



Netaji Subhas Open University

Honours in Zoology

Programme Code - HZO

Programme Objectives

The specific objective of HZO is to provide systematic knowledge in the subject which will serve as the basis of further higher education in this area. Fundamentally, with the provision of obtaining the degree to everyone interested to learn in this area, but unable to attain the conventional system of education; the course is structured in such a manner so that it can generate interest among learners with basic understanding of the subject. This course with theoretical and practical topics and evaluation system will serve as a screening process for the students to gain interest, sufficient understanding and skill on the subjects which will influence them to proceed further in this subject and gain an educated outlook to observe and assess living world. This programme will act as the gateway to next level of higher education and for various vocational or professional courses and as basic qualification of different types of job oriented entrance examinations.

Expected Programme Outcome

Following are the expected learning outcome of the programme –

- This programme is expected to make learners more enlightened regarding the life process and living world and its importance in overall aspects. This will develop a conscious and awareness among the citizens who have the ability to think and understand the natural and living world in a logical way.
- This will increase the ability and performances of workforces and widen the employability for fresher.
- This may serve as the initial step to provide the manpower to the knowledge based socio-economic system which is dependent on the bio-resources and allied fields.

- This programme will screen out some quality learners with a keen interest on the subject who will pursue next level of learning in this subject and serve the higher education with their skill and ability.
- Finally, this is expected to develop a conscious and aware citizen who may have the ability to serve the society at its own capacity.

Programme Structure

	SEM	CODE	Course Name	Theory/ Prac.	Credit	Study Hours	TEE Full Marks	Assignment Full Marks	Total Marks	Pass Marks 30%
1st Year	I	CC-ZO-01	Animal Diversity, Structure and Development Lab	Practical	6	180	70	00	70	21
		CC-ZO-02	Animal Physiology, Molecular Biology and Evolution Lab	Practical	6	180	70	00	70	21
		AE-BG-11 / AE-EG-12	Bengali / English*	Theory	2	60	50	20	70	21
		#GEC-01	Refer Table Below	Theory	6	180	50	20	70	21
	II	CC-ZO-03	Basic Concept of Taxonomy and Diversity of Non-chordates	Theory	6	180	50	20	70	21
		CC-ZO-04	Diversity of Chordates	Theory	6	180	50	20	70	21
		AE-ES-21	Environmental Studies	Theory	2	60	50	20	70	21
		#GEC - 02	Refer Table Below	Theory	6	180	50	20	70	21
III	CC-ZO-05	Ecology and Biochemistry Lab	Practical	6	180	70	00	70	21	

2nd Year		CC-ZO-06	Cell Biology and Parasitology Lab	Practical	6	180	70	00	70	21
		CC-ZO-07	Cell and Molecular Biology	Theory	6	180	50	20	70	21
		SE-ZO-11	Sericulture	Theory	2	60	50	10	60	18
		#GEC- 03	Refer Table Below	Theory	6	180	50	20	70	21
	IV	CC-ZO-08	Biochemistry and Metabolic Processes	Theory	6	180	50	20	70	21
		CC-ZO-09	Principals of Ecology	Theory	6	180	50	20	70	21
		CC-ZO-10	Developmental Biology	Theory	6	180	50	20	70	21
		SE-ZO-21	Aquarium Fish Keeping	Theory	2	60	50	10	60	18
		#GEC- 04	Refer Table Below	Theory	6	180	50	20	70	18
	3rd Year	V	CC-ZO-11	Genetics and Developmental Biology Lab	Practical	6	180	70	00	70
CC-ZO-12			Genetics	Theory	6	180	50	20	70	21
DS-ZO-11			Animal Behaviour and Chronobiology	Theory	6	180	50	20	70	21
DS-ZO-21			Animal Behaviour and Insect Biology Lab	Practical	6	180	70	00	70	21
VI		CC-ZO-13	Animal Physiology: Controlling and Coordinating System	Theory	6	180	50	20	70	21
		CC-ZO-14	Evolutionary Biology	Theory	6	180	50	20	70	21
		DS-ZO-31	Biology of Insect	Theory	6	180	50	20	70	21

	DS-ZO-41	Aquatic Biology	Theory	6	180	50	20	70	21
	TOTAL			140				1800	

CC: Core Course, **AECC:** Ability Enhancement Compulsory Course; **DSC:** Discipline Specific Course; **SEC:** Skill Enhancement Course

#Any one from each group (column) to be selected from the following

Option of GE courses for HZO

Subject	SEM-I: GE-01	SEM-II: GE-02	SEM-III: GE-03	SEM-IV: GE-04
Botany	GE-BT-11: Biodiversity	GE-BT-21: Plant Ecology and Taxonomy	GE-BT-31: Plant Anatomy and Embryology	GE-BT-41: Economic Botany and Plant Biotechnology
Chemistry	GE-CH-11: Basic Physical Chemistry	GE-CH-21: Basic Inorganic Chemistry	GE-CH-31: Basic Organic Chemistry	GE-CH-41: Application Oriented Chemistry GE-CH-42: Approved MOOCs'

* Learners have to choose any one from **AE-BG-11:** Bengali or **AE-EG-12:** English as Ability Enhancement Compulsory Course 1 (AECC1)

Learners have to choose any one paper from each individual GE group of Semester I, II, III and IV.

Examination System Per Semester

Term-End Examination Dec (Odd Sem July-Dec)

Semester I	Semester III	Semester V
CC1	CC5	CC11
CC2	CC6	CC12
AECC1 (Beng/ Eng)	CC7	DSEC1
GE1	SEC1	DSEC2
	GE3	
Total credit: 20	Total credit: 26	Total credit: 24

Term-End Examination June (Even Sem Jan-June)

Semester II	Semester IV	Semester VI
CC3	CC8	CC13
CC4	CC9	CC14
AECC2 (ENVS)	CC10	DSEC3
GEC2	SEC2	DSEC4
	GEC4	
Total credit: 20	Total credit: 26	Total credit: 24

**Assignment will be conducted through digital platform on MCQ*

Objective and Expected Outcome for Each Course

Course Code	Course Objectives	Expected Outcomes
Core Courses		
CC-ZO-01 Animal Diversity, Structure and Development Lab	The objective of this course is to provide the fundamental knowledge of animal diversity, their systematic position, morphology, structure, and development which will serve as the basis of knowing the animal kingdom in practical for further higher education in this area.	This course is expected to develop awareness and knowledge among the learners about the animal world in practical sense.
CC-ZO-02 Animal Physiology, Molecular Biology and Evolution Lab	The objective of this course is to provide knowledge to the learners regarding physiological processes and structures involved there, basic hands on applications to know molecular biology and evolutionary aspects of animal kingdom.	This course is expected to develop introductory practical knowledge among the learners to perform some experiments in the areas of animal physiology, molecular biology and evolutionary processes.
CC-ZO-03 Basic Concept of Taxonomy and Diversity of Non-chordates	The primary objective of this course is to provide the knowledge of basic science of taxonomy and classification of the living organisms as well as the diversity of the invertebrates, their structure and body plan. This course is also designed to signify the structural diversity of different invertebrate animals. Another objective of this course is to provide overall knowledge about how different forms developed from protista to metazoan animals and persists in this living world.	Successful completion of this course will develop the knowledge about the basic body plan of the invertebrate animals and their diverse forms and the mechanism of animal classification to systematically categorize the animal forms.
CC-ZO-04 Diversity of Chordates	The main objective of this course is to transduce the knowledge about structural and functional diversity of the chordates.	After successful completion of this course it will develop the knowledge about

	Another objective of this course is to elaborate the mechanism of adaptive radiation which ultimately causing the new speciation. Similarly this course also provide the knowledge about the mechanism of creation of hallmarks of the chordate characters.	diversity of chordate, their structural peculiarity as well as their diversity. Not only that, this course will provide the knowledge about zoogeography, and about endemic animals.
CC-ZO-05 Ecology and Biochemistry Lab	Primary objective of this course is to provide the practical knowledge about qualitative and quantitative testing procedure of different parameters which are very much important for the functioning of the animal body and the ecosystem in which the animals are living. The basic laboratory protocols learnt in this course also helps the students to test the functioning of life processes	This course is expected to develop the practical knowledge about the laboratory methodology among the learners who may utilize such concepts and practical expertise in the required areas
CC-ZO-06 Cell Biology and Parasitology Lab	Primary objective of this course is to provide the practical knowledge about different protocols which are generally used for the purpose of study of the unit of life that is the cell and its detail structure. This course also provides the knowledge about the structure and life stages of different parasitic animals and their ecosystems	This course is expected to develop the practical knowledge about the fundamental laboratory methodology among the learners which they can utilize to learn about cells, cytological structures, parasites and some basic blood-immune parameters
CC-ZO-07 Cell and Molecular Biology	The centralized goal of this course is to provide the detailed knowledge about the cell structure and the cellular organelles as well as the ultra structural organization of the cell. Another important objective of this course is to provide the knowledge about the molecular mechanism of cellular functioning and the different physicochemical rules and laws needed for the proper cellular functioning	This course is expected to develop the detail theoretical knowledge about the cellular functioning and the roles of thermodynamic principles in cellular functioning as well as the detail ultrastructure of different sub cellular components. Learners also learn about the 'central dogma' of life and related processes to run the fundamental life process of all animals.
CC-ZO-08 Biochemistry and Metabolic Processes	The central objective of this course is to provide knowledge to the learners regarding the chemistry of life functioning, the role of different biocatalysts for different chemical reaction at different cellular and subcellular levels. Another objective is to provide the detailed knowledge about the anabolic and catabolic processes for the generation of energy	This course is expected to develop the detail theoretical knowledge about the chemical reactions that enables our cells to derive energy, reproduce and perform other vital functions that take place in cellular medium

	needed for the functioning of the cell as well as for the total animals.	
CC-ZO-09 Principals of Ecology	The objective of this course is to provide systematic knowledge about the lavish richness of the Earth's biomass which is organized into a hierarchy of interacting units, namely, the individual organisms, the population, the community and finally the ecosystem that most bewilderingly complex of all natural systems. Another objective central to the ecological study is to know the habitat, the spatial location where an animal lives, how it gets its food and also how it arranges for its reproductive perpetuity, how it survives and stays adapted.	This course is expected to develop the detail theoretical knowledge about the living things within the biosphere at several different levels of ecological organization. Studying this course, learners will conceptualize that how each organism responds to its environment and why animals are distributed so as they are.
CC-ZO-10 Developmental Biology	The central objective of this course is to provide knowledge to the learners about the mystery of animal development from the concept of preformation to the concept of epigenesis. This course also provides the knowledge of progressive changes during development in an individual from fertilization to maturity.	This course is expected to develop the detail theoretical knowledge about the mechanism of animal development from fertilization to reproduction, from embryonic to post embryonic developmental mechanism and as well as the mechanism of formation of different organs and aging process in animals.
CC-ZO-11 Genetics and Developmental Biology Lab	The primary objective of this course is to transduce the knowledge of different laboratory protocols in respect to the study of genetics and developmental biology which ultimately enables the learners to visualize the chromosome, the mechanism of cell division and also the developmental process and its mechanism in chick.	After successful completion of this course learner will develop the practical knowledge about the cell division, structure of chromosome and also the structure of developing embryo.
CC-ZO-12 Genetics	The primary focus of this course is to disseminate the knowledge about "Why am I like dad?", that is the mechanism of inheritance from Mendelian type to complex polygenic type. This course will also elaborate the mechanism of gene functioning and its structure. Similarly this course also provides the principles of hereditary transmission.	This course is expected to develop the detail theoretical knowledge about how all organisms inherit a structural and functional organization from their progenitors. After successful completion of this course all learners will understand that how traits are inherited and how diversity arises within individuals and in population.
CC-ZO-13 Animal Physiology:	This course is formulated with an idea to provide sufficient theoretical knowledge about the physiological process of life, how	This course is expected to develop the detail theoretical knowledge about the internal

Controlling and Coordinating System	such processes are coordinated and controlled. This course also provides the knowledge about how the complex metazoan animals maintain homeostasis by coordinating activities of different in vivo systems like circulatory, nervous and chemical messengers etc	environment of animal as well as how all the animals survive in different conditions of their habitat. Similarly students will learn how the internal condition of an animal is changing and how the animal is managing it for its homeostatic purposes
CC-ZO-14 Evolutionary Biology	The main aim of this course is to give an idea to the students that the predominance feature of life's history is the legacy of perpetual change and these changes are perceived and measured in many ways. Another objective is to give an idea to the students that how from Lamarck, Darwin to Stephen J Gould elaborated these changes and their cause which are commonly known as evolutionary theories	This course will definitely give the idea to the students that why Lamarck's theory is known as transformational theory and why Darwin's theory is known as variational theory and why Gould's theory is known as neutral theory and ultimately it will open new vista to the learners. Finally learners will receive the maturity to observe nature and its structure-function relationship from evolutionary perspective with the realization that "nothing in biology makes sense without the light of evolution".
Discipline Specific Elective Courses		
DS-ZO-11 Animal Behaviour and Chronobiology	The primary objective of this course is to give an idea about Chronobiology which is a field of biology that examines timing processes, including periodic (cyclic) phenomena in living organisms, such as their adaptation to solar- and lunar-related rhythms. These cycles are known as biological rhythms. Another objective of this course is to give an idea how the behaviour of an animal is changing with chronobiology	This course is expected to develop awareness and understanding about the complex higher order life process of animals which is regulated in coordination with external cues
DS-ZO-21 Animal Behaviour and Insect Biology Lab	This course is formulated with an idea to develop knowledge among the students about the laboratory protocols for the study of animal behaviour and insect structure. Another objective of this course is to give an idea that how animals behave and why animals behave. Therefore, this course will	This course is expected to develop awareness among the learners regarding the diversity of the insect world and also their social behaviour which may ultimately open a new vista

	give an idea about proximate and ultimate causation of animal behaviour.	for creating something new for the others
DS-ZO-31 Biology of Insect	This course is formulated with an idea to develop knowledge among the students about the diversity of insect world which are most diverse group of all animals. The central objective of this course is to give an idea that why there is a separate option of study for insects which is known as Entomology and why they are so abundant and diverse and why they are capable to live in every part of the biosphere.	After successful completion of this course students will learn why these hexapods are so diverse and adaptive as well as why these insects are able to exploit the every corner of the ecosystems.
DS-ZO-41 Aquatic Biology	The central objective of this course is to study the aquatic biology that is the study of aquatic organisms, their behaviors and interactions with the environment. Students will learn how aquatic ecosystems perform numerous valuable environmental functions. How they recycle nutrients, purify water, attenuate floods, augment and maintain stream flow, recharge ground water, and provide habitat for wildlife and recreation for people	This course is expected to develop awareness among the learners regarding the diversity of the aquatic life and their modes of life processes and functions which will creates an interest about aquatic organism and their role in maintaining the biodiversity and their functioning in the ecosystem
Skill Enhancement Courses		
SE-ZO-11 Sericulture	This course is formulated for the knowledge of economic objective of silkworm rearing and silk cultivation and how this can earn huge foreign currency and how it can improve the life of silk cultivating farmers. This course also enlightens the status of India in respect to other silk cultivating countries.	This course is expected to develop awareness among the learners regarding the procedure of silk cultivation and their process. This course also gives an idea about the different diseases of silk worm and mulberry plant and their remedies
SE-ZO-21 Aquarium Fish Keeping	The central objective of this course is to study the process of aquarium fish keeping and how this can generate the employment for unemployed. This is also a part of economic zoology. This course also provides the knowledge about the process of generation of different ornamented fish and the feeding habits.	After successful completion of this course students will learn how the ornamented fish can be reared in aquarium and what short of food can be given to them. This course will also helps to learn different behaviour of aquarium fishes.
Generic Elective Courses		
GE-ZO-11 Animal Diversity	The objective of this course is to provide the fundamental knowledge of animal diversity, their systematic position, morphology, structure, and development which will serve as the basis of knowing the animal kingdom	This course is expected to develop awareness and knowledge among the learners of the other discipline about the animal

	in practical for further higher education in this area.	world both invertebrate and chordates in practical sense.
GE-ZO-21 Aquatic Biology	The central objective of this course is to study the aquatic biology that is the study of aquatic organisms, their behaviours and interactions with the environment. Students will learn how aquatic ecosystems perform numerous valuable environmental functions. How they recycle nutrients, purify water, attenuate floods, augment and maintain stream flow, recharge groundwater, and provide habitat for wildlife and recreation for people	This course is expected to develop awareness among the learners regarding the diversity of the aquatic life and their modes of life processes and functions which will create an interest about aquatic organism and their role in maintaining the biodiversity and their functioning in the ecosystem.
GE-ZO-31 Insect Vector and Disease	This course is created for the learners to develop their knowledge about the insects or the hexapod, their diversity and how these tiny creatures are helping to spread the various causative agents of human diseases and other domesticated animals. This course will also help to learn the process for the management and control of these insect species.	After successful completion of this course students will learn how the insects are acting as vector for different diseases of human as well as other animals. This course will also help the learner to know the life cycle of these vectors are completed
GE-ZO-41 Food, Nutrition and Health	The central objective of this course is to study the food and its chemistry as well as the nutritional value of different foods. The chemistry of different food types is also included in this course which will help the students to learn about the nutritional values of different types of food. This course will also give an idea about the food adulteration and its implication.	This course is expected to develop awareness among the learners regarding the diversity of foods and their nutritional values. Students will also learn the chemistry of different types of food which will help them to learn about the digestive value of different foods

Detailed Syllabus

Semester-I

Core Course-1 (Practical) Credit-6, Full Marks-70

Course Code: CC-ZO-01, Course Title: Animal Diversity, Structure and Development Lab

1. Study of the following specimens with proper reasons

Amoeba, Euglena, Plasmodium, Paramecium, Sycon, Hyalonema, and Euplectella, Obelia, Physalia, Jellyfish, Sea Anemone, Taenia, Male and female Ascaris, Aphrodite, Nereis, Earthworm, Hirudinaria, Palaemon, Scylla, Carcinoscorpis, Penaeus, Scolopendra, Millipede, Periplaneta, Apis, Chiton, Dentalium, Pila, Lamellidens, Loligo, Sepia, Octopus, Star fish, Ophiura, Echinus, Cucumaria and Antedon, Balanoglossus, Herdmania, Branchiostoma, Petromyzon, Sphyrna, Pristis, Torpedo, Scoliodon, Labeo, Exocoetus, Anguilla, Teniolosa, Ureotyphlus, Salamander, Bufo, Hyla, Turtle, Calotes, Chamaeleon,

Draco, Vipera, Naja, Crocodylus, Gavialis, Any six common birds from different orders available in the concerned college laboratory, *Sorex*, Mega-and Micro chiroptera, Squirrel.

2. Study of the following permanent slides:

T.S. and L.S. of Sycon, Study of life history stages of Mosquito/ Toad, T.S. of Male and female *Ascaris*

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

4. Osteology:

- a) Disarticulated skeleton of fowl and white rat
- b) Carapace and plastron of turtle
- c) Mammalian skulls: One herbivorous(rat) and one carnivorous animal(dog).

5. Examination of gametes

Frog/Rat - sperm and ova through permanent slides or photo- micrographs.

6. Chick developmental stages

Study of developmental stages - whole mount of permanent slides – 24 hrs, 48 hrs and 72 hrs embryo.

7. Demonstration of whole mount preparation of chick embryo

An “animal album” containing photographs, with appropriate write up about the above-mentioned taxa. Different taxa/ topics may be given to different sets of students for this purpose.

(Laboratory Note Book must be prepared on day-to-day basis and should be signed by the concerned teacher immediately after the laboratory work. The Laboratory Note Book should contain all the items in the syllabus and must be submitted on the day of examination.)

Semester-I

Core Course-2 (Practical) Credit-6, Full Marks-70

Course Code: CC-ZO-02, Course Title: Animal Physiology, Molecular Biology and Evolution Lab

1. Preparation of hemin crystals
2. Study of permanent histological sections of mammalian pituitary, thyroid, pancreas, adrenal gland, testis, ovary
3. Study of permanent histological slides of duodenum, intestine, liver, lung, kidney, bone, cartilage
4. Study of human blood group by agglutination reactions.
5. Isolation of DNA from blood Fish Blood (Demonstration)
6. Quantitative estimation of DNA using colorimeter (Diphenylamine reagent) or spectrophotometer.
7. Quantitative estimation of RNA using Orcinol reaction
8. Demonstration of Preparation of permanent slide to demonstrate : DNA by Feulgen reaction; DNA and RNA by MGP; Proteins by Mercurobromophenol blue/Fast Green
 - a) Study of fossil evidences from plaster cast models and pictures; b) Study of homology and analogy from suitable specimens/ pictures

9. Charts: a) Phylogeny of horse with diagrams/ cut outs of limbs and teeth of horse ancestors; b) Darwin's Finches with diagrams/ cut outs of beaks of different species
10. Visit to any National Museum and submission of report

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Semester-II

Core Course-3 (Theory) Credit-6, Full Marks-70

Course Code: CC-ZO-03, Course Title: Basic Concept of Taxonomy and Diversity of Non-chordates

Unit 1: Basics of Animal Classification

Definitions: Classification, Systematics and Taxonomy; Hierarchy, Taxonomic types; Codes of Zoological Nomenclature; Principle of priority; Synonym and Homonym; Species Concept – Biological and evolutionary; basic idea of numerical taxonomy, Molecular taxonomy.

Unit 2: Protista, Parazoa and Metazoa

General characteristics and Classification upto classes

Study of *Euglena*, *Amoeba* and *Paramecium* (Structure, locomotion, reproduction & nutrition)

Life cycle and pathogenicity of *Plasmodium vivax* and *Entamoebahistolytica* Evolution of symmetry, grade of organization and segmentation of Metazoa

Unit 3: Porifera and Cnidaria and Ctenophora

General characteristics and Classification upto classes, Canal system and spicules in sponges. Metagenesis in *Obelia*, Polymorphism in Cnidaria, Corals and coral reefs

Unit 4: Platyhelminthes

General characteristics and Classification upto classes

Life cycle and pathogenicity of *Fasciola hepatica* and *Taeniasolium*

Unit 5 :Nemathelminthes

General characteristics and Classification upto classes of phylum Nematoda Lifecycle, and pathogenicity of *Ascarislumbricoides* and *Wuchereriabancrofti* Parasitic adaptations in helminthes

Unit 6 :Arthropoda

General characteristics of crustacea and arachnida, Crustacean larvae, Bionomics and affinities of Peripatus (Onychophora)

Unit 7: Echinodermata

General characteristics and Classification. Ambulacral system.

Unit 8: Mollusca

General characteristics, Classification, Torsion and detorsion mechanism, Larval stages.

NOTE: Classification to be followed from Ruppert and Barnes Invertebrate Zoology VI edition, except for Protozoa (American Association of Protozoologist ref: Levine 1980) and Porifera (Brusca and Brusca 2002; IV edition. Invertebrate Zoology)

Semester-II

Core Course-4 (Theory) Credit-6, Full Marks-70
Course Code: CC-ZO-04, Course Title: Diversity of Chordates

Unit 1: Protochordata:

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

Unit 2: Origin of Chordata

Dipleurula concept and the Echinoderm theory of origin of chordates

Unit 3: Agnatha

General characteristics and classification of cyclostomes up to class

Unit 4: Pisces

General characteristics of Chondrichthyes and Osteichthyes, classification up to Order, Migration, Osmoregulation and Parental care in fishes

Unit 5: Amphibia

General characteristics and classification up to order; Parental care and Metamorphosis in Amphibians

Unit 6: Reptilia

General characteristics and classification up to order; Affinities of Sphenodon; Poison apparatus and Biting mechanism in snakes

Unit 7: Aves

General characteristics and classification up to order, Archaeopteryx-- a connecting link; Flight adaptations and Migration in birds

Unit 8: Mammals

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

Unit 9: Comparative Anatomy

Heart, Brain and Kidney

Semester-III
Core Course-5 (Practical) Credit-6, Full Marks-70
Course Code: CC-ZO-05, Course Title: Ecology and Biochemistry Lab

1. Preparation of nested quadrat and estimation of effective quadrat size.
2. Calculation of Sorenson's Similarity & Shannon-Weiner diversity indices for a community.
3. Study of an aquatic ecosystem: Major Phytoplankton (Up to Family) and zooplankton (Up to Genus), temperature, turbidity/ penetration of light, determination of pH, and Dissolved Oxygen content (Winkler's method) and freeCO₂.
4. Estimation of Primary productivity by light & dark bottle method.
5. Report on a visit to National Park/Biodiversity Park/Wild life sanctuary/Sea Shore.
6. Qualitative tests to identify functional groups of carbohydrates in
7. given solutions (Glucose, Fructose, Sucrose, Lactose)
8. Paper chromatography of aminoacids.
9. Estimation of total protein in given solutions by Lowry's method.
10. Study of activity of salivary amylase under optimum conditions.
11. Effect of pH, temperature and inhibitors on the action of salivary amylase.

(Laboratory Note Book must be prepared on day-to-day basis and should be signed by the concerned teacher immediately after the laboratory work. The Laboratory Note Book should contain all the items in the syllabus and must be submitted on the day of examination.)

Semester-III
Core Course-6 (Practical) Credit-6, Full Marks-70
Course Code: CC-ZO-06, Course Title: Cell Biology and Parasitology Lab

1. Study of polytene chromosome from chironomid larvae
2. Study of mitosis from bone marrow of goat/ Onion roottip
3. Study of various stages of meiosis grasshopper/ testis of mouse
4. Preparation of stained blood film to study various types of white blood cells
5. Demonstration of ELISA.
6. Study of life stages of Entamoebahistoltytica, Leishmaniadonovani and Plasmodium vivax, Taeniasolium, Ascarislumbricoides, Ancylostomaduodenale, Wuchereriabancrofti through permanent slides/microphotographs
7. Study of Pediculushumanus, Ctenocephalidesspp. And Cimex lectularius through permanent slides/photographs
8. Study of nematode/cestode parasites from the intestines of Poultry bird

(Laboratory Note Book must be prepared on day-to-day basis and should be signed by the concerned teacher immediately after the laboratory work. The Laboratory Note Book should contain all the items in the syllabus and must be submitted on the day of examination.)

Semester-III
Core Course-7 (Theory) Credit-6, Full Marks-70
Course Code: CC-ZO-07, Course Title: Cell and Molecular Biology

Unit 1: Plasma Membrane

Fluid Mosaic model of plasma membrane; Transport across membranes: Active and Passive transport, Facilitated transport; Cell junctions: Tight junctions, Gap junctions, Desmosome

Unit 2: Mitochondria and Peroxisomes

Mitochondria: Structure, Mitochondrial Respiratory Chain, Chemi-osmotic hypothesis, Peroxisome

Unit 3: Cytoskeleton

Structure and Functions: Microtubules, Microfilaments, and Intermediate filaments

Unit 4: Nucleus

Structure of Nucleus: Nuclear envelope, nuclear pore complex, nucleolus

Unit 5: Cell division

Mitosis; Meiosis; Cell cycle and its regulation;

Unit 6: Nucleic Acids

Salient features of DNA and RNA; Watson and Crick model of DNA

Unit 7: DNA Replication

DNA Replication in prokaryotes and eukaryotes, DNA polymerases, primosome, RNA priming, Replication of circular and linear ds-DNA, replication of telomeres

Unit 8: Transcription and Translation

RNA polymerase and transcription Unit, mechanism of transcription in prokaryotes and eukaryotes, transcription factors, Split genes: concept of introns and exons, splicing mechanism, Genetic code, Degeneracy of the genetic code and Wobble Hypothesis; mechanism of protein synthesis in prokaryotes: Ribosome structure and assembly in prokaryotes, amino acyl tRNA synthetases and charging of tRNA; Proteins involved in initiation, elongation and termination of polypeptide chain.

Unit 9: Gene Regulation

Transcription regulation in prokaryotes: lac operon and trp operon; Transcription regulation in eukaryotes: Activators, repressors, enhancers.

Semester-IV
Core Course-8 (Theory) Credit-6, Full Marks-70
Course Code: CC-ZO-08, Course Title: Biochemistry and Metabolic Processes

Unit 1: Biological macromolecules

Structure, types and biological importance: carbohydrate, protein, lipid and nucleic acids

Unit II: Bioenergetics

Laws of thermodynamics and its relevance to biological systems.

High-energy phosphate bonds and its role in energy capture and transfer.

Unit III: Enzymes

Enzymes: Nomenclature and classification; Cofactors; Specificity of enzyme action; Isozymes; Mechanism of enzyme action; Enzyme kinetics; Factors affecting rate of enzyme-catalyzed reactions; Derivation of Michaelis-Menten equation, Concept of K_m and V_{max} , Lineweaver-Burk plot; Multi-substrate reactions; Enzyme inhibition; Allosteric enzymes and their kinetics; Regulation of enzyme action.

Unit IV: 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 V: Carbohydrate Metabolism

Glycolysis and its regulation; Citric acid cycle; Phosphate pentose pathway Gluconeogenesis, Glycogenolysis and Glycogenesis

Unit VI: 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 VII: Protein Metabolism

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

Semester-IV

Core Course-9 (Theory) Credit-6, Full Marks-70
Course Code: CC-ZO-09, Course Title: Principles of Ecology

Unit 1: Introduction to Ecology

Levels of organization, Laws of limiting factors, study of physical factors

Unit 2: Population

Population attributes: 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

Unit 3: Community

Community characteristics: species richness, dominance, diversity, abundance, vertical stratification, Ecotone and edge effect, Ecological succession

Unit 4: Ecosystem

Types of ecosystems 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

Unit 5: Wild life Conservation

Wild life Conservation (ideas of in-situ and ex-situ conservation) Management strategies for tiger conservation; protection laws for wildlife conservation.

Unit 6: Ecological , Faunal and Floral characteristics

Tropical rain forest, Mangrove, Island and Desert Ecosystem

Unit 7: Zoogeography

Zoogeographical realms, Theories pertaining to distribution of animals

Semester-IV

Core Course-10 (Theory) Credit-6, Full Marks-70
Course Code: CC-ZO-10, Course Title: Developmental Biology

Unit 1: Introduction to Developmental Biology

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 :(acrosome reaction & egg activation, blocks to polyspermy); Planes and patterns of cleavage; Types of blastula; Fate map construction; Early development of frog and chick upto 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: hormonal regulations in amphibians and insects

Regeneration with special reference to Hydra.

Unit 5: Implications of Developmental Biology

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

Semester-V

Core Course-11 (Practical) Credit-6, Full Marks-70
Course Code: CC-ZO-11, Course Title: Genetics and Developmental Biology Lab

1. Pedigree analysis of some human inherited traits
2. Study of Mendelian Inheritance and gene interactions (Non Mendelian Inheritance) using suitable examples. Verify the results using Chi-square test.
3. Study of Linkage, recombination, gene mapping using the data.

4. Study of human karyotype (normal and abnormal)
5. Pedigree analysis of some human inherited traits
6. Study of sections of developmental stages of frog through permanent slides: Cleavage stages, blastula, gastrula, neurula, tail-bud stage, tadpole (external and internal gill stages) and sections of chick embryos of 48 and 72 hrs passing through eye, brain, heart and gut region.
7. Study of the developmental stages and life cycle of Drosophila from stockculture
8. Study of different sections of placenta (photomicrograph/slides)
9. Project report on Drosophila culture/chick embryo development

(Laboratory Note Book must be prepared on day-to-day basis and should be signed by the concerned teacher immediately after the laboratory work. The Laboratory Note Book should contain all the items in the syllabus and must be submitted on the day of examination.)

Semester-V
Core Course-12 (Theory) Credit-6, Full Marks-70
Course Code: CC-ZO-12, Course Title: 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 example 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: Polygenic Inheritance

Polygenic inheritance with suitable examples; simple numericals based on it

Unit 6: Recombination in Bacteria and Viruses

Conjugation, Transformation, Transduction, Complementation test in Bacteriophage

Semester-VI
Core Course-13 (Theory) Credit-6, Full Marks-70
Course Code: CC-ZO-13, Course Title: Animal Physiology: Controlling and Coordinating System

Unit 1: Physiology of Digestion

Structural organization and functions of gastrointestinal tract and associated glands; Mechanical and chemical digestion of food; Absorptions of carbohydrates, lipids, proteins

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 blood;

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: Nervous System

Structure of neuron, resting membrane potential, Origin of action potential and its propagation across the myelinated and unmyelinated nerve fibers.

Unit 5: Muscle

Histology of different types of muscle; Ultra structure of skeletal muscle;
Molecular and chemical basis of muscle contraction; Characteristics of muscle twitch.

Unit 6: Reproductive System

Histology of testis and ovary; Physiology of male and female reproduction;
Puberty.

Unit 7: Endocrine System

Histology of endocrine glands - pituitary, thyroid, parathyroid, pancreas, adrenal; hormones secreted by them and their mechanism of action; Classification of hormones; Regulation of their secretion; Mode of hormone action.

Semester-VI
Core Course-14 (Theory) Credit-6, Full Marks-70
Course Code: CC-ZO-14, Course Title: Evolutionary Biology

Unit 1:

Life's Beginnings: Chemogeny, RNA world, Biogeny, Evolution of eukaryotes

Unit 2:

Historical review of evolutionary concept: Lamarckism, Darwinism, Synthetic theory

Unit 3:

Evidences of Evolution: Fossil record (types of fossils), transitional forms, geological time scale, evolution of horse.

Unit 4:

Sources of variations: Heritable variations and their role in evolution

Unit 5:

Population genetics: Hardy-Weinberg Law (statement and derivation of equation, application of law to human Population); Evolutionary forces upsetting H-W equilibrium; Natural selection, Genetic Drift (mechanism, founder's effect, bottleneck phenomenon); Role of Migration and Mutation in changing allele frequencies

Unit 6:

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

Unit 7:

Origin and evolution of man, Unique hominid characteristics contrasted with primate characteristics, primate phylogeny from Australopithecus leading to Homo sapiens

Discipline Specific Elective Courses

Semester-V

Discipline Specific Elective Course-1 (Theory) Credit-6, Full Marks-70

Course Code: DS-ZO-11, Course Title: Animal Behaviour and Chronobiology

Unit 1: Introduction to Animal Behaviour

Origin and history of Ethology; Brief profiles of Karl von Frish, Ivan Pavlov, Konrad Lorenz, Niko Tinbergen, Proximate and ultimate causes of behaviour

Unit 2: Patterns of Behaviour

Stereotyped Behaviours (Orientation, Reflexes); Individual Behavioural patterns; Instinct vs. Learned behaviour; Associative learning, classical and operant conditioning, Habituation, Imprinting.

Unit 3: Social Behaviour

Social Behaviour: Concept of Society; Communication and the senses; Altruism; Insects' society with Honey bee as example; Foraging in honey bee and advantages of the waggle dance.

Unit 4: Biological Rhythm

Types and characteristics of biological rhythms: Short- and Long- term rhythms; Circadian rhythms; Tidal rhythms and Lunar rhythms; Circannual rhythms;

Unit 5: Biological Clocks

Relevance of biological clocks; Adaptive significance of biological clocks

Semester-V

Discipline Specific Elective Course-2 (Practical) Credit-6, Full Marks-70

Course Code: DS-ZO-21, Course Title: Animal Behaviour and Insect Biology Lab

1. To study nests and nesting habits of social insects (Termites and Ants).
2. To study geotaxis behaviour in earthworm.
3. Visit to Forest/ Wild life Sanctuary/Biodiversity Park/Zoological Park to study behavioural activities of animals and prepare a short report.
4. Study of different kinds of mouth parts of insects
5. Study of insect wings and their venation.
6. Methodology of collection, preservation and identification of insects
7. Study of any three insect pests and their damages
8. Study of any three beneficial insects and their products
9. Field study of insects and submission of a project report on the insect diversity

Semester-VI
Discipline Specific Elective Course-3 (Theory) **Credit-6, Full Marks-70**
Course Code: DS-ZO-31, Course Title: Biology of Insects

Unit 1: Introduction

General Features of Insects

Distribution and Success of Insects on the Earth

Unit 2: Insect Taxonomy

Basis of insect classification; Classification of insects up to orders

Unit 3: General Morphology of Insects

External Features; Head – Eyes, Types of antennae, Mouth parts w.r.t. feeding habits, Types of Legs adapted to diverse habitat

Unit 4: Physiology of Insects

Structure and Physiology of Insect respiratory & endocrine systems Sensory receptors Growth and metamorphosis

Unit 5: Insect Society

Group of social insects and their social life

Social organization and social behaviour (with reference to any one example)

Unit 6: Insect Plant Interaction

Theory of co-evolution, role of allelo-chemicals in host plant mediation

Unit 7: Insects as Vectors

Insects as mechanical and Biological vectors, Brief discussion on houseflies and mosquitoes as important insect vectors

Semester-VI
Discipline Specific Elective Course 4 (Theory) **Credit-6, Full Marks-70**
Course Code: DS-ZO-41, Course Title: Aquatic Biology

Unit 1: Aquatic Biomes

Brief introduction of the aquatic biomes: Freshwater ecosystem (lakes, wetlands, streams and rivers), estuaries, intertidal zones, oceanic pelagic zone, marine benthic zone and coral reefs.

Unit 2: Freshwater Biology

Lakes: Origin and classification, Lake as an Ecosystem, Physico-chemical Characteristics: Light, Temperature, Thermal stratification, Dissolved Solids, Carbonate, Bicarbonates, Phosphates and Nitrates, Turbidity; dissolved gases (Oxygen, Carbon dioxide). Nutrient Cycles in Lakes-Nitrogen:-Sulphur and Phosphorous.

Streams: Different stages of stream development, Physico-chemical environment, Adaptations of hill-stream fishes.

Unit 3: Marine Biology

Salinity and density of Sea water, Continental shelf, Adaptations of deep sea organisms.

Unit 4: Management of Aquatic Resources

Causes of pollution: Agricultural, Industrial, Sewage, Thermal and Oil spills, Eutrophication, Management and conservation (legislations), Sewage treatment Water quality assessment- BOD and COD.

Skill Enhancement Courses

Semester-III

Skill Enhancement Course 1 (Theory) Credit-2, Full Marks-60
Course Code: SE-ZO-11, Course Title: Sericulture

Unit 1: Introduction

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

Unit 2: Biology of Silkworm

Life cycle of Bombyxmori Structure of silk gland and secretion of silk

Unit 3: Rearing of Silkworms

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

Unit 4: Pests and Diseases

Pests of silkworm: Uzi fly, Dermestid beetles and vertebrates. Pathogenesis of silkworm diseases: Protozoan, viral, fungal and bacterial Control and prevention of pests and diseases.

Unit 5: Entrepreneurship in Sericulture

Prospects of Sericulture in India: Sericulture industry in different states, employment, potential in mulberry and non-mulberry sericulture.

Semester-IV

Skill Enhancement Course 2 (Theory) Credit-2, Full Marks-60
Course Code: SE-ZO-21, Course Title: Pharmaceutical Chemistry

Unit1: Introduction to Aquarium Fish Keeping

The potential scope of Aquarium Fish Industry as a Cottage Industry, Exotic and Endemic species of Aquarium Fishes

Unit 2: Biology of Aquarium Fishes.

Common characters and sexual dimorphism of Fresh water and Marine Aquarium fishes such as Guppy, Molly, Sword tail, Gold fish, Angel fish, Blue morph, Anemone fish and Butterfly fish

Unit 3: Food and feeding of Aquarium fishes

Use of live fish feed organisms. Preparation and composition of formulated fish feeds

Unit 4: Fish Transportation

Live fish transport - Fish handling, packing and forwarding techniques.

Unit 5: Maintenance of Aquarium

General Aquarium maintenance – budget for setting up an Aquarium Fish Farm as a Cottage Industry

Generic Elective Courses

(For learners of Honours programmes other than Zoology)

Semester-I

Generic Elective Course-1 (Theory) Credit-6, Full Marks-70

Course Code: GE-ZO-11, Course Title: Animal Diversity

- Unit 1.** Protista General characters of Protozoa; Life cycle of Plasmodium
- Unit 2.** Porifera General characters and canal system in Porifera
- Unit 3.** Radiata General characters of Cnidarians and polymorphism
- Unit 4.** Aceolomates General characters of Helminthes; Life cycle of *Taeniasolium*
- Unit 5.** Pseudo coelomates General characters of Nemethehelminthes; Parasitic adaptations
- Unit 6.** Coelomate Protostomes General characters of Annelida; Metamerism.
- Unit 7.** Arthropoda General characters. Social life in insects.
- Unit 8.** Mollusca General characters of mollusca; Pearl Formation
- Unit 9.** Coelomate Deuterostomes General characters of Echinodermata, Water Vascular system in Starfish.
- Unit 10.** Protochordata Salient features
- Unit 11.** Pisces Osmoregulation, Migration of Fishes
- Unit 12.** Amphibia General characters, Adaptations for terrestrial life, Parental care in Amphibia.
- Unit 13.** Amniotes; Origin of reptiles. Terrestrial adaptations in reptiles.
- Unit 14.** Aves: The origin of birds; Flight adaptations
- Unit 15.** Mammalia- Early evolution of mammals; Primates; Dentition in mammals.

Semester-II

Generic Elective Course-2 (Theory) Credit-6, Full Marks-70

Course Code: GE-ZO-21, Course Title: Aquatic Biology

Unit 1:

Aquatic Biomes Brief introduction of the aquatic biomes: Freshwater ecosystem (lakes, wetlands, streams and rivers), estuaries, intertidal zones, oceanic pelagic zone, marine benthic zone and coral reefs.

Unit 2:

Freshwater Biology Lakes: Origin and classification, Lake as an Ecosystem, Lake morphometry, Physico-chemical Characteristics: Light, Temperature, Thermal stratification, Dissolved Solids, Carbonate, Bicarbonates, Phosphates and Nitrates, Turbidity; dissolved gases (Oxygen, Carbon dioxide). Nutrient Cycles in Lakes- Nitrogen, Sulphur and Phosphorous. Streams: Different stages of stream development, Physico-chemical environment, Adaptation of hill-stream fishes.

Unit 3:

Marine Biology Salinity and density of Sea water, Continental shelf, Adaptations of deep sea organisms, Coral reefs, Sea weeds.

Unit 4:

Management of Aquatic Resources Causes of pollution: Agricultural, Industrial, Sewage, Thermal and Oil spills, Eutrophication, Management and conservation (legislations), Sewage treatment Water quality assessment- BOD and COD

Semester-III

Generic Elective Course-3 (Theory) Credit-6, Full Marks-70

Course Code: GE-ZO-31, Course Title: Insect Vector and Disease

Unit I:

Introduction to Insects General Features of Insects, Morphological features, Head – Eyes, Types of antennae, Mouth parts with respect to feeding habits

Unit II:

Concept of Vectors Brief introduction of Carrier and Vectors (mechanical and biological vector), Reservoirs, Host-vector relationship, Vectorial capacity, Adaptations as vectors, Host Specificity

Unit III

Insects as Vectors Classification of insects up to orders, detailed features of orders with insects as vectors – Diptera, Siphonaptera, Siphunculata, Hemiptera

Unit IV:

Dipteran as Disease Vectors Dipterans as important insect vectors – Mosquitoes, Sand fly, Houseflies; Study of mosquito-borne diseases – Malaria, Dengue, Chikungunya, Viral encephalitis, Filariasis; Control of mosquitoes Study of sand fly-borne diseases – Visceral Leishmaniasis, Cutaneous Leishmaniasis, Phlebotomus fever; Control of Sand fly Study of house fly as important mechanical vector, Myiasis, Control of house fly

Unit V:

Siphonaptera as Disease Vectors Fleas as important insect vectors; Host- specificity, Study of Flea-borne diseases – Plague, Typhus fever; Control of fleas

Unit VI:

Siphunculata as Disease Vectors Human louse (Head, Body and Pubic louse) as important insect vectors; Study of louse-borne diseases –Typhus fever, Relapsing fever, Trench fever, Vagabond's disease, Phthiriasis; Control of human louse

Unit VII:

Hemiptera as Disease Vectors 6 Bugs as insect vectors; Blood-sucking bugs; Chagas disease, Bed bugs as mechanical vectors, Control and prevention measures.

Semester-IV
Generic Elective Course-4 (Theory) Credit-6, Full Marks-70
Course Code: GE-ZO-41, Course Title: Food, Nutrition and Health

Unit 1:

Basic concept of food and nutrition Food Components and food-nutrients Concept of a balanced diet, nutrient needs and dietary pattern for various groups--- adults, pregnant and nursing mothers, infants, school children, adolescents and elderly

Unit 2:

Nutritional Biochemistry: Carbohydrates, Lipids, Proteins--- Definition, Classification, their dietary source and role Vitamins--- Fat-soluble and Water- soluble vitamins- their dietary source and importance Minerals--- Iron, calcium, phosphorus, iodine, selenium and zinc: their biological functions

Unit 3:

Health Introduction to health--- Definition and concept of health Major nutritional Deficiency diseases- Protein Energy Malnutrition (kwashiorkor and marasmus), Vitamin A deficiency disorders, Iron deficiency disorders, 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 and lifestyle modifications Social health problems--- smoking, alcoholism, drug dependence and Acquired Immuno Deficiency Syndrome (AIDS) --- their causes, treatment and prevention Common ailments- cold, cough, and fevers, their causes and treatment

Unit 4:

Food hygiene: Potable water- sources and methods of purification at domestic level Food and Water borne infections: Bacterial infection: Cholera, typhoid fever, dysentery; Viral infection: Hepatitis, Poliomyelitis, Protozoan infection: Amoebiasis, Giardiasis; Parasitic infection: Taeniasis and Ascariasis their transmission, causative agent, sources of infection, symptoms and prevention Brief account of food spoilage: Causes of food spoilage and their preventive measures.