UNIVERSITY OF KASHMIR

NAAC A++ Accredited

Hazratbal, Srinagar, Jammu & Kashmir - 190006, India

NOTICE

This is for the information of all eligible candidates that the syllabus for the posts of **Lab Assistant** and **Junior Lab Assistant** in following departments of the University of Kashmir, notified vide **Advertisement No. 01 of 2025 dated 02-01-2025**, is hereby annexed.

1. Lab Assistant (CORD)
2. Lab Assistant (Earth Science)
3. Lab Assistant (Geo-informatics)
4. Lab Assistant (Institute of Home Science)
5. Lab Assistant (Media Education Research Centre – MERC)
6. Lab Assistant (Pharmaceutical Sciences)
7. Lab Assistant (Zoology)
8. Lab Assistant (Geography and Disaster Management)
9. Junior Lab Assistant (Computer Science)
10. Junior Lab Assistant (Electronics)

By Order,

Sd/-

No: F(syllabi-01 of 2025) /KU/Rect/2026
Dated: 21-01-2026

Deputy Registrar
(Recruitment)

Syllabus

Screening Test for Microbiology Laboratory Assistant Post (CORD)

The syllabus is purposefully designed for screening test, emphasizing core concepts, laboratory skills, safety, diagnostics, and routine microbiological techniques. Focuses on daily duties of a **Microbiology Laboratory Assistant,** including media preparation, sterilization, staining, microbial identification, and basic diagnostics. It integrates medical, industrial, environmental, and diagnostic aspects while integrating balanced theory and practice from the M.Sc. curriculum. 10 credits with 50 targeted topics ensure thorough coverage of essential practical competencies and quality control.

The examination comprises **100 multiple-choice questions (MCQs),** with 10 questions per credit, evenly distributed across the 10-credit syllabus (50 topics). Each question will carry equal marks (1 mark/ MCQ) and total marks will be 100. The **total duration of the examination will be 120 minutes (2 hrs)** and all questions must be attempted within the stipulated time.

Credit 1: History, scope and laboratory safety

1. Historical milestones in microbiology (Pasteur, Koch, Jenner and Fleming)
2. Scope and branches of microbiology
3. Principles of microbial growth and nutrition
4. Handling and disposal of microbiological waste
5. Biosafety concepts and biosafety levels (BSL-I to BSL-IV)

Credit 2: Microscopy, staining, sterilization and aseptic techniques

1. Principles and working of light, bright-field, dark-field and phase-contrast microscopy
2. Electron and fluorescence microscopy
3. Staining techniques: simple, Gram, acid-fast
4. Aseptic techniques and working in laminar airflow
5. Sterilization methods and quality control

Credit 3: Culture media and microbial cultivation

1. Types and classification of culture media (natural, synthetic, selective, differential, enrichment)
2. Preparation and sterilization of culture media
3. Inoculation techniques: streak, spread, pour and slab plate
4. Anaerobic culture techniques
5. Pure culture techniques, Preservation and maintenance of cultures (sub-culturing, glycerol stocks, lyophilization)

Credit 4: Microbial identification, diversity and growth

1. Principles of microbial taxonomy and nomenclature
2. Bacterial growth curve and factors affecting growth
3. Colony morphology and cultural characteristics of bacteria and fungi
4. Motility testing (hanging drop, semi-solid media) and IMViC tests
5. Biochemical tests: Catalase, oxidase, coagulase, urease

Syllabus

Screening Test for Microbiology Laboratory Assistant Post

Credit 5: Basic diagnostic microbiology

1. Collection, transport and processing of clinical specimens (urine, sputum, stool, blood)
2. Direct microscopic examination of clinical samples
3. Antibiotic sensitivity testing (Kirby-Bauer disc diffusion method)
4. Interpretation of antibiotic susceptibility results
5. Detection of coliforms and faecal contamination (presumptive, confirmed tests)

Credit 6: Advance diagnostic microbiology

1. Identification of common bacterial pathogens (Staphylococcus, Streptococcus, E. coli, Pseudomonas)
2. Blood culture techniques and processing
3. Widal test for typhoid fever
4. VDRL/RPR test for syphilis
5. Basic fungal identification (KOH mount, lactophenol cotton blue)

Credit 7: Laboratory-relevant concepts on immunology

1. Cells and organs of the immune system
2. Antigens and antibodies: structure and functions
3. Antigen–antibody reactions (agglutination, precipitation)
4. Hypersensitivity and immunodeficiency (overview)
5. Immunodiagnostic techniques (ELISA, rapid tests)

Credit 8: Biochemistry, enzymology and microbial metabolism

1. Carbohydrates, lipids, proteins: structure and functions
2. Enzymes: classification and properties
3. Enzyme kinetics and inhibition
4. Fermentation vs respiration
5. Role of microbes in biogeochemical cycles

Credit 9: Basic biochemical and molecular techniques

1. Estimation of proteins (Lowry/ Bradford method)
2. Estimation of carbohydrates and lipids
3. Isolation of genomic/plasmid DNA from bacteria
4. Agarose gel electrophoresis of DNA
5. Basic PCR setup and visualization of PCR products

Credit 10: Applied, environmental and industrial microbiology

1. Water, soil, and food microbiology
2. Microbes in waste management and bioremediation
3. Industrial microbiology: enzymes, antibiotics, fermentation
4. Food spoilage, preservation, and safety
5. Laboratory ethics, safety, record keeping, and quality control

Department of Earth Sciences

Syllabus for the Post of Lab Assistant

Unit-1 Structural Geology

Mechanical properties of rocks and rock failure. Concept of stress and strain and their geological significance. Mechanics of folding and buckling. Faults and dynamics of faulting. Planer and linear fabrics in deformed rocks. Concept of petro-fabrics and symmetry. Interpretation of fabric data on microscopic and mesoscopic scale. Geometrical analysis of simple and complex structures on macroscopic scale.

Unit-2 Paleontology and Stratigraphy

Modern concepts of origin of life. Precambrian fossil record and origin of Metazoa. Taphonomy and fossil communities. Principles of biostratigraphy. Methods and techniques in palaeontology. Morphology and evolutionary trends in Ammonoids, Brachiopods, Graptolites and Trilobites. Morphology, classification, and evolutionary trends of Foraminifera, Ostracodes and Conodonts, their ecological and geological significance. Sequence of plant life through geological time. An account of Gondwana plant fossils of India with respect to paleoclimatic conditions. Landmarks in the evolution of vertebrates. Extinction of Dinosaurs, Siwalik vertebrates.

Principals of stratigraphy. Stratigraphic classification. International code of stratigraphic nomenclature. Concept of stratigraphic facies, stratigraphic correlation. Seismic stratigraphy, magnetostratigraphy. Precambrian-Cambrian, Permian-Triassic, Cretaceous-Tertiary, and Pliocene-Pleistocene boundary problems in stratigraphy.

Unit-3 Sedimentology

Sedimentary processes. Sedimentary structures and textures. Use of textures and structures in sediment dispersal and basin studies. Classification, environment of deposition, provenance and diagenesis of sandstones, carbonates and mudstones.

Sedimentary environments and classification of environments, lithologies, structures and vertical sequences formed in alluvial, deltaic and glacial and aeolian environments. Concept of sedimentary facies, Walters law of facies and application. Sedimentary cycles and cyclothems. Scalar properties and paleocurrents. Paleogeographic reconstruction and basin analysis.

Unit-4 Mineralogy and Geochemistry

Silicate mineral groups, Pauling's rule, ionic substitution and crystalline solutions. Polymorphism and pseudomorphism. Exsolution and non-crystalline minerals (mineraloids). Concept and application of optical indicatrix and interference phenomenon. Orthoscopic and conoscopic study of minerals. Optic figure, optic sign, dispersion, pleochroism and absorption. Determinative methods of Refractive Index. Pleochroic scheme and 2V microscopic methods. Axiality and optic sign. Geochemical classification of elements. Trace element geochemistry and concepts of partitioning and distribution coefficients of trace elements between solid and liquid phases vis-à-vis partial melting and magma generation. Distribution of REE in the Earth's mantle and crust. Isotope geochemistry, decay mechanism and growth of isotopes; Geochronological applications of Rb-Sr, and U-Th-Pb systematics.

Unit-5 Crystallography

Bravais Lattices, Parallel growth, crystal form, crystal habit. Twining-types, causes and laws. External & Internal symmetry in crystals; Symmetry elements; Improper axis; Combination of symmetry elements.

Crystal Systems: Normal classes of crystals, spherical and stereographic projections. Crystal structure of minerals.

Unit-6 Igneous and Metamorphic Petrology

Magma; nature and cooling behaviour. Volatiles in silicate melts. Classification schemes of igneous rocks.

Phase equilibria: Unary, binary and ternary systems. Genesis and tectonic setting of different Magma types. Application of major and trace elements (including REE) and Sr-, Pb-, and Nd-isotopes studies in deciphering magma generation, mantle-crust interactions and tectonic environments.

Metamorphism and metamorphic processes. Metamorphic differentiation. Metamorphic facies and systematic description of regional and thermal metamorphism of pelitic, basic-ultra-basic and calcareous rocks. Metamorphic reactions and their implications to geothermo-barometry. Metasomatism and Anataxis. Regional metamorphism and paired metamorphic belts in reference to plate tectonics. P-T-t- paths.

Unit-7 Ore, Fuel & Exploration Geology

Principal mechanisms of formation of the igneous, sedimentary and metamorphic mineral deposits. Weathering and placer deposits. Ore deposits and plate tectonics. Mineral economics and national mineral policy in relation to strategic, critical and essential minerals. Ore Microscopy and quantitative methods in ore microscopy. Microchemical studies of ore minerals. Fluid inclusions and their importance in ore geology.

Origin and occurrence of petroleum. Migration and accumulation of petroleum. Reservoir rocks and traps. Petroliferous basins of India. Rank and grade of coal; origin of kerogen and coal. Geological and geographical distribution of coal deposits in India with emphasis on Gondwana coal fields. Atomic minerals and mode of occurrence of atomic minerals in nature. Atomic minerals as source of energy and productive atomic mineral geological horizons in India.

Unit-8 Tectonic Geomorphology

Geomorphological cycle, Morphometric analysis of drainage basins. Tectonic Geomorphology; Active Tectonics & Models of landscape development. Geomorphic markers, landform dating techniques. Geomorphic expression of Faults. Palaeoseismology and field techniques in paleoseismology. Direct and

indirect observations of paleoseismic displacements. Paleoseismic landforms; use of liquefaction-induced features and landslides for paleoseismic analysis.

Unit-9 Hydrogeology

Groundwater table and Groundwater table fluctuations and controlling factors. Elementary theory of groundwater flow, Darcy's law and its range of validity. Steady and unsteady flow. Porosity and permeability transmissivity, storage coefficient and methods of determination. Steady, unsteady and radial flow into a well. Determination of aquifer characteristics from pump-tests. Groundwater exploration using geological, resistivity and seismic methods. Groundwater basin management methods. Water logging and artificial recharge. Fresh and saltwater relationship in coastal areas. Groundwater quality analysis.

Unit-10 Engineering Geology

Engineering properties and classification of rocks. Factors affecting engineering services of rocks. Engineering properties of soils. Geological considerations for evaluation of bridges, dams, reservoir and tunnels. Influence of geological conditions on foundation and design of buildings.

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SYLLABUS FOR THE POST OF LAB ASSISTANT IN THE DEPARTMENT OF GEOINFORMATICS [PGD-GEO-10]

UNIT I: REMOTE SENSING

Components of typical remote sensing systems. Radiation laws. Major satellite systems (IRS, Landsat, Sentinel). Interactions of EMR with the Earth's surface features. Elements of visual image interpretation. Image enhancement techniques. Radiometric and geometric corrections. Classification algorithms.

UNIT II: GEOGRAPHIC INFORMATION SYSTEMS

Typical components of GIS. GIS data models. Raster and vector data analysis in GIS. Open Geospatial Consortium standards. Sampling design and spatial interpolation. Multi-Criteria Decision Making in GIS. Recent trends in GIS. Issues and challenges in geospatial data conversion. Data compression techniques.

UNIT III: GNSS AND SURVEYING

Principles and techniques of surveying. Field-based instruments: Abney level, GNSS, Laser Distance meter, Total station, Terrestrial laser scanner, UAV and LiDAR, Spectroradiometer. Major global and regional GNSS. GPS accuracy, GPS signal interferences, and error corrections.

UNIT IV: GEOSPATIAL STATISTICS

Univariate and multivariate statistical analysis for geospatial data. Geostatistical approaches for spatial interpolation and extrapolation. Semivariogram and variogram for geospatial data. Data transformation and normalization techniques. Probability distribution and data redundancy techniques for spatial data.

UNIT V: GEOSPATIAL MODELLING

Distributed and lumped models, empirical models, semi-empirical models, deduction and induction models. Agent-based modelling, Nexus modelling. System dynamics approach. Model validation, calibration, and sensitivity analysis. Downscaling and upscaling of geospatial data.

UNIT VI: OPEN-SOURCE GIS

Philosophy, licensing, advantages, and global adoption of open-source GIS. Overview of major Open-Source GIS platforms (QGIS, MapWindow GIS). QGIS Plugins. Open Street Map integration in QGIS. Overview of cloud computing. Google Earth Engine Platform architecture. Computational capabilities.

UNIT VII: FUNDAMENTALS OF PROGRAMMING

Machine-level and high-level languages. C programming: character set, keywords, data types. Arithmetic, logical, relational, assignment, and conditional operators in C. Control statements and loops in C. Arrays, structures, functions, and pointers in C. Overview of JavaScript, Python, and R.

UNIT VIII: DIGITAL CARTOGRAPHY

Maps and map composition. Geoid and datum. Coordinate systems: Cartesian, cylindrical, and spherical. Map projections. Survey of India topographic maps. National geospatial data policy. Map generalization and exaggeration. NNRMS standards for mapping.

UNIT IX: GEOSPATIAL DATABASES

Global topographic datasets. Gridded population of the world. Global glacier inventories: RGI, ICIMOD, and GAMDAM. Harmonized world soil database. National Wetland Atlas and Wetland Atlas of Jammu and Kashmir. Data portals for geospatial data download: Earth Explorer, Bhuvan, Vedas.

UNIT X: GEOSPATIAL ARTIFICIAL INTELLIGENCE

Machine learning vs Deep learning. Supervised and unsupervised learning. Platforms: Jupyter notebook, Google Colab. Important libraries for geospatial data analysis. Training and testing datasets. Model overfit and evaluation matrices. Machine learning models.

SYLLABUS FOR THE POST OF LAB. ASSISTANT
INSTITUTE OF HOME SCIENCE PGD-HO-7

Unit I

Advanced Nutrition

- Body composition, Energy, Water, Carbohydrates, Proteins & Lipids as nutrients inside the body.
- Macro & micro elements, their biochemical role, absorption, deficiency, transport and storage inside the body.
- Fat & water-soluble vitamins: their absorption, Biochemical functions, Metabolism & Antagonists.
- Transport of nutrients across cell membrane.
- Emerging concepts in human nutrition.

Unit II

Life Span Nutrition

- Nutrition in Pregnancy & Lactation, Infancy, Childhood
- Nutrition during adolescents and adulthood.
- Geriatric & Sports Nutrition.
- Assessment of nutritional status of community.
- Various nutritional intervention programmes for improving health of the society.

Unit III

Clinical & Therapeutic Nutrition

- Dietetics, factors in patients care & rehabilitation Modification of normal diet.
- Diet in relation to fever & infections
- Gastro intestinal tract disease, disorders of liver and Gall bladder, Renal disease
- Acute and Chronic diseases of heart
- Metabolic disorders, obesity and under nutrition.

Unit IV

- **Carbohydrates**: Properties of monosaccharides, optical isomerism, mutarotation, biologically important derivatives of monosaccharides (glycosides, sugar alcohols, sugar acids, sugar phosphates, deoxy sugars, amino sugars), disaccharides (lactose, maltose, sucrose) structures and functions of poly-saccharides, (starch, glycogen, pectin, cellulose), mucopolysaccharides (hyaluronic acid, heparin, chondroitin sulphate). Flatulence factors.
- **Metabolism**: Glycolysis and TCA cycle, gluconeogenesis, glycogenolysis, hereditary disorders of carbohydrate metabolism.

Unit V

- **Lipids:** Triglycerides, fatty acids - nomenclature and their properties, phospholipids, lecithin, cephalin, sphingomyelins, glycolipids, lipoproteins (composition and transport) steroids (cholesterol and bile acids) prostaglandins.
- **Proteins**: Peptides and proteins. Determination of amino acid composition of proteins (N & C terminals). Orders of protein structure, factors responsible for protein structure, structure of collagen, denaturation, precipitation of proteins, isolation and purification of proteins. Oxidative degradation of amino acids. Urea cycle.

Unit VI

Communication Techniques

- Communication, Audio Visual Aids
- Traditional, modern and new media for development-Folk forms of songs, art, dance, theatre, puppetry advertisement, cinema, ICTs for development- community radio, participatory video, social media and mobile phones.
- Mass Media Approaches of Communication.
- Concept of development-communication models and approaches.

Unit VII

Methods for Community Participation

- Conceptual Specification
- Space Related PRA Methods - social map, resources map mobility map, services and opportunities map, transect map
- Time Related PRA- Methods- daily activity schedule, time line, seasonal diagram, trend analysis, dream map
- PRA Relation Methods-Venn diagram, pie diagram, spider diagram, body mapping

Unit VIII

Extension Management

- Extension-Definition and meaning, objectives, need, process and principles of extension. Personal management- Meaning. Job analysis, job description and job specification
- Planning: Definition, requirements, elements, contingency. Organizing: Definition, requirements, line and staff functions. Staffing: Definition, Requirements of effective staffing.

Leading: Definition, Requirements of effective leading. Controlling: Definition, Requirements of effective controlling, Monitoring and evaluation

- Organizations working for the Service of Children
- Organizations Working for the Service of Youth and Groups with Special Needs

Unit IX

Gender and Development

- Concept of gender, gender roles, changing trends, matrix shift from welfare to development and empowerment gender and development.
- Status of women- Status meaning, Situational analysis, Demographic education employment, political and health, changing scenario.
- Dowry, Domestic violence of female foeticide and infanticide, sexual harassment and exploitation.
- Role and functions of the department of women and child development, ICDS, National Commission for women.

Unit X

Extension programme planning

- Programme Planning: Definition, Objectives, Meaning and importance of programme planning in extension. Principles of programme planning.
- Steps of Programme Planning: Collection of facts, Analysis of situation, Identification of problems, deciding on programme objectives, Developing plan of work
- Programme implementation: Participation of organizations in programme planning.
- Extension Evaluation: Evaluation- Definition, Nature, Types, Purpose Components to be evaluated, Evaluation principles.

Media Education Research Centre, University of Kashmir

(Syllabus for Lab Assistant)

Unit 1 **Marks 10**

- Elements, Process and Functions of Communication
- Types of Communication: Intrapersonal, Interpersonal, Group and Mass Communication
- Verbal and Non-verbal Communication,

Unit 2 **Marks 10**

- Barriers to Communication
- Communication Models: Concept, Scope and Purpose
- Models of Communication: Aristotle, Harold Laswell, Shannon and Weaver, Wilbur Schramm & Osgood, Westley and Maclean

Unit 3 **Marks 10**

- Newsroom structure and Hierarchy
- Principles of Layout and Design; Graphics
- Social Media Platforms, YouTube Channels, Blog and Vlog

Unit 4 **Marks 10**

- Camera Types and Functions: DSLR, mirrorless, mobile
- Exposure triangle: Aperture, Shutter speed & ISO
- Composition Techniques: Rule of Thirds, Framing, Perspective; Lenses

Unit 5 **Marks 10**

- Camera handling: Shots, Camera Angles and Camera Movements
- Framing and Composition
- Lighting: Three-point lighting, Studio Lighting, Outdoor Shooting

Unit 6 **Marks 10**

- Pre-production, Production, and Post-production
- Anchoring, TV studio interview, TV news studio discussions, Talk shows
- Documentary filmmaking techniques

Unit 7 **Marks 10**

- Studio Setup: Cameras, Lights, Microphones, Teleprompters
- Control Room Functions: Vision Mixer, Audio Console
- Roles: Producer, Director, Floor Manager

Unit 8 **Marks 10**

- Fundamentals of Sound: Frequency, Pitch, Voice, Acoustics, Music, Audio Effects
- Podcasting: Content Creation, Types and Significance
- Audio-editing software, Adobe Audition, Qbase, FL Studio

Unit 9 **Marks 10**

- Evolution of audio and video editing (analog to digital)
- Video-editing software (Adobe Premiere Pro, Final Cut Pro, DaVinci Resolve)
- Color correction and grading; Collaborative editing and cloud workflows

Unit 10 (Knowledge of Computers) **Marks 10**

- Basic applications of computer and its component.
- Latest computer technologies.
- Input & output Devices.
- Operating system
- Knowledge of MS Word, MS Excel, MS Access, MS PowerPoint, PDF Internet and E-mail.
- Concept of Computer Virus and Anti-Virus.
- Software, Elements of Computers Processing System, Peripherals, Storage Media.

Syllabus for the conduct of screening test for the post of laboratory Assistant in Pharmaceutical Sciences

Unit 1

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES

1. Chromatographic techniques - Principles of separation and applications of TLC, Column chromatography, Paper chromatography, Ion exchange chromatography, G.C, HPTLC , HPLC and electrophoresis. , Th

2. Infrared spectroscopy - Introduction, basic theory, modes of vibration, instrumentation e Hook's Law & calculations of frequencies for different types of bonds, coupled interactions, hydrogen bonding radiation source, sample handling, applications of IR spectroscopy and introduction about FT-IR.

3.Ultraviolet spectroscopy – Introduction, electronic transitions, the origin and designation of UV band, absorption laws, calculation of Lambda maxim, the chromophore concept, factors effecting the position of UV bands, instrumentation, qualitative and quantitative applications.

4. Nuclear Magnetic Resonance spectroscopy – A. 1H NMR Spectroscopy - Introduction, principle, instrumentation, solvents, chemical shift, spin-spin coupling, coupling constant, spin-spin splitting, chemical equivalence, Pascal triangle. Application including interpretation of Proton-NMR spectra. B. 13C NMR Spectroscopy – Introduction, peak assignments, off resonance decoupling, selective proton decoupling, chemical shifts and factors affecting them, chemical shift equivalence, and spin coupling. Applications of 13C NMR.

5. Mass Spectrometry - Basic principle and theory involved, Instrumentation, types of ions, fragmentation, rearrangements, recognition of molecular ion peak, mass spectra of representative compounds, chemical ionization mass spectrometry (CIMS), field ionisation mass spectrometry (FIMS), fast atom bombardment mass spectrometry (F MS). Applications.

6. Thermal analysis - Introduction to various thermal methods of analysis, basic principle and theory, Different types of calorimeters and micro calorimeters differential thermal analysis (DTA), differential scanning calorimetry (DSC) and micro calorimetry.

7. Pharmacological evaluation of drugs in biological fluids: Bioassay.

8. Microbiological assays.

9. Radioimmunoassays.

10.Quantitative microscopy of herbal drugs. Lycopodium spore method, stomatal number, stomatal index, palisade ratio, vein-islet number, and vein-termination number.

Unit 2

AROMATIC COMPOUNDS: Structure and resonance of benzene, aromatic character, mechanism of electrophilic aromatic substitution, Orientation effects in electrophilic substitution, nucleophilic aromatic substitution.
Preparation, properties and actions of: Phenols, Sulphonic acid and derivatives, Carboxylic acids, Carboxamides, Nitro compounds, amines, diazonium salts, aryl halides and ketones.
Poly nuclear aromatic hydrocarbons: Naphthalene, Phenanthrene and Anthracene.
Heterocyclic compounds: Study of fundamentals of heterocyclics,

STEROIDS: Nomenclature, Stereochemistry, Classification, Isolation methods, Chemistry of Cholesterol (Excluding Synthesis), Diosgenin, Stigmastrol and Erogsterol.

CARDIAC GLYCOSIDES: Digoxin, Digitoxin
CORONARY DILATERS: Glyceryl trinitrate, lsosorbide dinitrate, Dipyridamole,
ANTILIPIDIMIC AGENTS: Theofibrate, Clifbrate, Probucol, Gemfibrozil, Lovastatin.
ANTI FIBRILLATORY AGENTS: Quinidine SO4
ANTIARRYTHMIC AGENTS: Procainamide, Mexiletine, Flecainide, amiodarone, Verapamil.
HYPOTENSIVE AGENTS: Methyl dopa, Clomidine, Guanidine, Propranelol, Minoxidil, Nitroprusside, Reserpine, Captopril, Nifidipine.
Classification, Structure and uses:

Antibiotics: Penicillin
Aminoglycosides Streptomycin, Gentamycin, Neomycin, Kanamycin, Chloramphenicol, Tetracyclines, Cephalosporines
Antimalarials: Chloroquine phosphate Hcl; Pamaquine, Primaquine, Pentaquine phosphate, Mepacrine Hcl, Proguanil Hcl, Pyrimethamine, Trimethoprim, Quinine sulphate.
Antiaemobic: Metronidazole, Diloxanide furcate, Paramomy cin, Phanquone.
Anthelminthes: Albendazole, Mebendazole, Praziquintal, Piperazine citrate.
Antifungal agents: Propionic acid, Ketoconazole, Griseofulvin, Natamycin.
Anti-Tubercular Drugs: P-Amino salicylic acid, Isomiazide, Pyrazinamide, Ethanbutol, Ethinoamide.
Medicinal Dyes: Crystal Violet, Brilliant green, Acriflavin, Methylene blue, Malachite green.
Anti-Viral agents: Amantidine Hcl, Idoxuolidine, Acycloviv, Vidabarin, Ribavarin, Methisazone.
Antineoplastic: Mechlorethamine Hcl, Mephalan, Cholrambucil, Buslfan, Triethylene, Melanine, Carmustine, Methotrextrate, Mercaptoparin, Flururacil, Cytrabin Azaserine, Daunorcrbicin, Cisplatin Mitotane.

Anticonvulsants: Phenobarbitone, Phenytoin, Trimethadion, Paramethadion, Phensuxlmide, Valproic acid, Primadone, Crbama epine.
Antihistaminics: Diphenyhydramine, lamotrigene, Dime4nhydrenate, Pyrilamine malaete, Triaplenenamine rrialeate, Pheniramine maleate, Promethazine,

Antiparkinsonism drugs: Bipridine, Trihexyphenidyl, Procyclidine, Thopropazine, Orphenadrine citrate, Levodopa, Amantidine.
Diuretics: Chloroeneowrin, Mercaptomerine, Chlorothiozaide, Bendroflumethiazide, Polythiazide, Acetazolamide, Disulfamide, Chlorothalidone, Furosemide, Ethacrynic acid, Spirmolactone, Triamterene.
Non-steroidal anti-inflammatory agents: Indomethacin, Tolmetin, Ibuprofen, Diclifenac, Ketoprofen, Naproxen, Auranofin, aspirin, Phenylbutazone
Expectorants & antitussives: Acetylcycsteine, Bromohexine, Ammonium chloride, Guaniphesine, Eucalyptol, Benzonatate, Nocapine, Genopropoxyphene,

hypoglycaemic agents: Insulin, Tolbutamide, Chlopropamide, Glibenclamide, Glipizide, Phentornine, Piglitazone

Antipyretic analgesics Paracetamol, Acetanalide, salicylamide, Benorylate phenozone Dipyrone, Mefananine acid

Uricosurics (Anti-gout Agents): Probenecid, Sulfinpyrazone, allopurinol, Colchicine, Prednisolone

Muscle relaxants Chlorzoxazone, Paclofen, Crisoproder, Mephencsin, Dantrollene 11.

Adregenic drugs: Adrenaline, Noradrenaline, Terdutaline, Amphetamine, Ephedrine, Isoprenaline

Cholinergics: Acetylcholine, Pilocarpine, Carbachol, Edrophonium, Physostigmine, anticholinepsterases

Antispasmodics: Homatropine, Diperidine Hcl, Dicyclolomine, Orphemnadrine citrate,

psychoactive drugs: Triflupromazine, Haloperidul, Diazepam, Oxazepam, Alprozolam, Amitryptiline, Imipramine, Fluoxetive, Venlafaxine, Phenelzine, Tranylcypromine

Unit 3

Acid base titration: Theories of acidimetry and alkalimetry, classification, direct titration of strong acids, strong bases, preparation and standardization of acids and bases, official assay procedures e.g. boric acid, hydrochloric acid, sodium hydroxide, Zinc oxide, Sodium carbonate, tartaric acid, aspirin

Redox reaction: Redox indicators, Potassium permanganate titrations, lodometry and lodimetry, Cerric ammounium sulphate titrations, Potassium iodate titrations Preparation and standardization of titrants like Silver nitrate, Ammonium thiocynate titrations according to Mohr's and Volhard's methods

Diazotization: Different conditions involved in diazotisation of different amines, end point determination, Pharmaceutical analytical applications

Gravimetric analysis: Introduction, precipitation, techniques, supersaturation, coprecipitation, digestion, washing of precipitates, filtration, filter paper and crucibles, ignition

Non-aqueous titrations: Acid-base equilibria; in non aqueous media, titration of weak bases, titration of weak acids

Complexometric titrations: Types, metal ion indicators, factors influencing the stability of complexes and applications e.g. Calcium gluconate, Bismuth carbonate, Potassium alum

Potentiometric analysis: Potentials of Galvanic cells, Potentiometric acid-base titrations, Potentiometric pH determination, precipitation and complex formation, Oxidation-reduction titrations, applications in Pharmacy.

Conductometric analysis: units in conductometric titrations, determination of water analysis of salt solutions, measurement of conductance, high frequency (Oscillometric method), applications.

Aquametry: Physical methods for water determination, thermal methods, azeotropic distillation, refractive index, spectrophotometric method, gas chromatography, electrochemical methods, chemical methods of water determination, Karl Fischer method of moisture determination.

Polarimetry: Its principles and applications; polarization types of molecule analysed; optical rotation; effects of concentration, wave length, solvent, temperature on optical rotation; polarimeter, light source, sample cells.

Introduction, Occurrence, Isolation, classification, general methods of determining structure with reference to Citral, Citronallol, Carvone Limonene, Thymol, Menthol and structural features of terpenoids (isoperene rule).

Alkaloids: Introduction, Occurrence, functions of Alkaloids. Classification, isolation, properties. General methods of determining structure of alkalods with reference to Ephedrine, Atropine, Quinine, Papaverine and Morphine.

Glycosides: Introduction, Natural glycosides, Classification and methods of isolation and determination of structure, Arbutin, Salicin, Amygdalin, Sinigrin and Indican.

Carbohydrates: Introduction, Nomenclature and Classification. General reactions of Monosaccharides, Configuration of Monosaccharides, Structure and properties of disaccharides, Maltose, Lactose and Sucrose. Structure and properties of Polysaccharides: Starch, Glycogen and Cellulose. Structure and conformation of Sugars. Isomerism in sugars. Mucopolysaccharides.

Lipids: Introduction, Classification of lipids. Fatty acids- Nomenclature and Physio-chemical properties. Phospholipids- Their properties and functions. Glyco lipids and Sphingo lipids. Lipo proteins.

Amino acids and proteins: Introduction, Classification of amino acids. General physical and chemical properties of amino acids. Polypeptides- Synthesis of polypeptides. Proteins and uses of proteins. Classification and structure of proteins

Purines: Introduction, Synthesis and Classification of Purines. Methods of determining structure with reference to Caffeine, Theobromine and Theophylline.

Flavones and Iso-flavones: A preliminary study

Unit 4

Surface and Interfacial Phenomenon: Determination of surface and interfacial tension, surface free energy, spreading co-efficient, adsorption isotherms, factors affecting adsorption and applications of adsorption, General characters and classification of surfactants, HLB, solubilization: Mechanism, factors and application of solubilization, Micelle formation, CMC, Detergency, Wetting agents, Contact angle, Foaming and Antifoaming agents..

Complexation: Protein binding Metal complexes, molecular organic complexes, inclusion complexes, method of analysis, protein binding, factors and its applications

Drug stability: Mechanisms of drug degradation, Influence of light and temperature on drug decomposition. Chemical stability testing in dosage forms and storage

Reaction kinetics: Molecularity of reactions, order of reaction, determination of order, factors affecting rate of reaction, accelerated stability analysis.

Viscosity and Rheology: Viscosity, factors affecting viscosity, Determination of flow properties, Viscoelasticity, Newtonian and Non-newtonian systems, thixotropy, Thixotropy measurement and applications. Rheopexy, negative thixotropy

Size Reduction and Size Separation Definitions, factors affecting size reduction; Principles, Laws and factors affecting energy requirements, different methods of size reduction, study of Hammer mill, Fluid energy mill and disintegrator. Various methods & equipments employed for size separation e.g. sieving, sedimentation, centrifugal, elutriation, microscopic methods

Prescriptions: Modern Methods of prescribing Common Latin abbreviations,

Alcohol dilutions, use of Alligation methods; proof spirit. Isotonic solutions.

Suppositories: Displacement value of suppositories

Posology: Dose and dosage of drugs, Factors influencing dose. Calculations of doses on the basis of age, sex and surface area, Percentage calculations %, w/v, v/v & w/w.

Powders: Types; merits and demerits; Compounding, storage and packaging of: Effervescent powders, Granules, Cachets and tablet triturates, Dusting powders.

Liquids Dosage Forms: Preparation, merits, demerits, storage and packaging of solutions and mixtures of Pharmaceuticals

Emulsions: Preparation, identification uses, Classification of emulsifying agents and stability of Emulsions.

Suspensions: Preparation of suspensions, suspending agents; Flocculated and Deflocculated suspensions; stability of suspensions.

Semi-Solid Dosage Forms: Ointment bases: dispensing, demerits and packaging aspects of ointments, pastes, jellies, Poultice, Suppositories and Pessaries.

Sterile Dosage Forms: Definition, types, their merits and demerits, Elementary study of the formulation characteristics of the following types: Injectable preparations, Ophthalmic and ENT products, Total Parenteral nutrition, Dialysis fluid

Preformulation studies: Solid state properties (Crystallinity, Polymorphism), Solubility studies (Dissociation, Partition coefficient, pH solubility profile, common ion effect) Stability study and Drug Excipient interaction

Tablets: Production of tablets, additives and components for compression, forms of compressed tablets, evaluation. Tablet coating: Sugar coating, film coating, air suspension coating, film defects.

Capsules: Hard gelatin capsules: formulation of shell & contents, capsule production, filling operation and equipment employed. Soft gelatin capsules: Manufacture, processing and quality control.

Microencapsulation: Importance and Application, techniques, equipment employed.

Pharmaceutical Aerosols: Components, formulation, types of systems, manufacturing, operation of an aerosol package , quality control and testing, oral, inhalation, nasal and topical aerosols, future developments.

Controlled Drug Delivery systems: Introduction, terminology, Drug targeting, Design and fabrication of oral controlled release drug delivery system. Introduction to implantable and transdermal therapeutic system.

Sustained action dosage form: Drug replacement rate, unit drug dose, mechanisms, formulation and manufacture of sustained action dosage form.

Packaging technology: Types of containers; materials used, closures, unit dose packaging, strip packaging materials, packaging of solid, parenterals and Ophthalmic dosage forms.

Biopharmaceutics: Fundamental principles and concepts, Bioavailability, Bioequivalence and inequivalence, Chemical equivalence, therapeutic equivalence etc.

Drug Absorption: Mechanisms, physio-chemical, biological and dosage form considerations in in gastrointestinal drug absorption.

Drug disposition: Distribution in blood, plasma-protein binding, cellular distribution, drug penetration to cell, drug excretion -renal, biliary, salivary and biotransformation.

Bioavailability: Introduction, comparative bioavailability, Methods of estimation of bioavailability

Pharmacokinetics: Introduction, importance in bioavailability and clinical practice and concepts,Terminologies used.

Absorption, distribution, metabolism and excretion of drugs. Biological halflife, apparent volume of distribution, Fluid compartments and circulatory system.

Unit 5

Definition, scope and branches of Pharmacology, Routes of drug administration and drug delivery systems, bioavailability and biotransformations, metabolizing enzymes as targets of drug action (induction and inhibition), Mechanisms of drug action, drug receptors and cellular signaling systems, Drug antagonism and synergism, Drug dependence and related conditions, Pharmacovigilance, Adverse Drug Effects and their monitoring, Iatrogenic Diseases, Pharmacogenetics and Pharmacoeconomics

ANS: Cholinergic receptors, cholinergic drugs (Parasympathomimetics, anticholinesterases), anticholinergic drugs. Adrenoceptors, sympathomimetics, adrenoceptor blockers and adrenergic neurone antagonists
Drug action on autonomic ganglia (ganglionic stimulants, ganglion blocking agents).
Neuromuscular blocking agents and centrally acting muscle relaxants
Autocoids: Histamine, Antihistaminics
Serotonin, agonists and antagonists
Arachidonic acid metabolites
Angiotensin, Plasmakinins, VIP, neurotensin, Substance P, PAF

CNS: Synaptic transmission in CNS, General Anesthesia, Hypnotic and Sedatives, Alcohol, Anti-convulsants, Psychopharmacological agents, Antipsychotics, Anxiolytics, Antidepressants, Antiparkinsonian drugs, Non-steroidal Analgesics, anti-inflammatory and anti-pyretic agents, drugs used in gout, DMARDs.

Drugs acting on cardiovascular system

Cardiac glycosides and inotropic agents used in CHF, Anti-arrhythmic agents, Anti-hypertensive agents, Coronary vasodilators and drugs used in angina, Hypolipedimic drugs., Fibrinolytic agents.

Chemotherapy: General principles of Chemotherapy, Sulfonamides, Quinolones, aminoglycosides, tetracyclines, penicillines, cephalosporins and macrolide antibiotics, Antiprotozoal drugs, Antimalarials, Antiamoebics, Antifungal and antiviral drugs, Anti-helmintics, Chemotherapy of Tuberculosis and leprosy.
Chemotherapy of cancer, Immunomodulators
Pharmacology of endocrine system: Pituitary hormones, Thyroid, antithyroid drugs, Insulin, Oral hypoglycemics and glucagons, Adrenocortical steroids and their antagonists Sex hormones, contraceptives and drugs used in fertility, Drugs regulating calcium homeostasis.
Drugs acting on the blood and blood forming agents: Coagulants, Anticoagulants, Hametinics (Iron, vitamin B2 and Follic acid), Plasma Expanders.
Diuretics
Drugs acting on gastrointestinal system: Purgatives, Antidiarrhoeal drugs, Antiacids and antiemetics, Digestants
Drugs acting on respiratory system: Expectorants, Antitussives. Drugs used for cough and bronchial asthma
Bioassays: General principles and methods of Bioassays, Official methods of bioassay: Insulin, Heparin, Oxytocin, d-Tubocurarine, Vasopressin, Digitalis, ACTH, Glucagon, Gonadotrophin. Evaluation of new drugs: Acute, subacute and chronic toxicity tests,

Teratogenicity & Carcinogenicity, Clinical trials.
Vitamins

Unit 6

Hospital Pharmacy: Functions and objectives, Location, Layout & flow chart of material and men, personnel and facilities required, including equipments.
Drug distribution system in Hospitals; a) Out patients b) In patients: Detailed discussion of; i) Unit dose dispensing ii) Floor ward stock system & satellite pharmacy services. iii) Central sterile services; bed side pharmacy. iv) Prepackaging
Maintenance of records of issue and use of Nacrotics and Dangerous drugs, Ward stock medicines and emergency drugs.
Medical stores: Medical store management, Organization of Drug store, Location and layout, Inventory and stock control, Procedures for procurement of drugs and supplies from different sources. Inspection and issue of material. Storage of materialsf Non-parenterals, Parenterals) , Pricing policy, Utilization of computers in drug store management. Maintenance of records of retail and wholesale., Pharmacy Therapeutics Committee: Constitution and functions of Pharmacy therapeutics committee, Hospital formulary system and their organization, Functions and composition,
Nomenclature and uses of surgical instruments, hospital equipments and health accessories.
Rational Drug Use & Essential Medicines- drug interactions, adverse reactions
Clinical Toxicology: Poisoning management, antidotes, heavy metal toxicity, Mutagenicity, Teratogenicity and Carcinogenicity
Spread and prevention of communicable diseases- AIDS, sexually transmitted diseases, small pox, measles, influenza, diphtheria, ` whooping cough, meningitis, tuberculosis, polio-myelites, viral hepatitis, cholera, typhoid, diarrhoea, amoebiasis, malaria, filariasis, rabies, tetanus, leprosy.
Contraception (mechanical, chemical, surgical, immunological, physical and physiological)
Immunization- vaccines, toxoids and their uses
Therapeutic Drug Monitoring- importance, high-risk drugs
Structure, function and properties of genetic material, Basic principles of genetic engineering, Blood products, Synthesis of monoclonal antibodies, biopolymers, derivative of biopolymers and their application in medicine
Enzyme & Cell immobilization-Methods and applications, Plant cell culture for the production of useful chemicals, plant tissue culture, protoplast fusion, totipotency, direct gene transfer

Unit 7

Introduction to different group of plant constituents and their tests.
Different systems of medicine practiced in India with specific reference to Unani, Ayurvedic and Homoeopathic medicines
Natural pesticides and insecticides.
Classification and chemistry of carbohydrates.
Study of drugs dealing with biological sources, geographical distribution, collection, chemical constituents, chemical tests for identity, substitutes, adulterants and uses of following drugs; Starches, Acacia, Tragacanth, Sterculia, Guargum, Plantago and Honey
Study of Lipids, their chemistry, classification and biogenesis of lipid containing drugs
Biological source, chemical constituents, tests for identity and use of the following: Arachis oil, Castor oil, Sesame oil, Cotton seed oil, Olive oil, Chaul moogra oil, Bees wax
Drugs of animal origin: Shellac, Cochineal, Cantharides, Spermaceti, Wool fat.

Tannin containing drugs: Catechu (Black and pale), Tannic acid, Myrobalon,
General study of formation of secondary metabolites. Biogenesis of primary metabolites and importance of photosynthesis in formation of primary metabolites and their relationship to the formation of secondary metabolites (Calvine cycle , TCA cycle, Shikimic acid pathway, Embden Merrhoffs pathway, Acetate hypothesis, Isoprenoid compounds biosynthesis
Study of drugs containing alkaloids: Nature, occurrence, Chemistry and Biosynthesis.
Tropane alkaloids: Belladona, Hyoscymus, Stramonium, Duboisia.
Quinoline alkaloids: Cinchona
Isoquinoline alkaloids: Opium, Ipecac.
Indole alkaloids: Nuxvomica, Ergot, Rauwolfia, Catharanthus
Steroidal alkaloids: Kurchi, Solanum. Dioscorrea
Alkaloidal Amines: Ephedra, Colchicum
Methods of plant extraction and chromatographic techniques as applicable to Phtopharmaceuticals.
Study of volatile oil containing following drugs with regard to the nature, occurrence, chemistry, biogenesis and Pharmacognostic study of turpentine, Mentha, Cardamom Cinnamon, Lemon grass, Caraway, Dill, spearmint, Clove, Star anise, Fennel,
Factors affecting formation of plant drug constituents, Drug adulteration and authentication. Evaluation of crude drugs
Plant tissue culture techniques and their contribution to phytopharmaceuticals.
Plant growth regulators

Unit 8

Historical background: Drug Legislation in India, Code of Ethics for Pharmacists, Drug Laws:
a) Prevention of Cruelty Against Animals Act,
b) Pharmacy Act-1948,
c) Drugs and Cosmetic Act-1940, Rules 1945,
d) Narcotic Drugs and Psychotropic Substance Act, and Rules thereunder,
e) Drugs and Magic Remedies (Objectionable Advertisements) Act 1954,
f) Medicinal and Toilet preparations (Excise duties) Act-1955, Rules-1976,
g) Poisons Act,
i) Indian Patents Act, 1970 with recent amendments,
j) The Drug (prices control) order, 1995,
j) The Insecticides Act,
k) Prevention of Food Adulteration, Act and Rules thereunder

Syllabus for the post of Lab Assistant – Zoology

Unit-1 Principles and Methods of Zoological Classification

Systematics: terms & definitions, taxonomic characters: definition and kinds - morphological, physiological, molecular, ecological, behavioral and geographical; Taxonomic keys: definition and kinds- bracket key, indented key and pictorial key; ICZN: historical background, overview of terms, principles and articles; Homonymy, Synonymy and Law of Priority; Typification: definitions, kinds and significance; Taxonomic publications

Unit-2 Animal Diversity- Invertebrates

General Characters and Classification upto order level: Protozoa, Porifera, Cnidaria, Platyhelminthes, Aschelminthes, Annelida, Arthropoda, Mollusca, Echinodermata; Parasitic protozoa (*Entamoeba histolytica, Plasmodium, Trypanosoma, Leishmania, Giardia, Balantidium coli*); Canal system and skeleton in Porifera; Polymorphism in Cnidaria; Corals and coral reefs, Economic importance of Helminthes, Metamerism and Coelom in Annelida, Economic importance of Arthropoda, Torsion in gastropods, Water vascular system in Echinodermata

Unit-3 Animal Diversity- Vertebrates

General characters and classification upto order level: Pisces, Amphibia, Reptilia, Aves and Mammalia; Scales and fins in fishes; Parental care in Amphibia; Poisonous and non-poisonous snakes; Flight adaptations and migration in birds; Thermoregulation and Adaptive radiation in mammals

Unit-4 Anatomy & Physiology

Structure of digestive system & associated glands; Physiology of digestion; structure of lungs, transport & exchange of respiratory gases & regulation of respiration; Cell respiration: glycolysis, TCA cycle; Structure and function of heart; Composition and function of blood; Structure of kidney; Physiology of excretion; Central Nervous System: brain and spinal cord; Peripheral Nervous System: cranial and spinal nerves; Structure, function, regulation and disorders of endocrine glands; Sensory receptors; Colour tests for Carbohydrates, Proteins, Lipids; Estimation of Haemoglobin; RBC count; WBC count

Unit 5 Developmental Biology

Gametogenesis; Fertilization; Cleavage and formation of morula; Formation and implantation of blastocyst; Gastrulation in mammals; Extra embryonic membranes – formation, structure and function; Types of placenta; Organogenesis and foetal development; Endocrine regulation of development; Natural and artificial parthenogenesis, significance of parthenogenesis

Unit-6 Microscopy

Principles of Microscopy: Lenses and images, Oculars, Condensers, Light sources, Magnification, Resolution and Contrast; Basic principles, working and setting up of different types of microscopes: Simple dissecting microscope, Compound microscope, Fluorescence microscope, Phase contrast microscope, Polarizing microscope, Oil immersion microscope, Electron microscope (SEM and TEM); Photomicrography; Micrometry and measurement

Unit-7 Laboratory Instrument and sterilization

Volumetric apparatus: pipettes, Burettes, volumetric flasks, measuring cylinder; General principles and working of basic equipment (pH meter, Weighing Balance, Hot air oven, Water Bath, Incubator, Centrifuge); General Principles of Hygiene, Sterilization methods; Glassware & Plasticware Sterilization; Ethical and safety considerations; Laboratory waste (Biological & Chemical) and Treatment

Unit-8 Laboratory chemicals, reagents and solutions

Classification of laboratory reagents: Acids, bases, salts and solvents; Fixing and killing agents, Solution for clearing glass apparatus, Fixation and fixatives, preparations of solutions (molar, normal, percentage, stock and working solutions), Normal and Physiological saline, storage and handling of laboratory reagents; use of organic solvents (Ethanol, Methanol, Acetone, Chloroform, Xylene); alcoholic grades: dehydrating and clearing, Stains and staining, Mounts and mountants

Unit- 9 Histological and Histochemical Techniques

Animal tissues: Epithelial, Connective, Nervous and Muscular; Histologic Techniques: Fixation of the material, Dehydration, Clearing, Embedding of the material, Sectioning (Microtome, Cryostat), Staining, Mounting; Localization of Chemical components: Carbohydrates, Proteins, Lipids, Nucleic acids, and enzymes

Unit-10 Bio-Techniques

Microbiological techniques: media preparation and sterilization; inoculation & growth monitoring Cell culture techniques: cell viability testing; culture media preparation and cell harvesting methods, Centrifugation – principle & types, Electrophoresis-principle, types (AGE & PAGE) and applications, Chromatography-types and applications, PCR-variants & applications; ELISA; RIA

SYLLABUS FOR THE POST OF LAB ASSISTANT (GEOGRAPHY)

UNIT-I

Continental Drift, Plate Tectonics, Endogenetic & Exogenetic Forces; Denudation and Weathering, Geomorphic Cycle (Davis, Penck, King), Theories and Process of Slope Development, Earth Movements (Seismicity, Folding, Faulting and Vulcanicity) and Different Landforms

UNIT –II

Composition and Structure of Atmosphere; Insolation, Heat Budget of Earth, Temperature, Pressure and Winds, Atmospheric Circulation (air-masses, fronts and upper air circulation, cyclones and anticyclones (tropical and temperate), Climatic Classification of Koppen & Thornthwaite, Climate Change: Evidences and Causes.

UNIT-III

Relief of Oceans, Composition: Temperature, Density and Salinity, Circulation: Warm and Cold Currents, Waves, Tides, Tsunami, Global Water Budget, Drainage Basin & its Characteristics, Hydrographs: Types, Components & Factors Influencing its Shape, Base Flow, Flood Frequency Analysis & Flood Design

UNIT –IV

Components of Ecosystem, Trophic Levels, Energy Flows, Cycles (geo-chemical, carbon, nitrogen and oxygen), Food Chain, Food Web and Ecological Pyramid, Environmental Ethics and Deep Ecology, Environmental Hazards and Disasters (Urban Heat Island, Pollution, Land Degradation)

UNIT-V

Sources of Population Data; World Population Distribution & Growth; Demographic Transition, Theories of Population Growth (Malthus, Sadler, and Ricardo); Fertility and Mortality Analysis (Indices, Determinants and World Patterns); Population Characteristics of India (Rural-Urban, Age, Sex, Occupational and Religious); Population Projection Methods

UNIT–VI

Maps and their Types; Scales, Coordinate Systems, Time Zonation & Map Projections; Techniques of Map Making (Choropleth, Isarithmic, Dasymetric, Chorochromatic, Flow Maps); Data Representation on Maps (Pie diagrams, Bar diagrams and Line Graph); Map Design & Layout; Hythergraph and Climograph; Services of Survey of India (SOI), National Atlas & Thematic Mapping Organization (NATMO)

UNIT–VII

Sampling Techniques; Correlation and Regression Analysis; Multivariate analysis through Principal Component Analysis (PCA); Measures of Inequality: Lorenz Curve, Gini's Coefficient

and Location Quotient; Hypothesis and its Testing: T-Test, Chi-Square Test, ANOVA; Trend Analysis: Mann–Kendall Test; Morphometric Analysis: Ordering of Streams, Bifurcation Ratio, Drainage Density and Drainage Frequency, Basin Circularity Ratio and Form Factor, Profiles, Slope Analysis, Clinographic Curve, Hypsographic Curve and Altimetric Frequency Graph.

UNIT–VIII

Concepts of Surveying, Methods and Instruments; Survey Types; Errors and Accuracy; Survey Techniques (Autonomous, Differential, RTK); Total Station: Components, Functions, Setup (Leveling, Centering, Orientation) and Measurement of Angles, Distances and Heights; Land Parcel Area Computation; GPS Components (space, ground control and receiver segments) and Applications; Segments and Positioning Principles

UNIT–IX

Basics of Remote Sensing (Electromagnetic Spectrum, Sensors and Platforms, Resolution and Types, Elements of Air Photo and Satellite Image Interpretation and Photogrammetry), Types of Aerial Photographs, Digital Image Processing; Developments in Remote Sensing Technology; Big Data Sharing and its Applications in Natural Resources Management in India

UNIT–X

Components of GIS; GIS Database (raster and vector data formats and attribute data formats); Functions of GIS (Conversion, Editing and Analysis), Georeferencing (Coordinate System and Map Projections and Datum); Data Input Methods; Data editing and Error Correction; Topology: Connectivity, Adjacency and Containment; Digital Elevation Model (DEM); GIS Applications (Thematic Cartography, Spatial Decision Support System)

Syllabus for Junior Lab Assistant Post (Computer Science)

UNIT–I: General Skills and Office Productivity

- General analytical and problem-solving skills
- Written and basic spoken English communication skills
- Hands-on experience with office productivity tools:
  - Word processors
  - Spreadsheets
  - Presentation software
- License management
- Documentation and record keeping of lab assets, software licenses, and inventories

UNIT–II: Operating Systems, Hardware, and Data Management

- Common Operating Systems (Windows, Linux basics)
- System and Database administration in a lab environment
- Basic hardware knowledge: desktops, laptops, peripherals (printers, scanners)
- Data backup and recovery
- Basic data security awareness

UNIT–III: Data Communication and Networking Fundamentals

- Bandwidth and latency
- Networking devices: switch, router – features and concepts
- Cabling standards: straight-through, crossover, rollover
- UTP/STP/Fiber cables

UNIT–IV: Ethernet, Wi-Fi, and Fiber Networks

- Basic concepts, operations, and connectors
- IP addressing and VLAN
- Static IP vs DHCP
- TCP/IP model
- Transport and application layer protocols
- LAN, WAN, SAN, and NAS
- Firewall basics

UNIT–V: Electrical and Power Systems

- Electrical connections
- Earthing
- Common electrical problems and troubleshooting
- Power supplies
- UPS: types, maintenance, and troubleshooting

UNIT–VI: Network Security, Access Control, and Incident Handling

- Proxy servers
- Firewalls
- iptables
- VPN management
- Basic incident handling and escalation procedures in lab or campus IT infrastructure

UNIT–VII: System Administration and Virtual Classroom Technologies

- Troubleshooting network issues (wired/wireless)
- System and network configuration
- Network printer configuration
- System administration or network management
- Virtual Classroom setup
- Collaboration tools: Zoom, TeamViewer, Meet, Webex etc.
- Handling different types of cameras and microphones
- Audio/video recording
- Multipoint Control Unit concepts
- Local and remote control of lecture theatres
- Live streaming of lectures over the web

UNIT–VIII: CCTV, Surveillance, and VOIP Systems

- CCTV architecture
- Types of cameras
- Retrieval of recordings
- Backup and recovery
- Concept of video analytics
- VOIP and telecommunication services
    - Server-based exchanges
    - Voice call concepts
    - Features of modern exchanges

UNIT–IX: Server Infrastructure and Cloud Awareness

- Server machines and components
- Salient features of server systems
- Cloud-based solutions (private/public cloud – basics)
- Network security solutions and mechanisms

UNIT–X: Web Programming, Hosting, and Security

- Working knowledge of Linux environments
    - Basic commands
    - User and permission management
    - Apache / web server setup
- Web technologies and databases: HTML, CSS, SQL, JavaScript, JSON
- Programming experience: C and Python basics
- Version control systems: Git (clone, commit, push, pull, branching basics)
- Website hosting and deployment
    - Hosting solutions
    - AWS/G-Cloud basics
    - Shared hosting vs cloud hosting
- Internet and Intranet services
    - VPN management
    - Proxy configuration
    - Web portal management
- Web security fundamentals
    - Common website attacks (SQL injection, XSS, CSRF, etc.)
    - Secure coding and mitigation techniques
- Web security and encryption
    - SSL/TLS
    - Key generation
    - Certificates
    - Hosting secure websites using HTTPS
    - Configuring SSH
    - Server monitoring and logging

Syllabus for Junior Lab Assistant-Electronics

Unit–I: Basic Circuit Elements and Sources

Voltage and current sources; ideal voltage source and ideal current source with their V–I characteristics; controlled (dependent) sources. Passive circuit elements—resistor, inductor and capacitor (R, L and C); V–I characteristics and ratings of R, L and C elements. Source transformation: conversion of voltage sources into current sources and current sources into voltage sources. Series, parallel and series–parallel combinations of resistances and determination of equivalent resistance. Colour coding of resistors.

Unit–II: Circuit Laws and Network Analysis

Ohm's law. Kirchhoff's Current Law (KCL) and Kirchhoff's Voltage Law (KVL) with simple applications. Concept of node and loop; nodal and mesh analysis. Star–Delta and Delta–Star transformations. Introduction to network theorems: Superposition, Thevenin's, Norton's, Reciprocity and Maximum Power Transfer theorems. Basic concept of one-port and two-port networks.

Unit–III: Semiconductor Fundamentals and Diodes

Introduction to semiconductors and classification of materials; commonly used semiconductor materials. Energy band concept in semiconductors; charge carriers (electrons and holes) and effect of temperature on conductivity. Intrinsic and extrinsic semiconductors; N-type and P-type semiconductors. Formation and working of P–N junction diode; V–I characteristics under forward and reverse biasing; concept of knee voltage and breakdown voltage; basic diode equation. Zener diode: working, characteristics and application as a voltage regulator; introduction to regulator ICs. Special purpose diodes such as LED and photodiode—basic working principles, characteristics and applications.

Unit–IV: Rectifier and Wave-Shaping Circuits

Rectifier circuits: definition and types; half-wave rectifier and full-wave rectifier (centre-tapped and bridge); basic working principle and output waveforms. Concept of rectifier efficiency and ripple factor for half-wave and full-wave rectifiers. Diode numbering system, polarity identification, and basic ratings including maximum forward current, peak inverse voltage (PIV) and power dissipation. Wave-shaping circuits: clippers—unbiased and biased (positive and negative), and clampers—positive and negative; basic working and applications.

Unit–V: Transistors and Biasing

Introduction to transistors as semiconductor devices. Bipolar Junction Transistor (BJT): construction and working of PNP and NPN transistors. Transistor configurations—common base (CB), common emitter (CE) and common collector (CC); input and output characteristics. Regions of operation (cut-off, active and saturation). Transistor as a switch. Current gains in

CB and CE configurations. DC load line and operating point (Q-point). Introduction to transistor biasing. Voltage divider bias, Stabilization of Q point.

Introduction to other transistors: Field Effect Transistor (FET) and Metal Oxide Semiconductor Field Effect Transistor (MOSFET)—basic structure and working (qualitative).

Unit - VI: Amplifiers and Oscillators

Transistor as an amplifier: basic principle of amplification. Single-stage and multistage amplifiers; need for cascading. RC-coupled amplifier: basic circuit and working. Concept of positive and negative feedback.

Oscillators: basic concept and need; essentials of oscillation and Barkhausen criterion. Sinusoidal oscillators—Hartley, Colpitts, RC phase shift and Wien bridge oscillators: basic working principle and frequency of oscillation. Crystal oscillator: basic idea and applications.

Unit VII: Linear Integrated Circuits

Introduction to operational amplifiers (op-amps); basic idea and ideal characteristics of an op-amp. Block diagram of IC 741 and basic working principle. Concept of open-loop and closed-loop operation of an op-amp. Basic op-amp applications: inverting and non-inverting amplifiers; summing amplifier and subtractor; integrator and differentiator.
Schmitt trigger. 555 Timer: basic introduction; monostable and astable modes of operation.
Introduction to active filters: basic idea of low-pass and high-pass filters.

Unit–VIII: Digital Electronics

Number systems, base conversions. Representation of signed and unsigned numbers. Binary arithmetic: addition and subtraction using 2's complement method. Introduction to BCD code. Logic gates: numbering, truth tables and logic symbols. Boolean algebra: basic postulates and fundamental theorems.

Combinational logic circuits: standard representation of logic functions (SOP and POS forms). Karnaugh map minimization. Half adder and full adder; half subtractor and full subtractor. Multiplexers, demultiplexers, encoders and decoders—basic operation and applications. Sequential logic circuits: flip-flops, Counters, Registers and memories: registers and shift registers—Memory devices: ROM, PROM, EPROM and EEPROM. RAM: static and dynamic. Introduction to Logic Families.

Unit–IX: Communication Electronics

Introduction to communication systems and their basic elements; Modulation techniques: Amplitude Modulation (AM)—basic principle, modulation index, generation and detection using envelope detector. Frequency Modulation (FM)—basic concept, advantages over AM, generation and detection. Introduction to digital communication; need for digital transmission; basic idea of Pulse Code Modulation (PCM). Introduction to Dipole Antenna, Optic Fibre Basics.

Unit–X: Electronic Instruments and Measurements

Introduction to measurement and basic concepts of errors. Definition and classification of transducers. Basic idea of resistive, inductive and capacitive transducers. Working principles and applications of piezoelectric, thermoelectric, photoelectric and Hall-effect sensors. Applications of transducers in the measurement of temperature, pressure, displacement and light. Measurement of voltage, current and resistance using analog instruments. Digital measuring instruments: Digital Voltmeter (DVM) and Digital Multimeter (DMM)—basic principle and applications. Cathode Ray Oscilloscope (CRO): basic block diagram, principle of operation and applications; measurement of voltage and frequency using CRO.