SHRI GURU RAM RAI UNIVERSITY

Patel Nagar, Dehradun-248001, Uttarakhand, India

[Estd. by Govt. of Uttarakhand, vide Shri Guru Ram Rai University Act no. 03 of 2017 & recognized by UGC u/s (2f) of UGC Act 1956]

1. Eligibility criteria for Applicants:

An applicant who has passed Post Graduate Degree Examination with at least 55% marks or with an equivalent Grade Point Average (GPA). Relaxation of 5% in the required percentage of marks will be given to applicants belonging to SC/ST/OBC (non-creamy layer)/differently-abled categories.

2. Written test:

For RET, there would be two papers i.e. **Paper-I and Paper-II** (Paper-I would be Research Methodology of 50 marks and Paper-II would be Subject specific of 50 marks. Both papers will have 50 questions each with multiple choices).The Entrance Test shall be of two hour duration (i.e. 120 minutes). Applicants have to qualify in aggregate with 50% **(**45% in case of reserved categories) marks. After qualifying the entrance examination, the applicant has to face a viva voce of 50 marks. Selected applicants list will be displayed on university web site; **www.sgrru.ac.in**.

3. Exemption from RET:

The applicants fulfilling at least one of the following conditions:

- Qualified in NET/SET/GATE/GPAT examination of the apex bodies as CSIR/UGC/ICAR/ICMR/DBT/AICTE.
- M.Phil Degree in a relevant subject obtained from any Recognized University.
- Senior citizen of age of 60 years and above with Master's degree.
- Candidate such as Advocate/Doctor/Artist/Industry Professional/Employee of Government/Semi-Government Organizations with Post Graduate Degree (at least 55% marks) and 10 years of professional experience.

The applicants entitled for exemption from RET shall also submit the application form along with relevant supporting documents within the stipulated period.

RET Paper I: Research Methodology

Unit I-Concept & Types of Research

Meaning and importance of Research – Types of Research – Selection and formulation of Research Problem – Research Design, Classification of Research, Pure and Applied Research, Exploring or Formulative Research, Descriptive Research, Diagnostic Research/Study, Evaluation research/Studies, Action Research, Experimental Research, Analytical Study of Statistical Method, Historical Research.

Unit II –Methods Research

Surveys, Case Study, Field Studies General Survey of various Methods including Survey Method, Interdisciplinary Method, Case Study Method, Sampling Method, Statistical Method, Observation Method, Interview Method, Schedule Method, Questionnaire Method, Documentary Method, Library Method, Historical Method and Scientific Method. Characteristic Features of Scientific Method; Empirical Verifiable, Cumulative, Self - Correcting, Deterministic, Ethical & Ideological neutrality (Value Free), Statistical Generalizability.

Unit III - Data Collection and Data Analysis

Collection, Objectives and Classification of Data, Aims, Methods and Objects of Tabulation of Data, Forms and Processes of Interpretation and Presentation of Data.

Primary, Secondary and Tertiary Data. Construction and adaptation of instruments, administration of questions and tests, Tabulation of data. Data organization in SPSS & Excel, Graphical representation of data

Definition and Aims of Content Analysis, Problems of Content Analysis, Computer and Content Analysis Discussion and Interpretation of results, Testing of Hypothesis: Logical and Statistical Techniques.

Unit IV: Report Writing

Locating Information on a Topic of Interest, Acquiring Copies of Articles of Interest, The Nature of Scientific Variables, Conceptual Versus Operational Definitions of Variables, Levels of Measurement, Various Paradigms, The Basic Format for a Research Report, Identification of the Parts of a Research Report, Citation and Referencing Styles, Essentials of Report Writing, Aids for Writing Good Research Report.

References:

1) Bagchi, Kanak Kanti (2007) Research Methodology in Social Sciences: A Practical Guide, Delhi, Abijeet Publications.

2) Kothari, C.R (2004) Research Methodology: An Introduction, Delhi, New Age.

3) Cooper, R. Donald and Pamela S. Schindler (2003) Business Research Methods, Delhi, Tata McGraw-Hill.

RET Paper II: Subject Specific

1. Agronomy

Unit I

Crop growth analysis in relation to environment; agro-ecological zones of India. Quantitative agro-biological principles and inverse yield nitrogen law; Mitscherlich yield equation, its interpretation and applicability; Baule unit. Effect of lodging in cereals; physiology of grain yield in cereals; optimization of plant population and planting geometry in relation to different resources, concept of ideal plant type and crop modeling for desired crop yield. Scientific principles of crop production; crop response production functions; concept of soil plant relations; yield and environmental stress. Water and its role in plants; water resources of India, major irrigation projects, extent of area and crops irrigated in India and different states. Soil water movement in soil and plants; transpiration.

Unit II

Soil, plant and meteorological factors determining water needs of crops; scheduling, depth and methods of irrigation; microirrigation system; fertigation; management of water in controlled environments and polyhouses. Water management of the crops and cropping systems; quality of irrigation water and management of saline water for irrigation; water use efficiency. Excess of soil water and plant growth; water management in problem soils; drainage requirement of crops and methods of field drainage, their layout and spacing.

Unit III

Soil fertility and productivity - factors affecting; features of good soil management; problems of supply and availability of nutrients; relation between nutrient supply and crop growth; organic farming - basic concepts and definitions. Criteria of essentiality of nutrients; Essential plant nutrients – their functions, nutrient deficiency symptoms; transformation and dynamics of major plant nutrients. Preparation and use of farmyard manure, compost, green manures, vermicompost, biofertilizers and other organic concentrates their composition, availability and crop responses; recycling of organic wastes and residue management.

Unit IV

Integrated farming systems, organic farming, and resource conservation technology including modern concept of tillage; dry farming; determining the nutrient needs for yield potentiality of crop plants, concept of balance nutrition and integrated nutrient management; precision agriculture.

Unit V

Weed biology and ecology, crop-weed competition including allelopathy; principles and methods of weed control and classification; weed indices. Herbicides introduction and history of their development; classification based on chemical, physiological application and selectivity; mode and mechanism of action of herbicides. Herbicide structure - activity relationship; factors affecting the efficiency of herbicides; herbicide formulations, herbicide mixtures; herbicide resistance and management; weed control through bio-herbicides, myco-herbicides and allelochemicals; Degradation of herbicides in soil and plants; herbicide resistance in weeds and crops; herbicide rotation.

2. Botany

Unit I

Cryptogams and Phanerogams: A General account, Diagnostic features for classification of flowering plants; ICN, Taxonomic Tools and evidences, Nature, causes and classification of plant pathogen; Dissemination and methods of preservation and control of plant diseases, Host-parasite relationship, plant defense mechanism.

Unit II

Fungal and Bacterial disease of plant crops- rice, wheat, maize, sugarcane, cotton and groundnut; fruit crops- apple, peach, mango, citrus and grapes; vegetable crops- crucifers, tomato, potato and brinjal; other crops- tobacco, turmeric and coriander. Introduction to mushroom groups, taxonomic study of order Agaricales, Ecology of mushrooms, role of mushrooms in forest ecosystems, Mycorrhiza: VAM fungi, ectomycorrhiza and forest ecosystem. Tissue culture of wild mushrooms; Preparation of herbarium: methods of collection, identification and preserving wild mushrooms. Cultivation of edible and medicinal mushrooms: Volvariella, Agaricus, Pleurotus, Lentinus, Ganoderma.

Unit III

Physiology and Biochemistry: Functions of biological molecules, cell and organisms as biochemical entities; Metabolism and biochemical energetic, Palynology: General Introduction and history, Importance of Palynology in plant taxonomy, pollen biotechnology, aerobiology and pollen allergy, forensic palynology, melissopalynology, palaeopalynology and in hydrocarbon exploration.

Unit IV

Plant Breeding: Objectives, activities and achievements. Breeding methods for self, cross pollinated and clonal crops; Breeding for resistance to various stresses and quality; Biotechnology applications in crop improvement, IPR and plant breeders rights (PBR). Green Revolution.

Unit V

Biodiversity: Concept, biodiversity of major groups including microbial biodiversity, distribution, maintenance and loss of biodiversity. Conservation of Biodiversity: Concept, Environmental policies, Biosphere Reserves, National Parks, Sanctuaries, Botanical Gardens, Pollen storage and Seed Banks, Tissue culture and role of biotechnology in conservation of biodiversity; Cryopreservation. CITES, IUCN, Ethnobotany: A General account. Forest types of Uttarakhand and other Himalayan provinces, Forest heritage in Garhwal Himalaya; Classification; forest products (NTFPs, medicinal and aromatic plants, fibre, etc.),

3. Biotechnology

Unit I

Plasma membrane: Structure, organisation, lipid bilayer, proteins & glycoconjugates, liposomes. Function- Ionic transport, types of transport (symport antiport, active & passive,), channel proteins. Intracellular compartmentalization Structure, organization and functions of Nucleus, Mitochondria, lysosome, Golgi body, Chloroplast, Peroxisome, Endoplasmic reticulum (Rough and smooth) Cell motility and shape: Structure and functions, Microfilament, Microtubules and Intermediate filament

Unit II

Mechanism of DNA replication in prokaryotes and eukaryotes, Mechanism of transcription in prokaryotes and eukaryotes, Reverse transcription, Post transcriptional processing of RNA: (capping, polyadenylation, splicing, RNA editing), Mechanism of translation in prokaryotes and eukaryotes.

Unit III

DNA sequencing: chemical and enzymatic methods, PCR. Site directed mutagenesis, Ribonuclease protection assay, Gel retardation assay, DNA foot printing, DNA finger printing, DNA profiling, Genomic analysis: Exon-intron trapping, S-1 mapping, RFLP, RAPD, AFLP. Gene therapy: Principles, strategies and ethics of gene therapy, Sequence alignment and applications: Local and Global alignment, Scoring Matrices; Homology and related concepts; Dot matrix; general gap, gap penalty.

Unit IV

Spectroscopic methods: principle and applications of UV-visible, IR, NMR, ESR Measurement of radioactivity: GM Counter, gamma counter, liquid scintillation counter. Tracer techniques of Autoradiography, Radioimmunoassay, Chromatography - General principle, types and application, Electrophoresis - General principle and application, Centrifugation: Basic principles. Common centrifuges used in laboratory, Microscopy.

Unit V

Carbohydrate – Classification, structure and functions, TCA cycle, Glycolysis, Amino acids & Proteins structures, Introduction to Monoclonal Antibodies and Hybridoma technology, Antigen-Antibody Interactions: Precipitation Reaction, Agglutination Reactions, RIA, ELISA, Western Blotting, Immuno precipitation, Immuno-fluorescence.

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4. Commerce

Unit I

Meaning and Definition of Management, Principles of Management, Meaning of Communication and its types, Meaning of Human Resource Management and Human Resource Planning, Meaning of a Company and its formation.

Unit II

Introduction of Economics, Definitions, Principles of Economics, Theory of Demand and Supply, Indifference Curve Analysis, Demand Forecasting, Demand Analysis, Classical approach: Implications – Keynesian approach, Economic Functions of Modern Government – Role of Government in Economic Planning and Market Governance.

Unit III

Overview of Financial Management, Capital Budgeting, Concept of Capital Structure, Characteristics and Objectives of Management Accounting ,Information Integrity of Accounting Information, Professional Organizations - Competence, Judgment, and Ethical Behavior Accounting Systems: Basic Functions of an Accounting System - Designing and Installation Accounting Systems, Introduction to Statistics, Calculation of Mean, Median, Mode and Standard Deviation.

Unit IV

Introduction of Marketing and its functions, Pricing Strategies, Introduction to Marketing Research, Qualitative and quantitative research methods, Sampling methods, Questionnaire design, reliability and validity, Emerging Trends in marketing: Rural Marketing, Green marketing, Experiential marketing, Digital Marketing ,e-business, Online marketing, Online retailing, Media marketing and advertising, Brand Management.

Unit V

Social Entrepreneurship Social entrepreneurship, social entrepreneurs as change agents, financial sustainability Social entrepreneurship in India and abroad, Business ethics Corporate Social responsibility Corporate governance, Succession Planning Business growth and need of succession Planning in India. Its role and importance in expansion management.

5. Computer Science/IT

Unit-I

Programming Skills and Algorithms:

Procedural programming using C, elementary data structure ,data types, arrays, functions, pointers ,divide & conquer method, binary search, minimum spanning tree and their algorithm, dynamic programing, backtracking, 8-queen problem. DFS, BFS, Analysis of Algorithms, Design of Algorithms, and Complexity of Algorithms, asymptotic notations**.** Recurrences and Solution of recurrence Equations, Prims Algorithm, Kruskal Algorithm, Single Source.

Unit-II

Computer Network and Architecture:

Boolean algebra and Minimization of Boolean functions, Combinational Circuit Design, Sequential & combinational Circuit Design, decoder, encoder, multiplexer, flip-flops. Hardwired and Microprogrammed processor design, Instruction formats, Addressing modes, memory types and organizations, Interfacing peripheral devices, Interrupts. Concept of OSI, LAN technologies (Ethernet). Flow and error control techniques, switching. IPv4/IPv6, routers and routing algorithms (distance vector, link state). TCP/UDP and sockets, congestion control. Application layer protocols (DNS, SMTP, POP, FTP, HTTP), authentication, basics of public key and private key cryptography, digital signatures and certificates

Unit-III

Software Engineering:-

Definition, software engineering problem, approach and goals of software engineering. Software Processes, component of software processes, characteristics of a software process, SDLC. Software requirement, need for SRS, characteristics and component of SRS. Software maintenance, adaptive ,corrective and perfective maintenance. Computer Aided Software Engineering.

Unit-IV

Computer Graphics:-

Concepts and applications, display types and display devices, color display technique, Line and circle drawing algorithm.3-D Transformations, matrix representation of all homogeneous coordinates composite transformation. Projection, Windowing & clipping, Bezier curves, B-Spline curves, Visible Surface detection Algorithm, A-Buffer, Back face removal,

Unit-V

Operating Systems: Characteristics & Function of operating system, Virtual memory, paging, fragmentation. Concurrent Processing , Mutual exclusion, Critical regions, Semaphores. CPU scheduling, I/O scheduling, resource scheduling, Deadlock and scheduling algorithms. Banker's algorithm for deadlock handling.

6. Chemistry

Unit I

Structure and bonding in homo- and heteronuclear molecules, including shapes of molecules (VSEPR Theory).Main group elements and their compounds: Allotropy, synthesis, structure and bonding, industrial importance of the compounds.Transition elements and coordination compounds: structure, bonding theories, spectral and magnetic properties, reaction mechanisms.Inner transition elements: spectral and magnetic properties, redox chemistry, analytical applications. Organometallic compounds: synthesis, bonding and structure, and reactivity. Organometallics in homogeneous catalysis. Cages and metal clusters. Bioinorganic chemistry: photosystems, porphyrins, metalloenzymes, oxygen transport, electron- transfer reactions; nitrogen fixation, metal complexes in medicine. Solid state: Crystal structures; Bragg's law and applications; band structure of solids

Unit II

Basic principles of quantum mechanics: Postulates; operator algebra; exactly- solvable systems: particle-in-a-box, harmonic oscillator and the hydrogen atom, including shapes of atomic orbitals; orbital and spin angular momenta; tunneling.Chemical applications of group theory; symmetry elements; point groups; character tables; selection rules.Chemical thermodynamics: Laws, state and path functions and their applications; thermodynamic description of various types of processes; Maxwell's relations; spontaneity and equilibria; temperature and pressure dependence of thermodynamic quantities; Le Chatelier principle; elementary description of phase transitions; phase equilibria and phase rule; thermodynamics of ideal and non-ideal gases, and solutions.Chemical kinetics: Empirical rate laws and temperature dependence; complex reactions; steady state approximation; determination of reaction mechanisms; collision and transition state theories of rate constants; unimolecular reactions; enzyme kinetics; salt effects; homogeneous catalysis; photochemical reactions.

Unit III

Principles of stereochemistry: Configurational and conformational isomerism in acyclic and cyclic compounds; stereogenicity, stereoselectivity, enantioselectivity, diastereoselectivity and asymmetric induction. Organic reaction mechanisms involving addition, elimination and substitution reactions with electrophilic, nucleophilic or radical species. Determination of reaction pathways.Common named reactions and rearrangements – applications in organic synthesis.Pericyclic reactions – electrocyclisation, cycloaddition, sigmatropic rearrangements and other related concerted reactions. Principles and applications of photochemical reactions in organic chemistry.

Unit IV

Synthesis and reactivity of common heterocyclic compounds containing one or two heteroatoms (O, N, S), Chemistry of natural products: Carbohydrates, proteins and peptides, fatty acids, nucleic acids, terpenes, steroids and alkaloids.Polymer chemistry: Molar masses; kinetics of polymerization

Unit V

Characterisation of inorganic compounds by IR, Raman, NMR, EPR, Mössbauer, UV-vis, NQR, MS, electron spectroscopy and microscopic techniques. Nuclear chemistry: nuclear reactions, fission and fusion, radio-analytical techniques and activation analysis. Structure determination of organic compounds by IR, UV-VIS, 1H & 13C NMR and Mass spectroscopic techniques.

7. Clinical Psychology

Unit-I

General Psychology

Unit-II

Biological Psychology

Unit-III

Psychopathology

Unit-IV

Research Methodology

8. Education

Unit-I

Philosophical & Sociological Bases of education

Unit-II

Advanced Educational Psychology

Unit-III

Research methodology and Statistics in Education

Unit-IV

Comparative Education and Curriculum Development

9. ENGLISH

1. English Literature till fifteenth century.
2. Elizabethan Age.
3. Jacobean to Restoration Period.
4. Neo-Classical Age & Pre- Romantic Period.
5. Victorians & Pre- Raphaelites.
6. The Modern Age.
7. Post-Modernist / Contemporary English Literature/Indian English Literature / American Literature.
8. Literary Criticism & Theory.

10. Geography

Unit I

Geographical Thought:

Contribution of Greeks and Romans GeographersArab World, Models and paradigms, system theory, phenomenological approach, Determinism andpossibilism, Areal differentiation and spatial organisation. Fundamental concepts and methods in contemporary geomorphology; Endogenetic and Exogenetic forces, Denudation and weathering, Geosynclines, continental drift and plate tectonics, Concept of geomorphic cycle, Landforms associated with fluvial, glacial, arid, coastal and karst cycles.

Unit II

Climatology:

Composition and structure of the atmosphere, Heat budget of the earth, Distribution of temperature, Atmospheric pressure and general circulation of winds, Monsoon and jet stream, Tropical and temperate cyclones, Classification of world climates, Koppen's and Thornthwaite's schemes. Ocean deposits, Coral reefs, Temperature and salinity of the oceans, Density of sea water, Tides and ocean currents.

Unit III

Bio-Geography:

World distribution of plants and animals, Forms and functions of ecosystem, Conservation and management of ecosystems, Problems of pollution. Patterns of world distribution, Growth and density of population, Patterns and processes of migration, Demographic trasition. ite, situation, types, size, spacing and internal morphology of rural and urban settlements, City- region, Primate city, Rank- size rule, Settlement hierachy, Christaller's Central Place theory, August Losch's theory of market centres.

Unit IV

Population:

Theories of population growth; Optimum population; Population projection; population pressure and population explosion; problem of declining and zero growth; population resources regions. Theory of Agriculture localization; Agricultures regionalization; Crop-relation, agricultural efficiency; agricultural productivity; Mix forming, multiple farming, corp.-combination.

Unit V

Cartography : Types of maps

Techniques for the study of spatial patterns of distribution, Choropleth, Isopleth and Pie diagrams, Mapping of location – specific data. Remote sensing and Computer application in mapping, Digital mapping, Geographic Information System (GIS).

11. Mass Communications

UNIT-I

ADVERTISING AND PUBLIC RELATIONS / CORPORATE COMMUNICATION

Advertising: Evolution and growth of advertising - definitions of advertising, relevance of advertising in marketing mix, classification of advertising, various media for advertising, national and global advertising scene, socio--economic effects of advertising.

Ad agency management, various specialist departments in an ad agency : (account, planning, account servicing, creative, media planning , HRD, etc.)

Client related issues and the process, business development, pitching for accounts, agency-client interface: the parameters - creative and media briefing process, agency-media interface, agency revenue earning and sources, agency audit.

Mass media laws concerning advertising, apex bodies in advertising AAAI, ASCI etc. ASCI and its code of conduct, case studies from ASCI.

Unit-II

Public Relations and Corporate Communication:

Evolution and history of public relations - definitions of PR, PR and allied disciplines (publicity, propaganda, public affairs, lobbying, opinion building, etc.).

Symmetrical and asymmetrical theories of PR - law and ethics of PR (defamation, copyright, invasion of privacy, PRSI code of ethics).

Interface of PR with various management disciplines (human resources and development, finance, marketing, management services, planning and development, etc.) - publics in PR, PR tools (interpersonal, mass media and selective media) - PR in industry (Public Sector, Private Sector and MNCs) - PR in Central and State Governments and the functioning of various media units of the State and Union Governments.

Writing for PR : Internal and External Publics (house journals – printed and electronic, bulletin, boards, open houses, suggestion boxes, video magazines, speeches, articles, etc.).

Writing for media (press release/backgrounder, press brief, features, rejoinders, etc.).

GENERAL AWARENESS AND CURRENT AFFAIRS

This paper would cover the issues and events of regional, national and international importance during the proceeding year effecting Indian, Social, Political economic, environment and security concerns etc.

PRINCIPLES OF MASS COMMUNICATION

Nature and progress of human communication, functions of communication, verbal and non-verbal communication, intra-personal, inter-personal, small group, public and mass communication.

Models: SMR, SMCR, Shannon and Weaver, Lasswel, Osgood, Dance, Schramm, Gerberner, Newcomb, convergent and gate-keeping, communication and socialization.

Nature and process of mass communication, media of mass communication, characteristics and typology of audiences.

Media systems and theories: authoritarian, libertarian, socialistic, social-responsibility, development, participatory; Mass media: public opinion and democracy, Media culture and its production, Media organization, media content, market-driven media content - effects,

skyvasion, culture integration and culture pollution.

Issues of media monopoly - cross-media ownership.

Ownership patterns of mass media, ethical aspects of mass media.

Freedom of speech and expression, right of information.

Media and social responsibility, media accountability, infotainment and ICE.

UNIT-III

DEVELOPMENT OF MEDIA

Print :

Language and society - development of language as a vehicle of communication, invention of printing press and paper, pioneer publications in Europe and USA.

Early communication systems in India - development of printing, early efforts to publish newspapers in different parts of India.

Newspapers and Magazines in the Nineteenth century, first war of Indian independence and the press, issues of freedom, both political and press freedom.

Birth of Indian language press, contribution of Raja Ram Mohan Roy, birth of the Indian and other news agencies.

The Indian Press and freedom movement - Mahatma Gandhi and his journalism; social; political and economic issues before Independence and the Indian press; historical development of important newspapers and magazines in English; important personalities of Indian Journalism.

Journalism in Indian languages (a brief historical perspective of important newspapers to be selected by the concerned university; history of the language journalism of the region (Uttarakhand).

The press in India after Independence: social, political and economic issues and the role of the Indian press problems and prospects.

Radio :

Development of radio as a medium of mass communication - technology innovations; history of radio in India, radio as an instrument of propaganda during the World War II.

Emergence of AIR, commercial broadcasting, F. M radio - state and private initiatives.

Television :

Development of television as a medium of communication, historical perspective of television in India, satellite and cable television in India.

Films :

Early efforts - film as a mass medium; historical development of Indian films - silent era – talkies, Indian cinema after independence; parallel cinema, commercial cinema; documentaries - issues and problems of Indian cinema.

Folk Media :

Traditional media in India, regional diversity, content form, character, utility, evolution - future.

New Media :

Development of new media; convergence, internet - on line.

Unit-IV

PRINT MEDIA - I (REPORTING AND EDITING)

Reporting :

News : definition, concept, elements, values, sources, lead writing, kinds; reporting : crime, weather, city life, speech, accident, disaster, court, election, riots, war/ conflict/ tensions.

Interviewing - kinds, purposes, techniques.

Interpretive reporting - purposes, techniques.

Investigative reporting - purposes, sources, styles, techniques; columns - development, criticism, reviews, feature writing, news analysis, backgrounding.

– political reporting

– Legislative reporting

– Diplomatic reporting

– scoop and exclusive and specialized reporting - science, sports, economic, development, commerce, gender and allied areas reporting for magazines.

Editing :

Meaning, purposes, symbols, tools, lead, body, paragraphing.

- proof reading, meaning, symbols, purposes.

- News desk, editorial department set-up, news flow, copy management and organization.

- Headlines - techniques, styles, purposes, kinds of headlines, Dummy page-make-up, layout, principles of photo editing.

- magazines editing, layout, graphics.

ELECTRONIC MEDIA (RADIO AND TELEVISION)

Evolution and growth of electronic media : radio, television and internet. Characteristics of radio, television and internet, as a medium of communication - spoken, visual and multiple version of information through links.

Principles and techniques of audio-visual communication - thinking audio and pictures, grammar of sound, AM and FM radio.

Technology and skill of linear and non-linear systems of audio - visual communication, various video Standard tape format

Sound construction and picture formation through a wide range of microphones, sound recorders, camcorder, video recorders, computer-graphics and studio equipment (exposure through field visits),.

Evolution and growth of Satellite communication, ground receiving and transmission systems, Transmission of sound, images and data through microwave, cable and television technologies.

Infrastructure, content and flows of internet with specific reference to India - reach and access to personal computers and internet connectivity. Newspaper, magazines, radio, television and on internet.

Impact of electronic media on society.

UNIT-V

COMMUNICATION RESEARCH

Definition - elements of research, scientific approach, research and communication theories, role, function, scope and importance of communication research, basic and applied research. Research

design components - experimental, quasi-experimental, bench mark, longitudinal studies, simulation, panel studies – co-relational design.

Methods of communication research - census method, survey method, observation, method-clinical studies, case studies, content analysis.

Media research - evaluation, feedback, feed forward, media habits, public opinion surveys, pre-election, studies and exit polls.

Report writing - data analysis, techniques, coding and tabulation, non-statistical methods, descriptive, historical, statistical analysis, parametric and non-parametric, uni-variate, bi-variate, multi-variate, test of significance, level of measurement, central tendency, test of reliability and validity, SPSS and other statistical packages.

Media research as a tool of reporting, Readership and audience surveys, preparation of research reports, project reports dissertations theses. Ethical perspectives of mass media research.

12. Management (Finance/Marketing/HR)

Unit I

Meaning and Definition of Management, Principles of Management, Meaning of Communication and its types, Meaning of Human Resource Management and Human Resource Planning, Meaning of a Company and its formation.

Unit II

Introduction of Economics, Definitions, Principles of Economics, Theory of Demand and Supply, Indifference Curve Analysis, Demand Forecasting, Demand Analysis, Classical approach: Implications – Keynesian approach, Economic Functions of Modern Government – Role of Government in Economic Planning and Market Governance.

Unit III

Overview of Financial Management, Capital Budgeting, Concept of Capital Structure, Characteristics and Objectives of Management Accounting ,Information Integrity of Accounting Information, Professional Organizations - Competence, Judgment, and Ethical Behavior Accounting Systems: Basic Functions of an Accounting System - Designing and Installation Accounting Systems, Introduction to Statistics, Calculation of Mean, Median, Mode and Standard Deviation.

Unit IV

Introduction of Marketing and its functions, Pricing Strategies, Introduction to Marketing Research, Qualitative and quantitative research methods, Sampling methods, Questionnaire design, reliability and validity, Emerging Trends in marketing: Rural Marketing, Green marketing, Experiential marketing, Digital Marketing ,e-business, Online marketing, Online retailing, Media marketing and advertising, Brand Management.

Unit V

Social Entrepreneurship Social entrepreneurship, social entrepreneurs as change agents, financial sustainability Social entrepreneurship in India and abroad, Business ethics Corporate Social responsibility Corporate governance, Succession Planning Business growth and need of succession Planning in India. Its role and importance in expansion management.

13. Medical Anatomy

Unit I

General Anatomy, Embalming, General Embryology, Recent Advances, General Histology

Unit II

Upper Limb, Thorax, Applied Anatomy, Relevant Osteology, Relevant Embryology, Relevant Histology.

Unit III

Lower Limb, Abdomen & Pelvis, Applied Anatomy, Relevant Osteology, Relevant Embryology, Relevant Histology

Unit IV

Head and Neck, Applied Anatomy, Relevant Osteology, Relevant Embryology, Relevant Histology.

Unit V

Brain - Neuroanatomy, Applied Anatomy, Relevant Embryology, Relevant Histology.

Histological Techniques, Genetics, Evolution, History of Anatomy

14. Medical Biochemistry

Unit I

Research Methodology, Quantitative Methods, Computer Application, Tools and Techniques including Instrumentation, Communication skills, Biostatistics, Bioinformatics, LIS, Quality Control.

Unit II

Foundation of Biochemistry, Physical Chemistry, Vitamins, Minerals, Enzymes, Immuno-chemistry, Biological Oxidation with Electron Transport Chain, Acid Base Balance.

Unit III

Chemistry of Carbohydrate, Protein and Lipids. Molecular Chemistry, Nutrition.

Unit IV

Metabolism -Carbohydrate metabolism, Protein metabolism and Lipid metabolism, Heme-metabolism, Nucleotide Metabolism

Unit V

Molecular Biology and Advanced Biochemistry

15. Medical Physiology

Unit I

Functional organization of human body, body fluids, internal environment and its control (homeostasis), cell membrane and transport across it.

Red blood cells, production and destruction, Formation of haemoglobin, WBCs, leukopoisis, life span, Functions, immunity, Anaemias, Agranulocytosis. Blood transfusion Tranplantation of tissue organs, Haemostasis, Blood coagulation.

UNIT II

Physiology of the cardiac muscles, cardiac cycle, conductive system of the heart, Regulation of cardiac function, normal ECG, Cardiac output, methods of measurement and regulation, Venous return, heart sounds,Cardiac failure, cardiac reserve, Haemodynamics Systemic circulation of blood, Regulation of systemic arterial pressure, Hypertension, coronoary circulation, ischaemic heart diseases, Circulatory shock, pulmonary circulation, cutaneous circulation, cerebral circulation, muscle blood flow, splanchnic circulation.

Formation of urine by the Kidney – RBF, GFR, tubular absorption and secretion. Concentration and dilution the urine. Role of kidney in the regulation of blood volume and acid-base balance, Micturition reflex and abnormalities, Renal function test, Diuretics, Artificial kidney (dialysis).

Unit III

Mechanics of respiration, Artificial respiration, Transport of O_2 and CO_2 in blood and interstitial fluids, Nervous and chemical regulation of respiration, Abnormality of respiratory control, pulmonary function tests, hypoxia, hyperventilation and related restrictive & obstructive lesions.

Aviation, high altitude and space physiology, physiology of deep sea diving.

G.I. Motility and its control, Secretary functions of G.I.T. Bile and Bile secretion. Digestive and absorptive function of the G.I.T. Metabolic functions of liver, liver function tests.

Hormones secreted by various glands and their applied- Pituitary, Thyroid, Parathyroid, pancreas, adrenal gland.

Unit IV

Spermatogenesis. Testosterone, Menstrual cycle, ovarian hormones, Regulation of the menstrual cycle, Physiological basis of contraception, Fertilization of ovum, implantation, formation of placenta, Hormonal factors in pregnancy,

Physiology of nerve fibres, mechanism of nerve conduction, mechanism of muscle contraction, Excitation- contraction- coupling, the motor units, Neuromuscular transmission, smooth muscle.

Organization of the nervous system, Synaptic transmission, Action potential Sensory receptors, Somatic sensation, physiology of pain, Motor functions of spinal cord, Spinal reflexes, Reticular formation, Vestibular apparatus, Equilibrium and control of posture, Basal ganglia, cerebellum, reticular activating system, Wakefulness and sleep, EEG, limbic system Hypothalamus, Higher functions of brain,

Unit V

Optics of vision, photoreceptor mechanism in the retina, colour vision, Errors of refraction, colour blindness, Visual pathway, visual cortex, Field of vision, Eye Movements and their control, Control of pupil and accommodation, The tympanic membrane, Transmission of sound, Functions of organs of Corti, auditory Pathway, Mechanism and abnormalities of hearing. Sense of taste, Sense of smell.

16. Microbiology

Unit I

Landmark achievements in 20th century: Refutation of a biogenesis: discovery of penicillin: discovery of vaccination: proposal of one gene one enzyme hypothesis: discovery of double helix structure of DNA: discovery of recombinant DNA technology. Major contribution of scientists– Leeuwen hoeck, Edward Jenner, Alexander Flemming, Joshep Lister, Robert Koch, Louis Pasteur, Hargobind Khorana.

Unit II

Whittaker's five– kingdom concept of living organism-(General characteristics of those five groups), characteristics and importance of yeast, moulds (Penicillium Aspergillus), protozoa, Giardia, Plasmodium, plant diseases (brown spot of rice, stem rot of jute, black stem rust of wheat, apple scab, grey blight of tea, bacterial blight of rice, citrus canker).

Unit III

Principles and applications, dark field, bright field, resolving power, numerical aperture, chromatic aberration, phase contrast microscopy, fluorescent microscopy, inverted microscopy, stereo microscopy, electron microscopy, TEM and SEM. Stains and staining- Principles of staining, simple staining, negative staining, differential staining, Gram and acid fast staining, flagella staining, capsule and endospore staining.

Unit IV

Introduction to biomolecules- Outline structure, function and examples of carbohydrate, lipid, protein (primary, secondary, tertiary and quaternary). Amino acids, DNA, RNA Control of microbes- Sterilisation, disinfection, antiseptic, tyndallisation, pasteurization: Physical- dry heat, moist heat, UV light, ionizing radiation, filtration, HEPA filter, Chemical-phenol and phenolic compounds, (halogen aliphatic alcohol, formaldehyde, ethylene oxide, heavy metals) anionic and cationic detergent Cell structure and sub cellular organelles of bacterian– Slime layer, capsule, cell wall, flagella, pili, fimbriae, nucleoid, plasmid and episome (F, R, Ti as example) ribosome, Virology-General classification of virus, (structure, nucleic acid, cultivation of bacteriophage, coliphage), animal virus (chick embryo, tissue culture, plant virus, TMV using carborandum). Importance of viruses, life cycle of viruses, lytic cycle (T4) and lysogenic (lambda).

Unit V

Air microbiology- Microorganisms in the air, sampling techniques, air borne pathogens.

Microbiology of water-Microbiology of fresh water and wastewater (sewage), BOD, COD (definitions), general outline of water treatment process: septic tank, sedimentation Activated sludge and trickling filter process. Important water borne diseases– cholera, typhoid, (name of pathogen, preventive measures). Outlines of method for detection of microorganisms in drinking water (presumptive, confirmatory and completed tests). Distinction between fecal and non-fecal coliforms, IMVIC tests.

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17. Pharmacology

Unit I

Systemic Pharmacology and Chemotherapy –

Central nervous System- General anesthetics. Alcohols and disulfiram. Sedatives, hypnotics and centrally acting muscle relaxants, Psychopharmacological agents: Antipsychotics, antidepressants, antianxiety agents, anti-manics and hallucinogens. Anti-epileptic drugs.Anti-parkinsonism drugs.Nootropics.Narcotic analgesics, drug addiction, drug abuse, tolerance and dependence. Pharmacology of cardiovascular system - hemodynamics and Electrophysiology of heart. Anti-hypertensive drugs, Anti-anginal agents, Anti-arrhythmic drugs. Drugs used in congestive heart failure. Anti-hyperlipidemic drugs. Drugs used in the therapy of shock. Haematinics, anticoagulants and haemostatic agents.Fibrinolytics and antiplatelet drugs.Blood and plasma volume expanders. Chemotherapy - Sulphonamides and co-trimoxazole. Antibiotics-Penicillins, cephalosporins, chloramphenicol, Macrolides, quinolones and fluoroquinolons,.Tetracyclines.Aminoglycosides and miscellaneous antibiotics. Chemotherapy of tuberculosis, leprosy, fungal diseases, viral diseases, AIDS, protozoal diseases, worm infections, urinary tract infections and sexually transmitted diseases. Chemotherapy of malignancy.

Unit II

Experimental Pharmacology:

Common laboratory animals in pharmacological research, limitations of animal tests, alternatives to animal use, anesthetics used in laboratory animals, some standard techniques used in laboratory animals, euthanasia of experimental animals. Regulations for the care and use of laboratory animals. In vivo and in vitro experimentation, its advantages and disadvantages

Preclinical evaluation: Pharmacological evaluation of acute, sub acute, and chronic toxicity studies.

Clinical Evaluation: Justification and purpose, clinical evaluation including phase I, II, III and IV studies, ethical and legal aspects of clinical trials, methods of randomization, size, documentation, monitoring and management of clinical trials

Unit III

Pharmacological methods and Toxicology –

Physicochemical, Biochemical and genetic basis of toxicity, principles of mutagenesis and carcinogenesis. Guidelines and regulatory agencies – CPCSEA, OECD, FDA, WHO etc. cellular and sub-cellular toxicity hypersensitivity and immune response. Acute poisoning and its treatment Cardiovascular pharmacology– Anti-hypertensives, anti-arrythmics, vasodilators and diuretics. Drugs for neurodegenerative diseases like Parkinsonism, Alzheimers, Respiratory pharmacology – Anti- asthmatics, Anti- allergic and antitussives, Reproductive pharmacology – and anti- fertility agents. Analgesics, anti- inflammatory and antipyretic agent. CNS pharmacology – behavioural and muscle co-ordination, CNS stimulants and depressants, anxiolytics, anti-epilepticsandNootropics. Gastrointestinal drugs – Anti- ulcer, anti-emetic, anti-diarrhoeal and laxatives. Anti-cancer agents. Drugs for metabolic disorders like anti-diabetic, anti- hyperlipidemic ,antiobesity, and hepatoprotective agents.

Unit IV

Recent advances in Pharmacology

Programmed Cell Death (Apoptosis):Molecular biology, physiological and pharmacological implications andtherapeutic potentials of apoptosis. Cytokines and Chemokines:Classification, physiology, pharmacology, pathological, and therapeutic implications of various cytokines and chemokines. Growth Factors:Biology and therapeutic potentials of various growth factors. Biology of Vascular Endothelium:Pharmacology of endothelins and nitric oxide. Clinical implications of endothelial dysfunction. Nucleic Acid Therapies:Basic concepts and clinical potentials of gene therapy, Genomics:Impact of human genome sequence on the discovery of newer pharmacological agents. Basic concept and applications of bioinformatics in drug discovery. Stem Cell Therapeutics:Biology of stem cells and their potentials in various disorders. Pharmcoeconomics:Principles, methods, and applications of pharmcoeconomics to pharmacotherapy and managed health care.

Unit V

Biostatistics

Basic Definitions and Concepts**,** Statistical Inference: Estimation and Hypothesis Testing: Statistical Estimation (Confidence Intervals), Statistical Hypothesis Testing, Comparison of Variances in Independent Samples, Test of Equality of More than Two Variances confidence limits for variance Tolerance Intervals**,** Analysis of Variance: One- Way Analysis of Variance Planned Versus a Posteriori (Unplanned) Comparisons in ANOVA, Another Example of One-Way Analysis of Variance: Unequal Sample Sixes and the Fixed and Random Models, Two-Way Analysis of Variance (Randomized Blocks), Statistical Models, Analysis of Covariance, ANOVA for pooling regression lines as related to stability data.

18. Pharmaceutics

Unit I

Fundamentals of Controlled release drug delivery systems:

Fundamentals and Rationale of Sustained / controlled drug delivery, factors influencing the design & performance of sustained/ Controlled release products, Drug Targeting, Use of polymers in controlled release of active agents, Pharmacokinetic / Pharmacodynamic basis of controlled drug delivery systems, regulatory requirements.

Unit II

Design & Fabrication of Controlled Drug Delivery Systems:

Novel chemical approaches for sustained drug delivery, Design & fabrication of oral controlled release drug delivery systems. Parenteral products,Implantable systems. Transdermal systems, ocular, Intra - Vaginal, intra - uterine systems.

Unit III

Biochemical and Molecular Biology approaches Controlled Drug Delivery:

Microparticulate drug Carriers ; Liposomes, Microspheres and cells, selective endocytosis of macromolecular drug carriers, Antibodies for drug delivery, Resealed erythrocytes, Niosomes. Nanoparticals and other advance drug delivery systems.

Unit IV

Advances in the monitoring of pharmacotherapeutics and in drug delivery system design. Basic principals of Biopharmaceutics and pharmacokinetics including compartment model, bioavailabilty and bioequivalence

Unit V

GMP and Validation: Concept and need of good manufacturing practice guidelines. Element of GMP covering controls of area and process and product . Regulations related to GMP. Introduction of validation process. Types of validation. Brief methodlogy of process, equipment and instrument validation.

19. Pharmacy practice

Unit I Clinical Pharmacy Practice

Definitions, development and scope of clinical pharmacy, Introduction to daily activities of a clinical pharmacist, Patient data analysis: The patient's case history, its structure and use in evaluation of drug therapy. **Drug & Poison information, Pharmacovigilance:** Scope, definition and aims, adverse drug reactions, causality assessment [different scales used], Reporting, evaluation, monitoring, preventing & management of ADRs. **Pharmaceutical care concepts, Medication errors.**

Unit II Hospital Pharmacy

Hospital - its Organisation and functions, Hospital pharmacy-Organisation and management: Organizational structure-Staff, Infrastructure & work load statistics, Roles & responsibilities of hospital pharmacist. **The Budget – Preparation and implementation, Hospital drug policy:** Pharmacy and Therapeutic committee (PTC), Hospital formulary, Hospital committees, Developing therapeutic guidelines. **Hospital pharmacy services:** Procurement & warehousing, Inventory control, Drug distribution in the hospital.

Unit III Pharmacotherapeutics

Etiopathogenesis and pharmacotherapy of disease associated with the following systems/diseases- **Cardiovascular system, Respiratory system, Endocrine system, renal system, Gastrointestinal system, Haematological system, Dermatology, Musculoskeletal disorders, Infectious disease, Oncology**.

Unit V Clinical Research

Drug development process, Clinical development of drug: Introduction to Clinical trials, Various phases of clinical trial, Abbreviated New Drug Application submission, Good Clinical Practice – ICH, GCP, Central drug standard control organisation, (CDSCO) guidelines, Ethical guidelines in Clinical Research, Composition, responsibilities, procedures of IRB / IEC, Overview of regulatory environment in USA, Europe and India, **Role and responsibilities of clinical trial personnel as per ICH GCP**- Sponsor, Investigators, Clinical research associate, Auditors, Contract research coordinators, Regulatory authority. **Informed consent Process**

Unit 5 Pharmacoepidemiology & Pharmacoeconomics

Introduction to Pharmacoepidemiology, Outcome measurement, Concept of risk, Pharmacoepidemiological Methods, Introduction to Pharmacoeconomics, Cost categorization, Outcomes and Measurements of Pharmacoeconomics, Pharmacoeconomic evaluations.

20. Pharmacognosy

Unit I

Plant drug cultivation: General introduction to the importance of Pharmacognosy in herbal drug industry, Indian Council of Agricultural Research, Current Good Agricultural Practices, Current Good Cultivation Practices, Current Good Collection Practices, Conservation of medicinal plants- Ex-situ and In-situ conservation of medicinal plants.

Unit II

Extraction and Phytochemical studies: Recent advances in extractions with emphasis on selection of method and choice of solvent for extraction, successive and exhaustive extraction and other methods of extraction commonly used like microwave assisted extraction, Methods of fractionation. Separation of phytoconstituents by latest CCCET, SCFE techniques, including preparative HPLC and Flash column chromatography.

Unit III

Evaluation of cosmetic products: Determination of acid value, ester value, saponification value, iodine value, peroxide value, rancidity, moisture, ash, volatile matter, heavy metals, fineness of powder, density, viscosity of cosmetic raw materials and finished products. Study of quality of raw materials, general methods of analysis of raw material used in cosmetic manufacture as per BIS.

Unit IV

Herbal drug industry: Infrastructure of herbal drug industry involved in production of standardized extracts and various dosage forms. Current challenges in upgrading and modernization of herbal formulations. Entrepreneurship Development, Project selection, project report, technical knowledge, Capital venture, plant design, layout and construction. Pilot plant scale – up techniques, case studies of herbal extracts. Formulation and production management of herbals.

Unit V

Different tissue culture techniques: Organogenesis and embryogenesis, synthetic seed and monoclonal variation, Protoplast fusion, Hairy root multiple shoot cultures and their applications. Micropropagation of medicinal and aromatic plants. Sterilization methods involved in tissue culture, gene transfer in plants and their applications.

21. Pharmaceutical Quality Assurance

Unit I

Introduction to Quality: Evolution of Quality, Definition of Quality, Dimensions of Quality

Quality as a Strategic Decision: Meaning of strategy and strategic qualitymanagement, mission and vision statements, quality policy, Quality objectives,strategic planning and implementation, McKinsey 7s model, Competitive analysis,Management commitment to quality.

Customer Focus: Meaning of customer and customer focus, Classification ofcustomers, Customer focus, Customer perception of quality, Factors affectingcustomer perception, Customer requirements, Meeting customer needs andexpectations, Customer satisfaction and Customer delight, Handling customercomplaints, Understanding customer behavior, concept of internal and externalcustomers. Case studies.

Cost of Quality: Cost of quality, Categories of cost of Quality, Models of cost ofquality, Optimizing costs, preventing cost of quality.

Unit II

Statistical Process control (SPC): Definition and Importance of SPC, Quality measurement in manufacturing, Statistical control charts - concepts and general aspects, Advantages of statistical control, Process capability, Estimating Inherent or potential capability from a control chart analysis, Measuring process control andquality improvement, Pursuit of decreased process variability.

Good Laboratory Practices: Scope of GLP, Definitions, Quality assurance unit, protocol for conduct of non-clinical testing, control on animal house, report preparation and documentation. CPCSEA guidelines.

Unit III

Principles of Drug discovery and development: Introduction, Clinical researchprocess. Development and informational content for Investigational New DrugsApplication (IND), New Drug Application (NDA), Abbreviated New DrugApplication (ANDA), Supplemental New Drug Application (SNDA), Scale Up PostApproval Changes (SUPAC) and Bulk active chemical Post approval changes(BACPAC), Post marketing surveillance, Product registration guidelines – CDSCO,USFDA.

Unit IV

Introduction to validation: Definition of Calibration, Qualification and Validation,Scope, frequency and importance. Difference between calibration and validation.Calibration of weights and measures. Advantages of Validation, scope of Validation,Organization for Validation, Validation Master plan, Types of Validation,Streamlining of qualification & Validation process and Validation Master Plan.

Unit V

Qualification: User requirement specification, Design qualification, FactoryAcceptance Test (FAT)/Site Acceptance Test (SAT), Installation qualification,Operational qualification, Performance qualification, Re-Qualification (Maintainingstatus- Calibration Preventive Maintenance, Change management).

22. (A). Pharmaceutical Chemistry (M.Sc. based)

Unit I

Structure, formation, reaction, stereochemistry and stability of Carbocation, Carbanions, free radicals, carbene, and nitrene. Mechanism involving free radical, nucleophile & electrophile mediated reactions. S_N1, S_N2 and mixed S_N1 and S_N2 mechanism and its stereo chemical aspects. Factor influencing neucleophilic substitution reactions, Reactivity effects of substrate structure, attacking nucleophilic group, leaving group and reaction medium, ambient nucleophile. Mechanisms involving Aromatic electrophilic reaction, Aromatic nucleophilic reactions, free radical reactions and elimination mechanism. Mechanism and stereo chemical aspects of addition reactions involving electrophiles, nucleophiles and free radicals, regio- and chemo selectivity, orientation and reactivity. Addition to cyclo propane ring. Geometrical isomerism & stereochemistry of olefins. Stereoisomerism of rings, stability of rings, ease of ring formation, Actual shape of six membered rings & its relation to properties & reactivity. Optical rotation, its significance, instrumentation.Optical rotatory dispersion-terminology, plain curve, rotatory dispersion & circular dichroism and octane rule.

Unit II

Chromatography: principles , instrumentation and application of following separation techniques Paper chromatography, Thin layer chromatography, Column chromatography, HPLC, GC, HPTLC, Electrophoresis, Ion exchange and Gel filtration chromatography. UV-Visible spectroscopy: Theory, absorption law, Colorimetric Methods, Chromophore and auxochrome concept, Solvent effect, Instrumentation and applications, Woodword's Fieser, Fieser Kuhn and Nelson rule, Spectral correlation with structures. Atomic spectrophotometry: Atomic emission & Atomic absorption spectrophotometry: principle, instrumentation, interferences and applications. Infrared spectroscopy, Interpretation of IR, spectra of simple compounds. NMR, Spectrometry: Principle, ionization techniques, instrumentation, fragmentation pattern & applications. GC-MS and LC-MS: Principle, Instrumentation and Applications.

Unit III

Carbohydrate : Introduction, classification, mutarotation, constituent of glucose, ring structure of glucose, configuration of monosaccharides, structure elucidation of disaccharides- sucrose, maltose, lactose, polysaccharides- starch. Glycosides arbutin ,amygdaline.

Alkaloids : General introduction, distribution in plants, classification, isolation & purification. General methods of structure determination. Structural elucidation of atropine, quinine, Nicotin, Terpenoids : General introduction, classification, isolation & purification, isoprene, structure elucidation of citral, menthol, camphor, Structures of abietic acid and β-carotene. Plant Pigments: Occurrence, nomenclature and general methods of structure determination. Isolation

and synthesis of cyanidin, and quercetin. Porphyrins: General Introduction of haemoglobin and chlorophyll. Chemistry of chlorophyll (without synthesis). Structure and synthesis of haem.

Heterocyclic compounds: General chemical behaviour of aromatic heterocycles, classification (structural type), Heteroaromatic reactivity and tautomerism in aromatic heterocycles Strain – bond angle and torsional strains and their consequences in small ring heterocycles. Conformation of six-membered heterocycles with reference to molecular geometry, barrier to ring inversion, pyramidal inversion and 1,3-diaxial interactions. Stereo-electronic effects, aromatic and related effects. Attractive interactions - hydrogen bonding and intermolecular nucleophilic, electrophilic interactions., Small Ring Heterocycles: Three-membered and four-membered heterocycles-synthesis and reactions of aziridines, oxiranes, thiiranes, azetidines, oxetanes and thietanes, Benzo-Fused Five-Membered Heterocycles: Synthesis and reactions including medicinal applications of benzopyrroles, benzofurans and benzothiophenes, Six-Membered Heterocycles with One, Two or More Heteroatoms: Synthesis and reactions of pyrylium salts and pyrones and their comparison with pyridinium & thiopyrylium salts and pyridines Synthesis and reactions of quinolizinium and benzopyrylium salts, coumarins and chromones Synthesis and reactions of diazines, triazines, tetrazines and thiazines

Unit-IV

Concept of isosterism and bioiososterism and their applications in drug design, Antimetabolite approach to drug design, Analog drug design, Prodrugs and drug latentiation – Carrier-linked prodrugs – Bioprecursors – Role of functional groups in prodrug design, General pathways of drug metabolism

Specific and non-specific drug action , Drug receptors, Basic concept and classification of receptors, Forces involved in drug receptors- interactions , Receptor agonism and antagonism , Stereochemical aspects of drug action – Setereoselectivity of optical isomers – Role of planarity in drug action – Stereoselectivity of conformational isomers,

Unit-V

Green chemistry: History, need, and goals. Green chemistry and Sustainability. Dimensions of sustainability, Limitations/Obstacles in pursuit of the goals of Green Chemistry. Opportunities for the next generation of materials designers to create a safer future. Hazard assessment and mitigation in chemical industry , Future trends in Green Chemistry: Oxidation-reduction reagents and catalysts, Statistical data analysis: Accuracy and precision, significant figures and computations, mean and standard deviation, distribution of random errors, reliability of results, confidence interval, comparison of results, comparison of means of two samples, paired t-test, number of replicate determinations and its use, correlation and regression, linear regression, analysis of variance, rejection of data.

22. (B). Pharmaceutical Chemistry (M.Pharma based)

UNIT 1 Concept of organic reactions

Organic reaction mechanism : Methods of determining reaction mechanisms (kinetic and non-kinetic methods); Energy profile diagrams, reaction intermediates, crossover experiments and isotopic labelling; Order of reactions, reversible, consecutive and parallel reactions, solvent, ionic strength and salt effects; Acid-base catalysis; Nucleophilic substitution reactions; Uni- and bimolecular reactions, attacking and leaving groups, steric and electronic effects; Neighbouring group participation; Formation and hydrolysis of esters, amides and acyl halides; Different mechanisms. Electrophilic substitution reactions; Aromatic electrophilic substitutions including Friedel-Crafts reactions; Addition and elimination reactions.

UNIT II Spectral Analysis

UV-Visible Spectroscopy: Brief review of electromagnetic spectrum, UV-Visible range, energy-wavelength-colour relationships, Interaction of electromagnetic radiation (UVVis) with matter and its effects, Chromophores and their interaction with EMR, BeerLambert's law, Instrumentation of single beam and double beam spectrophotometers and applications.

IR Spectroscopy, Identification of functional groups, confirming the molecules with IR, estimating the purity of compound, finger print region

Mass Spectrometry: Basic principles and brief outline of instrumentation. Ion formation and types, molecular ion, meta stable ions, Fragmentation processes, Fragmentation patterns, Mass spectrum, its characteristics and representation.

NMR : Reference, Chemical shift, solvents used in NMR, D2O exchange, identification of nature of protons and number of protons on particular chemical environment.

UNIT III Separation Techniques

Chromatography: General principles, classification of chromatographic techniques, normal and reversed phase, bonded phase, separation mechanisms.

Column chromatography: Merits and demerits, short-column chromatography and flash chromatography, vacuum liquid chromatography (VLC), medium pressure liquid chromatography, high pressure liquid chromatography (HPLC).

TLC, HPTLC, over pressure layer chromatography (OPLC), centrifugal chromatography.

Counter-current chromatography, droplet counter-current chromatography, ion-exchange, affinity, size exclusion and ion-pair chromatography.

Gas chromatography, introduction to GC-MS and LC-MS techniques.

UNIT IV Basics of Drug Action

General principles, Identification and study of targets for development of various therapeutic agents, Rational approach for drug design, Computer aided drug design, QSAR, Molecular

modelling, Combinatorial Chemistry, Study of recently developed drugs and molecules in development pipeline.

Concept of isosterism and bioiososterism and their applications in drug design, Antimetaboliteapproach to drug design, Analog drug design, Prodrugs and drug latentiation, Carrier-linked prodrugs, Bioprecursors, Role of functional groups in prodrug design, General pathways of drug metabolism

Specific and non-specific drug action, Drug receptors, Basic concept and classification of receptors, Forces involved in drug receptors- interactions , Receptor agonism and antagonism , Stereochemical aspects of drug action Setereoselectivity of optical isomers,Role of planarity in drug action,Stereoselectivity of conformational isomers.

UNIT V Phytochemistry and Phytopharmaceuticals

Extraction and Phytochemical studies: Recent advances in extractions with emphasis on selection of method and choice of solvent for extraction, successive and exhaustive extractionand other methods.
General introduction and classification, isolation and purification methods of alkaloids, structure elucidation of reserpine, atroipine and morphine.
Classification, method of isolation, chemistry, degradation, synthetic methods, spectral techniques for structural elucidation and biological activity of flavonoids rutin and quercetin.
Study of chemistry, stereochemical aspects and pharmaceutical importance of plant derived steroids -cardiac glycosides (cholesterol, diosgenin).
General introduction and classification terpenoids; Essential Oils; Production of Essential Oils ; Chemistry and Analysis of Essential Oils ; Biological Activities of Essential Oils ; Aromatherapy with Essential Oils ; Industrial Uses of Essential Oils, Essential Oils Used in Veterinary Medicine; Trade of Essential Oils; Recent EU Legislation on Flavors and Fragrances of Essential Oils.
Recent advances in the chemistry of naturally occurring anti-neoplastic agents (catharanthus alkaloids, camptothecin); antimalarials (cinchona alkaloids, artemisinin derivatives).

23. Political Science

Indian political system

Unit I

Background of constituent assembly of india: composition and working

Unit II

Idological bases of indian constitution: Preamble fundamental rights and duties and directive principles.

Unit III

Federlism : Theory and practies in india

Unit IV

Structure and process : President p.m. Council of minister working of the parliamentary system

Unit V

Election commision and eiectoral reforms.

24. Zoology

Unit I

Animal Diversity: General characters and Classification of Non Chordate Phyla, General character and Classification of chordates. Cell Biology: Theories in Origin of cell and cell as a unit of life, Structure of Prokaryotic and eukaryotic Cell, Cellular Oragnaelles and their functions: Plasma membrane and its various models, ionic transport, type of transport, cell cycle and its regulation Molecular basis of signal transduction. Cancer and its types, Apoptosis and necrosis, oncogenes and tumour suppressor gene Viral and cellular oncogene.

Unit II

Molecular Biology: DNA replication. Genetic code. Transcription and translation in prokaryotes and eukaryotes.RNA Synthesis and processing. Mutations & DNA repair systems. Theories in support of DNA as a geneticmaterial, The central Dogma of Molecular Biology. DNA: Structure and conformation, supercoiling,packing of DNA into chromosomes. Genetics: Mendelian laws Exception of Mendelian laws, lethal allele, multiple allels gene interaction (modification of dihybrid ratios) Sex linked inheritance, linkage and crossing over, Hardy-Weinberg law and its application, Mutation and its types.

Unit III

Evolution and Systematics: Concepts of organic evolution and evolutionary theories. Origin of life (including aspects ofprebiotic environment and molecular evolution). Micro and macroevolution. Synthetic theory of evolution,Natural selection. History of animal taxonomy. Species concepts (Typological, Nominalistic, Biological and Evolutionary). Linnean hierarchy. Zoological Nomenclature: ICZN; Taxon, Rank and Categories. Preparation of Keys, Techniques of museum preparation. The evolutionary time scale; Eras, periods and epoch; Major events in the evolutionary time scale; Origins of unicellular and multi cellular organisms; Stages in primate evolution including Homo.

Unit IV

Animal Physiology: Physiology of digestion & absorption: Mechanism of Digestion and absorption of proteins, fats and carbohydrates. Physiology of respiration: Exchange of respiratory gases at the pulmonary surface. Transport of respiratory gases by blood. Oxyhaemoglobin dissociation curve. Neural and chemical control of respiration. Nervous system: Functional differentiation of brain, Neuron - the basic functional unit. Ionic basis of resting and action potentials of neurons, Mechanism of synaptic transmission. Reflexes and types of reflexes.Mechanism of thermoregulation in poikilotherms, homeotherms and heterotherms.

Unit V

Developmental Biology: Potency, commitment, Specification, Cell Fate and Celllineages, Stem Cells, Programmed cell death, Aging and Senescence. Development and differentiation of sperm and oocytes, capacitation, vitellogenesis. Mechanism of fertilization acrosomal reaction, cortical reaction and fertilization membrane. Blocks to polyspermy, Parthenogenesis. Cellular differentiation (transcriptional regulation of gene expression, differential RNA processing and translation). axes and pattern formation in Drosophila, amphibia and chick; organogenesis –eye lens induction, limb development and regeneration in vertebrates; differentiation of neurons, post embryonic development- larval formation, metamorphosis; environmental regulation of normal development; sex determination