

UNIVERSITY OF JAMMU

ADVERTISEMENT NOTICE

Applications complete in all respects, on prescribed form are invited from the permanent residents of the Jammu & Kashmir State for the following posts:

S.NO.	NAME OF THE POST	PAY SCALE	GRADE PAY	NO. OF POST	CATEGORY
1	Assistant Registrar*	15600-39100	5400	02	Open = 02 (Bhaderwah Campus = 01, Kathua Campus = 01)
2	Assistant Registrar	15600-39100	5400	01	ST = 01 (Main Campus)
3	Lecture Assistant	9300-34800	4200	03	Zoology= 1 (RBA), Botany= 1(open) Chemistry= 1 (ST)
4	Museum-cum- Lecture Assistant	9300-34800	4200	01	Geology= 1 open
5	Junior Engineer (Civil)	9300-34800	4200	04	SC=01, ST=01, Open=02

* Assistant Registrar positions for Bhaderwah/Kathua campus are non-transferable.

Qualifications: -

1 & 2. Assistant Registrar

Good academic record plus Master's Degree with at least 55% (50% in case of SC/ST) of the marks or its equivalent grade of B in the UGC Seven Point Scale.

3. Lecture Assistant: -

1. Master's Degree in the subject concerned with at least 50% marks.
2. The candidate must have six months Diploma in computers inclusive of training in M.S. Office, from a recognized Computer Training Institute.
3. There shall be a **written Test of 100 Marks**. The candidates shall have to obtain **at least 50 Marks to qualify the written test**. The written test shall consist of the following components of the subject concerned (as per su-prescribed syllabus):

Time Duration: 2 Hours

- a) Multiple Choice Question 30 Marks (1 mark for each question)
- b). Short Answer Questions (with choice) 50 Marks (5 questions- 10 marks for each question)
- c). Long Answer Question (with choice) 20 Marks

Selection Procedure:

The weightage of marks shall be as under:

Qualification:

50-59%	40 Marks	} 50 Marks
60-69%	45 Marks	
70% & above	50 Marks	

Written Test

50-59%	20 Marks	}	30 Marks
60-69%	25 Marks		
70% and above	30 Marks		

Interview: 20 Marks

Total Marks: - (Qualification + Written Test + Interview) = 100 Marks

4. Museum-cum-Lecture Asstt. (Geology): -

1. Master's Degree in the subject concerned with at least 50% marks.
2. The candidate must have six months Diploma in computers inclusive of training in M.S. Office, from a recognized Computer Training Institute.
3. There shall be a **written test of 100 Marks**. The candidates shall have to obtain **at least 50 Marks to qualify the written test**. The written test shall consist of the following components of the subject concerned (as per su-prescribed syllabus):

Time Duration: 2 Hours

- a. Multiple Choice Question 30 Marks (1 mark for each question)
- b. Short Answer Questions (with choice) 50 Marks (5 questions- 10 marks for each question)
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Written Test

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60-69%	25 Marks		
70% and above	30 Marks		

Interview: 20 Marks

Total Marks: - (Qualification + Written Test + Interview) = 100 Marks

NOTE: The Syllabus for Lecture Assistant & Museum-cum-Lecture Assistant. (Geology) shall be available on the Website: www.jammuuniversity.in.

5. Junior Engineer (Civil)

Must hold Diploma in Civil Engineering of a recognized institute with at least 2-3 years experience as J.E.

OR

Bachelor of Engineering

I. **Age as on 01.01.2011: -**

- i) Minimum for all candidates: = 18 years
- ii) Maximum for:
 - a) General Candidates = 37 years
 - b) Socially and Educationally backward classes
viz. weak and under privileged classes
(Social Caste)/ALC/SC/ST/RBA candidates = 40 years
 - c) Physically Handicapped = 39 years
 - d) Ex-Serviceman = 48 years
 - e) In case of candidates already
in Government Service / Contractual employees = 40 years

II. Prescribed application forms can be obtained from the Forms & Stationery Section (Room No. 204, 2nd Floor), University of Jammu, Jammu, personally on payment of **Rs. 550** or by sending **Bank Draft of Rs. 600** for **S.No. 1 & 2** and **Rs. 330.00** or by sending **Bank Draft of Rs.380.00** for **S.No. 3 to 5** drawn in favour of the **REGISTRAR, UNIVERSITY OF JAMMU, JAMMU-180006**, payable at Jammu.

III. The application form can be also be downloaded from the University Website: www.jammuuniversity.in. Those who submit the downloaded application form shall be required to enclose **Bank Draft worth Rs. 550/- for S.No. 1 & 2** and **Rs. 330/- for S.No.3 to 5** drawn in favour of the **Registrar, University of Jammu, Jammu 180006 encashable at Jammu**. The candidate shall, however, be required to put his/her signature with date on the bottom of each page of the downloaded application form.

III. Application forms accompanied with attested copies of qualification certificates/testimonials including experience certificates etc. issued by the competent authority, alongwith self-addressed envelope affixed with postal stamps worth Rs. 25/- be sent only by Registered/Speed Post to the **Assistant Registrar, Adm.(C&R), Room No.102, Administrative Block, University of Jammu**, so as to reach him on or before **29th September, 2011**.

“University Employee desirous to apply can deposit his / her form by hand till the end of last date.”

Note:

1. In the seven point scale with letter grades O,A,B,C,D,E & F shall be regarded as equivalent of 55% wherever the grading system is followed

SEVEN POINT SCALE		
GRADE	GRADE POINT	%AGE EQUIVALENT
O=Outstanding	5.50 – 6.00	75 -100
A=Very Good	4.50 - 5.49	65 - 74
B=Good	3.50 - 4.49	55 - 64
C=Average	2.50 – 3.49	45 – 54
D=Below Average	1.50 – 2.49	35 – 44
E=Poor	0.50 – 1.49	25 – 34
F=Fail	0.00 – 0.49	00 - 24

2. If the number of applications received in response to this advertisement in respect of any of the posts is large, the University may shortlist the candidates on the basis of qualifications and experience higher than the minimum prescribed or by conducting a written/screening test. The interview letters shall be sent under Registered /Speed Post. The University shall, however, be not responsible for any postal delay/lapse.
3. Applications by Government servants should be sent through the Administrative Authority concerned, by the University Employees through the Registrars of their respective Universities and by the persons employed in the private Firms and Institutions through the Heads of the Firms/Institutions concerned. Applications not routed through the respective channels are liable to be rejected.
4. Applications received late or on plain paper or incomplete in any respect will not be entertained. The number of vacancies shown above is tentative and the same may increase or decrease, determinable at the time of selection.

5. Candidate selected for appointment will be placed on probation for two years. During the probationary period their services can be terminated on one month's notice or on payment of one month's salary.
6. Candidate selected for appointment will have to produce the original documents relating to his/her age, qualifications, experience, category and fitness, etc., before joining the post to which he/she is appointed.
7. Terms and conditions of appointment of candidates shall be governed by the provisions of the Kashmir and Jammu Universities Act, 1969, and the Statutes and Regulations made there under from time to time. Where the University does not have its own service rules, those prescribed by the State Government for its employees are, mutatis mutandis, applicable to the University employees also.
8. Candidates invited for interview will have to present themselves for interview at Jammu at their own cost.
9. In addition to pay bands, D.A. as admissible under rules is also payable. Medical Allowance as prescribed by the State Government for its employees is admissible to the University Employees which, at present, is paid at a uniform rate of Rs. 300/-p.m. besides coverage under J&K Civil Service Medical (Attendance) Rules 1990. City Compensatory Allowance and House Rent Allowance are also paid to the University employees as is being paid to the J&K State Govt. Employees. Limited residential accommodation at the University Campuses is available which is allotted on turn under rules.
10. Impersonation or submission of false / fabricated / tampered documents or making incorrect / false statements by a candidate, will, in addition to debarring him / her permanently or for a specific period from any employment in the University, also render him/her liable for criminal prosecution.
11. Canvassing in any form by or on behalf of the candidate will be a disqualification.
12. The University reserves the right not to fill up any of the vacancies advertised, if circumstances so warrant, without assigning any reason thereof.

Note :- The candidates who have already applied for the post of Junior Engineer (Civil) need not to apply again. However, they can submit their fresh Bio-data/ supporting document, if any, upto the last date of submission of application form.

**Sd/-
REGISTRAR**

No. Adm/C&R/11/1677-1776

Dated: 29.08.2011

Copy to:-

1. Spl. Secretary to Vice-Chancellor
2. P.S to Dean Academic Affairs
3. Sr. P.A. to Registrar
4. Sr. P.A. to Controller of Examinations.
5. Director, DIQA/DDE/CDC/CACE&E/ Computer Centre/ Physical Education/ Academic Staff College/Centre for Studies in Museology & Sheikh-ud-Din-Noorani Museum of Heritage/CSRS/Centre for History of Culture of Jammu & Ladakh region/SHTM/ICCR&HRM/ Coordinator, Institute of Human Genetics
6. All Rectors / Directors of the offsite Campuses of the University.
7. All Heads of the Teaching Departments of the University
8. Dean Students Welfare/Provost, Hostels (Boys / Girls)
9. Administrator, General Zorawar Singh Auditorium
10. Chair Professor, General Zorawar Singh Chair/ Maharaja Gulab Singh Chair.
11. I/C Librarian, Dhanvantri Library/ M.A. Urdu Professional Course
12. Joint Registrar (Finance / Exams / CDC)
13. Convener, Disaster Management Cell/OSD Foreign Collaborations
14. Programme Coordinator, NSS
15. Chief Medical Officer
16. All Wardens of University Hostels
17. All Dy. Registrars/Assistant Registrars
18. I/C SPRU
19. Executive Engineer/Manager Guest House
20. President, JUTA/NTEU/JUNGEA/JUOWA
21. Director Information department, J&K Government, Jammu.
22. Employment Information-cum-Advisory Bureau, University of Jammu
23. Station Director, Radio Kashmir, Jammu.
24. Director , Doordarshan, Kendra, Jammu.
25. All Sections
26. Forms & Stationery Section, with 3 spare copies.
27. Content Manager, University website
29. Guard file

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Syllabus for-entrance test for the post of Museum –Cum Lecture Assistant in Geology

UNIT – I

Radioactivity and age of earth. Volcanoes-causes and products, volcanic belts. Earthquakes-causes, earthquake belts, seismicity of India, intensity and magnitude, seismographs. Orogeny and epirogeny. Continents and oceans.

Davies cycle of erosion, climato-tectonic model, fluvial geomorphology, glacial geomorphology, aeolian geomorphology, classification and genesis of slopes, weathering indices and ratios, morphotectonic evolution of Himalaya & Tibet, geomorphological features of Western-ghats & Indo-gangetic plain.

UNIT – II

Aerial photographs and their interpretation, merits and limitations. The electromagnetic spectrum, orbiting satellites and sensor systems, Indian remote sensing satellites, satellite data products. Application of remote sensing in geology. The geographic information system and its applications, global positioning system.

UNIT -III

Behaviour of minerals and rocks under deformation conditions. Folds and faults, classification and mechanics. Structural analysis of folds, foliation, lineation, joints, faults and unconformities. Time relationship between crystallization and deformation: Introduction to petrofabrics.

Investigations of interior of the earth, mantle-crust relationship, significance of low velocity zone, gravity anomaly and isostasy. Geological evidences for the movement of continents, concept of plate-tectonics, mechanism of sea-floor spreading, island arcs, deep-sea trenches and mid-oceanic ridges. Geomagnetism and its types, application of reverse polarity in magnetostratigraphy. Tectonic frame work of India, evolutionary stages of Himalaya, Andaman sea spreading and Makran subduction zone, neo-tectonic evidences in Himalaya.

UNIT - IV

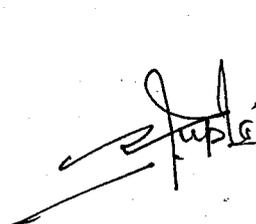
Species definition and nomenclature, modes of preservation of fossils. Morphology, geological history and evolutionary trends in cephalopoda, trilobita, brachiopoda, echinoidea and anthozoa. Stratigraphic utility of ammonoidea, trilobita and graptoloidea. Application of microfossils in correlation, petroleum exploration, palaeo-climatic and palaeo-oceanographic studies. Evolutionary trends in Hominidae, Equidae and Proboscidae. Siwalik fauna. Gondwana flora and its implications for climate.

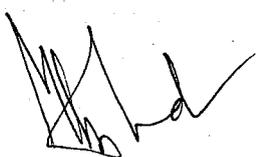
UNIT - V

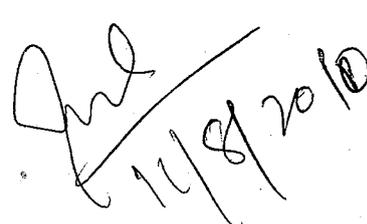
Classification of stratigraphic sequences-lithostratigraphic, biostratigraphic chronostratigraphic & magnetostratigraphic and their interrelationships. Stratigraphic distribution and lithology of Phanerozoic rocks of India with reference to fauna, flora and economic importance. Palaeoclimatic conditions, palaeogeography and igneous activity in the Indian sub-continent in the Phanerozoic Eon. Distribution and classification of Precambrian rocks of India.

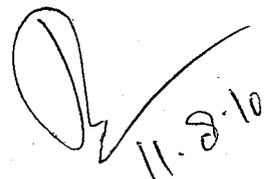
UNIT - VI

Optical properties of common rock forming minerals-paleochroism, extinction angle, double refraction, birefringence, twinning and dispersion in minerals. Physical and chemical characters of rock forming silicate minerals, structural classification of silicates. Minerals of the carbonate, phosphate, sulphide and halide groups. Common minerals of igneous and metamorphic rocks.









UNIT - VII

Generation and crystallization of magma. Crystallization of albite-anorthite, diopside-anorthite and diopside-wollastonite-silica system. Magmatic differentiation and assimilation. Petrogenetic significance of the textures and structures of igneous rocks. Petrography and petrogenesis of granite, syenite, diorite, basic and ultrabasic groups, charnokite, anorthosite and alkaline rocks. Types and agents of metamorphism, metamorphic grades and zones, elementary thermodynamics, facies of regional and contact metamorphism, ACF and AKF diagrams, texture and structure of metamorphic rocks, metamorphism of arenaceous, argillaceous and calcareous materials, retrograde metasomatism and migmatites. Granulite terrains of India. Deccan volcanic province.

UNIT - VIII

Economic ore minerals and gangue, tenor of ore, classification of ore deposits. Process of formation of mineral deposits. Controls of ore localization. Ore textures and structures. Metallogenic epochs and provinces. Geology of the important Indian deposits of aluminium, chromium, copper, gold, iron, lead, zinc, coal and petroleum. National mineral policy. Conservation and utilization of mineral resources. Marine mineral resources and law of sea.

Methods of prospecting – geological, geophysical, geochemical and geobotanical. Techniques of sampling. Estimation of ore reserves. Methods of exploration and mining of metallic ores, industrial minerals.

UNIT - IX

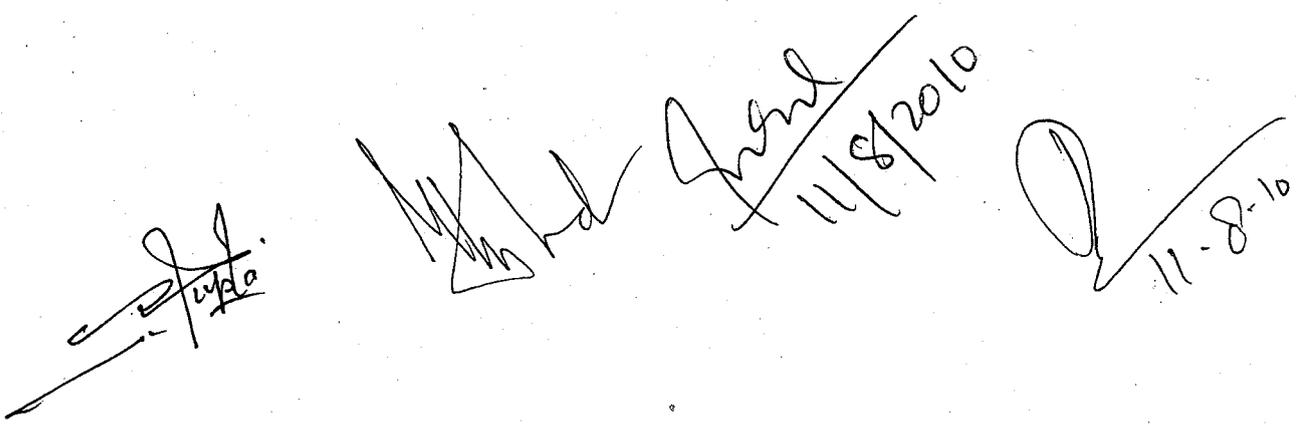
Sedimentary rocks-processes and formation. Diagenesis and lithification. Properties of sediments. Clastic and non-clastic rocks, their classification, petrography and depositional environment. Sedimentary facies and provenance. Sedimentary structures and their significance. Heavy minerals and their significance. Sedimentary basins of India.

Cosmic abundance of elements. Composition of planets and meteorites. Structure and composition of the earth and distribution of elements. Trace elements. Elements of crystal chemistry, types of chemical bonds, coordination number. Isomorphism and polymorphism.

UNIT - X

Hydrologic cycle- surface and subsurface waters. Springs & aquifers. Water bearing characteristics of rocks-porosity, permeability, hydraulic conductivity & storage coefficient. Drainage basin morphometry. Groundwater chemistry, salt water intrusion. Groundwater exploration, recharge, problems & management. Rainwater harvesting. Engineering properties of rocks, rocks as constructional material, geological investigations for roads, dams, tunnels and bridges.

Prevention of natural hazards - floods, landslides, coastal regions, earthquakes and volcanic activity. Environmental impact-due to urbanization, open cast mining, industrial & radioactive waste disposal, dumping of mine waste & fly ash and use of fertilizers. Pollution of ground and surface water, marine pollution.

The bottom of the page contains four handwritten signatures and dates. From left to right: 1. A signature that appears to be 'S. Gupta' with the date '11/8/2010' written below it. 2. A signature that appears to be 'M. K. Singh' with the date '11/8/2010' written below it. 3. A signature that appears to be 'R. K. Singh' with the date '11/8/2010' written below it. 4. A signature that appears to be 'S. K. Singh' with the date '11-8-10' written below it.

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SYLLABUS FOR WRITTEN TEST FOR THE POST OF LECTURE ASSISTANT
in Botany

Cell Biology

Plasma membrane – structure & functions.
Chloroplasts – structure, function & organization.
Mitochondria, Endoplasmic reticulum and golgi apparatus-structure & function.

Molecular Biology

DNA and RNA – structure, types and functions, Replication, Transcription, Splicing and Translation.
Cell cycle and apoptosis – role of cyclins and CDKs.

Cytology, Genetics and Cytogenetics

Molecular organization of centromere and telomere.
Recombination – site specific and generalized, Holliday model. Somatic cell genetics.
DNA damage and repair; Transposons in pro – and eukaryotes.
Transfer of whole genome and individual chromosomes and chromosome segments.

Microbiology

General characteristics, ultrastructure, reproduction and economic importance of Eubacteria, Archaeobacteria, Phytoplasmata, Plant viruses and Fungi.

Biology of Lower Plants

Life cycle patterns among algae, bryophytes and pteridophytes, alternation of generations and its significance; economic importance of algae, bryophytes and pteridophytes.

Gymnosperms

General characters and diversity of gymnosperms; their distribution in India, economic importance of gymnosperms.

Taxonomy of Angiosperms

Concept of artificial, natural and phylogenetic system of classifications. Taxonomic hierarchies. Taxonomic tools. Basic knowledge of ICBN. Endemism viz a viz hotspots with respect to Indian flora.

Plant Development

Seed – dormancy and seed germination; seedling development; organization of RAM and SAM secretory ducts and laticifers.

Contd...2

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Plant Reproduction

Flower development – MADS box concept, Male sterility-phenomenon and implications, Self-incompatibility: types and genetics. Embryo and endosperm development. Apomixis; Fruit development and ripening. Seed structure and function.

Plant Physiology and Metabolism

Concept of water potential, passive and active solute transport, physiological effects and mechanism of action of growth regulators: concept & role of photoperiodism and vernalization.

Electron and proton transport, C₃, C₄ and CAM pathways in photosynthesis, photorespiration, structure and function of lipids, fatty acid synthesis, Biological nitrogen fixation, sulphate transport and assimilation.

Genetic Engineering

Gene cloning technique, restriction endonucleases, plasmids and phages as vectors. Gene transfer methods in plants, transgenic plants for herbicide tolerance and insect resistance ;Artificial chromosomes (BAC and YAC), Aims, objectives and major achievements of Human Genome Project.

Plant Tissue Culture

Concept and application of somatic embryogenesis and synthetic seed production, disadvantages of long term cultures. Protoplast isolation, culture, fusion, hybrid selection and regeneration, genetic consequences of protoplast fusion, hybrids versus cybrids, applications of protoplast research. Applications and limitations of micropropagation. Origin, prospects and achievements of somaclonal variation.

Ecology

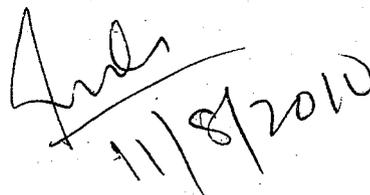
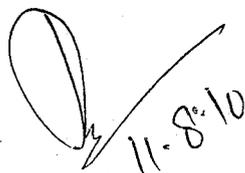
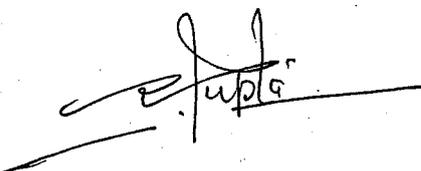
Nature and concept of biotic communities; life forms and biological spectrum; succession-mechanism & models; concept of ecosystems, energy flow; Biogeochemical cycles; Pollution – sources, types and control. Environmental impact assessment; sustainable development, ecological management.

Plant Resource Utilization

Origin of agriculture; centers of origin of crop plants; cereals and legumes as sources of food; medicinal plants of Jammu and Kashmir; Timber and forage plants; alcoholic beverages; green revolution; sustainable utilization of plant resources.

Plant Resource Conservation

Biodiversity – concept and concerns; concept of rare, threatened and endangered plants; priorities for conservation; *in situ* and *ex situ* conservation – methods and limitations; Activities and role of IUCN, WWF, ICAR and NBPGR in plant conservation.



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Syllabus for written test for Lecture Asstt. in Zoology

1. Ecology and Environmental biology.

Community analysis and species diversity in communities.
Water and soil pollution, their causes & remedial measures.
Competition, predation and parasitism, social behaviour.

2. Insect Diversity

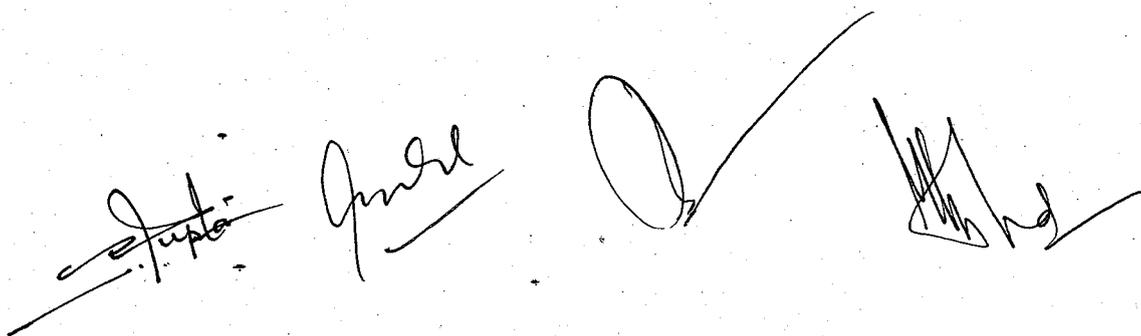
Basis of insect classification & Bionomics of insect orders.
General structure of head, thorax and abdomen, types of mouth parts and their diversity, types Antenna & legs of insects. Metamorphosis: Types and its control, different types of larvae and pupae.

3. Ichthyology

Distinctive characteristics of fishes.
Fins, their structure, modification and functions.
Electric organs; their structure and use in fishes.
Alimentary canal and its diversity in fishes.
Structure, modifications and functions of gills in fishes.
Hill streams fishes.
Migration in fishes.

4. Human and Wild Life Ecology

Biosphere; its composition and potential
Wildlife; its significance, conservation and management.
Wildlife habitats forests and grasslands with their characteristics fauna.
Wildlife census and its techniques.
Density, saturation and carrying capacity.
Important wildlife of J&K State Endangered mammals of India



5. Biotechnology

Origin, definition and scope of Biotechnology.

Tissue culture (slide, flask and test tube culture)

Large scale cell culture in Biotechnology.

Biotechnology in medicine, Animal and human health care, Gene therapy in human welfare.

6. Aquaculture

Importance & scope of aquaculture.

Artificial feed and their types, Biological characteristics of Aquaculture species.

General character of Indigenous & exotic culturable species. Cage culture, trout culture.

7. Limnology

Wetlands and their management techniques.

Lakes origin and classification

Eutrophication, ponds-origin & classification

Biotic characteristic of flowing water.

8. Functional Anatomy of Animals

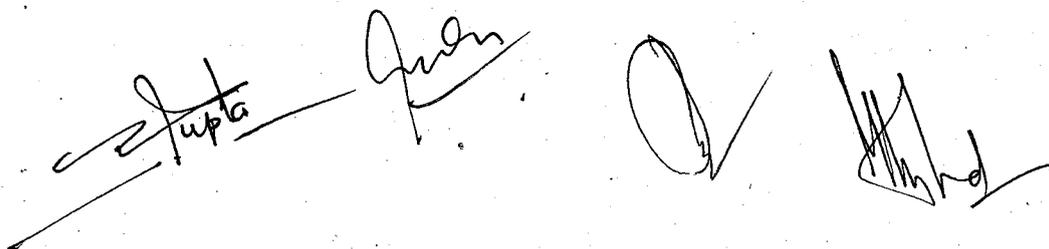
Principles of flight in birds, Patterns of reproduction, Larval forms of crustaceans & Echinoderms, thermoregulation, Metamerism, Coelom, Pulmonary & cutaneous respiration.

9. Genetics & Cytogenetics

Polytomy, specialized chromosomes, chromosomal rearrangements, chromosome structure in Pro & Eukaryota.

10. Reproductive & Developmental Biology

Modes of reproduction in animals, estrous cycle, induced breeding in animals, fertilization, Metamorphoses in frogs, Patterns of cleavage.



Syllabus for entrance test for the post of Lecturè Assistant in Chemistry

Time: 3 hours

Marks: 100

Section – I (Physical Chemistry)

Quantum Mechanics

Postulates of quantum mechanics, Eigen functions and eigen values of angular momentum, Space quantization, Hydrogenlike atoms, Angular wavefunctions and radial wavefunctions. Perturbation method (first order and nondegenerate system) and applications to He-atom. Variation method with application to He atom. Valence bond and molecular orbital models of H₂ molecule. Symmetric and antisymmetric wavefunctions. Comparison of valence bond and molecular orbital models. Huckel molecular orbital theory of ethylene and butadiene molecules. Huckel concept of bonding, antibonding and nonbonding molecular orbitals.

Solutions

Ideal solutions, Raoult's law. Gibbs-Duhem-Margules equation. Mean ionic activity, mean ionic activity coefficient and mean ionic molality of strong electrolytes, ionic strength.

Statistical Thermodynamics

Maxwell-Boltzmann Statistics, Fermi-Dirac Statistics and Bose-Einstein Statistics and their comparison, Application of Fermi-Dirac Statistics to electron gas in metals. Application of Bose-Einstein Statistics to He-atom. Concept of ensemble, macro and micro states. Partition function, Translational, Rotational and Vibrational partition function, Relationship with thermodynamic quantities.

Irreversible Thermodynamics

Transformation of generalized fluxes and forces, entropy production, States of minimum entropy production. Phenomenological relations, Onsager's reciprocity relations, principle of microscopic reversibility, electrokinetic phenomena.

Chemical Kinetics

Collision theory of reaction rates, Steric factor, Activated Complex theory, Comparison with Arrhenius equation, Kinetic and thermodynamic control of reactions. Ionic reactions, Kinetic salt effects. Photochemical reactions between Hydrogen-Bromine and Hydrogen-Chlorine. Homogeneous catalysis. Kinetics of enzyme reactions. Features of fast reactions. Study of fast reactions by flow and relaxation methods. Unimolecular reactions, Lindemann and Hinshelwood theories, Belousov-Zhabotinsky reaction.

Macromolecules

Types of polymers, number and mass average molecular mass, molecular mass determination by ultracentrifugation, Osmometer, Viscometer and Light scattering methods.

Surface Chemistry

AMS

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Te
(Prof. Renu Sachau)
HOD
P.G.D. Chemistry

Capillary action, Laplace equation, Kelvin equation, Gibbs adsorption equation, BET equation, Estimation of surface area by BET equation, Surface film on liquids, Catalytic activities at surface, Surface active agents, Classification, critical micellar concentration. Factors affecting the CMC of surfactants.

Electrochemistry

Debye-Huckel theory of ion-ion interaction, Debye-Huckel-Onsager equation, Thermodynamics of electrified interface, Lippman equation, Method of determination of surface excess. Structure of electrified interface: Helmholtz parallel plate model, Guoy-Chapmann model, Stern model. Derivation of Butler-Volmer equation, Tafel plot. Polarography theory, Ilkovic equation. Half wave potential and its significance.

Solid State Chemistry

Crystal Systems, Bravais lattices, symmetry, point symmetry and point groups. Defects in solids, intrinsic and extrinsic defects, line and plane defects. Vacancies-Shottky and Frenkel defects. Thermodynamics of Shottky and Frankel defect formation. Colour centres. Non-stoichiometry and defects.

Electronic Properties of Solids: Free electron theory and Band theory. Metals, insulators and semiconductors. Band structure of metals, insulators and semiconductors, intrinsic and extrinsic semiconductors, doping semiconductors, p-n junctions. Superconductivity. Types of superconductors.

Optical Properties – Optical reflectance. Photoconduction and photoelectric effect.

Origin and theory of diamagnetism. Quantum theory of paramagnetism – Co-operative phenomenon, Magnetic domains and magnetic hysteresis.

Solid state reactions, kinetics of solid state reactions. Methods of synthesis of solid state materials.

Organic solids, Electrically conducting solids, organic charge transfer complexes. Organic metals, organic superconductors.

M/S

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Section – II (Organic Chemistry)

Hyperconjugation, resonance and tautomerism. Aromaticity in non-benzoid compounds; antiaromaticity, pseudoaromaticity and homoaromaticity: enantiomerism and diastereoisomerism, racemic modification, determination of absolute configuration, atropisomerism.

Kinetic v/s thermodynamic control, Curtin-Hammelt principle, Kinetic isotopic effect, Hammett equation and linear free-energy relationship. Different aspects of SN1, SN2 and mixed SN1 & SN2 mechanism, neighbouring group participation, classical and non-classical carbocations, nucleophilic substitutions at an allylic, aliphatic trigonal and vinylic carbons.

Aromatic nucleophilic substitutions (the S_NAr, S_N1 and Benzyne Mechanism). The Von-Richter, Sommelet-Hauser and Smiles rearrangements, Mechanistic and stereochemical aspects of addition reactions involving electrophiles, nucleophiles and free radicals. Hydroboration & asymmetric epoxidation of olefins. Mechanism, orientation and stereochemistry in E₂ and pyrolytic eliminations. Peterson and Wittig olefination. Tandem reactions consisting of Michael addition & consecutive reactions.

Addition of Grignard reagents, organozinc and organolithium compounds to carbonyl and unsaturated carbonyl compounds.

FMO and PMO approach for pericyclic reactions (electrocyclic and cycloadditions: 4n and 4n+2 systems). Mechanism of free-radical substitutions including aromatic substrates. The effect of solvent on the reactivity in free-radical substitutions.

Enzyme mechanism for chymotrypsin and carboxypeptidase-A. Nucleophilic displacement on phosphorous atom and β-cleavages. Mechanism of action of NAD⁺, FAD, thiamine pyrophosphate and Co-enzyme A.

Photochemical Intermolecular reactions of the olefinic bond (geometrical isomerisms, cyclization reactions), rearrangement of 1,4- and 1,5-dienes. Photochemistry of cyclohexadienones.

Applications of UV, IR, NMR (¹H & ¹³C) and mass spectrometry in structural elucidation of organic compounds.

Principle of protection of alcohol and carbonyl groups.

Applications of the following in organic synthesis: Swern oxidation, MPV reduction, thalium(III) nitrate, DIBAL-H and Wolf-Kishner reduction.

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Section-III (Inorganic Chemistry)

Angular Momentum and Term Symbols

Electronic Angular Momentum: Orbital angular momentum, electron spin angular momentum, total electronic angular momentum, the angular momentum of many-electron atoms, summation of orbital contributions, summation of spin contributions, Total angular momentum, L-S and j-j coupling scheme, determination of all Terms of p^n and d^n ions, determination of ground state term for p^n and d^n ions using L-S scheme, determination of total degeneracy of terms, concept of microstates, splitting of Terms in Octahedral complexes.

Energetics of hybridization, Crystal Field Theory and its limitations, The splitting of d-orbitals in different fields (octahedral, tetrahedral, tetragonally distorted octahedral, square planar, complexes), Crystal field stabilization energy, Factors affecting extent of splitting and spectrochemical series.

Molecular Orbital Theory for Octahedral, Tetrahedral and Square Planar Complexes,

Factors affecting the stability of metal complexes, Chelate effect and its thermodynamic origin, energy profile of a reaction,

Reactivity of metal complexes, inert and labile complexes, Mechanism of electron transfer reactions in transition metal complexes (outer-sphere and inner- sphere), Trans effect.

Electron Spin Resonance Spectroscopy: Basic Principle, spin Hamiltonian, Hyperfine coupling, spin polarization and McConnell relationship, Isotropic and anisotropic hyperfine coupling constants, spin-orbit coupling and significance of g- tensor, Application to transition metal complexes(having one unpaired electron) including biological systems and inorganic free radical viz. BF_2 , F_2 , PH_4 etc.

Mossbauer Spectroscopy: Basic Principles, spectral parameters and spectrum display, Application of the technique to the studies of :

- (a) bonding and structure of Fe^{2+} and Fe^{3+} compounds including those of intermediate spin,
- (b) Sn^{2+} and Sn^{4+} compounds, nature of M-L bond, coordination number, and structure and
- (c) Detection of oxidation state and inequivalent MB atoms.

Environmental Chemistry: Chemical composition of atmosphere, Biogeochemical cycles of C, N, O and S, Soil pollution due to fertilizers, pesticides, plastics and metals, Aquatic pollution due to inorganic, organic pesticides, industrial sewage, detergent etc.

Water quality parameter such as DO, BOD, COD and contents of Chloride. Environmental implications and abatements of cement industry, sugar industry, distillery, paper and pulp mill, thermal and nuclear power plant and polymer/plastic industry, chlorofluoro hydrocarbons, green house effect, acid rain.

Hazardous wastes and chemical treatment of hazardous wastes. Bioderadation and principles of decomposition

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