# ANWARUL ULOOM COLLEGE
## (Autonomous)

(An Autonomous Muslim Minority Institution)
New Mallepally, Hyderabad – 500 001, T.S., India.
(Affiliated to Osmania University)

## Faculty of Science

# *Department of Zoology*

## Board of Studies in Zoology

## Academic Year 2021 – 22

# Anwarul Uloom College (Autonomous)

New Mallepally, Hyderabad
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## Faculty of Science

## Department of Zoology

## (2021 – 22)

Minutes of the members of the Board of Studies of B.Sc. Zoology held on _____ in the staff room of Department of Zoology. The following faculty members from the Department of Zoology were present and discussed the Agenda of the meeting.

| S.No. | Faculty Name | Designation | Signature |
|---|---|---|---|
| 1 | Prof. Reddya Naik. B | Professor, Department of Zoology, University College of Science, O. U., Hyderabad. | |
| 2 | Mrs. Maliha Afshan | Chairperson Board of Studies and H O D, Zoology, AUC, Hyderabad, | |
| 3 | Dr. Akhter Ali Siddiqui | Asst Prof., Zoology A U C, Hyderabad, Member | |
| 4 | Mr. Mirza Shafeeq Baig | Asst Prof., Zoology A U C, Hyderabad, Member | |
| 5 | Ms. Rizwana Begum | Asst Prof., Zoology A U C, Hyderabad, Member | |
| 6 | Dr. Arif Ahmed | Subject Expert, Asst. Prof. of Zoology, MANUU, Hyderabad | |
| 7 | Dr. Kaiser Jamil | H O D, Department of Genetics, Mahavir Research Center and Hospital Industrialist, Member | |
| 8 | Dr. P. Vasantha Kumari | Veterinary Asst. Surgeon, Dist. Veterinary Hospital, Member | |
| 9 | Mr. Mohd. Ghousuddin | Alumni, Govt. City College, Hyderabad | |
| 10 | Dr. G. Sunitha Devi | Subject Expert, Asst. Prof. Zoology, University College of Science, Osmania University, Hyd. | |

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## Faculty of Science
## Department of Zoology
### B. Sc. (B.Z.C., N. Z. C.)
### Course Structure in Part – II (2021 – 22)

| S. No. | Year | Sem. | Paper / Title | Teaching Hours / Week | Units | Credits | Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Internal Assessment | External Assessment | Total |
| 1 | 1st Year | I | Animal Diversity (Invertebrates) – Theory | 4 | 4 | 4 | 20 | 80 | 100 |
| 2 | | | Animal Diversity (Invertebrates) – Practicals | 2 | — | 1 | — | — | 50 |
| 3 | | | Environmental Science (AECC-I) | 2 | 2 | 2 | — | — | 50 |
| | | | | | | | | | |
| 4 | 1st Year | II | Animal Diversity – Vertebrates – Theory | 4 | 4 | 4 | 20 | 80 | 100 |
| 5 | | | Animal Diversity – Vertebrates – Practicals | 4 | — | 2 | — | — | 50 |
| 6 | | | Basic computer skills (AECC-II) | 2 | 2 | 2 | — | — | 50 |
| | | | | | | | | | |
| 7 | 2ndYear | III | Animal Physiology | 4 | 4 | 4 | 15 | 35 | 50 |
| 8 | | | Animal Physiology Practicals | 2 | — | 1 | — | — | 25 |
| 9 | | | Vectors – (SECC – I) | 2 | 2 | 2 | — | — | 50 |
| | | | Vermiculture – (SECC – II) | 2 | 2 | 2 | — | — | 50 |
| 10 | 2ndYear | IV | Cell Biology, Genetics & Evolution – Theory | 4 | 4 | 4 | 15 | 35 | 50 |
| 11 | | | Cell Biology, Genetics & Evolution – Practical | 2 | — | 1 | — | — | 25 |
| 12 | | | Apiculture – (SECC – III) | 2 | 2 | 2 | — | — | 50 |
| | | | Biodiversity Conservation & Eco - Tourism – (SECC – IV) | 2 | 2 | 2 | — | — | 50 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **13** | **3rdYear** | **V** | Zoology V A (Biochemistry and Endocrinology)– Theory | 4 | 4 | 4 | 15 | 35 | 50 |
| **14** | | | Zoology V A ((Biochemistry and Endocrinology) – Practicals (OR) | 2 | — | 1 | — | 25 | 25 |
| **15** | | | Zoology V B-Laboratory Animals Maintenance and Applications – Theory | 4 | 4 | 4 | 15 | 35 | 50 |
| **16** | | | Zoology V B– - Laboratory Animals Maintenance and Applications – Practicals | 2 | — | 1 | — | 25 | 25 |
| **17** | | | Apiculture – **(SECC – III)** | 2 | 2 | 2 | — | 50 | 50 |
| **18** | | | Integrated Pest Management – **(G E – I)** | 2 | 2 | 2 | — | 50 | 50 |
| | | | | | | | | | |
| **19** | **3rdYear** | **VI** | Zoology VI A (Fisheries & Limnology) – Theory | 4 | 4 | 4 | 15 | 35 | 50 |
| **20** | | | Zoology VI A (Fisheries & Limnology) – Practicals (OR) | 2 | — | 1 | — | 25 | 25 |
| **21** | | | Zoology VI B (Immunology & Biotechnology) – Theory | 4 | 4 | 4 | 15 | 35 | 50 |
| **22** | | | Zoology VI B (Immunology & Biotechnology) – Practicals | 2 | — | 1 | — | 25 | 25 |
| **23** | | | Biodiversity Conservation & Eco - Tourism – **(SECC – IV)** | 2 | 2 | 2 | — | 50 | 50 |
| **24** | | | **G E – II** Preventive Medicine | 2 | 2 | 2 | — | 50 | 50 |

**AECC – Ability Enhancement Compulsory Course**
**SECC – Skill Enhancement Compulsory Course**
**G E – Generic Elective**

**Head of the Department**

# Agenda

1. Approval of Syllabus of I & II semesters as per Osmania University for the Academic year 2021-22.
2. Approval of pattern of Examination ie., 20 marks Internals and 80 marks Externals for the I year students for the Academic year 2021-22.
3. Approval of Model Question papers ie., Section A – 5 Short questions with each 4 marks (20 marks) and Section – B 10 Essays of Internal Choice (to write only 5 Questions) with each 12 marks (60 marks).
4. Approval of Syllabus of III, IV, V & VI Semesters for the Academic year 2021-22.
5. Approval of Panel of Examiners & Paper setters for I to VI Semesters for the Academic year 2021-22.

# Resolutions

1. It was resolved to approve the syllabus for I & II Semesters for the Academic year 2021-22.

2. It was resolved to approve the Question paper pattern ie., 20/80 Marks for the Academic year 2021-22.

3. It was resolved to approve Model Question Paper for I & II Semesters for the Academic year 2021-22.

4. It was resolved to approve the Syllabus for III, IV, V & VI Semesters for the Academic year 2021-22.

5. It was resolved to approve the panel of Paper Setters & Examination for I sem to VI Semesters for the Academic 2021-22.

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## Faculty of Science

## Department of Zoology

**B. Sc. (B.Z.C., N. Z. C.) I Year**

## (2021 – 22)

## I – Semester

## Zoology Theory Syllabus

# Animal Diversity - Invertebrates

Hours per Week: 15 Hours
Max. / Min. Marks: 100 / 32

Duration of Examination: 3 Hours
No. of Credits: 4

**Unit – I:** (15 Periods)

**1.1 Brief history of Invertebrates**

1.1.1 Kingdom Animalia
1.1.2 Brief history of Invertebrates

**1.2 Protozoa**

1.2.1 General characters
1.2.2 Classification up to classes with examples
1.2.3 Type study – *Elphidium*
1.2.4 Life cycle of *Plasmodium*.
1.2.5 Locomotion, and Reproduction and Diseases.

**1.3 Porifera**

1.3.1 General characters
1.3.2 Classification of Porifera up to classes with examples
1.3.3 Type study – *Sycon*
1.3.4 Canal system in Sponges and Spicules.

**Unit – II:** (15 Periods)

**2.1Cnidaria**

2.1.1 General characters
2.1.2 Classification of Cnidaria up to classes with examples
2.1.3 Type study – *Obelia*
2.1.4 Polymorhphism in hydrozoa
2.1.5 Corals and coral reef formation

**2.2 Platyhelminthes**

2.1.1 General characters
2.1.2 Classification of Platyhelminthes up to classes with examples
2.1.3 Type study –Schistosoma

**2.2 Nemathelminthes**

2.1.1 General characters
2.1.2 Classification of Platyhelminthes up to classes with examples
2.1.3 Type study –*Dracunculus*
2.1.4 Parasitic adaptations in Helminthes

**Unit – III:** (15 Periods)

3.1 **Annelida**

3.1.1 General characters
3.1.2 Classification of Annelida up to classes with examples
3.1.3 Type study – *Hirudinaria granulosa*,
3.1.4 Evolutionary significance of Coelom, Coelomoducts and metamerism

**3.2 Arthropoda**

3.2.1 General characters
3.2.2 Classification of Arthropoda up to classes with examples
3.2.3 Type study – Prawn
3.2.4 Mouth parts of Insects
3.2.5 Insect metamorphosis
3.2.6 *Peripatus* – structure and affinities

**Unit – IV:** (15 Periods)

4.1 **Mollusca**

4.1.1 General characters
4.1.2 Classification of Mollusca up to classes with examples
*4.1.3* Type study – *Pila*
4.1.4 Pearl formation
4.1.5 Torsion and detorsion in gastropods

**4.2 Echinodermata**

4.2.1 General characters
4.2.2 Classification of Echinodermata up top classes with examples
4.2.3 Water vascular system in star fish
4.2.4 Echinoderm larvae and their significance

**4.3 Hemichordata**

4.3.1 General characters
4.3.2 Classification of Hemichordata up top classes with examples
4.3.3 *Balanoglossus* – Structure and affinities

**Suggested Readings**


1. L H Hyman – The Invertebrates, Vol. I, II and V, McGraw Hill Co. Ltd.
2. Kotpal R L, 1988 – 1992 Protozoa, Porifera, Coelenterata, Helminthes, Arthropoda, Mollusca, Echinodermata, Publications, Meerat
3. E L Jordan and P S Verma – Invertebrate Zoology – S Chand & Co., New Delhi
4. R D Barnes – Invertebrate Zoology by W B Saunders Co., 1986
5. Barrington E J W – Invertebrate Zoology – S Chand & Co., New Delhi.
6. P S Dhami and J K Dhami – Invertebrate Zoology – S Chand & Co., New Delhi
7. Parker T J and Haswell – A Text Book of Zoology – W A McMillian Co., London
8. Barnes R D (1982) – Invertebrate Zoology – 5th Edition


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## I – Semester – Invertebrates

## Model Paper

Max. / Min. Marks: 80 / 32 Time: 3 Hours

**C B C S**

**Section – A** **(5 X 4 = 20 M)**

(Short Answer Type questions)

**I. Answer ALL the following questions.**

1. **Unit – I**
2. **Unit – II**
3. **Unit – III**
4. **Unit – IV**
5. **Choose from any one Unit**

**Section – B** **(5 X 12 = 60 M)**

(Essay Answer Type questions)

**II. Answer ALL the following questions.**
**Diagrams are compulsory wherever necessary.**

6. ***a)*** **Unit – I**

**O R**

***b)*** **Unit – I**

7. ***a)*** **Unit – II**

**O R**

***b)*** **Unit – II**

8. ***a)*** **Unit – III**

**O R**

***b)*** **Unit – III**

9. ***a)*** **Unit – IV**

**O R**

***b)*** **Unit – IV**

10. ***a)*** **Choose from any one unit**

**O R**

b**) Choose from any one unit**

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## (2021 – 22)

## I – Semester

## Zoology Practical Syllabus

## Animal Diversity - Invertebrates

Periods: 30 Duration of Examination: 2 Hours
Max. / Min. Marks: 50 / 25 No. of Credits: 2

**1. Study of Museum slides / Specimens / models (Classification of animals up to Order)**

*i.* **Protozoa**: *Amoeba, Paramoecium, Paramoecium binary fission and conjugation, Vorticella, Entamoeba histolytica, Plasmodium vivax.*

**ii. Porifera***: Sycon, Spongilla, Euspongia, Sycon* – T S and L S, Spicules, Gemmule.

***iii.*** **Coelenterata:** *Obelia – Colony and Medusa, Aurelia, Physalia, Velella, Corallium, Gorgonia, Pennatula.*

**iv. Platyhelminthes:** *Planaria, Fasciola hepatica, Fasciola* larval forms - Miracidum, Redia, Cercaria, *Echinococcus granulosus, Taenia solium, Schistosoma haematobium*.

**v. Nemathelminthes:** *Ascaris (Male and Female), Dracunculus, Ancylostoma, Wuchereria.*

***vi.*** **Annelida:** *Nereis, Aphrodite, Chaetopteurs, HIrudinaria*, Trochophore larva.

**vii. Arthropoda:** Cancer, Palaemon, Scorpion, *Scolopendra, Sacculina, Limulus, Peripatus*, Larvae – Nauplius, Mysis, Zoea, Mouth parts of male and female *Anopheles and Culex,* Mouth parts of Housefly and Butterfly.

***viii.*** **Mollusca***: Chiton, Pila, Unio, Pteredo, Sepia, Loligo, Octopus, Nautilus,*

*Glochidium larvae.*

ix. **Echinodermata***: Asterias, Ophiothrix, Echinus, Clypeaster, Cucumaria, Antedon,* Bipinnaria larva.

x. **Hemichordata:** Balanoglossus, Tornaria larva.

**2. Dissections**

**Prawn**: Appendages, Digestive system, Nervous system, Mounting of Statocyst.
**Insect** Mouth parts.

**3. Laboratory Record work shall be submitted at the time of practical examination.**

4. An **"Animal album"** containing photographs, cut outs with appropriate write up about the above mentioned taxa. Different taxa/ topics may be given to different sets of students for this purpose.

5.**Computer aided techniques should be adopted – show virtual dissections.**

**Suggested Manuals**:

1. Practical Zoology – Invertebrates – S. S Lal
2. Practical Zoology – Invertebrates – P. S Verma
3. Practical Zoology – Invertebrates – K. P Kurl

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## I – Semester

## Zoology Practical

## Model Paper

Max. / Min. Marks: 50 / 25 Time: 2 Hours

1. Identification, labeled diagram and salient features of spots: 9 (7 Museum specimens + 2 slides) 18m
2. Dissection (one) (Diagram – 02 + Dissections and Display – 05). 7m
3. Field visit and Note book 4m
4. Project work 3m
5. Certified practical record 3m
6. Animal Album 3m
7. Viva voce 2m

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**Faculty of Science**

## II – Semester

## Environmental Studies (AECC – I)

## Model Paper

Max. / Min. Marks: 50 / 20 Time: 3 Hours

**C B C S**

**Section – A** **(5 X 2 = 10 M)**

(Short Answer Type questions)

**I. Answer ALL the following questions.**

1. **Unit – I**
2. **Unit – II**
3. **Unit – III**
4. **Unit – IV**
5. **Choose from any one Unit**

**Section – B** **(4 X 10 = 40 M)**

(Essay Answer Type questions)

**II. Answer ALL the following questions.**

**Diagrams are compulsory wherever necessary.**

6. ***a)*Unit – I**

**O R**

***b)*Unit – I**

7. ***a)*Unit – II**

**O R**

***b)*Unit – II**

8. ***a)*Unit – III**

**O R**

***b)*Unit – III**

9. ***a)*Unit – IV**

**O R**

***b)*Unit – IV**

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## (2021 – 22)

## I – Semester

### Ability Enhancement Compulsory Course Syllabus – I

## Environmental Science

Hours per Week: 2 Hours
Max. / Min. Marks: 50 / 20

Duration of Examination: 2 Hours
No. of Credits: 2

**Unit – I Ecosystem, Biodiversity and Natural Resources:**

1. Definition, scope and importance of Environmental studies
2. Structure of Eco-system – Abiotic and Biotic components, producers, consumers, decomposers, Food chain, Food webs, Ecological pyramids
3. Functions of Eco-systems: Energy flow in Eco-system (Single channel energy flow model)
4. Definition of Biodiversity, Genetics, Species and Eco-system diversity, Hotspots of Biodiversity, Threats to Biodiversity, Conservation of Biodiversity (In-situ and Ex-situ)
5. Renewable and Non – Renewable resources, brief account of Forests, Mineral and Energy (Solar Energy and Geothermal Energy ) resources.
6. Water conservation: Rain water harvesting and Water shed management

**Unit – II: Environmental Pollution, Global Issues and Legislation**

1. Causes, effects and control measures of Air Pollution, Water Pollution
2. Solid Waste management
3. Global warming and Ozone layer depletion
4. Ill effects of Fire works
5. Disaster management – Floods, earthquakes and Cyclones
6. Environmental legislation
7. Wild life Protection Act, Forest Act, Water Act, Air Act
8. Human Rights
9. Women and Child welfare
10. Role of Information Technology in Environment and Human health

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**Department of Zoology**

**B. Sc. (B.Z.C., N. Z. C.) I Year**

**(2021 – 22)**

**II – Semester**

**Zoology Theory Syllabus**

## Ecology, Zoogeography and Animal Behavior

Hours per Week: 15 Hours
Max/Min Marks: 80 / 32

Duration of Examination: 3 Hours
No. of Credits: 4

**Unit – I:** (15 Periods)

**1.1 Ecology - I**

1.1.1 Ecosystem structure and functions.

1.1.2 Types of Ecosystems -Aquatic and Terrestrial.

1.1.3 Biogeochemical cycles Nitrogen, Carbon, Phosphorus and Water.

1.1.4 Energy flow in ecosystem.

1.1.5 Food chain, food web and ecological pyramids.

1.1.6 Animal Associations - Mutualism, commensalism, parasitism, competition and predation.

**UNIT-II**

**2.1 Ecology-II**

2.1.1 Concept of Species, Population dynamics and Growth curves.

2.1.2 Community Structure and dynamics and Ecological Succession.

2.1.3 Ecological Adaptations.

2.1.4 Environmental Pollution-Sources, Effect and Control measures of Air, Water,

Soil and Noise pollution,

2.1.5 Wildlife conservation - National parks and Sanctuaries of India, Endangered

species.

2.1.6. Biodiversity and hotspots of Biodiversity in India.

## UNIT -III

## 3.1 Zoogeography

3.1.1 Zoogeographical regions - Palaearctic, Nearctic, Neotropical, Oriental, Australian and Ethiopian regions- their Climatic and faunal peculiarities

3.1.2 Wallace line, Discontinuous distribution

3.1.3. Continental Drift

## UNIT-IV

## 4.1 Animal Behaviour

4.1.1 Types of Behaviour - Innate and Acquired, Instinctive and Motivated behaviour

4.1.2 Taxes, Reflexes, Tropisms

4.1.3 Physiology and phylogeny of learning, trial and error learning, Imprinting, habituation, Classical

conditioning, Instrumental conditioning

4.1.5 Social behavior, Communication, Pheromones

4.1.6 Biological rhythms, Biological clocks, Circadian rhythms

### Suggested Readings

**M.P.Arora**, '*Ecology'* Himalaya Publishing company.

**P.D.Sharma***, 'Environmental Biology*'.

**P.R.Trivedi and Gurdeep Raj**. *'Environmental Ecology'*

**Buddhadev Sarma and Tej Kumar**, *Indian Wildlife Threats and Preservation*

**Chapman J.L. and Reiss M.J***, Ecology Principles and ApplicatIons*, Second

Ed., Cambridge University Press, London.

**Benny Joseph**, *Environmental Studies*, TATA MGraw Hill Com., New Delhi.

**Eugene P. Odum,** *Fundamentals of Ecology* Third Ed., Nataral Publishers, Dehradun.

**Veer Bala Rastogi**, "Ecology and Animal Distribution"

**P.K. Gupta**, "Text Book of Ecology and Environment"

**Bhatnagar and Bansal**, "Ecology and Wildlife biology

**Dasmann**, "Wild life Biology"

**Reena Mathur**, "Animal Behaviour"

**Alocock**, "Animal Behaviour- an Evolutionary Approach

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## II – Semester
## Zoology Practical Syllabus
**Ecology, Zoogeography and Animal Behavior**

Periods: 30 | Duration of Examination: 2 Hours
Max. / Min. Marks: 50 / 25 | No. of Credits: 1

1. Determination of pH of Soil and Water

2. Estimation of salinity (chlorides) of water in given samples.

3. Estimation of Carbonates and bicarbonates in the given water samples.

4. Estimation of dissolved oxygen of pond water, sewage water and effluents.

5. Identification of Zooplankton from a nearby water body.

6. Study of Pond Ecosystem / local polluted site-Report submission

7. Study of at least 3 endangered or threatened wild animals of India through photographs /

specimens / models

8. Field visit to Zoo Park to study the management, behavior and enumeration of wild animals.

9. Identification of Zoogeographical realms from the Map and identify specific fauna of respective regions.

10. Observe the response of invertebrates in different lightening conditions

**Computer aided techniques should be adopted as per UGC guide lines.**

**Suggested manuals**

1**. Robert Desharnais, Jeffrey Bell,** 'Ecology Student Lab Manual, Biology Labs'
2. **Darrell S Vodopich**, 'Ecology Lab Manual'

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## Faculty of Science

## II – Semester

## Zoology Practical Model Paper

### Ecology, Zoogeography and Animal Behavior

Max. / Min. Marks: 50 / 25 Time: 2 Hours

1. Major questions 13 M
2. Minor questions 10 M
3. Spotting 15 M
4. Viva voce 6 M
5. Record work 6 M

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## II – Semester

## BASIC COMPUTER SKILLS (AECC – II)

### Model Paper

Max. / Min. Marks: 50 / 20 Time: 2 Hours

**C B C S**

**Section – A** **(5 X 2 = 10 M)**

(Short Answer Type questions)

**I. Answer ALL the following questions.**

1. **Unit – I**
2. **Unit – II**
3. **Unit – III**
4. **Unit – IV**
5. **Choose from any one Unit**

**Section – B** **(4 X 10 = 40 M)**

(Essay Answer Type questions)

**II. Answer ALL the following questions.**
**Diagrams are compulsory wherever necessary.**

6. ***a)*** **Unit – I**

**O R**

***b)*** **Unit – I**

7. ***a)*** **Unit – II**

**O R**

***b)*** **Unit – II**

8. ***a)*** **Unit – III**

**O R**

***b)*** **Unit – III**

9. ***a)*** **Unit – IV**

**O R**

***b)*** **Unit – IV**

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## (2021 – 22)

## II – Semester

### Ability Enhancement Compulsory Course Syllabus – II

# BASIC COMPUTER SKILLS

**Hours per Week 2** **Exam Duration 2 Hour**
**Max /Min Marks: 50/20**

**Objective: To impart a basic level understanding of working of Computer and its Usage.**

Unit-I: Understanding of Computer and Word Processing.

Knowing Computer: What is Computer? Basic applications of Computer. Components of Computer System - Central Processing Unit (CPU), VDU, Keyboard and Mouse. Other Input/Output devices. Computer Memory, Concept of Hardware and Software. Concept of Computing, Data and Information, Applications of 1EC T,Connecting Keyboard, Mouse, Monitor and Printer to C PU and Checking power supply.

Operating Computer using G UI based Operating System: What is an Operating System? Basic of Popular Operating Systems, the User Interface, Using Mouse. Using right Button of the Mouse and Moving icons on the Screen. Use of Common Icons Status Bar, Line Menu and Menu selection, Running an application, Viewing of File, Folders and Directories, Creating and Renaming of Files and Folders Operating and closing of different Windows. Using help, Creating Short cuts, Basics of Operating System set- up, Common utilities

Understanding World Processing: Word Processing Basics; Opening and closing of Documents. Text creation and Manipulation, Formatting of text, Table handling, Spell check, language setting and thesaurus, Printing of Word document

Unit – II: Spreadsheet, Presentation Software and Introduction to Internet, www

and Web Browsers.

Using Spread Sheet: Basics of Spread Sheet. Manipulation of cells. Formulas and Functions. Editing of Spread Sheet, Printing of Spreadsheet.

Basic of Presentation Software: Creating Presentation. Preparation and Presentation of

Slides. Slide Show. Taking printouts of Presentation /handouts.

Introduction to Internet, www and Web Browsers:

Introduction to Internet: Basics of Computer Networks. LAN, WAN, Concept of Internet.

Applications of Internet. Connecting to Internet. What is I S P? Knowing the
Internet. Basics of Internet connectivity related troubleshooting.

World Wide Web: Search Engines. Understanding URL. Domain name, I P Address using

e- Governance Website..

Web Browsing: Software Communication and collaboration. Basics of electronic mail. Getting an e-mail account. Sending and receiving emails. Accessing sent e-mails. Using e-mails. Document collaboration. Instant Messaging. Netiquettes.

Suggesting Reading


1. Introduction to Computers-Peter Norton, McGraw Hill, 2012
2. Using Information Technology - Brian K Williams, Stacey C. Sawyer, Tata McGraw Hill


Web Resources:

http://online.standford.edu/courses/soe-yeses101-sp-computer-science-101 https://www.extension harvard.edu/open-learning-initiative/intesive-introduction

computer science

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## Faculty of Science

## II – Semester

## Basic Computer Skills (AECC – II)

## Model Paper

Max. / Min. Marks: 50 / 20 Time: 2 Hours

**C B C S**

**Section – A** **(5 X 2 = 10 M)**

(Short Answer Type questions)

**I. Answer ALL the following questions.**

1. **Unit – I**
2. **Unit – II**
3. **Unit – III**
4. **Unit – IV**
5. **Choose from any one Unit**

**Section – B** **(4 X 10 = 40 M)**

(Essay Answer Type questions)

**II. Answer ALL the following questions.**
**Diagrams are compulsory wherever necessary.**

6. ***a)*Unit – I**

**O R**

***b)*Unit – I**

7. ***a)*Unit – II**

**O R**

***b)*Unit – II**

8. ***a)*Unit – III**

**O R**

***b)*Unit – III**

9. ***a)*Unit – IV**

**O R**

***b)*Unit – IV**

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# Anwarul Uloom College (Autonomous)

New Mallepally, Hyderabad
Affiliated to Osmania University
(Re-Accredited with NAAC with A – Grade)

## Faculty of Science

## Department of Zoology

**B. Sc. (B.Z.C., N. Z. C.) II Year (2021 – 22)**

## III – Semester

## Zoology Theory Syllabus

## ANIMAL PHYSIOLOGY

Hours per Week: 15 Hours
Max. / Min. Marks: 35 / 14

Duration of Examination: 2 Hours
No. of Credits: 4

**Unit – I:** (15 Periods)

1.1**Physiology of Digestion**

i. Definition of digestion and types of digestion – Extra and Intra cellular digestion
ii. Digestion of Carbohydrates, Proteins, Lipids and Cellulose
iii. Absorption and Assimilation of digested Food material
iv. Role of gastro intestinal hormones in digestion

**1.2Physiology of Excretion**

v. Classification of animals on the basis of excretory products: Ammonotelic, Ureotelic and Uricotelic.
vi. Structure and function of nephron
vii. Urine formation counter current mechanism

**Unit – II:** (15 Periods)

**1.1 Physiology of Respiration**

i. Definition of respiration, types of respiration – external and internal respiration
ii. Structure of mammalian lungs and gaseous exchange,respiratory pigments
iii. Transport of oxygen – oxygen dissociation curves, Bohr's effect, transport of $CO_2$ – chloride shift,

2.2**Physiology of Circulation**

i. Types of circulation: open and closed circulation
ii. Structure of mammalian heart and its working mechanism
iii. Types of hearts: neurogenic and myogenic Hearts
iv. Heart functions, conduction and regulation of heartbeat, regulation of heart rate, tachycardia and bradycardia

**Unit – III:** (15 Periods)

3.1 **Physiology of Muscle contraction**

iv. Types of Muscles
v. Ultra structure of skeletal muscle fibre
vi. Sliding filament theory of muscle contraction

3.2 **Physiology of Nerve Impulse**

vii. Structure of Nerve cell
viii. Nature of Nerve impulse – resting potential, threshold potential, action potential, conduction of nerve impulse
ix. Transmission of nerve impulse
x. Synapse, mechanism of synaptic transmission, neurotransmitters EPSP, IPSP

**Unit – IV:** (15 Periods)

**4.1 Physiology of Endocrine System**

**4.2** Endocrine glands**:** Thyroid, Parathyroid, Adrenal glands and Pancreas

**4.3** Hormone action and concept of secondary messengers

**4.4** Male and female hormones,**Homeostasis**

4.4 **Physiology of Homeostasis**

4.4.1 Concept of Hemeostasis and its basic working mechanism
4.4.2 Mechanism of Homeostasis giving three illustration viz. Hormonal control of Glucose level,
4.4.3 Water and Marine animals, Temperature regulation in man

**Suggested Readings:**


1. Gerard J. Tortora and Sandra Reynolds Garbowski *Principals of Anatomy and Physiology*, Tenth Ed., John Wiley & Sons
2. Arthur C. Guyton MD, *A textbook of Medical Physiology* , Eleventh Ed., John E. Hall.,m Harcourt Asia Ltd.
3. William F. Ganong, *A Review of Medical Physiology,* 22 ed., McGraw Hill., 2005
4. Singh H .R., Text book of Animal Physiology and Biochemistry
5. Nagabhushanam, Comparative Animal physiology
   Veer Bal Rastogi, Text book of Animal Physiology

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## Faculty of Science

## Department of Zoology

**B. Sc. (B.Z.C., N. Z. C.) II Year (2021 – 22)**

## III – Semester

## Zoology Practical Syllabus

## Animal Physiology

Periods: 30 Duration of Examination: 2 Hours
Max. / Min. Marks: 25 / 14 No. of Credits: 1

1. Qualitative test of identification of carbohydrates, proteins and lipids.
2. Qualitative test of identification of ammonia, urea, uric acid (nitrogenous excretory products).
3. Effect of pH and temperature on salivary amylase activity.

Laboratory Record work shall be submitted at the time of practical examination

Computer aided techniques shall be adopted as per UGC guidelines.

# Anwarul Uloom College (Autonomous)

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**Faculty of Science**

## III – Semester

## Animal Physiology
## Practical Model Paper

Max. / Min. Marks: 25 / 14 Time: 2 Hours

1. Major question 10m
2. Minor question 5m
3. Certified Record work 5m
4. Viva voce 5m

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## Faculty of Science

## Department of Zoology

**B. Sc. (B.Z.C., N. Z. C.) II Year (2021 – 22)**

## III – Semester

## Zoology Theory (SECC – I) Syllabus

## Tropical Diseases and Role of Vectors

Hours per Week: 2 Hours | Duration of Examination: 2 Hours
Max. / Min. Marks: 50 / 20 | No. of Credits: 1

**Unit – I:**

Introduction to Tropical diseases. Brief account of causatic agent, pathogenety, mode of infection, prophylaxis of Amoebiasis, Malaria, Leishmaniasis, Trypanosomiasis, Filariasis, Bilharziasis, Infections of Fasciolopsis, Dracunculus.

**Bacterial disease:** Brief account of causative agent, Pathogenity, mode of infection, Prophylaxis of Cholera, Typhoid, Tetanus, Leprosy, Tuberculosis, Typhus and Trench Fever.

**Unit – II:**

**Viral disease:** Brief account of causative agent, Pathogenity, mode of HIV, Hepatitis, Yellow fever, Dengue, Chikangunya, Encephalitis, Rabies.

**Role of Vectors:** Morphology of important biological arthropod vectors viz. Anopheles, Culex, Aedes mosquitoes. Tse fly, Bed bug, Kissing bug, Michanical vectors viz. House fly, Cockroach, Role of Cyclops, Snails, Vector control – basic biological and integrated vector control

**References:**


1. Medical Entomology for students – Mike Service, Cambridge
2. Parasitology and Vector Biology – William C Marqueardt / Robert B Grieve
3. Integration Vector Management – Graham Mathews
4. A Text Book of Invertebrates – Dhami and Dhami
5. A Text Book of Microbiology – Ananta Narayana
6. A Text Book of Medical Parasitology – P Chakraborty
7. Parasitology – P Chakraborty

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## Faculty of Science

**B. Sc. (B.Z.C., N. Z. C.) II Year (2021 – 22)**

## III – Semester

## Zoology Theory (SECC – II) course Syllabus

## VERMICULTURE

Hours per Week: 2 Hours
Max. / Min. Marks: 50 / 20

Duration of Examination: 2 Hours
No. of Credits: 2

UNIT 1

1.1 Scope of vermi technology. Vermiculture and vermicomposting - difference between vermiculture and vermicomposting.

1.2 Earthworm diversity-Ecological groups of earthworms,biology of composting earthworms - Eoisena foeitida, Eudrilus lugeniae.

1.3 Soil - Physical, chemical and biological features

1.4 Organic waste sources - problems in traditional composting, vermicompositing

1.5 Types small and large scale pit method, heap method.

Unit 2

2.1. Vermiculture techniques - vermiculture process -site selection - Selection and collection of species mono and poly culture

2.2 Essential parameters for vermiculture – bedding. Methods of harvesting worms general manual methods, self harvesting method, mechanical method

2.3 Nutritive value of vermicompost, storing and packing of compost

2.4 Applications of vermicomposting in agricultural and horticultural practices

2.5 Economic of vermiculture, nationalized bank, NABARD support for vermi culture.

**References:**

1 Earthworm ecology by LEE

2. Biology of earthworm by Steven son

3 Vermi composting tech - soil health to human health by Ranganathan LS.

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## Faculty of Science

## Department of Zoology

**B. Sc. (B.Z.C., N. Z. C.) 2nd Year**

## (2021 – 22)

## IV – Semester

## Zoology Theory Syllabus

## Cell Biology, Genetics and Evolution

Hours per Week: 15 Hours | Duration of Examination: 2 Hours
Max. / Min. Marks: 35 / 14 | No. of Credits: 4

**Unit – I:** (15 Periods)

1. **Cell Biology**
2. Infrastructure of Animal cell
3. Structure and functions of Plasma Proteins
4. Structure and functions of cell organelles – Endoplasmic reticulum, Golgi body, Ribosomes, Lysosomes, Centrosomes, Mitochondria and Nucleus
5. Chromosomes – Structure, types, giant Chromosomes
6. Cell division – Mitosis, Meiosis,
7. Cell cycle and its regulation

**Unit – II:** (15 Periods)

1. **Molecular Biology**
2. D N A (Deoxy ribo Nucleic Acid) – Structure
3. R N A (Ribo Nucleic Acid) – Structure, type
4. D N A replication – conservative, semi-conservative and dispersive model
5. Protein Synthesis – Transcription and Translation
6. Gene expression – Genetic code, Operon concept
7. Molecular Biology Techniques – Polymerase chain reaction, Electrophoresis

**Unit – III:** (15 Periods)

1. **Genetics**

2. Mendel's laws of inheritance and Non – Mendelian inheritance – Epistasis
3. Linkage and Crossing over
4. Sex determination and sex – linked inheritance
5. Chromosomal Mutations – Deletion, Duplication, Inversion, Translocation, Aneuploidy and Polyploidy
6. Gene Mutations – Induced versus Spontaneous Mutations
7. Inborn errors of Metabolism
8. Operon concept

**Unit – IV:** (15 Periods)

1. **Evolution**
2. Theories of Evolution
3. Evidences of Evolution and hardy Weinberg law
4. Forces of Evolution – Mutation, Gene flow, Genetic drift and Natural selection
5. Isolation – Pre-mating and Post mating isolating mechanisms
6. Speciation: Methods of Speciation – Allopatric and Sympatric

**Suggested Readings:**


1. Lodish, Berk, Zipursky, Matsudaria, Baltimore, Darnel – Molecular Cell Biology, N H Freeman and Company, New York
2. Gardner, E J Simmons M J, Snustad D P (2008) – Principles of Genetics, 8th Edi, Wiley & Son, India
3. Stustad D P, Simmons M J (2009) – Principles of Genetics, 5th Edi. John Wiley & Sons, Inc.
4. Klug W S, Cummings M R, Spencers C A (2012) – Concept of Genetics, 10th Edi, Benjamin Cummins
5. Russel P J (2009) – Genetics – A Molecular Approach, 3rd Edi. Benjamin Cummins
6. Griffiths A J F, Wessler S R, Lewontin R C & Carroll S B – Introduction to Genetic Analysis, 10th Edition, W H Freeman & Co.
7. Ridley M (2004) – Evolution, 3rd Edi, Blackwell Publishing
8. Barton N H, Briggs D E G, Eisen J A, Goldstein D B & Patel N H (2007) – Evolution, Cold Spring, Harbour Laboratory Press
9. Hall B K & Hallgrimsson B (2008) – Evolution, 4th Edi. Jones & Bartlett Publishers
10. Campbell N A & Reece J B (2011) – Biology, 10th Edi. Pearson, Benjamin Cummins
11. Douglas J, Futuyma (1997) – Evolutionary Biology, Sinauer Associates
12. Minkioff E(1983) – Evolutionary Biology, Addison, Wiley
13. James D, Watson, Nancy H, Hopkins – Molecular Biology of the Gene
14. Jan M Savage – Evolution, 2nd Edi., Oxford & IBH Publishing Co., New Delhi
15. Gupta P K – Genetics

# Anwarul Uloom College (Autonomous)

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## Faculty of Science

## IV – Semester

## Cell Biology, Genetics and Evolution

## Model Paper

Max. / Min. Marks: 35 / 14 Time: 2 Hours

**C B C S**

**Section – A** **(5 X 3 = 15 M)**

(Short Answer Type questions)

**I. Answer ALL the following questions.**

1. **Unit – I**
2. **Unit – II**
3. **Unit – III**
4. **Unit – IV**
5. **Choose from any one Unit**

**Section – B** **(5 X 4 = 20 M)**

(Essay Answer Type questions)

**II. Answer ALL the following questions.**

**Diagrams are compulsory wherever necessary.**

6. ***a)*** **Unit – I**

**O R**

***b)*** **Unit – I**

7. ***a)*** **Unit – II**

**O R**

***b)*** **Unit – II**

8. ***a)*** **Unit – III**

**O R**

***b)*** **Unit – III**

9. ***a)*** **Unit – IV**

**O R**

***b)*** **Unit – IV**

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# Anwarul Uloom College (Autonomous)

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## Faculty of Science

## Department of Zoology

**B. Sc. (B.Z.C., N. Z. C.) 2nd Year (2021 – 22)**

## IV – Semester

## Cell Biology, Genetics and Evolution

## Zoology Practical Syllabus

Periods: 30 | Duration of Examination: 2 Hours
Max. / Min. Marks: 25 / 14 | No. of Credits: 2

**Unit – I:**

1. Cytology.
2. Preparation and identification of slides of Mitotic divisions with Onion root tips
3. Preparation and identification of different stages of Meiosis in Grasshopper Testes
4. Identification of study of the following slides
5. Different stages of Mitosis and Meiosis
6. Lamp brush and Polytene Chromosomes

**Unit – II:**

1. Museum study of Fossil animals, Paripatus, Coelacanth Fish, Dipnoi Fishes, Sphenodon, Archeopteryx
2. Study of homology and analogy from suitable specimens and pictures
3. Problems on Hardy – Weinberg law
4. Macro Evolution using Darwin finches (pictures)

Laboratory Record work shall be submitted at the time of practical examination

An album containing photographs, cut outs with appropriate write up about Genetics and Evolution

Computer aided techniques should be adopted as per U G C guidelines

Suggested Manuals:
Manual of Laboratory experiments in Cell Biology – Edward G

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## Faculty of Science

## IV – Semester

## Zoology Practical Model Paper
## Cell Biology, Genetics and Evolution

Max. / Min. Marks: 25 / 14 Time: 2 Hours

1. Major question 10 m
2. Minor question 5 m
3. Certified Record work 5 m
4. Viva voce 5 m

# Anwarul Uloom College (Autonomous)

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## Faculty of Science

## Department of Zoology (2021 – 22)

**B. Sc. (B.Z.C., N. Z. C.) II Year**

## IV – Semester

# Zoology Theory (SECC - III) Syllabus
# APICULTURE

Hours per week: 2 Hours — duration of examination: 2 hrs
Max / Min marks: 50/ 20 — No of credits: 2

**UNIT 1**

1.1 History, classification and present status of apiculture industry in India
1.2 Biology of honey bees and bee economy
1.3 Social organization of bee colony
1.4 Selection of bee species for apiculture
1.5 Bee rearing method: artificial Bee rearing (Apiary), Ben hives

**Unit 2**

2.1 Products of apiculture industry and its use-honey Bees wax propalic
2.2 Methods of extraction of honey-indigenous and modern
2.3 Bee keeping equipment
2.4 Colony inspection and maintenance of the equipment

2.5 Bee diseases and enemies, control and preventive method

**Suggested Reading:**


1. Textbook of Applied Zoology, Telugu Academy.
2. Apiculture by Prost PJ. Oxford aro IBH, New Delhi
3. . Apiculture by Bisht, ICAR publication

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## Faculty of Science

## Department of Zoology

**B. Sc. (B.Z.C., N. Z. C.) III Year (2021 – 22)**

## IV – Semester

## Zoology Theory (SECC – IV) course Syllabus

## Biodiversity Conservation and Eco-Tourism

Duration of Examination: 2 Hours
Max. / Min. Marks: 50 / 20 No. of Credits: 2

**Unit – I:**

Biodiversity – Definition, level of Biodiversity. Pattern of Biodiversity, importance of Biodiversity, Biodiversity in India

Biodiversity conservation

In situ – National parks in India, sanctuaries in India, Biosphere reserves, sacred lakes and forests

Ex situ – Invitro conservation, Botanical gardens, Zoos and Safari, Biodiversity Hotspots, special projects, Tigers, Lions, Crocodiles, Elephants

**Unit – II:**

IUCN categories, Red Data Book, Endangered species in India. Conventional societies on Biodiversity / wild life

Eco – Tourism – Definition, Principles of Sustainable Eco – Tourism, Benefits and impact of Eco – Tourism sites in India.

**Reference Books:**


1. Text Book of Biodiversity – K V Krishnamurthy, Science Publishers, Inc.
2. What is Biodiversisty? – Nora Bynum
3. The Biology of Biodiversity – Kato M
4. Wild life Animals of India – M M Ranga B N H S, Publications
5. Endangered Animals of India and their Conservation – Nair S N
6. Eco – Tourism, Jagbir Singh

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**Faculty of Science**

## Department of Zoology

**B. Sc. (B.Z.C., N. Z. C.) III Year**

## (2021 – 22)

## VA – Semester

## Zoology Theory Syllabus

# BIOCHEMISTRY AND ENDOCRINOLOGY

Hours per Week: 15 Hours | Duration of Examination: 2 Hours
Max. / Min. Marks: 35 / 14 | No. of Credits: 4

**Unit – I: Biomolecules of Importance** (15 Periods)

1.1 Types of biomolecules – Carbohydrates, Proteins, Lipids, Nucleic acids and their significance in biological systems.
1.2 Classification of Protein; Function of proteins based on their chemical nature
1.3 Protein metabolism: Transamination, deamination, urea cycle
1.4 Classification and function of carbohydrates

**Unit II: Lipids and enzyme Classification:**

2.1 Lipids: nomenclature and classification of lipids
2.2 Fatty acid synthesis
2.3 Cholesterol synthesis
2.4 Enzyme definition, nomenclature, classification and Enzyme kinetics

**Unit III: Introduction to Endocrinology**

3.1 Concept and scope of Endocrinology; hormones as chemical messengers
3.2 Classification of hormones
3.3 Mechanism of action of amino acid derivatives, peptide hormones and steroid hormones
3.4 Positive feedback mechanism and Negative feedback control

**Unit IV: Endocrine glands and their Hormones**

1.1 Hypothalamus and its hormones
1.2 Structure, hormones and functions of Pituitary gland
1.3 Structure, hormones and functions of Thyroid, Parathyroid, Thymus
1.4 Structure, hormones and functions of Adrenal, Pancreas, Pineal
1.5 Hormones and reproduction

**REFERENCE BOOKS:**


1. Text book of biochemistry
2. Text book of biochemistry and physiology
3. Molecular cell biology
4. Comparative Endocrinology of Invertebrates by Highman and Hill.
5. Comparative Vertebrate Endocrinology by P.J.Bentley, Cambridge Unive. Press
6. Text book of Endocrinology by Turner and Bangara (W.B.Sanders)
7. Essential Endocrinology by Joen Laycock and Peter Loise Oxford Univ. Press
8. Text book of Endocrinology by R.H.Williams (W.B.Saunders)

# Anwarul Uloom College (Autonomous)

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## Faculty of Science

## V – Semester

## Zoology Theory Paper – V A

## Model Paper

Max. / Min. Marks: 35 / 14 Time: 2 Hours

**C B C S**

**Section – A (5 X 3 = 15 M)**

(Short Answer Type questions)

**I. Answer ALL the following questions.**

1. **Unit – I**
2. **Unit – II**
3. **Unit – III**
4. **Unit – IV**
5. **Choose from any one Unit**

**Section – B (5 X 4 = 20 M)**

(Essay Answer Type questions)

**II. Answer ALL the following questions.**

**Diagrams are compulsory wherever necessary.**

6. ***a)*Unit – I**

**O R**

***b)*Unit – I**

7. ***a)*Unit – II**

**O R**

***b)*Unit – II**

8. ***a)*Unit – III**

**O R**

***b)*Unit – III**

9. ***a)*Unit – IV**

**O R**

***b)*Unit – IV**

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# Anwarul Uloom College (Autonomous)

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**Faculty of Science**

**Department of Zoology**

**B. Sc. (B.Z.C., N. Z. C.) III Year**

**(2021 – 22)**

## Semester – V B

# LABORATORY ANIMALS MAINTENANCE AND APPLICATIONS

Hours per Week: 15 Hours | Duration of Examination: 2 Hours
Max. / Min. Marks: 35 / 14 | No. of Credits: 4

**Unit – I Introduction to laboratory Animals and Animal care:(15 Periods)**

1. Laboratory animals – Introduction; Species of Laboratory Animals; Laboratory animals for research.
2. Animal Experimentations – Implications, Principles, Laboratory animals and Models of Human Diseases, Results of Animal Experimentations.
3. Animal Care – Animal Ethics, Ethical theories – Virtue Ethics, Humean theory, Utilitarian theory, Capabilities theory, Persons theory.
4. Animal Care – Regulations and Policies; Prevention of Cruelty to Animal Act, 1960. Breeding of and Experiments on Animals (Control and Supervision) Rules, 2006.

**Unit – II:Maintenance, Quality Control and Welfare of Laboratory Animals (15 Periods)**

1. Environment and Facilities of Laboratory Animals for terrestrial Animals and Aquatic Animals.
2. Nutrition and Animal Experimentation – Nutrients, energy, nutritional needs, animal feeds.
3. Microbiological standardization of Laboratory Animals – Reasons, causes, zoonosis; Contamination sources and routes of transmission.
4. Concept of Animal welfare – Origin, Connotation; Concept of Stress, Pain, and Distress in Laboratory Animals; Humane End Points of Animal Experiments

**Unit – III: Management and Husbandry of Laboratory Animals** (15 Periods)

1. Management of Laboratory Animals – Introduction, Laboratory Animal Welfare and controversy of animal experimentation.
2. Alternative Methods of Animal Experimentation – 3 Rs Theory, Protocol of Animal Experimentation.
3. Laboratory Management and Husbandry – Mice: general biological characteristics including anatomy and physiology; sexual differentiation, health features, cages and housing; husbandry and recording.
4. Laboratory Management and Husbandry – Rats: general biological characteristics including anatomy and physiology; sexual differentiation, health features, cages and housing; husbandry and recording.

**Unit – IV:**Applications of Laboratory Animals (15 Periods)

1. Animal Models – Need, Classification and Selection of Animal Models.
2. Animal Models – Types: Induced AM, Spontaneous AM, and Genetically Modified AM.
3. Applications in biomedical research – systemic diseases, transplantation studies, studies on embryogenesis and developmental biology.
4. Applications in behavioral research- neurological responses, behavioral changes, brain function, acclimatization studies.

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## Faculty of Science

# V – Semester

## Zoology Theory Model Paper – V B

Max. / Min. Marks: 35 / 14 Time: 2 Hours

**C B C S**

**Section – A (5 X 3 = 15 M)**

(Short Answer Type questions)

**I. Answer ALL the following questions.**

1. **Unit – I**
2. **Unit – II**
3. **Unit – III**
4. **Unit – IV**
5. **Choose from any one Unit**

**Section – B (5 X 4 = 20 M)**

(Essay Answer Type questions)

**II. Answer ALL the following questions.**

**Diagrams are compulsory wherever necessary.**

6. ***a)*Unit – I**

**O R**

***b)*Unit – I**

7. ***a)*Unit – II**

**O R**

***b)*Unit – II**

8. ***a)*Unit – III**

**O R**

***b)*Unit – III**

9. ***a)*Unit – IV**

**O R**

***b)*Unit – IV**

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## Faculty of Science

## Department of Zoology

**B. Sc. (B.Z.C., N. Z. C.) III Year**

## (2021 – 22)

## VA– Zoology Practical Syllabus
## BIOCHEMISTRY AND ENDOCRINOLOGY

Periods: 30 | Duration of Examination: 2 Hours
Max. / Min. Marks: 25 / 14 | No. of Credits: 1

**Unit – I: Biochemistry and Endocrinology**

1. Identification of carbohydrates – Molisch test, Benedict's/ Fehling's test, Iodine test, Barfoed's test.
2. Identification of Proteins- Biuret test, Sodium hydroxide test.
3. Identification of amino acids- Xanthoproteic test, Nin-hydrin test, Millon's test.
4. Identification of Lipids, Sudan-IV test.
5. Histology of Endocrine glands, Pituitary, Thyroid, Parathyroid, Thymus, Adrenal, Pancreas, Ovary and Testis, Uterus.

- Laboratory record work shall be submitted at the time of practical examination.
- Computer- aided techniques shall be adopted as per UGC guidelines.

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**Faculty of Science**

## V – Semester

## Zoology Practical – V A

## Model Paper

### BIOCHEMISTRY AND ENDOCRINOLOGY

Max. / Min. Marks: 25 / 14 Time: 2 Hours

1. Major questions: 8 M
2. Minor questions 5 M
3. Spotting 4 M
4. Certified Record work 4 M
5. Viva voce 4 M

# Anwarul Uloom College (Autonomous)

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**Faculty of Science**

## V – Semester

## Zoology Practical – V B

## Laboratory Animals Maintenance and Applications

Max. / Min. Marks: 25 / 14 Time: 2 Hours

1. Mounting zooplanktons for microscopic viewing.
2. Demonstration of microscopic drawings of zooplanktons.
3. Demonstration of ELISA using kit.
4. Exercise on data collection, tabulation and preparation of graphs.
5. Calculation of averages (mean, median, mode)
6. Calculation of difference in means using Student's t Test .

- **Laboratory record work shall be submitted at the time of Practical Examination.**
- **Computer – aided teaching material too can be used for these experiments as per UGC guidelines**

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## Faculty of Science

## Department of Zoology (2020 – 21)

**B. Sc. (B.Z.C., N. Z. C.) III Year**

## V – Semester

# Zoology Theory (SECC - III) Syllabus
# APICULTURE

Hours per week: 2 Hours
Max / Min marks: 50/ 20

duration of examination: 2 hrs
No of credits: 2

**UNIT 1**

1.3 History, classification and present status of apiculture industry in India
1.4 Biology of honey bees and bee economy
1.3 Social organization of bee colony
1.4 Selection of bee species for apiculture
1.5 Bee rearing method: artificial Bee rearing (Apiary), Ben hives

**Unit 2**

2.1 Products of apiculture industry and its use-honey Bees wax propalic
2.2 Methods of extraction of honey-indigenous and modern
2.3 Bee keeping equipment
2.4 Colony inspection and maintenance of the equipment

2.5 Bee diseases and enemies, control and preventive method

**Suggested Reading:**


4. Textbook of Applied Zoology, Telugu Academy.
5. Apiculture by Prost PJ. Oxford aro IBH, New Delhi
6. Apiculture by Bisht, ICAR publication

# Anwarul Uloom College (Autonomous)

New Mallepally, Hyderabad
Affiliated to Osmania University
(Re-Accredited with NAAC with A – Grade)

## Faculty of Science

## Department of Zoology

**B. Sc. (B.Z.C., N. Z. C.) III Year**

## (2021 – 22)

## V – Semester

# Zoology Theory (GE - I) course Syllabus

# INTEGRATED PEST MANAGEMENT

Max / Min Marks : 50/ 20 Duration of Examination : 2 hours
No of credits: 2

**UNIT 1 Pest, Integrated Pest Management**

1.1 Introduction, History and origin

1.2 Definition of pest and its ecology

1.3 Pest, population dynamics

1.4 Economic injury level (EIL) Economic threshold

1.5 Pest surveillance

1.6 Concepts of IPM

1.7 Components of IPM

1.8 Major IPM strategies

1.9 Strategies for IPM Mechanical, Physical, Cultural and biological

**UNIT :II Biological and Genetic Control, Chemical control**

2.1 Introduction and Principle

2.2 Bio control agents

2.3 Parasitoids, predators and pathogens (NPV, bacteria, fungi and nematodes

2.4 Merits and demerits

2.5 Genetic Control - stere insect technique, sterile insect release method

2.6 Classification of insecticides

2.7 Insecticide adjuvant and formulation

2.8 Chemical control with reference to organo chloride, organophosphate carbarnates

2.9 Synthetic pyrethroids, fumigants, pheromones legal or regulatory control Quarantine acts

**REFERENCES**


1. K P Srivastava A Text Book of applied Entomology/Vol I & II.Kalyani Publishers New Delhi
2. B.V David and KumaraSwamy. Elements of Economic Entomology

3.B.V.David and KumaraSwamy Elements of Economic Entomology
4. Pedigo Entomology and Pest Management Prentice Hall new Delhi
5. PradhanS. Insect Pests of Crops, National Book Trust New Delhi
6. Agricultural Pests of india and South East Asia by National AS Kalyani Publisher, New Delhi
7.Insect Pest of Crops by S. Pradhan, National Book Trust, New Delhi

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**Faculty of Science**

## Department of Zoology

**B. Sc. (B.Z.C., N. Z. C.) III Year**

## (2021 – 22)

## VI – Semester

## Zoology Theory Syllabus

## Fisheries & Limnology
## Theory Paper – VI A

Hours per Week: 15 Hours | Duration of Examination: 2 Hours
Max. / Min. Marks: 35 / 14 | No. of Credits: 4

**Unit – I: Introduction to Fisheries, aquaculture systems, management practices (15 Periods)**

1. Introduction, definition, history, scope and significance of fisheries.
2. Classification of fisheries.
    - Fin fisheries and shell fisheries;
    - Capture fisheries and Culture fisheries;
    - Freshwater, Brackish water and Marine fisheries.
3. Aquaculture systems: Pond culture, Pen culture, cage culture. Monoculture, composite culture, integrated culture systems.
4. Culture phases and management practices: Nursery, rearing and grow-out pond preparation.
5. Traits of important cultivable finfish and shellfish: Indian major carps and Minor carps; exotic carps.

**Unit – II: Feeding, Breeding and hatchery management of finfish and shellfish** (15 Periods)

1. Bundh breeding: Concept; wet and dry bundhs; collection and hatching of eggs.

2. Induced breeding: Environmental factors affecting spawning; Hypophysation of fishes; fish pituitary gland: Structure, collection, preservation and preparation of extract for injection, dosages and methods of injection.
3. Types of fish hatcheries: Traditional, Chinese, Glass jar, Modern controlled hatcheries.
4. Fish nutrition: Natural and supplementary feeding of cultivable finfish and shellfishes. Forms of feeds: Wet feeds, dry feeds, mashes, pelleted feeds, floating and sinking pellets.

**Unit – III: Limnology** (15 Periods)

1. Introduction to limnology, Inland water bodies: Characteristics and distribution of Ponds, Lakes, Reservoirs, Streams and Rivers.
2. Dynamics of lentic and lotic environments.
3. Major rivers and freshwater lakes of India. Origin, classification and morphometry of lakes.
4. Major groups of organisms in freshwater bodies: Planktons, Periphytons, Neustons, Nektons, Benthos, large aquatic plants etc.,

**Unit – IV: Productivity of lakes (**15 Periods)

1. Ecology of ponds and lakes (lentic ecosystems) – structure and dynamics - energy flow.
2. Productivity of water bodies: Concept of productivity, primary, secondary and tertiary productivity. Factors affecting productivity.
3. Laws of minimum and quantitative relationships in a standing crop.
4. Eutrophication—causes, consequences and control mechanisms.

**Refrence Books:**

1.Gold man CR. And home AJ.1983. Limnology. Mc Graw --- Hill International Book Company.
2.Ruttner F. 1953. Fundamentals of Limnology. University of Toronto press, Toronto.
3. Welch PS, 1952. Limnology, 2nd Ed. Mc Graw-Hill Book Co., New York.
4. Golterman, HL.1975. Physiological Limnology. Elsevier Publishing Co., Amsterdam.
5. Cole GA. 1983. Text book of Limnology. C.V Mosby Company, St. Louis, Missouri, USA.
6. Wetzel RG. 1975. Limnology. W.B. Sanders Company, Philadelphia.

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**Faculty of Science**

## VI – Semester

## Zoology Theory Model Paper

Max. / Min. Marks: 35 / 14 Time: 2 Hours

**C B C S**

**Section – A (5 X 3 = 15 M)**

(Short Answer Type questions)

**I. Answer ALL the following questions.**

1. **Unit – I**
2. **Unit – II**
3. **Unit – III**
4. **Unit – IV**
5. **Choose from any one Unit**

**Section – B (4 X 5 = 20 M)**

(Essay Answer Type questions)

**II. Answer ALL the following questions.**

**Diagrams are compulsory wherever necessary.**

6. ***a)*Unit – I**

**O R**

***b)*Unit – I**

7. ***a)*Unit – II**

**O R**

***b)*Unit – II**

8. ***a)*Unit – III**

**O R**

***b)*Unit – III**

9. ***a)*Unit – IV**

**O R**

***b)*Unit – IV**

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## (2021 – 22)

## VI – Semester

## Zoology Practical Syllabus

## Fisheries &Limnology
## Practical Paper – VI A

Max. / Min. Marks: 25 / 14 No. of Credits: 2

1. Histological studies of testis, ovary of fish.
2. Identification of important cultivable freshwater fishes – Indian major carps, exotic carps. trouts, tilapias, catfishes.
3. Study of fish fish pituitary gland.
4. Identification of freshwater phytoplankton.
5. Identification of freshwater zooplankton.
6. Field trip to local or nearby fisheries unit/ freshwater body is to be conducted and certified field note book should be submitted at the time of practical examination

References:


1. Ayyappan, S., 2011. Handbook of Fisheries and Aquaculture, ICAR Publications, New Delhi.
2. Rath, R.K., 2011. Freshwater Aquaculture, Scientific Publications.
3. Santhanam, R., Sukumaran, N. and Natarajan, P. 1987. A manual of Aquaculture. Oxford – IBH, New Delhi.
4. Ramanathan, N. and Francis T., 1996. Manual on breeding and larval rearing of cultivable fishes, Fisheries College and Research Institute, Tuticorin.
5. Jhingran, V.G., Pullin, R.S.V., 1997. A hatchery manual for the Common, Chinese and Indian Major Carps. Asian Development Bank, International Centre for living Aquatic Resources Management, Phillippines.

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## Faculty of Science

## VI – Semester

## Zoology Practical – VI A

## Fisheries and Limnology

## Model Paper

Max. / Min. Marks: 25 / 14 Time: 2 Hours

1. Major question 10 M
2. Minor question 10 M
3. Certified Record work 3 M
4. Viva voce 2 M

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## (2021 – 22)

## VI – Semester

## Zoology Theory Syllabus

## Immunology and Biotechnology
## Theory Paper – VI B

Hours per Week: 15 Hours | Duration of Examination: 2 Hours
Max. / Min. Marks: 25 / 14 | No. of Credits: 4

**Unit – I: Basics of Immune system** (15 Periods)

1. Cells of the immune system and the lymphoid organs (primary and secondary)
2. First line of defenses – physical and chemical barriers; second line of defenses – inflammation and phagocytosis.
3. Types of immunity – inherent (Active and Passive)and acquired immunity (Active and Passive), Humoral and cell mediated immunity.
4. Major histocompatibility complex (MHC) – structure and function of class I and class II proteins.

**Unit – II: Antibodies and Antigens and Immune system diseases** (15 Periods)

1. Antibodies/ Immunoglobulins – structure, functions and classification, antibody diversity, Monoclonal antibodies and applications.
2. Antigens structure, antigenic determinants/ epitopes, haptens, advujants and antigenicity.
3. Antigen- antibody reactions- agglutination, precipitation, opsonization, cytotoxicity
4. Hypersensitivity reactions.

**Unit – III: Animal Biotechnology**(15 Periods)

1. Concept and Scope of Animal Biotechnology.
2. Recombinant DNA technology and its applications.
3. Cloning vectors – Plasmids, Cosmids and shuttle vectors.
4. Transgenesis – Methods of Transgenesis.

5. Production of Transgenic animals – sheep and fish.

**Unit – IV: Applications of Biotechnology** (15 Periods)

1. Applications of Trabsgenic animals in Biotecchnology
2. Transgenesis and production of transgenic animals (fish and goat)
3. Applications of stem cell technology in cell based therapy (Diabetes and Parkinson's disease)

**Reference Books:**


1. Immunology, 5th Edi. (2003) – R A Goldsby, T J Kindt, B A Osborne and J Kuby, W H Freeman and Company, New York
2. Essentials of Immunology – Ivanriots
3. A Text Book of Immunology and Immune Technology by B Annadurai, S Chand Publications
4. Principles of Immunology – N V Shastri, Himalaya Publishing House Pvt. Ltd.
5. Genetic Engineering by Mohan P Arora, Himalaya Publications
6. Practical Immunology – Talwar
7. Introduction to basic Molecular Biology Techniques by G R Nath, Himalaya Publications
8. Immunology by I Kannan
9. N M S Immunology – Richard M Hyde
10. Text Book of Immunology – C V Rao
11. Biology – Campbell and Reece
12. Medical Zoology – Sobti
13. Parasitology – Chandler
14. Elements of Biotechnology – P K Gupta
15. Genomics and Biotechnology – P K Gupta
16. Molecular Biotechnology – Glick and Pasternak
17. The Fishes of India – Francis Day, Vol. I & II, William Dawson & Son Ltd. 1958
18. General and Applied Ichthyology (Fish and Fisheries) – S K Gupta and P C Gupta, S Chand Publishers
19. Fish and Fisheries of India – V G Jhingran, Hindustan Publishing Company (1991)
20. Aqua culture productivity – V R P Sinha and H C Siaslara, Oxford I B H (1991)
21. Advances in Aqua culture – T V R Pillay and M A Dill, Fishing news Books Ltd. (1979)

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## Department of Zoology

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## (2021 – 22)

## VI – Semester

## Zoology Practical Syllabus

## Immunology and Biotechnology
## Practical Paper – VI B

Max. / Min. Marks: 50 / 25 No. of Credits: 2

Unit 1- Immunology

1.Demonstration of agglutination(ABO blood grouping/Widal test) using kit
2. Demonstration of precipitation(VDRL/RPR test using kit
3. Radial immunodiffusion using kit.
4. Histology of lymphoid organs-Spleen, Thymus. Lymphnode, Bone marrow

II. Animal Biotechnology

1 Study the following techniques through photographs/virtual lab
a. Identification of Vectors
b.Identification of Transgenic animals
c.DNA sequencing (Sanger's method)
d. DNA finger printing
e. Southern blotting
f. Western blotting

2. PCR demonstration /virtual lab

- Laboratory Record work shall be submitted at the time of practical examination
- Computer aided techniques should be adopted as per UGC guide lines.

**Reference Books:**

1 Hand book of practical immunology-Ivan Riott
2Animal Biotechnology - PK Gupta

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**Faculty of Science**

## VI – Semester

## Zoology Practical – VI B

## Immunology and Biotechnology

## Model Paper

Max. / Min. Marks: 25 / 14 Time: 2 Hours

1. Major question 5 M
2. Minor question 5 M
3. Identification of vector / Genetic disorder / transgenic animal as given on chart or photograph 5 M
4. Certified Record work 5 M
5. Viva voce 5 M

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## Department of Zoology

**B. Sc. (B.Z.C., N. Z. C.) III Year (2021 – 22)**

## VI – Semester

## Zoology Theory (SECC – IV) course Syllabus

## Biodiversity Conservation and Eco-Tourism

Duration of Examination: 2 Hours
Max. / Min. Marks: 50 / 20 No. of Credits: 2

**Unit – I:**

Biodiversity – Definition, level of Biodiversity. Pattern of Biodiversity, importance of Biodiversity, Biodiversity in India

Biodiversity conservation

In situ – National parks in India, sanctuaries in India, Biosphere reserves, sacred lakes and forests

Ex situ – Invitro conservation, Botanical gardens, Zoos and Safari, Biodiversity Hotspots, special projects, Tigers, Lions, Crocodiles, Elephants

**Unit – II:**

IUCN categories, Red Data Book, Endangered species in India. Conventional societies on Biodiversity / wild life

Eco – Tourism – Definition, Principles of Sustainable Eco – Tourism, Benefits and impact of Eco – Tourism sites in India.

**Reference Books:**


1. Text Book of Biodiversity – K V Krishnamurthy, Science Publishers, Inc.
2. What is Biodiversisty? – Nora Bynum
3. The Biology of Biodiversity – Kato M
4. Wild life Animals of India – M M Ranga B N H S, Publications
5. Endangered Animals of India and their Conservation – Nair S N
6. Eco – Tourism, Jagbir Singh

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**Faculty of Science**

## VI – Semester

## Zoology (SECC – IV) (Biodiversity and Eco-Tourism)

### Model Paper

Max. / Min. Marks: 50 / 20 Time: 2 Hours

**C B C S**

**Section – A** **(5 X 3 = 15 M)**

(Short Answer Type questions)

**I. Answer ALL the following questions.**

1. **Unit – I**
2. **Unit – II**
3. **Unit – III**
4. **Unit – IV**
5. **Choose from any one Unit**

**Section – B** **(4 X 5 = 20 M)**

(Essay Answer Type questions)

**II. Answer ALL the following questions.**

**Diagrams are compulsory wherever necessary.**

6. ***a)*Unit – I**

**O R**

***b)*Unit – I**

7. ***a)*Unit – II**

**O R**

***b)*Unit – II**

8. ***a)*Unit – III**

**O R**

***b)*Unit – III**

9. ***a)*Unit – IV**

**O R**

***b)*Unit – IV**

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**B. Sc. (B.Z.C., N. Z. C.) III Year**

## (2021 – 22)

## VI – Semester

# Zoology Theory (GE - II) course Syllabus

**PREVENTIVE MEDICINE**

Max / Min Marks: 50 / 20 Duration of Examination : 2 hours
No of Credits: 2

UNIT I-Man and Medicine: Health for all, Principles of Epidemiology

1.1 Antiquity medicine. Types of medicine
1.2 Dawn of scientific medicine, modern medicine-curative medicine, preventive medicine and social medicine.
1.3. Definition of health, dimensions of health- Physical, Mental, Social Spiritual, Emotional and Vocational health,
1.4 Determinants of health - Biological, Behavioural, Environmental Socio economic and Health services
1.5 Concept of well being - Standard of living, Level of living and quality of life
1.6 . Definition of epidemiology, measurements in epidemiology-rates, ratio and proportion
1.7 Epidemiologic methods- observational and experimental studies
1.8 Uses of epidemiology and definitions of infectious disease epidemiology
1.9 Dynamics of disease transmission -source and reservoirs.
1.10 Epidemiological triad, modes of disease transmission direct and indirect.

UNIT II : Concept of Disease causation, Concepts of control & prevention

2.1. Germ theory of Diseases
2.2 Disinfection- types of disinfection
2.3 Immunity Active Immunity, Passive immunity, immunizing agents.
2.4. Nutrition and Health - Classification of foods; Nutritional requirements.
2.5. Screening of disease uses of screening, types of screening

2.6. Health care of the community - health care systems, levels of health care.
2.7 Modes of health interventions: Health Promotion, Specific Protection, Early Diagnosis and Treatment, Disability Limitations, and Rehabilitations
2.8. Concepts of control - Monitoring and Surveillance
2.9 Concepts of Prevention. Primary, Secondary & Tertiary
2.10 Health programmes in India.

**References:**

1. Park's Textbook of Preventive and Social Medicine,

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## Faculty of Science

## Department of Zoology

## Certificate Course in Clinical Laboratory Techniques

On the recommendation of U G C for the introduction of Job Oriented courses, the Department of Zoology is starting Certificate Course in Clinical Laboratory Techniques.

The importance of qualified personel in conducting Clinical analysis towards accurate diagnostic and prognosis of patients is well established. This has been selected in order to generate personnel, trained appropriately in theory and practical of Clinical Laboratory Techniques. The syllabus of this is so designed, aiming at providing adequate theoretical background on the clinical aspects related to physiological chemistry and instrumentation. Necessary trust is being given in the practical aspects of the clinical diagnosis by providing predetermined practical exercises. Further, students would undertake field work in the Clinical atmosphere at appropriate diagnostic laboratories and Hospitals within Hyderabad region.

Duration of Course: 6 months
Eligibility: Intermediate with Biology, Physics and Chemistry
Fee: Rs. 1,000
Examinations: Theory (80% marks – through examination and 20% Internal Assessment)
Practical: (80% marks – through examination and 20% Internal Assessment)

# Certificate Course in Clinical Laboratory Techniques

## Syllabus

## Theory

1. Introduction to Pathology: Definition, scope and branches of Pathology

2. Introduction to Haemotology: Structure and components of the Blood. Origin of Blood cells – Cell counting, Haemoglobin estimation and E S R. Blood grouping and Rh factor, Blood banking

3. Types of Immunity: Innate and Acquired Immunity, Lymphoid organs, Lymth nodes, thymus, T – cells, B – cells and Macrophages

4. Immunological techniques: Agglutination, precipitation, complement fixation, ELISA – test, Western blot techniques, Radio-Immuno assay, T and B- cells separation

5. Introduction of Microtome techniques: Fixation, section cutting and staining procedures. Biopsy and Autopsy of infected and normal tissues. Histopathlogical manifestations in tisuses

6. Diseases and types of diseases: Definition, causes, signs and symptoms. Prognosis communicable and non – communicable diseases, Hereditary diseases, radiatinal, metabolic and nutritional diseases, Bacterial, Fungal, Viral, Allergic and Pollutional diseases, Xenobiotics

7. Introductory Microbiology: Study of Viruses, Ricketisias, Spirochaetes, Poliomyelitis, Small-pox, Common cold, Dengue, Encephalitis, A I D S, Hepatitis, Rabies, Measles, Mumps. Study of Bacteria, classification, Bacterial infections, Cholera, Typhoid, Tuberculosis, Leprosy, Syphillis and Pneumonia

**Bio-Medical Tehcnology**:

i. Definition, scope of Biomedical Technology
ii. Diagnostic imaging: X – ray radiology, Angiography, CAT Scan, MRI
iii. Motoring Blood vitals: ECG, EEG
iv. Biochemical tests: ELISA, Western blotting
v. Others: Endoscopy, Haemodialysis, transplantation and types

# Certificate Course in Clinical Laboratory Techniques

## Syllabus

## Practicals

1. Enumeration of Blood counts – RBC, WBC and platelets. Differential counting of WBC, estimation of Haemoglobin, Erythrocytes sedimentation rate, PCV, MCV, MCHC, Blood grouping and Rh factor, bleeding and clotting time

2. Estimation of Blood Sugar, and Serum Proteins

3. Blood and faecal smear preparation – fixing, staining and identification of protozoans (Trophozoites and cysts), Helminths, Helminth eggs and their larvae

4. Urine analysis and estimation of Urine Sugar and Proteins. Microscopic examination of Urine – Crystals, Blood cells, Pus cells and Helminth eggs, Bile salts, Bile pigments

5. Sputum, CSF analysis

6. Fixation of tissues, Microtome sectioning, staining and examination. Only demonstration.

7. Biomedical Technology: Principle, procedure, demonstration of ECG, EEG. ELISA, Western blot. Endoscopy etc.

Visits to Hospitals, Diagnostic centers etc. for observing working of Biomedical instrumentation

**List of Books:**


1. Handbook of Clinical Pathology – Chakravarthy G and Bhattacharya K
2. Clinical Pathology – Cheesebrough M (ELBS)
3. Clinical Biochemistry – Harper
4. Essential of Immunology – Ivan Scotts
5. Practical Immunology – Talwar
6. Clinical Parasitology – Chaterjee
7. Haemotology – Ramnik Sood
8. Clinical Haematology – Windtob

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**Faculty of Science**

# Department of Zoology

## Certificate Course in Clinical Laboratory Techniques

### Model Paper – Theory

Max. Marks: 80 Time: 3 Hours

### Section – A ( 2 X 20 = 40 M )

( Essay Answer Type questions)

**I – Answer any TWO questions:**

1. Describe the structure and functions of=] Blood. Add a note on origin of Blood cells
2. Write an essay on Natural Immunity
3. Describe the Pathogenesis of any two Bacterial diseases
4. Describe the cause, sign and symptoms of AIDS

### Section – B ( 4 X 10 = 40 M )

( Short Answer Type questions)

**I – Answer any FOUR questions:**

1. Swine flue
2. Leprosy
3. Scope of Pathology
4. Dengue
5. Biopsy
6. Elisa
7. Poliomyelitis
8. Cell Medicated Immunity

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## Certificate Course in Clinical Laboratory Techniques

### Model Paper – Practical

Max. Marks: 80 Time: 3 Hours

1. Identification of Blood group and Rh factor
    - Procedure – 5 M, Experiment – 20 M; Total 25 M
2. Faecal examination – Eggs, Cyst / bleeding and clotting time
    - Procedure – 5 M, Experiment – 20 M; Total 25 M
3. Model chart / graph / ECG, EEG, ELISA, Western blot 20 M
4. Record 10 M
5. Viva 10 M

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# Department of Zoology

## Panel of Examiners

1. Dr. Tasneem, Asst. Professor, St. Ann's College, Hyderabad
2. Dr. Aruna, Asst. Professor, Reddy Women's College, Hyderabad
3. Dr. Surya K, Asst. Professor, Nizam College, Hyderabad
4. Mrs. Kameshwari, Asst. Professor, M S Degree College, Hyderabad
5. Dr. Salahuddin, Asst. Professor, B J R Degree College, Hyderabad
6. Dr. Mansoor, Asst. Professor, MANUU, Hyderabad
7. Mrs. Tabassum, Asst. Professor, St. Ann's Degree College, Hyderabad
8. Dr. Padmaja, Asst. Professor, NIzam Colelge, Hyderabad
9. Dr. Sumita Devi, Asst. Professor, University College of Science, Hyderabad
10. Mrs. Ayesha Jabeen – Asst. Professor, Vanitha Mahavidyalaya, Hyderabad
11. Mrs. Mairajunnissa, Asst. Professor, Govt. City College, Hyderabad
12. Ms. Sophia Siddiqua, Asst. Professor, Vanitha Mahavidyalaya, Hyderabad
13. Mrs. Shahnaaz, Asst. Professor, St. Ann's Degree College, Mehdipatnam, Hyderabad
14. Mrs. Tasneem Jahan, Asst. Professor, St. Ann's Degree College, Mehdipatnam, Hyd.
15. Ms. Kalpana, R B V R Degree College, Narayanguda, Hyderabad

# Department of Zoology

# Certificate Course in Clinical Laboratory Techniques

**Academic Year 2021 – 22**