B.Sc. Part III
Semester – Vth
Zoology
Session : 2019-20, 2020-21 & 2021-22

	Theory	Int. Ass.	Practical
Semester- V : Zoo.301 Paper-I Developmental Biology	40 marks	15 marks	40 marks
Semester- V : Zoo.302 Paper-II Genetics	40 marks	15 marks	
Semester- VI : Applied Zoology (3 Options) :			
Option I : Zoo.303 Paper-I Medical Zoology	40 marks	15 marks	40 marks
Option I : Zoo.304 Paper-II Medical Laboratory Technology	40 marks	15 marks	
Option II : Zoo.305 Paper-I Economic Entomology	40 marks	15 marks	40 marks
Option II : Zoo.306 Paper-II Pest Management	40 marks	15 marks	
Option III : Zoo.307 Paper-I Aquaculture-I	40 marks	15 marks	40 marks
Option III : Zoo.308 Paper-II Aquaculture-II	40 marks	15 marks	

Note : There will be one Practical paper of 3 hours pertaining to entire syllabus in each semester.

SEMESTER - V
Zoo. 301 : Developmental Biology
PAPER-I

Max. Marks: 55 ***Time Allowed: 3 hours***
Pass marks: 35% ***Lectures to be delivered: 45***
Theory-40 ***(Each of 45 minutes duration)***
Internal Assessment : 15

INSTRUCTIONS FOR PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and will carry 6 marks each. Section C will consist of 8 short-answer type questions (8 to 10 lines) which will cover the entire syllabus uniformly and will carry 16 marks in all.

INSTRUCTIONS FOR CANDIDATES`

Candidates are required to attempt two questions from each section A and B and the entire section C, which is compulsory.

Section : A

1. Gametogenesis with particular reference to differentiation of spermatozoa : vitellogenesis, role of follicle/ subtesticular cells in gametogenesis.
2. Egg maturation : egg membranes, polarity of egg.
3. Fertilization; parthenogenesis, Cleavage patterns.
4. Basic concepts of organizers and inducers and their role.

Section : B

5. Embryonic development: Cleavage, determination and differentiation, development upto three germ layers and their fate in *Herdmania, Amphioxus,* frog, chick and rabbit. Metamorphosis in *Herdmania* and Rana (Frog).
6. Foetal membranes, their formation and role. Mammalian placenta, its formation, types and functions.

Zoo.302 : Genetics

PAPER-II

Max. Marks: 55 ***Time Allowed: 3 hours***
Pass marks: 35% ***Lectures to be delivered: 45***
Theory-40 ***(Each of 45 minutes duration)***
Internal Assessment : 15

INSTRUCTIONS FOR PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and will carry 6 marks each. Section C will consist of 8 short-answer type questions (8 to 10 lines) which will cover the entire syllabus uniformly and will carry 16 marks in all.

INSTRUCTIONS FOR CANDIDATES`

Candidates are required to attempt two questions from each section A and B and the entire section C, which is compulsory.

Section : A

1. Modification of Mendelian ratios : Non-allelic gene interaction, Modified F_2 ratios (9 : 7, 9 : 3 : 4, 12 : 3 : 1, 13 : 3, 15 : 1, 9 : 6 : 1). Gene modifications due to incomplete dominance, lethal factors (2:1), Pleiotropic gene.
2. Multiple Alleles – Blood group inheritance, eye colour in *Drosophila*, pseudo-allelism.
3. Multiple factors : Qualitative and quantitative characters, Inheritance of quantitative traits (skin colour in man).

Section : B

4. Extranuclear inheritance : Chloroplast with special reference to *Mirabilis jalapa* and Kappa particles in *Paramecium*.
5. Population Genetics : Equilibrium of gene frequencies and Hardy Weinberg Law.

6. Genetic recombination in bacteria (conjugation, transduction and transformation), Recombinant DNA –technology, Genetic cloning and its applications in medicine and agriculture, DNA finger printing.

Practical Based on Theory Paper Zoo 301 & 302

1. Demonstration of Law of Segregation, Independent assortment and epistasis (use of coloured beads, capsules etc). Numericals for segregation and independent assortment.
2. Segregation demonstration in preserved material (Maize).
3. Cytoplasmic inheritance in *Mirabilis jalapa*.
4. Inheritance of other human characteristics, ability to taste. PTC, thiourea.
5. Comparison of variance in respect of pod length and number of seeds in pods.
6. Gene frequencies and random mating (coloured beads, capsules).
7. Study of Polytene chromosomes of *Chironomus/Drosophila* through permanent slide.
8. Dermatographics : Palm print taking and finger tip patterns.
9. Study of the development of frog from permanent slides.
10. Study of the development of chick embryo form permanent slides upto 96 hours.
11. Study of the following prepared slides:
    a. Stages of gametogenesis, structure of egg and sperm of a mammal.
    b. Larva of *Herdmania*
12. Project regarding Inheritance of human characteristics, Dermatographics or developmental biology.

B.Sc. Part III
Semester – VI

Applied Zoology
Option I : Medical Zoology (Zoo.303)
PAPER-I

Max. Marks: 55 ***Time Allowed: 3 hours***
Pass marks: 35% ***Lectures to be delivered: 45***
Theory-40 ***(Each of 45 minutes duration)***
Internal Assessment : 15

INSTRUCTIONS FOR PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and will carry 6 marks each. Section C will consist of 8 short-answer type questions (8 to 10 lines) which will cover the entire syllabus uniformly and will carry 16 marks in all.

INSTRUCTIONS FOR CANDIDATES

Candidates are required to attempt two questions from each section A and B and the entire section C, which is compulsory.

Section : A

1. Introduction to Parasitology (pertaining to various terminologies in use).
2. Brief Introduction to pathogenic microbes. Viruses, Ricketsiae, Spirochaetes and Bacteria.
3. Brief accounts of life history, mode of infection and pathogenicity of the following pathogens with reference to man; prophylaxis and treatment :
    a. Pathogenic protozoans : *Entamoeba, Trypansoma, Leishmania, Giardia, Trichomonas* and *Plasmodium*.
    b. Pathogenic helminthes : *Fasciolopsis. Schistosoma, Echinococcus, Ancylostoma, Trichinella, Wuchereria, Dracunculus* and *Oxyuris*.
4. Life cycle and control measures of arthropod vectors of human diseases : Malaira *(Anopheles stephensi, A culicifacies)* Yellow fever and Dengue, Haemorrhagic fever (*Aedes aegypti, A. albopictus*); Filariasis *(Culex pipiens fatigans) Mansonia sp.*, Japanese Encephalitis *(C. trinaenilorhynchus).*

Section : B

5. Epidemic deiseases such as typhoid, cholera, small pox; their occurrence and eradiction programmes.

6. Brief introduction to human defence mechanisms.
7. Humoral and cell mediated immune-response, Antigens-physical & chemical properties. Antibodies-structure and function of immunoglobulin M, G, A, E and D.
8. Antigen and antibody interactions : Serodiagnostic assays.
9. Vaccines.

Option I : Medical Laboratory Technology (Zoo.304)
PAPER-II

Max. Marks: 55 ***Time Allowed: 3 hours***
Pass marks: 35% ***Lectures to be delivered: 45***
Theory-40 ***(Each of 45 minutes duration)***
Internal Assessment : 15

INSTRUCTIONS FOR PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and will carry 6 marks each. Section C will consist of 8 short-answer type questions (8 to 10 lines) which will cover the entire syllabus uniformly and will carry 16 marks in all.

INSTRUCTIONS FOR CANDIDATES`

Candidates are required to attempt two questions from each section A and B and the entire section C, which is compulsory.

Section : A

1. Laboratory safety rules, hazards and precautions during sample collection and laboratory investigations.
2. Laboratory techniques : Colorimetry, Microscopy, Autoclaving, Centrifugation, Spectrophotometry.
3. Collection, Transportation and Preservation of different clinical samples.
4. Bacteriology : Sterilisation, (dry heat, moist heat, autoclave, filtration), Disinfection, Staining techniques (gram's stain, AFB stain, etc), Culture media (Defined & Synthetic media & routine laboratory media), Bacterial culture (aerobic and anaerobic), antibiotic sensitivity.

Section : B

5. Haematology : Collection of blood (Venous and Capillary), Anticoagulants (merits and demerits). Romanowsky's stains. Total RBC count, Erythrocyte sedimentation rate, TLC, DLC, Eosinophil count, Platelet count, Reticulocyte count.
6. Biochemistry : Protein estimation, estimation of blood urea, sugar and cholesterol, serum creatinine and uric acid, urine analysis; estimation of protein, sugar, bile salts, bile pigments, ketone bodies; enzyme studies (serum transaminase, phosphatase, amylase and lipase), liver function test.
7. Histopathology : Common fixatives and staining techniques, Histochemistry : Principle and method : Staining of carbohydrates, proteins and fats with bromo phenol blue, Periodic acid Schiff, Sudan Black blue and Feulgen reaction.

Practical Based on Theory Paper

ZOO 303 & 304

1. Demonstration of safety rules in laboratory like proper handling of paints, specimens and disposal of syringes, needles etc.
2. Demonstration of the use of autoclave, centrifuge and spectrophotometer.
3. Cleaning and sterilization of glassware using hot air oven, autoclave etc.
4. Demonstration of parts of microscope, its functioning and care.
5. Processing of clinical samples for culture and identification of pathogens : blood, throat swab, sputum, pus, urine, stool, CSF and other body fluids.
6. Estimation of haemoglobin using Shali's haemometer.
7. Preparation of thick and thin film for malarial parasite.
8. Counting of WBC, RBC & DLC.
9. Examination of stool for demonstration of intestinal parasites.
10. Study of permanent slides and specimens of parasitc protozoans, helminthes, arthropods, mentioned in theory syllabus.
11. Analysis of blood group, A, B, AB, O and Rh.
12. ESR, haematocrit, bleeding time, coagulation time, prothrombin time.
13. Estimation of blood sugar, serum urea, protein and cholesterol.
14. Fixation, embedding, cutting of tissue sections and their staining (routine Haematoxyline and Eosin and special staining with Hg-BPB, PAS, SBB and Feulgen reaction.

Suggested Readings

1. Baker F.J. and Silverton, R.E. *Introduction to Medical Laboratory Technology*, 6th edition. Butlerworth and Co. Ltd.. 1985.
2. Cheesborough, M. *Medical Laboratory technology for Tropical countries*, 2nd edition, Butlerworth and Co. Ltd., 1987.
3. Talib, V.H., *Essential Laboratory Manual,* Mehta Publishers, New Delhi, 1999.
4. Kube, J., *Immunology*, W.H. Freeman & Co., USA, 2000.
5. Chatterjee, K.D., *Parasitology, Protozoology and helminthology*, 12th edition, 1995.
6. Garcia, L.S., *Diagnositic Medical Parasitology,* 4th edition, ASM Press Washington, 2001.

Applied Zoology

Option II : Economic Entomology (ZOO 305)

PAPER-I

Max. Marks: 55 ***Time Allowed: 3 hours***
Pass marks: 35% ***Lectures to be delivered: 45***
Theory-40 ***(Each of 45 minutes duration)***
Internal Assessment : 15

INSTRUCTIONS FOR PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and will carry 6 marks each. Section C will consist of 8 short-answer type questions (8 to 10 lines) which will cover the entire syllabus uniformly and will carry 16 marks in all.

INSTRUCTIONS FOR CANDIDATES

Candidates are required to attempt two questions from each section A and B and the entire section C, which is compulsory.

Section : A

Systematic position, habits and nature of damage of the following pests of crops and vegetables.

1) Sugarcane
   - *i.* Sugarcane leaf hopper *(Pyrllia perpusilla)*
   - *ii.* Sugarcane top borer *(Scirpophaga nivella)*
   - iii. Sugarcane stem borer *(Chilo infuscatellus)* alongwith life cycle and control of *Pyrilla perpusilla* (Sugarcane leaf hopper).

2) Cotton:
    i. Pink Bollwork *(Pectinophora gossypiella)*
    ii. Red cotton bug (*Dysdercus cinglulatus)*
    iii. Cotton grey weevil *(Myllocerus maculosus)*
    iv. Surface grasshopper *(Chrotogonus trachypterus)*
    v. Cotton jassid *(Empoasca devastans)* alongwith life cycle and control of Pink boll work (*Pectinophora gossypiella)*
3) Paddy:
    i. Rice Gundhy Bug *(Leptocorisa varicornis)*
    ii. Rice Grasshopper *(Hieroglyphus banian)*
    iii. Rice Hispa *(Diclodispa armigera)* alongwith life cycle and control of Gundhy bug *(Leptocorisa varicornis)*
4) Wheat :
    i. Wheat stem borer *(Sesamia inferens)* alongwith life cycle and control.
    ii. Termites
    iii. Aphids, Jassids

Section : B

Systematic position, habits and nature of damage of following pests of vegetables.

5) Vegetables :
    i. Red Pumpkin beetle *(Aulacophora foveicollis)*
    ii. Pumpkin fruit fly *(Dacus cucurbitae)*
    iii. Hadda beetle (*Epilachna vigindictopunctata)* alongwith life cycle and control of pumpkin/fruit fly *(Dacus cucurbitae)*
6) Pests of stored grains : Systematic position, habits and nature of damage of the following pests of stored grains :
    i. Pulse Beetle *(Callosobruchus maculates)* alongwith life cycle and control.
    ii. Rice weevil *(Sitophilus oryzae)*
    iii. Khapra beetle *(Trogoderma granarium)*
    iv. Rust red flour beetle *(Tribolium castaneum)*
    v. Lesser grain borer *(Rhizopertha dominica)*
    vi. Rice moth *(Corcyra cephalonica)*

7) Systematic position, disease caused and control of the following pests of Medical and Veterinary importance :
   i. Mosquitos
   ii. Sand fly *(Phlebotomus minutes)*
   iii. House fly *(Musca domestica)*
   iv. Horse fly *(Tabanus striatus)*
   v. Blow fly *(Calliphora erythrocephala)*
   vi. Warble fly *(Hypoderma lineatus)*
   vii. Lice Poultry louset *(Menopon gallinae)*
   viii. Sucking louse *(Haematopirus eurysternus)*
   ix. Fleas

Option II : Pest Management (ZOO 306)

PAPER-II

Max. Marks: 55 ***Time Allowed: 3 hours***
Pass marks: 35% ***Lectures to be delivered: 45***
Theory-40 ***(Each of 45 minutes duration)***
Internal Assessment : 15

INSTRUCTIONS FOR PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and will carry 6 marks each. Section C will consist of 8 short-answer type questions (8 to 10 lines) which will cover the entire syllabus uniformly and will carry 16 marks in all.

INSTRUCTIONS FOR CANDIDATES

Candidates are required to attempt two questions from each section A and B and the entire section C, which is compulsory.

Section : A

1. Sericulture
   i) Species of silkworm
   ii) Requirements of Sericulture Industry
   iii) Grainage Management
   iv) Pre and Post-cocoon processing (Spinning & Reeling)
   v) Diseases of silkworm.

2. Apiculture
   i) Species of Honeybees
   ii) Flora for Apiculture
   iii) Methods & Appliances of Bee Keeping
   iv) Products – a) Honey b) Bee wax c) Propalis
   d) Pollen e) Royal Jelly f) Bee Venom
   v) Disease of Honey Bees
3. Lac Culture
   i) Species of Lac culture
   ii) Host Plants
   iii) Cultivation of Lac
   iv) Processing of Lac Industry
   v) Diseases of Lac Cultivation

Section : B

Pest Management

4) Biological Control : History : Techniques in Biological Control, Agents of Biological Control (a) Vertebrates (b) Nemathelminthes (c) Arthropods (d) Protozoan : Microbial Control with the help of Bacteria, Virus and Fungi.
5) Chemical Control : History : Types and Classification of Insecticides (i) Insecticides of Plant origin with special reference to Nicotine, Pyrethrum, Rotenone and Azadisachtin (ii) Chlorinated Hydrocarbon insecticides with special reference to DDT, Hoxaphene, BHC Chlordane, Aldrin, Endrin and Endosulfan (iii) Organophosphorus Insecticides with special reference to Malathion, TEPP, Parathion and DDVP (iv) Carbamate Insecticides with reference to Carbaryl and Carbofuran (v) Fumigants with reference to Hydrozen Cyanide Methyl Bromide, Ethylene dichloride, Carbon tetrachloride and Aluminium phosphide.
6) Recent methods of Pest Control : (i) Sterile Insect Release Methods (ii) Behavioural control involving use of Pheromones (iii) Integrated Pest Control : Introduction to IPM : Pre-requisites, Implementation strategy, Framework of IPM programme and Perspective in IPM.

Practical Based on Theory Paper

ZOO 305 & 306

1. Feeding apparatus : Mouth parts of honey bee, butterfly and red cotton bug by preparing permanent mounts.
2. A study of different types of larvae and pupae of insects.
3. External morphology and identification marks of the pest viz., *Pyrilla perpusilla* (Sugarcane leaf hopper), *Pectinophora gossypielia* (Pink bollworm), *Leoptocorisa varicornis* (Gundhy bug), *Hieroglyphus banian* (Paddy Grasshopper), *Dacus cucurbitae* (Pumpkin fruit fly).
4. External morphology and identification marks of the following stored grain pests, *Sitophilus oryzae* (Rice weevil), *Tribolium castaneum* (Rusted flour beetle), *Rhizopertha dominica* (Lesser grian borer/susri), *Trogooderma granarium* (Khapra beetle), *Collosobruchus maculates* (Pulse beetle/Dhora).
5. External morphology and identification marks of the following insects of Medical/Veterinary importance-Mosquitoes (*Culex, Anopheles* and *Aedes*), house fly, blow fly, warble fly and horse fly.
6. A study of life stages of silk worm and honey bees.
7. Collection of insects representing different orders, storage and preservation of insect material.
8. Structure and working of common sprayers, Hand Compression sprayer, Knap sack sprayer.
9. Visit to apiary and godowns for study of infections.

Applied Zoology

Option III : Aquaculture-I (ZOO 307)

PAPER-I

Max. Marks: 55 ***Time Allowed: 3 hours***
Pass marks: 35% ***Lectures to be delivered: 45***
Theory-40 ***(Each of 45 minutes duration)***
Internal Assessment : 15

INSTRUCTIONS FOR PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and will carry 6 marks each. Section C will consist of 8 short-answer type questions (8 to 10 lines) which will cover the entire syllabus uniformly and will carry 16 marks in all.

INSTRUCTIONS FOR CANDIDATES

Candidates are required to attempt two questions from each section A and B and the entire section C, which is compulsory.

Section : A

1. History of inland fisheries in India
2. Morphology of a typical fish (carp, cat-fish, fresh water eel, perch).
3. Structure of mouth of different fishes in relation to feeding habits.
4. Identification and classification of important fishes of Punjab, Haryana & Himachal Pradesh.
5. Bionomics of
   Labeo rohita
   Caatla catla
   Cirrhinus mirigala
   Wallago attu

Section : B

6. Exotic fishes : History, their introduction, morphology, their role in fish culture, impact on native fish fauna.
7. Induced Breeding
   History
   Technique
   Chemicals involved induced breeding impact on fish culture

8. Pond culture
   - Construction of pond
   - Types of pond
   - Hydrobiological factors of water and soil of a fish pond
   - Fertilization of pond
   - Maintenance of pond
9. Aquatic weeds and their control both biological and chemical.

Option III : Aquaculture-II (ZOO 308)

PAPER-II

Max. Marks: 55 ***Time Allowed: 3 hours***
Pass marks: 35% ***Lectures to be delivered: 45***
Theory-40 ***(Each of 45 minutes duration)***
Internal Assessment : 15

INSTRUCTIONS FOR PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and will carry 6 marks each. Section C will consist of 8 short-answer type questions (8 to 10 lines) which will cover the entire syllabus uniformly and will carry 16 marks in all.

INSTRUCTIONS FOR CANDIDATES

Candidates are required to attempt two questions from each section A and B and the entire section C, which is compulsory.

Section : A

1. Riverine fisheries of river Sutlej and Beas.
2. Reservoir fisheries of river Sutlej and Beas.
3. Culture systems
   - Conventional
   - Extensive
   - Intensive
   - Monoculture
   - Poly culture
4. Integrated fish farming
   - Duck-cum-poultry-cum-pig-dairy fish farming.

Section : B

5. Sewage fed fisheries
6. Cold water fisheries
   Mahseer fisheries
   Trout fisheries
7. Fish Diseases and their control
   (i) Viral
   (ii) Bacterial
   (iii) Fungal
   (iv) Helminth
   (v) Crustacean
   (vi) Diseases due to unhygienic conditions
   (vi) Diseases during transportation.
8. Fish by-product
9. Marketing of fish
   a. Fresh fish
   b. Preservation of fish.

Practical Based on Theory paper ZOO 307 & 308

1. Morphology of a carp, cat fish and perch.
2. Morphometirc and meristic characters of a typical fish.
3. Identification of the following fishes using key:
   Notopterus spp. : *Labeo rohita, L. colbasu, L. bata, Cirrhinus mrigala, Catla catla, Puntius sarana, Tor putitora, Schizothorex, Asperata seenghala, Wallago attu, Callichrous padda, Bagarius bagarius, Heteropneustes fossilis. Channa marulius, C. striatus, Xenentondon cancila, Cyprinus carpio, Hypophthalmichthyes molitrix, Ctenopharyngodon idella, Colisa fasciatus, Mastacembelus armatus.*
   For the identification of the fishes, the students can use already prepared keys or can prepare their own keys.
4. Determination of food and feeding habits of locally available fishes on the basis of stomach analysis adopting the following methods.
   a. Frequency occurrence method
   b. Feeding intensity
   c. Point method

5. Determination of maturity stages (both male and female) of any commercial fish (preserved specimens).
6. Preparation of permanent slides of Phytoplankton and Zooplanktons which constitute the food of commercial fishes. Their identification and study of important characters.
7. Identification of aquatic weeds of a fish pond.
8. Estimation of following chemical parameters of the water of a fish pond:
    a. Temperature
    b. pH
    c. Dissolved oxygen
    d. Phosphate
    e. Total Dissolved solids
    f. Nitrates
    g. Hardness
    h. Chlorids
9. Examination of diseased fishes.
10. Visits of various fish ponds and fish market.

Suggested Readings

1. Fish and Fisheries of India : V.G. Jhingran Hindustan Publishing Corpration of India, Delhi, 1991.
2. Fish of India Vol. I & II : F-day. Reprinted Edition Jagmander Book Agency, New Delhi, 1994.
3. Mornography on the Fishes of Reorganised Punjab : M.S. Johal & K.K. Tandon, Pb. Fish of Bull, Vols. I & II 1979, 1980.
4. Fishery Development : S.C. Agarwal & M.S. Johal, Narendra Publishing House, Delhi, 1997.
5. Fishes of Punjab : M.S. Johal & K.K. Tandon, Res. Bull., Panjab University, Vol. 32, pp. 143 – 154, 1981.

6. Freshwater Fishery Biology : Karl F. Legler Wm. C-Brown Company Publ., Dubuque, IOWA, USA, 1969.

7. Fisheries Techniques : Brain R. Murphy & David W. Willis (Ed.) American Fisheries Society Bethesde Maryland, USA, 1996.

Guidelines for the conduct of Practical Examination

1. Demonstrate the law of independent assortment/segregation/epistasis from the material provided. Identify the characters involved showing the dominance/recessiveness of characters. 6
2. Calculate the gene frequency form a known sample of characteristics using Hardy-Weinberg Law.

   or

   Make a dermatographic print of your finger tips or plam pattern and classify the various visible pattern with the help of diagrams and demonstrate it to the examiner 6
3. Make a permanent/temporary preparation and identify the material provided. Write a brief note on it. 5
4. Idenfy the slides A to C giving two reasons for each identification. 8
5. Practical Note Book 5
6. Viva-voce 5
7. Project Work 5

Option – I (303 & 304)

1. To make a permanent stained preparation of blood smear showing different stages of Plasmodium/rectal ciliate of frog/bacteria in sputum. Write briefly about your observation under the microscope. Draw a labeled sketch. 4

2. To test the given sample of urine/stool under the microscope for its pathology. Write the procedure adopted. 4
3. To identify the specimens A, B & C. Write the disease caused by each and two reasons for their identification. 9

4. To find out the blood groups, erythrocyte sedimentation rate/bleeding time/coagulation time/prothomobin time of the given sample and write the procedure adopted. 4
5. To identify the slides D, E and write diagnostic features. 5
6. Practical Note-book 5
7. Viva- voce 5
8. Project Work 4

Option II (ZOO 305 & 306)

1. To make a permanent preparation of the mouth parts of the given specimen. Make a labeled sketch of the same. 6
2. To identify specimens A, B & C belonging to crop pests, stored grain pests and insects of medical importance respectively. Give one outstanding morphological character and one identification mark of each. Mention their scientific names and economic importance also. 9
3. To mention the type of larval and pupal stages of life history of silk worm and honeybee. Write a note on its external morphology 6
4. To name the apparatus provided and explain its structure and working. 5
5. Insect collection. 5
6. Practical Note-book 5
7. Viva-voce 4

Option III (ZOO 307 & 308)

1. To identify the given sample A and write the morphometic and meristics characters. Make labeled sketch of given samples. 6
2. Identify and write morpho–ecological note on specimens B and C. 8
3. To identify slides D and E. write two identifying characters of each. 6
4. Estimation of chemical parameters of water from a fish pond. 5
5. Practical Note-book 5
6. Viva-voce 5
7. Project Work Report 5