UNIVERSITY OF MUMBAI
No.UG/ 58 of 2008

CIRCULAR:-

A reference is invited to the Ordinances, Regulations and syllabi relating to B.Sc. degree course *vide* pamphlet No.136 and to this office Circular No.UG/97 of 2002 dated 22nd February,2002 and the Principals of the affiliated Colleges in Science are hereby informed that the recommendation made by the Board of Studies in Zoology at its meeting held on 23rd August,2007 has been accepted by the Academic Council at its meeting held on 14th December,2007 vide item No.4.1 and that, in accordance therewith, the syllabus in the subject of Zoology at the F.Y.B.Sc. examination has been revised as per Appendix and that the same will be brought into force with effect from the academic year 2008-2009.

MUMBAI-400 032
12th February,2008

for I/c. REGISTRAR

To The Principals of the affiliated colleges in Science.

AC/4.1/14.12.2007

No.UG/ 58 - A of 2008, MUMBAI-400 032 12th February,2008

Copy forwarded with compliments for information to :-

1) The Dean, Faculty of Science
2) The Chairperson, Board of Studies in Zoology
3) The Offg. Controller of Examinations,
4) The Co-Ordinator, University Computerization Centre,

12/02

for I/c. REGISTRAR

12/2

Copy to :-

The Director, Board of College and University Development, , the Deputy Registrar (Eligibility and Migration Section), the Director of Students Welfare, the Executive Secretary to the Vice-Chancellor, the Pro-Vice-Chancellor, the Registrar and the Assistant Registrar, Administrative sub-center, Ratnagiri for information .

The **Offg. Controller of Examinations (10 copies),** the Finance and Accounts Officer (2 copies), Record Section (5 copies), Publications Section (5 copies), the Deputy Registrar, Enrolment, Eligibility and Migration Section (5 copies), the Deputy Registrar, Statistical Unit (2 copies), the Deputy Registrar (Accounts Section), Vidyanagari (2 copies), the Deputy Registrar, Affiliation Section (2 copies), the Director, Institute of Distance Education, (10 copies) the Director University Computer Center (IDE Building), Vidyanagari, (2 copies) the Deputy Registrar (Special Cell), the Deputy Registrar,(PRO) . the Assistant Registrar, Academic Authorities Unit (2 copies), the Assistant Registrar, Executive Authorities Unit (2 copies) . They are requested to treat this as action taken for the concerned resolution adopted by the Academic Council referred to in the above Circular and that, no action Taken Report will be sent in this connection. the Assistant Registrar Constituent Colleges Unit V, B.C.U.(1 copy), the Deputy Account, Unit V(1 copy), the In-charge Director, Centralize Computing Facility, the Receptionist (1 copy), the Telephone Operator (1 copy), the Secretary MUASA (1 copy), the Superintendent, Graduate Section (2 copies), the Superintendent, Thesis Section (2 copies)

Registrar

Enclosure to Item No. 4.1
Appendix

UNIVERSITY OF MUMBAI

Revised Syllabus

at the F.Y.B.Sc.
in the subject of
Zoology

(With effect from the academic year 2008-2009)

Revised Syllabus of F. Y. B. Sc. Zoology
(Effective from the academic year 2008-2009)

Preamble

The present syllabus of F. Y. B. Sc. Zoology came into force from the academic year 2002-03. Since then, many developments have taken place in the subject and also the syllabi at lower classes have been revised. Keeping that in view the Board of Studies in Zoology during its meeting held on 01-08-2006 decided to form a syllabus committee consisting of some board members and some co-opted members for revision of the F. Y. B. Sc. syllabus. The committee held several meetings and prepared a draft syllabus. The Chairperson, Board of Studies in Zoology requested suggestions from zoology teachers of different colleges. The chairperson then invited Head's of the Dept. of Zoology of various colleges and presented the draft syllabus before them for deliberations. Suggestions of the teacher's were noted and discussed further during the joint meeting of the Board of studies in Zoology and Syllabus Committee members held on 13-11-2006 at the University of Mumbai and necessary changes have been incorporated in the syllabus. Subsequent finalization of the said syllabus was done at B.O.S. meeting held on 23-08-2007. It was resolved that the revised syllabus of F. Y. B. Sc. Zoology (2 units) be made effective from the academic year 2008-2009.

Hence, the Board of Studies in Zoology presents this revised syllabus of F. Y. B. Sc Zoology (2 units) and recommends that the same be introduced from the academic year 2008-2009.

Date : 1st September 2007

Chairperson

Board of Studies in Zoology

Revised F. Y. B. Sc. Zoology Syllabus
to be introduced from the Academic year 2008-2009

Distribution of topics and lectures

PAPER	UNIT	TOPICS	NO.OF LECTURES
I	1.	Diversity of animal kingdom I	15
	2.	Life processes I	15
	3.	Ecology	15
	4.	Diversity of animal kingdom II	15
	5.	Life processes II	15
	6.	Ethology	15
II	1.	Molecular basis of life I	15
	2.	Biotechnology I	15
	3.	Genetics	15
	4.	Molecular basis of life II	15
	5.	Biotechnology II	15
	6.	Evolution	15

Note:

i) Two short field excursions for habitat studies are compulsory.

ii) Field work of not less than eight hours duration is equivalent to one period per week for a batch of 15 students.

iii) No topic from the syllabus should be assigned as project work or seminar.

iv) A candidate will be allowed to appear for the practical examination only if he/she submits a certified journal of F.Y.B.Sc Zoology or a certificate from the Head of the Department/Institute to the effect that the candidate has completed the practical course of F.Y.B.Sc Zoology as per the minimum requirements. In case of loss of journal a candidate must produce a certificate from the Head of the Department/Institute that the practicals for the academic year were completed by the student. However such a candidate will be allowed to appear for the practical examination but the marks allotted for the journal will not be granted.

REVISED SYLLABUS
F.Y.B.Sc Zoology
(Effective from the academic year 2008-2009)

Two papers each carrying 60 marks
Each paper will be divided into 6 Units :
Units 1 to 3 to be covered in the first term and
Units 3 to 6 to be covered in the second term.
Each term will have 45 periods of 48 minutes per paper.

PAPER I :
Diversity of animal kingdom, Life processes , Ecology & Ethology — 45 Lectures

First Term	
Unit1 Diversity of animal kingdom I	15 lectures
Unit 2 Life processes I	15 lectures
Unit 3 Ecology	15 lectures
Second Term	
Unit 4 Diversity of animal kingdom II	15 lectures
Unit 5 Life processes II	15 lectures
Unit 6 Ethology	15 lectures

PAPER II
Biochemistry, Biotechnology, Genetics, Evolution and Biodiversity — 45 lectures

First Term	
Unit1 Biochemistry I	15 lectures
Unit 2 Biotechnology I	15 lectures
Unit 3 Genetics	15 lectures
Second Term	
Unit 4 Biochemistry II	15 lectures
Unit 5 Biotechnology II	15 lectures
Unit 6 Evolution and Biodiversity	15 lectures

Revised F. Y. B. Sc. Zoology Syllabus
to be introduced from the Academic year 2008-2009

Paper I: Diversity of Animal Kingdom, Life Processes, Ecology and Ethology.

Unit 1: Diversity of Animal Kingdom I

15

1.1: Levels of organization 03

1.1.1: Unicellularity vs. Multicellularity, Colonization and organization of germ layers (diploblastic and triploblastic condition)
1.1.2: Division of labour and organization of tissues (Brief fate of ectoderm, mesoderm and endoderm)
1.1.3: Development of coelome : Acoelomate, pseudocoelomate and coelomate organization
1.1.4: Radial and bilateral symmetry
1.1.5: Segmentation and cephalization

1.2: Unicellular and multicellular organization (Salient features with examples for Phyla, subphyla and classes mentioned below) 05

1.2.1: Unicellular organization: Phylum Protozoa
1.2.2: Multicellular organization: Colonization level-Phylum Porifera
1.2.3: Multicellular organization: Division of labour (cell differentiation) Phylum Coelenterata

1.3: Triploblastic acoelomate and pseudocoelomate organization 02

1.3.1: Acoelomate organization- Phylum Platyhelminthes
1.3.2: Pseudocoelomate organization- Phylum Nemathelminthes

1.4: Triploblastic coelomate organization 05

1.4.1: Animals with metameric segmentation: Phylum Annelida
1.4.2: Animals with jointed appendages: Phylum Arthropoda

Unit 2: Life Processes I

15

2.1: Movement and locomotion 04

2.1.1: Amoeboid movement
2.1.2: Ultrastucture of cilia and ciliary movement
2.1.3: Ultrastucture of myofibril and sliding filament theory
2.1.4: Action of muscle (Role of muscle in movement)

2.2: Nutrition 04

2.2.1: Types of nutrition: Autotrophic and heterotrophic. Apparatus for nutrition: Food vacuole

Animals without alimentary canal, ex. *Amoeba*
Animals with incomplete alimentary canal, ex. *Hydra*
Animals with complete alimentary canal, ex. Bird

2.2.2: Brief account of physiology of digestion in vertebrates and symbiotic digestion in Ruminants.

2.3 Respiration 04

2.3.1: Types of respiratory surfaces:
General body surface: Cell membrane- ex. *Amoeba*
Skin-ex. Earthworm and Frog

Specialized respiratory structures:
Trachea and spiracles, Gills of fish,
Lungs of Frog and Human, Air sacs of birds.

2.3.2: External respiration and cellular respiration with reference to human

2.4: Circulation 03

2.4.1: Types of circulating fluids: Water, coelomic fluid, lymph and blood

2.4.2: Types of circulation: Protoplasmic streaming, open and closed circulation, single and double circulation

2.4.3: Hearts: Types, heart in *Daphnia*, cockroach and chordates (1, 2, 3, and 4 chambered hearts)

2.4.4: Structure of cardiac muscle.

Unit 3: Ecology 15

3.1: Concept of Ecosystem
3.2: Concept of energy flow, food chain and food web
3.3: Concept of biogeochemical cycles:
[carbon, oxygen, nitrogen, phosphorous and water cycle]
3.4: Human activities affecting biogeochemical cycles.
3.5: Concept of animal interactions:
Symbiosis: Mutualism, commensalisms,
Parasitism and predation
Antibiosis

Unit 4: Diversity of Animal Kingdom II 15

4.1: Triploblastic coelomate organization

4.1.1: Animals with mantle: Phylum Mollusca
4.1.2: Animals with enterocoel: Phylum Echinodermata 04

4.2: Phylum Hemichordata 01

4.3: Phylum Chordata 02

1.6.1: Subphylum Urochordata
1.6.2: Subphylum Cephalochordata

4.4 Subphylum Vertebrata
4.4.1: Super-class: Agnatha-Class Cyclostomata
4.4.2: Super-class: Gnathostomata
4.4.2.1: Class Pisces (Cartilagenous and bony fish)
4.4.2.2: Class Amphibia
4.4.2.3: Class Reptilia
4.4.2.4: Class Aves
4.4.2.5: Class Mammalia

08

Unit 5: Life Processes II

15

5.1 Excretion and Osmoregulation
5.1.1: Concept of osmoregulation and excretion.
5.1.2: Categorization of animals on the basis of principal nitrogenous excretory products.
5.1.3: Ornithine cycle, formation of urea, deamination and detoxification.

04

5.2 Control and Coordination
5.2.1: Irritability
5.2.2: Structure of a neuron: sense organs human eye and ear.
5.2.3: Conduction of nerve impulse:
Resting potential, action potential and refractory period.
5.2.4: Synaptic transmission
5.2.5: Endocrine regulation: Hormones as chemical messengers, Feedback mechanisms.

06

5.3 Reproduction
5.3.1: Gametogenesis, structures of egg and sperm of mammal
5.3.2: Fertilization and Invitro fertilization
5.3.3: Oviparity, viviparity and ovoviviparity

05

Unit 6 : Ethology

15

6.1. Development of behaviour:
Ontogeny of behaviour,
Environmental influence on behaviour,
Sensitive periods during development,
Juvenile behaviour, Innate behaviour

6.2 Animal Learning:
Conditioning and learning:
Classical conditioning, acquisition, extinction, habituation and generalization,
instrumental learning,
reinforcement operant behaviour.
Biological aspect of learning:
Constraints of learning,
learning to avoid enemies, mimicry,
learning to avoid sickness,
stimulus relevance

Cognitive aspect of learning:
Hidden aspects of conditioning,
nature of cognitive process,
insight learning,
associative learning and representation

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Paper II: Molecular Basis of Life, Biotechnology, Genetics, Evolution and Biodiversity.

Unit 1: Molecular basis of life - I **15**

1.1: Biological micro and macromolecules 02
Monomeric constituents, polymers and significance of carbon

1.2: Proteins 06
1.2.1: Amino acids: Types based on carboxylic, amino and aromatic groups
1.2.2: Peptide bond
1.2.3: Structure of proteins: Primary, secondary, tertiary and quaternary structure
1.2.4: Biological role of proteins

1.3: Carbohydrates 07
1.3.1: Nomenclature, isomerism and classification.
1.3.2: Glycosidic bond
1.3.3: Types of carbohydrates:
Monosaccharides: Glucose, fructose, galactose
Disaccharides: Maltose, sucrose, lactose
Polysaccharides: Starch, glycogen, cellulose, chitin and heparin
1.3.4: Biological role of carbohydrates

Unit 2: Biotechnology I **15**

2.1: Concept of biotechnology 02
2.1.1: Definition
2.1.2: An overview of achievements and scope

2.2: Fundamentals of laboratory techniques in biotechnology 06
2.2.1: Safe handling of equipment
2.2.2: Sterilization techniques
2.2.3: Molecular separation techniques:
Principles and applications : Paper chromatography, TLC
Electrophoresis: Agarose and PAGE

2.3: Food biotechnology 04
[Applications of biotechnology in making bread, beer, wine, yogurt and cheese]

2.4: Enzyme technology 03
2.4.1: Enzymes as meat tenderizer
2.4.2: Bio-detergents
2.4.3: Concept of enzyme immobilization

Unit 3 : Genetics 15

3.1: Gene and gene concept, definition of gene and gene expression
3.2: Mendelian inheritance:
i] Monohybrid and dihybrid cross,
ii] concept of dominance,
iii] exception to Mendelian inheritance:
incomplete dominance, co-dominance, interaction of genes: [Epistasis: Recessive, dominant, double recessive and double dominant epistasis]
iv] Lethal genes
3.3: Cytoplasmic inheritance: ex. Kappa particles in *Paramoecium*, sigma factor in *Drosophila* and shell coiling in *Limnae*
3.4: Effect of environment on heredity
3.5: Introduction to human genetics:
i] Mendelian phenotypic traits in humans: Dominant, recessive and X-linked characters (2 examples each)
ii] Pedigree analysis: Dominant, recessive and X-linked traits
iii] Genetic counseling
Risk of recurrence of hereditary diseases in a family
Risk of inheriting a disease from consanguineous marriage
Risk of acquiring common hereditary diseases

----------x----------x----------

Unit 4 : Molecular basis of life II 15

4.1: Lipids 05
4.1.1: Fatty acids: Structure, types and properties
4.1.2: Mono, di and triglycerides
4.1.3: Phospholipids, sphingolipids
4.1.4: Sterols and waxes
4.1.5: Biological role of lipids

4.2: Nucleic acids 10
4.2.1: Chemical structure of nitrogenous bases, pentoses
4.2.2: Nucleosides and nucleotides
4.2.3: Polynucleotides: 3'—> 5' phosphodiester linkage
4.2.4: Watson-Crick model of DNA
4.2.5: Types of RNA: mRNA, tRNA and rRNA
4.2.6: Cloverleaf model of tRNA
4.2.7: Differences between DNA and RNA

Unit 5 : Biotechnology II

15

5.1: Transgenic animals and animal cloning

5.1.1: Transgenic animals for production of pharmaceuticals: [α-1 antitrypsin, tissue plasminogen activator (tPA)] 04

5.1.2: Animal cloning experiments for "Dolly"

5.2: Biotechnology and therapy

5.2.1: Biotechnology in production of insulin and hGH 07

5.2.2: Gene therapy: Ex-vivo and In-vivo approach, gene therapy for SCID (severe combined immune deficiency) and cystic fibrosis

5.2.3: Ethical issues with reference to gene therapy

5.3: Environmental biotechnology

5.3.1: Bioremediation: Concept and applications 04

5.3.2: Biodegradation of polycyclic aromatic hydrocarbons (PAHs) and petrochemicals

Unit 6 : Evolution and Biodiversity

15

6.1: Evolution

6.1.1: Origin of life : Emergence of life on primitive earth

6.1.2: Evolution and adaptation :
Microevolution, Role of natural selection in microevolution, Coevolution.

6.1.3: Ecological niches and adaptation.

6.2: Biodiversity

6.2.1: Definitions, Biodiversity hotspots, Benefits of Biodiversity, Biodiversity Conservation, Biowealth of India.

6.2.2: Human activities affecting biodiversity.

6.2.3: Future of evolution.

----------X ----------X----------

Term wise distribution of portion:

Paper I	First Term	Second term
	Unit 1	Unit 4
	Unit 2	Unit 5
	Unit 3	Unit 6

Paper II	First Term	Second term
	Unit 1	Unit 4
	Unit 2	Unit 5
	Unit 3	Unit 6

PRACTICAL-I

1. **Levels of organization in animal kingdom**

A] Symmetry:
- i) Asymmetric organization: *Amoeba*
- ii) Radial symmetry: Sea anemone, *Aurelia*
- iii) Bilateral symmetry: Planaria / liver fluke

B] Acoelomate: T. S. of Planaria / liver fluke
C] Pseudocoelomate: T. S. *Ascaris*
D] Coelomate: T. S. Earthworm

E] Segmentation:
- i) Pseudosegmentation: Tapeworm
- ii) Metamerism: Earthworm
- iii) Specialization of body parts for division of labour: Head, thorax and abdomen-ex. Insec

F] Cephalization:
- i) Cockroach-Head
- ii) Prawn / crab -Cephalothorax

2. **Animal diversity**

Protozoa: *Amoeba, Paramoecium, Euglena, Plasmodium*
Porifera: *Leucosolenia*, bath sponge
Coelenterata: *Hydra, Obelia* colony, *Aurelia*, sea anemone and any one coral
Platyhelminthes: Planaria, liver fluke & tapeworm
Nemathelminthes: *Ascaris* male and female
Annelida: *Nereis*, earthworm and leech
Arthropoda: Crab, lobster, *Lepisma*, beetle, dragonfly, butterfly, moth, spider, centipede, millipede
Mollusca: *Chiton, Dentallium, Pila*, bivalve, *Sepia and Nautilus*
Echinodermata: Starfish, brittle star, sea urchin, sea cucumber, feather star
Hemichordata: *Balanoglossus*
Urochordata: *Herdmania*
Cephalochordata: *Amphioxus*
Cyclostomata: *Petromyzon /Myxine*
Pisces: Chondrichthyes: Shark, skates, sting ray/electric ray
Osteichthyes: Sciaena, flying fish
Amphibia: Frog, Toad, Caecilian, salamander
Reptilia: Chameleon, *Calotes*, turtle/ tortoise, snake, alligator/crocodile Aves: Kite, kingfisher, duck
Mammalia: Shrew, hedgehog, guinea pig, bat

3. Study of *Paramoecium* culture to observe food vacuole, contractile vacuole and ciliary movement.
4. Study of nutritional apparatus: *Amoeba*, L. S. *of Hydra*, Planaria, digestive system of cockroach and earthworm (both for demonstration only), wheel organ *of Amphioxus*, scroll valve of Shark, digestive system of Pigeon, ruminant stomach.
5. Detection of activity of digestive enzymes (invertase, amylase, protease, lipase) from the gut of cockroach
6. Study of effect of pH and temperature on amylase / trypsin activity.
7. Mounting of trachea and spiracles from cockroach, study of gills of fish, lung of frog and mammal, rate of oxygen consumption by cockroach (demonstration only)
8. Study of heart of cockroach, determination of the rate of heart beat in Daphnia, Study of whole mounts and L. S. of following hearts: Fish (2-chambered), Frog (3-chambered), Mammal (4-chambered).
9. Study of permanent slides of blood smear of Frog and mammal
Mounting of septal nephridium of earthworm, observation of sagital section of

mammalian kidney, permanent slide of T. S. of mammalian kidney, Bowman's capsule (under high power), Urine analysis for detection of normal and abnormal constituents. Detection of ammonia in the water excreted by live fish. Detection of uric acid from the excreta of bird or cockroach.

10. Study of irritability in *Paramoecium* by demonstration of release of trichocysts.
Study of mammalian brain (entire and sagital section with the help of specimen/ model), observation of T. S. of mammalian spinal cord.

11. Observation of permanent slides of: Sponge gemmule, Hydra budding, mammalian sperm, T. S. mammalian testis, T. S. mammalian ovary showing Graffian follicle, observation of hens egg with developing embryo at any stage of development

12. Study of animal interactions:
Commensalism- Hermit crab and sea anemone, *Echinus* and shark
Mutualism - Termite and *Trichomonympha*
Antibiosis - Effect of antibiotic on bacterial growth on a petri plate
Parasitism - Ectoparasite-head louse, bed bug
Endoparasite- *Trichinella spiralis*
Predation -. Praying mantis, spider

13. Determination of population density (*Daphnia* or any suitable organism) by sub-sampling method.

14. Mimicry: Leaf insect, stick insect, stick worm (caterpillar), Kallima butterfly, Monarch butterfly and common tiger butter fly (Danais)

PRACTICAL-II

1] Introduction to basic laboratory safety practices, precautions and safety rules. Handling of common laboratory equipment (instrument and glassware): Burner, autoclave, centrifuge, colorimeter, balance, homogenizer, electrophoresis apparatus. Study of microscope: Use, care and functions of its components.

2] Aseptic technique: Autoclaving and Packaging of test tubes, pipettes, petri plates, conical flask. Aseptic transfer of liquid between burners.

3] Paper chromatography for separation of amino acids.

4] Thin layer chromatography of lipids and adsorption chromatography using chalk to separate plant pigments or other pigments (food colours)

5] Qualitative tests for proteins, lipids and carbohydrates

6] Extraction and qualitative detection of nucleic acids:
DNA (SDS-NaCl extraction), RNA (phenol extraction)

7] Preparation of beads of calcium alginate for immobilization of enzyme amylase or yeast cells.

8] Assay of immobilized amylase or invertase from immobilized yeast cells by DNSA method (visual observation for comparative colour intensity in test tubes).

9] Demonstration of agarose gel electrophoresis for the separation of egg white proteins.

10] To demonstrate fermentation of grape juice/sugarcane juice or any fruit juice – (Detection of alcohol generated during fermentation by benzoic acid).

11] Effect of Papain (raw papaya extract) as a meat tenderizer

12] Identification through photographs: Methodology for transgenesis-
i) By microinjection into egg. ii) Transgenesis of embryonic stem cell
iii) Methodology for gene therapy for SCID or any human disease

13] Study of bacteria using Gram stain.

14] To evaluate the quality of milk by methylene blue reduction method

15] Study of evidences of evolution:
A] Analogy - Leg of grasshopper and leg of a mammal, wing of insect, wing of bird, wing of bat.

B] Homology- Fore limb of an amphibian / a reptilian, and wing of bird / bat. Any two fossils.

16] Human pedigree analysis: Dominant, recessive and X-linked characters.

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F.Y.B.Sc Zoology

Distribution of practicals for conduction of examinations

Practical I

40 Marks

Q.1. Major Experiment
[Enzyme activity / urine analysis] - 12 Marks

Q.2. Minor Experiment
a - Detection of ammonia/ Daphnia heart beat/ Protozoan food or contractile vacuole / estimation of population density - 07 Marks
b - Temporary mountings - 04 Marks
- 03 Marks

Q.3. Identification [8 specimens/ slides] - 16 Marks
[Any 8 specimens/ slides from 1,2,4,8,9,10,11,12,14]

Q.4. Journal and Field Book - 05 Marks

Practical II

40 Marks

Q.1. Major experiment [only one] - 14 Marks
[Qualitative tests /
Extraction and detection of Nucleic acids /
Human pedigree analysis]
OR

Q.1. Two experiments
a [mmobilization of enzyme - 06 Marks
b Activity of immobilized enzyme - 08 Marks

Q.2. Minor experiment [only one] - 09 Marks
[Chromatography – (Paper/TLC/adsorption) /
Gram staining / Evaluation of quality of milk]
OR

Q.2. Two minor experiments
a [Aseptic transfer of liquid/ Papain as meat tenderizer] - 05 Marks
b [Fermentation process – demonstration / Aseptic techniques] - 04 Marks

Q.3. Identification [6 specimens/ slides] - 12 Marks
[Any 6 specimens/ slides from 1, 9, 12,15]

Q.4. Journal - 05 Marks

Pattern of Question Paper for Theory and Practical Examinations of F.Y.B.Sc Zoology (with effect from academic year 2008-2009)

Each paper to be set for 90 marks of which students will attempt questions worth not more than 60 marks.
Each question to be set for 21 or 23 marks of which students to attempt worth 15.
Marks [15/21 + 15/23 + 15/23 = 60/90]

FIRST TERM : PAPER I & PAPER II 60 marks each

Q.1 Based on Units 1, 2 & 3
a] Three only, one mark each = 3 marks
b] Two out of three six marks each = 12 marks
Total 15 marks out of 21

Q.2 Based on Unit 1
a] Compulsory , of 3 marks = 3 marks
b] Any three out of five of four marks each = 12 marks
Total 15 marks out of 23

Q.3 Based on Unit 2
a] Compulsory , of 3 marks = 3 marks
b] Any three out of five of four marks each = 12 marks
Total 15 marks out of 23

Q.4 Based on Unit 3
a] Compulsory , of 3 marks = 3 marks
b] Any three out of five of four marks each = 12 marks
Total 15 marks out of 23

SECOND TERM : PAPER I & PAPER II 60 marks each

Q.1 Based on Units 4, 5 & 6
a] Three only, one mark each = 3 marks
b] Two out of three six marks each = 12 marks
Total 15 marks out of 21

Q.2 Based on Unit 4
a] Compulsory , of 3 marks = 3 marks
b] Any three out of five of four marks each = 12 marks
Total 15 marks out of 23

Q.3 Based on Unit 5
a] Compulsory , of 3 marks = 3 marks
b] Any three out of five of four marks each = 12 marks
Total 15 marks out of 23

Q.4 Based on Unit 6
a] Compulsory , of 3 marks = 3 marks
b] Any three out of five of four marks each = 12 marks
Total 15 marks out of 23

Format for practical examination based on Paper I and Paper II

- Practical examination will be conducted at the end of the year for 80 marks.
- There will be two practicals each of three hours duration.
- Each practical will be of 40 marks.

Distribution of Marks will be as follows:

Journal	Viva voce	Experiments	Total
10	-	70	80

Practical I

40 Marks

Q.1. Major Experiment	12 Marks
Q.2. Minor Experiment [a and b]	07 Marks
Q.3. Identification [8 specimens/ slides]	16 Marks
Q.4. Journal and Field Book	05 Marks

Practical II

40 Marks

Q.1. Major Experiment [only one OR a and b]	14 Marks
Q.2. Two experiments [only one or a and b]	09 Marks
Q.3. Identification [6 specimens/ slides]	12 Marks
Q.4. Journal	05 Marks

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