

Course break up, Zoology

Dr. B.Paital and D.Dash

Class, Year and Semester: +2 Sc. 1st Yr.,Section-B, 2016

Course details: I. Diversity in Living World b. II. Structural Organization in Animals b.
V. Human Physiology a,b,c,e

Lecture no.	Details to be taught	Remarks
1	Five Kingdom classification; Salient features and classification of Monera, Protista	
2	Five Kingdom classification; Salient features and classification of Fungi into major groups; Lichens; Viruses and Viroids.	
3	Animal tissues (epithelial, connective, muscular, nervous); Morphology, anatomy	
4	Animal tissues connective-proper	
5	Animal tissues connective-skeletal	
6	Animal tissues connective-fluid	
7	Animal tissues muscular	
8	Animal tissues nervous	
9	Functions of different systems (digestive, circulatory, respiratory) of an insect (cockroach) (Brief account only).	
10	Functions of different systems (nervous and reproductive) of an insect (cockroach)(Brief account only).	
11	Alimentary canal and digestive glands	
12	Role of digestive enzymes and gastrointestinal hormones	
13	Peristalsis, digestion, absorption and assimilation of proteins	
14	Peristalsis, digestion, absorption and assimilation of fats	
15	Calorific value of proteins, carbohydrates and fats (brief account)	
16	Egestion; Nutritional and digestive disorders- PEM, indigestion,	
17	Respiratory organs in animals (tracheal, bronchial, cutaneous, pulmonary); Respiratory system in humans; Mechanism of respiration (breathing) and its regulation in humans- Exchange of gases, transport of gases, Respiratory volumes; Disorders related to respiration- Asthma, Emphysema, Occupational respiratory disorders.	
18	Respiratory organs in animals (tracheal, bronchial, cutaneous, pulmonary); Respiratory system in humans; Mechanism of respiration (breathing) and its regulation in humans- Exchange of gases, transport of gases, Respiratory volumes; Disorders related to respiration- Asthma, Emphysema, Occupational respiratory disorders.	
19	Respiratory organs in animals (tracheal, bronchial, cutaneous, pulmonary)	
20	Respiratory system in humans; Mechanism of respiration (breathing) and its regulation in humans	
21	Respiratory system in humans- Exchange of gases, transport of gases, Respiratory volumes	
22	Disorders related to respiration- Asthma, Emphysema, Occupational respiratory disorders.	

23	Compositon of blood, blood groups coagulation of blood Composition of lymph and its function	
24	Human circulatory system- Structure and working of human heart, blood vessels;	
25	Cardiac cycle, cardiac output, ECG; Double circulation;	
26	Regulation of cardiac activity. Disorders of circulatory system- Hypertension, Coronary artery disease, Angina pectoris, Heart failure.	
27	Types of movement- ciliary, flagellar, muscular;	
28	Skeletal muscle- contractile proteins and muscle contraction;	
29	Joints; Disorders of muscular and skeletal system- Myasthenia gravis, Tenany, Muscular dystrophy, Arthritis, Osteoporosis, Gout.	

Book Recommended:

1. Bureau's Higher Secondary (+2) Zoology, Practical, Published by Odisha State Bureau of Text Book Preparation and Production, Bhubaneswar.
2. Text Book of Biology, NCERT

Course break up, Zoology, Dr.A.K.Mohanty and Dr.N.Upadhaya

Class, Year and Semester: +2 Sc. 1st Yr., Section-A, 2016

Course details: I. Diversity in Living World (a., d.) and V. Human Physiology (d., f. & g.)

Lecture no.	Details to be taught	Remarks
1	Scope of Zoology, Characteristics of living organisms, differences between living and non-living, Biodiversity: its' importance and sustenance	
2	Classification: Need, brief history, 2 to 5 kingdom classification, taxonomy and systematics, taxonomical / Linnaean hierarchy	
3	3 Domains of life: Archaea, Bacteria and Eukarya (6 Kingdom classification proposed by Carl Woese, Kandler and Wheelis	
4	Binomial Nomenclature: Common rules with examples	
5	Taxomocal tools: Museum, Zoo, Herbarium, Botanical garden	
6	Study of Animal Kingdom: Five salient features and two examples of Kingdom Protista (Phylum Protozoa), Phylum- Porifera, Coelenterata, Platyhelminthes, Nematelminthes	
7	Study of Animal Kingdom: Five salient features and two examples of Phylum- Annelida, Arthropoda, Mollusca, Echinodermata	
8	Study of Animal Kingdom: Five salient features and two examples of each class of Phylum Chordata (Pisces - Chondrichthyes, Osteichthyes, Tetrapoda - Amphibia, Reptilia, Aves and Mammalia)	
9	Human Physiology: Excretion - Types of excretory products, Aminotelism, Ammonotelism, Ureotelism and Uricotelism, organs of excretion Nephridia, Malpighian tubules, Maxillary gland (green gland), Skin (perspiration), Lungs (Exhalation)	
10	Human Physiology: Excretion – Kidney; Location, shape, size, structure: Nephron;	

	structure, types, distribution	
11	Human Physiology: Excretion – Mechanism of urine formation; Ultrafiltration (regulation through rennin-angiotensin mechanism), Selective Reabsorption and counter current mechanism, Tubular Secretion	
12	Human Physiology: Excretion – Urinary disorders; Oligouria, Polyuria, Dysuria, Hematuria, Nephrosis, Nephritis, Ptosis, Kidney stone, Gout, Renal failure and dialysis, artificial kidney	
13	Human Physiology: (Control and Co-ordination) Nervous System – Types of neurons: non-polar, unipolar, bipolar, multipolar, sensory, motor, internuncial, somatic and visceral, Nerves/nerve fibres – myelinated and unmyelinated. Parts of neuron: cyton, axon, Dendron and synapse	
14	Human Physiology: Nervous System – Central nervous system (Brain and Spinal cord), structure and function of brain	
15	Human Physiology: Nervous System – structure and function of spinal cord, Peripheral nervous system (Cranial and Spinal nerves), Reflex action	
16	Revision	
17	Human Physiology: Visceral nervous system: sympathetic (Thoraco- lumbar) and parasympathetic (cranio-sacral) system, their operation with examples	
18	Human Physiology: Conduction of nerve impulse through axon (depolarization/action potential , repolarization/ resting potential, operation of Na ⁺ & K ⁺ pumps, Donnan equilibrium	
19	Human Physiology: Electrical and chemical synapse, Conduction of nerve impulse through synapse, neurotransmitters	
20	Human Physiology: Sensory perception – sense organs like eye, ear, skin, tongue etc., elementary idea on structure and function of eye and ear	
21	Human Physiology: (Control and Co-ordination) Endocrine system- general organization of endocrine glands and their location	
22	Human Physiology: Endocrine system- Chemical nature of hormone, receptors, elementary idea on mechanism of hormone action	
23	Human Physiology: Endocrine glands – Structure and function of Hypothalamus, Pineal, Pancreas	
24	Human Physiology: Endocrine glands – Structure and function of Pituitary; Malfunction (Hypo & Hyper secretion)- Dwarfism, Gigantism, Acromegaly, Simmond's disease	
25	Structure and function of Thyroid, Parathyroid and Adrenals, malfunctioning (Hypo & Hyper secretion) of thyroid – Cretinism, Goitre, exophthalmus , Malfunctioning (Hypo & Hyper secretion) of Adrenals – Addison's disease, Conn's syndrome, Cushing's syndrome, Adreno-genital syndrome	
26	Structure and function of Gonads (Testes & Ovaries), Sex hormones and Hormones associated with reproduction	
27	Revision	

Book Recommended:

1. Bureau's Higher Secondary (+2) Zoology, Practical, Published by Odisha State Bureau of Text Book Preparation and Production, Bhubaneswar.

2. Text Book of Biology, NCERT

Class : +2Sc Year, 2nd Year, Section A

Course title: Zoology

Credit: 2+0

Course teachers: Dr.C.S.K.Mishra, Dr.R.Pattnaik

Unit/Chapter	Unit name	No. of lectures	Name of the teacher
1	Neural control and coordination	06	
2	Chemical coordination and regulation	04	
3 A	Animal reproduction	04	
3 B	Human development	04	
4.	Reproductive health	02	
5.	Genetics	07	
6 A	Human health and diseases	02	
6B	Immunity	02	
6C	Adolescence	02	
7	Strategies for enhancement of food production	02	
8	Biodiversity	01	
9	Environmental issues	04	

LESSON PLAN

Class : +2 2nd year SECTION-B

Course title: BIOLOGY – II (Zoology) Theory + 2, 2nd Year Science

Credit:

Course teachers: Dr.S.T.Patnaik ,D.Mohapatra

Unit	Unit name	No. of lectures	Name of the teacher
1	Neural Control and Coordination	6	D.Mohapatra
2	Chemical Coordination and Regulation	4	D.Mohapatra
3	Animal Reproduction	4	D.Mohapatra

	Human Development	4	
4	Reproductive Health	4	D.Mohapatra
5	Genetics	7	Dr.S.T.Patnaik
6	Human Health and Diseases	6	Dr.S.T.Patnaik
7	Strategies for enhancement of Food Production	2	Dr.S.T.Patnaik
8	Biodiversity	1	Dr.S.T.Patnaik
9	Environmental Issues	4	Dr.S.T.Patnaik

COURSE BREAK UP

COURSE BREAK UP

Unit – 5 Genetics

Dr.S.T.Patnaik

Lecture No.	Topics to be covered
L-1	Introduction to genetics, gene, terms, Mendelism-monohybrid cross.
L-2	Mendelism-dihybrid cross, rules of mendelism
L-3	Linkage and crossing over,
L-4	Sex determination
L-5	Sex linked inheritance, Pedigree analysis of Haemophilia, Chromosomal aberrations (Structural) Genetic disorders (Haemophilia, Sickle- cell anaemia, Phenylketonuria, Down's syndrome, Klinefelter's Syndrome and Turner's Syndrome).
L-6	Elementary idea about Recombinant DNA technology, Human Genome Project, DNA Fingerprinting,
L-7	Discussion

COURSE BREAK UP

Unit – 6 Human health and diseases

Dr.S.T.Patnaik

Lecture No.	Topics to be covered
L-1	Introduction to Common Diseases in Humans: Typhoid, Pneumonia, Common Cold,
L-2	Introduction to Common Diseases in Humans: Malaria, Amoebiasis, Ascariasis.
L-3	Introduction to Common Diseases in Humans: Filariasis, Ringworm
L-4	Immunity: Innate immunity, Acquired immunity, Cell mediated immunity, Humoral immunity, Active and Passive immunity,
L-5	Vaccination and Immunization, Allergies, Autoimmune Diseases, Immune System of our body. AIDS, Cancer.
L-6	Problems of Adolescence : Drug and Alcohol abuse, Effect of Drug/ Alcohol abuse (prevention and control).

Unit – 7 Strategies for enhancement of Food Production

Dr.S.T.Patnaik

Lecture No.	Topics to be covered
L-1	Introduction to Animal Husbandry : Management of Farm animals (Diary Farm Management, Poultry Farm Management, Animal Breeding)
L-2	Introduction to Bee Keeping, Fisheries.

Unit – 8 Biodiversity

Dr.S.T.Patnaik

Lecture No.	Topics to be covered
L-1	Its importance, Biosphere reserve, National Parks, Zoos, Sanctuaries

Unit – 9 Environmental Issues

Dr.S.T.Patnaik

Lecture No.	Topics to be covered
L-1	Introduction to Air pollution and its control,
L-2	Introduction to Water pollution and its control,
L-3	Introduction to Solid wastes, Agro-chemicals and their effects, Radioactive wastes,
L-4	Introduction to Green house Effect and Global Warming, Ozone Depletion in the Stratosphere, Degradation by Improper resource utilization & maintenance and Deforestation.

+3 1st semester

ZOC-T-1101

Dr.R.Patnaik and Dr.B.Pailat

Unit -1

Lect. No	Topics to be covered
L-1	General characteristics and classification of Protista
L-2	General characteristics and classification of parazoa
L-3	General characteristics and classification of metazoan
L-4	Type study of <i>Euglena</i> : general morphology ,locomotion, nutrition and respiration
L-5	Osmoregulation and reproduction in <i>Euglena</i>
L-6	Type study of <i>Paramecium</i> : : general morphology ,locomotion, nutrition and respiration
L-7	reproduction in <i>Paramecium</i> : transverse binary fission, autogamy cytogamy and endomixis

L-8	Type study of <i>Amoeba</i> general morphology ,locomotion, nutrition and osmoregulation
L-9	Reproduction: binary fission, sporulation , encystment
L-10	Life cycle of <i>plasmodiumvivax</i> : history, types of malaria,symptoms
L-11	Pathogenesis, duration of infection,
L-12	Control of malaria, anti malariacampaignin India
L-13	<i>Entamoebahistolytica</i> : amoebic dysentery, symptoms and mode of transmission
L-14	Diagnosis therapy, prevention
L-15	Locomotoryorganellesin protozoa: pseudopodia, flagella, cilia
L-16	Mode of locomotion, flagellar movement, ciliary movement, amoeboid movement
L-17	Reproduction in protozoa, asexual reproduction,budding, multiple fission
L-18	Sexual reproduction, syngamy, conjugation,parthenogenesis
L-19	Evolution of symmetry and its significance in metazoan
L-20	Segmentation in metazoan
L-21	General characteristics and classification of Cnidaria
L-22	Metagenesis in <i>Obelia</i>
L-23	Polymorphism in Cnidaria: patterns of polymorphism, importance of polymorphism
L-24	What are corals, structure of coral polyps, types of corals in different groups
L-25	Coral reefs, types, formation , and economic importance of coral reefs

ZOC (T)-1101: Unit – 2: Porifera and Cnidaria	
Lesson	Course Breakup

No.	
L-1	<i>Porifera: General characteristics, Pinacoderm, choanoderm, mesenchyme, ostia, oscula, buds, gemmules.</i>
L-2	Classification up to classes: Calcarea (Calcispongiae), acsonoid, syconoid and leuconoid
L-3	Homocoela: (Asconosa), choanocytes, spongocoel, example- <i>Clathrina</i> , Heterocoela: (Syconosa), body wall and flagellated chambers, Scypha, Grantia
L-4	Hexactinellida: (Hyalospongiae), glass sponge, skeletons and finger shaped chambers,
L-5	Demospongia: Tetractinellida, Monaxonida, Keratosa. Other types of Porifera.
L-6	Canal system and spicules in sponges, definition, sessile, water currents in spongocoel, Food route.
L-7	Reaction stimuli, nervous system, swimming flagellated larvae form.
L-8	Asconoid, osculum, pinacocytes, ostium, porocyte,
L-9	Syconoid, incurrent canals, Dermal ostium, radial canal
L-10	Leuconoid, Excurrent canal, aphodus, prosodus, Advantages of canal system in Porifera.
L-11	Spicules in sponges, monaxon, triaxon, tetraaxon, polyaxon.
L-12	Cnidaria: General characteristics and Classification up to classes
L-13	Metagenesis in Obelia: Diploid sexual phase, haploid sexual phase, saprophytic, gametophytic, alternation of generation, Hyman concept.
L-14	Polymorphism in Cnidaria: Polyp, Tube with tentacles, sessile coral polyps, medusa, umbrella shape, tentacles around mouth, motile, free swimming, Nematocyst,
L-15	Corals Great barrier reef, Cnidarians, Coral polyps, collar feeding, Scleractinian corals, Hard corals,
L-16	Coral reefs: Zooxanthellae, mutualism in corals, coral reef zonation, Threats to coral reef, Benefits of coral reefs.

ZOC (T)-1101: Unit – 4: Nematelminthes	
Lesson No.	Course Breakup
L-1	General characteristics: Triploblastic, syncytial epidermis, Blastocoel, pseudocoel, glandular canals, dimorphism.
L-2	Classification up to classes: Aphasmdia, Enoploidea, Dorylaimoidea, Mermithoidea and other orders.
L-3	Phasmdia: Trichuroidea, Dictiphymoidea, Rhabditoidea and other oredres.
L-4	<i>Ascaris lumbricoides</i> : Distribution and habit habitat, shape, size, body wall
L-5	Reproductive organs, Testes, vas deference, seminal vesicle, ejaculatory duct, penial setae, oavaries, oviducts, uteri, vagina
L-6	Copulation and fertilization, Gamete formation, zygote, cleavage and early development
L-7	Infection to new host, Later development and migration, primary and secondary migration
L-8	Pathogenesis: Infection to organs, pneumonia, enteritis, toxins release by worms, physiologic and physical markers for infection
L-9	<i>Wuchereria bancrofti</i> : Copulation, larval development in man, microfilariae
L-10	Development in mosquito, infection to new human host
L-11	Elephantasis: diagnosis, pathogenesis, therapy, control.
L-12	Parasitic adaptation in helminthes: cuticle, locomotion, muscular pharynx, continuous blood supply, pre-digestion
L-13	Protection inside host, life outside host, resistance to environmental risks, minute size.
L-14	Infection mode to new host, physiologic adaptation, biochemical adaptation.

References

1. Barnes: The Invertebrates – A synthesis (3rd ed 2001, Blackwell)
2. Hunter: Life of Invertebrates (1979, Collier Macmillan)
3. Marshall: Parker & Haswell Text Book of Zoology, Vol. I (7th ed 1972, Macmillan)
4. Moore: An Introduction to the Invertebrates (2001, Cambridge University Press)
5. Brusca and Brusca: Invertebrates (1990, Sinaur Publisher)

ZOC-T-1102

ZOC-C-1102 DR.B.PAITAL

ZOC (T)-1102: Unit – 2: Tools and techniques in biology	
Lesson No.	Course Breakup
L-1	Growth curve: Introduction to Population Biology, Immigration, migration, birth and death rates,
L-2	Environmental resistance, r: the growth rate, Calculation growth rate,
L-3	Exponential growth: Doubling time, Biotic potential, Reproductive frequency, J shaped curve, Eagle as example, Effects of death rates, Boom and bust cycle.
L-4	Logistic growth: Stabilization of population at carrying capacity, origin of logistic growth curve, Consequences of exceeding k,
L-5	Equation and patterns for population growth, Calculation of population growth
L-6	r and K strategies: Critical factors, Energy ratio, Reproductive to energy maintenance ratio, Uncrowned and over crowded environment.
L-7	Population regulation: Density dependent and independent factors, climate and weathers, predations, parasitism and competition,
L-8	Population interactions: Critical Environmental Factors, Adaptation, Natural Selection,
L-9	Speciation, Ecological Niche, Population Dynamics, Community Properties, Succession, Introduced Species
L-10	Gause's Principle with laboratory and field examples, Niche, Gause's Law of competitive exclusion, Same guild different niche, Physical and physiological

	modifications in organisms to obey Gause's Principle, Examples: guild, Specialist, Generalist.
L-11	Lotka-Volterra equation, Food and predation, Problems in predation, Nutrient ration, Threshold Elemental ratio, P:C, Negative and positive nutrient exhaustion
L-12	Lotka-Volterra equation for competition, Stoichiometry and facilitation based chemostat, Daphnia population as example,
L-13	Lotka-Volterra equation, Predation, predator-prey model, Modeling autotrophs, Nutrient Dilution rates.
L-14	Lotka-Volterra equation for functional responses, Ingestion and handling time constrains, Holling's type I, II and II model,
L-15	Lotka-Volterra equation for numerical responses, stability and persistent with stoichiometry depend on nutrient level
L-16	Time series of full stoichiometry model and traditional Lotka-Volterra models and equations.

ZOG-T-1101

Class : +3Sc 2ND Year, 3rd Semester

Course title: ZOG(T) - 2303, Aquatic biology

Credit: 4+0

Course teachers: D.Mohapatra, Dr.C.S.K.Mishra, Dr.S.T Pattnaik

Unit	Unit name	No. of lectures	Name of the teacher
1	Aquatic biomes	16	D. Mohapatra
2	Fresh water biology	16	Dr. C.S.K.Mishra
3	Marine biology	16	D. Mohapatra
4	Management of aquatic resources	16	Dr.S.T.Pattnaik

COURSE BREAK UP

Dr.C.S.K.Mishra

Lecture No.	Topics to be covered
L-1	Introduction to lakes: Origin and classification
L-2	Lake as an ecosystem, lake morphometry
L-3	Physico chemical characteristics:Light, temperature,thermal stratification of lake
L-4	Dissolved solids, carbonates, bicarbonates,
L-5	Phosphates and nitrates, turbidity
L-6	Dissolved gases: Oxygen,carbondioxide
L-7	Nutrient cycles in lakes: nitrogen cycle
L-8	Sulphur and phosphorous cycle
L-9	Introduction about streams, stages of stream development
L-10	Physico chemical characteristics of streams
L-11	Adaptation of hill stream fishes
L-12	Revision class

Dr. N.UPADHYA

Class #	Paper	Unit	Content breakups
1	ZOC(T)-2306	1	Ecosystem, types of ecosystem and freshwater ecosystem
2	ZOC(T)-2306	1	Lakes: Origin and classification (1)
3	ZOC(T)-2306	1	Lakes: Origin and classification (2)
4	ZOC(T)-2306	1	Lake as an Ecosystem;
5	ZOC(T)-2306	1	Lake morphometry
6	ZOC(T)-2306	1	Physico–chemical Characteristics of Lake: Light
7	ZOC(T)-2306	1	Physico–chemical Characteristics of Lake: Temperature, Thermal stratification
8	ZOC(T)-2306	1	Physico–chemical Characteristics of Lake: Dissolved Solids (Carbonate, Bicarbonates, Phosphates and Nitrates) and Turbidity
9	ZOC(T)-2306	1	Physico–chemical Characteristics of Lake: Dissolved gases (Oxygen and Carbon dioxide)
10	ZOC(T)-2306	1	Nutrient Cycles in Lakes-Nitrogen, Sulphur and Phosphorous (1)
11	ZOC(T)-2306	1	Nutrient Cycles in Lakes-Nitrogen, Sulphur and Phosphorous (2)
12	ZOC(T)-2306	1	Streams: Different stages of stream development
13	ZOC(T)-2306	1	Streams:Physico-chemical environment
14	ZOC(T)-2306	1	Streams: Adaptation of hill-stream fishes
15	ZOC(T)-2306	1	Revision and question answer discussion

Dr.S.T.PATNAIK unit-iv

Lecture No.	Topics to be covered
L-1	Introduction to the topic
L-2	Types of pollutant
L-3	Agricultural pollution-introduction and cause
L-4	Agricultural pollution effect and prevention
L-5	Sweage pollution-introduction and cause
L-6	Sweage pollution effect and prevention
L-7	Thermal pollution-introduction and cause
L-8	Thermal pollution effect and prevention
L-9	Oil spill pollution-introduction and cause
L-10	Oil spill pollution effect and prevention
L-11	EUTROPHICATION-cause, effect and prevention
L-12	Management and conservation (legislations
L-13	Sewage treatment, types and models
L-14	Water quality assessment in various environment
L-15	BOD and COD with procedure
L-16	Discussion

ZOC-T-2305

LESSON PLAN

Class : CORE COURSE V,ZOC(T)-2305

Course title: DIVERSITY OF CHORDATA

Credit: 4

COURSE BREAK UP

Unit – 1, IV
Dr.S.T.Patnaik

Lecture No.	Topics to be covered
L-1	Introduction to the topics
L-2	General characteristics of chordata
L-3	outline classification of chordata up to pisces
L-4	outline classification of chordata up to tetrapoda
L-5	General characteristics of Hemichordata
L-6	Morphology and examples of Hemichordata
L-7	General characteristics of Urochordata
L-8	Morphology and examples of Urochordata
L-9	General characteristics of Cephalochordata
L-10	Morphology and examples of Cephalochordata
L-11	Study of larval forms in protochordates
L-12	Life history in Urochordata
L-13	Retgressive metamorphosis in Urochordata
L-14	Dipleurula concept and the Echinoderm theory of origin of chordates
L-15	Advanced features of vertebrates over Protochordata
L-16	Discussion

Unit – 4
Dr.S.T.Patnaik

Lecture No.	Topics to be covered
L-1	Introduction to the topics
L-2	General characters of class mammalia
L-3	Classification up to 1-7 order
L-4	Classification up to 8-16 order
L-5	Classification up to 17-21 order
L-6	Classification up to 22-28 order
L-7	General characters of Prototheria
L-8	Affinities of Prototheria
L-9	Adaptive radiation with reference to locomotory appendages
L-10	Evolutionary significance of adaptive radiation in mammals
L-11	Zoogeographical realms of world and India
L-12	Theories pertaining to distribution of animals
L-13	Plate tectonic and Continental drift theory,
L-14	Distribution of vertebrates in different realms SA,NA,Africa
L-15	Distribution of vertebrates in different realms Australia,Asia,Oriental
L-16	Discussion

DR. R. PATNAIK

Lect. No	Topics to be covered

L-1	Introduction to vertebrates, advance features of vertebrates over protochordates
L-2	Phylogeny and evolutionary history of vertebrates
L-3	General characters and classifications of cyclostomes upto classes Classification of cyclostomes continues
L-4	Systematic position , distribution , habit and habitat , external features of petromyzon
L-5	Internal anatomy and physiology of petromyzon
L-6	General characters and external morphology of myxine
L-7	Affinities of petromyzon and myxine
L-8	General characters of chondrichthyes and classification upto order
L-9	General characters of osteichthyes and classification upto order
L-10	Migration in fishes: causes of migration, gametic or spawning migration, feeding migration
L-11	Osmoregulatory or protective migration, factors influencing migration
L-12	Osmoregulation: what is osmoregulation, mechanism of osmoregulation in fishes
L-13	Parental care in fishes

ZOC-T-2306

Course break up

Class, Year and Semester: +3 Sc. 2nd Yr. 3rd Semester, 2016

Course No.: ZOC (T) - 2306

Unit: III & IV

Lecture no.	Details to be taught	Remarks
1	Types of muscles- Skeletal, smooth, cardiac, structure of muscle fibres	
2	Ultra structure of skeletal muscles, structure of myofibrils (Thick filaments, thin filaments, A band, I band, H zone, Pseudo H zone, M line)	
3	Contractile proteins- Myosin, Actin, Tropomyosin and Troponins	
4	Mechanism of muscle contraction: Cross bridges, Theories (sliding filament, Davies, calcium release) and Phosphagenes	

5	Muscle twitch (preparatory phase, contraction phase, relaxation phase), motor unit, summation, All or none principle, Refractory period, Tetanus, Rigor mortis, Cori cycle, muscular dystrophy	
6	Male reproductive system: Testis, its structure	
7	Male reproductive system: Accessory reproductive glands- Seminal vesicle, prostate gland, cowper's gland, their structure and function	
8	Male puberty, sperm production in seminiferous tubule	
9	Vasa efferentia, Epididymis, vas deferens, spermatic cord, Male contraception (condom, vasectomy)	
10	Female reproductive system: Ovary, its' structure	
11	Female reproductive system: Accessory reproductive glands-Bartholin gland, Uterus, fallopian tube	
12	Female puberty, ova production, Graafian follicle, corpus luteum	
13	Menstrual cycle, Biological risk period, Biological safe period, Rhythm method of birth control, Intra-uterine devices, Tubectomy, contraceptive pills.	
14	Endocrine glands of our body (Permanent and seasonal), their location	
15	Revision	
16	Hormones, receptors, signal transduction by steroid and non-steroid hormones	
17	Hypothalamus, neuro-endocrine control, role of nuclei in neuro-endocrine system	
18	Pineal gland (Epiphysis cerebri): circadian rhythm, melatonin, effect of light on reproduction	
19	Pituitary gland (Hypophysis cerebri), its' structure, Histology	
20	Hormones of pituitary: STH, TSH, ACTH, LPH (Function and Malfunction)	
21	Hormones of pituitary: FSH, LH, Prolactin, MSH, Oxytocin, Vasopressin (Function and Malfunction)	
22	Thyroid gland: its' structure, Hormones- MIT, DIT, T ₃ , T ₄ , Calcitonin	
23	Function and Malfunction of Thyroid hormones	
24	Parathyroid gland, structure, hormones (Parathormone/ Calcirium), calcium metabolism	
25	Pancreas –structure, Glucagon, Insulin, Somatostatin,	
26	Malfunction of pancreas, diabetes mellitus, insulin shock	
27	Adrenal Gland: structure, Glucocorticoids, Mineralo-corticoids, Sex hormones, catecholamines (Epinephrine and Nor-epinephrine)	
28	Malfunctioning of adrenal, role in emergency	
29	Male Gonads: Testes, Androgens, function	
30	Female Gonads: Ovaries, Oestrogens, Progesterone,	
31	Placental Hormones and revision	

DR. N.UPADHYA

Class #	Paper	Unit	Content breakups
1	ZOC(T)-2306	1	Hierarchical organization of Body: organism-organ system-organ-tissues-cell; organ systems of Human being.
2	ZOC(T)-2306	1	Tissues: classification, embryonic origin and characteristic features.
3	ZOC(T)-2306	1	Epithelial tissue: Characteristic, classification and general functions
4	ZOC(T)-2306	1	Simple epithelium including pseudo stratified epithelium
5	ZOC(T)-2306	1	Stratified epithelium and transitional epithelium

Class #	Paper	Unit	Content breakups
6	ZOC(T)-2306	1	Glands: Origin, structural classification, functional classification and characteristics
7	ZOC(T)-2306	1	Exocrine glands: structure and functions
8	ZOC(T)-2306	1	Endocrine glands: structure and functions
9	ZOC(T)-2306	1	Connective tissue: Embryonic; adult connective tissue – components and types
10	ZOC(T)-2306	1	Connective tissue Proper: Areolar
11	ZOC(T)-2306	1	Connective tissue Proper: Fibrous, adipose and reticular
12	ZOC(T)-2306	1	Skeletal Connective tissue: Chordal tissue and cartilage – characters, types and function
13	ZOC(T)-2306	1	Skeletal Connective tissue: character, components, types and function (1)
14	ZOC(T)-2306	1	Skeletal Connective tissue: character, components, types and function (2)
15	ZOC(T)-2306	1	Ossification, bone growth and resorption
16	ZOC(T)-2306	1	Revision of epithelial tissue with question and answer
17	ZOC(T)-2306	1	Revision of connective tissue with question and answer
18	ZOC(T)-2306	1	Muscular tissue: characteristic, type and function
19	ZOC(T)-2306	1	Nervous tissue: Components and function
20	ZOC(T)-2306	2	Structure of neuron
21	ZOC(T)-2306	2	Resting membrane potential and action potential
22	ZOC(T)-2306	2	Origin of action potential and its propagation along the myelinated nerve fibers
23	ZOC(T)-2306	2	Propagation action potential across the unmyelinated nerve fibers
24	ZOC(T)-2306	2	Types of synapsis
25	ZOC(T)-2306	2	Synaptic transmission
26	ZOC(T)-2306	2	Neuromuscular junction
27	ZOC(T)-2306	2	Reflex action and its types
28	ZOC(T)-2306	2	Reflex arc
29	ZOC(T)-2306	2	Physiology of hearing (1)
30	ZOC(T)-2306	2	Physiology of hearing (2)
31	ZOC(T)-2306	2	Physiology of vision (1)
32	ZOC(T)-2306	2	Physiology of vision (2)
33	ZOC(T)-2306		Revision of nervous tissue and with question and answer
34	ZOC(T)-2306		Revision of transmission of nerve impulse with question and answer
35	ZOC(T)-2306		Revision of Physiology of vision and hearing with question and answer

ZOC-T-2307

DR.B.PAITAL

ZOC (T)-2307: Unit – 1: Integumentary and skeletal system	
Lesson No.	Course Breakup
L-1	Definition, skin and accessory structures, epidermis, dermis, hypodermis, hair, glands, nails, horns.

L-2	Epidermis: characteristics, superficial layer, stratified squamous layers, five main layers, cells of epidermis, function.
L-3	Dermis: Thickest layer, dense irregularity, accessory structures, function,
L-4	Hypodermis: deepest layer, areolar and adipose tissues, blood supply and nerve connections, functions.
L-5	Keratinocytes, melanocytes, langerhans cells, Merkel cells,
L-6	Desmosomes, diseases related to epidermis, papillary region, reticular region,
L-7	Skin colour, inflammation, melanin, vitiligo, albinism,
L-8	Hair; structure, shaft, root, hair follicle, anatomy of hair, types, colour, composition, function,
L-9	Nail: morphology, eponychium, lunula, nail bed, free edge, nail matrix, composition, function.
L-10	Cancer and skin, Hoofs: horns and antlers, beaks, feathers, plumules, scales, bristles, Glands.
L-11	Comparison among vertebrates for skin modification, structural and functional level.
L-12	Skeletal system: Definition, function, endoskeletons, exoskeletons, cartilages, bones.
L-13	Cranial system; Chondrocranium, dermatocranium, splanchnocranium, ethmoid centres, otic centers, anapsid, diapsid, euryapsid, synapsid,
L-14	Attachments: paleostylic, euautostylic, amphistylic, hyostylic, metautostylic, craniostylic,
L-15	Axial skeleton: notochord, vertebral column, ribs, sternum, skull, structure, types and functions of ribs.
L-16	Types of centra: aspondyly, monospondyly, stereospondyly, polyspondyly, aspidospondyly, amphicoelous, procoelous, opisthocoelous, heterocoelous, acoelous
L-17	Appendicular skeleton; Fins in fishes, girdles, miscellaneous bones in different

	vertebrates, comparison of bones in vertebrates.
L-18	Jaw suspensorium: Jaw suspension in different vertebrates, evolution, autodiastylitic, amphistylitic, hyostylitic, autostylitic, craniostylitic, comparative account.

ZOC (T)-2307: Unit – 2: Digestion and respiration in fish	
Lesson No.	Course Breakup
L-1	COMPARATIVE ACCOUNT OF ALIMENTARY CANAL IN FISHES, general plan of alimentary canal, mouth, teeth.
L-2	Mouth: terminal, sub-terminal, interior, superior, in gnathostomata and in agnatha, pike and handsaw, in carnivores and herbivores,
L-3	Teeth; palatine, vomer, maxillary, pre-maxillary, teeth in characinoides, specially modified teeth.
L-4	Buccal cavity: pharynx, gill rakers, in carnivores, omnivores and herbivores, in plankton feeders,
L-5	Oesophagus and stomach: in carnivores, omnivores, and herbivores, stomach size and digestion, stomach and its glands.
L-6	Intestine: in carnivores, omnivores, and herbivores, intestine length to body length ratio as marker to identify fish type.
L-7	Pyloric caeca and process of digestion, rate of gastric secretion in selected fish,
L-8	Respiratory organs in fish: Skin, gills, accessory respiratory organs. Gills; filaments, rakers and arches, flow of water.
L-9	Gills in different fishes, role of operculum, esophagus in water pulling, pouched, septal and opercular gills, external gills.
L-10	Accessory respiratory organs: skin, its modification, gaseous exchange through mucous layer, mechanism,

L-11	Oral papillae, buccopharyngeal epithelium, labyrinthine organ,
L-12	Lungs in fishes, air bladder, gas secretion and resorption, functions of swim bladder,

ZOG-T-2303

Class : +3Sc 2ND Year,3rd Semester

Course title: ZOG(T) - 2303, Aquatic biology

Credit: 4+0

Course teachers: D.Mohapatra, Dr.C.S.K.Mishra, Dr.S.T Pattnaik

Unit	Unit name	No. of lectures	Name of the teacher
1	Aquatic biomes	16	D. Mohapatra
2	Fresh water biology	16	Dr. C.S.K.Mishra
3	Marine biology	16	D. Mohapatra
4	Management of aquatic resources	16	Dr.S.T.Pattnaik

COURSE BREAK UP

Dr.C.S.K.Mishra

Lecture No.	Topics to be covered
L-1	Introduction to lakes: Origin and classification
L-2	Lake as an ecosystem, lake morphometry
L-3	Physico chemical characteristics:Light, temperature,thermal stratification of lake
L-4	Dissolved solids, carbonates, bicarbonates,
L-5	Phosphates and nitrates, turbidity
L-6	Dissolved gases: Oxygen,carbondioxide
L-7	Nutrient cycles in lakes: nitrogen cycle
L-8	Sulphor and phosphorous cycle
L-9	Introduction about streams, stages of stream development
L-10	Physico chemical characteristics of streams
L-11	Adaptation of hill stream fishes
L-12	Revision class

GF

Class #	Paper	Unit	Content breakups
1	ZOC(T)-2306	1	Ecosystem, types of ecosystem and freshwater ecosystem
2	ZOC(T)-2306	1	Lakes: Origin and classification (1)
3	ZOC(T)-2306	1	Lakes: Origin and classification (2)
4	ZOC(T)-2306	1	Lake as an Ecosystem;
5	ZOC(T)-2306	1	Lake morphometry
6	ZOC(T)-2306	1	Physico–chemical Characteristics of Lake: Light
7	ZOC(T)-2306	1	Physico–chemical Characteristics of Lake: Temperature, Thermal stratification
8	ZOC(T)-2306	1	Physico–chemical Characteristics of Lake: Dissolved Solids (Carbonate, Bicarbonates, Phosphates and Nitrates) and Turbidity
9	ZOC(T)-2306	1	Physico–chemical Characteristics of Lake: Dissolved gases (Oxygen and Carbon dioxide)
10	ZOC(T)-2306	1	Nutrient Cycles in Lakes-Nitrogen, Sulphur and Phosphorous (1)
11	ZOC(T)-2306	1	Nutrient Cycles in Lakes-Nitrogen, Sulphur and Phosphorous (2)
12	ZOC(T)-2306	1	Streams: Different stages of stream development
13	ZOC(T)-2306	1	Streams:Physico-chemical environment
14	ZOC(T)-2306	1	Streams: Adaptation of hill-stream fishes
15	ZOC(T)-2306	1	Revision and question answer discussion

Dr.S.T.PATNAIK unit-iv

Lecture No.	Topics to be covered
L-1	Introduction to the topic
L-2	Types of pollutant
L-3	Agricultural pollution-introduction and cause
L-4	Agricultural pollution effect and prevention
L-5	Sweage pollution-introduction and cause
L-6	Sweage pollution effect and prevention
L-7	Thermal pollution-introduction and cause
L-8	Thermal pollution effect and prevention
L-9	Oil spill pollution-introduction and cause
L-10	Oil spill pollution effect and prevention
L-11	EUTROPHICATION-cause, effect and prevention
L-12	Management and conservation (legislations
L-13	Sewage treatment, types and models

L-14	Water quality assessment in various environment
L-15	BOD and COD with procedure
L-16	Discussion

ZOS-T-2301

Class, Year and Semester: +3 Sc. 2nd Yr. 3rd Semester,
2016

Course No.: ZOS (T) - 2301

Unit: I & II

Lecture no.	Details to be taught	Remarks
1	Introduction: Healthy, diseased, Parameters checked for a diseased person	
2	Diagnostic tools, Methods used for used for analysis of blood samples (cells, Hb., sugar, lipids, electrolytes, urea, uric acid, pathogens etc.), urine samples (pH, electrolytes, albumin, urea, uric acid, pathogens, pus, blood etc.), fecal matter analysis (pathogens, cysts, pus, blood etc.), immunological tests	
3	Collection and storage of blood samples, anticoagulants used, preparation of smear , Composition of Blood: Plasma- composition, function	
4	Composition of Blood: R.B.C.- structure, function, formation	
5	Composition of Blood: W.B.C. - types, structure, function, formation	
6	Composition of Blood: Platelets - structure, function, formation	
7	Differential Count (D.C.): stains used- Leishman's stain, Giemsa stain, D.C. counting machine, counting of different types of leucocytes	
8	TEC (Total Erythrocytes Count): Diluting fluid, Haemocytometer, Micropipettes, calculation, TLC (Total Leucocytes Count): Diluting fluid, Haemocytometer, Micropipettes, calculation	
9	Platelet counting using Haemocytometer, Diluting fluid, calculation	
10	Erythrocyte sedimentation Rate (ESR): Addition of anticoagulant, normal rate, Why increase or decrease? Procedure, its' utility	
11	Packed cell volume/ hematocrit: Normal value, factors affecting PCV, Procedure, Utility	
12	Infectious diseases : Common causes and Preventive measures	
13	Tuberculosis: causative organism, mode of infection, symptoms, diagnosis and prevention, treatment	
14	Hepatitis: causative organism, mode of infection, symptoms, diagnosis and prevention, treatment	
15	Revision	

ZOL

ZOL[E]4105

LESSON PLAN

Class : PG 1st semester

Course title: ZOL (E)- 4105, Applied Entomology (Elective)

Credit: 4+0

Course teachers: Dr.C.S.K.Mishra, Dr.S.T.Pattnaik

Unit	Unit name	No. of lectures	Name of the teacher
1	Mulberry sericulture	16	Dr. C.S.K.Mishra
2	Apiculture, Lac culture	16	Dr. C.S.K.Mishra
3	Medical entomology	16	Dr. C.S.K.Mishra
4	Pests of farm animals ,Forensic entomology, biotechnological applications	16	Dr.S.T.Pattnaik

COURSE BREAK UP

Dr.C.S.K. Mishra

Lecture No.	Topics to be covered
L-1	General introduction about sericulture, Moriculture: Cultivation and propagation of mulberry plants, Diseases and pests of the food plant.
L-2	Rearing of mulberry silk worms: Silk worm life cycle, rearing houses, Equipments for rearing, Sanitation, hatching, feeding, cleaning and spacing, collection of mature worms for mounting
L-3	Harvesting and processing of cocoons: Cocoon selection, stifling
L-4	Reeling and reeling appliances: Direct reeling and reeling machines, silk examination, lacing and skeining
L-5	Genetic improvement of mulberry silk worms: Silk worm genetics, importance of silk worm as a model for genetic research, polyploidy, heredity, mutation
L-6	Exploitation of heterosis in the genetic improvement of mulberry silk worm
L-7	General introduction about non mulberry sericulture, types of non mulberry sericulture, Arboriculture, cultivation of food plants: climate and soil, important food plants and their propagation
L-8	Rearing of tasar silk worms: rearing methods, equipments.
L-9	Pupation and cocoon formation, reeling of cocoons.
L-10	Cultivation of muga food plants and rearing of silk worms
L-11	Cocoon formation, grainage technology and reeling of cocoons
L-12	Cultivation of eri food plants, rearing of silk worms
L-13	Cocoon harvest, reeling of cocoons
L-14	Revision class
L-15	Diseases of the silk worms: Pebrine, Flacherie, Grasserie and their control: Symptoms, causative agents, mode of infection and multiplication, pathological effects, prophylaxis and control methods.
L-16	Pests, parasites and predators of silk worms and their control: Types, nature of damages, prevention and control methods.
L-17	Sustainability of sericulture as an agro-industry: Sericulture as an employment generating practice and its contribution to income generation of farmers and national economy.
L-18	Introduction to apiculture, Honey bee as a social insect, body structure, types of honey bees and organization of bee colony: queen, drones and workers

L-19	Life history and behavior of bees, dance language of bees, origin of the bee types, swarming, senses and communication
L-20	Bee keeping : Introduction, Bee keeping tools: Hives, comb foundation, queen excluder, honey extractor, uncapping knife, smoker, hive tool, overall, bee veil, gloves, brush, swarm catching equipment, feeder, queen cell protector, apiary management
L-20	Handling of bees, extraction of honey, wax, bee products: Honey: Definition and composition, physico-chemical characteristics, uses.
L-21	Bee wax and its use, bee venom, propolis, royal jelly, pollen and their use.
L-22	Revision class
L-23	Introduction to lac culture and its history ,Economic importance,, Distribution of lac insects in India,Life history of lac insect
L-24	Host plant management, strains of lac insects, propagation of lac insects
L-25	Lac cultivation: Natural and artificial inoculation, harvesting of lac, , crop management,
L-26	Processing of Shellac: Hand made process, heat process, solvent process, natural enemies of lac insects.
L-26	Revision class
L-27	Introduction to medical entomology, Pests of public importance
L-28	Mosquitoes :Types, common characters, life cycle,distinguishing features of different species, mosquito borne diseases .Chemical and biological control of mosquitoes.
L-29	House flies : Different species,characters,life cycle,economic importance.Control of house flies.
L-30	Human flea: Systematic position,distribution,characters,life cycle,flea borne diseases,control of fleas.
	The human louse: Systematic position,types, distribution,life cycle,louse borne diseases, control of lice.
	Bed bugs: Systematic position,types, distribution,life cycle, bed bug borne diseases, control of bed bugs.
L-31	General introduction of insect borne diseases of man,Typhus,Yellow fever
L-32	Dengue and Encephalitis: Causative agents, symptoms, pathogenecity, prophylaxis and treatment.

L-33	Plague and Leishmaniasis: Causative agents, symptoms, pathogenicity, prophylaxis and treatment
L-34	Sleeping sickness, Filariasis: Causative agents, symptoms, pathogenicity, prophylaxis and treatment
L-35	Malaria Causative agents, symptoms, pathogenicity, prophylaxis and treatment
L-36	Insect venoms,allergenicity: Chemical nature of insect venoms,biological roles,evolution of venoms- use for prey capture,defensive venoms, venom allergy.
L-37	Blister and urtica inducing insects: Types and mechanism of blister and urtica induction,treatment.
L-38	General introduction about house hold pests, cockroach,ant: Structure,life cycle,nature of damages caused.Control of the populations.
L-39	Wasps, carpet beetles, furniture beetles, book lice: Structure,life cycle, nature of damages caused.Control of the populations.
L-40	Revision class

Unit – IV

Dr.S.T.Patnaik

Lecture No.	Topics to be covered
L-1	Introduction to the topics
L-2	Pest of farm animals and their control -Blood-sucking flies
L-3	Types of Blood-sucking flies
L-4	Myiasis flies structure
L-5	Myiasis flies etiology
L-6	Lice etiology
L-7	Fleas etiology
L-8	Arthropods of forensic importance
L-9	Insects succession on corpse and its relationship to determining time of death-general
L-10	Insects succession on corpse and its relationship to determining time of death-pig
L-11	Insects succession on corpse and its relationship to determining time of death-human
L-12	Biotechnological applications in forensic entomology

L-13	Transgenesis and its application
L-14	Insects as bioreactors and its application
L-15	Insect cell culture and its application
L-16	DISCUSSION

ZOL[C] 5313

LESSON PLAN

Class : PG 3rd Semester

Course title: Chordates

Credit:

Course teachers: Dr.S.T.Patnaik ,

Unit	Unit name	No. of lectures	Name of the teacher
1	Chordates	16	Dr.S.T.Patnaik
2	Chordates	16	Dr.S.T.Patnaik
3	Physiology		Dr.A.Mohanty
4	physiology		Dr.A.Mohanty

COURSE BREAK UP

Unit – I and II

Dr.S.T.Patnaik

Lecture No.	Topics to be covered
L-1	Introduction to the topics-characters of chordata
L-2	Origin of Chordata with evolutionary time
L-3	Origin of Chordata different theories
L-4	Classification of Chordata-character of chordata
L-5	Classification of Chordata-upto super class pisces
L-6	Classification of Chordata upto super class tetrapoda
L-7	Phylogeny and affinities of urochordates and amphioxus
L-8	Adaptive radiation in vertebrates Aquatic
L-9	Adaptive radiation in vertebrates Terrestrial
L-10	Adaptive radiation in vertebrates Aerial
L-11	Adaptive radiation in vertebrates Arboreal
L-12	Transition from Agnatha to Gnathostomata
L-13	Different theories of origin of jaw
L-14	Neoteny in Amphibia

L-15	Paedogenesis in Amphibia
L-16	Discussion
L-1	Introduction to the topics
L-2	Skull in reptiles Anapsida, Diapsida,
L-3	Skull in reptiles Euryapsida, and Synapsida
L-4	Plumage and colouration in birds
L-5	Evolution of primates-earliest primates
L-6	Evolution of primates-arising of new chaacters
L-7	Evolution of human
L-8	Comparative account of Respiratory organs in vertebrates-upto super class pisces
L-9	Comparative account of Respiratory organs in vertebrates-upto super class tetrapoda
L-10	Comparative account of Jaw suspensorium in vertebrates-upto super class pisces
L-11	Comparative account of Jaw suspensorium in vertebrates upto super class tetrapoda
L-12	Comparative account of Limbs and girdles in vertebrates-upto super class pisces
L-13	Comparative account of Limbs and girdles in vertebrates upto super class tetrapoda
L-14	Comparative account of Organ of olfaction and taste in vertebrates-upto super class pisces
L-15	Comparative account of Organ of olfaction and taste in vertebrates upto super class tetrapoda
L-16	Discussion

Class, Year and Semester: M.Sc. 3rd Semester 2016

Course No.: ZOL (C) - 5313

Unit: IV Dr. A.Mohanty

Lecture no.	Details to be taught	Remarks
1	Introduction on Circulatory System: Blood, Lymph, Heart, Vessels etc.	
2	Blood as connective tissue: Plasma composition, volume, function, Haemopoiesis	
3	Erythrocytes – numbers, structure, contents, haemoglobin, function, life span, erythropoiesis	
4	Blood: Leucocytes- Granulocytes: Neutrophils, Eosinophils, Basophils, structure, numbers, contents, function, formation, life, Agranulocytes – Monocytes,	

	Lymphocytes, structure, numbers, contents, function, formation, life span	
5	Platelets- structure, contents, numbers, function, formation, life span, Lymph: composition, circulation (dynamics), function	
6	Blood coagulation (haemostasis), factors, theories, mechanism	
7	Heart: structures - Atria, Ventricles, Origin and conduction of cardiac impulse through S.A. Node, A.V. Node, Bundle of His, Purkinje fibres, Columnae Carnea, Papillary muscles, Chordae tendinae	
8	Heart: Double circulation, structure of cardiac muscles and their properties (Contractility, Rhythmicity, Conductivity, All or None principle, stair case phenomenon, Refractory period) , Cardiac Cycle (Auricular Systole, Auricular Diastole, Ventricular Systole, Ventricular Diastole, Pause), stroke volume, cardiac output	
9	Cardiac regulation: Effect of temperature, pH, electrolytes like Na, K, Ca, Sympathetic and parasympathetic fibres, Metabolism, Oxygen availability, effects of hormones like adrenaline, nor-adrenaline, sex hormones, alkaloids, Baroreceptor reflex, Bainbridge effect	
10	ECG: Galvanometer, leads/ electrodes, recording P, Q, R, S, T and analysis, Common diseases of circulation; Anaemia, Arrhythmia, Angina pectoris, myocardial infarction, arteriosclerosis, atherosclerosis etc.	
11	Respiration: aerobic, Anaerobic, Respiratory system, Structure and function of parts of respiratory system (nasal chamber, pharynx, larynx, trachea, bronchi, bronchioles, alveolar ducts, lungs and alveoli)	
12	Pulmonary ventilation/ breathing, mechanism, control/ regulation, Gaseous exchange at lungs and tissue, partial pressure, Artificial Respiration, Pulmonator/ Resuscitator	
13	Surfactant: Natural and Artificial, chemical nature, production, function, compliance, disorders	
14	Tidal volume, vital capacity, residual volume, inspiratory reserve volume, expiratory reserve volume, dead space, respiratory quotient, Respiratory pigments	
15	Revision	
16	Transport of oxygen , oxygen dissociation curve, Bohr's effect, oxygen debt	
17	Transport of carbon dioxide, loading tension, alkali reserve, chloride shift, Haldane's effect, Hill reaction	
18	Basal Metabolic Rate, food energy, BMR estimation, respiratory buffering (carbonic acid/ bicarbonate buffer, phosphate buffer, proteins as buffer) respiratory and renal mechanism	
19	Excretion: Amminotelic, Ammonotelic, Ureotelic, Uricotelic, types and formation of nitrogenous wastes	
20	Kidney location, size shape, structure: cortex (Renal columns of Bertini), medulla (Renal pyramids, minor calyces, major calyces, Duct of Bellini, Renal papillae)	
21	Nephrons: Types (cortical, juxtamedullary), location, structure (Bowman's capsule, glomerulus), Proximal convoluted tubule, Loop of Henle (Descending limb, Ascending limb), Distal Convoluted tubule, Collecting duct	

22	Urine formation: Ultra-filtration and it's regulation, Urine formation: Selective Reabsorption, Counter Current Theory	
23	Urine formation: Tubular Secretion, Excretion of H ⁺ and ammonium, Acid Base Balance and homeostasis, urine composition	
24	Renal function tests: Urinalysis, serum creatine test, blood urea nitrogen (BUN), Estimated Glomerular filtration Rate (GFR), Kidney malfunction: Oligouria, Polyuria, Dysuria, Hematuria, Nephrosis, Nephritis, Ptosis, Kidney stone, Gout etc.	
25	Muscles: Types (Skeletal, Smooth, Cardiac), Structure of skeletal muscles, myofibrils (Thick filaments, thin filaments, A band, I band, H zone, Pseudo H zone, M line)	
26	Mechanism of muscle contraction: Cross bridges, Theories (sliding filament, Davies, calcium release) and Phosphagenes	
27	Muscle twitch (preparatory phase, contraction phase, relaxation phase), summation, All or none principle, Refractory period, Tetanus, Rigor mortis, Cori cycle, muscular dystrophy, Types of contraction: Isometric contraction Isotonic contraction, antagonistic muscles	
28	Nutrition, types (stages of nutrition: Ingestion, digestion, Absorption, Assimilation, Egestion), Food intake, composition of food, Dietary balance, obesity, starvation	
29	Digestive system and its histology, Digestion in mouth, stomach, intestine	
30	Gastro-intestinal Hormones, Absorption of nutrients, Egestion, Deficiency diseases,	
31	Revision	

Course break up

Class, Year and Semester: M.Sc. 3rd Semester 2016

Course No.: ZOL (C) - 5314

Unit: I Dr.A.Mohanty

Lecture no.	Details to be taught	Remarks
1	Introduction: Evolution, it's importance, what brings the change	
2	Geological time scale: Era, Periods, Epoch, approximate age in millions of years	
3	Origin of Life: Theories/ Hypotheses	
4	Origin of Life: Oparin- Haldane Hypothesis, Miller-Urey's experiment	
5	Origin of Life: Biochemical Evolution: Coacervation, formation of amino acids, nucleic acids and nucleoproteins, brief idea about Evidences in favour of evolution (anatomical, palaeontological, embryological)	
6	Pre-Darwinian concepts and theories: Aristotle, James Ussher, Linnaeus, John Ray,	
7	Pre-Darwinian concepts and theories: Erasmus Darwin, Lamark, Thomas Malthus, George Cuvier, Charles Lyell	
8	Darwin's theory: Synthesis of Idea from B.R. Malthus and Alfred Russel Wallace, Prodigality of production, struggle for existence, completion (intra and inter-specific), survival of the fittest	
9	Darwin's theory: Variation and heredity, Origin of species	

10	Objection to Darwinism, Neo-Darwinism	
11	Major thoughts of evolutionary synthesis: Alfred Russel Wallace, Julian Huxley, Simpson, De Vries, Correns, Tschermak, Dobzansky	
12	Idea about gene flow, recombination, mutation and isolation	
13	Natural selection, types: Macro and Micro-evolution, Speciation (Allopatric and Sympatric), species, polymorphism, convergent and divergent evolution	
14	Synthesis of genetics and evolution	
15	Revision	

UNIT ii, iii, iv Dr.N.Upadhaya

ZOL[C] 5315

ZOL(C)-5315

DR.R.PATNAIK

Unit – I: (Molecular Biology)

Lect. No	Topics to be covered
L-1	What are DNA binding proteins. Functions of DNA binding proteins
L-2	classification of DNA binding proteins and their attachment sites and their interactions with DNA
L-3	Transcription in prokaryotes: transcription machinery, RNA polymerase,
L-4	Transcription factors(TFs), mediators of transcription initiation with pol II
L-5	Promoter sites for initiation of transcription in prokaryotes
L-6	Initiation and elongation of RNA synthesis in prokaryotes
L-7	Inchworm model for elongation of transcripts
L-8	Stability of elongation complex (RNA-DNA Hybrid vs RNAP-DNA interactions)
L-9	Termination of transcription
L-10	Regulation of transcription
L-11	RNA processing in prokaryotes, degradation of RNA in E. coli

L-12	REPs , DEAD-Box and degradosome
L-13	Cutting and nucleotide modification
L-14	Polyadenylation of m RNA in prokaryotes
L-15	Transcription and processing of RNA polymerase I and III transcripts in eukaryotes Initiation of RNA synthesis in eukaryotes
L-16	Capping of the 5 end of the transcripts
L-17	Elongation of eukaryotic pre-rRNA and pre-tRNA
L-18	Splicing of pre-rRNA and pre-tRNA
L-19	Chemical modification of rRNA and tRNA

Unit – II: (Molecular Biology)

Lect. No	Topics to be covered
L-1	1. Transcription and processing of RNA polymerase II transcripts in eukaryotes a) Formation of transcription initiation complex with RNA polymerase II
L-2	Regulation of transcription initiation
L-3	Capping of RNA polymerase II transcripts
L-4	Elongation of eukaryotic pre-mRNAs
L-5	Termination of synthesis of pre-mRNAs and polyadenylation (addition of poly A tail)

L-6	Removal of introns from nuclear pre-mRNA (Splicing); alternate splicing and trans-splicing
L-7	RNA editing: Discovery and types
L-8	Insertation/deletion types of RNA editing c- insertion /dinucleotide insertion editing
L-9	Substitution/modification types of RNA editing
L-10	Genetic code , properties of genetic code Codon assignments, chain initiation and chain termination codon
L-11	Wobble hypothesis
L-12	Mutation and the genetic code

ZOL(C)-5315 : Molecular biology – II and Ethology, Unit – III: (Molecular Biology)	
Lesson No.	Course Breakup
L-1	Structure of tRNA. Cloverleaf model. 3' and 5' ends.
L-2	Aminoacid in tRNA. tRNA charging. Ester bond formation.
L-3	3' CCA end. Enzyme mediated and ATP utilization. The cyclic process.
L-4	Brief introduction on types of ribosomes. Ribosome and noble prize. Ribosomal sub-units. Initiation, elongation and translocation sites.
L-5	Cryo-electron 3D structure. The early stage of ribosome crystallography. Ribosomal sub-units under high resolution. Ribosomal structure and accuracy in mRNA translation.
L-6	Closing and opening of 30S sub-unit. Ribosomal function and clinical importance.

L-7	The process of translation. Molecular requirements. Steps involved. A, P and E sites in ribosome.
L-8	Elongation. Start codon. Initiations factors. Energetics. IF1, IF2 and IF3. Shine-Dalgarno. Sequence. f-Met-tRNA.
L-9	Elongation process. Role of peptidyl transferase. Peptide bond formation. Translation termination. Release factor.
L-10	Brief introduction. Major differences between pro and eukaryotes in relation to translation. Eukaryotic mRNA.
L-11	Initiation, elongation and termination process. No Shine-Dalgarno sequence, no fMet-tRNA
L-12	eIF 1 to eIF 5. The complex (40S – Met-tRNA – eIFs). “scanning” of mRNA. Energetics, role of GDP. Chain elongation and termination.
L-13	Splicing variants. Types of PTM. Requirement of PTM. Human proteomics and Swiss port annotation.
L-14	Nascent protein. Protein sorting, sequencing and modification. Different chemical modifications.
L-15	Charge dependent changes. Organelle dependent changes. Functions of histone and nucleosome. H3 barcode hypothesis. Chromatin remodelling. Phosphorylation. Glycation. Methods to examine PTM

ZOL-C-5316

LESSON PLAN

Class : PG 3rd semester

Course title: ZOL (C)- 5316, Developmental biology and Immunology

Credit: 4+0

Course teachers: Dr. C.S.K.Mishra, Dr.B.R.Paital

Unit	Unit name	No. of lectures	Name of the teacher
1	Developmental biology-1	16	Dr. C.S.K. Mishra
2	Developmental biology-2	16	Dr. C.S.K. Mishra
3	Developmental biology-3	16	Dr. C.S.K. Mishra
4	Immunology	16	Dr.B.R.Paital

COURSE BREAK UP

Dr.C.S.K.Mishra

Lecture No.	Topics to be covered
L-1	Introduction to fertilization, fertilization in sea urchin: Gamete release and transport, Recognition of gametes and acrosomal reaction, sperm penetration, Blocks of polyspermy.
L-2	Fertilization in sea urchin, Prevention of polyspermy, metabolic activation of the egg, gamete fusion, Activation of egg metabolism, fusion of the genetic material
L-3	Fertilization in mammals: Sperm transport in the female reproductive tract, egg transport, viability of ova and sperms
L-4	Fertilization in mammals: Union of gametes, Development and fusion of pronuclei. Hormonal control of fertilization, Significance of fertilization.
L-5	Early development, cleavage patterns: The cell during cleavage, distribution of yolk and its effect on cleavage, cleavage patterns and types.
L-6	Formation of blastula in amphibians, gastrulation, fate map: The significance of blastula, mechanism of formation, mechanism of gastrulation, significance of gastrula. Methods for construction of fate map.
L-7	Cell movement and formation of germ layers in echinoderms (sea urchin).
L-8	Cell movement and formation of germ layers in amphibians and birds.
L-9	Organisation and properties of the embryo during cleavage and blastulation.
L-10	Molecular events during cleavage and blastulation, parental imprinting.

L-11	Potency, commitment, specification, Induction, competence, determination.
L-12	Revision class
L-13	Introduction to stem cells, stem cell differentiation, Origin of stem cells, Assymetric division of stem cells, Stem cell types: adult stem cells, fetal stem cells, embryonic stem cells, haematopoietic, mesenchymal and neural stem cells.
L-14	Migration of stem cells to injured tissues, stem cell therapy and other applications.
L-15	Differentiation: Definition, Chemical basis
L-16	Selective action of genes in differentiation: Signals to genes, recognition of genes by signal molecules, relation of differentiation to mitosis.
L-17	Differentiation gone out of control, Changing pattern of protein synthesis, Regulation of differentiation.
L-16	Pattern formation: Antero-posterior pattern formation in <i>Drosophila</i>
L-17	Dorso-ventral pattern formation in <i>Drosophila</i> , role of maternal, segmentation and homeotic genes
L-18	Organisation of HOX genes in vertebrates
L-19	Axis formation in amphibians, Nieuwkoop centre and primary organizer
L-20	Axis formation in birds and mammals, role of pattern forming genes
L-21	Revision class
L-22	Late embryonic development: Vulva formation in <i>Coenorhabditis</i>
L-23	Neural tube formation in vertebrates
L-24	Development of limb in vertebrates: Introduction, cellular and molecular mechanism.
L-24	Role of HOX genes and other pattern forming genes in the limb development
L-25	Metamorphosis in insects and amphibians: Changes in organisation, causation, tissue reactivity in amphibians, moulting in insects, causation, factors controlling molting

L-26	Hormonal control of metamorphosis in insects and amphibians
L-27	Regeneration of salamander limbs: Typical case of regeneration, renewal of the limb, regenerative ability, stimulation and suppression.
L-28	Polar coordinate model: Significance and explanation of the model.
L-29	Senescence: Introduction, types, mechanism, regulation.
L-30	Revision class

ZOL(C)-5316: Developmental biology and Immunology	
Lesson No.	Course Breakup
L-1	Brief introduction to immunology. History. Edward Jenner's work. Variolation. Vacca Selective theory. Enzyme substrate theory
L-2	Classification of immuno system. Natuarl, artificial and passive and active immunity. Skin as innate immunity. Physiological barriers. Phagocytes. Summary of innate immunity
L-3	Acquired immunity. Natural and artificial. Acquired immunity. Antibody therapy. Ag receptors in B-cells. Overall process of immunity.
L-4	B cells, T cells and NK cells. Originated from bone marrow. Lymphoid and myeloid origin. LGL. Cells of adaptive immunity. TCR and BCR. Origin and functions of T, B and NK cells.
L-5	T helper cells. T cytotoxic cells. T regulatory cells. CD4, CD8, T cells. T memory cells. T NK cells
L-6	Plasma cells. Memory cells. B1 cells. Regulatory cells. Null cells. WBCs. Phagocytes. Dendritic cells
L-7	CRPs. C1-C9 proteins and their properties. Paul Ehrlich's work.
L-8	Classical pathway. Lectin (MBL) pathway. Alternative pathway
L-9	Common pathway of three pathways. Biological effects of CS. Regulation of CS. Clinical aspects of CS.

L-10	Antigens. Immunogens. Properties of immunogens. Example and in silico modelling of immunogens. Factors affecting immunogen function.
L-11	Susceptibility to Ag. Biological system contribute to immunogenicity. Common immunogens
L-12	Epitopes. Conformational and linear epitopes. Super Ag. Sag and and S-arrestin.
L-13	Haptens. Experiments to determine haptens. T-cell dependent and independent Ag.
L-14	Introduction to immune responses. Need of PR. Time to take PR. Involvement of CD and B-cells. Key concepts f primary response. Enzyme activation-induced cytidine deaminase (AID) interactions
L-15	Introduction to immune responses. Need of SR. Time to take PR. Involvement of immuno cells. PR vs SR
L-17	Ab structure and contribution of Porter, Edelman and Nisonoff. Fc, Fab, HC, LC regions. Bence-Jones protein. Monoclonal Ab and hybridoma. Chemical bonds in Ab structure. 3D structure.
L-18	Ag receptor diversity. Types of Ab and their uniqueness.
L-19	Comparison among different Ab as per their ml wt., serum level, half-life, involvement in CRP pathways etc. Ig, a special Ab and its uniqueness.
L-20	Variable regions of Ab. Theories of genetic diversity of Ab. Germ line, Somatic and two gene model.
L-21	Kappa genes. Lambda genes. Heavy chain gene. 3 Ig genes. Alternate splicing in B-cells. Ig M and IgD splicing.
L-22	Combinational V-(D)-J joining. Junctional flexibility. Junctional diversity. P and N region nucleotide addition. CDR region domain.
L-23	Class /Isotype switching. Idiotypes. Factors affecting class switching. Role of Golgi complexes. Research applications.
L-24	IgG and TCR Structure of TCR Alpha and beta chain. Membrane bound and free parts.
L-25	Development of TCR Functions of TCR. Link with membrane associated Fab. Organisation of TCR. V-domain. Binding sites in TCR. TCR diversity. Specificity of TCR

	for Ag.
L-26	TCR in human. Disease related to TCR dysfunction. Synthesis of TCR. TCR complex. Alpha -beta and Gamma -delta TCR.
L-27	TCR in human. Disease related to TCR dysfunction. Synthesis of TCR. TCR complex. Alpha -beta and Gamma -delta TCR.
L-28	Gorer and Snell's work on MHC. General characters of MHC. Genes of MHC. Human Leucocyte Ag (HLA). Class I, II and III MHC. Ag recognition and presentation.
L-29	MHC in human and mouse. Mechanism of action of MHCs. Location of MHC genes. Organisation of MHC proteins.
L-30	MHC polymorphism. Biological roles of MHC. Genetic diseases and MHC.
L-31	Ag recognition by BCR. TCR and MHC-Ag complex recognition. TCR and CD4/8 to recognise microbial pathogens. Role of MHC to recognise varieties of non-self proteins.
L-32	Mechanism of APC. TCR ligand and MHC complex formation. Ag presentation to B cells.
L-33	Cell Mediated purpose. Activation of Naïve and Effector T cells. Phases of T-cell response. MHC associated peptide recognition. Biochemical signals for T-cell activation.
L-34	Un-usual T-cell activation. Role of co-stimulators. T cell stimulation by CD8 and CD28. Limiting and terminating immuno responses.
L-35	Biochemical pathways. Transcription factors. NK=κB activation. IL2 and T cell activation. Clonal expansion of T cells. Helper T cell subsets. Development of helper T-cells. TH1, TH2, TH17, and memory T cells
L-36	Properties of CT cells. Targets of CT cells. Action with IL21, helper T cells etc. CD4 and 8 cells
L-37	Mechanism of killing. Perforin/Granzyme killing. FasL/Fas killing. Other CT cells.
L-38	Hygiene, drugs, vaccine. Vaccine vs immunisation. Definition of Vaccine. Mechanism of action. APC
L-39	Endogenous pathway. Exogenous pathway. Polio as an example.
L-40	Live attenuated vaccine. Killed vaccine. Traditional vaccines. Limitations and problem in vaccination for certain diseases. Modern vaccines.

