

B.Sc. PART II ZOOLOGY

Scheme:

Paper	Duration	Max. Marks	Min. Pass Marks
Paper I	3 hrs.	50	18
Paper II	3 hrs.	50	18
Paper III	3 hrs.	50	18
Practical	5 hrs.	75	27
Total Marks		225	81

Note: Each theory paper is divided into three independent units. The question paper is divided into three parts Part -A, Part -B and Part -C. Part A (10 marks) is compulsory and contains 10 questions (20 words) at least three questions from each unit, each question is of one mark. Part -B (10 marks) is compulsory and contains five questions at least one from each unit. Candidate is required to attempt all five questions. Each question is of two marks (50 words). Part -C (30 marks) contains six questions, two from each unit. Candidate is required to attempt three questions, one from each Unit. Each question is of ten marks (400 words).

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PAPER I

STRUCTURE AND FUNCTIONS OF INVERTEBRATE TYPES

UNIT I

Structural and functional organisation of vital systems of nonchordates as exemplified by *Amoeba*, *Paramecium*, *Euglena*, *Obelia*, *Sycon*, *Fasciola*, *Taenia*, *Nereis*, *Hirudinaria*, *Palaemon*, *Lamellidens*, *Pila* and

Asterias :

- 1 Locomotion :Pseudopodial(*Amoeba*), ciliary(*Paramecium*) and flagel-lar (*Euglena*), parapodial (*Nereis*), pedal muscular foot(*Pila*) and tube feet (*Asterias*).
- 2 Skeleton : Endoskeleton (spicules of *Sycon*), exoskeleton, chitinous (*Palaemon*), calcareous (Corals, *Pila*, *Lamellidens*, *Asterias*), siliceous (*Radiolaria*).
- 3 Nervous System : Sensory and nerve cells (*Obelia*); brain ring and longitudinal nerves (*Fasciola* and *Taenia*), brain and ventral nerve cord (*Nereis*, *Palaemon*), nervous system of *Pila* and *Lamellidens*.
4. Sense-organs : Statocyst and osphradium(*Lamellidens* and *Pila*), compound eye (*Palaemon*) and simple eye (*Nereis*, *Pila*), tactile and olfactory organs (*Palaemon*), nuchal organs(*Nereis*).

UNIT II

- 1 Food, Feeding, Digestive structures and Digestion: Autotrophic (*Euglena*), heterotrophic: through food vacuole (*Paramecium*) and in hydroid and medusoid zooids (*Obelia*), parasitic (*Fasciola*, *Taenia*, *Hirudinaria*), predatory (*Nereis*, *Palaemon*, *Asterias*), filter feeding (*Lamellidens*)
- 2 Respiration : Aquatic general body surface (*Euglena*, *Nereis*, *Hirudinaria*), dermal branchiae(*Asterias*), parapodia (*Nereis*), gills (*Palaemon*, *Lemellidens*, *Pila*), aerial, pulmonary sac (*Pila*), trachea (Insect), anaerobic (*Fasciola*, *Taenia*).
- 3 Excretion : General body surface (Protozoa, *Sycon*, *Obelia*), protonephridial system and flame cells(*Fasciola*, *Taenia*), nephridia(*Nereis*, *Hirudinaria*), malpighian tubules (insect); organ of Bojanus(*Lamellidens*, *Pila*).
- 4 Circulation : Cyclosis (*Euglena*, *Paramecium*), diffusion (*Sycon*, *Obelia*, *Fasciola*, *Taenia*), open circulatory system (*Hirudinaria*, *Palaemon*, *Lamellidens*, *Pila*, *Asterias*), closed circulatory system (*Nereis*).
- 5 Reproduction : Asexual (*Paramecium*, *Euglena*, *Sycon*), alternation of generation (*Obelia*), sexual (*Fasciola*, *Taenia*, *Nereis*, *Lamellidens*, *Pila*, *Hirudinaria*, *Asterias*).

UNIT III

- 1 Evolution of canal system of sponges.
- 2 Parasitic adaptations in helminthes and arthropods.
- 3 Characteristics of social insects; Social organisation in termites.
- 4 Direct and Indirect Development in Insects.
- 5 Water vascular system in Starfish.
- 6 Torsion in Gastropoda.
- 7 Adaptive radiation in Annelida.
- 8 Autotomy and regeneration in Echinodermata.

PAPER II ANIMAL PHYSIOLOGY AND BIOCHEMISTRY

UNIT- I

Animal Physiology with special reference to Mammals :

- 1 Osmoregulation, membrane permeability, active and passive transport across membrane.
- 2 Physiology of Digestion: nature of food stuff, various types of digestive enzymes and their digestive action in the alimentary canal.
- 3 Physiology of Circulation: Composition and function of blood, mechanism of blood clotting, heart beat, cardiac cycle, blood pressure, body temperature regulation.
- 4 Physiology of Respiration : Mechanism of breathing, exchange of gases, transportation of oxygen and carbon dioxide in blood, regulation of breathing.
5. Physiology of Excretion : Kinds of nitrogenous excretory end-products (aminotelic, ureotelic and uricotelic), role of liver in the formation excretory end products, functional architecture of mammalian kidney tubule and formation of urine, hormonal regulation of water and electrolyte balance.

UNIT II

Regulatory aspects of animal physiology

1. Physiology of Nerve Impulse and Reflex Action : Functional architecture of a neuron, origin and propogation of nerve impulse, synaptic transmission, spinal reflex arc, central control of reflex action.
2. Physiology of Muscle Contraction : Functional architecture of skeletal muscle, chemical and biophysical events during contraction and relaxation of muscle fibres.
3. Types of Endocrine Glands, their secretions and functions: Pituitary, Adrenal, Thyroid, Islets of Langerhans, Testis and Ovary. Elementary idea about mechanism of hormone action
4. Hormonal control of male and female reproduction and implantation, parturition and lactation in mammals.
- 5 Preliminary idea of neurosecretion, hypothalamic control of pituitary function : neuroendocrine and endocrine mechanism of Insecta.

UNIT III

BIOCHEMISTRY

- 1 Carbohydrate : Structure, function and significance. Oxidation of glucose through glycolysis, Krebs cycle and oxidative phosphorylation, elementary knowledge of interconversion of glycogen and glucose in liver, role of insulin.
2. Proteins : Essential and non-essential amino acids, catabolism

decarboxy-lation, fate of ammonia (ornithine cycle), fate of carbon skeleton. Structure, function and significance.

- 3 Lipids : Structure, function and significance. Biosynthetic and beta oxidative pathways of fatty acids, brief account of biosynthesis of triglycerides.

PAPER III

IMMUNOLOGY, MICROBIOLOGY AND BIOTECHNOLOGY

UNIT I

Immunology

- 1 Immunology : Definition, types of immunity, innate and acquired, humoral and cell mediated.
- 2 Antigen : Antigenicity of molecules, haptens
- 3 Antibody : Definition (IgG, IgM, IgD, IgA and IgE) outline idea of properties and function of each class of immunoglobulin.
- 4 Antigen-antibody reactions : Precipitation reaction, agglutination reaction, neutralizing reaction, complement and lytic reactions and phagocytosis.
- 5 Cells of Immunity ; Macrophages, lymphocytes (B and T types), T - Helper cells, T-killer cells, plasma cells and memory cells.
- 6 Mechanism of humoral or antibody mediated immunity.

UNIT II

Microbiology

1. Brief introduction to the history of microbiology : work of Antony Van Leeuwenhoek, theory of spontaneous generation, Germ theory of fermentation and disease, Works of Louis Pasteur, John Tyndal, Robert-Koch and Jenner.
2. The Prokaryota (Bacteria)
Structural organization :
i) Size, shapes and patterns
ii) Structural organization
Slime layer (capsule), cell envelopes cytoplasmic membrane (inner membrane) cell wall (outer membrane) of Gram negative and Gram positive bacteria, mesosomes, cytoplasmic organization cell projections, flagella and pili.
3. Genetic material of bacteria.
i) Chromosome (ii) Plasmids (iii) replication of bacterial DNA.
4. Reproduction in Bacteria , asexual reproduction: binary fission, budding, endospore formation, exospore and cyst formation, sexual reproduction, conjugation.
5. Microbial nutrition culture of Bacteria
a) Carbon and energy source
b) Nitrogen and minerals
c) Organic growth factors

- d) Environmental factors : Temperature, hydrogen-ion concentration
- 6 Bacteria of medical importance
i) Gram positive
a) Cocci: Staphylococci, Streptococci
b) Bacilli : Diphtheria, Tetanus
ii) Gram-negative
a) Cocci : Gonorrhea, Meningitis
b) Bacilli : Diarrhea
iii) Mycobacteria : Tuberculosis, Leprosy.
- 7 AIDS and Hepatitis (with emphasis on B)
i) The causative agents
ii) Transmission
iii) Pathogenicity
iv) Laboratory diagnosis, treatment and prevention.

UNIT III

Biotechnology

1. History, scope, significance of Biotechnology. Major areas of Biotechnology, Biotechnology industries in India.
2. Vectors for gene transfer (plasmids and phages). Basic concepts of cell and tissue culture. Hybridoma technology.
3. Monoclonal antibodies and their applications.
4. Protoplast fusion in Prokaryotes and Eukaryotes.
5. Recombinant DNA technology and its application.
6. Bacteria and genetic engineering (outline idea only), benefits of genetic engineering, potential hazards and regulations of genetic engineering.
7. Transgenic animals and their uses in biotechnology.
8. Brief account of cloning; genomic research its advantages and disadvantages.
9. Biotechnology in Medicine, P.C.R., Antibiotics, Vaccines, Enzymes, Vitamins, Steroids.
10. Environmental Biotechnology: Metal and petroleum recovery, pest control, waste water treatment.
11. Food and drink and dairy microbiology (outline idea only): Fermented food production: dairy products, alcoholic beverages and vinegar, microbial spoilage and food preservation.

PRACTICAL ZOOLOGY

Duration 5 hrs.

Max. Marks 75

Min. Marks 27

Practical work based on Papers I, II and III

I. External features and Anatomy

- (a) External features, alimentary canal, nervous system, excretory and reproductive systems in *Hirudinaria*.
- (b) External features, appendages, alimentary canal and nervous system *Palaemon*.

(c) External anatomy, pallial organs and nervous system *Unio* and *Pila*
 Note: External features and anatomy should be studied preferably by digital techniques and alternatives like charts etc.

II. Study of Microscopic Slides:

Porifera: T.S and L.S. of Sycon.

Coelenterata: Obelia medusa and polyp, Planula, Scyphistoma, Ephyra larva of Aurelia.

Platyhelminthes: T.S. body of *Taenia* and *Fasciola*. Scolex of *Taenia*, mature and gravid proglotid of *Taenia*, Hexacanth, Bladderworm and cysticercus stages of *Taenia*, Miracidium, Sporocyst, Redia and Cercaria Larva of *Fasciola*.

Aschelminthes: Ascaris T.S. body wall; Ascaris T.S. Pharynx; Ascaris T.S. mature male and female

Annelida: T.S. of Leech and Neries through different regions,

Arthropoda - Nauplius, Zoea, Megalopa and Mysis larvae,

Mollusca: T.S. gill of *Pila*, Glochidium.

Echinodermata: Pedicellareae

III. Permanent Preparation and Study of the following

Protozoa: Euglena, Paramecium, Polystomella, or any other foraminifera.

Porifera: Spicules, spongin fibres, gemmule.

Coelenterata: Obelia medusa

Annelida: Neries (parapodia)

Arthropoda: Cyclops, Daphnia.

Mollusca: *Pila*- Gill lamella, Osphradium, Radula, *Unio*- Gill lamella

V. Microbiology.

1. Preparation and use of culture media for microbes.

2. Study of microbes in food materials

3 Educational tour to microbiological laboratories, dairy, food processing factory, distillery, museum of natural science for first hand study and collection of material. Methods of microbial waste disposal. Candidates are expected to submit a report of their visit.

VI. Animal Physiology

1 Counting of red and white blood cells in a blood sample.

2 Estimation of haemoglobin in a blood sample.

3 Estimation of haematocrit value in a blood sample.

4 Demonstration of enzyme activity (catalyses) in liver.

5 Study of histological structure of major endocrine glands of mammals and their physiological importance using slide/charts/models/digital techniques.

VII. Biochemistry

1 Detection of proteins, carbohydrates and lipids.

2 Demonstration of the principle of paper chromatography.

VIII. Live Zoology:

To study local invertebrate fauna. Observation of their locomotion, feeding, respiration, circulation and reproduction in the natural habitats. Student is required to prepare a report of these observations and submit along with the practical record. A note on the conservation of invertebrate fauna is compulsory in this report.

Note : (i) Use of animals for dissection is subject to the conditions that these are not banned under the Wild life (Protection) Act.

(ii) Those Institutions which are already having Zoology Museums should not procure Museum Specimens now onwards and should use charts / slides / models / photographs and digital alternatives in case of need. Those new institutions which are not having Zoology Museum in their Department should provide learning related to zoological specimens with the help of charts / slides / models / photographs and digital alternatives/ and visit of students to already established museums.

Scheme of Practical Examination

Time: 5 hrs.	Min.Pass Marks: 27	Max. Marks: 75
Regular/Ex-students/Non-Collegiate		
1	Anatomy (Through Chart / Model / Photograph / CD)	05
2	Permanent preparation	06
3	Exercise in Animal Physiology	08
4	Exercise in Biochemistry	08
5	Exercise in Microbiology	05
6	Identification and Comments	
	Spots (1 to 8)	16
7	Live Zoology: Study report of animals in Nature	07
8	Viva-voce	10
9	Class record	10
Total		75

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i'u 1 vd dk gA Hkx c %10 vd% Hk vfuok; g o ble dy 5
i'u g rFk iR; d bdkb l de l de 1 i'u gA vH; Fkh dk l Hk
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%;Xyhuk] ik'oikn; %ujh l % i'kh; ikn %ikbyk% vkj uky ikn % ,LVfj; l %
- 2- **ddky %vUr%ddky %l k; dku dh dfVdk; %] cká ddky & dkbVuh**
%ifyeku% dfY'k;eh %ioky] ikbyk] yefyMU l] ,LVfj; l %] flyhdke;
%jfm;kyfj; %
- 3- **rf=dk r= %lonh vkj rf=dk dkf'kdk, %vkcfy; %efLr"d oy;**
vkj vun/; rf=dk, %Ql hvkyk vkj Vhf; %efLr"d vkj v/kj rf=dk
jTt %ujh l] ifyeku% ikbyk vkj yefyMU l dk rf=dk r=A
- 4- **lonh vx %luryu ifVdk vkj tyf{dk %yefyMU l vkj ikbyk%**
l ;Dr u= %ifyeku% vkj l jy u= %ujh l vkj ikbyk% Li'kKkid vkj
?kk.k vx %ifyeku% U; dy vx %ujh l %A

bdkb & II

- 1- **[kk] v'ku ikpd ljpuk, vkj ikpu %Lo'ik'kh %;Xyhuk% fo"ke**
ik'kh; ([kk] fjfDrdk }kj %ijkef'k;e% vkj gkbMkbM thod vkj eMlkbM
thod e %vkcfy; %ij thoh; %Ql hvkyk] Vhf; k] fg: Mhufj; %Hk{kdh
%ujh l] ifyeku] ,LVfj; l % fuLinu v'ku %yefyMU l %
- 2- **'olu %tyh; & lkekU; ng lrg %;Xyhuk] ujh l] fg: Mhufj; %peh;**
Dyke % ,LVfj; l % ik'oikn %ujh l %] fxYl %ifyeku] yefyMU l] ikbyk%
(ok;oh;] QQl dk'k %ikbyk% 'okl ufydk %dhV% (vok;oh; %Ql hvkyk]
Vhf; %

- 3- **mRl tu %lkekU; ng lrg %ikVktkvk] l k; dku] vkcfy; %vkfn oDdh;**
r= vkj Tokyk dkf'kdk, %Ql hvkyk] Vhf; %oDdh %ujh l] fg: Mhufj; %
eYih?kh ufydk, %dhV% (cktul d vx %yeyhMU l] ikbyk%
- 4- **ifj l pj.k r= %pØ.k %;Xyhuk] ijkef'k;e% (fol j.k %l k; dku] vkcfy; k]**
Ql hvkyk] Vhf; % [kyk ifj l pj.k r= %fg: Mhufj; k] ifyeku] yeyhMU l]
ikbyk] ,LVfj; l % (cUn ifj l pj.k r= %ujh l %
- 5- **ituu %vyfxd %ijkef'k;e] ;Xyhuk] l k; dku] ih<h ,dkUrj.k %vkcfy; %**
yfxd %Ql hvkyk] Vhf; k] ujh l] yeyhMU l] ikbyk] fg: Mhufj; k] ,LVfj; l %

bdkb & III

- 1- Litk e uky r= dk mnfodk lA
- 2- Ñfe; k ,o vkFkikMk e ijthoh vudyuA
- 3- lkekftd ikf.k; k d y{k.k % nhid e lkekftd lxBu
- 4- dhVk e iR; {k ,o viR; {k ifjo/kuA
- 5- rkjkehu ety logu ru=A
- 6- xLVkikM e ,Bu
- 7- ,uyhMk l vudyh fofdj.k
- 8- bdkuMeVk e LokxkPNnu o iu: nHkou

i'u i= II

tUr dkf;dh ,o to jlk;u

bdkb I

- tUr dkf;dh & Lrfu; k d fo'k'k lUnHk e %
- 1- ijk l j.k fu;eu] f>Yyh ikjxE; rk] f>Yyh d vkj ikj l fØ; ,o fuf'Ø;
ifjoguA
- 2- **ikpu dkf;dh %HkT; inkFk dh iÑfr] fofHku idkj d ikpd ,Ut kbE l**
vkj vkgkj uky e mudh ikpd fØ; kA
- 3- **ifj l pj.k dh dkf;dh %jDr dk lxBu ,o dk; (jDr Ld/ku dh**
fØ; kfof/k(ân; Linu(ân; pØ(jDr nkc(nfgd rki fu;euA
- 4- **'olu dh dkf;dh %lokru dh fØ; kfof/k(x l k dk fofue; (jDr**
e dkcU & Mkb & vkD l kbm ,o vkD l htU dk ifjogu(lokru dk fu;euA
- 5- **mRl tu dh dkf;dh %ukbVktu ;Dr mRl th inkFk d vr mRiknk**
d idkj %vekuVfyd] ;fjvVfyd ,o ;fjdVfyd% (bu vr mRiknk
d fuek.k e ;Ñr dh Hkfedk(Lru/kkj h oDd ufydk dk fØ; kRed Lo: i
,o e= fuek.k(ty vkj folr ?kVdk dk gkekuh; fu;euA

bdkb & II

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- 1 **rfl=dk vkox ,o ifrorh fØ;k dh dkf;dh** % ,d rfl=dk dkf'kdk
dk fØ;kRed Lo:ij rfl=dk vkox dh mRifuk ,o logu] ;Xekucl/
ku i'k.k(e: ifrorh pki(ifrorh fØ;k dk dUnh; fu;U=.kA
- 2- **i'kh ldpu dh dkf;dh** % ddky i'kh dk fØ;kRed Lo:ij i'kh
rUrvk d ldpu ,o f'kfFkyu d nkju gku okyh jlk;fud ,o to
Hkfrdh; ?kVuk,A
- 3- vUr% L=koh xFufk;k d idkj] mud LoHko o dk;(ih;'k] vf/koDd] FkbbjkbM]
yxj gl dh }hfidk;] o'k.k] v.Mk'k;A gkeu fØ;k dh fØ;kfof/k dh
ikjFEhd tkudkjha
- 4- uj ,o ekn ituu dk gkekuk }kjk fu;U=.k vkj vkjki.k] ilo vkj
Lrfu;k e nX/k L=koA
- 5 rfl=dk L=o.k dk ikjFEhd Kku] ih;"k d dk;k dk gkbikFkyel }kjk
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bdkb & III

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- 1 **dkckgibMV** % ljpuk] dk; ,o egRoA Xykbdkykbfl l }kjk Xydk
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,o Xydk d vUr% : iKurj.k dk ikjFEhd Kku] bu lfyu dh HkfedkA
- 2 **ikVhUl** % vko';d ,o vuko';d vehuk vEy] vip;] MhdckfD l yhdj.k]
veku;k dh fu;fr %vkufFku pØ%] dku ddky dh fu;frA ljpuk]
dk; ,o egRoA
- 3 **olk** % ljpuk] dk; ,o egRoA olk vEy dk to l'y'k.k ,o
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mikftr ifrj{kk(rjy ,o dkf'kdk e;/orh ifrj{kkA
- 2- ifrtu % v.kvk dh ifrtfurk] gIVU lA
- 3- ifrj{kh % ifjHkk"kk % IgG, IgM, IgD, IgA ,o IgE % bE;ukXyK;fyu d
iR;d ox d x.kk ,o dk;k dh :ij[kkA
- 4- ifrtu&ifrj{kh vfhfØ;k, % vo[ki.k vfhfØ;k] legu vfhfØ;k] mnk l hndj.k
vfhfØ;k] ijd ,o y;u vfhfØ;k, vkj dkf'kdk Hk[k.kA
- 5- ifrj{kdrk dh dkf'kdk, % o'gn Hkkt h] fyEQ l kbV %ch o Vh idkj%]

Vh&l gk; d dkf'kdk,] Vh&ekjd dkf'kdk,] lykTek dkf'kdk, ,o Lej.k
dkf'kdk,A

- 6- rjy ;k ifrj{kh e;/orh ifrj{kdrk dh fØ;kfof/kA

bdkb & II

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- 2- ikdjh; kVv % thok.k%
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(i) vdkkj] vkÑfr ,o 0;oLFk dk ifr: i
(ii) ljpukRed lxBu %
'yf'ed Lrj] lEiv(dkf'kdk vkj.k(dkf'kdkn0;h f>fy; ;k %vkrfjd f>Yy%
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- 3- thok.k dk vkuof'kd inkFk %
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- 4- thok.kvk e ituu] vyfxd ituu(f}fo[k.Mu] edyu] ,UMl ik fuek.k]
,DlL ik ,o iVh fuek.k(yfxd ituu] l ;XeuA
- 5- thokf.od ik'k.k ,o thok.kvk dk lo/ku
%v% dku ,o Åtk L=kr
%c% ukbVktu vkj [kfut
%l % dkcud of) dkjd
%n% i;koj.kh; dkjd % rkieku] gkbMktu vk;u lKunrkA
- 6- fpfdRl k egRo d thok.k
%ze xe lo.kh
%v% dkdkb % LVfQykdkd] LVIVkdkd]b
%c% cflyh % fMIFkifj;k(fVvUl
%ze xe vo.kh
%v% dkdkb % xukfj;k] efuUt kbVl
%c% cflyh % Mk;fj;k
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%ze dkj.k vfhkdrk

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bdkb & III

to rduhdh %

- 1 to rduhdh dk bfrgk l] {k=} egRo] to rduhdh d ie[k {k= ,o Hkkjr e to rduhdh m|kxA
- 2- thu LFkkukU rj.k d okgd %ykyfTeM vkj Hkk t h% dkf'kdk ,o Ård lo/ku dh eyHkr vo/kkj.kk,A gkbfcMkek rduhdh dh eyHkr vo/kkj.kk,A ekukDykuh ifrj{kk ,o mud vui;kxA
- 3- ikdj;kvI ,o ;dj;kvI thon0;d ly;uA
- 4- iu;kth Mh ,u , rduhdh vkj bld vui;kxA
- 5- thok.k ,o vkuof'kd vfHk;kfU=dh %doy cká j[kh; KkuH(vkuof'kd vfHk;kfU=dh d yHk(iHkkoh n?KVuk ,o vkuof'kd vfHk;kfU=dh dk fu;euA
- 7- ijkftuh %VKU ltfud% tUr vkj to rduhdh e mud mi;kxA
- 8- DykfuX dk l{fklr y[kk tk[kk(thufed vul/kku & bldh mikn;rk ,o vu&mikn;rkA
- 9- vk'kf/k;k e torduhdh] ih-lh-vkj-] ifr tfod] Vhd] fd.od] foVkfU l] LVhjk,MIA
- 10- okrkj.kh; to rduhdh % /kkv vkj iVfy;e ikflr] uk'kd&tho fu;U=.k] vif'k"V ty mipkjA
- 11- Hkk tu] i; vkj M;jh l{e tfodh %ckg; j[kh; KkuH(fdf.or Hkk tu mRiknu % M;jh mRikn] ,Ydkgyd i; vkj fljkd(l{etfod foÑfr ,o Hkk tu ifjj{k.kA

ik;kfxd & ik.kh foKku

le; 5 ?k.V i.kk.d 75 U;ure vd 27

1. बाह्य लक्षण एवं शारीरिकी
(अ) हिरूडिनेरिया (जोंक) के बाह्य लक्षण, आहारनाल, तंत्रिका तन्त्र, उत्सर्जन एवं जनन तन्त्र।
(ब) पेलीमॉन के बाह्य लक्षण, उपांग, आहार नाल एवं तंत्रिका तन्त्र।
(स) यूनिओ और पाईला के बाह्य लक्षण, पेलियल अंग और तंत्रिका तन्त्र।
ukV % ckg; y{k.k ,o vkuurfjd 'kkjhfdh dk tgg rd lHko gk fMftVy rduhdh ;k vU; fodYik }kjk v/;;u fd;k tk; A tc Hkh fd l h thfor ik.kh dk vkuurfjd 'kkjhfdh gr v/;;u fd;k tk; rk og ;k rk uk'kd gk ;k lo)u dh gb itkfr gk ft l ihMkjfgr v/;;u fd;k tk; A

2. सूक्ष्मदर्शीय स्लाइडों का अध्ययन :-

पेरिफेरा : साइकॉन का अनुदैर्घ्य एवं अनुप्रस्थ काट का अध्ययन

सीलेन्ट्रेटा : ओबीलिया- मेड्यूसा एवं पॉलिप, ओरीलिया के प्लेन्यूला, स्काइफीस्टोमा एवं एफाइरा लार्वा

प्लैटीहेलमिन्थीस : टीनिया एवं फेसिओला की देह का अनुप्रस्थ काट, टीनिया स्कोलेक्स, टीनिया के परिपक्व व ग्रेविड खण्ड, हैक्सकैथ, ब्लेडर वर्म और सिस्टिसरकस अवस्था।

फेसिओला के मिरासिडियम, स्पोरोसिस्ट, रेडिया एवं सरकेरिया लार्वा।

ऐस्केलिमन्थीज : ऐस्केरिस की देह, ग्रसनी परिपक्व नर व मादा का अनुप्रस्थ काट।

ऐनेलिडा : शरीर के विभिन्न भागों से नेरिस व जोंक का अनुप्रस्थ काट।

आर्थोपोडा : नॉप्लियस, जोइया, मेगालेपा एवं माइसिस लार्वा

मोलस्का : पाईला के गिल का अनुप्रस्थ काट, ग्लोकीडियम लार्वा

इकानोडर्मेटा : वृत्तपद।

III स्थाई आरोपण तैयार करना एवं उनका अध्ययन

प्रोटोजोओ : यूलीना, पेरामिशियम, पोलिस्टोमेला अथवा कोई फॉरमिनिफेरा।

पेरिफेरा : कंटिकायें, स्पेन्जिन तन्तु, जेम्यूल

सीलेन्ट्रेटा : ओबीलिया मेड्यूसा

ऐनेलिडा : नेरीस के उपांग

आर्थोपोडा : साइक्लोप्स, डेफिनिया

मोलस्का : पाईला-गिल लैमिला, ऑस्फ्रेडियम, रेड्यूला, यूनिओ - गिल लैमिला

iv l{e t fodh %

- 1- l{e thok d fy; lo/ku ek/e dk fuek.k ,o mi;kxA
- 2- [kk] inkFkk e l{e thok dk v/;;uA
- 3- l{etfodh; i;kx'kkykvk] M;jh [kk] i lldj.k dkj[kkuk] fMLVhyjh] ikÑfrd foKku lXgky;k dk ikFkfed Kku ,o inkFkk d lXg gr 'k{kf.kd Hke.kA l{e tfodh vif'k"V mipkj dh fof/k;kA fo|kfFk;k l mijkDr lLFkkuk d voykdu dh fjikV dk iLrrhdj.k vif{krr gA

v tUr dkf;dh %

- 1- jDr ifrn'k e yky vkj 'or jDr dkf'kdkvk dh x.kukA
- 2- jDr ifrn'k e ghekXykfcu dk ekiuA
- 3- jDr ifrn'k e fgeVkfØV oY; dk ekiuA
- 4- ;Ñr e ,Utkbe fØ;k %dVyt% dk in'kuA
- 5- Lru/kkfj;k dh e[; vUr'ókoh xfuFk;k dh Årdh; ljpuk dk LykBM @pkV@ekMYI@fMftVy rduhdh }kjk v/;;u ,o mudh dk;dh; fo'k"krk,A

VI to jlk;u

1- ikVhu] dkckgkbMV ,o olk dh igpkuA

2- iij ØkeVxxkQh d fl)kUrk dk in'kuA

VII I tho ik.kh foKku& LFkkuh; ikÑfrd vkokl e ik; tku oky vd'k: dh;
 tUrvk dk v/;;u A mud xeu] Hkk tu xg.k fof/kj 'olu] ifjlpj.k
 o tuu dk ikÑfrd vkokl e v/;;u A fo|kFk;k dk bu voykduk
 dh ,d fjikV cukdj ik;kfxd fjikV d lkFk iLrr djuk g"xkA LFkkuh;
 vd'k: dh; tUrvk d lj{k.k ij ,d ukV vko';d g A

ukV %& (i) foPNnu d fy, i;Dr tUr dk; e yu l io ;g lfuf'pr
 dj y fd tUr ou; tho lj{k.k d vUrxr ifrcfU/kr ugh gA½

(ii) o lLFkku tgg ij tUr lxgky; igy l gh miyC/k g ogk u; lxgky;
 çfrn'k ugh exk; tk; rFkk vko';drk iMu ij pkVI@ LykbMI@
 ekMYI@fp= o fmftVy fodYik dk mi;kx fd;k tk; A ftu lLFkkuk
 e ik.kh 'kkL= fo'k; u;k [kyk g rFkk tUr lxgky; mud foHkkx e
 miyC/k ugh g o pkVI@LykbMI@ekMYI@fp= rFkk fmftVy fodYik
 }kjk lxgky; çfrn'k dk v/;;u djok; rFkk fo|kFk;k dh vU;= fLFkr
 tUr lxgky;k dh Hke.k djko A

ik;kfxd ijh{kk dh ;k tuk

Ie; 5 ?k.V

U;ure mÜkh.kkd & 27

i.kkd&75

fu;fer@io fo|kFkh@Lo; ikBh

1- 'kkjhfdh %pkV@ekMy@QkvxxkQ@lh-Mh- d }kjkk½ 05

2- LFkbb vkjki.k %LykbM½ 06

3- tUr dkf;dh d i;kx 08

4- to jlk;u d i;kx 08

5- l{e tfodh d i;kx 05

6- ikn'kk dh igpku ,o fVli.kh 16

%1 l 8½

7- I tho ik.kh foKku& iÑfr e ikf.k;k d v/;;u dh fjikV 07

8- ekf[kd 10

9- fjdM 10

dy 75