid, Coagulation, Hardy Schulze law, flocculation value, Protection, Gold number, Emulsion, micelle. Gel, Syneresis and thixotropy, Application of colloid.

**C. SOLID STATE**

Space lattices, unit cells, Elements of Symmetry in crystalline solids, X-rays diffraction, Miller indices, identification of unit cell by Bragg's Spectrometer, Powder method, Neutron and electron diffraction (Elementary idea only)

**UNIT-5 A. CHEMICAL KINETICS**

Rate of reaction, Factors influencing rate of reaction, rate constant, Order and

molecularity of reactions, Zero, first and second order reaction, methods of determining order of reaction, Complex reactions : Consecutive, opposing and side reactions, Chain reactions.

Temperature dependence of reaction rate, Arrhenius theory, Physical significance of Activation energy, collision theory, demerits of collision theory, non mathematical concept of transition state theory.

#### B. CATALYSIS :

Homogeneous and Heterogeneous Catalysis, types of catalyst, characteristic of Catalyst, Enzyme Catalysed reactions, Micellar catalysed reactions, Industrial applications of Catalysis.

#### REFERENCE BOOKS :

1. Physical chemistry, G.M. Barrow, International student edition, MC Graw Hill
2. Basic programming with application, V.K. Jain, Tata Mc Graw-Hill
3. Computers & Common sense, R. Hunt & Shelly, Prentice-Hall
4. University general chemistry, C.N.R. Rao Macmillan.
5. Physical Chemistry, R.A. Alberty, Wiley Eastern.
6. The elements of Physical Chemistry, P.W. Atkins, Oxford.
7. Physical Chemistry through problems, S.K. Dogra & Dogra, Wiley Eastern.
8. Physical Chemistry, B.D. Khosla
9. Physical Chemistry, Puri & Sharma
10. Bhoutic Rasayan, Puri, Sharma & Palhanian, Vishal Publishing Company.
11. Bhoutic Rasayan, P.L. Soni
12. Bhoutic Rasayan, Bahi & Tuli.  $Pb^{2+}$ ,
13. Bhoutic Rasayan, I. R. Gambin
14. Bhoutic Rasayan, Bhagchandani, Sahitya Bhawan Publication.
15. Rasayan Vigyan, Bhatnagar, Arun Prakashan.

#### PAPER - IV

#### LABORATORY COURSE

180 Hrs.

The following experiments are to be conducted during the curriculum

#### 1 Inorganic Chemistry

Semimicro Analysis - cations analysis, separation and identification of ions from

$Bi^{3+}$ ,  $Cu^{2+}$ ,  $Cd^{2+}$ ,  $Sb^{3+}$ ,  $Sn^{2+}$ ,  $4+$ ,  $Fe^{3+}$ ,  $Al^{3+}$ ,  $Cr^{3+}$ ,  $Ni^{2+}$ ,  $Co^{2+}$ ,  $Zn^{2+}$ ,  $Mn^{2+}$ ,  $Ba^{2+}$ ,  $Sr^{2+}$ ,  $Ca^{2+}$ ,  $Mg^{2+}$ ,  $NH_4^+$  and Anions  $CO_3^{2-}$ ,  $SO_3^{2-}$ ,  $S^{2-}$ ,  $SO_4^{2-}$ ,  $NO_2^-$ ,  $NO_3^-$ ,  $Cl^-$ ,  $Br^-$ ,  $I^-$ ,  $CH_3COO^-$ ,  $C_2O_4^{2-}$ ,  $BO_3^{3-}$ ,  $F^-$ .

#### 2 Organic Chemistry

i Calibration of Thermometer

$80^\circ - 82^\circ$  (Naphthalene),  $113.5^\circ - 114^\circ$  (Acetanilide),  $132.5^\circ - 133^\circ$  (Urea),  $100^\circ$  (Distilled Water)

ii Determination of Melting Point

80° – 82° (Naphthalene), Benzoic acid 121.5° – 122°, Urea 132.5° – 133°, Succinic acid 184.5° – 185°, Cinnamic acid 132.5° – 133°, Salicylic acid 157.5° – 158°, Acetanilide 113.5° – 114°, m- Dinitrobenzene 90°, p-Dichlorobenzene 52° Aspirin 135°.

iii. Determination of boiling points

Ethanol = 78°, Cyclohexane 81.4°, Toluene 110.6°, Benzene 80°.

ix. Mixed Melting point Determination

Urea- Cinnamic acid mixture of various compositions (1 : 4, 1 : 1, 4 : 1)

v. Distillation (Demonstration)

Simple distillation of ethanol- water mixture using water condenser.

Distillation of nitrobenzene and aniline using air condenser.

vi. Crystallization

Phthalic acid from hot water (using fluted filter paper and stemless funnel).

Acetanilide from boiling water

Naphthalene from ethanol

Benzoic acid from water.

vii. Decolorisation and crystallisation using charcoal

Decolorisation of brown sugar with animal charcoal using gravity filtration

Crystallization and decolorisation of impure naphthalene (100g of naphthalene mixed with 0.3g of congo red using 1g of decolorising carbon) from ethanol.

viii. Sublimation

Camphor, Naphthalene, Phthalic acid and Succinic acid

ix. Qualitative Analysis

Detection of elements (N, S and halogens) and functional groups (Phenolic, Carboxylic, Carbonyl, Esters, Carbohydrates, Amines, Amides, Nitro and Anilide) in simple organic compounds.

3. Physical Chemistry

(i) Chemical Kinetics

To determine the specific rate of hydrolysis of methyl/ ethyl acetate catalysed by hydrogen ions at room temperature.

To study the effect of acid strength on the hydrolysis of an ester

To compare the strengths of HCl & H<sub>2</sub>SO<sub>4</sub> by studying the kinetics of hydrolysis of ethyl acetate

To study kinetically the reaction between H<sub>2</sub>O<sub>2</sub> & Iodide

(ii) Distribution Law

To study distribution of iodide between water & CCl<sub>4</sub>

To study distribution of benzoic acid between benzene & water.

(iii) Colloids

To prepare arsenious sulphide sol & compare the precipitating power of mono-, bi, & tri valent anions.

(iv) Viscosity & Surface Tension

To determine the of % composition of a given mixture (Non interacting system) by viscosity mehtod.

To determine the viscosity of anyI alcohol in water at diffemt concentrations & calculate the excess viscosity of these solutions.

To determine the % composition of a given binary mixture by surface tension method (acetone & ethyl methyl ketone).

**BOOK :**

- 1 ogeps qualitative analysis, revised svehla, orient longman
- 2 Standered methods of chemical analysis, W.W. scott, The Technical Press
- 3 Experimental Organic Chemistry, Vol. I & II, P.R. Singh, D.S. Gupta & K.S. bajpai, Tata Mc Graw Hill
- 4 Manual ingorganic chemistry, R.K. Bansal Wiley Eastern
- 5 vogel's text book of practical organic chemistry, B.S. Fumis A.J. Hannaford, V. Rogers, P.W.G. Smith & A.r. Tatchel, ELBS
- 6 Experiments in general chemistry, CNR Rao & U.C. Agarwal
- 7 Experiments in physical chemistry, R. C. Das & B. Behara Tata Mc Graw Hill
- 8 Advanced practical physical chemistry, . J.B. Yadav, Goel publishing house

**PRACTICAL EXAMINATION**

**05 Hrs.**

Three experiments are to be performed

**M.M. 50**

1. Inorganic Mixture Analysis, four radicals two basic & two acid (insoluble, Interfering & combination of acid radicals) any one to be given. 12 Marks.
2. Detection of functional group in the given organic compound and determine its MPt/BPt. 8 marks
- OR** Crystallization of any one compound as given in the prospectus along with the determination of mixed MPt.
- OR** Decolorisation of brown sugar along with sublimation of camphor/ Naphthlene.
3. Any one physical experiment that can be completed in two hours including calculations. 14 marks
4. Viva 10 marks
5. Sessionals 06 marks

In case of Ex-Students two marks will be added to each of the experiments.

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## ZOOLOGY

### PAPER - I (paper code - 0813)

#### (CELL BIOLOGY & INVERTEBRATES)

M.M. 50

- UNIT-1** The Cell (Prokaryotic & Eukaryotic)  
Methods in cell biology (Microscopy light & Electron)  
Organisation of cell extranuclear and nuclear (Plasma membrane, mitochondria, chromosomes, ER. Golgi bodies, Ribosomes)
- UNIT-2** Cell divisions (Mitosis & Meiosis)  
An elementary idea of cell transformation & Cancer Immunity (elementary idea)
- UNIT-3** General Characteristics & Classification of invertebrates upto orders with examples  
Protozoa - type study *Paramecium*, protozoa & disease  
Porifera - type study *Sycon*  
Coelenterata - type study *Obelia*
- UNIT-4** Helminths - type study *Fasciola*  
Annelida - type study *Pheretima*  
Arthropoda - type study *Palaemon*
- UNIT-5** Mollusca - type study *Asterias* (starfish)  
Protochordata - type study *Balanoglossus*

### PAPER - II (paper code - 0814)

M.M. 50

#### (VERTEBRATES & EMBRYOLOGY)

- UNIT-1** Origin and classification of Chordates.  
Protochordata - type study *Amphioxus*.  
A comparative account of *Petromyzon* & *Myxine*
- UNIT-2** Fishes - Skin and scales  
Migration in fishes  
Parental care  
Amphibia - Parental care  
Neoteny  
Reptilia - Poisonous & non poisonous snakes, Poison apparatus, snake venom.
- UNIT-3** Aves - Flight adaptation in birds  
Discuss - Birds are glorified reptiles  
Mammals- comparative account of prototheria, metatheria & Eutheria and Affinities.
- UNIT-4** Gametogenesis, Fertilization & Parthenogenesis.  
Development of frog upto formation of three germ layers
- UNIT-5** Development of Chick upto formation of three germ layer, Extra embryonic membranes.  
Placenta in mammals.  
Embryonic induction organisers & differentiation.

#### PARACTICAL

M.M. 50

The practical work will, in general be based on the syllabus prescribed in theory and the candidates will be required to show a knowledge of the following.

1. Dissection of earth worm.
2. Dissection of Cockroach, *Palaemon*, *Pila*.

3. Minor Dissection- Appendages of Prawn & hastate plate, Mouth-parts of Insects, Radula of Pila.
4. Mounting-Setae, Spermatheca, Septal Nephridia, Nerve ring & ovary of earth worm/ Parapodia of Nereis Salivary gland of Cockroach, ctenidium of pila, Malpighian tubules.
5. Cytological preparation- Onion root-tip "Squash Preparation" for mitosis/Grasshopper testis squash for meiosis.
6. Osteology-Frog & Rabbit
7. Museum Specimen invertebrate & Vertebrate, frog embryology.
8. Slides-Chick embryology, Cytology, Mammal Histology, Bird feather & invertebrate Slides.

**Scheme of Practical Exam.**

**Time 3 Hrs,  
M.M. 50**

1	Major Dissection	8 Marks
2	Minor Dissection	6 Marks
3	Mounting	5 Marks
4	Cytological Preparation	5 Marks
5	Spots- 8 (Slides-4, Specimens-2, & Bones-2)	16 Marks
6	Sessional	10 Marks

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## BOTANY

### PAPER - I

(GENERAL DIVERSITY OF MICROBES AND CRYPTOGAMS) M.M. 50

(paper code - 0811)

- UNIT-1** Viruses and Bacteria: General account of viruses and mycoplasma; bacteria structure; nutrition, reproduction and economic importance; general account of cyanobacteria. 12 Hrs.
- UNIT-2** Algae: General characters, classification and economic importance; important features and life history of Chlorophyceae-Volvox, Oedogonim, Coleochaete; Xanthophyceae-Vaucheria; Phaeophyceae- Ectocarpus, Sargassum; Rhodophyceae- Polysiphonia. 12 Hrs.
- UNIT-3** Fungi: General characters, classification and economic importance; important features and life history of Mastigomycotina- Pythium, Phytophthora; Zygomycotina- Mucor, Ascomycotina-Saccharomyces, Eurotium, Chaetomium, Peziza; Basidiomycotina-Puccinia, Agaricus; Deuteromycotina-Cercospora, Colletotrichum; general account of Lichens. 12 Hrs.
- UNIT-4** Bryophyta: Amphibians of plant kingdom displaying alternation of generations; structure, reproduction and classification of Hepaticopsida (e.g. Riccia Marchantia); Anthocerotopsida (e.g. Anthoceros), Bryopsida (e.g. Funaria) 12 Hrs.
- UNIT-5** Pteridophyta: The first vascular plants; important characteristics of Psilopsida, Lycopsidea, Sphenopsida and Pteropsida; structure, Reproduction in Rhynia, Lycopodium Selaginella, Equisetum, Pteris and Marsilea.

## BOTANY

### PAPER - II

CELL BIOLOGY AND GENETICS

(paper code - 0812)

- UNIT-1** The cell envelope: Plasma membrane; bilayer lipid structure; functions; the cell wall. Ultra structure and function of nucleus: nuclear membrane; nucleolus and other organelles: Golgi bodies, ER, peroxisomes, Vacuoles. 12 Hrs.
- UNIT-2** Chromosome organization: Morphology; centromere and telomere; chromosome alterations; deletions, duplications, translocations, inversions; variations in chromosome number aneuploidy, polyploidy; sex chromosomes. Cell division : Mitosis; meiosis 12 Hrs.
- UNIT-3** DNA the genetic material: DNA structure; replication; DNA- protein interaction; the nucleosome model; genetic code; satellite and repetitive DNA. Extranuclear genome: Presence and function of mitochondrial and plastid DNA; plasmids. 12 Hrs.

**UNIT-4** Gene expression: Structure of gene; transfer of genetic information; transcription, translation, protein synthesis; tRNA; ribosomes; regulation of gene expression in prokaryotes and eukaryotes; proteins, 1D, 2D and 3D structure. 12 Hrs.

**UNIT-5** Genetic Variations: Mutations, spontaneous and induced; transposable genetic elements; DNA damage and repair:

Genetic inheritance: Mendelism; laws of segregation and independent assortment; linkage analysis; allelic and non-allelic interactions. 12 Hrs.

### **BOTANY PRACTICAL**

**Time : 3 Hrs**

**Marks-50**

1. Algae/Fungi	10
2. Bryophyta/ Pteridophyta	10
3. Disease Symptoms/Gram's Staining	05
4. Cytology/Genetics	05
5. Spots (1-5)	10
6. Viva Voce	05
7. Sessionals	05

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**50 marks**

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**MATHEMATICS**  
**PAPER - I**  
**ALGEBRA AND TRIGONOMETRY**  
**(paper code - 0798)**

- UNIT-1** Symmetric, Skew symmetric, Hermitian and skew hermitian, matrices. Elementary operations on matrices, Inverse of a matrix. Linear independence of row and column matrices, Row rank, Column rank and rank of a matrix. Equivalence of column and row ranks. Eigen values, Eigen vectors and the characteristic equations of a matrix. Cayley Hamilton theorem and its use in finding inverse of a matrix.
- UNIT-2** Application of Matrices to a system of linear (both homogeneous and nonhomogeneous) equations. Theorems consistency of a system of linear equations. Relation between the roots and coefficients of general polynomial equations in one variable. Transformation of equations. Descartes's rule of signs. Solutions of cubic equations (Cardan's Method), Biquadratic equation.
- UNIT-3** Mappings, Equivalence relations and partitions. Congruence modulo  $n$ . Definition of a group with examples and simple properties. Cyclic groups generators, Coset decomposition, Lagrange's theorem and its consequences. Fermat and Euler's theorems. Normal subgroups. Quotient group, Permutation groups, Even and odd permutations the alternating groups. Cayley's theorem  $A_n$ .
- UNIT-4** Homomorphism and Isomorphism the fundamental theorems of homomorphism. Introduction, properties and examples of Rings, Subrings, Integral domain and fields Characteristic of a ring and field.

**TRIGONOMETRY :**

- UNIT-5** De Moivre's theorem and its applications. Direct and inverse Circular and Hyperbolic functions. Logarithm of a complex quantity. Expansion of Trigonometrical functions. Gregory's series. Summation of series.

**TEXT BOOK :**

1. I.N. Herstein, Topics in Algebra Wiley Eastern Ltd., New Delhi, 1975
2. K.B. Datta, Matrix and Linear Algebra, Prentice Hall of India Pvt. Ltd. New Delhi, 2000.
3. Chandrika Prasad, Text-Book on Algebra and Theory of equations, Pothishala Private Ltd., Allahabad.
4. S.L. Loney, Plane Trigonometry Part II, Macmillan and Company, London.

**REFERENCES :**

1. I.N. Herstein, Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975.
2. K.B. Datta, Matrix and linear algebra, Prentice Hall of India Pvt. Ltd. New Delhi, 2000.
3. P.B. Bhattacharya, S.K. Jain and S.R. Nagpaul, First Course in linear Algebra, Wiley Eastern, New Delhi, 1983.
4. P.B. Bhattacharya, S.K. Jain and S.R. Nagpaul, Basic Abstract Algebra (2 edition), Cambridge University Press, Indian Edition, 1997.
5. S.K. Jain, A. Gunawardena and P.B. Bhattacharya, Basic linear Algebra with MATLAB, Key College Publishing (Springer-Verlag), 2001.
6. H.S. Hall and S.R. Knight, Higher Algebra, H.M. Publications, 1994.
7. Chandrika Prasad, Text-Book on Algebra and Theory of Equations, Pothishala Private Ltd., Allahabad.
8. S.L. Loney, Plane Trigonometry Part II, Macmillan and Company, London.
9. R.S. Verma and K.S. Shukla, Text Book on Trigonometry, Pothishala Pvt. Ltd., Allahabad.

**PAPER - II**  
**CALCULUS**  
(paper code - 0799)

**DIFFERENTIAL CALCULUS :**

**UNIT-1**  $\epsilon - \delta$  definition of the limit of a function. Basic properties of limits. Continuous functions and classification of discontinuities. Differentiability. Successive differentiation. Leibnitz theorem. Maclaurin and Taylor series expansions.

**UNIT-2** Asymptotes curvature. Tests for concavity and convexity. Points of inflexion. Multiple points. Tracing of curves in Cartesian and polar coordinates.

**INTEGRAL CALCULUS :**

**UNIT-3** Integration of irrational algebraic functions and transcendental functions. Reduction formulae. Definite integrals. Quadrature. Rectification. Volumes and surfaces of solids of revolution.

**ORDINARY DIFFERENTIAL EQUATIONS :**

**UNIT-4** Degree and order of a differential equation. Equations of first order and first degree. Equations in which the variables are separable. Homogeneous equations. Linear equations and equations reducible to the linear form. Exact differential equations. First order higher degree equations solvable for  $x$ ,  $y$ ,  $p$ . Clairaut's form and singular solutions. Geometrical meaning of a differential equation. Orthogonal trajectories. Linear differential equations with constant coefficients. Homogeneous linear ordinary differential equations.

**UNIT-5** Linear differential equations of second order. Transformation of the equation by changing the dependent variable/the independent variable. Method of variation of parameters. Ordinary simultaneous differential equations.

**TEXT BOOK :**

1. Gorakh Prasad, Differential Calculus, Pothishala Private Ltd. Allahabad.
2. Gorakh Prasad, Integral Calculus, Pothishala Private Ltd. Allahabad.
3. D.A. Murray Introductory Course in Differential Equations, Orient Longman (India), 1976.

**REFERENCES :**

1. Gabriel Klambauer, Mathematical Analysis, Marcel Dekkar, Inc. New York, 1975.
2. Murray R. Spiegel, Theory and Problems of Advanced Calculus, Schaum's outline series, Schaum Publishing Co. New York.
3. N. Piskunov, Differential and Integral Calculus, Peace Publishers, Moscow.
4. P.K. Jain and S.K. Kaushik, An Introduction to Real Analysis, S. Chand & Co. New Delhi, 2000.
5. Gorakh Prasad, Differential Calculus, Pothishala private ltd. Allahabad.
6. Gorakh Prasad Integral Calculus, Pothishala Private ltd. Allahabad.
7. D.A. Murray, Introductory Course in Differential Equations, Orient Longman (India), 1967.
8. G.F. Simmons, Differential Equations, Tata Mc Graw Hill, 1972.
9. E.A. Codrington, An Introduction to Ordinary Differential Equations, Prentics Hall of India, 1961.
10. H.T.H. Piaggio, Elementary Treatise on Differential Equations and their Applications, C.B.S. Publishe & Distributors, Dehli, 1985.

11. W.E. Boyce and P.O. Diprima, Elementary Differential Equations and Boundary Value Problems, John Wiley, 1986.
12. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley and Sons, 1999.

**PAPER - III**

**VECTOR ANALYSIS AND GEOMETRY**

**M.M. 50**

(paper code - 0800)

**VECTOR ANALYSIS :**

- UNIT-1** Scalar and vector product of three vectors. Product of four vectors. Reciprocal Vectors. Vector differentiation. Gradient, divergence and curl.
- UNIT-2** Vector integration. Theorems of Gauss, Green, Stokes and problems based on these.
- UNIT-3** General equation of second degree. Tracing of conies. System of conies. Confocal conies. Polar equation of a conic.
- UNIT-4** Plane the Straight line and the plane. Sphere cone. Cylinder.
- UNIT-5** Central Conicoids. Paraboloids. Plane sections of conicoids. Generaing lines. Confocal Conicoids. Reduction of second degree equations.

**TEXT BOOKS :**

- 1 N. Saran and S.N. Nigam, Introduction to vector Analysis, Pothishala Pvt. Ltd. Allahabad.
- 2 Gorakh Prasad and H.C. Gupta, Text Book on Coordinate Geometry, Pothishala Pvt. Ird., Allahabad.
- 3 R.J.T. Bill, Elementary Treatise on Coordinate Geometry of three dimensions, Machmillan India Ltd. 1994.

**REFERENCES :**

- 1 Murray R. Spiegel, Theory and Problems of Advanced Calculus, Schaum Publishing Company, New York.
- 2 Murray R. Spiegel, Vector Analysis, Schaum Publishing Company, New York.
- 3 N. Saran And S.N. Nigam Introduction to Vector Analysis, Pothishala Pvt. Ltd., Allahabad.
- 4 Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 1999.
- 5 Shanti Narayan, A Text Book of Vector Calculus, S. Chand & Co., New Delhi.
- 6 S.L. Loney, The Elements of Coordinate Geometry, Macmillan and Company, london.
- 7 Gorakh Prasad and H.C. Gupta, Text Book on Coordinate Geometry, Pothishala Pvt. Ltd., Allahabad.
- 8 R.J.T. Bill, Elementary Treatise on Coordinate Geometry of three Dimensions, Macmillan India Ltd., 1994.
- 9 P.K. Jain and Khalil Ahmad, A Text Book of Analytical Geometry of two Dimensions, Wley Eastern Ltd., 1994.
10. P.K. Jain and Khalil Ahmad, A Text Book of Analytical Geometry of three Dimensions, Wiley Eastern ltd., 1999.
11. N. Saran and R.S. Gupta, Analytical Geometry of three Dimensions, Pothishala Pvt. Ltd. Allahabad.

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## MICROBIOLOGY

PAPER - I

M.M. 50

### GENERAL MICROBIOLOGY

(paper code - 0819)

- UNIT-1** Unity of microbial world, scope of microbiology, Microbiology and human health, beneficial and harmful microbes. development of microbiology (contributions and pioneers)
- UNIT-2** Diversity of microbial world: principle of classification, classification of viruses, Bacteria (including Cyanobacteria) Algae and Fungi ( including yeast) and protozoa.
- UNIT-3** Methods of studying microorganism: Origin of microbes, microscopy, pure culture techniques, Sterilization, Aseptic techniques, isolation of pure culture, conditions and media for growth of microorganisms in the laboratory.
- UNIT-4** General organization of microbes; Structural functional organization and economic importance of algae (*Nostoc*, *anabaena*, *Ocellularia*), fungi (*Rhizopus*, *Penicillium*, *Aspergillus*), yeast and lichens.
- UNIT-5** Structure, Functional organization and economic importance of bacteria (Gram +ve and Gram -ve), viruses (Plant and Animal) and protozoa (Ciliates, Flagellates and Sporozoans).

#### TEXT BOOKS :

1. General Microbiology by Brock.
2. Microbiology by Black.
3. General Microbiology by Pelzar et al.
4. Introduction on Microbial Techniques by Gunasekaran.

PAPER - II

### BIOCHEMISTRY AND IMMUNOLOGY

M.M. 50

(paper code - 0820)

- UNIT-1** Structure and properties of mono and disaccharides, amino acids and peptides, bases; purines and pyrimidens, sugars; ribose, deoxyribose and nucleoside and nucleotide; general account of lipids.
- UNIT-2** concept of macromolecules; Structural and functional organization of polysaccharides (starch, glycogen, cellulose, mucopolysaccharides), proteins and nucleic acids (DNA, RNA).
- UNIT-3** Enzymes; historical account, classification, Co-enzymes and their role. Enzyme action, Enzyme kinetic. Km, Vm and Enzyme inhibition. Allosteric enzyme and isoenzyme. Extracellular enzymes and their role.
- UNIT-4** Metabolism; General concept of metabolims (anabolism, catabolism and amphibolism). Glycolysis TCA Cycle and HMP Shunt. Anaerobic catabolims of glucose; alpha, beta and gamma oxidation of fatty acids.

**UNIT-5** Concept of immunity, Innate and acquired immunity. Brief account of cells and organs of immune system. Antigen and Antigenicity. Antibody structure and function. Antigen-Antibody reaction.

**Text Books :**

1. General Biochemistry by A.C. Deb.
2. Biochemistry by Lehninger (Kalyani publication)
3. Biochemistry by U. Satyanarayan.
4. General Immunology by Fatima.
5. Microbiology by Anantanarayan and Panikar.
6. Immunology by C.V. Rao.

**PRACTICAL**

**M.M. 50**

Preparation of solid/liquid culture media  
 Sterilization techniques  
 Isolation of single colonies on solid media.  
 Enumeration of Bacterial numbers by serial dilution and plating.  
 Simple and differential staining.  
 Measurement of microorganism (micrometry) and camera lucida drawing of isolated organism.  
 Determination of antibiotic resistances / sensitivity of bacteria.  
 General and specific qualitative test for carbohydrates  
 General and specific qualitative test for amino acids  
 General and specific qualitative test for lipids  
 Estimation of protein  
 Estimation of blood glucose  
 Assay of the activity of amylases  
 Assay of the activity of Phosphatase  
 Identification and Enumeration of White Blood Cells  
 Differential leukocyte count  
 Structure and histology of lymphoid organs  
 Antigen- antibody reaction  
 Agglutination reaction

**Scheme of Practical Examination**

**Time - 4 hours**

**M.M. 50**

1.	Exercise on Microbiological methods	10
2.	Exercise on Biochemical tests	10
3.	Exercise on Immunological techniques	05
4.	Spotting (1-5)	10
5.	Viva-Voce	05
6.	Sessional	10
	<b>Total</b>	<b>50</b>

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**GEOLOGY**  
**PAPER - I**  
**INTRODUCTION TO GEOLOGY**  
**(paper code - 0801)**

**M.M. 50**

- UNIT-1**
1. Geology and its perspectives. Earth in the solar system: origin, size, shape, mass, and density.
  2. Internal structure of earth, Chemical composition of crust, mantle and core.
  3. Formation of atmosphere, hydrosphere and biosphere.
  4. Age of the earth. Radioactivity, Production of magnetic field.
  5. Origin of solar system and universe Universe with indian perspective.
- UNIT-2**
1. Elementary ideas of continental drift and Plate Tectonics.
  2. Origin of oceans, continents and mountains.
  3. Earthquake and earthquake belts, measure of earthquake. Volcanoes- types and distribution.
  4. Rock-weathering. Erosion and transportation by rivers.
  5. Erosion & transportation by winds & glaciers.
- UNIT-3**
1. Wave erosion and beach processes.
  2. Bedding identification and data measurement Effects of topography on outcrop.
  3. Unconformity, Onlap, offlap outlier, inlier.
  4. Forms of igneous rocks.
  5. Simple deformational structures; folds, Faults and joints.
- UNIT-4**
1. Elementary idea about crystal structure, edges, solid angles, zone.
  2. Crystallographic axes and axial angles. Axial parameters and indices.
  3. Crystal symmetry and Plane - Axis & Centre of symmetry.
  4. Classification of crystal : Symmetry elements of normal class of cubic, tetragonal and hexagonal system.
  5. Symmetry elements of normal class of Orthorhombic, Monoclinic and Triclinic systems.
- UNIT-5**
1. Definition and classification of minerals Physical properties of minerals.
  2. Optical properties of minerals : Twinkling, Refractive index, birefringence, pleochroism, interference colours.
  3. Physical & optical properties of Quartz and Feldspar family.
  4. Physical & optical properties of Pyroxene & Amphibole family.
  5. Physical & optical properties of Mica & Garnet.

**PAPER - II**  
**INTRODUCTION TO GEOLOGY**  
**(paper code - 0802 )**

**M.M. 50**

- UNIT-1**
1. Magma: definition, composition and origin.
  2. Bowen's reaction series. Magmatic differentiation and assimilation.
  3. Texture structure and classification of igneous rocks.
  4. Definition and agents of metamorphism. Texture, structure and classification of metamorphic rocks.
  5. Metamorphic facies, facies series and isograds. Relationship between metamorphism and deformation.
- UNIT-2**
1. Origin, transportation and deposition of sediments. Consolidation and diagenesis.

2. Sedimentary fabric and texture Classification of sedimentary rocks-Terrigenous and chemical sedimentary rocks.
  3. Definition & Scope of paleobiology, processes of fossilization, preservation potential of organisms.
  4. Elementary idea of origin of life, evolution of fossil record.
  5. Classification of organisms.
- UNIT-3**
1. Morphology, environmental factors & geological distribution of Mollusca.
  2. Morphology, environmental factors and geological distribution of Brachiopoda
  3. Morphology, environmental factors and geological distribution of echinodermata, and Arthropoda.
  4. Gondwana Plant fossils & their significance.
  5. Morphology of corals
- UNIT-4**
1. Principles of stratigraphy. Geological time scale.
  2. Lithostratigraphic, Chronostratigraphic and biostratigraphic units. Stratigraphic correlation.
  3. Physical and structural subdivisions of Indian subcontinent and their Characteristics.
  4. Classification & distribution of Dharwar.
  5. Classification & distribution of Aravallis, saugar. Group and Cuddapah.
- UNIT-5**
1. Brief account of geology and distribution of Vindhyan and Chhattisgarh.
  2. Classification and geographic distribution of Gondwana in India.
  3. Geology and age of Deccan traps. Inter-trappians & Infra trappean beds.
  4. Classification & distribution of Siwalik.
  5. Evolution of Himalayas.

#### **PRACTICAL**

**M.M. 50**

**LABORATORY WORK :**

M.M. 40

1. Study and drawing of block diagrams of important geomorphological models. Reading topographical maps and interpretation of landforms and drainage from topographical maps. - 5 Marks
2. Exercises on structural geology problems: completion of outcrops, Drawing and interpretation of cross-sections through elementary representative geological structures. - 6 Marks
3. Study of elements of symmetry of at least one representative crystal of normal classes of each crystal system. Study of physical properties of important minerals in hand specimens. - 7 Marks
4. Study of optical characters of important rock forming minerals using polarizing microscope. - 4 Marks
5. Study of morphological characters of phyla included in theory syllabus. - 5 Marks
6. Preparation and study of stratigraphic maps - 3 Marks
7. Sessional - 5 Marks
8. Viva-Voce - 5 Marks

**GEOLOGICAL FIELD WORK :**

M.M. 10

- Students will be required to carry out field work for 7 days in a suitable geological area to study the following aspects and submit a report there on.
1. Use of clinometer/ Brunton in determination of attitude of planar and linear structures.
  2. Study of mode of occurrence of rocks and minerals in the field.

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## ANTHROPOLOGY

### PAPER - I

#### FOUNDATION OF ANTHROPOLOGY

M.M. 50

(paper code - 0815)

- UNIT-1** Meaning and scope of Anthropology, history of Anthropology, Branches of Anthropology.
- (a) Sociocultural Anthropology;
  - (b) Physical-Biological Anthropology;
  - (c) Archaeological Anthropology;
  - (d) Linguistic Anthropology.
- UNIT-2** Relationship with other disciplines: Life sciences, Earth sciences, Medical Sciences, Social Sciences, Humanities, Environment Sciences.
- UNIT-3** Foundation in Biological Anthropology.
- (a) Human Evolution
  - (b) Human Variation
  - (c) Human Genetics
  - (d) Human Growth and Development.
- UNIT-4** Fundamentals in Social-Cultural Anthropology.
- (a) Culture, Society, Community, Group, Institution
  - (b) Human Institution : Family, Marriage, Kinship Religion.
  - (c) Development and change.
  - (d) Research Methods : Tools and Techniques.
- UNIT-5** Fundamentals in Archaeological Anthropology.
- (a) Tool typology & Technology.
  - (b) Cultural evolution: Broad outlines of cultures.
  - (c) Chronology.

### PAPER - II

#### INTRODUCTION TO PHYSICAL ANTHROPOLOGY

M.M. 50

(paper code - 0816)

- UNIT-1** Meaning & scope & History of Physical Anthropology & its applied aspects. Theories of organic evolution, synthetic theory of evolution Lamarckism & Darwinism.
- UNIT-2** Position of Man in animal kingdom : comparative anatomy of Man and Apes.
- UNIT-3** Fossil evidence of human evolution, origin of tool making and their evolution. Ramapithecus, Australopithecus, Pithecanthropus, Sinanthropus, Neanderthal, Cromagnon, Grimaldian, Chouvalade.
- UNIT-4** Concept of race, Genetic basis of Race, UNESCO Statement on Race- Ethnic Group population, Racial classification of human Populations.
- UNIT-5** Human Genetics, Mendelian principles, Genetic markers, DNA.

PAPER - III

ANTHROPOLOGY PRACTICAL

M.M. 50

- I Identification of bones of Human Skeleton Sketching and labeling of various norms of skull Overview of Pectoral & Pelvic girdles & Femur & Human bone.
- II Craniometry :
- (i) Maximum Cranial length
  - (ii) Maximum Cranial breadth
  - (iii) Minimum frontal Breadth
  - (iv) Bizygomatic Breadth
  - (v) Nasal Height
  - (vi) Nasal Breadth
  - (vii) Basibregmatic Height
  - (viii) Bimaxillary Breadth
  - (ix) Biometrical Breadth
  - (x) Length of occipital foramen.
- III Solliatometry :
- Osteometry
- Femur
- (1) Maximum length
  - (2)

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## STATISTICS

### PAPER - I

#### PROBABILITY THEORY (paper code - 0803)

Important concepts in probability: definition of Probability- classical and relative frequency approach to probability, Richard Von Mises, Cramer and Kolmogorov's approaches to probability, merits and demerits of these approaches any general ideas to be given.

Random Experiment: Trial, sample point and sample space, definition of an event, operation of events, mutually exclusive and exhaustive events. Discrete sample space, properties of probability based on axiomatic approach, conditional probability, independence of events, Bayes' theorem and its applications.

Random Variables: Definition of discrete random variables, probability mass function, idea of continuous random variable, probability density function, illustrations of random variables and its properties, expectation of a random variable and its properties -moments, measures of location, dispersion skewness and kurtosis-probability generating function (if it exists), their properties and uses.

Standard univariate discrete distributions and their properties: Discrete Uniform, Binomial, Poisson, Hypergeometric, and Negative Binomial distributions.

Continuous univariate distributions- uniform, normal, Cauchy, Laplace, Exponential, Chi-Square, Gamma and Beta distributions. Bivariate normal distribution (including marginal and conditional distributions).

Chebyshev's inequality and applications, statements and applications of weak law of large numbers and central limit theorems.

#### REFERENCES :

- Bhat B.R., Srivenkatramana T and Rao Madhava K.S. (1997): Statistics: A Beachner's Text, Vol. II new Age International (P) Ltd.  
Edward P.J. Ford J.S. and Lin (1974): Probability for statistical decision- Making, Prentice Hall.  
Goon A.M. Gupta M.K., Das Gupta.B. (1999): Fundamentals of statistics, Vol World Press Calcutta.  
Mood A.M. Grabill F.A. and Boes D.C. (1974): Introduction to the theory of statistics, Mc Graw Hill.

#### ADDITIONAL REFERENCES :

- Cooke, Cramer and Clarke (): Basic Statistical computing, Chapman and Hall.  
Devid S. (1996): Elementary Probability, Oxford Press.  
Hoel P.G. (1971): Introduction to Mathematical Statistics, Asia Publishing House  
Meyer P.L. (1970): Introductory Probability and Statistical applications. Addison Wesley

### PAPER - II

#### DESCRIPTIVE STATISTICS (paper code - 0804)

Type of Data: Concepts of a statistical population and sample from a population; qualitative and quantitative data; nominal and ordinal data; cross sectional and time series data; discrete and continuous data; frequency and non- frequency data. Different type of scales- nominal, ordinal, ratio and interval.

Collection and security of data: Primary data- designing a questionnaire and a schedule; checking their consistency. Secondary data-its major sources including some government publications. Complete enumeration, controlled experiments, observational studies and sample survey. Scrutiny of data for internal consistency and detection of errors of recording. ideas of cross- validation.

Presentation of Data: Construction of tables with one or more factors of classification. Diagrammatic and graphical representation of grouped data. Frequency distributions, cumulative frequency distributions and their graphical representation, histogram, frequency polygon and ogives. Stem and leaf chart Box plot.

Analysis of Quantitative Data: Univariate data-Concepts of central tendency or location, dispersion and relative dispersion, skewness and kurtosis, and their measures including those based on quantiles and moments. Sheppard's corrections for moments for grouped data (without derivation).

Bivariate Data: Scatter diagram. Product moment correlation coefficient and its properties. Coefficient of determination. Correlation ratio. Concepts of error in regression. Principle of least squares. Fitting of linear regression and related results. Fitting of curves reducible to polynomials by transformation. Rank correlation- Spearman's and Kendall's measures.

Multivariable data: Multiple regression, multiple correlation and partial correlation in three variables. Their measures and related results.

Analysis of Categorical Data: Consistency of categorical data. Independence and association of attributes, Various measures of association for two way and three way classified data Odds ratio.

#### **REFERENCES :**

- Bhat B.R. Srivenkairamana T and Rao Madhava K.S. (1996): Statistics: A Beginner's Text, Vol. I, New Age International (P) Ltd.
- Croxson F.E. Cowden D.J. and kelin S (1973): Applied General Statistics, Prentice Hall of India.
- Goon A.M. Gupta M.K., Das Gupta. B. (1991): Fundamentals of Statistics, Vol. I, World Press, Calcutta.

#### **ADDITIONAL REFERENCES :**

- Anderson T.W. and Sclove S.L (19718) An Introduction to the Statistical Analysis of. Houghton Mifflin\Co.
- Cooke, Cramer and Clarke (): Basic Statistical Computing, Chapman and Hall.
- Mood A.M, Graybill F.A. and Boes D.C. (1974): Introduction to the Theory of Statistics, Mc Graw Hill.
- Snedecor G.W. and Cochran, W.G. (1976): Statistical Methods. Iowa State University Press.
- Spiegel, M.R. (1967): Theory & Problems of Statistics, Schaum's Publishing Series.

### **PAPER - II PRACTICAL**

1. Presentation of data by Frequency tables, diagrams and graphs.
2. Calculation of Measures of central tendency, dispersion, skewness and Kurtosis:
3. Product Moment Correlation and Correlation ratio.
4. Fitting of Curves by the least square method.
5. Regression of two variables.
6. Spearman's Rank correlation and Kendall's tau.
7. Multiple regression of three variables.
8. Multiple correlation and Partial correlation.
9. Evaluation of Probabilities using Addition and Multiplication theorems, conditional probabilities, and Baye's theorems.
10. Exercises on mathematical expectations and finding measures of central tendency dispersion, skewness and Kurtosis of univariate probability distributions.
11. Fitting of standard univariate and continuous distributions.

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## DEFENCE - STUDIES

### PAPER - I

#### INDIAN MILITARY HISTORY

M.M. 50

(paper code - 0817)

**AIM :** The main idea behind this paper is to give a conceptual background about the events and factors which influenced course of history and helped in developing the art of war in India.

**Note :** Questions will be set from each unit, There will be only internal choice.

**UNIT-1** 1 The definition and scope of Defence Studies and its relationship with other subjects.

2 Art of war of Epic and Puranic period.

3 Comparative study of Indo-Greek art of war with special reference to the Battle of Hydaspes 326 B.C.

4 Mauryan Military system and art of war.

**UNIT-2** 1 Kautilya's Philosophy of war.

2 Gupta's military system and art of war.

3 Military system of Harshavardhan.

4 Decline of Chariots and Importance of Elephant and Cavalry.

**UNIT-3** 1 Mughal military system.

2 Rajput and Turk pattern of warfare with special reference to Battle of Somnath and Battle of Tarain up to 12th century A.D.

3 Causes of the fall of Rajput Military system.

4 Army organization during Sultanate period.

5 Battle of Panipat 1526 A.D. and Battle of Haldighati 1576 A.D.

**UNIT-4** 1 Maratha Military system.

2 Warfare of Shivaji.

3 Battle of Assaye 1803 A.D.

4 Sikh Military system.

5 Battle of Sobraon 1846 A.D.

**UNIT-5** 1. 1857 Liberation Movement.

2 Reorganizations of Indian Army under the Crown.

3 Nationalization of, Indian Army after independence.

4 Military reforms of Lord Kitchener's.

#### READING LIST :

- |   |                                    |   |               |
|---|------------------------------------|---|---------------|
| 1 | Military System of Ancient India   | : | B.K. Majumdar |
| 2 | Generalship of Alexander the Great | : | J.F.C.Fuller  |
| 3 | Kautilya Arthashastra              | : | K.P. Kanbley  |
| 4 | Military history of India          | : | J.N. Sarkar   |

**PAPER - II**  
**DEFENCE MECHANISM OF THE MODERN STATE**  
**(paper code - 0818)**

**IM :** To enable students to appreciate the importance of higher political direction in the formulation of national defence policy and roles as political and military leadership in furthering national security.

**Note :** Question will be from each unit, there will be only internal choice.

- UNIT-1**
- 1 Evolution of National defence policy.
  - 2 Inter dependence of Foreign, Defence and Economics policies.
  - 3 Higher defence organization of U.S.A., U.K. and RUSSIA.
  - 4 Higher defence organization of CHINA, PAKISTAN and NATO.

- UNIT-2**
- 1 Higher defence organization in India.
  - 2 Powers of President and relation to Armed forces.
  - 3 Parliament and the Armed forces.
  - 4 Defence (Political affair) committee of the cabinet. Its composition, methods of working during war and peace.
  - 5 National Defence Council and its Valiant.

- UNIT-3**
- 1 Organization of Ministry of Defence.
  - 2 Organization of Army head quarter.
  - 3 Organization of Naval head quarter.
  - 4 Orgatiization of Air head quarter.

- UNIT-4**
- 1 Organization and role of Para-militaty forces - B.S.F., I.T.B.P., C.I.S.F. etc.
  - 2 Organization and role of Intelligence Agencies - RAW, CBI, CID., IB etc.
  - 3 Military Intelligence.
  - 4 Role of N.C.C. in preparing youth for Defence services.

- UNIT-5**
- 1 Organization of Civil - defence.
  - 2 Importance and role of civil defence during war and peace.
  - 3 Air-Raid signal and precaution before and after bombardment.
  - 3 Role of Indian armed forces in war and peace.

**READING LIST :**

- 1 Indian Army, A Sketch of its History & Organisation : E.H.E. Choen
- 2 Defence Organization in India : Venkateshwarm

**PRACTICAL**

**M.M. : 50**

There shall be practiccall examination ot 3 hours duration and carying 50 marks. The distribution of marks shall be as follows -

- 1 Exercises based on Map reading : 20 Marks
- 2 Exercises based on models : 10 Marks

3. Sessional Work and Record : 10 marks  
4. Viva-Voce : 10 marks,

**PART - A**

**ELEMENTARY MAP READING**

1. Maps- Definition, types, Marginal Information.
2. Conventional signs - Military and Geographical.
3. Direction and cardinal points.
4. Types of North, Angle of Convergence.
5. Study of Liquid compass, its parts, various tactical uses and preparation of Night navigation chart.
6. service Protractor and its uses.
7. To find North by Compass, Watch, Sun, Stars etc.
8. Bearing and interconversion of bearing.
9. Setting of Map.
10. Grid System.

**PART - B**

**RECOGNITION & ELEMENTARY STUDY OF FOLLOWING MODELS**

1. equivalent Rank and Badges of Indian Army, Navy and Air Force.
2. Famous Armoured vehicles used in war.
3. Weapons used in Infantry.
4. Various Ships of Indian Navy.
5. Famous Air-Crafts Used by Air-Force.

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## INDUSTRIAL CHEMISTRY

### PAPER - I

#### INDUSTRIAL ASPECTS, OF ORGANIC & INORGANIC CHEMISTRY

(paper code - 0821)

- UNIT-1** 1.1 Nomenclature Generic names, Trade names.  
1.2 Raw Materials for Organic compounds :-  
Petroleum, natural gas, Fractionation of Crude oil.
- UNIT-2** 2.1. Petrochemicals :- Cracking, reforming Hydroforming isomerisation.  
2.2. Coal :- Types, Structure, Properties, distillation of coal, chemicals derived there from.
- UNIT-3** 3.1. Renewable natural resources :- Cellulose, starch, properties, modification, important ind. Chemicals derived from them, Alcohol and alcohol based chemicals, Oxalic acid, Furfural.  
3.2. Basic metallurgical operations :- Pulverisation, calcination, Roasting, refining.
- UNIT-4** 4.1 Physico chemical principles of extraction of, :- Iron, Copper, Lead, Silver, Sodium, Aluminium, Magnesium, Zinc, Chromium.
- UNIT-5** Inorganic materials of Industrial Importance :- Their availability, forms, structure and modification. Alumina, Silica, Silicates, Clays, Mica, Carbon, Zeolites.

#### BOOKS :

1. Coal Conversion, E.J. Hoggman, The Energy Co., Laramie Wyoming, U.S.A.
2. Introduction of Petroleum Chemicals, H. Steiner, Pergamon Press.
3. From Agrocarbon to Petrochemicals, L.F. Hatch & S. Matam, Gulf Publishing Co., Houston.
4. Cellulose : Its Chemistry & Technology, Hall A.G.
5. Methods in Carbohydrate Chemistry, Vol. 3 - Cellulose, Whistler, R.L.
6. Chemistry of Cellulose, Heuser, E.
7. Chemistry & Industry of Starch, Kerr, R.W.
8. Modified Starches : Properties & Uses, Wurzburg, O.B.
9. Principles of Extractive Metallurgy, Herbashi, Vol. I & II.
10. Theory of Metallurgical Processes, Volsky, A. & Sergievskaya, F.
11. Text book of Metallurgy, Bailey, A.R.
12. Clays, H. Reis, John Wileys & Sons.
13. Unit Processes of Extractive Metallurgy, Peuhke, Elsevier Publication.
14. Industrial Chemistry, Reigel, Reinhold Publication.

### PAPER - II

#### INDUSTRIAL ASPECTS OF PHYSICAL CHEMISTRY

#### MATERIAL AND ENERGY BALANCE

(paper code - 0822)

- UNIT-1** Surface chemistry and Interfacial Phenomena Adsorption Isotherm, Sols, Gels, Emulsions, Microemulsions, micelles, Aerosols, Effect of surfactants, Hydrotopes.
- UNIT-2** Catalysts :- Introduction, Types, Homogeneous and Heterogeneous, Basic Principles, Mechanisms factors affecting the performance, Introduction to phase transfer catalysis
- UNIT-3** 3.1. Enzyme catalysed reactions - Rate model, Industrially important reactions.  
3.2. Material Balance without chemical Reactions:- flow diagram for material balance,

simple material with or without recycle or by-pass for chemical engineering operations such as distillation, crystallisation, evaporation, extraction, etc.

- UNIT-4** 4.1. Dimensions and Units :- Basic. chemical calculations -Atomic weight, molecular, weight, equivalent weight, mole composition of (i) liquid mixture & (ii) gaseous mixture.
- 4.2. Material balance involving chemical reaction :- concept of limiting reactant, conversion, yield liquid phase reaction, gas phase reactions with/without recycle or by-pass.
- UNIT-5** Energy Balance :- Heat capacity of pure gases and gaseous mixtures at constant pressures. Sensible heat changes. in liquids, Enthalpy changes.

**BOOKS :**

1. Aerosol, Science & Technology, Shepherd, H.R.
2. Catalysis :Heterogeneous & Homogeneous, Delmon, Elsevier Science Publication.
3. Catalysis, Science & Technology, Anderson, J.
4. Catalysis in Micellar & Macromolecular systems, Fendler & Fendler.
5. Phase Transfer Catalysis, Principle & Techniques, Strles, C.
6. Surface Chemistry, J.J. Bikermann, Academic Press.
7. Physical Chemistry of Surfaces by A.W. Admson.
8. Stoichiometry, B.I. Bhatt & S.M. Vora.
9. Chemical Process Principle - Part I, B.A. Hougen, K.M. Watson & R.A. Ragats, Asia Publication.

**PAPER - III**

**UNIT OPERATIONS IN CHEMICAL INDUSTRY AND UTILITIES,  
FLUID FLOW AND HEAT TRANSPORT IN INDUSTRY**

(paper code - 0823)

- UNIT-1** 1.1. Distillation - Introduction; Batch and continuous distillation, separation of azeotropes, plate columns & packed, columns.
- 1.2. Absorption - Introduction, Equipments- Packed columns, spray columns, bubble columns, packed bubble columns, mechanically, agitated contractors.
- UNIT-2** 2.1 Evaporation - Introduction, Equipments - short tube (standard) evaporator, forced circulation evaporators, falling film evaporators, climbing film (Upward flow) evaporators, wiped (agitated) film evaporator.
- 2.2 Filtration - Introduction, filter media and filter aids, Equipments- Plate and frame, filter press, nutch filter, rotatory drum filter, sparkler filter, candle filter, bagfilter, centrifuge.
- 2.3 Drying - Introduction, free moisture, bound. moisture, drying curve, Equipments tray dryer, rotatory dryer, flash drater, fluid bed dryer, drum dryer, spray dryer.
- UNIT-3** 3.1 Utilities in chemical Industry
- Fuel - Types of fuels -advantages and disadvantages, combustion of fuels, calorific value. specification for fuel oil.
- Boilers - Types of .boilers and their functioning.
- Water - Specifications for industrial use, various water treatments.
- Steam - Generation and use.

Air - Specifications for Industrial use processing of air.

**UNIT-4** Fluid Flow : Fans, blowers, compressors, vacuum pumps, ejector.  
Pumps :- Reciprocating pumps,, Gear pumps,, centrifugal pumps.

**UNIT-5** Heat Exchangers -: Shall and Tube type; finned tube heat exchangers, plate heat exchangers, refrigeration cycles.

**BOOKS :**

1. Introduction Chemical Engineering, W.L. Badger, J.J. Banchero, McGraw Hill.
2. Unit Operations in Chemical Engineering, W.L. McCabe & J.C. Smith, McGraw Hill.
3. Chemical Engineer's Hand Book, J.H. Perry, McGraw Hill.
4. Unit Operations - I & II, D.D. Kale, Pune Vidyarthi Griha Prakashan, Pune.
5. Unit Operations of Chemical Engineering, Vol. I, P. Chattopadhyay, Khanna Publishers, Delhi.

**PRACTICAL**

Duration of Examination : 04 Hrs.

Discription of marks	Experiment	:	30 marks
	Viva	:	05 marks
	Sessional	:	05 marks
	Project	:	40 marks
	<b>Total</b>	:	<b>80 marks</b>

**EXPERIMENTS TO BE PERFORMED :**

1. Simple laboratory techniques crystallisation, Fraction Crystallisation, Distillation, Fractional distillation Boiling Point.Diagram.
2. Extraction Processes- Phase diagram, partition co-efficient.
3. Preparation of standard solutions- Primary and secondary standards, Determination of  $\text{H}_2\text{SO}_4$  and  $\text{H}_3\text{PO}_4$  in a mixture.
4. Calibration of Thermometres.
5. Acquaintance with safety measures in a laboratory Hazards of Chemicals.
6. Depression and elevation in.b.p./m.p. of solids and liquids.
7. Chromatography-column, Paper, Thin layer.
8. Ore analysis dolomite, limestone, -calcite, Analysis of alloys such as cupro-nickel.
9. Determination of Physical Constants  
Refractive -index, surface tension, Effect of surfactants, on surface tension, viscosity- Fluids, Polymer solutions effect of additives on viscosity, optical rotation.
10. Study, experimenfs/demonstration experiments.

**Note :** Any two experiments have to be carried out by the students in the Examination. A Minimum of 60% of the experiments have to be conducted by the students.

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**COMPUTER**  
**PAPER - 1**  
**COMPUTER HARDWARE**  
**(paper code - 0805)**

**AIM :** 'Introduction to computer hardware organization-& computer digital electronics:

**Note :** Question paper should be prepared, having unit-wise questions with internal choice.

**OBJECTIVE OF COURSE :**

1. To introduce, the computer PC's and clones to the students.
2. To introduce and explain terms, various parts of computer, which will be helpful in understanding of computer hardware & use of computer.
3. To introduce an idea of digital electronics and digital circuits for building up- the computer.

**UNIT-1 GENERAL OVERVIEW OF COMPUTER HARDWARE :**

- (A) **Introduction to computer :** Computer Vs-Calculator & typewriter ; Parts of a computer ; The system unit/inside the system unit, CPU; RAM-KeyBoard Storage Media Floppy disc & hard disc; Monitor, Mouse; . Printer; Types of Computer, Evolution of personal computer from PC-XT, PC-AT (286) to pentium PC. Hardware & Software Types of Software System Software, Application Software, introduction to Programming Languages, Procedural Oriented Language, Structured Programming, Object Oriented Programming, Languages [Ex. BASIC, COBOL, PASCAL, C, C++, Visual Basic, JAVA & C#]. Types of operating System" introduction to DOS, UNIX, Windows, Simple DOS Commands and Features of UNIX & Working of Windows.
- (B) **Computer System Operation** Number system: Unary system, Decimal system, Binary system conversions, addition, subtraction by 9's and 10's complements and by 1's and 2's complements. Binary multiplication & division : Octal number system & hexadecimal number system and use.

**UNIT-2 COMPUTER DIGITAL ELECTRONICS - PART A :**

- (A) **Computer Communication Code -'** Binary code, 8421 code; Excess 3 code; parity code-, Grey code ASCII & EBCDIC codes.
- (B) **Computer Logic System Logic Gates:** Diode and BJT as switch; Response of BJT to square waves, New logic, Mathematical logic, Basic logic operations /gates, AND, OR, NOT operator./ gate, Positive and Negative logic, NOR & NAND gates, Boolean, equations by logic symbol

**UNIT-3 COMPUTER DIGITAL ELECTRONIC - PART B :**

- (A) **Integrated Circuits for Computer Logic Family :** Electrical characteristics, Propagation delay Noise immunity, Types of load RTL, DTL, TTL & CMOS Bipolar & MOS integration circuits, TTL circuits.
- (B) **Basic bone of Digital Circuitry, Boolean Algebra :** Laws of boolean Algebra, Demorgan's theorem, Dual nature of Boolean Laws, Boolean expression And logic diagram. The Karnaugh map, Truth table to K-map, Simplification of K-map.
- (C) **Computer Logic Circuits, :,** Ex-OR, Ex-NOR circuitry, Half and full adder, Half

and full subtractor, Subtraction by 1's & 2's compliments.

**UNIT-4 COMPUTER DIGITAL ELECTRONICS - PART C :**

- (A) **More computer Logic circuit combinational logic circuits :** Encode & Decoder, Four bit binary, decoder, BCD to 7 segment, decoder encoder, Multiplexers & demultiplexers, Data transmission, Logic function generator.
- (B) **Multivibrator Circuits:** Monostable, Astable & Bistable circuits, Schmitt Trigger, RS flip-flop, RS flip-flop using NOR gate and NAND gate, clocked-RS flip-flop, D flip-flop or latch, Edge triggered flip-flop, Preset and clear, propagation delay-Set-up time, Hold time Master-Slave flip-flop.

**UNIT-5 COMPUTER DIGITAL ELECTRONICS - PART D :**

- (A) **Computer counters and shift registers:** Binary counter, Down counter, Parallel or Synchronous counter, counter with feedback, code-7 precision time interval, Monitor horizontal to Vertical generator, shift registers in brief, application of shift registers.
- (B) **Computer Memories** Types of, memory, RAM, ROM., PROM, EPROM, DRAM, SRAM.

**TEXT BOOK :**

- 1 Riapidex computer course - (Pustak Mahal) by vikas Gupta.
- 2 Digital & Analogue Techniques, - (Kitab Mahal) by Navneet, Gokhale & Kale

**REFERENCE BOOKS :**

- 1 Computer To-day - By Donald H. Sanders
- 2 IBM PC & Clones, - By B. Govindarajalu
- 3 Fundamental of Digital Computers - By Thomas Bharti
- 4 Introduction to Digital Electronics - By Moninder singh
- 5 Fundamental of Computer - By V. Rajaraman.

**PAPER - II**

**COMPUTER, SOFTWARE PART - A**

(paper code - 0806)

**AIM :** Introduction to computer software organization & use for solving any problem by Computer.

**NOTE :** Question paper should be prepared-having unit-wise question with internal choice.

**OBJECTIVE OF COURSE :**

- 1 To introduce the basic knowledge of software require for running the computer.
- 2 To introduce the basic knowledge of programming in HLL, BASIC for solving-the problem.
- 3 To introduce the WORLD PRO CESSOR package for document processing and mail merge.

**UNIT-1 Fundamentals for using the Computer:**

**(A) Driving the Computer**

- (1) Computer Operating System & other Software :

- Ⓐ Windows & UNIX system Software & their versions.
- Ⓑ HLL Software : BASIC, COBOL, PASCAL, C, C++, Visual Basic, JAVA & C#.
- Ⓒ Package Softwares - MS- Office & Foxpro.
- (2) Introduction to DOS Ver 6.22 & Windows-95, Windows-98 & Windows-2000.
- (3) Windows concept, various features & advantages, Windows structure, Desktop, Taskbar, Start Menu, My Computer, Recycle bin.
- (4) Accessories: Calculator, Notepad, Paint, WordPad, Character Map, Explorer : Creating Folders and other Explorer Facilities.
- (5) Object Linking & embedding. Communication - Dialup Networking, Phone dialer.

**(B) General idea of Problem Solving with Computers**

Problem Analysis & Solving Scheme, Computational procedure, program outline, algorithm, pseudocodes, flow chart, testing of flow chart, branching and looping, writing, executing & testing the program with examples.

**(C) Programming Constants, and Variables**

Character set, constants (numeric string), variables (numeric & String), rules for arithmetic expression and hierarchy of operations, relational expressions, logical expressions and operator, library, functions.

**UNIT-2 (A) Working with MS-Office**

**Introduction to word :** Basics of WordProcessing; Features, & Advantages of Word Processing; Creating, editing, formatting & previewing documents; Advanced features; Using Thesaurus, Mail merge, Table & Charts, Implementing OLE concept.

**Introduction to Excel :** Worksheet Basics, Creating, Opening, & Moving in Worksheet, Working with Formula & Cell referencing, Absolute & Relative addressing, Working with Ranges, Formatting of worksheet, Graphs & charts, Database, Function, and Macros.

**Introduction to Power Point :** Creating a presentation, Modifying Visual Elements, Adding objects, Applying Transitions, animations and linking, Preparing, handouts. presenting a slide show.

**(B) Working on Internet**

**Introduction to Internet ;** Concept of Internet, Application of Internet, Services on Internet, World WideWeb (WWW) & Web Browsers, working with Internet Explorer. Introduction to Internet search Engines, Yahoo, Alta Vista, Google etc. Surfing the Internet, Chatting on Internet Electronic Mail (E-Mail), working with Outlook Express; Overview of telnet & FTP (File transfer Protocol) Services. Internet Security, Web security firewalls, Type of firewalls,

**UNIT-3 PROGRAMMING WITH C : PART - A**

Introduction Character set, Identifiers and Keywords, Variables, Displaying variables, Reading Variables, Character and Character, String, Qualifiers, Type define Statements, Value initialized Variables, Constants, Constant Qualifier, Operators and Expressions, Operator Precedence- and Associativity, Basic input output : Single Character I/O General Outputs, Types of Characters in format string, Scanf with Specifier, Searchset

Arrangements and Supression Character, Format Specifier for scanf.

Control Structure: If-statement, If else statement, Multiway decision, Compound **Statement, Loops** : For- loop, While-loop, Do-while loop, Break statement, Switch statement, Continue statement, Goto statement. Functions Function main, Function accepting more than one parameter, User defined and library function, Concept associativity with functions, function parameter, Return value, recursion comparisons, of Iteration and recursion variable length argument list.

#### **UNIT-4 PROGRAMMING WITH C : PART - B**

Scope and Extent, Arrays, Strings, Multidimensional Arrays, Strings, Array of. Strings, I Function in String, Pointers: Definition, and Use of Pointer, address operator, pointer variable, referencing pointer, void pointers, pointer arithmetic, pointer to pointer, pointer and arrays, -passing arrays to functions, pointer and functions, accessing array inside functions, pointers and two dimensional arrays, array of pointers, pointer constants, pointer and functions, accessing array inside functions, pointers and two dimensional arrays, array of pointers, pointer constants, pointer and strings.

#### **UNIT-5 PROGRAMMING WITH C : PART - C**

Structure and Union, Declaring and using Structure, Structure initialization, Structure within Structure, Operations of Structures, Array of Structure, Array within Structure, Creating user defined data type, pointer to Structure and function. Union, difference between Union and Structure, Operations on Union, Scope of Union.

Dynamic memory allocation. Library function for Dynamic memory allocation, Dynamic Multi-Dimensional arrays, Self-referential structure. File:- Introduction, Structure, Filehandling, Functions file types, Unbuffered and buffered file" Error handling. Low level five Input-Output.

#### **TEXT BOOKS :**

- |   |                         |   |   |
|---|-------------------------|---|---|
| 1 | PC Software made Simple | - | R.K. Taxali                                     |
| 2 | - Let us C              | - | Yashwant Kanitkar                               |
| 3 | Microsoft Office        | - | Ginni Courter, Annotte Marquis, BPB Publication |

#### **REFERENCE :**

- |   |                          |   |                                    |
|---|--------------------------|---|------------------------------------|
| 1 | Programming with C       | - | SchAum's Series (Tata McGraw Hill) |
| 2 | Programming with C       | - | K.R. VENIUGOPAL, SUDDEP PRASAD     |
| 3 | Computer Today           | - | Donald H. Sanders                  |
| 4 | Fundamentals of Computer | - | V. Rajafaman                       |

#### **PRACTICALWORK :**

1. The practical exercises should be done to understand the working of DOS, WINDOWS & also to see the various features of existing versions of Windows OS, (eg. Windows 95, Windows 98, Windows 2000).
2. The sufficient practical work should be done for understanding the topics of Unit-II.
3. At, least Five programs on each unit from Unit III to Unit V be prepared.
4. All practical work should be prepared in form of printouts, & be evaluated, while practical examination.

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# ELECTRONICS EQUIPMENT MAINTENANCE

## PAPER - I

### PRINCIPLES OF ELECTRONICS

(paper code - 0809)

- UNIT-1** General information : Symbol, colour code, types (Such as carbon, metal film, thin-film thick-film, wire-wound), Variable resistors potentiometers (logarithmic linear multi-turn wire wound rheostat).  
Physical properties : Temperature dependence (Thermistor), Light Dependence (LDR), Voltage Dependence (VDR). technical specification wattage and working voltages. Methods of measurement of resistance: very low to very high values.  
**INDUCTORS** : General Information: symbol, Types such as air core, iron core, ferrite core, choking inductors (Coil), frequency response of an inductor.  
Method of measurement of inductances: using universal bridges design and fabrication rules.  
**CAPACITORS** : General information : symbol, colour code, types of capacitors such as Air, paper, Electrolytic, Mica, Tantalum Polyurethane, fixed and variable capacitors. Measurement of Capacitance: universal bridge. application areas.  
**BATTERIES** : Dry Cells, Lead-Acid Accumulators, Nickel Cadmium cells, standard cells, principles, Specifications.  
**FUSES** : Fast and Slow Fuses, Pilot Lamps.  
**PCB** : Types of PCB, layout techniques, cables and connectors for PCB
- UNIT-2** **TRANSFORMERS**: General information- principle, types of transformer such as single phase, auto mains and isolation transformers. Frequency dependence of transformer theorem. (Audio, IF and RF), Design of mains transformers and CVT.  
**RELAYS** : General information: symbol, types of relays, such as reed electromagnetic. Specifications, rating, application areas.  
**MICROPHONES AND LOUDSPEAKERS** : General information: frequency response, input and output Impedance, power rating, directionality (omni and uni-directional). Application areas.  
**TRANSDUCERS** : Commonly used transducers, L.D.R., thermistors thermocouples, photodiodes, photo transistors, IR detectors L Volt.
- UNIT-3** **SWITCHES, CABLE AND CONNECTORS** : Spdt, dpdt, band switches, touch switches, thumbwheel switches, micro switches, specifications, application areas.  
**NETWORK THEOREMS** : Kirchoffs current and voltage law, maximum power transfer, **THEOREM** : venin's theorem, norton's theorem, super position theorem.  
**LCR AND WAVESHAPING CIRCUITS** : Serial and parallel response, idea of black box, equivalent circuits. Idea of two terminal and two part network, equivalent circuits. Integration, differentiation using R.C. circuits, *chopping clamping*.
- UNIT-4** **NUMBER SYSTEMS** : Introduction to decimal binary, octal hexadecimal, number system interconversions of decimals binary and BCD number. Binary arithmetic and Boolean algebra & Boolean axiom, De Morgan's theorems- statement verification and applications.  
**LOGIC GATES** : Positive and Negative logic, different logic gate, such as AND, OR NOT, NAND, NOR, EXOR, symbol and truth tables. Inverting a non-inverting suffers.  
**LOGIC FAMILIES** : TTL, ECL & CMOS parameters like power dissipation, speed, supply requirements, logic level, fan in, fan out noise half adder, full adder, half subtractor.
- UNIT-5** **COMBINATIONAL CIRCUITS** : Encoder-decoder sequential circuits, flip flops (As, K, D, J, N, S) -shift, registers, counter Semiconductors memory.

PAPER - II

**ELECTRONIC DEVICES, COMPONENTS & ASSEMBLIES (paper code - 0810)**

**UNIT-1 INTRODUCTION- TO SEMI CONDUCTORS**

**ENERGY BAND DIAGRAM:** conductors, semi conductor, insulation, intrinsic and extrinsic semi conductors (P.N. type), diffused junctions, depletion layer, barrier potential.

**JUNCTION DIODES :** Rectifying diode, forward and reverse bias characteristic, switching diode, varactor diode, photo diode. light emitting diode, IR sources and detector optical isolators, Zener diode, Tunnel diode, tunnel diode.

**BIPOLAR JUNCTION TRANSISTORS :** Basic working principle (qualitative), characteristic, Basic configurations and biasing. Operating point, load line, biasing for stabilization of operating point.

**UNIT-2 JET & MOSFET:** Basic working principle (qualitative), characteristic Breakdown voltage, **UNI JUNCTION TRANSISTORS :** Basic working principle (qualitative), characteristic applications, as a switch.

**POWER CONTROL DEVICES :** Four layer diode (PNPN), Silicon controlled, rectifier (SCR) triac, diac, principle & characteristics.

**AMPLIFIERS :** Different terms used in amplifiers, such as signal source, input output, voltage and current gain power gain, - decibel, input and output impedance. Classification according to the frequency response, RC coupled, class A common emitter Amplifier, Introduction to the class & operation

**FEED BACK IN AMPLIFIER :** Effect of negative feedback on amplifier performance.

**UNIT-3 POWER AMPLIFIER :** Transformer coupled equivalent circuit only in brief, class A, class B. class AB and class C the constant power hyperbola, the AC load line input and output considerations, determination of Non-linear distortion.

**PUSH-PULL AMPLIFIERS :** Phase splitter circuits, complementary push-pull, thermal runaway, Heat sinks.

Class B and C resonant load amplifiers, graphical class C analysis, **resonant** load requirements.

**OPERATIONAL AMPLIFIER :**

Basic, idea of an OPAMP with black box concept inverting and noninverting inputs, virtual ground

Parameters such as input impedance, output impedance, open loop gain, measurements of parameters.

Qualitative description of OPAMP as inverting and non inverting amplifier, summing and difference amplifier, comparator and linear integrators, instrumentation amplifier.

**UNIT-4 OSCILLATORS :** Positive feedback, Barkhausen criteria, phase shift oscillators, Wien bridge oscillators Tuned oscillators, Hartley, Colpitts-oscillators, crystal oscillator.

**POWER SUPPLIES :** Regulated power supply, Zener regulated power supply series and shunt regulated power supply, block diagram of IC 723, regulated supply of IC 723. Three terminal ICs power supply. Study of power supply. w.r. to variation in load and input voltage.

**SWITCHED MODE POWER SUPPLY :** Design principle, and application.

**IC 555 :** Operations and applications.

**UNIT-5 MODULATION :** AM and FM : Principles, modulation, index, modulation, bandwidth, balanced modulator,

**DEMODULATION :** Am and Fm detectors diode detectors, ratio detector, balanced demodulator'.

Introduction to communication systems, basic principles and operation of communication system.

## ELECTRONICS

### PAPER - I

#### ELECTRON DEVICES & PASSIVE CIRCUITS

M.M. 50

(paper code - 0807)

- UNIT-1** Physic of semiconductors : Basic idea of crystal structure and energy bands, simple idea of effective mass, carrier concentration at normal equilibrium in an intrinsic semiconductor, Fermi level for intrinsic semiconductor. Donors and acceptors, Physical picture of electronic and holes as majority carriers, dependence of Fermi level on donor and acceptor concentration, Law of mass action ( $n_p p_p = N_i^2$ ).
- UNIT-2** Basic derivation of the relationship between carrier concentration mobility and electron charge from Ohm's Law, idea of drift and diffusion, simple idea of Hall effect.  
PN junction, Barrier formation, current components in equilibrium under open circuit, derivation of barrier potential and current voltage characteristics, the resistance of p-n junction diode and its variation with biasing, definition of transition capacitance, capacitance voltage relationship for an abrupt p.n. junction diode.  
Basic idea and working of a varactor diode, Solar, cell, LED, Schottky diode, tunnel diode, Zener diode and qualitative mechanism of breakdown.
- UNIT-3** PNP and NPN transistors (Eber-Moll Model), definition of alpha and beta and derivation of relationship between them, basic idea of junction capacitance.  
The construction and working of JFET, the idea of channel width, field dependent mobility showing current dependence of voltage, Physical explanation of different regions of I-V curves, various parameters of JFET.
- UNIT-4** MOS Devices, Basic structure and energy level diagram, definition of work function, electron affinity, surface potential and difference between intrinsic Fermi level and Fermi level of doped semiconductor, Physical explanation of the formation of accumulation, depletion and inversion regions under an external bias, the idea of band bending (assume that  $E_f$  remains fixed).  
Basic construction of MOSFET and its working Physical explanation of the characteristics curve enhancement and depletion modes, MOSFET Parameters.
- UNIT-5** Basic idea of the impedance of L, C and R, representation of L and C in presence of loss (non ideal). Transformer and its equivalent circuit, mutual inductance, qualitative idea of magnetic core, Qualitative idea of Steady State and transient response. Network analysis (resistive and reactive), Network definition, loop and nodal analysis, principle of duality, reduction of complicated network, T and Pi form, conversion between T and Pi sections, superposition theorems, Norton's theorem, maximum power transfer theorem, Definition of Z, Y, H, G, Transmission (A, B, C, D parameters) for two port networks, inter-relationship of these parameters.

### PAPER - II

#### LINEAR ACTIVE CIRCUITS

M.M. 50

(paper code - 0808)

- UNIT-1** P-N Junction diode characteristic curves, static and dynamic resistance of a diode,

idea of positive, negative biased resistance of a diode, idea of positive, negative biased and combination clipping circuits, Avalanche breakdown and Zener effect, half wave and full wave rectifiers and bridge rectifiers, ripple factor and power conversion efficiency for the half wave and full wave rectifiers, use of Zener diode in power supplies, voltage regulation, filter (series inductor, shunt capacitor, L-C and Pi section filters).

**UNIT-2** Characteristic curves of bipolar transistors, determination of load line (static), active, Cut off and saturation regions, dynamic load lines.

Biasing (fixed and self) of a transistor circuit, thermal instability of bias, transfer curves showing dependence of  $I_E$  on  $V_{BE}$ ,  $I_{C0}$  and  $\beta$ ,  $I_{C0}$  and  $V_{BE}$ , derivation of stability factor  $S$ ,  $S'$  and  $S''$ .

**UNIT-3** The black box idea of CE, CB and CC transistor circuit as a two port network, small signal active circuit, hybrid model of a CE transistor circuit and its  $g_m$  equivalent, similarity in the small signal amplifiers using JFET and BJT, derivation of voltage and current gains, input impedance and output impedance RC coupled amplifier and derivation of half power points for its frequency response, idea of bandwidth.

**UNIT-4** Parallel resonant circuit, its quality factor and frequency response, basic circuits for tuned amplifiers, equivalent circuit of a single tuned transistor amplifier and determination of its gain and bandwidth (for CE case), idea of cascading of tuned amplifiers, Class A, Class B and Class C amplifiers, Power amplifiers, analysis and design considerations of push pull amplifiers.

**UNIT-5** Feedback in amplifiers, advantage of negative feedback in amplifiers, voltage and current feedback transistor amplifiers, positive feedback, Barkhausen criterion for self-sustained oscillations, Analysis of LC and Phase shift oscillators, Working of Hartley, Colpitt and Weinbridge Oscillators.

Operational amplifiers : requirements of an ideal Op-Amp, Op-Amp basic idea of common mode gain, difference gain, common mode rejection ratio, application of Op-Amp as inverting and non inverting amplifier, adder, subtractor, integrator and differentiator.

### PRACTICALS

**M.M. 50**

A student is required to do at least 15 experiments in an academic year. The scheme of Practical Examination will be as follows :-

⊕	One Experiment	3 Hours
⊕	Marks	
	Experiment	30
	Viva-Voce	10
	Sessional	10
		50

#### LIST OF PRACTICALS :

Familiarisation with electronic components :-

I Passive Circuit elements.

## II. Active circuit elements including IC.

Familiarisation with basic electronic instruments, Power supply signal generator LCR bridge. CRO, frequency meter multimeters VTVM, EVM.

- 1) Determination of energy band-gap of a diode.
- 2) Verification of Norton's Theorem and Superposition Theorem.
- 3) Measurement of capacitance and resistance combinations using LCR bridge.
- 4) Frequency and phase measurement with CRO.
- 5) Verification of network theorems (Thevenin's and Max. power transfer theorem).
- 6) Study of simple RC network.
- 7) Study of series and parallel resonance circuits.
- 8) Study of diode, (including Zener diode) characteristics.
- 9) Study of Transistor characteristics.
- 10) Study of simple power supply.
- 11) Study of RC coupled amplifier.
- 12) Study of transistor bias stability.
- 13) Study of LC oscillator.
- 14) Study of emitter follower (Measurement of input, output impedance and gain).
- 15) Study of transistor phase shift Oscillators.
- 16) Study of FET characteristics.
- 17) Study of the clamping and clipping circuits.
- 18) Study of IC Op-AMP applications, viz. Integrator, Differentiator, Adder, Subtractor.
- 19) Study of biasing of a BJT-Designing of potential divider arrangement for given point condition. Measure the dc voltage at different points.
- 20) Study of frequency response of a single CE amplifier (Make your own circuit).

- Note :**
1. Out of above mentioned twenty experiments at least fifteen experiments should be done, use of bread board and use of soldering is expected for at least four experiments.
  2. Other experiments of equal standard may also be set.

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## **INFORMATION TECHNOLOGY**

Elective/Core Subject Information Technology

Eligibility for B.Sc. I, II & III subjects

First Year

Theory

Paper-I	Fundamental of I.T. and PC software	:	50 Marks	(I+II=100)
Paper-II	Programming concept using C Language	:	50 Marks	(I+II+III=150)
Practical		:	50 Marks	

### **PAPER - I**

#### **FUNDAMENTAL OF I.T. COMPUTERS & PC SOFTWARE**

**(paper code - 0824)**

- UNIT-1** Introduction to computer Von-Neumann model general architecture of computer input and output devices. Application of computers.
- UNIT-2** Fundamental of DOS version of DOS booting process internal and external commands creating and executing batch files, files and directories creating text files.
- UNIT-3** Introduction to windows features of windows hardware requirement for running various versions of windows. New installation and upgradation. Origin of windows, part of windows screen, types and anatomy of windows, using program manager, creating and using groups, using file manager Accessories.
- UNIT-4** Introduction word processing (MS-WORD) advantage of word processing introduction and installation. Editing a file Using paragraph styles. Newspaper style columns using macros, Advanced word processing, Headers and footers, Finding text setting up printer. Mailmerge and other application Mathematical calculator. Table handling.
- UNIT-5** Introduction to spreadsheet (MS-EXCEL) Definition and advantage of electronic worksheet, working on spread sheets, Range and related operations Setting saving and retrieving worksheets, inserting deleting coping and moving of data cells inserting and deleting rows and column protecting cells printing a worksheet erasing a worksheet in Graphs creation types of graphs creating a chart sheet 3D. Columns charts moving and changing the size of chart printing the chart.

#### **BOOK RECOMMENDED :**

1. PC Software by Ravi Taxali
2. Computer Fundamental by P. K. Sinha
3. Computer Fundamental by Nagpal.

### **PAPER - II**

#### **PROGRAMMING CONCEPT USING C LANGUAGE**

**(paper code - 0825)**

- UNIT-1** History of programming Language Low Level Middle Level and High Level Languages.

Programming Development Techniques using flow charts algorithms Compiler and Interpreters.

**UNIT-2** Introduction to C Programming Structure and C Compiler.

Data representation : simple data types like real integer character etc.

Program, Statements and Header files Simple Input Output Statements in C Running simple C Programs.

Primitive data types in C++ char integer Float Double Long Double Void etc.

**UNIT-3** Operator and expression Arithmetic Operators Assignments operator increment and decrement operator relational and boolean operators Mixing of different data types and operators for forming expressions.

Control Structures using if, if else, Nested If else Switch statement Using of loops : For loop situations, while loop situation Nested loops.

**UNIT-4** User defined functions (Simple Call by value and recursion)

The array data types 1 dimensional and multi dimensional the array of character constructing strings and string manipulation, data structures, Nested structures and union.

**UNIT-5** Introduction to pointers, Use of pointer in function (call by reference) . Pointer in Array, Structures Pointers and file handlings.

**BOOK RECOMMENDED :**

- 1 Let us C- y. Kanetkar
- 2 Ansi C- Balaguruswami
- 3 Programming in C- Gotrfield (Schaum Series)

**PRACTICAL**

**M.M. : 50**

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## INDUSTRIAL MICROBIOLOGY

Paper	Title	Time	Marks
First	General Microbiology, Tools and Techniques	3 hrs.	50
Second	Molecular Biology, Biochemistry and Microbial Genetics	3 hrs.	50
	PRACTICAL (including sessionals)	4 hrs.	50 (40+10)

### PAPER -

### GENERAL MICROBIOLOGY, TOOLS AND TECHNIQUES M.M.50

#### I (paper code - 0826)

- UNIT-1** History and development of Industrial Microbiology. Contributions of Antony von Leeuwenhoek, Louis Pasteur, Robert Koch, Edward Jenner, Wakman, Alexander Fleming.
- UNIT-2** General characteristics and structure of Bacteria, Cyanobacteria, Fungi, Actinomycetes, Mycoplasmas, Viruses.
- UNIT-3** Microscopy - Invention of Microscope, Compound microscope, Dark field, Fluorescent, Phase contrast and Electron microscope.
- UNIT-4** Method of sterilization, culture media and isolation techniques. Methods of preservation of microbial cultures.
- UNIT-5** Basic principles and usage - pH meter, Densitometer, Colorimeter, Spectrophotometry, Fluorimetry, Centrifugation - Principles and applications. Usage of Fermentation.

### PRACTICALS

The Practical works will, in general be based on the prescribed syllabus in theory and the candidates will be required to show the knowledge of the following :

1. Preparation of media, autoclaving and sterilization of glassware.
2. Isolation of Phytopathogens.
3. Isolation of Microorganisms from soil and water : Bacteria, Fungi, and Algae.
4. Purification of microbial cultures.
5. Camera Lucida Drawing.
6. Standard Plate count.
7. Haemocytometer.
8. Chromatographic techniques : Separation of amino acids by paper and thin layer chromatography.
9. Measurement of pH of fruit juice.
10. Estimation of carbohydrate by colorimeter.

#### **BOOK RECOMMENDED :**

1. General Microbiology, Vol. II by Power and Dagainawala.
2. Microbiology by Pelczar, Reid and Chan.
3. General Microbiology by Davis and Harper.
4. A Treatise on Media and Methods Used in Bacteriological Techniques by V. Iswam.
5. Introductory Mycology by C.J. Alexopoulos & Mims.
6. Microbiology by P.D. Sharma.

**PAPER - II**  
**MOLECULAR BIOLOGY, BIOCHEMISTRY AND MICROBIAL GENETICS**  
(paper code - 0827)

**M.M. 50**

- UNIT-1** Nucleic Acids - Structure of DNA and RNA(s), Replication of DNA, Synthesis of RNAs and their types, Genetic code, Concept of genes.
- UNIT-2** Molecular Biology - Translation and Protein Synthesis, Operon Concept, CAMP CAP (Catabolic activator protein), Gene expression in Prokaryotes, Lac-Operon. Gene regulation in Eukaryotes (Britton-Davison Model of Gene Expression).
- UNIT-3** Genetic recombination in Bacteria - Transformation, Transduction and conjugation, Genetic Mapping, Extrachromosomal genetic material, Plasmids, Cosmids, Transposons, Overlapping genes, Silent genes and their evolutionary significance. Mutation - Molecular mechanism of mutation, Chemical and Physical Mutagens, Repair of Mutation Damage.
- UNIT-4** Biochemistry - Classification of carbohydrates, Chemical structure and property of starch, Cellulose, Glycogen, Synthesis of Purines & Pyrimidine.  
Lipids - Saturated and unsaturated fatty acids, Biosynthesis of fatty acids, Distribution and functions of lipids in microorganisms, Degradation of lipids by O<sub>2</sub> and Co oxidation, Lipid peroxidation.
- UNIT-5** Enzymes - Classification. Co-enzymes, Cofactors, Mechanism of enzyme action, Competitive and non-competitive inhibition. Allosteric regulations of enzymes, isoenzymes, factors contributing to catalytic efficiency of enzymes.  
Amino acids - Classification of essential amino acids based on polarity. Acid-base properties and solubilities. Amino acid sequencing of proteins; Primary, Secondary and Tertiary structure.

**PRACTICAL**

The Practical work will, in general, be based on the syllabus prescribed in theory and the candidates will be required to show the knowledge of the following -

1. Isolation of antibiotic resistant bacteria.
2. Estimation of alkaline phosphatase activity.
3. Measurement of  $\alpha$ -amylase activity in extra-cellular fraction of microbial cultures.
4. Estimation of glycogen in bacterial cells.
5. Measurement of cellulase activity by Viscometric technique.
6. Determination of cellulase and amylase activity by reducing sugar assay test.
7. Isolation of DNA.

**BOOK RECOMMENDED :**

1. General Microbiology, Vol. 1 by Power & Dagainawala.
2. Microbial Biochemistry by Moat.
3. Principles of Biochemistry by Lehninger.
4. Outline of Biochemistry by Cohn and Stumph.
5. Biochemistry by Harper.
6. Text book of Biochemistry by Rama Rao.
7. Text book of Biochemistry by O.P. Agrawal.

# BIO CHEMISTRY

## PAPER-I

### BIOMOLECULES

M.M. 50

(paper code - 0832)

#### UNIT-I

Introduction to Biochemistry, water as a biological solvent, weak acids and bases, pH, buffers, Henderson-Hasselbalch equation, physiological buffers, fitness of the aqueous environment for living organisms.

#### CARBOHYDRATES

Structure of monosaccharides. Stereoisomerism and optical isomerism of sugars. Reactions of aldehyde and ketone groups. Ring structure and anomeric forms, mutarotation. Reactions of sugar due to hydroxyl groups. Important derivatives of monosaccharides, disaccharides and trisaccharides (structure, occurrence and functions of important ones). Structure occurrence and biological importance of monosaccharides, oligosaccharides and polysaccharides e.g. Cellulose, Chitin, agar, algenic acids, pectins, proteoglycans, sialic acids, blood group polysaccharides, glycogen and starch. Bacterial cell wall polysaccharides etc. Glycoproteins.

#### UNIT-II Lipids

Definition and classification. Fatty acids : introduction, classification, nomenclature, structure and properties of saturated and unsaturated fatty acids. Essential fatty acids, prostaglandins. Triacylglycerols: nomenclature, physical properties. chemical properties and characterization of fats - hydrolysis, saponification value, rancidity of fats, Reichert-Meissel number and reaction of glycerol. Biological significance of fats. Glycerophospholipids (lecithins, lysolecithins, cephalins, phosphatidyl serine, phosphatidyl inositol, plasmalogens), sphingomyelins, glycolipids - cerebrosides, gangliosides. Properties and functions of phospholipids, isoprenoids and sterols.

#### UNIT-III Proteins

Introduction, classification based on solubility, shape, composition and functions. Aminoacids: common structural features, stereo-isomerism and RS system of designating optical isomers, classification and chemical properties, titration of amino acids, separation of amino acids. Essential amino acids.

Peptides: structure of peptide bond, chemical synthesis of polypeptides - protection and deprotection of N-terminal, and C-terminal ends and functional groups in the side-chains, formation of peptide bonds, condensing agents, strategy of chemical synthesis, Merrifield solid-phase peptides synthesis. Determination of the amino acid sequence of a polypeptide chain, specific chemical and enzymatic cleavage of a polypeptide chains and separation of peptides. Protein structure: levels of structure in protein architecture, primary structure of proteins, secondary structure of proteins helix and pleated sheets, tertiary structure of proteins, forces stabilizing the tertiary structure and quaternary structure of proteins. Denaturation and renaturation of proteins. Behaviour of proteins in solutions, salting in and salting out of proteins. Structure and biological functions of fibrous proteins (keratins, collagen and elastin), globular proteins (hemoglobin, myoglobin), lipoproteins, metalloproteins, glycoproteins and nucleoproteins

**UNIT-IV** Nature of genetic material: evidence that DNA is the genetic material, Composition of RNA and DNA, generalized structural plan of nucleic acids, nomenclature used in writing structure of nucleic acids, features of DNA double helix. Denaturation and annealing of DNA, structure and roles of different types of RNA Size of DNA in procaryotic and eucaryotic cells, central dogma of molecular biology, Gene, Genome, chromosome.

**UNIT-V Porphyrins**

Prophyrins: Porphyrin nucleus and classification of porphyrins. important Metalloporphyrins occurring in nature. Detection of porphyrins spectrophotometrically and by fluorescence. Bile pigments - chemical nature and their physiological significance.

**PAPER - II**

(paper code - 0833)

**BIOPHYSICAL AND BIOCHEMICAL TECHNIQUES M.M. 50**

**UNIT-I Concepts of Bioenergetics**

Principles of thermodynamics and their applications in biochemistry - introduction, thermodynamic system, thermodynamic state functions, first and second laws of thermodynamics, concept of free energy, standard free energy, determination of  $\Delta G$  for a reaction, relation between equilibrium constant and standard free energy change, biological standard state and standard free energy change in coupled reactions. Biological oxidation-reduction reactions - introduction, redox potentials, relation between standard reduction potentials and free energy change (derivations and numericals included). High-energy phosphate compounds - introduction, phosphate group transfers-free energy of hydrolysis of ATP and sugar phosphates along with reasons for high  $\Delta G$ .

**UNIT-II Hydrodynamic Methods**

Sedimentation - sedimentation velocity, preparative and analytical ultracentrifugation techniques. determination of molecular weight by hydrodynamic methods (derivations excluded and numericals included).

**Measurement of pH**

Principles of glass and reference electrodes, types of electrodes, complications of pH measurement (dependence of pH on ionic strength, electrode contamination and sodium error) and use of pH paper.

**UNIT-III Radioisotopic Techniques**

Types of radioisotopes used in Biochemistry, units of radioactivity measurements, techniques used to measure radioactivity (gas ionization and liquid scintillation counting), nuclear emulsions used in biological studies (pre-mounted, liquid and stripping), isotopes commonly used in biochemical studies- )  
Autoradiography. Biological hazards of radiation and safety measures in handling radioisotopes. Biological application.

**UNIT-IV Chromatography**

General principles and applications of :

1. Adsorption chromatography

- 2 Ion-exchange chromatography
- 3 Thin-layer chromatography
- 4 Molecular-sieve chromatography
- 5 Hydrophobic chromatography
- 6 Gas-liquid chromatography
- 7 HPLC
- 8 Affinity chromatography
- 9 Paper chromatography

#### **Electrophoresis**

Basic principles of agarose electrophoresis, PAGE and SDS-PAGE, Two-dimensional electrophoresis, its importance. Isoelectrofocussing.

#### **UNIT-V Spectroscopic Techniques**

Beer-Lambert law, light absorption and its transmittance, determination and application of extinction coefficient, application of visible and UV spectroscopic techniques (structure elucidation and numericals excluded). Principle and application of NMR, ESR, Mass spectroscopy. Fluorescent and emission spectroscopy.

#### **Immunological Techniques**

Immunodiffusion, immunoelectrophoresis, radioimmunoassay, ELISA, immunofluorescence.

#### **PRACTICAL**

**M.M. 50**

- 1 Preparation of standard buffers and determination of pH of a solution.
- 2 Qualitative tests for :
  - a Carbohydrates
  - b Proteins and amino acids
  - c Lipids
- 3 Determination of saponification value and iodine number of fats.
- 4 Estimation of ascorbic acid.
- 5 Titration curve for amino acids and determination of pK value;
- 6 Verification of Beer-Lambert's law.
- 7 Estimation of
  - i Carbohydrate by anthrone method.
  - ii Blood glucose by the methods (a) Folin-Wu, (b) Nelson-Somogyi
- 8 Estimation of amino acids by ninhydrin method.
- 9 Isolation and assay of glycogen from rat liver.
10.
  - i Extraction of total lipids by Folch method
  - ii Estimations of food adulterant.
11. Estimation of DNA and RNA.
12. Separation of sugars using paper chromatography.

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## BIOTECHNOLOGY

### PAPER - I

#### BIOCHEMISTRY, MATHS & COMPUTERS

- UNIT-1**
1. Biochemistry : Introduction scope Development, Definition, aims and nature.
  2. Carbohydrates : Structure, Classification and function of mono, Oligo & polysaccharides .
  3. Proteins - Introduction, structure, classification, physical & chemical properties.
  4. Amino acids : Classification, Essential & non-essential, General properties.
- UNIT-2**
1. Lipids : Structure, Classification, chemical properties.
  2. Enzymes : Introduction, Definition co-enzymes & Cofactors, Nomenclature. Classification, mechanism of enzyme action factors affecting the enzymes action.
  3. Hormones : Introduction, Definition, Structure, Classification, Function and application of plant hormone-Auxin and Gibberellins, Animal hormone-Pancreas and Thyroid.
- UNIT-3**
1. Biological Oxidation : Oxidation & Reduction constituents of electron transport chain, mechanism of oxidation in electron transport chain.
  2. Carbohydrate metabolism - glycogenesis glyconeogenesis, glycogenolysis Glycolysis, Krebs cycle.
  3. Fat metabolism - Introduction, metabolism of glycerol fatty acid oxidation, conversion of fats into carbohydrates.
  4. Protein metabolism - Introduction, conversion of amino acids, decarboxylation. Deamination of amino acids formation of Urea.
  5. Enzyme technology - Introduction, Comparison between enzyme and catalysis production of enzyme, chemical energetics, enzyme kinetics, enzyme Immobilization use of enzyme solution, Application of Immobilized enzyme, Enzyme reactor, biosensors enzyme engineering.
- UNIT-4**
1. Set theory and its properties linear equation.
  2. The binomial theorem, Logarithm.
  3. Simple Differentiation and Integration
  4. Probability Calculation, Methods of Sampling.
  5. Measurements of central tendencies and deviations.
- UNIT-5**
1. Computers - General introduction, Organization of computer, digital and analogue computers, computer algorithm.
  2. Computer in on line monitoring and automation.
  3. Application of computer in co-ordination of solute concentration, pH and temperature etc. of a fermenter in operation.

#### List of Books :

1. Nelson and Cox-Principles of Biochemistry, Fourth Edition (2005)
2. Albert L. Lehninger - Biochemistry, Second Edition (2005)
3. Todd and Howards Mason - Text book of Biochemistry, Fourth Edition (2004)
4. Lubert Stryer and Berg - Biochemistry, Fifth Edition (2004)
5. E. Balaguruswamy - Programming in BASIC
6. Diana Rain, Marni Ayers Barby - (2006) Textbook on Q level Programming. 4th Edition.
7. Karl Schwartz : (2006) Guide of Micro Soft. Marina Raod, 4th Edition.

**PAPER-II**

**CELL BIOLOGY, GENETICS AND MICROBIOLOGY**

- UNIT-1**
1. Cell theory and the cell : Idea of cell theory, shape and size.
  2. Cell wall and plasma membrane.
  3. The nucleus - significance structure nucleolus  
Chromosomes - Morphology, chemical composition, Ultra structure & special types of chromosomes.
  4. Mitochondria - Morphology, ultra structure, chemical composition origin & functions.
  5. Plastids - Chloroplasts, ultra structure & functions
- UNIT-2**
1. Cytoskeleton : Microtubules - Structure, chemical composition, microtubules in cilia and flagella and role in cell division, Microfilaments in muscle cells and muscle contraction and in non-muscle cell.
  2. Cytoplasm - Structure and functions of endoplasmic reticulum Ribosome's.
  3. Golgi complex, Lysosomes, Centrosome.
  4. Cell division-Amitosis, mitosis Meiosis & Comparison with Mitosis.
  5. Mendel's laws of Inheritance.
  6. Linkage and crossing over.
- UNIT-3**
1. Structural changes in chromosomes  
Deletion, Duplication, Translocation, Inversion etc.
  2. Numerical changes in chromosomes  
Aneuploidy, Euploidy (Monoploidy and polyploidy and its importance).
  3. Mutation - History, physical and chemical mutagens, Detection of mutation in Drosophila and plants.
  4. Human Genetics
  5. Structure and synthesis of Nucleic acids
- UNIT-4**
1. Microbiology - Introduction and History
  2. Bacteria - Size, Shape & Structure
  3. Classification : Bergey's manual.
  4. Microbiol Growth & nutrition.
  5. Reproduction : Conjugation, Transduction and Transformation.
  6. Genetics of Bacteria, Plasmids, transposons and retrotransposons.
- UNIT-5**
1. Viruses - Basic features, structure, classification, multiplication, Bacteriophages (morphology, life cycle, infection and medicinal importance)
  2. Mycoplasma - History, classification, structure reproduction & Diseases.
  3. Food and Dairy Microbiology - Food-production (Dairy, Alcoholic) Food spoilage & food preservation.
  4. Soil Microbiology - Soil & Micro - organisms, Biogeochemical cycles (Carbon nitrogen, sulphur & phosphorous Cycle)

**List of Books :**

1. C.B. Power- Cell biology, First Edition (2005), Himalaya Publishing House.
2. Gereld Karp - Dell and molecular biology, 4th Edition (2005)
3. Lewis J. Klein Smith and Valerie M.Kish - Principles of cell and molecular biology-Third Edition (2002)
4. P.K. Gupta - Cell and molecular biology, Second Edition (2003), Restogi publications.

5. Tortora, Funke and Case - Microbiology, An introduction, sixth Edition (1995), Benjamin/Cummings Publishing Company.
6. Prescott, Harley and Klein - Microbiology, Third Edition, Wm. C. Brown Publishers (1996).
7. P. Chakraborty - Textbook of microbiology, Second Edition (2007).
8. C.B., Cowar - Cell biology, Third Edition (2005) Himalaya Publishing House.
9. S.S. Purohit - Microbiology : Fundamentals and Applications, 6th Edition (2004)
10. R.C. Dubey and D.K. Maheshwari : Practical Microbiology. S.Chand Publication.
11. R.C. Dubey and D.K. Maheshwari Microbiology.
12. B.R. Vashishita, A.K. Sinha and V.P. Singh Botany for Degree students. Part I. S.Chand & Co. Ltd. New Delhi.
13. B.R. Vashishita, A.K. Sinha and V.P. Singh Botany for Degree students. part II. S.Chand & Co. Ltd. New Delhi.
14. C.J. Alexopoulos : Introductory Mycology. Wiley Eastern Limited.
15. M.S. Ghemawat, J.N. Kapoor, H.S. Narayana : A Textbook of Algae, Ramesh Book Depot, Jaipur.
16. Bendre and Kumar : A textbook of Practical Botany - I. Rastogi Publications.
17. Prescott, Harley and Klein - Microbiology. Third Edition. Wm. C. Brown.

## **PRACTICALS**

### **MICROBIOLOGY AND BIOCHEMICAL TECHNIQUES**

- (1) Laboratory rules, Tools, Equipment and Other requirements in Microbiological laboratory.
- (2) Micrometry - Use of ocular & stage micrometer
- (3) Counting of bacteria by counting chamber, by plate count.
- (4) Microscopic examination of living micro organisms
  - (a) Temporary wet mount
  - (b) Hanging drop technique
- (5) Smears and staining methods
  - (a) Preparation of bacterial smear
  - (b) Simple staining of bacteria
  - (c) Acid fast staining
  - (d) Negative & Positive gram staining
- (6) Preparation of media and cultivation techniques
  - (a) Basic liquid media (broth)
  - (b) Basic Solid media, (agar slants and deep tubes)
  - (c) Demonstration of selective and differential media
  - (d) Isolation and enumeration of micro organisms
  - (e) Isolation from air.
  - (f) Isolation from Soil.
- (7) Methods of obtaining pure cultures
  - (a) Streak plate method
  - (b) Pure plate method
  - (c) Spread plate method
  - (d) Broth cultures
- (8) Growth & Biochemical techniques
  - (a) Determination of bacterial growth

- (b) Amylase production test
- (c) Cellulose production test
- (d) Estimation of Sugar in given solution
- (e) Extraction and separation of lipids
- (f) Estimation of proteins
- (g) Isolation and purification of protein.
- (h) Kinetic studies on enzymes.
- (i) Mitosis and Meiosis
- (j) Biostatistics : By Manual and by computer.
  - 1. Problems on chi-square test
  - 2. Problems on mean, mode and median.

#### SCHEME OF PRACTICAL EXAMINATION

Time - 4 hrs.	M. M. : 50
1. Instrument based Experiment (Two) 5x2	: 10 Marks
2. Experiment based on Culture of Micro-organisms	: 10 Marks
3. Bacterial Growth	: 07 Marks
4. Biochemical techniques	: 08 Marks
4. Bio statistics	: 05 Marks
5. Viva - Voce	: 05 Marks
6. Record/Sessional	: 05 Marks

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पं. रविशंकर शुक्ल विश्वविद्यालय रायपुर (छत्तीसगढ़)



पाठ्यक्रम

बी.एस.सी. भाग-1 (कोड-301)

B. Sc. Part - I (Code - 301)

परीक्षा : 2015

कुलसचिव पं. रविशंकर शुक्ल विश्वविद्यालय

रायपुर (छत्तीसगढ़) की ओर से



अधिकृत मुद्रक एवं प्रकाशक :

गीता पब्लिकेशन

महामाईपारा, रायपुर (छत्तीसगढ़)

मूल्य : 25/-