



Department of Zoology
Baba Ghulam Shah Badshah University
Rajouri-185 234, Jammu & Kashmir

The Deputy Registrar (Academics)
Baba Ghulam Shah Badshah University,
Rajouri

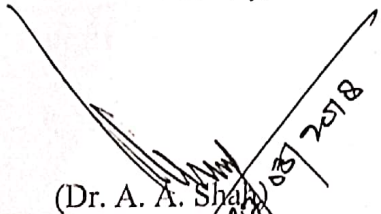
Ref. No! BGSBU/SBA/18/359
Dated!- 29/5/18

Sir,

Please find attached herewith the syllabi of M.Phil. and Pre Ph.D. programmers of Zoology for the approval of the competent authority of the university.

Thanking you.

Yours faithfully,


(Dr. A. A. Shah)
Co-ordinator
Department of Zoology,
Baba Ghulam Shah Badshah University,
SBB, BGSBU, Rajouri-185234
Rajouri



Baba Ghulam Shah Badshah University Raipuri (J&K)

University Notification No. 06 of 2018, dated: 3-7-2018

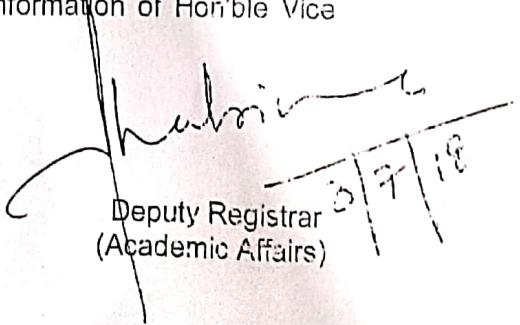
As approved by Hon'ble Vice Chancellor in anticipation of confirmation by Academic Council, the Course Structure and Syllabi of M.Phil. Arabic, Botany, Computer Science, Economics, English & Zoology for semester 1st and pre-Ph.D. in Arabic, Botany, Computer Science, English, Economics, Islamic Studies, Education, Mathematics, Management Studies, Urdu, Biotechnology, Zoology and Electrical Engineering are hereby notified for information of all the concerned. The validity of the above syllabi is for a period of one year i.e. 2018.

Sd:-
Registrar

No. BGSBU/Acad/18/123
Dated: 3-7-2018

Copy to:

1. Dean Academic Affairs
2. Controller of Examinations
3. Dean, School of Mathematical & Computer Sciences
4. Dean, School of Engineering & Technology
5. Dean, School of Biosciences & Biotechnology
6. Dean, School of Management Studies
7. Dean, School of Education
8. Dean, School of Islamic Studies & Languages
9. Coordinator Botany
10. Coordinator Zoology & Biotechnology
11. Head, Department of Arabic / Urdu / Islamic Studies
12. Head, Department of Computer Sciences
13. Head, Department of Mathematics Sciences
14. Head, Department of English
15. Head, Department of Electrical & Renewable Energy Engineering
16. Deputy Controller of Examinations
17. Private Secretary to Hon'ble Vice Chancellor for the kind information of Hon'ble Vice Chancellor
18. All Concerned
19. Office Copy


Deputy Registrar
(Academic Affairs)
3/7/18

Syllabus for Pre-Ph.D Examination-2018
Paper I (Zoology & Biotechnology)

Title of the Paper : Research methodology

Credits: 04
Maximum Marks: 100
Duration: 3 hrs

Unit I : Literature survey and scientific writing

- 1.1 Library and Research Documentation – Methods of literature collection, online Internet and Website.
- 1.2 Technical papers, Reviews, Monographs and Abstract services, Information storage and retrieval, Plagiarism-concept and its consequences.
- 1.3 Preparation and presentation of research papers for Journals, Symposia and Conferences-Impact factor-citation index- refereed journals.
- 1.4 Experimental approach – Designing of Methodology – Planning and Execution of Investigations – Methods of Editing and Abstracting, Preparation of Manuscript and Proof Reading – Thesis Writing.

Unit II : Microscopy

- 2.1 Microscopy: Light Microscopy, Bright field, Phase contrast, DIC, Fluorescence Microscopy.
- 2.2 Confocal Microscopy, SEM & TEM, Histology, and Histochemistry.
- 2.3 Different fixation and staining techniques for EM, freeze-etch and freeze fracture methods for EM.
- 2.4 Live cell imaging and its applications.

Unit III : Centrifugation and Electrophoresis

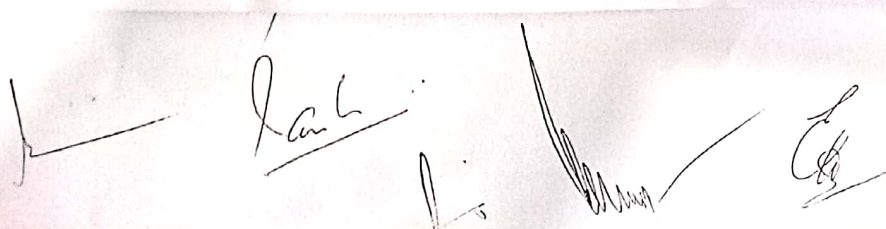
- 3.1 Centrifuges: Types of centrifuge - Differential & density gradient centrifugation.
- 3.2 Chromatography: TLC and Paper chromatography; Reverse-phase and Affinity chromatography and HPLC.
- 3.3 Electrophoresis: Agarose gel electrophoresis; isoelectric focusing, Pulsed field gel electrophoresis, SDS PAGE and their Applications.
- 3.4 ELISA and Radioimmunoassay, FISH and GISH.

Unit IV : Radiation Biology and Spectroscopy

- 4.1 Isotopes half life, GM counter, autoradiography.
- 4.2 Principles and Applications of Tracer Techniques in Biology, Brief idea of radiation dosimetry.
- 4.3 Spectroscopy: Basic principles, instrumentation and use of UV and IR.
- 4.4 Mass spectroscopy: LC-MS, GC-MS and MALDI-TOF.

Unit V : Nucleic acid isolation and Biostatistics

- 5.1 Genomic and plasmid DNA isolation. PCR: basic principle, types and applications.
- 5.2 Blotting techniques: Northern blot, Southern blot and Western blot. Flow cytometry, X-ray diffraction by crystals.
- 5.3 Test of Hypothesis and two types of error's. Tests of means and proportions-students t test, Chi square test and their applications.
- 5.4 Analysis of Variance (one way and two way). Correlation, simple partial and multiple correlations. Simple and multiple regressions and their use in biology.



Syllabus for M. Phil (Zoology) Examination -2018

Credits: 04
Maximum Marks: 100
Duration: 3 hrs

Paper II: Parasitology

Name of the student: Rukhsana Kousar

Unit 1: Introduction to parasitology

- 1.1 Concept of parasitism, animal associations
- 1.2 Parasitic adaptation and host – parasite relationship.
- 1.3 Concept of susceptibility
- 1.4 Concept of vector and types of host.

Unit 2: Epidemiology of Malaria.

- 2.1 Morphology, life history, mode of infection of Plasmodium
- 2.2 Molecular biology of Plasmodium, drug targets, mechanism of drug resistance.
- 2.3 Types of immune responses against parasitic infection.
- 2.4 Natural and acquired immunity to malaria.

Unit 3: Habit, habitat, general morphology, mode of transmission, life- cycle, pathogenesis and prophylaxes of protozoan parasites of man:

- 3.1 *Giardia lamblia*
- 3.2 *Entamoeba histolytica*
- 3.3 *Leishmania spp.*
- 3.4 *Trypanosoma spp.*

Unit 4: Habit, habitat, general morphology, mode of transmission, life-cycle and pathogenesis of helminth parasites:

- 4.1 *Ancylostoma duodenale*
- 4.2 *Wuchereria bancrofti*
- 4.3 *Schistosoma spp.*
- 4.4 *Tenia solium and Tenia saginata*

Unit 5: Interaction and immunology of parasites:

- 5.1 Host – parasite interactions.
- 5.2 Concept of Niche – restriction
- 5.3 Immune evasion strategies of parasites
- 5.4 Antigenic variation in Trypanosoma.

Rukhsana Kousar

Syllabus for M. Phil (Zoology) Examination -2018

Credits: 04
Maximum Marks: 100
Duration: 3 hrs

Paper III: Animal Biotechnology

Name of the student: Rukhsana Kousar

Unit I

- 1.1 Nuclear structure, organization, and function, transposons, retrotransposons, and retroviruses.
- 1.2 Nucleic acids, proteins, and chromatin structure.
- 1.3 Central dogma, Gene structure, transcription.
- 1.4 Translation and regulation of gene expression.

Unit II

- 2.1 Tools in Genetic engineering –cloning vectors, high capacity vectors, retroviral vectors, expression vectors and other advanced vectors in use.
- 2.2 Gene cloning strategies: methods of transforming E. coli and Somatic cell nuclear transfer.
- 2.3 Manipulating genes in animals: gene transfer to animal cells, genetic manipulation of animals. transgenic technology.
- 2.4 Genetically modified organisms: gene knockouts, mouse disease models.

Unit III

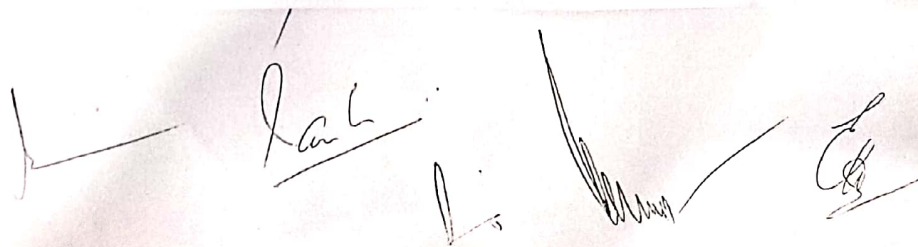
- 3.1 Primary culture, cell lines and cloning, Disaggregation (enzymatic and mechanical) of tissue and primary culture.
- 3.2 Cultured cells and revolution of cell lines, Maintenance of cultures-cell lines.
- 3.3 Somatic cell fusion, Tissue and organ culture, Tissue culture, Organ culture.
- 3.4 Whole embryo culture, Tissue engineering (artificial skin and artificial cartilage).

Unit IV

- 4.1 Genetic engineering in aquaculture – Transgene delivery.
- 4.2 Transgene integration – Detecting integration and Expression of transgene.
- 4.3 Cell culture - Organ culture - whole embryo culture - Embryo transfer.
- 4.4 In vitro fertilization (IVF) technology - Dolly - embryo transfer in human.

Unit V

- 5.1 Molecular techniques in disease diagnosis.
- 5.2 Gene therapy, somatic and germ- line therapy.



Syllabus for M. Phil (Zoology) Examination -2018

Credits: 04
Maximum Marks: 100
Duration: 3 hrs

Paper IV: Immunology, Microbiology and Biochemistry

Name: *Rukhsana Kousar*

Unit 1: Introduction to Immunology

- 1.1 Immunology; definition, history and important milestones.
- 1.2 Types of immunity; Features of immune system; detailed study of cell and organ immune system.
- 1.3 Immunoglobulins; organization, genes, classes and structure.
- 1.4 Antibody and antigens- role, diversity, affinity and interaction

Unit 2: Immunodiagnostics and Immuno-biotechnology

- 2.1 Techniques; ELISA, RIA, FACS.
- 2.2 Generation of monoclonal antibodies; Hybridoma technology; application of monoclonal antibodies.
- 2.3 1st generation and 2nd generation vaccines, DNA vaccines; use, potential and applications.
- 2.4 Stem cells; source, uses, applications; few case studies

Unit 3: Introduction to Microbiology

- 3.1 The history and scope of microbiology: Discovery of microorganisms; Golden age of microbiology.
- 3.2 Prokaryotic cell structure and function: An overview of prokaryotic cell structure, prokaryotic cell membrane, cytoplasmic matrix and nucleoid, plasmid, bacterial and archeal cell wall.
- 3.3 Microbial nutrition: The common nutrient requirements, Requirement for carbon, oxygen, hydrogen and electrons; nutrition types of micro-organisms; Requirements for nitrogen, phosphorus and sulphur; growth factors, uptake of nutrients by the cell; culture media ; isolation of pure culture.
- 3.4 Microbial growth: growth curve; measurement of microbial growth; the continuous culture of micro-organisms.

Unit 4: Introduction to Biochemistry

- 4.1 The history and scope of biochemistry, Foundations of biochemistry.
- 4.2 Structure and classifications of carbohydrates; mono, di and Polysaccharides. Homopolysaccharides. occurrence, structure and biological functions of Cellulose, starch and glycogen.

Rukhsana Kousar

Syllabus for M.Phil Examination-2017

Paper II (Zoology)

Title of the paper: Introduction to Aquatic Entomology and Ecology.

Name of the Candidate: Avinaash Kumar Sudan

Credits:04

Maximum Marks:100

Duration: 3 hrs.

Unit:1 Introduction to Ecology and Ethology

- 1.1 Environment; abiotic and biotic factors and their role
- 1.2 Ecosystem; concept, components, energy flow, food chain and trophic levels.
- 1.3 Adaptations in freshwater, marine and terrestrial habitats.
- 1.4 Pollution of air, water and land.

Unit:2 Assessment of Water Quality

- 2.1 Physical properties of water, surface tension, hydrophilic and hydrophobic interactions.
- 2.2 Chemical properties of water: pH, salinity, osmotic relations, dissolved gases, solubility, CO_2 , O_2
- 2.3 Biomonitoring protocols using macroinvertebrates as indicator species.
 - 2.3.1 Why to study freshwater invertebrates
 - 2.3.2 Water quality monitoring
- 2.4 Respiration in aquatic organisms, problems associated with respiration in aquatic habitat.

Unit: Arthropod physiology & morphology

- 3.1 Larval forms and parasitism in Crustacean; Feeding in aquatic organisms
- 3.2 Social forms and metamorphosis in insects; types of metamorphosis.
- 3.3 Role of hormones and pheromones in behavior/pheromones in insects.
- 3.4 Earthworm, Leeches: coelom and metamerism

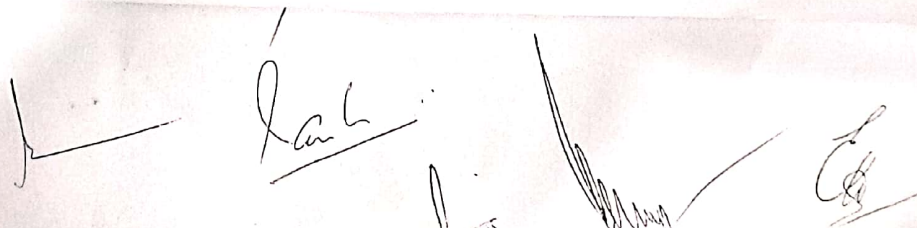
Unit:4 Evolution and Systematics

- 4.1 Natural selection, Hardy-Weinberg law, Theories of organic evolution.
- 4.2 Cryptic and Warning colouration mimicry, isolating mechanisms and their role in evolution
- 4.3 Concept of species and sub-species, zoological nomenclature.
- 4.4 History of evolutionary thought, origin of life, nature of organic variation.

Unit:5 Techniques of studying macroinvertebrates

- 5.1 Methods of studying macroinvertebrates in their natural habitat, Sampling protocols.
- 5.2 Role of technology in studying aquatic macroinvertebrates, biomonitoring using aquatic fauna.
- 5.3 Calculating biomonitoring scores: ASPT and BMWP scores---General concept
- 5.4 Collection and preservation of sample, Tools for Sampling Aquatic insect

Note for the Paper Setter:



Syllabus for M. Phil (Zoology) Examination -2018

Credits: 04

Maximum Marks: 100

Duration: 3 hrs

Paper III: Animal Biotechnology

Name: *Ayinaash Kumar Sudan*

Unit I

- 1.1 Nuclear structure, organization, and function, transposons, retrotransposons, and retroviruses.
- 1.2 Nucleic acids, proteins, and chromatin structure.
- 1.3 Central dogma, Gene structure, transcription.
- 1.4 Translation and regulation of gene expression.

Unit II

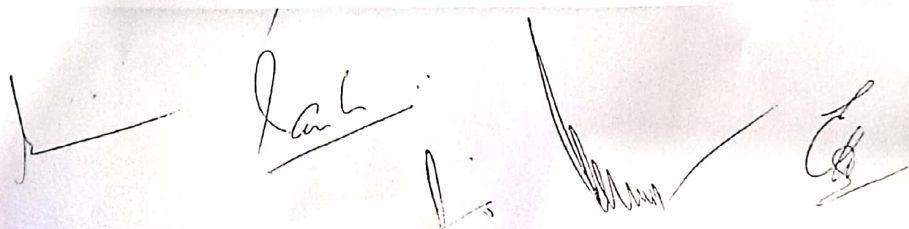
- 2.1 Tools in Genetic engineering; cloning vectors, high capacity vectors, retroviral vectors, expression vectors and other advanced vectors in use.
- 2.2 Gene cloning strategies: methods of transforming *E. coli* and Somatic cell nuclear transfer.
- 2.3 Manipulating genes in animals: gene transfer to animal cells, genetic manipulation of animals, transgenic technology.
- 2.4 Genetically modified organisms: gene knockouts, mouse disease models.

Unit III

- 3.1 Primary culture, cell lines and cloning, Disaggregation (enzymatic and mechanical) of tissue and primary culture.
- 3.2 Cultured cells and revolution of cell lines, Maintenance of cultures; cell lines.
- 3.3 Somatic cell fusion, Tissue and organ culture, Tissue culture, Organ culture.
- 3.4 Whole embryo culture, Tissue engineering (artificial skin and artificial cartilage).

Unit IV

- 4.1 Genetic engineering in aquaculture; Transgene delivery.
- 4.2 Transgene integration; Detecting integration and Expression of transgene.
- 4.3 Cell culture - Organ culture - whole embryo culture; Embryo transfer.
- 4.4 In vitro fertilization (IVF) technology; Dolly, embryo transfer in human.



Syllabus for M. Phil (Zoology) Examination -2018

Credits: 04
Maximum Marks: 100
Duration: 3 hrs

Paper IV: Immunology, Microbiology and Biochemistry

Name: Avinash Kumar Sudan

Unit 1: Introduction to Immunology

- 1.1 Immunology; definition, history and important milestones.
- 1.2 Types of immunity; Features of immune system; detailed study of cell and organ immune system.
- 1.3 Immunoglobulins; organization, genes, classes and structure.
- 1.4 Antibody and antigens- role, diversity, affinity and interaction

Unit 2: Immunodiagnosics and Immuno-biotechnology

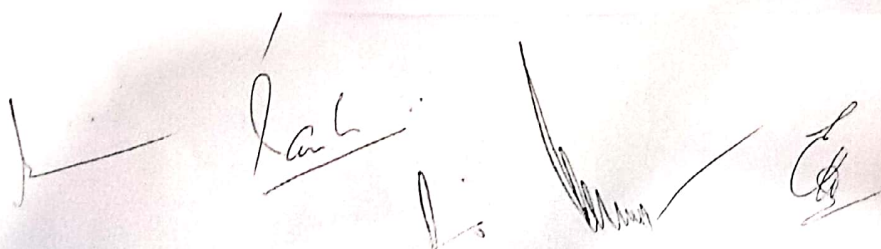
- 2.1 Techniques; ELISA, RIA, FACS.
- 2.2 Generation of monoclonal antibodies; Hybridoma technology; application of monoclonal antibodies.
- 2.3 1st generation and 2nd generation vaccines, DNA vaccines; use, potential and applications.
- 2.4 Stem cells; source, uses, applications; few case studies

Unit 3: Introduction to Microbiology

- 3.1 The history and scope of microbiology: Discovery of microorganisms; Golden age of microbiology.
- 3.2 Prokaryotic cell structure and function: An overview of prokaryotic cell structure, prokaryotic cell membrane, cytoplasmic matrix and nucleoid, plasmid, bacterial and archeal cell wall.
- 3.3 Microbial nutrition: The common nutrient requirements, Requirement for carbon, oxygen, hydrogen and electrons; nutrition types of micro-organisms; Requirements for nitrogen, phosphorus and sulphur; growth factors, uptake of nutrients by the cell; culture media ; isolation of pure culture.
- 3.4 Microbial growth: growth curve; measurement of microbial growth; the continuous culture of micro-organisms.

Unit 4: Introduction to Biochemistry

- 4.1 The history and scope of biochemistry, Foundations of biochemistry.
- 4.2 Structure and classifications of carbohydrates; mono, di and Polysaccharides. Homopolysaccharides. occurrence, structure and biological functions of Cellulose, starch and glycogen.



Syllabus for M. Phil (Zoology) Examination -2018

Credits: 04
Maximum Marks: 100
Duration: 3 hrs

Paper III: Animal Biotechnology

Name: Sabu Khamari

Unit I

- 1.1 Nuclear structure, organization, and function, transposons, retrotransposons, and retroviruses.
- 1.2 Nucleic acids, proteins, and chromatin structure.
- 1.3 Central dogma, Gene structure, transcription.
- 1.4 Translation and regulation of gene expression.

Unit II

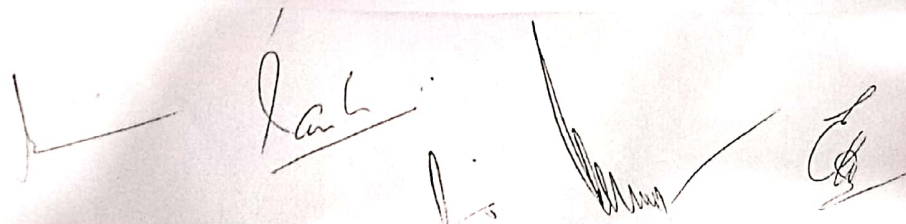
- 2.1 Tools in Genetic engineering; cloning vectors, high capacity vectors, retroviral vectors, expression vectors and other advanced vectors in use.
- 2.2 Gene cloning strategies: methods of transforming E. coli and Somatic cell nuclear transfer.
- 2.3 Manipulating genes in animals: gene transfer to animal cells, genetic manipulation of animals, transgenic technology.
- 2.4 Genetically modified organisms: gene knockouts, mouse disease models.

Unit III

- 3.1 Primary culture, cell lines and cloning, Disaggregation (enzymatic and mechanical) of tissue and primary culture.
- 3.2 Cultured cells and revolution of cell lines, Maintenance of cultures; cell lines.
- 3.3 Somatic cell fusion, Tissue and organ culture, Tissue culture, Organ culture.
- 3.4 Whole embryo culture, Tissue engineering (artificial skin and artificial cartilage).

Unit IV

- 4.1 Genetic engineering in aquaculture; Transgene delivery.
- 4.2 Transgene integration; Detecting integration and Expression of transgene.
- 4.3 Cell culture - Organ culture - whole embryo culture; Embryo transfer.
- 4.4 In vitro fertilization (IVF) technology; Dolly, embryo transfer in human.



Syllabus for M. Phil (Zoology) Examination -2018

Credits: 04
Maximum Marks: 100
Duration: 3 hrs

Paper II: Advanced Zoology

Name: Saba Kirmani

Unit I

- 1.1 Physiology of respiration, excretion, immune system, nervous system, reproduction.
- 1.2 Introduction to Genetics; Mendelian principles, polygenic inheritance, multiple alleles.
- 1.3 Linkage and crossing over, Mono hybrid ratio and dihybrid ratio.
- 1.4 Population genetics; gene pool, gene frequency, Hardy-Weinberg equation.

Unit II

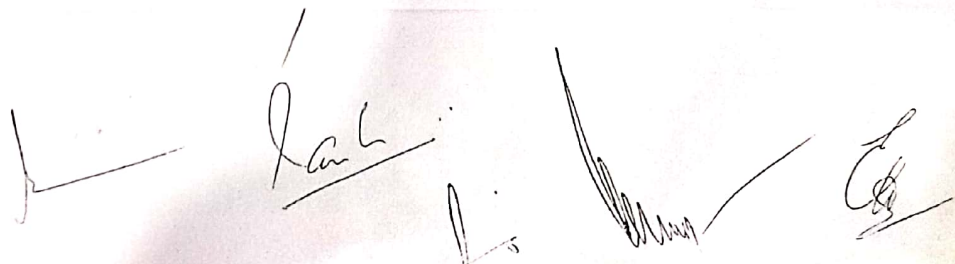
- 2.1 Structural and functional Proteins; Genome organization; Co- and post translational modifications of proteins.
- 2.2 DNA, RNA, Cell Injury, Metabolism, Proteins, Lipids, Hormones.
- 2.3 Cell cycle; Biochemistry of stress and shock.
- 2.4 Biochemistry of digestive disorders; Diagnostic importance of blood sugar, ketone bodies, blood urea nitrogen and uric acid.

Unit III

- 3.1 Chemical coordination enzyme and hormones.
- 3.2 Parasitology; Life cycle of parasites, *Entamoeba histolytica*, *Plasmodium falciparum*, and *Leishmania*.
- 3.3 Parasitic diseases; livestock, Diagnosis and control.
- 3.4 Chemotherapy in relation to parasite control; Acaricides and Herbicides use and risks involved.

Unit IV

- 4.1 Invasion of host; attributes of a pathogen; bacterial, viral, fungal and parasitic.
- 4.2 Diagnosis, administration of Vaccine or Chemotherapy; Effect of climate on animal production, adaptability and acclimatization of animals to stress conditions.
- 4.3 Influence of climatic factors in relation to animal survivability.
- 4.4 Environmental pollution; biotechnological application in environmental studies.



Syllabus for M. Phil (Zoology) Examination -2018

Credits: 04
Maximum Marks: 100
Duration: 3 hrs

Paper IV: Immunology, Microbiology and Biochemistry

Name: *Saba Khurami*

Unit 1: Introduction to Immunology

- 1.1 Immunology; definition, history and important milestones.
- 1.2 Types of immunity; Features of immune system; detailed study of cell and organ immune system.
- 1.3 Immunoglobulins; organization, genes, classes and structure.
- 1.4 Antibody and antigens- role, diversity, affinity and interaction

Unit 2: Immunodiagnostics and Immuno-biotechnology

- 2.1 Techniques; ELISA, RIA, FACS.
- 2.2 Generation of monoclonal antibodies; Hybridoma technology; application of monoclonal antibodies.
- 2.3 1st generation and 2nd generation vaccines, DNA vaccines; use, potential and applications.
- 2.4 Stem cells; source, uses, applications; few case studies

Unit 3: Introduction to Microbiology

- 3.1 The history and scope of microbiology: Discovery of microorganisms; Golden age of microbiology.
- 3.2 Prokaryotic cell structure and function: An overview of prokaryotic cell structure, prokaryotic cell membrane, cytoplasmic matrix and nucleoid, plasmid, bacterial and archeal cell wall.
- 3.3 Microbial nutrition: The common nutrient requirements, Requirement for carbon, oxygen, hydrogen and electrons; nutrition types of micro-organisms; Requirements for nitrogen, phosphorus and sulphur; growth factors, uptake of nutrients by the cell; culture media ; isolation of pure culture.
- 3.4 Microbial growth: growth curve; measurement of microbial growth; the continuous culture of micro-organisms.

Unit 4: Introduction to Biochemistry

- 4.1 The history and scope of biochemistry, Foundations of biochemistry.
- 4.2 Structure and classifications of carbohydrates; mono, di and Polysaccharides. Homopolysaccharides. occurrence, structure and biological functions of Cellulose, starch and glycogen.

Saba Khurami

Syllabus for M.Phil. Examination-2018
Paper II (Zoology)
Title of Paper: Toxicology and Pharmacology

Name of Student: Monika

Maximum marks: 100

Credits: 04

Duration: 3hrs

Unit I

- 1.1. History and scope of Toxicology
- 1.2. Dose-response relationship
- 1.3. Absorption, distribution, and elimination of toxicants
- 1.4. Acute, sub acute and chronic toxicity

Unit II

- 2.1. Animal handling, route of administration of drugs,
- 2.2. Local toxicity: Skin morphology and pathology.
- 2.3. Haematotoxicity: Blood cell types and pathology
- 2.4. Neurotoxicity: Structure and pathology.

Unit III

- 3.1. Hepatotoxicity: Liver structure, functions and pathology.
- 3.2. Nephrotoxicity: Kidney morphology and pathology.
- 3.3. Cardiotoxicity: Cardiovascular structure and pathology.
- 3.4. Occupational health hazards in industries

Unit IV

- 4.1. Aquatic toxicology-toxicants, factors and effects
- 4.2. Concentration- response relationship in aquatic medium
- 4.3. Bioaccumulation in aquatic organisms
- 4.4. Biotransformation and biomagnifications in aquatic organisms

Unit V

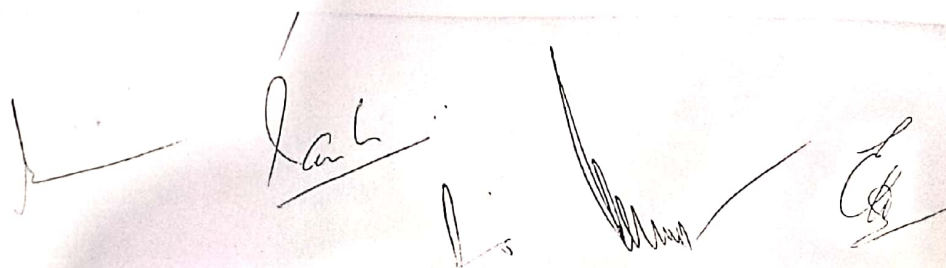
- 5.1. Chromatography: Need for learning separation techniques, separation techniques in natural product research and drug discovery, extraction techniques.
- 5.2. High performance liquid chromatography
- 5.3. Planar Chromatography - TLC/HPTLC/OPLC
- 5.4. Hyphenated techniques: Introduction to GC-MS and LC-MS techniques and their applications in natural products.

Recommended Books:

1. Casarett & Doull's Essentials of Toxicology by Curtis D. Klaassen, John B. Watkins
2. Principles of Toxicology by Karen Stine, Thomas M. Brown
3. Text Book of Pathology by Harsh Mohan
4. Robins Basic Pathology, by Saunders, Elsevier
5. Principles and Methods of Toxicology by A. Wallace Hayes
6. Clinical Pharmacology by Lawrence
7. Methods in Biotechnology, Natural Product Isolation by Sarker, Latif, Gray
8. Methods in Biotechnology, Natural Product Isolation by Richard Canell

Note for Paper Setting:

The question paper shall comprise of 10 long answer type questions , two questions from each unit and each question will carry 20 marks and the candidates will be required to answer five questions selecting one from each unit.



Syllabus for M. Phil (Zoology) Examination -2018

Credits: 04
Maximum Marks: 100
Duration: 3 hrs

Paper III: Animal Biotechnology

Name: Monika

Unit I

- 1.1 Nuclear structure, organization, and function, transposons, retrotransposons, and retroviruses.
- 1.2 Nucleic acids, proteins, and chromatin structure.
- 1.3 Central dogma, Gene structure, transcription.
- 1.4 Translation and regulation of gene expression.

Unit II

- 2.1 Tools in Genetic engineering; cloning vectors, high capacity vectors, retroviral vectors, expression vectors and other advanced vectors in use.
- 2.2 Gene cloning strategies: methods of transforming *E. coli* and Somatic cell nuclear transfer.
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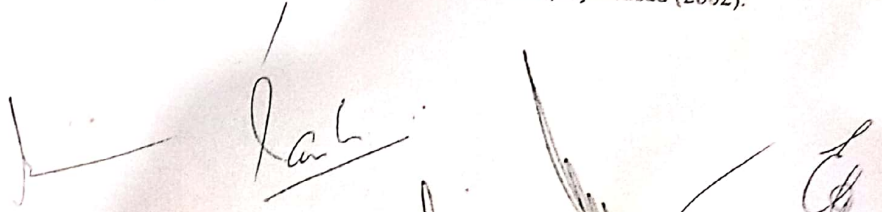
Unit III

- 3.1 Primary culture, cell lines and cloning, Disaggregation (enzymatic and mechanical) of tissue and primary culture.
- 3.2 Cultured cells and revolution of cell lines, Maintenance of cultures; cell lines.
- 3.3 Somatic cell fusion, Tissue and organ culture, Tissue culture, Organ culture.
- 3.4 Whole embryo culture, Tissue engineering (artificial skin and artificial cartilage).

Unit IV

- 4.1 Genetic engineering in aquaculture; Transgene delivery.
- 4.2 Transgene integration; Detecting integration and Expression of transgene.
- 4.3 Cell culture - Organ culture - whole embryo culture; Embryo transfer.
- 4.4 In vitro fertilization (IVF) technology; Dolly, embryo transfer in human.

2. Laboratory methods for work with plant and soil nematodes, J.F. Southey, London.
3. Nematode structure, M. Shamim Jairajpuri, Impressions quality printers, Hyderabad (2002).



Syllabus for M. Phil (Zoology) Examination -2018

Credits: 04
Maximum Marks: 100
Duration: 3 hrs

Paper IV: Immunology, Microbiology and Biochemistry

Name: *Monika*

Unit 1: Introduction to Immunology

- 1.1 Immunology; definition, history and important milestones.
- 1.2 Types of immunity; Features of immune system; detailed study of cell and organ immune system.
- 1.3 Immunoglobulins: organization, synthesis, diversity of antibody and immunoglobulin

Unit 2: Innate Immunity and Innate Immunity

- 2.1 Features of innate immunity
- 2.2 Recognition of pathogens and barriers: Physical barriers and chemical barriers
- 2.3 Recognition and killing of pathogens: PAMPs, DAMPs, TLRs and other receptors
- 2.4 Role of NK cells, macrophages, dendritic cells

Unit 3: Introduction to Microbiology

- 3.1 The history and scope of microbiology: Discovery of microorganisms, changes in microbiology
- 3.2 Principles of classification and identification: Evolution of classification systems, phenotypic and genotypic classification, molecular classification
- 3.3 Microbial growth: The growth curve, requirements for growth, oxygen, nutrient and growth factors, types of microorganisms
- 3.4 Microbial growth: growth curves, measurement of microbial growth, the resistance of microorganisms

Unit 4: Introduction to Biochemistry

- 4.1 The study and scope of biochemistry: Foundations of biochemistry
- 4.2 Structure and basic features of carbohydrates, lipids and nucleic acids: Microorganisms as sources of enzymes and biological products of cellulose, starch and protein.