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# **CBCS syllabus**

## **for**

# **Post-graduate Courses**

## **SUBJECT: ZOOLOGY**

Submitted by  
University Department of Zoology  
T.M.Bhagalpur University  
Bhagalpur-812007

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15/06/18

### **Revised by Subject Experts**

- (1) Prof U.S. Sinha, Retd. Professor, V.K.S. University, Ara**
- (2) Prof P.K.Khan, Dept. of Zoology, Patna University, Patna**
- (3) Dr. G.B. Chand, Dept. of Zoology, Patna University, Patna**

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15/06/18

Dated-14/06/2018

To  
His Excellency  
The Chancellor cum Governor  
Universities of Bihar, Patna

Sub: Submission of CBCS Syllabus of Zoology (M.Sc.) after revision

Hon'ble Sir,

With reference to your letter No. BSU (Regulation) -20/2018-1510/GS(1) dated 05/06/2018, we have been appointed as subject experts for examining the CBCS Syllabus of Zoology (M.Sc.) submitted by T.M. Bhagalpur University. We studied ~~the syllabus~~ and found that it needs certain necessary modifications.

We are submitting a revised CBCS Syllabus of Zoology (M.Sc.) after necessary modifications for your kind perusal and approval.

Yours faithfully

- (1) Dr. U.S. Sinha, Retd. Prof., V.K.S.U., Ara- *14/6/18*  
(2) Dr. P.K. Khan, Dept. Of Zoology, P.U., Patna- *14/6/18*  
(3) Dr. G.B. Chand, Dept. Of Zoology, P.U., Patna- *14/6/18*

ENCL:

1. Revised CBCS Syllabus of Zoology (hard copy)
2. Soft copy (CD) of the same.
3. CBCS Syllabus of Zoology (prepared by T.M. Bhagalpur University)

## SEMESTER – I

**Core Course (CC- 1): Functional Biology of Invertebrates and Chordates** Full Marks – 70

Time: 3 hrs

Questions to be set in three parts representing all the five units. Part A will consist of 10 objective questions of 2 marks each. Part B will consist of five short questions (Four to be answered) of 5 marks each. Part C will consist of five long questions (three to be answered) of 10 marks each.

### Unit – I

- 1.1 Organization of coelom and its significance
- 1.2 Patterns of feeding and digestion in invertebrates
- 1.3 Invertebrate larvae: Types and significance

### Unit – II

- 2.1 Respiratory pigments in different phylogenetic groups
- 2.2 Organs of Respiration in Invertebrates: Gills, Lungs and Trachea
- 2.3 Mechanism of Respiration in Invertebrates

### Unit- III

- 3.1 Organs of respiration in vertebrates: Gills, ARO and Lungs
- 3.2 Principles of gaseous exchange and Fick's modified equation
- 3.3 Transport of gases in blood and body fluid
- 3.4 Regulation of respiration (Neural and chemical control)
- 3.5 Respiratory adaptations at higher altitude and in diving mammals

### Unit – IV

- 4.1 Patterns of nitrogenous excretion in different phylogenetic groups
- 4.2 Organs of excretion: Coelomoducts, nephridia, malpighian tubules and kidney
- 4.3 Mechanism of osmoregulation and excretion in aquatic (freshwater and marine) and terrestrial animals
- 4.4 Mechanism of acid-base balance

### Unit – V

- 5.1 Thermoregulation in vertebrates
- 5.2 Mechanism of energetic of muscle contraction (Skeletal)
- 5.3 Physiology of electrical and synaptical transmitters in neurons
- 5.4 Neurotransmitters and their functions
- 5.5 Acoustico-lateral system and electroreception in aquatic vertebrates

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## SEMESTER – I

### Core Course (CC- 2): Molecular Cell Biology

Full Marks – 70

Time: 3 hrs

Questions to be set in three parts representing all the five units. Part A will consist of 10 objective questions of 2 marks each. Part B will consist of five short questions (Four to be answered) of 5 marks each. Part C will consist of five long questions (three to be answered) of 10 marks each.

#### Unit I:

##### (A) Bio membrane

- 1.1 Molecular composition, arrangement and functional consequences
- 1.2 Models of bio-membrane
- 1.3 Transport across bio-membrane: diffusion, active transport and membrane pumps (P-type pump, V-type pump and ABC transporter)
- 1.4 Cotransport by symporters and antiporters

##### (B) Cytoskeleton

- 1.5 Microtubules and microfilaments: Structure and dynamics
- 1.6 Role of Kinesin and Dynein in intracellular transport
- 1.7 Axonal transport and cell movement (with respect to non-muscle motility)

#### Unit II: DNA replication

- 2.1 Outline of prokaryotic replication
- 2.2 Replication features of single stranded phages
- 2.3 Mechanism and machinery of replication in eukaryotes
- 2.4 DNA damage and repair mechanisms

#### Unit III: Transcription

- 3.1 Outline mechanism of prokaryotic transcription
- 3.2 Organization of eukaryotic transcription machinery
- 3.3 General and specific transcription factors
- 3.4 Regulatory elements & DNA binding domains of transcription apparatus
- 3.5 Processing of primary transcript & RNA editing in eukaryotes

#### Unit IV: Translation

- 4.1 Genetic code: Codon assignment and features
- 4.2 Outline of Prokaryotic translation
- 4.3 Eukaryotes translation: machinery (Ribosome & t RNA)
- 4.4 Eukaryotes translation: mechanism (Initiation, elongation and termination)

#### Unit V: Intra cellular protein trafficking:

- 5.1 Targeting proteins to ER: Signal hypothesis
- 5.2 Co- and post – translational modifications of proteins
- 5.3 Trafficking mechanisms:
  - (a) Vesicular transport
  - (b) Protein sorting
  - (c) Endocytosis and exocytosis

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## SEMESTER – I

### Core Course (CC- 3): Genetics

Full Marks – 70

Time: 3 hrs

Questions to be set in three parts representing all the five units. Part A will consist of 10 objective questions of 2 marks each. Part B will consist of five short questions (Four to be answered) of 5 marks each. Part C will consist of five long questions (three to be answered) of 10 marks each.

#### Unit I: Organization of Chromosomes

- 1.1 Organization of prokaryotic chromosomes
- 1.2 Organization of eukaryotic chromosome: Nucleosome as functional particle, 30 nm chromatin fibre, higher order structure of chromatin
- 1.3 Organization of centromere and kinetochore, Organization of telomere and its maintenance
- 1.4 Heterochromatin: Types, organization, formation and significance
- 1.5 Structural organization and functional significance of Polytene and Lampbrush chromosomes.

#### Unit II: Microbial genetics

- 2.1 Transformation, conjugation, transduction and sex-duction in bacteria
- 2.2 Construction of linkage map in bacteria
- 2.3 Molecular mechanism of recombination

#### Unit III: Cell cycle

- 3.1 Stages and check points in cell cycle
- 3.2 Genetics of cell cycle regulation: Role of cyclins and CDKs
- 3.3 Molecular basis of cellular check points

#### Unit IV: Sex determination and dosage compensation

- 4.1 Genetic and Molecular basis of sex determination in *Caenorhabditis elegans*, *Drosophila* & human
- 4.2 Genetic basis of dosage compensation in *Caenorhabditis elegans*, *Drosophila* & mammals

#### Unit V: Techniques & Methods in genetics

- 5.1 DNA sequencing: Base destruction method, chain termination method and automated sequencing, pyro- sequencing and whole genome short-gun sequencing.
- 5.2 DNA amplification: Polymerase chain reaction, its application and limitations.
- 5.3 DNA finger printing: VNTR profiling, STR profiling (Autosomal & Y Chromosome), mitochondrial DNA profiling and SNP profiling
- 5.4 Genome expression analysis: Southern, Northern & Western blotting, Reverse Transcription PCR, DNA micro array.

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## SEMESTER - I

Core Course (CC- 4) Practical

Full Marks - 70

### 1<sup>st</sup> Sitting

1. Squash preparation using any of the following: 10
  - (a) *Chironomus/Drosophila* larvae for polytene chromosomes
  - (b) Onion root tip for mitosis and mitotic index
  - (c) Grasshopper testes for meiosis and related features
  
2. Experimental demonstration (any one of the following): 10
  - (a) Enumeration of RBC
  - (B) Enumeration of WBC (TC and DC)
  - (C) Preparation of a histological slide of the given paraffin section/whole mount of an invertebrate larva 05
3. Identification and comments upon spots (cytological slides: Nos. 02) 05

### 2<sup>nd</sup> Sitting

4. Identification and comments upon spots (invertebrate slide-03, vertebrate slide-02) 10
5. Genetics (any of the following) 10
  - (a) Solving problems on Mendelian principles and sex-linked inheritance
  - (b) Preparation of linkage map based on data from *Drosophila* crosses and tetrad analysis in *Neurospora*
  - (c) Pedigree analysis in human
6. Class records, charts/ models & field collection 10
7. Viva-voce 10

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