Syllabus for three years B.Sc.(General Course), Zoology, University of Calcutta, 2010

University of Calcutta
Syllabus structure for B.Sc. (General) Zoology

Part -I	Paper –I	Marks
	Gr. A Non-Chordate	35
	Gr. B. Cell Biology and Genetics, Molecular Biology	35
	Gr. C. Developmental Biology	30
		100
Part-II	Paper II	
	Gr. A. Chordate	35
	Gr. B. Ecology, Animal Behavior, Biodiversity and Wildlife	35
	Gr. C Histology, Endocrinology, Animal Physiology & Biochemistry	30
		100
Paper III	Laboratory Course (all Groups)	100
Part -III		
	Paper IV	
	Gr. A .Applied Zoology	30
	Gr. B. Evolutionary Biology	20
	Gr. C. Parasitology & Immunology	20
	Gr. D Laboratory course	30
		100
	Total.	400

Zoology General

Part –I : (100 Marks)

Paper I: Theory (Full Marks –100)

Group-A: Course No ZG-01 :Functional Anatomy of Non-Chordates
(Full marks –35)
(Lectures : 35)

1. Classification with distinctive features and suitable examples of sub-kingdom Protozoa (upto Phylum) (Levine *et al*, 1980) and Phylum Porifera, Cnidaria, Platyhelminthis, Annelida, Arthropoda, Mollusca and Echinodermata (up to Class)

2. General structure & function of the following with reference to the specimens mentioned:
   - I) Locomotion (a) Microfibrils (*Amoeba*), (b) Flagella (*Euglena*), (c) Cilia (*Paramoecium*)
   - II) Feeding & digestion (a) Microphagy (*Amoeba*), Macrophagy (*Periplanata*)
   - III) Respiration (a) Respiratory pigments (Hemoglobin & hemocyanin, (b) Ctenidium & pulmonary sac (Pila), gills, Traechea and booklung (prawn, cockroach, scorpion)
   - IV) Excretion (a) Flame cells (Taenia), b) Nephridia (Earthworm), Malpighian tubules (Cockroach), Green gland (Prawn)
   - V) Circulation (a) Open circulation (Cockroach, (b) Closed circulation (Earth worm)
   - VI) Neural Integration : Integration –simple & complex nerve nets, (b) Nervous system, (Cockroach, Apple snail)
   - VII) Reproduction : a) Fission (Amoeba) (b) Budding (*Hydra*) (c) Conjugation (*Paramoecium*), (d) Sexual (Cockroach), (e) Metagenesis in *Obelia* (in Brief)

   N.B. Scheme of classification other than Protozoa as per Ruppert and Barnes
   (1994), 6th Ed., Invertebrate Zoology.

Group –B: Course No ZG-02:Cell Biology, Genetics and Molecular Biology
(Full marks –35)
(Lectures : 35)

1. Ultrastructure & function of plasma membrane, GERL system, ribosome, lysosome

2. Chromosome structure, nucleosome concept
3. Cell cycle, oncogene & cancer (basic idea)
4. Physio chemical properties, types, structures (in brief) and functions of DNA and RNA.
5. Nucleic acids as genetic material,
6. Mechanisms of replication, transcription and translation in *E. coli*
7. Modes of inheritance of autosomal and sex linked genes in man (Thalassemia & Haemophilia, colour blindness)
8. Linkage and recombination,
9. Chromosomal aberrations-in number and structures, point mutation, Down syndrome & Klinefelter syndrome
10. Sex determination in *Drosophila* and man
11. Basic concept of genetic engineering & gene cloning, and gene manipulation

Group-C. Course No. ZG-03. Developmental Biology

(Full Marks –30)

(Lecture: 30)

1. Spermatogenesis and Oogenesis
2. Fertilization in sea urchin
3. Types of eggs & cleavages; process of cleavage in frog and chick
4. Gastrulation in frog and chick
5. Extra-embryonic membranes in chick
6. Placenta types and function
7. Organizer concept
8. Concept of Protostomia & Deuterostomia with reference to metazoan origin

Part –II

Paper II Theory (Full Marks –100)

Group A : Course No.ZG-04: Functional Anatomy of Chordates

(Full Marks –35)

(Lectures : 35)

1. Classification of Phylum Chordata with distinctive features and suitable examples –upto living subclass (Amphibia, Reptilia and Mammalia); upto subclass (Fishes and Aves) (Scheme of classification as per J.Z. Young 1980, Life of vertebrates)
2. Functional anatomy in relation to respiration (*Bufo*); Circulation (*Columba*)
3. Structure & function of the followings :
    i) Integument-general structure & function; integumentary derivatives (scales in fishes, horny scales & plates in reptiles; feathers of Columna ; hair of mammals, Camel).
    ii) Pharynx (Branchiostoma); stomach (*Columba* & *Bos*)

iii) Respiratory structures and Respiration : Gill (Fish), accessory respiratory organs (Fish); lung (*Columba* and *Cavia*), Air sac – *Columba*
iv) Circulatory structure and circulation: Single circuit heart (fish); double circuit heart (Amphibia and Mammals)
v) Excretory system-pro, meso and meta-nephric kidneys;
vi) Nervous system- Brain in *Cavia*,
vii) Origin and distribution of cranial nerves (in *Cavia*).

Group B. Course No **ZG-05 Ecology, Animal Behavior, Biodiversity and Wildlife**

(Full Marks 35)
(Lectures 35)

1. Ecology & Ecosystem-definition, components, energy flow, food chain, food web, ecological pyramids
2. Population- definition and growth
3. Community- definition and types
4. Basic concept of Biodiversity, Biodiversity hotspots.
5. Pollution- air, water and noise (Sources of pollutants, effects on human life and control measures)
6. Honey bee- Hive, castes and their roles
7. Conservation of wild life- purpose & methods, concept of Biosphere Reserve, importance & strategies of wildlife conservation; conservation act and application. National park & Wildlife Santuary, Animal cruelty and prevention act.
8. Scheduled I of wild life protection Act, 1972 and importance of schedules in conservation.
9. Basic idea of ecotoxicology and xenobiotics, concept of EIA.

Gr.C Course No **ZG-06: Histology, Endocrinology, Animal Physiology & Biochemistry,**

(Full marks- 30) (Lectures : 30)

1. General characters of hormones : Histology of pituitary, thyroid and pancreas, Naming and function of hormones secreted from Pituitary, Thyroid and Pancreas
2. Insects endocrine glands (in brief)
3. Composition of vertebrate blood; clotting & coagulation; ABO blood group & Rh factor
4. Enzyme- classification & characteristics; mechanism of enzyme action; effects on enzymetic action (pH and temperature)
5. Classification of carbohydrate, protein and lipid; concept of glycolysis, neoglucogenesis (aerobic, anaerobic & fermentation)

6. Physiology of nerve impulse & synaptic transmission (in brief)
7. Osmoconformers and Osmoregulators; Osmoregulation in fishes

Paper III. Laboratory Course No. ZG 07
(5 hrs) (Full marks 100)

1. Dissection (two major dissections – one invertebrate and one vertebrate)

(15+15=30)

i) Apple snail : Digestive and nervous systems
ii) Cockroach: digestive, nervous and female reproductive system
iii) Lata : afferent and efferent, brain, cranial nerves (IX th and X th origin and distribution).

2. Mounting and preparation : (Two) (6+6=12)

i) Mouth parts of cockroach
ii) Radula of Pila
iii) Osphradium of Pila
iv) Placoid scale of *Scoliodon* sp, and Ctenoid scale of fin fish

(8)

3. (i) Blood film of rat
ii) Haemolymph of cockroach (Leishman/Giemsa stain)
iii) Gut contents of cockroach for protozoa (Fixation, staining and identification)
iv) Whole mount of aquatic and soil micro-arthropods
v) Epithelial cells from buccal smears

ii) Identification with reasons : one from bones, one from histological slides, two from non-chrodates and two from chordate specimens; systematic position upto taxon as mentioned in the theory.
25 marks

a. Bones: Skull, vertebrae, limb and girdle bones of Columba & Cavia
b. Histological slides : Sections of mammalian liver, pancreas, testis, ovary, kidney, thyroid.
c. Non-chordate specimens : *Plasmodium vivax, Paramoecium,* Scypha, *Obelia,* Sea-anaemone, *Ascaris, Hirudinaria,* Scorpion, *Bombyx mori, Lamellidens, Achatina, Loligo,* Starfish, *Balanoglossus.*
d. Chordate specimens : *Branchiostoma, Petromyzon, Scolidon, Lates, Rhacophorous,* Axolotl larva, *Tylototriton, Gekko; Hemidactylus,* Turtle, *Naja,* Chiroptera

5. Report on field study tours: 10 marks

Zoological importance : Zoological garden and Museum,

5. Viva –voce 10
6. Laboratory Note Book 5

Part III

Full marks –100

Paper IV Group A. Course No **ZG-8 : Applied Zoology**

(Full Marks 30)

(Class 30)

1. Sericulture : characteristics of sericulture industry and its scope; types of silk moths/ worms, (scientific names), host plants and improvement and their variety. Life history and rearing of *Bombyx mori,* harvesting & processing of cocoon, reeling and extraction of silk, pest on mulberry plants and diseases of worms of *Bombyx mori* and control measures. Research & development of sericulture in India.

2. Aquaculture : Principles, definition and scope. Fisheries resources of India (inland & off-shore) and their important ichthyofauna. Exotic fishes- their merits and demerits. Fish breeding and their application. Basic principles of different aquaculture system (Polyculture and integrated farming); marine pearl culture, culture of prawn and shrimps.

3. Pest and Management : a) Definition and types of pests with examples. Life history, behaviour, ecology, damage and control of the following pests : i) Paddy *Scirpophaga* (Syn. *Tryporyza*) *incertulas,* ii) Stores grain-*Sitophilus oryzae*, iii) Termite, iv) Mammalian pest (*Bandicota bengalensis*).

   b) Integrated Pest Management

4. Apiculture : Development of Apiary in India. Types of honey bees, modern methods of apiary management, products and its uses. Problems and prospects.
5. Lac culture : Lac insect (Scientific name). Composition of Lac. Strains of lac insects, cultivation of lac, lac host plants (name only), Processing of lac and uses.
6. Poultry : Duck and fowl - Types of breeds, rearing and disease management.

Gr. B. Course No **ZG-09 Parasitology & Immunology**

(Full Marks: 20)

(Lectures-20)

1. Parasitism (definition and types) and other interspecific (symbiosis, commensalism and mutualism) interactions.
2. Life history, Pathogenecity and clinical features of *(a) Entamoeba histolytica, (ii) Plasmodium vivax, iii) P. falciparum, iv) Ascaris, v) Fasciola hepatica.*
3. Outline structure and classification of immunoglobulin, antigen-antibody reaction, basic principle of vaccination

Group –C. Course No **ZG-10 Evolutionary Biology**

(Full marks : 20)
(Lectures-20)

1. Definition of systematics & taxonomy
2. Species as a unit of evolution (definition and types: biological, sibling and polytypic species)
3. Chemical basis of origin of life
4. Hardy-Weinberg equilibrium in relation to natural selection- a brief idea.
5. Anatomical and Physiological adaptations : Aquatic, Desert and Volant animals.
6. Zoogeographical realms & their subdivisions with characteristic fauna.

Group –D. Laboratory course. Course No.**ZG-11**

(Full marks –30)

1. Experimental works :
   a. Estimation of dissolved O_2 content of water 8
      or
      Estimation of dissolved free CO_2 content of water

   b. Pedigree analysis : sex linked recessive, autosomal recessive and dominant 4
   c. Determinant of ABO blood group & Rh factor in man
      or 4
      Measurement of water pH and handling of pH meter

2. Field training : (Submission of report on field study tour at **any two** places from following: (4+4=8)
   i) Estuarine bheri/ freshwater fish farm
   ii) Poultry farm
   iii) Apiary
   iv) Sericulture center
   v) Place of wild life interest (Sanctuary, National Park, Biosphere Reserve etc.)
   vi) Agriculture farms for pest study & idea of IPM practices
   vii) Species diversity studies in local area.

3. Identification: (Write specimen characters and applied importance) **any three** 3x2=6

   Microfilaria of *Wuchereria bancrofti, Taenia solium, Scirpophaga (Syn. Tryporyza) incertulas, Sitophilus oryzae, , Leptocorisa, Epilachna, Coccinella, Lepisma,* Termite*, Bandicota bengalensis, Labeo rohita, L. bata, Catla catla, Cirrhinus mrigala, Hypophthalmichthyes molitrix, Cyprinus carpio, Ctenopharyngodon idellus,Tenualosa (Hilsa) ilisha, Penaeus sp, Macrobrachium rosenbergi.*