MODIFIED CBCS CURRICULUM OF

ZOOLOGY HONOURS PROGRAMME

SUBJECT CODE = 57

FOR UNDER GRADUATE COURSES UNDER RANCHI UNIVERSITY

Implemented from
Academic Session 2017-2020

Members of Board of Studies of CBCS Under- Graduate Syllabus as per Guidelines of the Ranchi University, Ranchi.

1. **Chairman –**

   Prof. Ashok Kumar Choudhary
   University Professor & Head,
   University Department of Botany, Ranchi University, Ranchi

2. **Members-**

   i. **Dr. Anjani Kumar Srivastava**
   University Professor,
   University Department of Botany, Ranchi University, Ranchi

   ii. **Prof. Jyoti Kumar**
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   iii. **Prof. Hanuman Prasad Sharma**
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   iv. **Dr. Mrs. Latika Saran**
   Associate Professor,
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   v. **Dr. Anil Kumar**
   Assistant Professor,
   University Department of Botany, Ranchi University, Ranchi

   vi. **Dr. Radha Krishna Jha**
   Assistant Professor,
   University Department of Botany, Ranchi University, Ranchi

   vii. **Dr. Mrs. Smrity Prabha**
   Assistant Professor,
   University Department of Botany, Ranchi University, Ranchi

   viii. **Mrs. Ladly Rani**
   Assistant Professor,
   University Department of Botany, Ranchi University, Ranchi

3. **Spl. Invitee :-**

   i. **Dr. Jaikant Prasad Singh**
   Assistant Professor,
   Department of Botany, R.L.S.Y. College, Ranchi

Director Computer Centre
Kindly notify the
Syllabus in RU Website

Professor & Head
Univ. Dept. of Botany
RANCHI UNIVERSITY, RANCHI

Contents

COURSE STUCTURE FOR UNDERGRADUATE **'HONOURS'** PROGRAMME

Table AI-1: Distribution of 140 Credits [*wherever there is a practical there will be no tutorial and vice –versa.]

Course	Papers	Credits Theory + Practical	Credits Theory + Tutorial
I. Core Course	**(CC 1 to 14)**		
Theory	14 Papers	14X4=56	14X5=70
Practical/Tutorial*	14 Papers	14X2=28	14X1=14
II. Elective Course (EC)			
A. Discipline Specific Elective	**(DSE 1 to 4)**		
Theory	4 Papers	4X4=16	4X5=20
Practical/ Tutorial*	4 Papers	4X2=8	4X1=4
B. Generic Elective/ Interdisciplinary	**(GE 1 to 4)**		
Theory	4 Papers	4X4=16	4X5=20
Practical/ Tutorial*	4 papers	4X2=8	4X1=4
III. Ability Enhancement Compulsory Courses (AECC)			
1. English/ Hindi Communication/ NH+MB/ Business Communication for Commerce	1 Paper	1X2=2	1X2=2
2. Environmental Science	1 Paper	1x2=2	1x2=2
3. Skill Enhancement Course of the Core Course opted	**(SEC 1 & 2)** 2 Papers	2X2=4	2X2=4
	Total Credit = 140		**= 140**

Table AI-1.1: Course structure for B.Sc./ B.A./ B.Com.(Hons. Programme)

Semester	Honours (Core Courses) 14 Papers	Allied (Elective Courses) 8 Papers	Ability Enhancement (Compulsory Courses) 4 Papers	Total Credits
Sem-I	C-1, C-2 (6+6=12 Credits)	GE-1 (06 Credits)	Eng Comm./ Hindi/ NH + MB (02 Credits)	**20 Credits**
Sem-II	C-3, C-4 (6+6=12 Credits)	GE-2 (06 Credits)	EVS (02 Credits)	**20 Credits**
Sem-III	C-5, C-6, C-7 (6+6+6=18 Credits)	GE-3 (06 Credits)	SEC-1 (02 Credits)	**26 Credits**
Sem-IV	C-8, C-9, C-10 (6+6+6=18 Credits)	GE-4 (06 Credits)	SEC-2 (02 Credits)	**26 Credits**
Sem-V	C-11, C-12 (6+6=12 Credits)	DSE-1, DSE-2 (6+6=12 Credits)		**24 Credits**
Sem-VI	C-13, C-14 (6+6=12 Credits)	DSE-3, DSE-4 (6+6=12 Credits)		**24Credits**

Total = 140 Credits

COURSES OF STUDY FOR UNDERGRADUATE **'B. Sc. Hons'** PROGRAMME

Table AI-2 Subject Combinations allowed for B. Sc. Hons. Programme (140 Credits)

Honours/Core Subject **CC 14 Papers**	Discipline Specific Elective Subject **DSES 4 Papers**	Skill Enhancement Course **SEC 2 Papers**	Compulsory Course **AECC 1+1=2 Papers**
Zoology	Zoology Specific	SEC in Zoology	Language Communication + EVS

Table AI-2.1 Semester wise Examination Structure for Mid Sem & End Sem Examinations:

Sem	Core Honours, Allied DSE, Compulsory AECC Courses		Examination Structure		
	Code	**Papers**	**Mid Semester Theory (F.M.)**	**End Semester Theory (F.M.)**	**End Semester Practical/ Viva (F.M.)**
I	C1	Non Chordates I **+Lab**	15	60	50
	C2	Ecology **+Lab**	15	60	
	GE1	Refer Table AI-2.3 of the Syllabus of Subject opted			
	AECC	Language Communication		100	
II	C3	Non-Chordates II **+Lab**	15	60	50
	C4	Cell Biology **+Lab**	15	60	
	GE2	Refer Table AI-2.3 of the Syllabus of Subject opted			
	AECC	EVS		100	
III	C5	Chordates **+Lab**	15	60	75
	C6	Physiology **+Lab**	15	60	
	C7	Biochemistry **+Lab**	15	60	
	GE3	Refer Table AI-2.3 of the Syllabus of Subject opted			
	SEC 1	Elementary Computer Application Software **+Lab**		100	
IV	C8	Vertebrate Anatomy **+Lab**	15	60	75
	C9	Physiology **+Lab**	15	60	
	C10	Metabolism **+Lab**	15	60	
	GE4	Refer Table AI-2.3 of the Syllabus of Subject opted			
	SEC 2	Sericulture **+T**		100	
V	C11	Molecular Biology **+Lab**	15	60	50
	C12	Genetics **+Lab**	15	60	
	DSE 1	Biology of Insecta **+Lab**	15	60	50
	DSE 2	Endocrinology **+Lab**	15	60	
VI	C13	Developmental Biology **+Lab**	15	60	50
	C14	Evolution **+Lab**	15	60	
	DSE 3	Fish & Fisheries **+Lab**	15	60	50

	DSE 4	Immunology +**Lab**	15	60	

Table AI-2.2 Generic Subject Papers for B. Sc. Hons. Programme (140 Credits);

<u>All Four Papers of Any One Subject</u> to be opted leaving aside the papers of Hons. Subject:

Generic Elective Subject **GE 4 Papers**	Generic Elective Courses for Arts Stream (GE will be other than Core Subject opted			
	Semester I **GE1**	Semester II **GE2**	Semester III **GE3**	Semester IV **GE4**
Chemistry	Atomic Structure, Bonding, General Org Chem & Aliphatic Hydrocarbons +**Lab**	Chemical Energetics, Equilibria & Functional Gp Org Chemistry-I +**Lab**	Chem. of s- and p-block elements, States of matter and Chem. Kinetics +**Lab**	Chem. of d-block elements, Molecules of Life +**Lab**
Botany	Biodiversity +**Lab**	Plant Ecology & Taxonomy +**Lab**	Plant Anatomy & Embryology +**Lab**	Plant Physiology & Metabolism +**Lab**
Geology	Essentials of Geology +**Lab**	Rocks & Minerals +**Lab**	Fossils & their Applications +**Lab**	Earth Resources +**Lab**

Table AI-2.3 Semester wise Structure for End Sem Examinations of Generic Elective in Zoology:

Sem	**Core Honours, Allied DSE, Compulsory AECC Courses**		**Examination Structure**		
	Code	**Papers**	**Mid Semester Theory (F.M.)**	**End Semester Theory (F.M.)**	**End Semester Practical/ Viva (F.M.)**
I	GE1	Animal Diversity +**Lab**		75	25
II	GE2	Human Physiology +**Lab**		75	25
III	GE3	Food, Nutrition & Health +**Lab**		75	25
IV	GE4	Environment & Public Health +**Lab**		75	25

SEMESTER I **4 Papers**

Total 100 x 4 = 400 Marks

I. ABILITY ENHANCEMENT COMPULSORY COURSE (AECC)

(Credits: Theory-02)

Any One Compulsory Language Communication Prescribed by Ranchi University:
English Communication/ Hindi Communication / NH + MB Communication
(Refer AECC Curriculum of Ranchi University)

II. GENERIC ELECTIVE (GE 1)

(Credits: Theory-04, Practicals-02)

All Four Papers (One paper to be studied in each semester) of any One Subject to be opted other than the Honours Subject. Refer Content from the Syllabus of Opted Generic Elective Subject.

III. CORE COURSE –C 1:

(Credits: Theory-04, Practicals-02)

Marks : 15 (MSE: 1Hr) + 60 (ESE: 3Hrs) + 25 (Pr 3Hrs)=100	**Pass Marks: Th (MSE +ESE) = 30 + Pr ESE =10**

Instruction to Question Setter for
Mid Semester Examination (MSE):

*There will be **two** group of questions. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type** three questions of five marks each, out of which any two are to answer.*

End Semester Examination (ESE):

*There will be **two** group of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** five questions of fifteen marks each, out of which any three are to answer.*
***Note:** There may be subdivisions in each question asked in Theory Examinations.*

NON CHORDATES - I

PROTISTA TO PSEUDOCOELOMATES **Theory: 60 Lectures**

Unit 1: Kingdom Protista, Parazoa and Metazoa

General characteristics and classification up to classes; Study of *Euglena, Amoeba* and *Paramecium*; Life cycle, pathogenicity of *Plasmodium vivax* and *Entamoeba histolytica;* Locomotion and Reproduction in Protista; Evolution of symmetry and segmentation of Metazoa.

Unit 2: Phylum Porifera

General characteristics and classification up to classes; Canal system in sponges

Unit 3: Phylum Cnidaria

General characteristics and classification up to classes; Metagenesis in *Obelia*; Polymorphism in Cnidaria; Corals and coral reefs

Unit 4: Phylum Ctenophora

General characteristics and evolutionary significance

Unit 5: Phylum Platyhelminthes

General characteristics and classification up to classes; Life cycle, pathogenicity of *Taenia solium* and *Fasciola hepatica.*

Unit 6: Phylum Nemathelminthes

General characteristics and classification up to classes; Life cycle, pathogenicity of *Ascaris lumbricoides* and *Wuchereria bancrofti;* Parasitic adaptations in helminths

Note: Classification to be followed from "Barnes, R.D. (1982). *Invertebrate Zoology*, V Edition"

ZOOLOGY PRACTICAL- C 1 LAB **60 Lectures**

Kingdom Protista

1. Study of whole mount of *Euglena, Amoeba* and *Paramecium;* Binary fission and Conjugation in *Paramecium.*
2. Examination of pond water collected from different places for diversity in Protista.

Phylum Porifera

3. Study of *Sycon* (including T.S. and L.S.), *Hyalonema, Euplectella* and *Spongilla.*

Phylum Cnidaria

4. Study of *Obelia, Physalia, Millepora, Aurelia, Tubipora, Corallium, Alcyonium, Gorgonia, Metridium, Pennatula, Fungia, Meandrina and Madrepora.*

Phylum Ctenophora

5. Any one specimen/slide

Phylum Platyhelminthes

6. Study of adult *Fasciola hepatica, Taenia solium* and their life cycles (Slides/micro-photographs)

Phylum Nemathelminthes

7. Study of adult *Ascaris lumbricoides* and their life stages (Slides/micro-photographs)
8. To submit a project report on any related topic on life cycles/corals/coral reefs.

Note: Classification to be followed from "Barnes, R.D. (1982). *Invertebrate Zoology*, V Edition,"

Suggested Readings:

- Barnes, R.D. (1982). *Invertebrate Zoology*, V Edition. Holt Saunders International Edition.
- Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). *The Invertebrates: A New Synthesis,* III Edition, Blackwell Science
- Barrington, E.J.W. (1979). *Invertebrate Structure and Functions*. II Edition, E.L.B.S. and Nelson
- Boradale, L.A. and Potts, E.A. (1961). *Invertebrates: A Manual for the use of Students.* Asia Publishing Home.
- Singh, S. Keshari S. and Abhishek, K.S. (2016). *Medical Zoology and Parasitology*, Jharkhand Jharokha, Classical Publishing Company.

IV. CORE COURSE- C 2: (Credits: Theory-04, Practicals-02)

Marks : 15 (MSE: 1Hr) + 60 (ESE: 3Hrs) + 25 (Pr 3Hrs)=100	Pass Marks: Th (MSE +ESE) = 30 + Pr ESE =10

Instruction to Question Setter for
Mid Semester Examination (MSE):

*There will be **two** group of questions. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type** three questions of five marks each, out of which any two are to answer.*

End Semester Examination (ESE):

*There will be **two** group of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** five questions of fifteen marks each, out of which any three are to answer.*

***Note:** There may be subdivisions in each question asked in Theory Examinations.*

ECOLOGY **Theory: 60 Lectures**

Unit 1: Introduction to Ecology
History of ecology, Autecology and synecology, levels of organization, Laws of limiting factors, Study of physical factors.

Unit 2: Population
Unitary and Modular populations, Unique and group attributes of population: Density, natality, mortality, life tables, fecundity tables, survivorship curves, age ratio, sex ratio, dispersal and dispersion; Exponential and logistic growth, equation and patterns, r and K strategies, Population regulation - density-dependent and independent factors; Population interactions, Gause's Principle with laboratory and field examples, Lotka-Volterra equation for competition and Predation, functional and numerical responses

Unit 3: Community
Community characteristics: species richness, dominance, diversity, abundance, vertical stratification; Ecotone and edge effect; Ecological succession with one example; Theories pertaining to climax community.

Unit 4: Ecosystem
Types of ecosystem with one example in detail, Food chain, Detritus and grazing food chains, Linear and Y-shaped food chains, Food web, Energy flow through the ecosystem, Ecological pyramids and Ecological efficiencies. Nutrient and biogeochemical cycle with one example of Nitrogen cycle or carbon cycle. Human modified ecosystem.

Unit 5: Applied Ecology
Ecology in wildlife conservation and management.

ZOOLOGY PRACTICAL-C 2 LAB **60 Lectures**

1. Study of life tables and plotting of survivorship curves of different types from the hypothetical/real data provided'
2. Determination of population density in a natural/hypothetical community by quadrate method and calculation of Shannon-Weiner diversity index for the same community.
3. Study of an aquatic ecosystem: phytoplankton and zooplankton; Measurement of area, temperature, turbidity/penetration of light, determination of pH, and Dissolved Oxygen content (Winkler's method), Biological Oxygen Demand, Chemical Oxygen Demand and free CO_2.
4. Report on a visit to National Park/Biodiversity Park/Wild life sanctuary

Suggested Readings:

- Colinvaux, P. A. (1993). *Ecology.* II Edition. Wiley, John and Sons, Inc.
- Krebs, C. J. (2001). *Ecology.* VI Edition. Benjamin Cummings.
- Mukherjee, B.2012. Fundamentals of Environmental Biology. Silverline Publications, Allahabad.
- Odum, E.P., (2008). *Fundamentals of Ecology*. Indian Edition. Brooks/Cole
- Robert Leo Smith Ecology and field biology Harper and Row publisher.
- Ricklefs, R.E., (2000). Ecology. V Edition. Chiron Press.

SEMESTER II 4 Papers

Total 100 x 4 = 400 Marks

I. ABILITY ENHANCEMENT COMPULSORY COURSE (AECC)

(Credits: Theory-02)

Marks : 100 (ESE: 3Hrs) =100	**Pass Marks Th ESE = 40**

Instruction to Question Setter for

End Semester Examination (ESE):

*There will be **objective type test** consisting of hundred questions of 1 mark each. Examinees are required to mark their answer on **OMR Sheet** provided by the University.*

AECC – ENVIRONMENT STUDIES **Theory: 30 Lectures**

Unit 1 : Introduction to environmental studies

Multidisciplinary nature of environmental studies;
Scope and importance; Concept of sustainability and sustainable development.

(2 lectures)

Unit 2 : Ecosystems

What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession. Case studies of the following ecosystems :

Forest ecosystem
Grassland ecosystem
Desert ecosystem
Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

(2 lectures)

Unit 3 : Natural Resources : Renewable and Non--renewable Resources

Land resources and landuse change; Land degradation, soil erosion and desertification.
Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.
Water : Use and over--exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter--state).
Energy resources : Renewable and non renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

(5 lectures)

Unit 4 : Biodiversity and Conservation

Levels of biological diversity : genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots
India as a mega--biodiversity nation; Endangered and endemic species of India
Threats to biodiversity : Habitat loss, poaching of wildlife, man--wildlife conflicts, biological invasions; Conservation of biodiversity : In--situ and Ex--situ conservation of biodiversity.

Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

(5 lectures)

Unit 5 : Environmental Pollution

Environmental pollution : types, causes, effects and controls; Air, water, soil and noise pollution

Nuclear hazards and human health risks

Solid waste management : Control measures of urban and industrial waste.

Pollution case studies.

(5 lectures)

Unit 6 : Environmental Policies & Practices

Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture

Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD).

Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.

(4 lectures)

Unit 7 : Human Communities and the Environment

Human population growth: Impacts on environment, human health and welfare.

Resettlement and rehabilitation of project affected persons; case studies.

Disaster management : floods, earthquake, cyclones and landslides.

Environmental movements : Chipko, Silent valley, Bishnois of Rajasthan.

Environmental ethics: Role of Indian and other religions and cultures in environmental conservation.

Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

(3 lectures)

Unit 8 : Field work

Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc.

Visit to a local polluted site--Urban/Rural/Industrial/Agricultural.

Study of common plants, insects, birds and basic principles of identification.

Study of simple ecosystems--pond, river, Delhi Ridge, etc.

(Equal to 4 lectures)

Suggested Readings:

- Raziuddin, M.., Mishra P.K. 2014, *A Handbook of Environmental Studies*, Akanaksha Publications, Ranchi.
- Mukherjee, B. 2011: *Fundamentals of Environmental Biology*.Silverline Publications, Allahabad.
- Carson, R. 2002. *Silent Spring*. Houghton Mifflin Harcourt.
- Gadgil, M., & Guha, R.1993. *This Fissured Land: An Ecological History of India*. Univ. of California Press.
- Gleeson, B. and Low, N. (eds.) 1999.*Global Ethics and Environment*, London, Routledge.
- Gleick, P. H. 1993. *Water in Crisis*. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
- Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll.*Principles of Conservation Biology*. Sunderland: Sinauer Associates, 2006.
- Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. *Science*, 339: 36---37.
- McCully, P. 1996. *Rivers no more: the environmental effects of dams*(pp. 29---64). Zed Books.
- McNeill, John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century.
- Odum, E.P., Odum, H.T. & Andrews, J. 1971.*Fundamentals of Ecology*. Philadelphia: Saunders.
- Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2011. Environmental and Pollution Science. Academic Press.
- Rao, M.N. & Datta, A.K. 1987. *Waste Water Treatment*. Oxford and IBH Publishing Co. Pvt. Ltd.
- Raven, P.H., Hassenzahl, D.M. & Berg, L.R. 2012.*Environment*. 8th edition. John Wiley & Sons.
- Rosencranz, A., Divan, S., & Noble, M. L. 2001. *Environmental law and policy in India*. *Tripathi 1992*.
- Sengupta, R. 2003. *Ecology and economics*: An approach to sustainable development. OUP.
- Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi.
- Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. *Conservation Biology*: *Voices from the Tropics*. John Wiley & Sons.
- Thapar, V. 1998. *Land of the Tiger*: *A Natural History of the Indian Subcontinent*.
- Warren, C. E. 1971. *Biology and Water Pollution Control*. WB Saunders.
- Wilson, E. O. 2006.*The Creation: An appeal to save life on earth*. New York: Norton.
- World Commission on Environment and Development. 1987. *Our Common Future*. Oxford University

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II. GENERIC ELECTIVE (GE 2): (Credits: Theory-04, Practicals-02)

All Four Papers (One paper to be studied in each semester) of any One Subject to be opted other than the Honours Subject. Refer Content from the Syllabus of Opted Generic Elective Subject.

III. CORE COURSE -C 3: (Credits: Theory-04, Practicals-02)

Marks : 15 (MSE: 1Hr) + 60 (ESE: 3Hrs) + 25 (Pr 3Hrs)=100	Pass Marks: Th (MSE +ESE) = 30 + Pr ESE =10

Instruction to Question Setter for

Mid Semester Examination (MSE):

*There will be **two** group of questions. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type** three questions of five marks each, out of which any two are to answer.*

End Semester Examination (ESE):

*There will be **two** group of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** five questions of fifteen marks each, out of which any three are to answer.*

***Note:** There may be subdivisions in each question asked in Theory Examinations.*

NON-CHORDATES - II **Theory: 60 Lectures**

COELOMATES

Unit 1: Introduction to Coelomates

Evolution of coelom and metamerism.

Unit 2: Phylum Annelida

General characteristics and classification up to classes; Excretion in Annelida

Unit 3: Phylum Arthropoda

General characteristics and classification up to classes; Vision in Arthropoda; Metamorphosis in Insects; Social life in insects (bees and termites)

Unit 4: Phylum Onychophora

General characteristics and evolutionary significance

Unit 5: Phylum Mollusca

General characteristics and classification up to classes; Respiration in Mollusca; Torsion and detorsion in Gastropoda; Pearl formation in bivalves; Evolutionary significance of trochophore larva

Unit 6: Phylum Echinodermata

General characteristics and classification up to classes; Water-vascular system in Asteroidea; Larval forms in Echinodermata; Evolutionary significance (Affinities with Chordates)

Note: Classification to be followed from "Barnes, R.D. (1982). *Invertebrate Zoology*, V Edition, Holt Saunders International Edition"

ZOOLOGY PRACTICAL-C 3 LAB 60 Lectures

Phylum Annelida

1. Study of the following specimens: *Aphrodite, Nereis, Heteronereis, Sabella, Serpula, Chaetopterus, Pheretima, Hirudinaria*
2. T.S. through pharynx, gizzard, and typhlosolar intestine of earthworm.
3. Study of digestive system, septal nephridia and pharyngeal nephridia of earthworm.

Phylum Arthropoda

4. Study of the following specimens: *Limulus*, *Palamnaeus, Palaemon, Daphnia*, *Balanus*, *Sacculina, Cancer*, *Eupagurus*, *Scolopendra*, *Bombyx*, *Periplaneta,* termite and honeybees.
5. Mount of mouth parts and dissection of digestive system and nervous system of *Periplaneta*.

Phylum Onychophora

6. Study of the specimen: Peripatus.

Phylum Mollusca

7. Study of the following specimen: Chiton, Dentalium, Pila, Doris, Helix, Unio, Ostrea Pinctada, Sepia, Octopus and Nautilus

Phylum Echinodermata

8. Study of the following specimen: Pentaceros/Asterias, Ophiura, Clypeaster, Echinus, Cucumaria and Antedon.

9. To submit a Project report on any related topic to larval forms (crustacean, mollucs and echinoderms).

Note: Classification to be followed from "Barnes, R.D. (1982). Invertebrate Zoology, V Edition, Holt Saunders International Edition"

Suggested Readings:

- Barnes, R.D. (1982). Invertebrate Zoology, V Edition. Holt Saunders International Edition.
- Barnes, R.S.K., Calow, P., Olive, P. J. W., Golding, D.W. and Spicer, J.I. (2002). The Invertebrates: A New Synthesis, III Edition, Blackwell Science
- Barrington, E.J.W. (1979). Invertebrate Structure and Functions. II Edition, E.L.B.S. and Nelson

Boradale, L.A. and Potts, E.A. (1961). Invertebrates: A Manual for the use of Students. Asia Publishing Home

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IV. CORE COURSE -C 4: (Credits: Theory-04, Practicals-02)

Marks : 15 (MSE: 1Hr) + 60 (ESE: 3Hrs) + 25 (Pr 3Hrs)=100	Pass Marks: Th (MSE +ESE) = 30 + Pr ESE =10

Instruction to Question Setter for

Mid Semester Examination (MSE):

*There will be **two** group of questions. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type** three questions of five marks each, out of which any two are to answer.*

End Semester Examination (ESE):

*There will be **two** group of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** five questions of fifteen marks each, out of which any three are to answer.*

***Note:** There may be subdivisions in each question asked in Theory Examinations.*

CELL BIOLOGY **Theory: 60 Lectures**

Unit 1: Overview of Cells
Prokaryotic and Eukaryotic cells, Virus, Viroids, Mycoplasma, Prions.

Unit 2: Plasma Membrane
Various models of plasma membrane structure; Transport across membranes: active and passive transport, facilitated transport; Cell junctions: Occluding junctions (Tight junctions), anchoring junctions (desmosomes) and communicating junctions (gap junctions).

Unit 3: Endomembrane System
Structure and functions: The Endoplasmic Reticulum, Golgi apparatus and Lysosomes**.**

Unit 4: Mitochondria and Peroxisomes
Structure of mitochondria, Semi- autonomous nature of mitochondria, endosymbiotic hypothesis, Mitochondrial Respiratory Chain, Chemi-osmotic hypothesis, Peroxisomes

Unit 5: Cytoskeleton
Structure and functions of microtubules, microfilaments and intermediate filaments.

Unit 6: Nucleus
Ultra-structure of nucleus, Nuclear Envelope, Nuclear pore complex and Nucleolus; Chromatin: Euchromatin and Heterochromatin, packaging (nucleosome).

Unit 7: Cell Division
Meiosis, Mitosis, Cell cycle and its Regulation.

Unit 8: Cell Signaling
GPCR and role of Second Messenger (cAMP).

ZOOLOGY PRACTICAL- C 4 LAB **60 Lectures**

1. Preparation of temporary stained squash of onion root tip to study various stages of mitosis.
2. Study various stages of meiosis from permanent slides.
3. Preparation of permanent slide to show the presence of Barr body in human female blood cells/cheek cells.
4. Preparation of permanent slide to demonstrate:
   i. DNA by Feulgen reaction
   ii. DNA and RNA by MGP
   iii. Mucopolysaccharides by PAS reaction
   iv. Proteins by Mercurobromophenol blue/Fast Green.

Suggested Readings:

- Karp, G. (2010). Cell and Molecular Biology: Concepts and Experiments. VI Edition.
- John Wiley and Sons. Inc.
- De Robertis, E.D.P. and De Robertis, E.M.F. (2006). Cell and Molecular Biology. VIII Edition. Lippincott Williams and Wilkins, Philadelphia.
- Cooper, G.M. and Hausman, R.E. (2009). The Cell: A Molecular Approach. V Edition.
- ASM Press and Sunderland, Washington, D.C.; Sinauer Associates, MA.
- Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. (2009). The World of the
- Cell. VII Edition. Pearson Benjamin Cummings Publishing, San Francisco.
- Bruce Albert, Bray Dennis, Levis Julian, Raff Martin, Roberts Keith and Watson James (2008). Molecular Biology of the Cell, V Edition, Garland publishing Inc., New York and London.

SEMESTER III 5 Papers

Total 100 x 5 = 500 Marks

I. SKILL ENHANCEMENT COURSE SEC 1: (Credits: Theory-02)

Marks : 100 (ESE: 3Hrs) =100	**Pass Marks Th ESE = 40**

Instruction to Question Setter for

End Semester Examination (ESE):

*There will be **objective type test** consisting of hundred questions of 1 mark each. Students are required to mark their answer on **OMR Sheet** provided by the University.*

ELEMENTARY COMPUTER APPLICATION SOFTWARES:

A Common Syllabus Prescribed by Ranchi University **Theory: 30 Lectures**

Objective of the Course

The objective of the course is to generate qualified manpower in the area of Information Technology (IT) and Graphic designing which will enable such person to work seamlessly at any Offices, whether Govt. or Private or for future entrepreneurs in the field of IT.

A. INTRODUCTION TO COMPUTER SYSTEM

Basic Computer Concept

Computer Appreciation - Characteristics of Computers, Input, Output, Storage units, CPU, Computer System. **(1 Lecture)**

Input and Output Devices

Input Devices - Keyboard, Mouse, joystick, Scanner, web cam,

Output Devices- Soft copy devices, monitors, projectors, speakers, Hard copy devices, Printers – Dot matrix, inkjet, laser, Plotters. **(4 lectures)**

Computer Memory and Processors

Memory hierarchy, Processor registers, Cache memory, Primary memory- RAM, ROM, Secondary storage devices, Magnetic tapes, Floppy disks, hard disks, Optical Drives- CD-ROM, DVD-ROM, CD-R, CD-RW, USB Flash drive, Mass storage devices: USB thumb drive. Managing disk Partitions, File System. Basic Processor Architecture, Processor speed, Types of processor.

(5 lectures)

Numbers Systems and Logic Gates

Decimal number system, Binary number system, Octal number system, Hexadecimal number system, Inter-conversion between the number systems. Basic Logic gates-AND, OR, NOT, Universal logic gates- NAND, NOR

(3 lectures)

Computer Software

Computer Software- Relationship between Hardware and Software, System Software, Application Software, Compiler, Names of some high level languages, Free domain software.

(2 Lectures)

Internet & its uses

History of Internet, WWW and Web Browsers: Web Browsing software, Surfing the Internet, Chatting on Internet, Basic of electronic mail, Using Emails, Document handling, Network definition, Common terminologies: LAN, WAN, MAN, Node, Host, Workstation, Bandwidth, Network Components: Severs, Clients, Communication Media. Wireless network

(3 Lectures)

Operating system-Windows

Operating system and basics of Windows, The User Interface, Using Mouse and Moving Icons on the screen, The My Computer Icon, The Recycle Bin, Status Bar, Start and Menu & Menu-selection, Running an Application, Windows Explorer Viewing of File, Folders and Directories, Creating and Renaming of files and folders, Opening and closing of different Windows, Windows Setting, Control Panels, Wall paper and Screen Savers, Setting the date and Sound, Concept of menu Using Help, Advanced Windows, Using right Button of the Mouse, Creating Short cuts, Basics of Window Setup, Notepad, Window Accessories

(2 Lectures)

B. MICROSOFT OFFICE 2007 AND LATEST VERSIONS

Word Processing

Word processing concepts: saving, closing, Opening an existing document, Selecting text, Editing text, Finding and replacing text, printing documents, Creating and Printing Merged Documents, Character and Paragraph Formatting, Page Design and Layout. Editing and Checking. Correcting spellings. Handling Graphics, Creating Tables and Charts, Document Templates and Wizards, Mail merge and Macros.

(3 Lectures)

Microsoft Excel (Spreadsheet)

Spreadsheet Concepts, Creating, Saving and Editing a Workbook, Inserting, Deleting Work Sheets, entering data in a cell / formula Copying and Moving from selected cells, handling operators in Formulae, Functions: Mathematical, Logical, statistical, text, financial, Date and Time functions, Using Function Wizard. Formatting a Worksheet: Formatting Cells changing data alignment, changing date, number, character or currency format, changing font, adding borders and colors, Printing worksheets, Charts and Graphs – Creating, Previewing, Modifying Charts. Integrating word processor, spread sheets, web pages. Pivot table, goal seek, Data filter and scenario manager

(4 Lectures)

Microsoft Power Point (Presentation Package)

Creating, Opening and Saving Presentations, Creating the Look of Your Presentation, Working in Different Views, Working with Slides, Adding and Formatting Text, Formatting Paragraphs, Drawing and Working with Objects, Adding Clip Art and other pictures, Designing Slide Shows, Running and Controlling a Slide Show, Printing Presentations. Creating photo album, Rehearse timing and record narration. Master slides. **(3 Lectures)**

Suggested Readings:

- Nishit Mathur, Fundamentals of Computer , Aph publishing corporation(2010)
- Misty E. Vermaat,.Microsoft word 2013 1st Edition (2013).
- Satish Jain, M.Geeta, MS- Office 2010 Training Guide, BPB publication (2010)
- Joan Preppernau, Microsoft PowerPoint 2016 step by step, Microsoft press(2015)
- Douglas E Corner, The Internet Book 4th Edition, prentice –Hall(2009)
- Faithe wempen, word 2016 in depth 1st edition, que publishing(2015)
- Steven welkler, Office 2016 for beginners, Create Space Independent publishing Plateform (2016)

SKILL ENHANCEMENT LAB- SEC 1 LAB

A. MS-WORD LAB ASSIGNMENT

1. Write down the following Paragraph OR any one provided by your teacher;

Without a doubt, the Internet is one of the most important inventions of modern times. The Internet is a global interconnected computer networks which allow each connected computer to share and exchange information with each other. The origins of the Internet can be traced to the creation of Advanced Research Projects Agency Network (ARPANET) as a network of computers under the auspices of the U.S. Department of Defense in 1969.

Apply following effects on The paragraph:

i. Paragraph **font-size** and **font-type** must be 12 Verdana.
ii. Paragraph **alignment** must be justified and double line spacing.
iii. **Highlight** the "(ARPANET)" with green color.
iv. Make the "Internet" keywords **Bold and Italic**.
v. Insert any "**WordArt**" and a **symbol** to your document.
vi. Insert a **clipart** to your document.
vii. Add following lines to your document:

Internet, Intranet, Extranet, URL, WWW, Networking, Protocols, HTTP, TCP/IP

2. Create a Table of following fields:

Name, Surname, Age, Gender, Job and apply the following effects

i. Insert 10 records
ii. Font size should be 12
iii. Title size should be 14
iv. Font type should be Times new Roman
v. Title color should be blue
vi. Text color should be black
vii. Table border should be 2

3. Write a letter on 'Road Safety' and send to 'Multiple Recipients' using mail merge.

4. Type the paragraph given below:

Today, the Internet is a public, cooperative and self-sustaining facility accessible to hundreds of millions of people worldwide. Physically, the Internet uses a portion of the total resources of the currently existing public telecommunication networks. Technically, what distinguishes the Internet is its use of a set of protocols called TCP/IP (for Transmission Control Protocol/Internet Protocol). Two recent adaptations of Internet technology, the intranet and the extranet, also make use of the TCP/IP protocol. Today, the Internet is a public, cooperative and self-sustaining facility accessible to hundreds of millions of people worldwide. Physically, the Internet uses a portion of the total resources of the currently existing public telecommunication networks. Technically, what distinguishes the Internet is its use of a set of protocols called TCP/IP (for Transmission Control Protocol/ Internet Protocol). Two recent adaptations of Internet technology, the intranet and the extranet, also make use of the TCP/IP protocol.

Apply the following:

i. Change Internet into Internets at a time
ii. Heilight TCP/IP in red color
iii. Replace protocol into protocols
iv. Find the word "Public"

B. MICROSOFT EXCEL LAB ASSİGNMENT

Basic Formatting and Spreadsheet Manipulation

1. Add rows and columns to an existing spreadsheet
2. Reformat data (center, comma and currency styles, bold, text color)
3. Work with a simple formula (product) and function (sum)

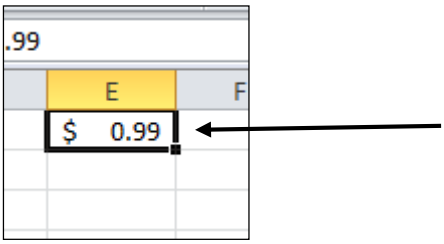
Assignment

1. Create a workbook as shown below.
2. To enter new rows or columns, simply click on the row or column header to select the whole row or column. Then right click with the mouse and choose insert.
3. Add the new row for S Spade with the data that's shown below (between the original rows 7 and 8).
4. Add a column for gender and the data as shown below (between the original columns A and B). Enter the appropriate gender for yourself in the last row.

A	B	C	D
Name	**Male/Female**	**Genre**	**Number of Songs**
J Smith	F	Blues	50
B Doe	M	Country	110
S Spade	F	Country	200
F Zappa	M	Blues	1400
F Zappa	M	Alternative	2300
J Smith	F	Alternative	150
S Spade	F	Blues	1000
B Doe	M	Blues	75
yourname	M	Blues	800

5. Center the data in columns B and C. Do this by selecting the whole column and click the center icon on the ribbon.
6. Bold the data in row 1, the column headings (ensure that the data all remains visible within the column boundaries).
7. Change the font color for row 1 to Blue.
8. Change the format of the data in column D to comma style (no decimal places showing).There is an icon on the home tab that sets it to comma style easily.
9. Add two new column labels to the right of the current columns; **Unit Price** and **Total Cost**. (They will be in columns E and F.) These two columns of data should be currency type so that the dollar sign is shown. There is an icon to quickly format the selected column as currency type.
10. All tunes are $.99, so enter that value for all rows in Column E. You can copy quickly by using the **Auto Fill** handle and drag that amount down. When you over your mouse over the tiny square in

the bottom right hand corner of the active cell, your mouse shape will become a skinny plus sign, and you can click and drag that cell to make a copy.



11. Calculate Total Cost (column F) as *column D times Column E*. You will type in a formula like this into cell F2: **=D2*E2** (Be sure to begin the formula with an equal sign)
12. Use the AutoFill (skinny plus sign) again to copy the formula down column F; down to F10. Double check the picture below to make sure yours has the correct values
13. Add a border to all of the cells (A1-f10) using the Borders tool in the Fonts group on the Home Tab.
14. Change the page layout to landscape. Do this by clicking the Page Layout tab on the ribbon and then to Orientation to Landscape.
15. Save the file.
16. Click in cell F11 and Use the sum function or the shortcut icon that looks like ∑ to get the total of the Total Cost column.
17. Ensure that the data is all visible within the column boundaries. Make the columns wider if needed.
18. Save the workbook. Your final spreadsheet should look like the following when printed.

Name	Male/Female	Genre	Number of Songs	Unit Price	Total Cost
J Smith	F	Blues	50	$ 0.99	$ 49.50
B Doe	M	Country	110	$ 0.99	$ 108.90
S Spade	F	Country	200	$ 0.99	$ 198.00
F Zappa	M	Blues	1,400	$ 0.99	$ 1,386.00
F Zappa	M	Alternative	2,300	$ 0.99	$ 2,277.00
S Spade	F	Blues	1,000	$ 0.99	$ 990.00
J Smith	F	Alternative	150	$ 0.99	$ 148.50
B Doe	M	Blues	75	$ 0.99	$ 74.25
yourname	M	Blues	800	$ 0.99	$ 792.00
					$ 6,024.15

Create a sample table given below in Excel

- Using formula find Total
- Find the maximum value using MAX function from the **Units** column
- Find minimum value from **Total** column

Order Date	Region	Rep	Item	Units	Unit Cost	Total
1/6/2016	East	Jones	Pencil	95	1.99	189.05
1/23/2016	Central	Kivell	Binder	50	19.99	999.50
2/9/2016	Central	Jardine	Pencil	36	4.99	179.64
2/26/2016	Central	Gill	Pen	27	19.99	539.73
3/15/2016	West	Sorvino	Pencil	56	2.99	167.44
4/1/2016	East	Jones	Binder	60	4.99	299.40
4/18/2016	Central	Andrews	Pencil	75	1.99	149.25
5/5/2016	Central	Jardine	Pencil	90	4.99	449.10
5/22/2016	West	Thompson	Pencil	32	1.99	63.68
6/8/2016	East	Jones	Binder	60	8.99	539.40
6/25/2016	Central	Morgan	Pencil	90	4.99	449.10
7/12/2016	East	Howard	Binder	29	1.99	57.71
7/29/2016	East	Parent	Binder	81	19.99	1,619.19
8/15/2016	East	Jones	Pencil	35	4.99	174.65
9/1/2016	Central	Smith	Desk	2	125.00	250.00
9/18/2016	East	Jones	Pen Set	16	15.99	255.84
10/5/2016	Central	Morgan	Binder	28	8.99	251.72
10/22/2016	East	Jones	Pen	64	8.99	575.36
11/8/2016	East	Parent	Pen	15	19.99	299.85
11/25/2016	Central	Kivell	Pen Set	96	4.99	479.04
12/12/2016	Central	Smith	Pencil	67	1.29	86.43
12/29/2016	East	Parent	Pen Set	74	15.99	1,183.26

C. MS-POWERPOINT LAB ASSIGNMENT

Activity 1 : Using Text & Background/Themes

i. Create one new slide and insert any text.
ii. To make your slide more attractive, use the themes or background.
iii. Make sure it apply for every slide not only one slide.

Activity 2 : Apply Custom Animation On Text

i. Use the custom animation to add effects on your text. Set the text move after you click the mouse.
ii. If you have more than one text, add effects for each of text.

Activity 3 : Insert Image & WordArt

i. Insert one new blank slide.
ii. Choose one pictures or clip art from any source and insert in your new slide.
iii. Using the WordArt, make a note or title on your picture.
iv. Use the custom animation again to add effects on your picture and WordArt.

Activity 4 : Insert Text Box

i. Insert one new blank slide.
ii. Use the text box to insert one paragraph of text and adjust your text.

Activity 5 : Insert Smart Art

i. Insert one new blank slide.
ii. Insert the Smart Art and put your text on the Smart Art.

Activity 6 : Insert Audio

i. Back to your first slide and insert one audio on that slide. The audio must play automatically when you show your slide.
ii. Make sure the speaker also not appear when you show your slide. (the icon).
iii. The audio must play when you show alls your slide, not only one slide.

Activity 7 : inserting Video

i. Insert one new slide and insert one short video

Activity 8 : Save File

i. Save your file

Activity 9 : Create Photo Album & Hyperlink

i. Insert one new slide and put a text ex: “My Photo Album”
ii. Create one photo album and adjust your text and your photos
iii. Save your photo album with a new file
iv. Make a hyperlink to your photo using the text “My Photo Album”

Suggested Readings::

- Faithe wempen, word 2016 in depth 1st edition, que publishing(2015)
- steven welkler, Office 2016 for bignners, Create Space Independent publishing plateform(2016)
- Elaine Marmel, office 2016 simplified, 1st Edition, John wiley and sons Inc(2016)
- Patrice-Anne Rutledge, Easy office 2016 1st edition, Que publishing(2016)

II. GENERIC ELECTIVE (GE 3)

(Credits: Theory-04, Practicals-02)

All Four Papers (One paper to be studied in each semester) of any One Subject to be opted other than the Honours Subject. Refer Content from the Syllabus of Opted Generic Elective Subject.

III. CORE COURSE -C 5: (Credits: Theory-04, Practicals-02)

Marks : 15 (MSE: 1Hr) + 60 (ESE: 3Hrs) + 25 (Pr 3Hrs)=100	Pass Marks: Th (MSE +ESE) = 30 + Pr ESE =10

Instruction to Question Setter for
Mid Semester Examination (MSE):

*There will be **two** group of questions. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type** three questions of five marks each, out of which any two are to answer.*

End Semester Examination (ESE):

*There will be **two** group of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** five questions of fifteen marks each, out of which any three are to answer.*
***Note:** There may be subdivisions in each question asked in Theory Examinations.*

CHORDATES **Theory: 60 Lectures**

DIVERSITY OF CHORDATA

Unit 1: Introduction to Chordates
General characteristics and outline classification.

Unit 2: Protochordata
General characteristics of Hemichordata, Urochordata and Cephalochordata; Study of larval forms in protochordates; Retrogressive metamorphosis in Urochordata

Unit 3: Origin of Chordates
Dipleurula concept and the Echinoderm theory of origin of chordates; Advanced features of vertebrates over Protochordata.

Unit 4: Agnatha
General characteristics and classification of cyclostomes up to class.

Unit 5: Pisces
General characteristics of Chondrichthyes and Osteichthyes and classification up to order; Migration, Osmoregulation and Parental care in fishes.

Unit 6: Amphibia
Origin of *Tetrapoda* (Evolution of terrestrial ectotherms); General characters and classification up to order; Parental care in Amphibians.

Unit 7: Reptilia
General characteristics and classification up to order; Affinities of *Sphenodon*; Poison apparatus and Biting mechanism in snakes

Unit 8: Aves
General characteristics and classification up to order; Principles and aerodynamics of flight, Flight adaptations; *Archaeopteryx*-- a connecting link; Migration in birds

Unit 9: Mammals

General characteristics and classification up to order; Affinities of Prototheria; Adaptive radiation with reference to locomotory appendages

Unit 10: Zoogeography

Zoogeographical realms, Theories pertaining to distribution of animals, Plate tectonic and Continental drift theory, Distribution of vertebrates in different realms

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ZOOLOGY PRACTICAL-C 5 LAB **60 Lectures**

1. **Protochordata**

   Balanoglossus, Herdmania, Branchiostoma, Colonial Urochordata Sections of *Balanoglossus* through proboscis and branchiogenital regions Sections of *Amphioxus* through pharyngeal, intestinal and caudal regions Permanent slide of *Herdmania* spicules

2. **Agnatha**

   Petromyzon, Myxine

3. **Fishes**

   Scoliodon, Sphyrna, Pristis, Torpedo, Chimaera, Mystus, Heteropneustes, Labeo, Exocoetus, Echeneis, Anguilla, Hippocampus, Tetrodon/ Diodon, Anabas, Flat fish

4. **Amphibia**

   Ichthyophis/Ureotyphlus, Necturus, Bufo, Hyla, Alytes, Salamandra

5. **Reptiles**

   Chelone, Trionyx, Hemidactylus, Varanus, Uromastix, Chamaeleon, Draco, Ophiosaurus, Bungarus, Vipera, Naja, Hydrophis, Zamenis, Crocodylus

   Key for Identification of poisonous and non-poisonous snakes.

6. **Aves**

   Study of six common birds from different orders

   Types of beaks and claws

7. **Mammalia**

   Sorex, Bat (Insectivorous and Frugivorous), *Funambulus, Loris, Herpestes, Erinaceous.*

8. Mount of Weberian ossicles of *Mystus/ Labeo* pectin from fowl head.

9. Dissection of Fowl head (dissection and mounts subject to permission).

10. Power point presentation on study of any two animals from two different classes by students (may be included if dissections not given permission).

Suggested Readings:

- Young, J. Z. (2004). *The Life of Vertebrates*. III Edition. Oxford university press.
- Pough H. *Vertebrate life,* VIII Edition, Pearson International.
- Darlington P.J. *The Geographical Distribution of Animals*, R.E. Krieger Pub. Co.
- Hall B.K. and Hallgrimsson B. (2008). *Strickberger's Evolution*. IV Edition. Jones and Bartlett Publishers Inc.

IV. CORE COURSE -C 6: (Credits: Theory-04, Practicals-02)

Marks : 15 (MSE: 1Hr) + 60 (ESE: 3Hrs) + 25 (Pr 3Hrs)=100	Pass Marks: Th (MSE +ESE) = 30 + Pr ESE =10

Instruction to Question Setter for
Mid Semester Examination (MSE):

*There will be **two** group of questions. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type** three questions of five marks each, out of which any two are to answer.*

End Semester Examination (ESE):

*There will be **two** group of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** five questions of fifteen marks each, out of which any three are to answer.*
***Note:** There may be subdivisions in each question asked in Theory Examinations.*

PHYSIOLOGY **Theory: 60 Lectures**

ANIMAL PHYSIOLOGY – CONTROLLING AND COORDINATING SYSTEM

Unit 1. Tissues
Structure, location, classification and function of epithelial tissue, connective tissue, Muscular tissue and nervous tissue.

Unit 2. Bone and cartilage
Structure and types of bones and cartilages, Ossification, bone growth, resorption.

Unit 3. Nervous System
Structure of neuron, resting membrane potential, Origin of action potential and its propagation across the myelinated and unmyelinated nerve fibers; Types of synapsis, Synaptic transmission and Neuromuscular junction; Reflex action and its types – reflex arc; Physiology of hearing and vision.

Unit 4. Muscle
Histology of different types of muscle; Ultra structure of skeletal muscle; Molecular and chemical basis of muscle contraction; Characteristics of muscle twitch; Motor Unit, summation and tetanus.

Unit 5. Reproductive System
Histology of male and female reproductive systems, Physiology of male and female reproduction; Puberty; Methods of contraception in males and females.

Unit 6. Endocrine System
Functional Histology of endocrine glands - pineal, pituitary, thyroid, parathyroid, pancreas, adrenals; hormones secreted by them and their mechanism of action, Classification of hormones; Regulation of their secretion; Mode of hormone action; Signal transduction pathways utilized by steroidal and non-steroidal hormones; Hypothalamus (neuroendocrine gland) - principal nuclei involved in neuroendocrine control of anterior pituitary and endocrine system, Placental hormones.

ZOOLOGY PRACTICAL- C 6 LAB **60 Lectures**

1. Recording of simple muscle twitch with electrical stimulation (or virtual).
2. Demonstration of the unconditioned reflex action (Deep tendon reflex such as knee jerk reflex).
3. Preparation of temporary mounts: Squamous epithelium, Striated muscle fibres and nerve cells.
4. Study of permanent slides of Mammalian skin, Cartilage, Bone, Spinal cord, Nerve cell, Pituitary, Pancreas, Testis, Ovary, Adrenal, Thyroid and Parathyroid.
5. Microtomy: Preparation of permanent slide of any five mammalian (goat/white rat) tissues.

Suggested Readings:

- Guyton, A.C. & Hall, J.E. (2006). Textbook of Medical Physiology. XI Edition. Hercourt Asia PTE Ltd. /W.B. Saunders Company.
- Tortora, G.J. & Grabowski, S. (2006). Principles of Anatomy & Physiology. XI Edition John Wiley & sons.
- Victor P. Eroschenko. (2008). diFiore's Atlas of Histology with Functional correlations. XII Edition. Lippincott W. & Wilkins.
- Arey, L.B. (1974). Human Histology. IV Edition. W.B. Saunders.
- DeFiore Atlas of Human histology. Physiology Vandor

V. CORE COURSE -C 7: (Credits: Theory-04, Practicals-02)

Marks : 15 (MSE: 1Hr) + 60 (ESE: 3Hrs) + 25 (Pr 3Hrs)=100	Pass Marks: Th (MSE +ESE) = 30 + Pr ESE =10

Instruction to Question Setter for

Mid Semester Examination (MSE):

*There will be **two** group of questions. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type** three questions of five marks each, out of which any two are to answer.*

End Semester Examination (ESE):

*There will be **two** group of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** five questions of fifteen marks each, out of which any three are to answer.*

***Note:** There may be subdivisions in each question asked in Theory Examinations.*

BIOCHEMISTRY **Theory: 60 Lectures**

FUNDAMENTALS OF BIOCHEMISTRY

Unit 1: Carbohydrates

Structure and biological importance; monosaccharides, disaccharides, polysaccharides and glycoconjugates.

Unit 2: Lipids

Structure and significance; physiologically important saturated and unsaturated fatty acids; triacylglycerols, phospholipids, glycolipids and steroids.

Unit 3: Proteins

Amino acids: Structure, classification and general properties of α-amino acids; physiological importance of essential and non- essential α-amino acids; Urea cycle.

Proteins: Bonds stabilizing protein structure; levels of organization in proteins; Denaturation; Introduction to simple and conjugate proteins.

Immunoglobulins: Basic structure, classes and function, Antigenic determinants.

Unit 4: Nucleic Acids

Structure: Purines and pyrimidines, nucleosides, Nucleotides, Nucleic acids; Cot curves: Base pairing, denaturation and Renaturation of DNA. Types of DNA and RNA, Complementary of DNA, Hypo – Hyperchromaticity of DNA.

Unit 5: Enzymes

Nomenclature and classification; Introduction; cofactors; Specificity of enzyme action; Mechanism of action; Enzyme kinetics; Factors affecting rate of enzyme-catalyzed reactions; Enzymes inhibition; Allosteric enzymes and their kinetics; Regulation of enzyme action; coenzymes and isoenzymes.

ZOOLOGY PRACTICAL-C 7 LAB **60 Lectures**

1. Quantitative test of functional groups in carbohydrates, proteins and lipids.
2. Paper chromatography of amino acids.
3. Action of salivary amylase under optimum conditions.
4. Effect of pH, temperature and inhibitors on the action of salivary amylase.
5. Demonstration of proteins separation by SDS-PAGE.

Suggested Readings:

- Cox, M.M and Nelson, D.L. (2008). *Lehninger Principles of Biochemistry*, V Edition, W.H. Freeman and Co., New York.
- Berg, J.M., Tymoczko, J.L. and Stryer, L. (2007). *Biochemistry*, VI Edition, W.H.Freeman and Co., New York.
- Murray, R.K., Bender, *D.A.*, Botham' K.M., Kennelly, P.J., Rodwell, V.W. and Well, P.A. (2009,). *Harper's Illustrated Biochemistry*' XXVIII Edition, International Edition, The McGraw-Hill Companies Inc.
- Hames, B.D· and Hooper, N.M. (2000). *Instant Notes in Biochemistry*, II Edition ,BIOS Scientific Publishers Ltd., U.K.

SEMESTER IV 5 Papers

Total 100 x 5 = 500 Marks

I. SKILL ENHANCEMENT COURSE SEC 2: (Credits: Theory-02)

Marks : 100 (ESE: 3Hrs)=100	**Pass Marks: Th ESE = 40**

Instruction to Question Setter for

End Semester Examination (ESE):

*There will be **two** group of questions. **Group A is compulsory** and will contain three questions. **Question No.1 will be very short answer type** consisting of ten questions of 1 mark each. **Question No.2 & 3 will be short answer type** of 5 marks. **Group B will contain descriptive type** six questions of 20 marks each, out of which any four are to answer.*

***Note:** There may be subdivisions in each question asked in Theory Examinations.*

SERICULTURE **Theory: 30 Lectures**

Unit1: Introduction (3 Lectures)

Sericulture: Definition, history and present status; Silk route. Types of silk worms, Distribution and Races. Exotic and indigenous races. Mulberry and non-mulberry Sericulture

Unit2: Biology of Silk worm (3 Lectures)

Life cycle of Bombyxmori

Structure of silk gland and secretion of silk

Unit3: Rearing of Silk worms (13 Lectures)

Selection of mulberry variety and establishment of mulberry garden. Rearing house and rearing appliances. Disinfectants: Formalin, bleaching powder, RKO. Silk worm rearing technology: Early age and Late age rearing. Types of mountages Spinning, harvesting and storage of cocoons

Unit4: Pests and Diseases (4 Lectures)

Pests of silk worm: Uzifly, dermestid beetles and vertebrates Pathogenesis of silk worm diseases: Protozoan, viral, fungal and bacterial Control and prevention of pests and diseases

Unit5: Entrepreneurship in Sericulture (2 Lectures)

Prospectus of Sericulture in India: Sericulture industry in different states, employment, potential in mulberry and non-mulberry sericulture. Visit to various Sericulture centres.

Suggested Readings:

- Handbook of Practical Sericulture: S.R. Ullaland M.N. Narasimhanna CSB, Bangalore
- Appropriate Sericultural Techniques; Ed. M.S. Jolly, Director, CSR & TI, Mysore.
- Handbook of Silkworm Rearing: Agriculture and Technical Manual-1, Fuzi Pub.Co. Ltd., Tokyo, Japan 1972.
- Manual of Silkworm Egg Production; M.N. Narasimhanna, CSB, Bangalore 1988.
- Silkworm Rearing; Wupang —Chunand Chen Da-Chung, Pub. By FAO, Rome 1988.
- A Guide for Bivoltine Sericulture; K. Sengupta, Director, CSR & TI, Mysore 1989.
- Improved Method of Rearing Young age silkworm; S. Krishnaswamy, reprinted CSB, Bangalore, 1986.

II. GENERIC ELECTIVE (GE 4) (Credits: Theory-04, Practicals-02)

All Four Papers (One paper to be studied in each semester) of any One Subject to be opted other than the Honours Subject. Refer Content from the Syllabus of Opted Generic Elective Subject.

III. CORE COURSE -C 8: (Credits: Theory-04, Practicals-02)

Marks : 15 (MSE: 1Hr) + 60 (ESE: 3Hrs) + 25 (Pr 3Hrs)=100	**Pass Marks: Th (MSE +ESE) = 30 + Pr ESE =10**

Instruction to Question Setter for
Mid Semester Examination (MSE):

*There will be **two** group of questions. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type** three questions of five marks each, out of which any two are to answer.*

End Semester Examination (ESE):

*There will be **two** group of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** five questions of fifteen marks each, out of which any three are to answer.*

***Note:** There may be subdivisions in each question asked in Theory Examinations.*

VERTEBRATE ANATOMY **Theory: 60 Lectures**

COMPARATIVE ANATOMY OF VERTEBRATES

Unit 1: Integumentary System
Structure, functions and derivatives of integument

Unit 2: Skeletal System
Overview of axial and appendicular skeleton, Jaw suspensorium, Visceral arches

Unit 3: Digestive System
Alimentary canal and associated glands, dentition.

Unit 4: Respiratory System
Skin, gills, lungs and air sacs; Accessory respiratory organs

Unit 5: Circulatory System
General plan of circulation, evolution of heart and aortic arches

Unit 6: Urinogenital System
Succession of kidney, Evolution of urinogenital ducts, Types of mammalian uteri.

Unit 7: Nervous System
Comparative account of brain; Autonomic nervous system, Spinal cord, Cranial nerves in mammals

Unit 8: Sense Organs
Classification of receptors: Brief account of visual and auditory receptors.

ZOOLOGY PRACTICAL-C 8 LAB **60 Lectures**

1. Study of placoid, cycloid and ctenoid scales through permanent slides/ photographs.
2. Disarticulated skeleton of Frog, Varanus, Fowl, Rabbit.
3. Carapace and plastron of turtle/ tortoise.
4. Mammalian skulls: One herbivorous and one carnivorous animal.
5. Dissection of rat to study arterial and urinogenital system (subject to permission).
6. Study of structure of any two organs (heart, lung, kidney, eye and ear) from video Recording (may be included if dissection not permitted).
7. Project on skeletal modifications in invertebrates (may be included if dissection not permitted).

Suggested Readings:

- Kardong, K.V. (2005) *Vertebrates' Comparative Anatomy, Function and Evolution*. IV Edition. McGraw-Hill Higher Education.
- Kent, G.C. and Carr R.K. (2000). *Comparative Anatomy of the Vertebrates*. IX Edition. The McGraw-Hill Companies.
- Weichert C.K and William Presch (1970). *Elements of Chordate Anatomy*, Tata McGraw Hills
- Hilderbrand, M and Gaslow G.E. *Analysis of Vertebrate Structure*, John Wiley and Sons.
- Walter, H.E. and Sayles, L.P; *Biology of Vertebrates*, Khosla Publishing House.

IV. CORE COURSE -C 9: (Credits: Theory-04, Practicals-02)

Marks : 15 (MSE: 1Hr) + 60 (ESE: 3Hrs) + 25 (Pr 3Hrs)=100	Pass Marks: Th (MSE +ESE) = 30 + Pr ESE =10

Instruction to Question Setter for

Mid Semester Examination (MSE):

*There will be **two** group of questions. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type** three questions of five marks each, out of which any two are to answer.*

End Semester Examination (ESE):

*There will be **two** group of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** five questions of fifteen marks each, out of which any three are to answer.*

***Note:** There may be subdivisions in each question asked in Theory Examinations.*

PHYSIOLOGY **Theory: 60 Lectures**

ANIMAL PHYSIOLOGY: LIFE SUSTAINING SYSTEMS

Unit 1. Physiology of Digestion

Structural organization, histology and functions of gastrointestinal tract and its associated glands; Mechanical and chemical digestion of food; Absorptions of carbohydrates, lipids, proteins, water, minerals and vitamins; Role of gastrointestinal hormones on the secretion and control of enzymes of Gastrointestinal tract

Unit 2. Physiology of Respiration

Histology of trachea and lung; Mechanism of respiration, Pulmonary ventilation; Respiratory volumes and capacities; Transport of oxygen and carbon dioxide in the blood; Respiratory pigments, Dissociation curve and the factors influencing it; Carbon monoxide poisoning; Control of respiration

Unit 3. Renal Physiology

Structure of kidney and its functional unit; Mechanism of urine formation; Regulation of water balance; Regulation of acid – base balance.

Unit 4. Blood

Components of blood and their functions; Structure and functions of haemoglobin; Haemostasis: Blood clotting system, Kallikrein – Kinninogen system, Component system & Fibrinolytic system, haemopoiesis; Blood groups: Rh factor, ABO and MN.

Unit 5. Physiology of Heart

Structure of mammalian heart; Coronary circulation; structure and working of conducting myocardial fibers. Origin and conduction of cardiac impulses; Cardiac cycle; Cardiac output and its regulation, Frank-Starling Law of the heart, nervous and chemical regulation of heart rate; Blood pressure and its regulation; Electrocardiogram.

ZOOLOGY PRACTICAL-C 9 LAB **60 Lectures**

1. Determination of ABO Blood group.
2. Enumeration of red blood cells and white blood cells using haemocytometer.
3. Estimation of haemoglobin using Sahli's haemoglobinometer.
4. Preparation of haemin and haemochromogen crystals.
5. Recording of frog's heart beat under *in situ* and perfused conditions.
6. Recording of blood pressure using a sphygmomanometer.
7. Examination of sections of mammalian oesophagus, stomach, duodenum, ileum, rectum liver, trachea, lung, kidney.

Suggested Readings:

- Guyton, A.C. & Hall, J.E. (2006). Textbook of Medical Physiology. XI Edition. Hercourt Asia PTE Ltd. /W.B. Saunders Company.
- Tortora, G.J. & Grabowski, S. (2006). Principles of Anatomy & Physiology. XI Edition John Wiley & sons,
- Victor P. Eroschenko. (2008). diFiore's Atlas of Histology with Functional correlations. XII Edition. Lippincott W. & Wilkins.
- Arey, L.B. (1974). Human Histology. IV Edition. W.B. Saunders.
- DeFiore Atlas of Human histology.
- Physiology Vander

V. CORE COURSE -C 10: (Credits: Theory-04, Practicals-02)

Marks : 15 (MSE: 1Hr) + 60 (ESE: 3Hrs) + 25 (Pr 3Hrs)=100	Pass Marks: Th (MSE +ESE) = 30 + Pr ESE =10

Instruction to Question Setter for

Mid Semester Examination (MSE):

*There will be **two** group of questions. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type** three questions of five marks each, out of which any two are to answer.*

End Semester Examination (ESE):

*There will be **two** group of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** five questions of fifteen marks each, out of which any three are to answer.*

***Note:** There may be subdivisions in each question asked in Theory Examinations.*

METABOLISM **Theory: 60 Lectures**

BIOCHEMISTRY OF METABOLIC PROCESSES

Unit 1: Overview of Metabolism

Catabolism *vs* Anabolism, Stages of catabolism, Compartmentalization of metabolic pathways, shuttle systems and membrane transporters; ATP as "Energy Currency of Cell"; coupled reactions; Use of reducing equivalents and cofactors; Intermediary metabolism and regulatory mechanisms.

Unit 2: Carbohydrate Metabolism

Sequence of reactions and regulation of glycolysis, Citric acid cycle, Phosphate pentose pathway, Gluconeogenesis, glycogenolysis and glycogenesis.

Unit 3: Lipid Metabolism

β-Oxidation and omega – oxidation of saturated fatty acids with even and odd number of carbon atoms; Biosynthesis of palmitic acid; Ketogenesis.

Unit 4: Protein Metabolism

Catabolism of amino acids: Transamination, Deamination, Urea cycle; Fate of C – skeleton of Glucogenic and Ketogenic amino acids.

Unit 5: Oxidative Phosphorylation

Redox systems; Review of mitochondrial respiratory chain, Inhibitors and un – couplers of Electron Transport System.

ZOOLOGY PRACTICAL-C 10 LAB **60 Lectures**

1. Estimation of total protein in given solutions by Lowry's method.
2. Detection of SGOT and SGPT or GST and GSH in serum/ tissue.
3. To study the enzymatic activity of Trypsin and Lipase.
4. Study of biological oxidation (SDH) [goat liver].
5. To perform the Acid and Alkaline phosphatase assay from serum/ tissue.
6. Dry Lab: to trace the labeled C atoms of Acetyl-Co-A till they evolve as CO_2 in the TCA cycle.

Suggested Readings:

- Cox, M.M and Nelson, D.L. (2008). *Lehninger Principles of Biochemistry*, V Edition, W.H. Freeman and Co., New York.
- Berg, J.M., Tymoczko, J.L. and Stryer, L. (2007). *Biochemistry*, VI Edition, W.H.Freeman and Co., New York.
- Murray, R.K., Bender, *D.A.*, Botham' K.M., Kennelly, P.J., Rodwell, V.W. and Well, P.A. (2009,). *Harper's Illustrated Biochemistry*' XXVIII Edition, International Edition, The McGraw-Hill Companies Inc.
- Hames, B.D· and Hooper, N.M. (2000). *Instant Notes in Biochemistry*, II Edition ,BIOS Scientific Publishers Ltd., U.K

SEMESTER V 4 Papers

Total 100 x 4 = 400 Marks

I. ZOOLOGY SPECIFIC (DSE 1): (Credits: Theory-05, Tutorials-01)

Marks : 15 (MSE: 1Hr) + 60 (ESE: 3Hrs) + 25 (Pr 3Hrs)=100	**Pass Marks: Th (MSE +ESE) = 30 + Pr ESE =10**

Instruction to Question Setter for
Mid Semester Examination (MSE):

*There will be **two** group of questions. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type** six questions of five marks each, out of which any four are to answer.*

End Semester Examination (ESE):

*There will be **two** group of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** six questions of fifteen marks each, out of which any four are to answer.*
***Note:** There may be subdivisions in each question asked in Theory Examinations.*

BIOLOGY OF INSECTA **Theory: 75 Lectures**

Unit I: Introduction
General Features of Insects
Distribution and Success of Insects on the Earth

Unit II: Insects Taxonomy
Basis of insect classification; Classification of insects up to orders

Unit III: General Morphology of insects
External Features; Head – Eyes, Types of antennae, Mouth parts w.r.t. feeding habits
Thorax: Wings and wing articulation, Types of Legs adapted to diverse habitat
Abdominal appendages and genitalia

Unit IV: Physiology of Insects
Structure and physiology of insect body system – Integumentary, digestive excretory, circulatory, respiratory, endocrine, reproductive, and nervous system
Sensory receptors
Growth and metamorphosis

Unit V: Insect Society
Group of social insects and their social life
Social organization and social behavior (w.r.t. any one example)

Unit VI: Insect Plant Interaction
Theory of co-evaluation, role of allelochemicals in host plant mediation
Host plant selection by phytophagous insects, insects as plant pests

Unit VII: Insects as Vectors
Insects as mechanical and biological vectors, Brief discussion on houseflies and mosquitoes as important insect vectors

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ZOOLOGY PRACTICAL-DSE 1 LAB **60 Lectures**

1. Study of one specimen from each insect order
2. Study of different kinds of antennae, legs and mouth parts of insects
3. Study of head and sclerites of any one insect
4. Study of insect wings and their venation.
5. Study of insect spiracles
6. Methodology of collection, preservation and identification of insects.
7. Morphological studies of various castes of *Apis, Camponotus* and *Odontotermes*
8. Study of any three insect pests and their damages
9. Study of any three beneficial insects and their products

Find study of insects and submission of a project report on the insect diversity

Suggested Readings:

- A general text book of entomology, Imms, A.D., Chapman & Hall, UK
- The Insects: Structure and function, Chapman, R.F., Cambridge University Press, UK
- Principles of insect Morphology, Snodgrass, R.E., Cornell Univ. Press, USA
- Introduction to the study of insects, Borror, D.J., Triplehorn, C.A., and Johnson, N.F., M saunders College Publication, USA
- The insect Societies, Wilson, E.O., Harward Univ. Press, UK
- Host Selection by Phytophagous insects, Bernays, E.A., and Chapman, R.F., Chapman and Hall, New York, USA
- Physiological system in insects, Klowden, M.J., Academic Press, USA
- The Insects, An outline of Entomology, Gullan, P.J., and Cranston, P.S., Wiley Blackwell, UK
- Insect Physiology and Biochemistry, Nation, J.L., CRC Press, USA

I. ZOOLOGY SPECIFIC (DSE 2): (Credits: Theory-04, Practicals-02)

Marks : 15 (MSE: 1Hr) + 60 (ESE: 3Hrs) + 25 (Pr 3Hrs)=100	**Pass Marks: Th (MSE +ESE) = 30 + Pr ESE =10**

Instruction to Question Setter for

Mid Semester Examination (MSE):

*There will be **two** group of questions. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type** three questions of five marks each, out of which any two are to answer.*

End Semester Examination (ESE):

*There will be **two** group of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** five questions of fifteen marks each, out of which any three are to answer.*

***Note:** There may be subdivisions in each question asked in Theory Examinations.*

ENDOCRINOLOGY **Theory: 75 Lectures**

Unit I: Introduction to Endocrinology

History of endocrinology, Classification, Characterization and Transport of Hormones, Neurosecretions and Neurohormones

Unit II: Epiphysis, Hypothalamo-hypophysial Axis

Structure of Pineal gland, Secretions and their functions in biological rhythms and reproduction.
Structure of hypothalamus, Hypothalamic nuclei and their functions, Regulation of neuroendocrine glands, Feedback mechanisms
Structure of pituitary gland, Hormones and their functions, Hypothalamo- hypophysial portal system, Disorders of pituitary gland.

Unit III: Peripheral Endocrine Glands

Structure, Hormones, Functions and Regulation of Thyroid gland, Parathyroid, Adrenal, Pancreas, Ovary and Testis
Hormones in homeostasis, Disorders of endocrine glands

Unit IV: Regulation of Hormone Action

Hormone action at cellular level: Hormones receptors, transduction and regulation
Hormone action at Molecular level: Molecular mediators, Genetic control of hormone action

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DSE-2 LAB: ENDOCRINOLOGY **60 Lectures**

1. Dissect and display of Endocrine glands in laboratory bred rat*

2. Study of the permanent slides of all the endocrine glands

Suggested Readings:

- General Endocrinology C. Donnell Turner Pub- Saunders Toppan
- Endocrinology: An integrated Approach; Stephen Nussey and Saffron Whitehead.
- Oxford: BIOS Scientific Publishers; 2001
- Hadley, M.E. and Levine J.E.2007. Endocrinology, 6th Edition Pearson Prentice- Hall, Pearson Education Inc., New Jersey.
- Vertebrate Endocrinology by David O. Norris,

II. CORE COURSE -C 11: (Credits: Theory-04, Practicals-02)

Marks : 15 (MSE: 1Hr) + 60 (ESE: 3Hrs) + 25 (Pr 3Hrs)=100	Pass Marks: Th (MSE +ESE) = 30 + Pr ESE =10

Instruction to Question Setter for
Mid Semester Examination (MSE):
*There will be **two** group of questions. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type** three questions of five marks each, out of which any two are to answer.*

End Semester Examination (ESE):
*There will be **two** group of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** five questions of fifteen marks each, out of which any three are to answer.*

***Note:** There may be subdivisions in each question asked in Theory Examinations.*

MOLECULAR BIOLOGY **Theory: 60 Lectures**

Unit 1: Nucleic Acids
Salient features of DNA and RNA; Watson and Crick model of DNA.

Unit 2: DNA Replication
DNA Replication in prokaryotes and eukaryotes, mechanism of DNA replication, Semi-conservative, bidirectional and semi-discontinuous replication, RNA priming, Replication of circular and linear *ds*-DNA, replication of telomeres

Unit 3: Transcription
RNA polymerase and transcription Unit, mechanism of transcription in prokaryotes and eukaryotes, synthesis of rRNA and mRNA, transcription factors

Unit 4: Translation
Genetic code, Degeneracy of the genetic code and Wobble Hypothesis; Process of protein synthesis in prokaryotes: Ribosome structure and assembly in prokaryotes, fidelity of protein synthesis, aminoacyl tRNA synthetases and charging of tRNA; Proteins involved in initiation, elongation and termination of polypeptide chain; Inhibitors of protein synthesis; Difference between prokaryotic and eukaryotic translation.

Unit 5: Post Transcriptional Modifications and Processing of Eukaryotic RNA
Structure of globin mRNA; Split genes: concept of introns and exons, splicing mechanism, alternative splicing, exon shuffling, and RNA editing; Processing of tRNA.

Unit 6: Gene Regulation
Transcription regulation in prokaryotes: Principles of transcriptional regulation with examples from *lac* operon and *trp* operon; Transcription regulation in eukaryotes: Activators, repressors, enhancers, silencers elements; Gene silencing, Genetic imprinting.

Unit 7: DNA Repair mechanisms
Pyrimidine dimerization and mismatch repair.

Unit 8: Regulatory RNAs
Ribo-switches, RNA interference, miRNA, siRNA

ZOOLOGY PRACTICAL-C 11 LAB **60 Lectures**

1. Study of polytene chromosomes from Chironomus / drosophila larvae.
2. Preparation of liquid culture medium (LB) and raise culture of *E. coli*.
3. Estimation of the growth kinetics of *E. coli* by turbidity method.
4. Preparation of solid culture medium (LB) and growth of *E. coli* by spreading and streaking.
5. Demonstration of antibiotic sensitivity/resistance of *E. coli* to antibiotic pressure and interpretation of results.
6. Quantitative estimation of salmon sperm/calf thymus DNA using colorimeter (Diphenylamine reagent) or spectrophotometer (A260 measurement).
7. Quantitative estimation of RNA using Orcinol reaction.
8. Study and interpretation of electron micrographs/ photograph showing
   (a) DNA replication
   (b) Transcription
   (c) Split genes.

Suggested Readings:

- Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. (2009). *The World of the Cell.* VII Edition. Pearson Benjamin Cummings Publishing, San Francisco.
- Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter: *Molecular Biology of the Cell*, IV Edition.
- Cooper G. M. and Robert E. Hausman R. E. *The Cell: A Molecular Approach***,** V Edition, ASM Press and Sinauer Associates.
- De Robertis, E.D.P. and De Robertis, E.M.F. (2006). *Cell and Molecular Biology*. VIII Edition. Lippincott Williams and Wilkins, Philadelphia.
- Karp, G. (2010) *Cell and Molecular Biology: Concepts and Experiments*. VI Edition. John Wiley and Sons. Inc.
- Lewin B. (2008). *Gene XI*, Jones and Bartlett.

III. CORE COURSE -C 12: (Credits: Theory-04, Practicals-02)

Marks : 15 (MSE: 1Hr) + 60 (ESE: 3Hrs) + 25 (Pr 3Hrs)=100	Pass Marks: Th (MSE +ESE) = 30 + Pr ESE =10

Instruction to Question Setter for
Mid Semester Examination (MSE):

*There will be **two** group of questions. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type** three questions of five marks each, out of which any two are to answer.*

End Semester Examination (ESE):
*There will be **two** group of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** five questions of fifteen marks each, out of which any three are to answer.*
***Note:** There may be subdivisions in each question asked in Theory Examinations.*

GENETICS Theory: 60 Lectures

PRINCIPLES OF GENETICS

Unit 1: Mendelian Genetics and its Extension
Principles of inheritance, Incomplete dominance and co-dominance, Multiple alleles, Lethal alleles, Epistasis, Pleiotropy, Sex-linked, sex-influenced and sex-limited characters inheritance.

Unit 2: Linkage, Crossing Over and Chromosomal Mapping
Linkage and crossing over, Cytological basis of crossing over, Molecular mechanisms of crossing over including models of recombination, Recombination frequency as a measure of linkage intensity, Two factor and three factor crosses, Interference and coincidence, Somatic cell hybridization.

Unit 3: Mutations
Types of gene mutations (classification), Types of Chromosomal aberrations (classification, figures and with one suitable examples of each); Molecular basis of mutations in relation to UV light and chemical mutagens; Detection of mutations: CLB method, attached *X* method.

Unit 4: Sex Determination
Chromosomal mechanisms of sex determination in *Drosophila* and Man.

Unit 5: Extra-chromosomal Inheritance
Criteria for extra-chromosomal inheritance, Antibiotic resistance in *Chlamydomonas*, Mitochondrial mutations in *Saccharomyces*, Infective heredity in *Paramecium* and Maternal effects.

Unit 6: Polygenic Inheritance
Polygenic inheritance with suitable examples; simple numerical based on it.

Unit 7: Recombination in Bacteria and Viruses
Conjugation, Transformation, Transduction, Complementation test in Bacteriophage.

Unit 8: Transposable Genetic Elements
Transposons in bacteria, Ac-Ds elements in maize and p elements in *Drosophila*, Tansposons in humans.

ZOOLOGY PRACTICAL-C 12 LAB **60 Lectures**

1. To study the Mendelian laws and gene interactions.
2. Chi- square analyses using seeds/beads/*Drosophila*.
3. Linkage maps based on data from conjugation, transformation and transduction.
4. Linkage maps based on data from *Drosophila* crosses.
5. Study of human karyotype (normal and abnormal).
6. Pedigree analysis of some human inherited traits.

Suggested Readings:

- Gardner, E.J., Simmons, M.J., Snustad, D.P.(2008). *Principles of Genetics*. VIII Edition. Wiley India.
- Snustad, D.P., Simmons, M.J. (2009). *Principles of Genetics*. V Edition. John Wiley and Sons Inc.
- Klug, W.S., Cummings, M.R., Spencer, C.A. (2012). *Concepts of Genetics*. X Edition. Benjamin Cummings.
- Russell, P. J. (2009). *Genetics- A Molecular Approach.* III Edition. Benjamin Cummings.
- Griffiths, A.J.F., Wessler, S.R., Lewontin, R.C. and Carroll, S.B. *Introduction to Genetic Analysis*. IX Edition. W. H. Freeman and Co.

SEMESTER VI 4 Papers

Total 100 x 4 = 400 Marks

II. ZOOLOGY SPECIFIC (DSE 3): (Credits: Theory-04, Practicals-02)

Marks : 15 (MSE: 1Hr) + 60 (ESE: 3Hrs) + 25 (Pr 3Hrs)=100	**Pass Marks: Th (MSE +ESE) = 30 + Pr ESE =10**

Instruction to Question Setter for

Mid Semester Examination (MSE):

*There will be **two** group of questions. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type** six questions of five marks each, out of which any four are to answer.*

End Semester Examination (ESE):

*There will be **two** group of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** six questions of fifteen marks each, out of which any four are to answer.*

***Note:** There may be subdivisions in each question asked in Theory Examinations.*

FISH & FISHERIES **Theory: 60 Lectures**

Unit I: Introduction and Classification:
General description of fish; Account of systematic classification of fishes (upto classes); Classification based on feeding habit, habitat and manner of reproduction.

Unit II: Morphology and Physiology:
Types of fins and their modifications; Locomotion in fishes; Hydrodynamics; Types of Scales, Use of scales in classification and determination of age of fish; Gills and gas exchange; Swim Bladder: Types and role in Respiration, buoyancy; Osmoregulation in Elasmobranchs; Reparoductive strategies (Special reference to Indian fishes); Electric organs; Bioluminiscince; Mechanoreceptors; Schooling; Parental care; Migration

Unit III: Fisheries
Inland Fisheries; Marine Fisheries; Environmental factors influencing the seasonal variations in fish catches in the Arabian Sea and the Bay of Bengal; Fishing crafts and Gears; Depletion of fisheries resources; Application of remote sensing and GIS in fisheries; Fisheries law and regulations

Unit IV: Aquaculture
Sustainable Aquaculture; Extensive, semi- intensive and intensive culture of fish; Pen and cage culture; Polyculture; Composite fish culture; Brood stock management; Induced breeding of fish; Management of finfish hatcheries; Preparation and maintenance of fish aquarium; Preparation of compound diets for fish; Role of water quality in aquaculture; Fish diseases: Bacterial, viral and parasitic; Preservation and processing of harvested fish, Fishery by- products

Unit V: Fish in research
Transgenic fish, Zebrafish as a model organism in research

DSE-3 LAB: IMMUNOLOGY **60 Lectures**

1. Morphometric and meristic characters of fishes
2. Study of *Petromyzon, Myxine, Pristis, Chimaera, Exocoetus, Hippocampus, Gambusia, Labeo, Hateropneustes, Anabas*
3. Study of different types of scales(through permanent slides/ photographs).
4. Study of crafts and gears used in Fisheries
5. Water quality criteria for Aquaculture; Assessment of p^H, conductivity, Total solids, Total dissolved solids
6. Study of air breathing organs in *Channa, Heteropneustes, Anabas and Clarias*
7. Demonstration of induced breeding in Fishes (video)
8. Demonstration of parental care in fishes (video)
9. Project Report on a visit to any fish farm/ pisciculture unit/ Zebrafish rearing Lab.

Suggested Readings:

- Q Bone and R Moore, Biology of fishes, Talyour and Francis Group, CRC Press, U.K.
- D.H. Evans and J.D. Claiborne, The Physiology of fishes, Taylor and Francis Group, CRC Press, UK von der Emde, R.J. Mogdans and B.G. Kappor. The Senses of Fish: Adaptations for the Reception of Natural Stimuli, Springer, Netherlands
- C.B.L. Srivastava, Fish Biology, Narendra Publishing House
- J.R. Norman, A history of Fishes, Hill and Wang Publishers
- S.S. Khanna and H.R. Singh, A text book of Fish Biology and Fisheries, Narendra Publishing House

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III. ZOOLOGY SPECIFIC (DSE 4): (Credits: Theory-04, Practicals-02)

Marks : 15 (MSE: 1Hr) + 60 (ESE: 3Hrs) + 25 (Pr 3Hrs)=100	Pass Marks: Th (MSE +ESE) = 30 + Pr ESE =10

Instruction to Question Setter for

Mid Semester Examination (MSE):

*There will be **two** group of questions. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type** three questions of five marks each, out of which any two are to answer.*

End Semester Examination (ESE):

*There will be **two** group of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** five questions of fifteen marks each, out of which any three are to answer.*

***Note:** There may be subdivisions in each question asked in Theory Examinations.*

IMMUNOLOGY **Theory: 60 Lectures**

Unit1: Overview of Immune System

Historical perspective of Immunology, Early theories of Immunology, Cells and organs of the Immune system

Unit2: Innate and Adaptive Immunity

Anatomical barriers, Inflammation, Cell and molecules involved in innate immunity, Adaptive immunity (Cell mediated and humoral), Passive: Artificial and natural immunity, Active: Artificial and natural Immunity, Immune dysfunctions(brief account of autoimmunity with references to Rheumatoid Arthritis and tolerance, AIDS).

Unit3: Antigens

Antigenicity and immunogenicity, Immunogens, Adjuvants and haptens, Factors influencing immunogenicity, B and T- Cell epitopes.

Unit4: Immunoglobulins

Structure and functions of different classes of immunoglobulins, Antigen-antibody interactions, Immunoassays (ELISA and RIA), Polyclonal sera, Hybridoma technology; Monoclonal antibodies in therapeutics and diagnosis.

Unit5: Major Histocompatibility Complex

Structure and functions of MHC molecules, endogenous and exogenous pathways of antigen presentation.

Unit6: Cytokines

Properties and functions of cytokines, Therapeutics Cytokines.

Unit7: Complement System

Components and pathways of complement activation.

Unit8: Hypersensitivity

Gell and Coombs' classification and Brief description of various types of hypersensitivities

Unit9: Vaccines

Types of vaccines: Recombinant vaccines and DNA vaccines

DSE-4 LAB: IMMUNOLOGY **60 Lectures**

1. Demonstration of lymphoid organs.
2. Histological study of spleen, thymus and lymph nodes through slides/ photographs
3. Preparation of stained blood film to study various types of blood cells.
4. ABO blood group determination.
5. Demonstration of
    a) ELISA
    b) Immunoelectrophoreisis.

Suggested Readings:

- Kindt, T.J., Golds by, R.A., Osborne, B.A. and Kuby, J(2006).*Immunology*, VI Edition. W.H. Freeman and Company.
- David, M., Jonathan, B.,David, R.B. and Ivan R.(2006). *Immunology*, VII Edition, Mosby, Elsevier Publication.
- Abbas, K. Abul and Lechtman H. Andrew(2003.) *Cellular and Molecular Immunology*. V Edition. Saunders Publication.

IV. CORE COURSE -C 13: (Credits: Theory-04, Practicals-02)

Marks : 15 (MSE: 1Hr) + 60 (ESE: 3Hrs) + 25 (Pr 3Hrs)=100	Pass Marks: Th (MSE +ESE) = 30 + Pr ESE =10

Instruction to Question Setter for

Mid Semester Examination (MSE):

*There will be **two** group of questions. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type** three questions of five marks each, out of which any two are to answer.*

End Semester Examination (ESE):

*There will be **two** group of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** five questions of fifteen marks each, out of which any three are to answer.*

***Note:** There may be subdivisions in each question asked in Theory Examinations.*

DEVELOPMENTAL BIOLOGY **Theory: 60 Lectures**

Unit 1: Introduction

Historical perspective and basic concepts: Phases of development, Cell-Cell interaction, Pattern formation, Differentiation and growth, Differential gene expression, Cytoplasmic determinants and asymmetric cell division.

Unit 2: Early Embryonic Development

Gametogenesis, Spermatogenesis, Oogenesis; Types of eggs, Egg membranes; Fertilization (External and Internal): Changes in gametes, Blocks to polyspermy; Planes and patterns of cleavage; Types of Blastula; Fate maps (including techniques); Early development of frog and chick up to gastrulation; ; Embryonic induction and organizers.

Unit 3: Late Embryonic Development

Fate of Germ Layers; Extra-embryonic membranes in birds; Implantation of embryo in humans, Placenta (Structure, types and functions of placenta)

Unit 4: Post Embryonic Development

Metamorphosis: Changes, hormonal regulations in amphibians and insects; Regeneration: Modes of regeneration, epimorphosis, morphallaxis and compensatory regeneration (with one example each); Ageing: Concepts and Theories.

Unit 5: Implications of Developmental Biology

Teratogenesis: Teratogenic agents and their effects on embryonic development; *In vitro* fertilization, Stem cell culture (ESC), Amniocentesis.

ZOOLOGY PRACTICAL-C 13 LAB **60 Lectures**

1. Study of whole mounts and sections of developmental stages of frog through permanent slides: Cleavage stages, blastula, gastrula, neurula, tail-bud stage, tadpole (external and internal gill stages).
2. Study of whole mounts of developmental stages of chick through permanent slides: Primitive streak (13 and 18 hours), 21, 24, 28, 33, 36, 48, 72, and 96 hours of incubation (Hamilton and Hamburger stages)
3. Study of the developmental stages and life cycle of *Drosophila* from stock culture
4. Study of different types of placenta (photomicrograph/ slides)
5. Project report on *Drosophila* culture/chick embryo development.

Suggested Readings:

- Gilbert, S. F. (2010). *Developmental Biology*, IX Edition, Sinauer Associates, Inc., Publishers, Sunderland, Massachusetts, USA.
- Balinsky B.I. and Fabian B. C. (1981). *An Introduction to Embryology*, V Edition, International Thompson Computer Press.
- Kalthoff (2008). *Analysis of Biological Development*, II Edition, McGraw-Hill Publishers.
- Lewis Wolpert (2002). *Principles of Development*. II Edition, Oxford University Press

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V. CORE COURSE -C 14: (Credits: Theory-04, Practicals-02)

Marks : 15 (MSE: 1Hr) + 60 (ESE: 3Hrs) + 25 (Pr 3Hrs)=100	Pass Marks: Th (MSE +ESE) = 30 + Pr ESE =10

Instruction to Question Setter for

Mid Semester Examination (MSE):

*There will be **two** group of questions. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type** three questions of five marks each, out of which any two are to answer.*

End Semester Examination (ESE):

*There will be **two** group of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** five questions of fifteen marks each, out of which any three are to answer.*

***Note:** There may be subdivisions in each question asked in Theory Examinations.*

EVOLUTION **Theory: 60 Lectures**

Unit 1: History of Life

Life'S beginnings: Chemogeny, RNA World, Biogeny, Origin of photosynthesis, Evolution of eukaryotes.

Unit 2: Introduction to Evolutionary Theories

Historical review of evolutionary concept: Lamarckism, Darwinism, Neo-Darwinism

Unit 3: Evidences of Evolution

Evidences of Evolution: Fossil record (types of fossils), transitional forms, geological time scale, evolution of horse; Molecular (universality of genetic code and protein synthesizing machinery), three domains of life, neytral theory of molecular evolution, molecular clock, example of globin gene family, rRNA/cyt c.

Unit 4: Processes of Evolutionary Change

Sources of variations: Heretable variations and their role in evolution.

Unit 5: Principles of population genetics

Population genetics: Hardy – Weinberg Law (statement and derivation of equation, application of law to human population); Evolutionary forces upsetting Hardy-Weinberg equilibrium.
Natural selection (concept of fitness, selection coefficient, derivation of one unit of selection for a dominant allele, genetic load, mechanism of working, types of selection, density – dependent selection, heterozygous superiority, kin selection, adaptive resemblances, sexual selection.
Genetic drift (mechanism, fonder's effect, bottleneck phenomenon; role of Migration and Mutation in changing allele frequencies.

Unit 6: Species Concept

Product of evolution: Micro evolutionary changes (inter – population variations, clines, races, Species concept, Isolating mechanisms, mode of speciation – allopatric, sympatric, Adaptive radiation / macroevolution (exemplified by Galapagos finches).

Unit 7: Extinctions

Background extinction and Mass extinction (Causes and effects), detailed example of k – T extinction.

Unit 8: Origin and Evolution of Man

Unique hominin characteristics contrasted with primate characteristics, primate phylogeny from *Dryopithecus* leadind to *Homo sapiens*), molecular analysis of human origin.

Unit 9. Phylogenetic trees

Multiple sequence alignment, construction of phylogenetic trees, interpretation of trees.

ZOOLOGY PRACTICAL-C 14 LAB **60 Lectures**

1. Study of fossil evidences from plaster cast models and pictures.
2. Study of homology and analogy from suitable specimens/ pictures.
3. Study and verification of Hardy – Weinberg Law by chi – square analysis.
4. Demonstration of role of natural selection and genetic drift in changing allele frequencies using simulation studies.
5. Graphical representation and interpretation of data of height/ weight of a sample of 100 humans in relation to their age and sex.
6. Construction of phylogenetic tree with the help of bioinformatics tools (Clustal X and Phylip) and its interpretation.

Suggested Readings:

- Ridley, M. (2004). *Evolution*. III Edition. Blackwell Publishing
- Barton, N. H., Briggs, D. E. G., Eisen, J. A., Goldstein, D. B. and Patel, N. H. (2007). *Evolution*. Cold Spring, Harbour Laboratory Press.
- Hall, B. K. and Hallgrimsson, B. (2008). *Evolution*. IV Edition. Jones and Bartlett Publishers
- Pevsner, J. (2009). *Bioinformatics and Functional Genomics*. II Edition. Wiley- Blackwell.
- Campbell, N. A. and Reece J. B. (2011). *Biology*. IX Edition, Pearson, Benjamin, Cummings.
- Douglas, J. Futuyma (1997). *Evolutionary Biology*. Sinauer Associates.
- Minkoff, E. (1983). *Evolutionary Biology*. Addison-Wesley.

COURSES OF STUDY FOR **GENERIC ELECTIVE 'B. Sc. Hons'** PROGRAMME IN

"ZOOLOGY"

SEMESTER I **GENERIC ELECTIVE** **1 Paper**

Total 100 x 1 = 100 Marks

I. GENERIC ELECTIVE (GE 1): (Credits: Theory-04, Practicals-02)

- All Four Generic Papers (One paper to be studied in each semester) of Botany to be studied by the Students of **Other than Zoology Honours.**
- Students of **Zoology Honours** must Refer Content from the **Syllabus of Opted Generic Elective Subject**.

Marks : 75 (ESE: 3Hrs) + 25 (Pr 3Hrs)=100	**Pass Marks: Th ESE = 30 + Pr ESE =10**

Instruction to Question Setter for

End Semester Examination (ESE):

*There will be **two** group of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** six questions of fifteen marks each, out of which any four are to answer.*

***Note:** There may be subdivisions in each question asked in Theory Examinations.*

ANIMAL DIVERSITY **Theory: 60 Lectures**

Unit 1: Kingdom Protista
General characters and classification up to classes; Locomotory Organelles and locomotion in Protozoa

Unit 2: Phylum Porifera
General characters and classification up to classes; Canal System in Sycon 3

Unit 3: Phylum Cnidaria
General characters and classification up to classes; Polymorphism in Hydrozoa

Unit 4: Phylum Platyhelminthes
General characters and classification up to classes; Life history of Taeniasolium

Unit 5: Phylum Nemathelminthes
General characters and classification up to classes; Life history of Ascarislumbricoides and its parasitic adaptations

Unit 6: Phylum Annelida
General characters and classification up to classes; Metamerism in Annelida

Unit 7: Phylum Arthropoda
General characters and classification up to classes; Vision in Arthropoda, Metamorphosis in Insects

Unit 8: Phylum Mollusca
General characters and classification up to classes; Torsion in gastropods

Unit 9: Phylum Echinodermata
General characters and classification up to classes; Water-vascular system in Asteroidea

Unit 10: Protochordates
General features and Phylogeny of Protochordata

Unit 11: Agnatha
General features of Agnatha and classification of cyclostomes up to classes

Unit 12: Pisces
General features and Classification up to orders; Osmoregulation in Fishes

Unit 13: Amphibia
General features and Classification up to orders; Parental care

Unit 14: Reptiles
General features and Classification up to orders; Poisonous and non-poisonous snakes, Biting mechanism in snakes

Unit 15: Aves
General features and Classification up to orders; Flight adaptations in birds

Unit 16: Mammals
Classification up to orders; Origin of mammals

GE 1 LAB: ANIMAL DIVERSITY **60 Lectures**

1. Study of the following specimens:
   Amoeba, Euglena, Plasmodium, Paramecium, Sycon, Hyalonema, and Euplectella, Obelia, Physalia, Aurelia, Tubipora, Metridium, Taeniasolium, Male and female Ascaris lumbricoides, Aphrodite, Nereis, Pheretima, Hirudinaria, Palaemon, Cancer, Limulus, Palamnaeus, Scolopendra, Julus, Periplaneta, Apis, Chiton, Dentalium, Pila, Unio, Loligo, Sepia, Octopus, Pentaceros, Ophiura, Echinus, Cucumaria and Antedon, Balanoglossus, Herdmania, Branchiostoma, Petromyzon, Sphyrna, Pristis, Torpedo, Labeo, Exocoetus, Anguilla, Ichthyophis/Ureotyphlus, Salamandra, Bufo, Hyla, Chelone, Hemidactylus, Chamaeleon, Draco, Vipera, Naja, Crocodylus, Gavialis, Any six common birds from different orders, Sorex, Bat, Funambulus, Loris

2. Study of the following permanent slides:
   T.S. and L.S. of Sycon, Study of life history stages of Taenia, T.S. of Male and female Ascaris

3. Key for Identification of poisonous and non-poisonous snakes

Suggested Readings:

- Ruppert and Barnes, R.D. (2006). Invertebrate Zoology, VIII Edition. Holt Saunders International Edition.
- Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). The
- Invertebrates: A New Synthesis, III Edition, Blackwell Science
- Young, J. Z. (2004). The Life of Vertebrates. III Edition. Oxford university press.
- Pough H. Vertebrate life, VIII Edition, Pearson International.
- Hall B.K. and Hallgrimsson B. (2008). Strickberger's Evolution. IV Edition. Jones and Bartlett Publishers Inc.
- Pechnek, J.A.2000. Biology of Invertebrates. Tata McGraw-Hill Publishing Company, New Delhi.
- Kardong, K.V.2002. Vertebrates. Tata McGraw-Hill Publishing Company, New Delhi.

SEMESTER II **GENERIC ELECTIVE** **1 Paper**

Total 100 x 1 = 100 Marks

II. GENERIC ELECTIVE (GE 2) (Credits: Theory-04, Practicals-02)

Marks : 75 (ESE: 3Hrs) + 25 (Pr 3Hrs)=100	**Pass Marks: Th ESE = 30 + Pr ESE =10**

Instruction to Question Setter for

End Semester Examination (ESE):

*There will be **two** group of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** six questions of fifteen marks each, out of which any four are to answer.*

***Note:** There may be subdivisions in each question asked in Theory Examinations.*

HUMAN PHYSIOLOGY **Theory: 60 Lectures**

Unit I: Digestion and Absorption of Food
Structure and function of digestive glands; Digestion and absorption of carbohydrates, fats and proteins; Nervous and hormonal control of digestion (in brief)

Unit II: Functioning of Excitable Tissue (Nerve and Muscle)
Structure of neuron, Propagation of nerve impulse (myelinated and non-myelinated nerve fibre); Structure of skeletal muscle, Mechanism of muscle contraction (Sliding filament theory), Neuromuscular junction

Unit III: Respiratory Physiology
Ventilation, External and internal Respiration, Transport of oxygen and carbon dioxide in blood, Factors affecting transport of gases.

Unit IV: Renal Physiology
Functional anatomy of kidney, Mechanism and regulation of urine formation,

Unit V: Cardiovascular Physiology
Structure of heart, Coordination of heartbeat, Cardiac cycle, ECG

Unit VI: Endocrine and Reproductive Physiology
Structure and function of endocrine glands (pituitary, thyroid, parathyroid, pancreas, adrenal, ovaries, and testes), Brief account of spermatogenesis and oogenesis, Menstrual cycle

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GE 2 LAB: HUMAN PHYSIOLOGY **60 Lectures**

1. Preparation of temporary mounts: Neurons and Blood film.
2. Preparation of haemin and haemochromogen crystals.
3. Estimation of haemoglobin using sahli's haemoglobinometer.
4. Examination of permanent histological sections of mammalian oesophagus, stomach, duodenum, rectum, lung, kidney, thyroid, pancreas, adrenal, testis, ovary.

Suggested Readings:

- Tortora, G.J. and Derrickson, B.H. (2009) Principles of Anatomy and Physiology, XII Edition, Jhon Wiley and Sons, Inc.
- Widmaier, E.P., Raff, H. and Strang, K.T. (2008). Vander's Human Physiology, XI Edition, McGraw Hill.
- Guyton, A.C. and Hall, J.E. (2011). Textbook of Medical Physiology, XII Edition, Harcourt Asia Pvt. Ltd/W.B. Saunders Company.
- Marieb, E. (1998). Human Anatomy and Physiology, IV Edition, Addison-Wesley.
- Kesar, S. and Vashisht, N. (2007). Experimental Physiology, Heritage Publishers.
- Prakash, G. (2012). Lab Manual on Blood Analysis and Medical Diagnostic, S. Chand and Company Ltd.

SEMESTER III **GENERIC ELECTIVE** **1 Paper**

Total 100 x 1 = 100 Marks

III. GENERIC ELECTIVE (GE 3)

(Credits: Theory-04, Practicals-02)

Marks : 75 (ESE: 3Hrs) + 25 (Pr 3Hrs)=100	**Pass Marks: Th ESE = 30 + Pr ESE =10**

Instruction to Question Setter for

End Semester Examination (ESE):

*There will be **two** group of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** six questions of fifteen marks each, out of which any four are to answer.*

***Note:** There may be subdivisions in each question asked in Theory Examinations.*

FOOD, NUTRITION & HEALTH

Theory: 60 Lectures

Unit 1: Basic concept of food and nutrition

Unit 2: Functions of food Components of food-nutrients (Macro and micronutrients): their biochemical role and dietary sources. Food groups and the concept of a balanced diet. Causes of food spoilage; Food adulteration Nutrition through the life cycle- Physiological considerations, nutrient needs and dietary pattern for various groups- adults, pregnant and nursing mothers, infants, preschool and school children, adolescents and elderly.

Unit 3: Nutritional Biochemistry Carbohydrates, Lipids, Proteins - Definition, Classification, Structure and properties Significance of acid value, iodine value and saponification value of lipids; Essential and Non-essential amino acids; Enzymes- Definition, Classification, Properties; Coenzymes Vitamins- Fat-soluble and Water-soluble vitamins; their Structure and properties Minerals- Iron, calcium, phosphorus, iodine, selenium and zinc: their properties

Unit 4: Health Introduction to health- Definition and concept of health; Major nutritional deficiency diseases- Protein Energy Malnutrition, Vitamin A deficiency, Iron deficiency anaemia, Iodine deficiency disorders, their causes, symptoms, treatment, prevention and government programmes, if any. Life style related diseases- hypertension, diabetes mellitus, and obesity- their causes and prevention through dietary/lifestyle modifications. Social health problems- smoking, alcoholism, drug dependence and Acquired Immuno Deficiency Syndrome (AIDS); Common ailments- cold, cough, fevers, diarrhoea, constipation- their causes and dietary treatment

Unit 5: Food hygiene, Potable water- sources and methods of purification, Food and Water borne infections

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GE 3 LAB: FOOD, NUTRITION & HEALTH **60 Lectures**

1. To detect adulteration in a) Ghee b) Sugars c) Tea leaves and d) Turmeric
2. To determine absorbed oil content in fried foods
3. Estimation of lactose in milk
4. Ascorbic acid estimation in food by titrimetry
5. Estimation of calcium in foods by titrimetry
6. Preparation of temporary mounts of various stored grain pests
7. Project- Undertake computer aided diet analysis and nutrition counselling for different age groups. OR Identify nutrient rich sources of foods, their seasonal availability and price; study of nutrition labelling on selected foods.

Suggested Readings:

- Fifth Ed; 2007; New Age International Publishers
- Srilakshmi B. Nutrition Science; 2002; New Age International (P) Ltd.
- Srilakshmi B. Food Science; Fourth Ed; 2007; New Age International (P) Ltd.
- Swaminathan M. Handbook of Foods and Nutrition; Fifth Ed; 1986; BAPPCO.
- Bamji MS, Rao NP, and Reddy V. Text Book of Human Nutrition; 2009; Oxford & IBH Publishing Co. Pvt Ltd.
- Wardlaw GM, Hampl JS. Perspectives in Nutrition; Seventh Ed; 2007; McGraw Hill.
- Lakra P, Singh MD. Textbook of Nutrition and Health; First Ed; 2008; Academic Excellence.
- Manay MS, Shadaksharaswamy. Food-Facts and Principles; 1998; New Age International (P) Ltd.
- Jain P et al. Poshan va swasthya ke mool siddhant (Hindi); First Ed; 2007; Acadamic Pratibha.
- Gibney et al. Public Health Nutrition; 2004; Blackwell Publishing.
- Berg, J. M., Tymoczko, J. L. and Stryer, L. (2006). Biochemistry. VI Edition. W.H. Freeman and Co.

SEMESTER IV **GENERIC ELECTIVE** **1 Paper**

Total 100 x 1 = 100 Marks

II. GENERIC ELECTIVE (GE 4))

(Credits: Theory-04, Practicals-02)

Marks : 75 (ESE: 3Hrs) + 25 (Pr 3Hrs)=100	**Pass Marks: Th ESE = 30 + Pr ESE =10**

Instruction to Question Setter for
End Semester Examination (ESE):

*There will be **two** group of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** six questions of fifteen marks each, out of which any four are to answer.*

***Note:** There may be subdivisions in each question asked in Theory Examinations.*

ENVIRONMENT & PUBLIC HEALTH

Theory: 60 Lectures

Unit I: Introduction
Sources of Environmental hazards, hazards identification and accounting, fate of toxic and persistent substances in the environment, dose Response Evaluation, exposure Assessment.

Unit II: Climate Change
Greenhouse gases and global warming, cid rain, Ozone layer destruction, Effect of climate change on public health

Unit III: Pollution
Air, Water, Noise pollution sources and effects, Pollution control

Unit IV: Waste Management Technologies
Sources of waste, types and characteristics, Sewage disposal and its management, Solid waste disposal, Biomedical waste handling and disposal, Nuclear waste handling and disposal, waste from thermal power plants, Case histories on Bhopal gas tragedy, Chernobyl disaster, Seveso disaster and three mile island accident and their aftermath.

Unit V: Diseases
Causes, Symptoms and control of tuberculosis, Asthma, Cholera, Minamata disease, typhoid

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GE 4 LAB: ENVIRONMENT & PUBLIC HEALTH

60 Lectures

To determine pH, CI, SO_4, NO_3 in soil and water samples from different locations

Suggested Readings:

- Cutter, S.L., Environmental Risk and Hazards, Prentice- Hall of India Pvt.Ltd. New Delhi, 1999.
- Kolluru Rao, Bartell Steven, Pitblado R and Stricoff "Risk Assessment and Management Handbook", Mc Graw Hill Inc., New York, 1996.
- Kofi Asante Duah "Risk Assessment in Environmental Management", Jhon Wiley and sons, Singapore, 1998.
- Kasperson, J.X. and Kasperson, R.E. and Kasperson, R.E., Global Environmental Risks, V.N. Univ. Press, New York, 2003.
- Joshep F Louvar and B Diane Louver Health and Environmental Risk Ansalysis fundamentals with applications, Prentice Hall, New Jersey 1997.

SAMPLE CALCULATION FOR SGPA & CGPA FOR UNDERGRADUATE **'B.Sc./B.A./B.Com Honours & General'** PROGRAMME

Distribution of Credits Semester wise for Undergraduate Honours Courses

Table B-1: UG (B.A./ B.Sc./B.Com. Hons. Programme)

Semester wise distribution of 140 Credits

	CC	AECC	GE	SEC	DSE	Total credits
Semester I	12	02	06			20
Semester II	12	02	06			20
Semester III	18		06	02		26
Semester IV	18		06	02		26
Semester V	12				12	24
Semester VI	12				12	24
	84	**04**	**24**	**04**	**24**	**140**

CC=Core Course; AECC=Ability Enhancement Compulsory Course; GE=Generic Elective; SEC=Skill Enhancement Course; DSE=Discipline Specific Elective

Table B-2: UG (B.A./ B.Sc./B.Com. Programme)

Semester wise distribution of 120 Credits

	CC	AECC	GE	SEC	DSE	Total credits
Semester I	18	02				20
Semester II	18	02				20
Semester III	18			02		20
Semester IV	18			02		20
Semester V				02	18	20
Semester VI				02	18	20
	72	**04**		**08**	**36**	**120**

CC=Core Course; AECC=Ability Enhancement Compulsory Course; GE=Generic Elective; SEC=Skill Enhancement Course; DSE=Discipline Specific Elective

Table B-3: Sample calculation for SGPA for B.Sc./B.A./B.Com Honours Programme

Course	Credit	Grade Letter	Grade Point	Credit Point (Credit X Grade)	SGPA (Credit Point/Credit)
Semester I					
C-1	06	A	8	48	
C-2	06	B+	7	42	
AECC-1	02	B	6	12	
GE-1	06	B	6	36	
Total	**20**			**138**	**6.9 (138/20)**
Semester II					
C-3	06	B	6	36	
C-4	06	C	5	30	
AECC-2	02	B+	7	14	
GE-2	06	A+	9	54	
Total	**20**			**134**	**6.7 (134/20)**
Semester III					
C-5	06	A+	9	54	
C-6	06	0	10	60	
C-7	06	A	8	48	
SEC-1	02	A	8	16	
GE-3	06	0	10	60	
Total	**26**			**238**	**9.15 (238/26)**
Semester IV					
C-8	06	B	6	36	
C-9	06	A+	9	54	
C-10	06	B	6	36	
SEC-2	02	A+	9	18	
GE-4	06	A	8	48	
Total	**26**			**192**	**7.38 (192/26)**
Semester V					
C-11	06	B	6	36	
C-12	06	B+	7	42	
DSE-1	06	0	10	60	
DSE-2	06	A	8	48	
Total	**24**			**186**	**7.75 (186/24)**
Semester VI					
C-13	06	A+	9	54	
C-14	06	A	8	48	
DSE-3	06	B+	7	42	
DSE-4	06	A	8	48	
Total	**24**			**192**	**8.0 (192/24)**
CGPA					
Grand Total	**140**			**1080**	**7.71 (1080/140)**

Table B-4: Sample calculation for CGPA for B.Sc./B.A./B.Com Honours Programme

Semester I	Semester II	Semester III	Semester IV	Semester V	Semester VI
Credit:20; SGPA:6.9	Credit:20; SGPA: 6.7	Credit:26; SGPA: 9.15	Credit:26; SGPA: 7.38	Credit:24; SGPA: 7.75	Credit:24; SGPA: 8.0

Thus CGPA= (20x6.9+20x6.7+26x9.15+26x7.38+24x7.75+24x8.0)/140**=7.71**

Table B-5: Sample calculation for SGPA for B.A./B.Sc./B.Com. Program

Course	Credit	Grade Letter	Grade Point	Credit Point (Credit X Grade)	SGPA (Credit Point/Credit)
Semester I					
DSC - 1A	06	B	6	36	
DSC - 2A	06	B+	7	42	
DSC - 3A	06	C	5	30	
AECC – 1	02	**B**	6	12	
Total	**20**			**120**	**6.0 (120/20)**
Semester II					
DSC - 1B	06	B	6	36	
DSC - 2B	06	B	6	36	
DSC - 3B	06	C	5	30	
AECC – 2	02	A+	9	18	
Total	**20**			**120**	**6.0 (120/20)**
Semester III					
DSC - 1C	06	A	8	48	
DSC - 2C	06	A+	9	54	
DSC - 3C	06	A	8	48	
SEC – 1	02	A	8	16	
Total	**20**			**166**	**8.3 (166/20)**
Semester IV					
DSC - 1D	06	C	5	30	
DSC - 2D	06	B	6	36	
DSC - 3D	06	B+	7	42	
SEC - 2	02	A+	9	18	
Total	**20**			**126**	**6.3 (126/20)**
Semester V					
DSE - 1A	06	B	6	36	
DSE - 2A	06	A+	9	54	
DSE - 3A	06	A	8	48	
SEC – 3	02	B	6	12	
Total	**20**			**150**	**7.5 (150/20)**
Semester VI					
DSE - 1B	06	B+	7	42	
DSE - 1B	06	B	6	36	
DSE - 1B	06	C	5	30	
SEC - 4	02	C	5	10	
Total	**20**			**118**	**5.9 (118/20)**
CGPA					
Grand Total	**120**			**800**	**6.67 (800/120)**

Table B- 6: Sample calculation for CGPA for B.A./B.Sc./B.Com. Program

Semester I	Semester II	Semester III	Semester IV	Semester V	Semester VI
Credit:20; SGPA: 6.0	**Credit:20; SGPA: 6.0**	**Credit:20; SGPA: 8.3**	**Credit:20; SGPA: 6.3**	**Credit:20; SGPA: 7.5**	**Credit:20; SGPA: 5.9**

Thus CGPA= (20x6.0+20x6.0+20x8.3+20x6.3+20x7.5+20x5.9)/120=**6.67**

MARKS DISTRIBUTION FOR EXAMINATIONS AND FORMAT OF QUESTION PAPERS

Marks Distribution of Mid Semester Theory Examinations:

Table No. C1: Marks distribution of Theory Examinations of Mid Semester

Topic	Code	Full Marks	Pass Marks	Time	Group-A (Very short answer type Compulsory Questions) No. of Questions x Marks = F.M.	Group-B (Descriptive Questions with Choices) No. of Questions x Marks = F.M.	Total No. of Questions to Set	
							Group A	Group B
Mid Sem*	T15	15	6	1 Hr	5 x1 =5	2 (out of 3) x5 =10	5	3
	T25	25	10	1 Hr	5 x1 =5	4 (out of 6) x5 =20	5	6

Marks Distribution of End Semester Theory Examinations:

Table No. C2: Marks distribution of Theory Examinations of End Semester

Topic	Code	Full Marks	Pass Marks	Time	Group-A# (Very short answer type Compulsory Questions) No. of Questions x Marks = F.M.	Group-B (Descriptive Questions with Choices) No. of Questions x Marks = F.M.	Total No. of Questions to Set	
							Group A#	Group B
End Sem	T60	60	24	3 Hrs	Q.No.1 (10x1) + 1x5 =15	3 (out of 5) x15 =45	2	5
	T75	75	30	3 Hrs	Q.No.1 (10x1) + 1x5 =15	4 (out of 6) x15 =60	2	6
	T100	100	40	3 Hrs	Q.No.1 (10x1) + 2x5 =20	4 (out of 6) x20 =80	3	6
	T50 +T50	50X2=100	20	3 Hrs	2 x5 =10	2 (out of 3) x20 =40	2	3

 # Question No.1 in Group-A carries 10 very short answer type 1 Mark Questions.

Marks Distribution of Mid/End Semester Practical Examinations:

Table No. C3: Marks distribution of Practical Examinations of End Semester

Topic	Code	Full Marks	Pass Marks	Time	Distribution of Marks			Total No. of Questions to Set
					Experiment	Record	Viva	
End Sem	P25	25	10	3 Hrs	15	5	5	
	P50	50	20	3 Hrs	30	10	10	Pr. with components of both papers
	P75	75	30	3 Hrs	45	15	15	Pr. with components of all three papers
	P100	100	40	3 Hrs	60	20	20	Pr. with components of all four papers

Abbreviations : T= Theory Examination, **P**= Practical Examination.

Mid Sem* **:** There will be 15 Marks Theory Examination in Practical Subjects and 25 Marks Theory Examination in Non-Practical Subjects/ Papers. 25 Marks Theory Examination may include 10 Marks questions from Assignment/ Project/ Tutorial where ever applicable.

Note **:** There may be subdivisions in each question asked in Theory Examinations.

FORMAT OF QUESTION PAPER FOR MID SEM EXAMINATION

OF

SUBJECTS WITH PRACTICAL

Ranchi University, Ranchi

Mid Sem No. Exam Year

Subject/ Code

F.M. =15 **Time**=1Hr.

General Instructions:
समान्य निर्देश :

i. **Group A** carries very short answer type compulsory questions.
(खंड 'A' में अत्यंत लघु उत्तरीय अनिवार्य प्रश्न हैं।)
ii. **Answer 2 out of 3** subjective/ descriptive questions given in **Group B**.
(खंड 'B' के तीन में से किन्हीं दो विषयनिष्ठ/ वर्णनात्मक प्रश्नों के उत्तर दें।)
iii. Answer in your own words as far as practicable.
(यथासंभव अपने शब्दों में उत्तर दें।)
iv. Answer all sub parts of a question at one place.
(एक प्रश्न के सभी भागों के उत्तर एक साथ लिखें।)
v. Numbers in right indicate full marks of the question.
(पूर्णांक दायीं ओर लिखे गये हैं।)

Group A

1. ..... [5x1=5]
2. .....
3. .....
4. .....
5. .....

Group B

6. ..... [5]
7. ..... [5]
8. ..... [5]

Note: There may be subdivisions in each question asked in Theory Examination.

FORMAT OF QUESTION PAPER FOR MID SEM EXAMINATION

OF

SUBJECTS WITHOUT PRACTICAL

Ranchi University, Ranchi

Mid Sem No. Exam Year

Subject/ Code

F.M. =25 **Time**=1Hr.

General Instructions:
समान्य निर्देश :

i. **Group A** carries very short answer type compulsory questions.
(खंड 'A' में अत्यंत लघु उत्तरीय अनिवार्य प्रश्न हैं।)
ii. **Answer 4 out of 6** subjective/ descriptive questions given in **Group B**.
(खंड 'B' के छः में से किन्हीं चार विषयनिष्ठ / वर्णनात्मक प्रश्नों के उत्तर दें।)
iii. Answer in your own words as far as practicable.
(यथासंभव अपने शब्दों में उत्तर दें।)
iv. Answer all sub parts of a question at one place.
(एक प्रश्न के सभी भागों के उत्तर एक साथ लिखें।)
v. Numbers in right indicate full marks of the question.
(पूर्णांक दायीं ओर लिखे गये हैं।)

Group A

1. ..... [5x1=5]
2. .....
3. .....
4. .....
5. .....

Group B

6. ..... [5]
7. ..... [5]
8. ..... [5]
9. ..... [5]
10. ..... [5]
11. ..... [5]

Note: There may be subdivisions in each question asked in Theory Examination.

FORMAT OF QUESTION PAPER FOR END SEM EXAMINATION

OF

AECC NH + MB COMMUNICATION

Ranchi University, Ranchi

End Sem No. Exam Year

Subject/ Code

F.M. =50 **P.M.**=20 **Time**=1.5Hrs.

General Instructions:

i. **Group A** carries short answer type **compulsory** questions.
(खंड 'A' में लघु उत्तरीय अनिवार्य प्रश्न हैं।)

ii. **Answer 2 out of 3** subjective/ descriptive questions given **in Group B**.
(खंड 'B' के तीन में से किन्हीं दो विषयनिष्ठ/ वर्णनात्मक प्रश्नों के उत्तर दें।)

iii. Answer in your own words as far as practicable.
(यथासंभव अपने शब्दों में उत्तर दें।)

iv. Answer all sub parts of a question at one place.
(एक प्रश्न के सभी भागों के उत्तर एक साथ लिखें।)

v. Numbers in right indicate full marks of the question.
(पूर्णांक दायीं ओर लिखे गये हैं।)

Group A

1. ..... [5]
2. ..... [5]

Group B

3. ..... [20]
4. ..... [20]
5. ..... [20]

Note: There may be subdivisions in each question asked in Theory Examination.

FORMAT OF QUESTION PAPER FOR END SEM EXAMINATION

OF

SUBJECTS WITH PRACTICAL

Ranchi University, Ranchi

End Sem No. Exam Year

Subject/ Code

F.M. =60 **P.M.**=30 (Including Mid Sem) **Time**=3Hrs.

General Instructions:

i. **Group A** carries very short answer type **compulsory** questions.
ii. **Answer 3 out of 5** subjective/ descriptive questions given in **Group B**.
(खंड 'B' के पाँच में से किन्हीं तीन विषयनिष्ठ / वर्णनात्मक प्रश्नों के उत्तर दें।)
iii. Answer in your own words as far as practicable.
(यथासंभव अपने शब्दों में उत्तर दें।)
iv. Answer all sub parts of a question at one place.
(एक प्रश्न के सभी भागों के उत्तर एक साथ लिखें।)
v. Numbers in right indicate full marks of the question.
(पूर्णांक दायीं ओर लिखे गये हैं।)

Group A

1. [10x1=10]

i. ..... [10x1=10]
ii. .....
iii. .....
iv. .....
v. .....
vi. .....
vii. .....
viii. .....
ix. .....
x. .....

2. ..... [5]

Group B

3. ..... [15]
4. ..... [15]
5. ..... [15]
6. ..... [15]
7. ..... [15]

Note: There may be subdivisions in each question asked in Theory Examination.

FORMAT OF QUESTION PAPER FOR END SEM EXAMINATION

OF

SUBJECTS WITHOUT PRACTICAL

Ranchi University, Ranchi

End Sem No. Exam Year

Subject/ Code

F.M. =75 **P.M.**=40 (Including Mid Sem) **Time**=3Hrs.

General Instructions:

i. **Group A** carries very short answer type **compulsory** questions.
ii. **Answer 4 out of 6** subjective/ descriptive questions given in **Group B**.
(खंड 'B' के छः में से किन्हीं चार विषयनिष्ठ / वर्णनात्मक प्रश्नों के उत्तर दें।)
iii. Answer in your own words as far as practicable.
(यथासंभव अपने शब्दों में उत्तर दें।)
iv. Answer all sub parts of a question at one place.
(एक प्रश्न के सभी भागों के उत्तर एक साथ लिखें।)
v. Numbers in right indicate full marks of the question.
(पूर्णांक दायीं ओर लिखे गये हैं।)

Group A

1. [10x1=10]

i. .....
ii. .....
iii. .....
iv. .....
v. .....
vi. .....
vii. .....
viii. .....
ix. .....
x. .....

2. ..... [5]

Group B

3. ..... [15]
4. ..... [15]
5. ..... [15]
6. ..... [15]
7. ..... [15]
8. ..... [15]

Note: There may be subdivisions in each question asked in Theory Examination.

FORMAT OF QUESTION PAPER FOR END SEM EXAMINATION

OF

GE, SEC, GENERAL & AECC HINDI/ ENGLISH COMMUNICATION

Ranchi University, Ranchi

End Sem No. Exam Year

Subject/ Code

F.M. =100 **P.M.**=40 **Time**=3Hrs.

General Instructions:

i. **Group A** carries very short answer type **compulsory** questions.
ii. **Answer 4 out of 6** subjective/ descriptive questions given in **Group B**.
(खंड 'B' के छः में से किन्हीं चार विषयनिष्ठ / वर्णनात्मक प्रश्नों के उत्तर दें।)
iii. Answer in your own words as far as practicable.
(यथासंभव अपने शब्दों में उत्तर दें।)
iv. Answer all sub parts of a question at one place.
(एक प्रश्न के सभी भागों के उत्तर एक साथ लिखें।)
v. Numbers in right indicate full marks of the question.
(पूर्णांक दायीं ओर लिखे गये हैं।)

Group A

1. [10x1=10]

i. .....
ii. .....
iii. .....
iv. .....
v. .....
vi. .....
vii. .....
viii. .....
ix. .....
x. .....

2. ..... [5]

3. ..... [5]

Group B

4. ..... [20]

5. ..... [20]

6. ..... [20]

7. ..... [20]

8. ..... [20]

9. ..... [20]

Note: There may be subdivisions in each question asked in Theory Examination.