EAPCET (AM)
ZOOLOGY

CENTRE FOR EDUCATIONAL DEVELOPMENT OF MINORITIES
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ZOOLOGY

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EAPCET (AM)

(Engineering, Agriculture & Pharmacy Common Entrance Test)

ZOOLOGY

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PREFACE

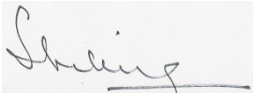
Taking competitive examinations has became the order of the day for any educated young man who is desirous of seeking any coveted job, a seat in any prestigious college. The approach required for such competitive examination is different from that of taking an academic examination.

It was observed that most of the minority candidates do not fare well at these competitive examinations not because they lack in talents but because they can neither afford to join the private coaching centres nor could purchase the required study material.

In order to improve the participation and performance of the candidates belonging to minorities in such competitive examinations, the Minorities Welfare Department, State Government sponsored a project to Osmania University. The University in turn established Centre for Educational Development of Minorities (CEDM) in 1994 in Nizam College. Since then, the Centre has been offering free coaching for the benefit of candidates belonging to minority communities appearing for various job seeking and admission seeking competitive examinations at Hyderabad and other minority concentrated districts of the state. In respect of job-seeking examinations, the Centre is providing free coaching and study material for TS TRT, TS TET etc. and for admission oriented examinations such as NEET, EAPCET, ICET, ECET, EdCET, DEECET and POLYCET etc. In addition to these coaching programmes, the Centre is also providing free coaching and study material to X class Urdu medium minority students in minority concentrated districts of the state to strengthen their educational foundation and to improve their performance in SSC Public Examination.

We wish to place on record the pains the compilers have taken to summarize and arrange the important questions. The Centre gratefully acknowledges their services.

If these study materials are of any help to the candidates, we feel immensely rewarded for the humble efforts we have put in.



Hyderabad
April 2024

Prof. S. A. Shukoor,
D I R E C T O R

EAMCET Zoology

Index

1. DIVERSITY OF LIVING WORLD

Zoology - study of animals

- Morphology - study of external structures of animals
- Taxonomy - study of classification
- Physiology - study of internal physical functions of the body
- Hematology - study of blood
- Angelology - study of blood vessels
- Cardiology - study of cardiac muscles (heart)
- Neurology - study of Nervous system
- Evolution - study of progressive development of the organism
- Genetics - study of genes (heredity)
- Eugenics - study of genetics branch which deals with the development of human races on application of genetics laws
- Euphenics - branch of genetics in which study & experiment and treatment is done for genetical diseases.
- Ecology - study of relative factors (or) environment
- Microbiology - study of micro organisms eg. Bacteria, Viruses, Protozoans
- Anthropology - study of apes & man
- Gynecology - study of female reproductive system
- Osteology - study of bones
- Chondrology - study of cartilage
- Icthiology - study of fishes
- Father of Zoology Aristotle
- Father of Biology Aristotle
- Father of Botany Theophrastus
- Father of Genetics Gregor. John Mendal

- Father of Evolution — Charles Darwin
- Father of Cytology — Robert Hoek
- Father of Microbiology — A.V. Leewuen Hoek
- Father of Immuniology — Edward Jenner
- Father of Physiology — William Harvey
- Father of Modern Genetics — T. H. Morgan
- Father of Taxonomy — Carolus Lineus
- Blood, Blood Circulation firstly discovered by Willian Harvey
- Blood group 'O' is discovered by De Castello
- Blood group A,B & AB is discovered by Karl Land Stainer
- Mitochondria firstly discovered by Altman
- The word mitochondria is propounded by Benda
- Method of Vaccination is propounded by Edward Jenner
- Pencillin firstly discovered by Alexander Flemming
- Mutation Theory is proposed by De Vries
- Vitamins discovered by Casmir Funk
- Structure of D.N.A. synthesized by Indian Scientist is known as H.G. Kohorana
- Protoplasm firstly discovered by Purkenji
- Huxley called protoplasm is living substance
- Genetic code is discovered by Koharana & Narenberg
- Simple Microscope is discovered by A.V. Leewen Hoek
- Compound Microscope Johnson & Johnson
- Protozoa is discovered by Goldfus
- Porifera is discovered by R.E. Grant
- Coelentrata — Leukart
- Platyhelmenthes — Gegenberg
- Aschelmenthes — Grover
- Annelida — Lamarck

- Arthropoda Vonsiebold
- Mollusca Aristotle
- Echinodermata Jacob Klien
- Chordata Balfour

BASIC PRINCIPLES OF CLASSIFICATION

According to Mayer (1969) a million animal species have been identified & show a lot of diversity in structure Habits, Habitats & Life Style

Classification is use fulto understand the diversify of organism

Each spieces existing in different forms such as sexes, age, classes, seasonal forms, morphs etc.

BIONOMIAL NOMENCLATURE

According to this each animal should have 2 names first name is called generic name (genus) should be written OR start with capital letter.

Second name should be species have to written with small letter

Eg. Plasmodium, vivax

Genus Species

TRINOMIAL NOMENCLATURE

In which three names are included Genus, Species Sub Species

Eg. Corvus Splendens Splendens (Indian Crow)

Genus Species Subspecies

Corvus Splendens Insolen (Burmese Crow)

Genus Species Subspecies

TAUTONYM

In Which genus & species are induced with same name.

Eg. Naja naja (cobra) loa loa (Eye serpent worm)

Genus species Genus species

LEVELS OF CLASSIFICATION

In the classification 7 texts are used.

Eg. Kingdom biggest unit
Sub kingdom prominent unit
Class closely related orders are grouped in to a class order. Closely related families are grouped into order

Family closely related genes are gouped into a family genus. Closely related species are gouped in to genus.

Species basic unit of classification

CLASSIFICATION OF MAN

Kingdom, Animalia

Sub Kingdom Eumetazoa

Grade Bilateria

Division Deuterostomia

Sub Divison Enterocoelomata

Phylum Chordata

Sub Phylum Vertebrata

Super Class Tetra Poda

Class Mammalia

Sub Class Eutheria

Order Primates

Sub order Anthropoidia

Family Homonidae

Genus Homo

Species Sapian

1. DIVERSITY OF LIVING WORLD

1. **Statement:** Sub species has a geographical area and geographically isolated from other sub species.
   Reason: When members of a species are geographically isolated they give rise to a sub species.
   1) Both are correct and reason is the correct explanation to statement.
   2) Reason is the correct explanation to the statement but statement is false.
   3) Both are incorrect.
   4) Reason is incorrect & statement true.

2. Which one of the following taxonomic categories tops the hierarchical categories.
   1) Genus 2) Order
   3) Species 4) Class

3. The term "new systematics" was introduced by
   1) Julian Huxley 2) Linnaeus
   3) A.P. de. Candole 4) Benthom

4. Read the following:
   1. Dinophyceae members produce Red tide.
   2. Contractile Vacuole is present in Entameba.
   3. Protists which are diploid, reproduce asexually by the process of Gametic meiosis.
   1) 1 & 2 are true 3 is false.
   2) All are correct.
   3) 1 & 3 are true & 2 is incorrect
   4) 3 is correct 1 & 2 are incorrect.

5. Match the following.
   A. Dictyostelium
   B. Mycoplasma
   C. Arcella
   D. Dictydium
   I. Biflagellete swarm cells are present.
   II. Transposons
   III. PPLO
   IV. Pseudo Plasmodium formed
   V. Naked amoeba (Protozoan)

	A	B	C	D
(1)	III	V	II	I
(2)	IV	III	V	II
(3)	V	III	IV	II
(4)	IV	III	V	I

6. The Uninucleate structures in the life cycle of cellular slime moulds are
   1) Sclerotium
   2) Myxamebae
   3) Plasmodia
   4)Granular nucleus

7. Dinoflagellates have these pigments.
   1. Chlorophyll-a, Chloro-c, α carotene more Xanthophyll
   2. Chlorophyll-a, Chloro-b, β carotene + less Xanthophyll
   (1) Both are correct
   (2) Both are false
   (3) '1' is correct, 2 is incorrect
   (4) 2 is true & '1' is false

8. Branch of biology connected with the improvement of human race through laws of heredity is
   1) Eugenics 2) Euthenics
   3) Euphenics 4) Ethnology

9. First step in taxonomy is
   1) Naming
   2) Identification
   3) Description
   4) Classification

10. Two kingdom classification was proposed by
   1) Linnaeus 2) John Ray
   3) copeland 4) Whittaker

11. Three kingdom classification was proposed by
   1) Linnaeus 2) John Ray
   3) Hackel 4) Copeland

12. Binomial Nomenclature was introduced by
   (1) A. P. De Candole
   (2) Schleiden
   (3) Linnaeas
   (4) None of the above

13. The study of cause of disease
   (1) Pathology
   (2) Etiology
   (3) Ethology
   (4) Zymology

14. Study of snakes is
   (1) Ichthyology
   (2) Serpentology
   (3) Herpetology
   (4) Entomology

15. Ornithology is concerned with the study of
   (1) Fishes
   (2) Birds
   (3) Mammals
   (4) Reptiles

16. The theory of mutation was propounded by
   (1) Darwin
   (2) Lamarck
   (3) De Vries
   (4) Mendel

17. Study of animals that live and subsist on other animals
   (1) Pathology
   (2) Ecology
   (3) Parasitology
   (4) Taxonomy

18. The cell theory was propounded by
   (1) Schleiden and Schwann
   (2) De Muller
   (3) Beadle and Tautum
   (4) K. V. Fritsch

19. The study of improvement of human race genetically is
   (1) Eugenics
   (2) Euthenics
   (3) Euphenics
   (4) Ethnology

20. 'Philosophic Zoologique' was written by
   (1) Darwin
   (2) Lamarck
   (3) Mendel
   (4) Weisman

21. The term 'Biology' was introduced by
(1) Aristotle
(2) Lamarck
(3) Darwin
(4) Linnaeus

22. Electron microscope was invented by
(1) Knoll and Ruska
(2) Former and Moore
(3) Jansen and Jansen
(4) Graham and Shortt

23. Blood circulation was first discovered by
(1) W. Harvey
(2) Landsteiner
(3) Andrios Vaslius
(4) Correns

24. In protoplasm, percentage of water is
(1) 95-100%
(2) 1-25%
(3) 25-50%
(4) 50-95%

25. Match the following and choose the correct answer.

A) Monera	I) Eukaryotes
B) Metaphyta	II) Sponges
C) Metazoa	III) Viruses
D) Protista	IV) without nucleus
	V) Hornwort

	A	B	C	D
(1)	IV	V	I	II
(2)	IV	V	II	I
(3)	IV	III	II	I
(4)	IV	V	II	III

26. Schizocoelomata includes
(1) Annelida, Arthropoda, Mollusca
(2) Annelida, Nematoda, Echinodermata
(3) Annelida, Chordata, Mollusca
(4) Annelida,Arthropoda,Echinoder mata

27. Enterocoelomata includes
(1) Platyhelminthes, Nematode, Annelida
(2) Annelida, Arthropoda, Mollusca
(3) Echinodermata, Hemichordata, Chordata
(4) Mollusca, Echinodermata, Chordata

28. Which is not correct statement in the following?
(1) All schizocoelomates are protostomians
(2) All prostomians are schizocoelomates
(3) All enterocoelomates are deuterostomians
(4) All deuterostomians are enterocoelomates

29. Application of computer technology to the management of biological information
(1) Biometry
(2) Bioenergetics
(3) Bioinformatics
(4) Biotechnology

30. Unicellular Eukaryotes are included in kingdom
(1) Monera
(2) Protista
(3) Fungi
(4) Parazoa

31. Unicellular organisms without distinct nucleus are included in
    (1) Monera
    (2) Fungi
    (3) Plantae
    (4) Protista

KEY

1. 1	2. 4	3. 1	4. 3	5. 4
6. 2	7. 3	8. 1	9. 2	10. 1
11. 3	12. 3	13. 2	14. 2	15. 2
16. 3	17. 3	18. 1	19. 1	20. 2
21. 2	22. 1	23. 1	24. 4	25. 2
26. 1	27. 3	28. 2	29. 3	30. 2
31. 1				

2. STRUCTURAL ORGANISATION OF ANIMALS

Zoology - study of animals

Triploblastic - body is madeup of three germ layers primarily, i.e. ectoderm, mesoderm, endoderm

Coelom – body cavity, animals can be divided in three types on the base of coelom

Acoelomata – Platyhelminthes are known as acoelomates body cavityis filled with mesenchymal tissues

Pseudo coelomates – aschelminthes are known as pseudo coelomates, body cavity is filled with mesenchymal tissues falsely.

Eucoelomata – these animals are called true coelomates because body cavity splits completely is divided into two types Schizocoelomates, Enterocoelomates

Schizocoelomtes – in these animals body cavity is divided in pouches Eg. Annelida, anthropoda, Mollusca.

Enterocoelomates – body cavity split from enteron Eg. Echinodermata, to chordate

Symmetry – Shaping of animals

Asymmetry – animals do not exhibit symmetry, Eg. Amoeba

Bilateral Symmetry – If animal is cut from two lateral sites anterior to posterior should be divided in to two equal halves (should exhibit mirror images of each other) Eg. Annelids, Arthropods & All Vertebrates

Radial Symmetry – If animal cuts from its radius should be divided in to two equal halves Eg. Sycon, coelentrata (radiata)

Spherical Symmetry – Some animals are round in structure, if cut from its central plane should be divided into equal halves Eg. volvox

All the animals can be divided in Unicellular & Multi cellular

Unicellular the organisms are made up of one cell, Eg. All Protozoans etc.

Multicellular animals which are made up of more than one cell, porifera to mammalia .

The phylum coelentrata ia also called radiata, because these animals exhibit radial symmetry.

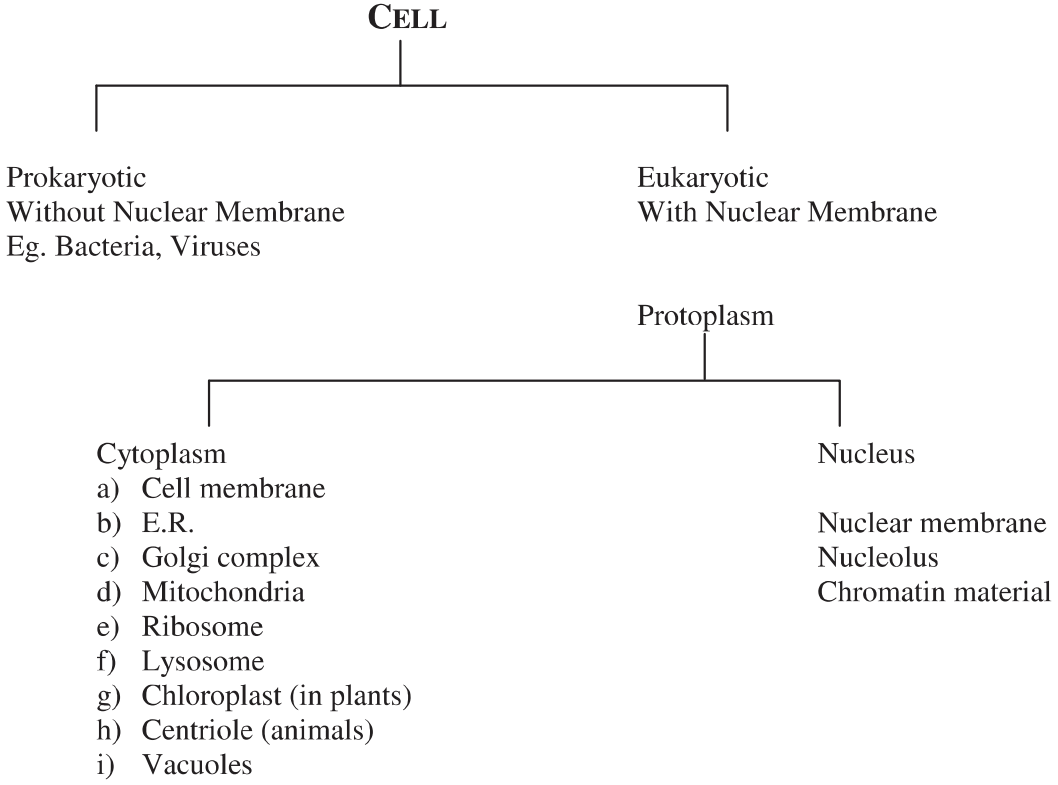
Fate of Blastopore if the blastopore modify to form mouth first are called protostomia, animals belongs to platy helminthes to mollusca are called prostostomia.

Deuterostomia the animas in which blastopore modify to form anus first & later mouth are refered as deuterostomia, echinodermata to mammalia.

Cell cell is the basic, structural & functional unit of the organism, Sheldon & Schwan proposed Cell theory, according to this all the organisms made up of cell or group of a cell, cells collectively from tissues, tissues collectively form organs, organs unite to form organ cells are two types Prokaryotic, Eukaryotic.

- The name cell was given by Robert Hoek.
- The term protoplasm is coined by Purkenji.
- Who discovered mitochonria first – Altman – Later – Benda (Bioplast)
- Golgi complex is discovered by Golgi in the acrosome of sperm.
- Centrosomes are discovered by Van Benden.
- Smallest cell is Mycoplasma a largest cell is ostrich egg.
- Lonngest cell – Nerve cell.
- Protoplast was name by Hanstain.
- Tri laminar nature of plasma membrane was discovered by 'Davson & Danialli'.
- Autonomous cell organells in cell are ' Mitochondria & Chloroplast'.
- Ultra Skeleton of cell is – Endoplasmic reticulum.
- Desmosomes are useful in adhesion of cells.
- Cell eating is called phago cytosis, drinking is called Pinaco cytosis.
- Endoplasmic reticulum is absent in Prokeryotic cell, RBC. Eg. Embyonic cell.
- Myeloid bodies of pigmented retinal cells are modified forms of E.R.
- Aeorosome of sperm is modified form of Golgi complex.
- Intra cellular impulses are conducted by E.R.

- Ribosomes are the centres of protein synthesis.
- Centrosome is found in cytoplasm.
- Golgi complex is absent in Mycoplasma.
- Lysosomes are compared as Atom bombs of the cell.
- Reducing of tail in tadpole larva is concerned to lysosomes.
- Site of Respiration is Mitochondria.
- Kreb's cycle takes place in matrix of mitochondria
- In Cristae of mitochondria electron transport system happens.
- Irregular nucleus is present in Spermatozoa.
- Study of Nucleus is called Karyology.
- Nucleus discovered by Robert Brown.
- Nucleolus is discovered by Fantana.
- In Eukaryotes chromatin material is present in side the nucleus.
- The difference between Prokaryote & Eukaryote is Nuclear envelop.
- The chromosomes which involve in sex are called Allosomes.
- Cell division happens in somatic cells is mitosis.
- Mitosis is discovered by Fleming.
- The cell division which takes place in Germ cells is called Meiosis.
- Crossing over takes place in Pachytens.
- Chiasmata formation is seen in Diplotene.
- DNA replication takes place in 'S' shape.
- DNA (Deoxyribose Nucleic Acid) is called genetic material its having nitrogen base are Adenine, Guanine) Purine, (Cytosine &thymine) pyrimidine.
- RNA is having deviated Pyrimidine is Uracil.
- Cytochrome is found in cytoplasm.
- A largest organelle in plant cell is Chloroplast.
- Quanta somes are present in the Thylakoids of chloroplasts.



Cell Wall: is differentiated in between plants & animals plants cells are bounded with cell wall made up of heard substance cellulose. Cell wall is protective in function.

Cytoplasm: The protoplasm that does not have the nucleus is known as cytoplasm. All the cell organelles are present in cytoplasm.

- Nucleic acids were first noticed by Misches.
- The model of RNA was proposed by Wilkins.
- Adenine & Thymine (A = T) are having two Hydrogen bond. While the No. of Hydrogen bonds are present between genes & cytocine are $(a \equiv c)$ three.
- mRNA carries information in the form of Triplet code.
- The Indian born American scientist who synthesized the triplet code artificially gene & triplet code is H.G. Kohrana.

- Exchange of genetic material is takes place in Diplotene.
- J. Huxley called protoplasm is the " Physical basis of life".
- Protoplasm contains 80% water, 20% in organic & organic substances. Organic substances , Carbohydrates, Proteins & Lipids are present, inorganic substances like electrolytes & essential elements. Ca, Mg, K, Fe, etc are present.
- Protoplasm discovered by Purkenji.
- Energy rich compound ATP stored in Mitochondria it supplies energy to body muscle in the shape of phosphate P & in suitable condition an oxidation of glucose molecule it gets another phosphate to form ATP. This process is called Phospherylation.
- Oxysomes are present in Mitochondria.
- Cell membrane is semi permeable made up of lipo proteins.
- Micro bodies (Peroxi somes) usually contain " Oxydative enymes".
- Double Helix model of DNA is given by Watson & Crick.

Cell Membrane: The covering membrane of protoplasm is called as plasma membrane, made up of lipo proteins.

- It is selectively permeable.
- Robertson described this structure as unit membrane.
- In the three layered structure outer & inner layers are made with proteins in the middle layer phospholipids arranged in the two rows.

Endoplasmic Reticulum: It is a complex network of tubular system and its connects nucleus to plasma membrane K.R. Porter discovers

- It is made up of proteins. Hence called as " Cellular functional units". These are two types Rough Endoplasmic reticulum, (Ribosomes attached on E.R.) & Smooth E.R.(Without Ribosomes)
- Rough E.R. performs protein. Synthesis smooth E.R. takes parts in the formation of steroids.

Golgi Complex: Golgi complex is a cluster of flattened fliud filled cisternae.

- It packages the proteins and sugars in the cell and send them to the outer part of cell.
- It is found in the Aerosome of sperm. The main function is secretion & it also helps in storage.

Mitochondria: is rod like structure with double layered membrane inner layer has folding called crista, and the centre part is called matrix, Mitochondria is called " Semi autonomous body of the cell" performs oxidizing of food substances and liberates energy. is stored in the shape of ATP & supplies to body parts. Hence Mitochondria is also called power house of the cell, discovered by Altman, named Broplast by Benda.

Ribosomes: are called protein blocks plays an important role in protein synthesis.

- Ribosomes are the Ribo nucleo protein particles of cytoplasm.
- They are different types. 70's, 80's 30's etc.
- '70's type of Ribosomes are present in Prokaryotic cells.
- They are free in cytoplasm (or) may attach to E.R.

Lysosomes: are called Atom bombs of the cell or also called sucidial bags.

- Lysosome is a rounded or spherical body surrounded by a single membrane.
- Hydrolytic enzymes are present.
- Autophagy in nature, the waste cells will be autodigested by lysomes. So they are called as suicidal bags.
- The secondary lysosome is formed by the fusion of primary lysosome with a phagosomes.
- The Auto phagosomes are formed by the fusion of primary lysosomes with cytoplasmic organelles.

Chloroplasts: Present only in plant cells with chlorophyll.

Absorb sunlight and prepares food by the process of Photosynthesis.

- Chloroplasts are double layered discoid cells.

- The Chloroplast is filled with protein acqous matrix called stroma. And the stalked thyla coids are called grana.
- Chloroplast contain proteins, phospholipids, RNA, DNA, chlorophyll, carotenoids.

Centriole: Centrioles present in animal cell only takes part in cell division & placed very nearer to the nucleus.

Vacuoles: are present in plant cells occupies larger space. The layer around the vacuole is called as Tonoplast consists of food substances, excretory substances. Salts & Pigments.

Nucleus: Nucleus is present Eukaryotes is discovered by Robert Brown. RBC of mammals is lack of nucleus (Except camel)

- Nucleus regulates the heredity and all the cellular activities. The multinucleate cell is called as Coenocytic cell Eg. Rhizopus.
- The protoplasm of nucleus is called Nucleioplasm
- Main parts of Nucleus are a) Nuclear membrane b) Nucleolus c) Chromatin Material

a) **Nuclear membrane:** The nucleus is surrounded by a nuclear membrane and it is interrupted at certain places by nuclear pores. This membrane regulates the transfer of materials from nucleus to cell organelles.

b) **Nucleolus:** is discovered b Fantana.
    - Nucleus contains prominent round body called as Nucleolus.
    - It contains of RNA & Proteins.

Chromatin Material: The dispersed inter woven network in Nucleoplasm is chromatin material. During the cell division the chromatin condenses into chromosomes. Chrosomoses contain DNA.

The main function of DNA is to determine Heredity & inhereting characters form generation to generation.

Nucleic Acid: F. Meischer first identified Nucleic acid. Griffith made an experiment on rats and he gave the importance of genetic material to the world. Two types of Nucleic acid.

DNA (Deoxy Ribose Nucleic Acid) RNA (Ribose Nucleic Acid)

DNA (Dexy Ribiose Nucleic Acid) is known as genetic material .Double helical structure of DNA proposed by Watson & Crick.

Artificial DNA is synthesized by Indian born scientist Hargobind Kohran (H.G. Kohrana)

The molecular units in the DNA are Nucleotides in that

a) Sugar b) Phosphates c) Nitrogen bases are present.

- DNA is a sugar molecule, it is a carbon molecule.
- Nitrogen bases are purines & pyrimidine.
- Adenine, Guanine, Cytosine, Thymine.
- DNA transcribes the genetic material in the shape of triplet codon through mRNA..
- The diameter of DNA molecule is approximately $20A^{o}$, the length of complete helix is $34\ A^{o}$. 10 Nucluotides are present in one complete helix. The distance between two nucleotide is $3.4A^{o}$.

RNA: Generally RNA is not a genetic material But in some like TMV it works as GRNA (Genetic RNA) it functions as genetic material like DNA. Where DNA is not present.

RNA are three types. mRNA (messenger RNA) rRNA (ribosomal RNA) tRNA(transfer RNA)

- Ribose sugar present in RNA molecule in nitrogen bases it contains "Uracil" instead of thymine in pyrimidine. Nirtogen bases of RNA.

  Purine – Adenine, Guanine

  Pyrimidine – Cytosine, Uracil.

mRNA has genetic codes. The preparation of mRNA from DNA is called as transcription. tRNA transfers the Amino acids from cytoplasm to ribosomes.

The function of rRNA is not known. It constitutes the bulk of cellular RNA.

NEURON (NERVE CELL)

Aggregation of cell bodies are called ganglia.

Nerves:	Bundles of Axons (or) Nerve fibres.
Endo neurium:	Each nerve fibre is enveloped by a delicate vascular loose connective tissues sheath called endo neurium.
Peri neurium:	Each of the bundles of nerve fibres called fasiculi. With a nerve is ensheathed by another connectie tissue connective sheath called epineurium.

TYPES OF NUERONS

Unipolar: receptor	If a neuron has only one Axon but no dendrites Eg. photo cells. Rods & cones of the retina.
Bi polar Neuron:	Neuron has only one dendrite and one Axon present is one of the layer of the retina of man.
Multi Polar:	If a neuron has many dendrites one axon is called multi polar. These are two types.
a) Myelinated Neurons:	Whose axon is covered with myelinated sheath.
b) Un Myelinated: Neurons:	Without myelinated sheath around the axon
Nodes of Ranvier:	Narrow constructions '1' mm in length are present between successive sheaths are called Nodes of Ranvier.
	Movement of 'Na' & 'K' ions in end out of the axon needed for the conduction of impulses. Can occur only at their Nodes of Ranvier. Where myclin sheath is absent.
Synaptic Knobs:	Axon terminals with swollen endings synaptic vesicles contain neuro transmitter substance called Acetyl chlorine functions like chemical bridge between two successive neurons.
Synapse	is the junction of two neurons are connected with inter neurons, contains gap of 250 A^{o} called normal synapse.
Pre synaptic membrane	The membrane of the synaptic knobs is called Pre-synaptic

membrane.

Post synaptic membrane — The membrane of the ends of the dendrites is named.

TYPES OF NERVES

Sensory, Motor, Mixed Nerves.

ASTROCYTES: These are star shaped cells sending out cytoplasmic extensions in several directions. These processes adhere to both neurons & capillaries, hold them together & thus maintain their relative positions.

BLOOD BRAIN BARIER: Large no of Astrocytes are inclose contact with the outer surface of extra thick basement membrane of capillaries in brain & spinal cord and thus form a part is called 'Blood Brain Barier' Which protects neurons from toxins & toxic drugs in the brain also in blood streams.

FIBROUS ASTROCYTES: Containing fibrous elements, present in white matter of Brain in Spinal cord (in myelin sheath)

PROTOPLSMIC ASTROCYTES: Present in gray matter of Brain & Spinal cord.

OLIGO DENDROCYTES: Present in myelin sheath & gray matter.

MICROGLIAL CELLS: Present in grey matter regarded as special type of resting Macrophage, because they are normally non motile, becomes motile at the time of infection.

EPENDYMAL CELLS: Ciliated epithelial cell lines the cavities of Brain and Spinal cord.

Prokaryotic cell, the cell is without nuclear membrane is called prokaryotic cells, the animals are made up of these cells called Prokaryotes.

Eukaryotic cell, the cells contains nuclear membrane is called Eukaryotic cells, the animals are made up of these type of cells called eukaryotes. Eg. Amoeba, All from protozoa to mammalia & plants.

Bacteria & Viruses are prokaryotes

Structural Organisation in Animals

Animal Tissues

A tissue is a group of similar cells specialised for the performance of a common function. The term 'tissue' was introduced by Bichat.

The branch of biological science dealing with the study of tissue is called Histology. Term Term histology' was coined by **Mayer**. Marcello Malpighi is known as founder of Histology.

Animal tissues are classified as **epithelial** (i.e., covers body surface, lines body cavities and forms glands). **connective** (i.e., protects and supports the body and its organs and binds organs together), **muscular** (i.e., responsible for movements) and **nervous** (i.e.. transmits nerve impulses (hat coordinate body activities) tissues.

1. Epithelial Tissue

It covers the outer surface of all body organs and also lines the cavities of all hollow organs of body. Cells are compactly arranged and are held together by intercellular junctional complexes. Cells of the lower most layer rest on basement membrane. Depending upoo the number of layers of cells, epithelial tissues are of two types, i.e., simple or constratifled and compound or stratified or multilaminar epithelial.

Types of Epithelial Tissues

Types of Tissue	Location	Function
Simple squamous	Lines major organ (heart, air sacs of of lungs, Bowman's capsule of kidney); lines body cavity	Absorption, exchange of materials, filtration, scretion
Simple cuboidal	Lines tubules and ducts of glands; covers surface of surface of ovary; lines interior of eye	Absorption and secretion
Simple columnar	Lines gastrointestinal tract	Secretion of materials from special goblet cells and absorption
Stratified Squarmous	Lines interior of mouth, tongue, oesophagus, vagina	Protection
Transitional	Lines, urinary bladder	Permits stretching

Some columnar or cuboidal cells get specialised Tot secretion and called glandular epithelium. They may be unicellular (e.g., gob/et *cells of alimentary canal) and multicellular [e.g., soliwiy gfond).*

Based on I he mode of pouring of their secretions, glands may be Exocrine (i.e., secretion releases through ducts or tubes) or Endocrine hormones secreted directly into blood).

In animal tissues, specialised junctions provide both structural and functional links between its individual cells. Three types of junctions found lu epithelium and other tissues are

(i) **Tight junctions**, which help to stop substances from leaking across a tissue.

(ii) **Adhering junctions**, perform cementing to keep neighbouring tolls together.

(ii) **Gap junctions**, ladlitate the cells to communicate with each other by connecting the cytoplasm of adjoining tells, for rapid transfer of ions, small molecules and sometimes big molecules.

2. Connective Tissue

Connective tissue is the most abundant and widely distributed tissue of the body. It is mesodermal in origin. It binds together the various tissues in an organ to support different parts of the body and form packaging around different organs.

Hertwig in 1883 coined the word mesenebyma (or the mesodermal bulk between ectoderm and endoderm Connective tissue constitutes about 30% of the body mass, tt has both cellular end extracellular components. Connective tissue plays a role in body defence, tissue repair, fat storage, transport of materials support, insulation, etc.

Typos of Connective Tissues

Types of Tissue	Types of Connective Tissues	Function
Loose connective tissue	Deep layers of skin, blood vessels. nerves and body organs	Support and elasticity
Dense connective tissue	Teridons and ligaments	Attaches structures to one another and provides great strength
Elastic connective tissue	Lungs, arteries, trachea and vocal cords	Provides elasticity
Reticular connective tissue	Spleen, liver and lymph nodes	Provides internal scaffold for soft organs
Cartilage	Ends of long bones tip of nose. parts of larynx and trachea	Provides flexibility and support
Bone	Bones	Provides and support muscle attachment
Vascular connective tissue (blood)	Within blood vessels	Transport of oxygen and carbon dioxide and immune response blood clotting
Adipose tissue	Deep layers of skin, surrounds heart and kidneys and padding around joints	Support, protection, heat conservation and energy source

T**endons** and ligaments are dense connective tissues. Tendons attach skeletal muscles to bones, whereas ligaments attach one bone to another bone.

Bones have e bard and aon-pliable ground substance rich in calcium salts and collagen fibres, which give bone its strength. The bone colls (osteocytes) are present in the space called lacunae. The bone marrow in some bones is the site of production of blood cells. Cartilage is a specialised connective tissue consists of cells called chondrocytes.

Blood

Blood is red coloured connective tissue, which Is softest in the body. It Is heavier then water and salty in taste. In an adult person, the volume of blood is about 5-6 L It Is slightly alkaline having pH 7.3 to 7.4 pH of blood in arteries is more then In veins. The study of blood is called Haematology. It is composed of two main component. *I.e.,* blood plasma (watery fluid) and blood cells (floating bodies)

(i) Blood Plasma

It Is pole yellow but transparent fluid, which constitutes about so% volume of the blood. It is slightly alkaline, non-living, intercellular substance Water forms about 90 to 92% of the plasma and solids form about 8% of the plasma. Plasma solid part consists of 7% substances (proteins—albumin, globulin and detrinogen) and 1% inorganic substances (bicarbonates and da salts of Na. K and Cal.

(ii) Blood OBs (Blood Corpuscles)

Blood cells are also known as blood corpuscles. These form about 40-45% volume of the blood. These àãe of three types, **RBCs** (Red Blood Corpuscles) *i.e.,* Erythrocytes. **WBCs** (white Blood Corpuscles). *i.e.,* leucocytes and **blood** platelets (thrombocytes).

(iii) Red Blood Corpuscles (RBCs)

These are most abundant cells In the human body. RBCs vertebrates are nucleated except mammals. RBCs of mammals are non-nucleated except camel.

Salamander has the largest RBCs (about 80 pm um in diameter). Musk deer (Tragupus javanicus) the smallest 11.5 pm).

RBCs are mostly biconcave and circular, however RBCs of camel and llamas are oval. The number of RBCs are counted by Instrument called Beanocytometer.

A normal adult man and woman have 5 and 4.5 million RBCs per cubic mm of blood respectively. Life span of RBC in man is about 120 days. Bone marrow is the main site

formation of RBC. *i.e.,* called erythropoiesis. Haemoglobin (Hb) is a purple coloured conjugated protein present in the cytoplasm of RBC. It gives red colour to it and acts as respiratory pigment (or oxygen carrying pigment) 100 mL of blood of a normal man and woman contains about is g and 13 g of haemoglobin respectively. An abnormal rise in RBCs count is called polycythemia and decrease is called erythrocytopenia. Low total count of RBCs lends to anaemia.

Functions of RBCs

(i) Haemoglobin of RBCs readily combines with oxygen to form oxyhaemoglobin in the tissues, oxyhaemoglobin readily gives up its oxygen, which is used for oxidation of food.

(ii) RBCs transport CO_2.CO_2 combines with NH_2 group of Hb to form carbamino haemoglobin. Hb which is an acid-base buffer, maintains the pH of blood.

(b) White Blood Corpuscles (WBCs)

They are nucleated, colourless, complete cells and are also called leucocytes. They are bigger than RBCs (12-20 öø| hut their number Is less. In blood 5,000 to 10,000 per cubic millimetre WBCs are present. Rise in WBCs count Is called leucocytes is, while decrease in WBCs count Is called leukopenia. WBCs are of two main types. *i.e.,* agranulocytes and granulocytes.

(c) Blood Platelets

These are protoplasmic disc found In mammalian blood also called thrombocytes. These are non-nucleated and colourless. They are oval to round, often stellate and much smaller than both RBCs and WBCs. They are fewer than RBCs and more than WBCs in number (about 2-5 lacs/cu mm). Life span of blood platelets is about a week.

Characteristics Different types of White Blood Carpuscles

Character	Neutrophils	Basophils	Acidophils	Monocytes	Lymphocytes
Percentage	62%	0.5 - 2%	2-4%	5.3%	30%
Diameter	10-12 μm	8-10μm	8-10μm	12-15μm	8-12μm
Madeus	Multilobed	S-shaped	Bilobed	Kidney shaped	Rounded
Cytoplasm	Neutrophilic	Basophilic	Eosinophilic	Basophilic	Basophilic
Gratules	Fine grannular	Coarse granular	Coarse grnular	Absent	Absent
Life spain	10-12 hours	8-10 hours	14 hours	10-20 hours	Months to years
Farmution	Red bone marrow	Red bone marrow	Red bone marrow	Spleen and lymph nodes	Lymph modes and Thymus
Functions	Soldiers acting as phagocytes	Heparin and histamine secretion	Antiallergic and healing of wounds	Scavenger	Antiboidies Formation

Common Functions of Blood

(i) It transports dlrment materials of body like O_2 ,CO_2 hormones. etc., between various parts.

(ii) It maintains tho normal temperature of body.

(iii) It regulates the amount of salts, acids, bases and water ate in the tissue fluids.

(iv) The leucocytes play important role in defence by toxins and invaders. Act as soldiers of tho body.

(v) It helps in rapid healing of wounds and injuries by coagulation.

Comparision between Blood and Lymph

RBCs Present	RBCs absent
WBCs less, neutrophils most numerous	WBCs more, lymphocytes most numerous
Soluble proteins more than insoluble proteins	Insoluble proteins more than soluble proteins
Nutrients and O_2 comparatively more	Nutrients and O_2 comparatively less
Amount of CO_2 and metabolic wastes normal	Amount of these much more

3. Muscular Tissues

Study of muscles is called Myology. Muscular tissues are mesodermal in origin except Iris and ciliary body of eyes, are ectodermal in origin. They contribute most of tbe total weight of body (about 40%-50%).

The muscle cells are always elongated, slender and spindle-shaped, fibre like cells. These arc of three types, i.e.. striated non-striated and cardiac muscles.

Differences between Straited, Smooth and Cardiac Muscles

Character	Striated muscle	Smooth muscle	Cardiac muscle
Location	Limbs,tongue,pharynx, beginning of oesphagus	In wall of visceral organs and in hair muscles	Myocardium of heart
Size and shape	Long, cylindrical with blunt ends	Short, spindle-shaped with pointed ends	Shrt cylindrical with flat ends
Nucleus	Multinucleate nuclei peripheral	Uninucleate, nucleus central	Uninucleate, nucleus central
Myofibrils	Presence of dark and light bands	No bands	Bands present
Blood supply	Highly vascular	Less vascular	Highly vascular
Mitochondria and glycogen granules	Numerous	Less in number	Numerous
Innervation	From CNS	From ANS	Both CNS and ANS
Branching	Unbranched	Unbranched	Branched
Mode of contraction	Contract rapidly for short period as soon get fatigued	Contract slowly for long period as do not get fatigued	Conbtract rapidly, rhythmically and never get fatigued.

Difference between Myosin and Actin filaments of Striated Muscle.

Character	Myosin filament	Actin filament
Occurrence	Found in only A-band	Found in I-band and also project in A-band
Thickness	Thicker(100A)	Thinner(50A)
Number	1,500 myosin filaments per myofibril	3,000 actin filaments per myofibril
Molecular weight	470,000 daltons	46,000 daltons
Cross bridges(heads)	Present	Absent

4. Nervous Tissue

Nerve cells origins Jrom embryonic ectoderm. Nervous system consists of two kinds of

Division/ Structure	Description and Location	Function
Central Nervous System (CNS)	Brain within the cranium and the spinal cord within the vertebral canal.	Responds to nerve impulses (sensations) from sensory nerves and body control center.
Brain	Composed of gray and white matter within the cranium.	Serves as control center for nervous system
Spinal Cord	Composed of gray and white matter within the vertebral canal of the spinal column.	Conveys messages (impulses) to and from brain, reflex center.
Peripheral Nervous System (PNS)	Composed of sensory, motor or mixed nerves.	Conveys impulses so and tram CNS.
Autonomic Nervous System (ANS)	Composed of specific structures of CNS and nerves of PNS; divided into sympathetic and parasyrnpathetic divisions.	Exerts involuntary control of vital body function including heart rate, respiratory rate, blood pressure, digestion, body temperature, and so forth.
Neuron	Cell within nervous tissue.	Responds to stimuli and conveys nerve rqwhn.
Sensory different neuron	Component of a sensory or a mixed nerve within PNS.	Transmits impulses from sensory reeptor to CNS
Motor different neuron	Component of a motor or a mixed nerve within PNS	Transmits tmpuhrs from CNS to effector organs {muscles or glands).
Neuroglium	Cell within nervous tissue	Supports neurons.
Nerve	Bundle or nerve fibres within PNS.	Conveys impulses.
Tract	Bsmdte of nerve fibres within CNS.	Interconnects structures of CNS. conveys Impulses
ganglion	Cluster of cell bodies of neurons within PNS	Serves as control centre for a bundle of neurons.
Nucleus	Cluster of cell bodies of neurons with in white matter of CNS	Serves as control center far a bundle of neurons, matter of CNS.
Nerve plexus	Network of nerves wMim PNS.	Provides overtapping innervation inerve supply to certain body regions.

cells namely neurons and neuroglia. Neurons form the structural and functional unit of the nervous system. Neuroglia is non-excltable supporting component of nervous tissue.

Feature	Prokaryotic	Eukaryotic
Organism	Bacteria	Plants and animals, protists and fungi.
Cell size	Average diameter 0.5 to -10pm.	10-100pm diameter common; commonly 1000-10000 timed volume of prokaryotic cells.
Form	Mainly unicellular.	Mainly multicellular (except Protista, many of which are unicellular).
Evolutionary Origin	3.5 thousand million years ago.	1.2 thousand million years ago, evolved from prokaryotes.
Cell Division	Mostly binary fission, no spindle formation.	Mitosis, meiosis or both; spindle is formed.
Genetic material	DNA is circular and lies free in the cytoplasm (no true nucleus).	DNA is linear and contained in *a* nucleus.
Protein systhesis	DNA is naked (not associated with protetns or RNA to form chromosomes).	DNA is associated with proteins and RNA to form chromosomes,
Organ cells	70 5 ribosomes (smaller)'.	80 5 ribosomes (larger).
	No endoptasmic reticulum present (many other details ofprotein synthasis differ including susceptibiliiy to antibieotics, e.g., prokaryotes inhibited by streptomycin).	Ribosomes may be attached to endoplasmic rocticutum.
	Few organelles.	Maney Organells.
	None are surrounded by an envelope (two membranes).	Envelope-bound organelles present, e.g. nucleus, mitochondria, chloroplasts.
	Internal membranes scarce; if present usually associated with respiration or photosynthesis.	Creat diversity of organcells bounded by single membrane, e.g, Golgi apparatus, lysosomes, vacuoles, microboies, endoplasmic reticulum.
	Rigid and contain polysaccharides with amino acids; murein is main strengthing compound.	Cell walls of green plants and fungi are rigid and contain polysaocharides; cellulose is main strergthhening compound of plant walls, chutun of fungal walls (cell wall is absent in animal cells.
	Simple, lacking microtubule: extracellular (not enclosed by ñîé surface membrane). 12 nm diameter	Complex with 9 - 2 arrangement of microtubules; intracellular (surrounded by cell surface membrane) 200 nm diameter.
	Mesosomes in bacteria, cywptamic membranes snbtuo-gretn bacteria.	Mitochondria for aerobic respiration.
	No chtoroplasts; takes place on membranes which show no stacking.	Chloroplasts containing membranes, which are usually stacked into lamellae or grana.
	Some have the ability.	None have the ability.

These are of following types

(i) Neuroglial cell - In CVS

(ii) Ependymal cells — in internal cavities

(iii) Capsular cells — Surrounding autonomic ganglion

|(iv) Schwann cells — Forming sheath

(v) Supporting cells — Sheathing nerve terminals

The glial cells are protective and supporting in function

Organ and Organ Systems

Tissues organise to form **organs,** which in turn associate to form organ system in the multicellular organisms. Such an organisation i sessential for more efficient and better coordinaties of millions of cells constituting an organism.

Plant and Animal Cells

Plant and animal cells have common beak structure with call membrane, cytoplasm, nucleus and venous cytoplasmic organelles but they differ in many features.

Differences between Bacterial, Animal and Plant Cells

Feature	Bacterial Cell	Animal Cell	Plant Cell
Exterior Structure			
Cell wall	Present	Absent	Present
Cell membrance	Present	Absent	Present
Flagella	May be present (one stand)	May be present	Absent except in sperms of a few species
Interior Structure			
Endoplasmic reticulum	Absent	Usually present	Usually present
Microtubules	Absent	Present	Present
Centrioles	Absent	Present	Absent
Golgi Bodies	Absent	Present	Present
Ribosomes	Present	Present	Present
Organelles			
Nucleus	Absent	Present	Present
Mitochondria	Absent	Present	Present
Chloroplasts	Absent	Absent	Present
Chromosomes	A single circle of naked DNA	Multiple units, DNA associated with protien	Multiple units, DNA associated with protien
Lysosomes	Absent	Usually present	
Vacuole	Absent	Absent or small	

Structure of Cell

The cells of ell living organisms consist of protoplasm, which is bounded bv a cell membrane. Protoplasm la represented by cytoplasm and nucleus. Cytoplasm is a jelly like homogenous ground suletanca called cytosol It encloses living inclusions called cell organelles and non-living inclusions called ergaslic substances.

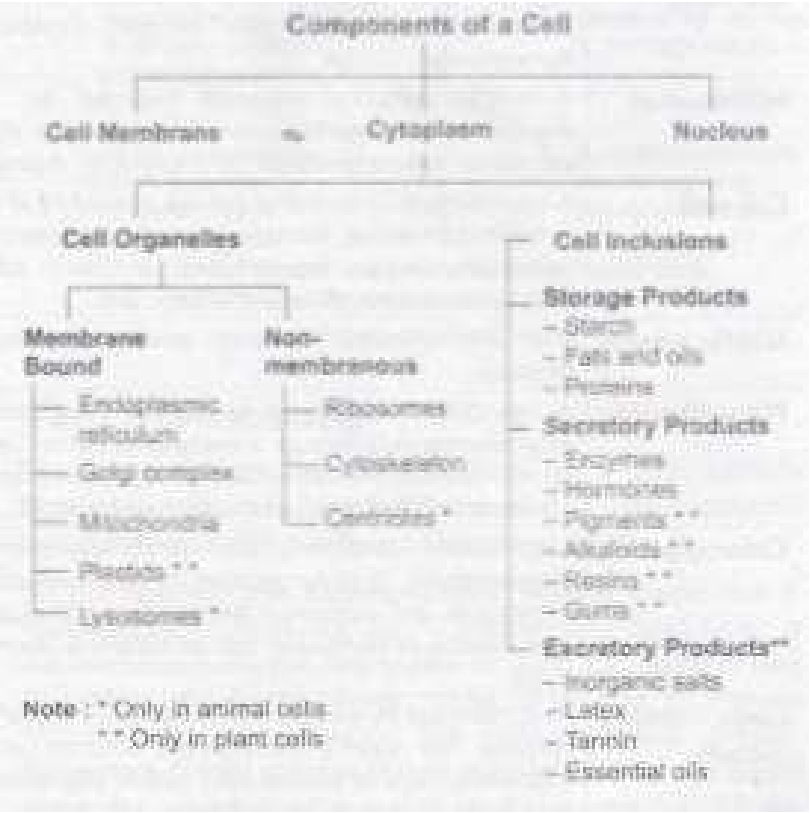
Cell organdies am mainly of two types.

1. Membrane Round Organelles

It include endoplasmic reticulum. Golgi complex, mitochondria, r.hloroplasts and lyeosomes.

2. Non-raembranous Organelles

include ribosomes, centrosomes, microbodies, ubulas and microfilaments.



2. STRUCTURAL ORGANISATION OF ANIMALS

1. Identify the correct:
   A. Mesodermal calcareous plates in the body wall of Echinoderms that forms the endoskeleton
   B. The clearing and defence organs in Echinoderms are Pedicellaria
   (1) A and B are false
   (2) A is correct explanation to B
   (3) Both are correct
   (4) B is correct, A is false.

2. Which system is poorly developed in Echinoderms.
   (1) Respiratory (2) Excretory
   (3) Circulatory (4) Nervous

3. Ambulacral system is mainly useful for
   (1) Locomotion (2) Circulation
   (3) Feeding (4) Defence

4. Match up.
   A. Pila Globosa
   B. Sea anemone
   C. Echinoderms
   D. Pseudocoelome
   (1) Alimentary canal not lined by mesoderm
   (2) Platy helminthes
   (3) Biradial
   (4) Asymmetrical
   (5) Triplobastic + Radial Symmetry

	A	B	C	D
I)	4	5	1	3
II)	4	3	5	1
III)	3	4	1	5
IV)	5	4	1	3

5. Following are the statements:
   Choose the correct answer.
   A. Stomach and intestines lined by columnar ep
   B. Cuboidal epithelium lines the vesicles of thyroid glands.
   C. Epididymis is lined by Pseudostratified epithelium.
   (1) A and B are correct & C is false
   (2) B & C are correct & A is false
   (3) All are true
   (4) All are false

6. Yellow bone marrow is made up of Adipose tissue.
   (1) True (2) False
   (3) Unknown (4) All are false

7. Match up:
   A. Fibrous cartilage
   B. Hyaline cartilage
   C. Elastic cartilage
   D. Calcified cartilage
   (1) Inter auricular ligaments
   (2) Tracheal rings
   (3) Larynx
   (4) Pubic of Pelvic girdle
   (5) Caecum

	A	B	C	D
I)	5	2	3	4
II)	3	1	2	4
III)	1	2	3	4
IV)	4	5	3	2

8. In the compact bone lamella are arranged in concentric rings around the haversian canal and form
   (1) Haversian System (2) Osteon
   (3) Lamellar System (4) 1 + 2

9. This is about Blood mark the correct.
   (1) Smallest WBC in the blood with life span 3 days are lymphocytes.
   (2) Monocytes are the largest with shortest life span.
   (3) Spindle cells are helpful in clotting of blood
   (1) All are correct
   (2) 1 & 3 are correct
   (3) 1 & 2 are correct & 3 is incorrect
   (4) All are incorrect

10. Considering the statements:
   A: Axon is a long process branched at the terminal region.
   B: Axon is formed from axon hillock of cyton.
   (1) A is false B is true
   (2) B is false A is true
   (3) B is correct explanation to A
   (4) A and B are true

11. Following are the statements for Cardiac muscles.
   A) These are branched muscles with syncitial arrangement of nuclei
   B) They contract quickly and do not get fatigue
   C) Also present in the sternum
   (1) A & C are correct with B correct
   (2) B is incorrect , A& C correct
   (3) A & B are true, C is incorrect
   (4) C is incorrect, A & B incorrect.

12. Match up:
   A. Paramecium
   B. Verticella
   C. Helicoidal undulations
   D. Foraminiferans
   1. Gyrational movements
   2. Reticulopodia
   3. Filopodia
   4. Proter
   5. Anisogamantogony

(1)	A	B	C	D
	4	1	5	2
(2)	A	B	C	D
	4	5	1	2
(3)	A	B	C	D
	4	3	1	2
(4)	A	B	C	D
	3	4	5	2

13. Arrange the names in order
   1) Proscolex 2) Hexacanth
   3) Cysticerous 4) Bladder worm
   5) Ooncosphere
   (1) 3-2-1-4-5 (2) 5-1-2-3-4
   (3) 5-2-3-1-4 (4) 2-5-1-3-4

14. Vector control research centre is in
   (1) New Delhi (2) Pondicherry
   (3) Chennai (4) Hyderabad

15. For the control of Trypanosoma.rhodesiense one of the following vector should be killed
   (1) G. palpalis (2) G. mossitans
   (3) P. aregentipes (4) P. sergenti

16. Apolysis helps in
   A. Limiting the length
   B. Transfer of Embryos
   C. Increasing the length
   (1) A is correct, B & C are false
   (2) All are true
   (3) A and B correct, C incorrect
   (4) C is correct

17. Match up:
A. Septalnephridia
B. Integumentary nephridia
C. Buccopharyngeal
D. Dhloragosomes
1. Eleocytes
2. Open & Exoncphric
3. Open & Enteronephric
4. V shaped & Closed
5. Endonephric in 3 pairs

	A	B	C	D
(1)	III	IV	II	I
(2)	III	II	IV	I
(3)	III	IV	V	I
(4)	II	I	V	IV

18. In Pheretina septal walls are absent in between
(1) 9 and 10 seg / First five segments
(2) First four seg / 9 and 10 seg
(3) 10 and 11 seg / 2/3, 3/4, 4/5
(4) 4/5, 5/6, 6/7 and 12 and 13 seg

19. Mature sperms in Pheretina are produced in
(1) Testis (2) Testis Sacs
(3) Seminal vesicles
(4) Spermathecae

20. Chitinous rings in the trachea of cockroach
(1) Taenidea (2) Tracheoles
(3) Intima (4) 1 + 3

21. Match up:

A. Stigmata	1. Pseudolegs
B. Housefly	2. Stink glands
C. Caterpillar	3. Holometaboly
D. Apis	4. Holopneustic
	5. Unsegment maxillary palps

	A	B	C	D
(1)	2	4	5	4
(2)	4	5	1	3
(3)	3	5	1	2
(4)	4	1	5	3

22. Competetion for food, light & space is most severe in
(1) Closely related species growing in the same area
(2) Closely related species growing in different habitats.
(3) Distantly related species growing in the same area
(4) Distantly related species growing in different habitats.

23. Overgrazing by animals results in
(1) Sheet erosion (2) Hill erosion
(3) Positive pollution
(4) Negative Pollution

24. The region of lake with the decreasing temperature with increase of depth is
(1) Hypolimnion (2) Epilimnion
(3) Thermocline (4) None

25. Identify the correct answer:
A. Sulphurdioxide air pollutant is a threat to beauty of Taj Mahal.
B. Nitrogen oxides air pollutant turns book pages yellow
(1) A and B are correct
(2) B is correct & A is false
(3) A is true & B is incorrect
(4) A and B are incorrect

26. In early hours truck driver coming from Bombay on entering the industrial area of Sanathnagar has fond the visibility reduced due to the formation of thick mist. Name the gases responsible for the formation of this smog.
(1) $Co + No_2$ (2) $So_2 + No_2$
(3) PAN (4) CFC

27. Muscles immune to fatigue are
(1) Cardiac (2) Striped
(3) Unstriped (4) Fibrous

28. The nails, horns and hoofs are derivatives of
(1) Cartilage (2) Bone
(3) Connective tissue (4) Epidermis

29. Ciliated epithelium is known to occur in man is
(1) Trachea (2) Loop of henle
(3) Pancreatic duct
(4) Eustachian tube

30. Horns of rhinoceros are composed of
(1) Bone (2) Cartilage
(3) Chitin (4) Keratin

31. Sprain is caused by excessive pulling of
(1) Muscles (2) Ligaments
(3) Tendons (4) Nerves

32. The strongest cartilage is
(1) Hyaline cartilage (2) Elastic cart
(3) Fibrous cart (4) 1 + 3

33. Matrix of a bone is composed of
(1) Chondrin (2) Osteon
(3) Auxin (4) Ostein

34. Blood is
(1) Connective tissue
(2) Muscular tissue
(3) Fluid connective tissue
(4) All the above

35. The coelomic epithelium is composed of
(1) Squamous epithelium
(2) Ciliated
(3) Columnar (4) Glandular

36. Goblet cells are characteristic of
(1) Ciliated epithelium
(2) Columnar epithelium
(3) Nerve tissue
(4) Muscles

37. Ratio of RBC and WBC in Man.
(1) 5 : 1 (2) 50 : 1
(3) 500 : 1 (4) 5000 : 1

38. One of the following ions is important for initiating contractibility in muscles.
(1) Sodium (2) Potassium
(3) Iron (4) Calcium

39. The site of blood cell production is
1) Spleen 2) Liver
3) Bone marrow 4) None

40. The endothelium of blood vessel is composed of
(1) Cuboidal epithelium
(2) Squamous epithelium
(3) Columnar epithelium
(4) Ciliated epithelium

41. The nerve transmitter produced at the synapse is destroyed by
    (1) Acetylcholinc
    (2) Cholinesterase
    (3) Phosphokinase
    (4) 2 & 3

42. Antibody production is assisted by
    (1) Monocytes (2) Leucocytes
    (3) Lymphocytes (4) Erythrocytes

43. The disease, which is characterized by profuse bleeding by slight injury due to the inability of blood coagulation is
    (1) Erythroclasia (2) Haemoclasia
    (3) Haemophilia (4) Haemopenia

44. The muscles connected only by the nerves of autonomous nervous system
    (1) Smooth (2) Striped
    (3) Intercalary muscles (4) Skeletal

45. The sheath enveloping the fasiculus of the voluntary muscle is
    (1) Perineurium (2) Epimycium
    (3) Perimycium (4) Endomycium

46. Read the following:
    A. Thromboplastin produced by Thrombocytes in responsible for clotting of blood.
    B. Conversion of Prothrombin into thrombin takes place by Thromboplastin produced by Thrombocytes, due to which clotting of blood takes place.
    (1) A is incorrect, B is correct
    (2) B is incorrect and A is correct.
    (3) A & B are true, A is correct Explanation to B
    (4) Both are true, B is correct.

47. Name of blood cancer
    (1) Leukaemia (2) Sarcoma
    (3) Carcinoma (4) None

48. The cartilage which is thin, hard and brittle is
    (1) Fibrous (2) Hyaline
    (3) Calcified (4) Elastic

49. Read the following:
    A. Example for smooth muscles is penis.
    B. Smooth muscles are found in muscles of Iris.
    C. Alimentary canal is lined by smooth muscles

    (1) A is false & B, C are correct
    (2) All are false statement
    (3)
    (3) All are true statement
    (4) C is only true, A&B are incorrect

50. Bone formed by the ossification of fibrous tissue of tendons is
    (1) Sesmoid (2) Gasmoid
    (3) Placoid (4) None

51. Whorton's jelly a gelatinous ground substance is present in this type of tissue.
    (1) Pigmented connective tissue
    (2) Mucous connective tissue
    (3) Reticular connective tissue
    (4) 1 & 3

52. Cougulation of blood during normal circulation is prevented by

(1) Heparin (2) Calcium
(3) Histolysin (4) Fibrinogen

53. Bacteria are removed from the blood by
(1) Killing with Kupffer cells
(2) Phagocytosis by all WBC's
(3) Phagocytosis by Neutrophills
(4) Phagocytosis by Eosinophills

54. Mast cells secrete
(1) Heparin (2) Serotonin
(3) Histamines (4) All the above

55. Pseudo stratified epithelium is found in
(1) Genital ducts (2) Gland ducts
(3) Lungs (4) Vagina

56. Which are not true cells in blood.
(1) Platelets (2) Monocytes
(3) Neutrophills (4) Basophills

57. Cells in which Tigroid bodies are associated with
(1) Nerve cell (2) Blood cell
(3) Bone cell (4) None

58. The tissue in which intracellular matrix is reduced.
(1) Muscular (2) Nervous
(3) Epethelial
(4)Connective tissue proper

59. Epithelium that covers the wet surfaces of the body
(1) Squamous (2) Columnar
(3) Ciliated (4) Cuboidal

60. Transitional epithelium is present in
(1) Pharynx (2) Ureters
(3) Epethilum of tongue
(4) Oviducts

61. Match the following:
A. Stratified cuboidal epithelium
B. Simp. Cuboidal
C. St. Columnar ep
D. Pseudostratified
E. St. squamous (NK)
I. Ducts of parotid
II. Thyroid glands
III. Cornea of eyes
IV. Conjuctiva of eyes
V. Trachea & Large Bronchi

	A	B	C	D	E
(1)	V	III	II	I	IV
(2)	IV	II	I	V	III
(3)	II	IV	I	III	V
(4)	V	II	III	IV	I
(5)	I	II	III	IV	V

62. The dense connective tissue that connects the muscle with bone is
(1) Tendon (2) Ligament
(3) Cartilage (4) None

63. The cartilage present in trachea, bronchi, articular regions of long bones is
(1) Fibrous (2) Elastic
(3) Hyaline (4) Calcified

64. The cartilage in which perichondrium is absent
(1) Fibrous (2) Elastic
(3) Hyaline (4) None

65. Pinna & Enstachian tubes contain what type of cartilage
(1) Elastic Catrtilage (2) Fibrous
(3) Hyaline (4) None

66. Fill up the following:
Chondrocyte : Cartilage ; Osteocyte:
(1) Bone (2) Mixed Bone
(3) Chondrium (4) None

67. Haversion system includes haversion canals with surrounding concentric lamellae to form
(1) Osteon (2) Chondrion
(3) Perichodrion (4) None

68. The reticular tissue present in the bone
(1) Bone marrow (2) Ossein
(3) Osteocytes (4) Periosteium

69. The functional unit of muscle is
(1) Sarcosomere (2) Sarcosome
(3) Sarcoplasm (4) Sarcomere

70. The syncytial muscles are
(1) Cardiac (2) Striped
(3) Smooth (4) Unstriped

71. The muscles that contain spindle shaped, Uninucleate muscle fibres.
(1) Rough muscles (2) Cardiac
(3) Skeletal (4) Smooth

72. RBC's of mammals are without Nucleus, because
(1) They lose it during their formation
(2) They are not true cells
(3) They don't need it
(4) They don't have anucleus from the beginning.

73. Glisson's capsule is a delicate connective tissue capsule covering the
(1) Spleen (2) Liver
(3) Kidney (4) Gall Bladder

74. The most abundant granulocytes in human blood is
(1) Neutrophils
(2) Monocytes
(3) Basophils
(4) Eosinophils

75. Haversian system is present in
(1) ligaments
(2) tendon
(3) cartilage
(4) bone

76. Nissl's granules are characteristically found in
(1) mast cells
(2) bone cells
(3) nerve cells
(4) cartilage cells

77. Sliding filament hypothesis of muscle contraction was proposed by
(1) Albert Szent Gyorigii
(2) H. E. Huxley and A. F. Huxley
(3) Cori and Cori
(4) Landsteiner and Weiner

78. Bone destroying cells are called
(1) Osteoblasts
(2) Osteoclasts
(3) Osteocytes
(4) Mast cells

79. Cardiac muscle fibres are
(1) striated and voluntary
(2) striated and involuntary

(3) Lysosome
(4) Endoplasmic reticulum

82. Function of mitochondria is
(1) excretion
(2) respiration
(3) digestion
(4) excretion and respiration

83. Which of the following is transparent tissue?
(1) Fibrous cartilage
(2) Hyaline cartilage
(3) Tendon
(4) None of the above

84. The site of blood cell production is
(1) spleen
(2) liver
(3) bone marrow
(4) none of the above

85. Muscles are connected to the bones by
(1) Ligaments
(2) Tendons
(3) Adipose tissue
(4) Areolar tissue

86. Membrane covering nerve fibre is
(1) Plasmalemma
(2) Sarcolemma
(3) Neurilemma
(4) None of the above

87. Hyaline cartilage occurs in
(1) Trachea
(2) Ear
(3) Eye
(4) Palm

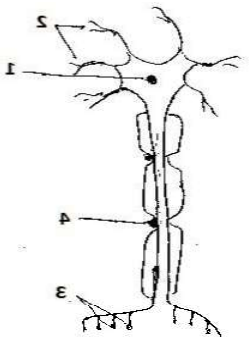
88. Ligament is the tissue which connects
(1) bone to a bone
(2) muscle to a muscle
(3) nerve to a muscle
(4) skin to muscles

89. Dictyosomes are
(1) golgi bodies
(2) respiratory particles
(3) class of ribosomes
(4) place of flagellar

90. If an animal can be cut into two identical halves along only two perpendicular diameters it is said to be
(1) asymmetrical
(2) radially symmetrical
(3) biradially symmetrical
(4) spherically symmetrical

91. Ratio between RBC and WBC in a healthy human is
(1) 50 : 1 (3) 500 : 1
(2) 700 : 1 (4) 70 : 1

92. Find out the correct series



1) Nucleus, Terminal Knobs, Dendrites
2) Nucleus, Dendrites, Node of Ranvier, Terminal Knobs
3) Nucleus, Dendrites, Terminal Knobs & Node of Ranvier
4) Node of Ranvier, Terminal Knobs & Axon

93. Match the following & chose the correct Answer

	Column – I	Column – II
A.	Diptoblastica helminthes	I. Nematy
B.	Triploblastica	II. Bilateria
C.	Entero coelomata	III. Deuterostomia
D.	Pseudo coelomata	IV.Tissue grade Organisation
		V. Protostomia

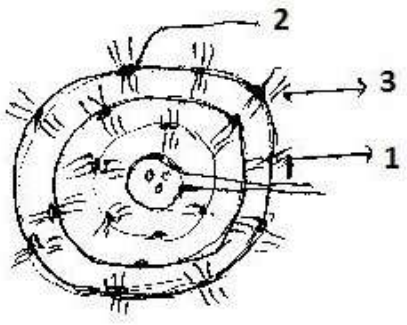
	A	B	C	D
1)	I	II	III	IV
2)	V	IV	III	II
3)	IV	III	II	I
4)	IV	II	III	I

94) One of the following muscular tissue is involuntary in function
1) Striated 2) Smooth
3) Cardiac 4) 2 & 3.

95) One of the following Blood cell produces allergic reaction.
1) Besophil 2) Eosinophil
3) Neutophils 4) Lymphocytes

96) Find out the correct statement
A: Sesa moid Bones like patella are formed by ossification in tendons.
B: Vis ceral Bones are formed by ossification in the soft & tissues.
C: Cartilage Bones of limbs, girdles and vertebrae are formed by the ossification in with in the cartilage.
1) A, B & C are false
2) A & B are true and C is false
3) B & C are true, and A is false
4) A, B & C are true, none is false.

97) Find out the correct & series of Diagram



1) Artery, Lacunae, Canaliculi
2) Canaliculi, Volkmann's Canal, Vein
3) Volkmann's Canal, Bone Lacunae, Bone Lamellae
4) Volkmann's Canal, Lacunae, Canaliculi

98) Match the following & Chose the correct Answer:

A.	Thermal insulation	I. Liver
B.	WAT	II. Bone marrow
C.	BAT	III. Adults
D.	Reticular tissue	IV. Infants
		V. Blubber, hump

	A	B	C	D
1)	I	II	III	IV
2)	V	IV	I	II
3)	V	IV	III	I
4)	V	IV	III	II

KEY

1. 3	2. 4	3. 1	4. 2	5. 3
6. 1	7. 3	8. 4	9. 2	10. 4
11. 3	12. 2	13. 3	14. 2	15. 2
16. 3	17. 3	18. 2	19. 3	20. 1
21. 2	22. 1	23. 1	24. 3	25. 3
26. 2	27. 1	28. 4	29. 1	30. 4
31. 2	32. 3	33. 4	34. 3	35. 1
36. 1	37. 3	38. 4	39. 3	40. 2
41. 2	42. 3	43. 1	44. 1	45. 3
46. 4	47. 1	48. 3	49. 3	50. 1
51. 1	52. 1	53. 3	54. 4	55. 1
56. 1	57. 1	58. 3	59. 3	60. 2
61. 2	62. 1	63. 3	64. 1	65. 1
66. 1	67. 1	68. 1	69. 4	70. 2
71. 4	72. 1	73. 2	74. 1	75. 4
76. 3	77. 2	78. 2	79. 2	80. 2
81. 1	82. 2	83. 2	84. 3	85. 2
86. 3	87. 1	88. 1	89. 1	90. 3
91. 3	92. 3	93. 4	94. 4	95. 2
96. 4	97. 4	98. 4		

3. ANIMAL DIVERSITY - I

INVERTEBRATE PHYLA

PROTOZOA

Purkenji found firstly protoplasm(living substance) in protozoa. Hence named protozoa.

Protozoans were described as animalcules by antony von leuven hoek.

The term protozoa coined by gold fuss, unicellular nature of protozoans is described by Vonsiebold.

Protozoans discovered as Acellular by L.H. Hyman.

Animals without death Protozoans.

Type of Nutrition in Protozoans, Holozoic, Saprozoic, Holophytic.

Type of digestion in protozoans intra cellular.

Respiratioin takes palce through general body surface.

Protozoans without contractile vacuole are endoparasite & marine forms.

Function of contractile vacuole, excretion & osmo-regulation.

Locomotory organs are flagella, cilia, pseudopodia & myonemes.

Reproduction by two methods, asexual & sexual.

Asexual method. Binary fission, multiple fission, Plasmotomy, Sporulisation.

Sexual reproduction, By syngamy, conjugation.

The flagellate considered to be connective link between plants & animals is euglena.

Metagenesis & dimorphism is seen in elphidium, megalospheric, microspheric forms.

Marine free living protozoan is elphidium.

PORIFERA

The term porifera was coined by R.E. Grant.

Dermally bearing pores animals are named porifera.

Commonly called sponges, the study of sponges is called parazooogy.

Diploblastic animals made up of two germ layers, ectoderm & endoderm

Between this two a gelatinous substance is present called mesoglea

Poriferans are metazoans with cellular grade of organization.

Multicellular animals without tissues are sponges.

Symmetry is asymmetrical & radial, various types of cells are present.

Chaenocytes (Collar cells, flagellated cells, Nutritive cells) performs digestion carries sperms Thesocyte - Food storage cells, amoebocyte. Locomotive cells, Archeocyte (totipotent cells) reproductive cells, Scleroblast cells, producing spicules cells.

Spicules are endoskeletal body of sponges are various types, Monoxan, Trioxon, Polyaxon, etc.

Specialized system is present in poriferans is water canal system.

Performs vital activities, digestion, circulation, respiration, excretion, reproduction.

Ingressing of water – dermal ostia – incurrent canal – prosopyle – excurrent canal – Apopyle – radial canal – spongocoel – osculum – egress out.

The sponges without spicules are demospongia.

Zoological name	**Common name**
Euplectella	Venous Flower basket
Sycon(scypha)	Crown Sponge
Cliona	Boring Sponge
Hyalonema	Glassrope Sponge
Spongilla	Fresh water Sponge
Euspongia	Bath Sponge
Phyllospongia	Leaf Sponge

CNIDERIA

The term coelentrata is coined by leucart.

First group of tissue grade animals – cnidaria

Radial symmetrical, dipoblastic, made up two germ layers, ectoderm & endoderm.

Between these two mesoglea is present in large quantity.

Cniderians are commonly called stinging animal cules.

Primary characters of cnideria – presence of cnidoblast.

Groups of cnidoblast is called cnidome

The poisonous fluid present in nemtocyst is called – hypnotoxin.

Polymorphism is the habitat of hydrozon & Scyphozoa, order siphonophora.

Two types of Zooids are Polyps medusa are present.

Digestion is intracellular, intercellular also called contact digestion.

Free swimming larva of this phylum is Planula

Corals are exhibited by class anthozoa three types of coral reefs are present.

a) Barrier reef b) Fringing reef c) Atoll

THEORIES

a) Darwin dana subsidence theory b) Semper murrey solution theory

c) Hypoglacial theory

Zoological Name	**Common Name**
Hydra	Fresh Waterpolyp
Obelia	Sea fur
Physalia	Portugese man of war
Aurelia	Little sail
Meandrina	Brain coral
Fungia	Mushroom coral
Metridium	Sea anemone
Tubipora	Organ pipe coral
Pennatula	Sea pen
Gorgonia	Sea fan

PLATY HELMINTHES

Commonly called flat worms.

Platyhelminthes are coined by gegenberg.

Triploblastic,bilateral symmetry, firstly found in Platyhelminthes.

Acoelomates are Platyhelminthes.

Body organization is organ grade system

Firstly found alimentary canal in animalia is turbellaria (Platyhelminthes)

Ancestors of flat worms in planula.

The nervous system with brain develop for the first time in flat worms.

Mode of reproduction is asexual & sexual.

Planarians in which segmentation is absent.

Trematodes& Cestodes leads endoparastic life in Vertebrates.

Turbellarians exhibit poly embryony means exhibiting of more larval stages from single zygote.

Development in fasciola

Miracidium larva – sporocyst – radia – cercaria – metacercaria – adult

Fasciola hepatica primary host –sheep

Secondary host – snail

Zoological Names	**Common Names**
Taena solium	Pork tape worm
Taena saginata	Beef tape worm
Dibothriocephalus	Fish tape worm (largest tape worm)
Hymenolepes nana	Dwarf tape worm

ASCHELMINTHES (NEMATY HELMINTHES)

Aschelmenthes – means – hollow worms or round worms or thread worms

Nematy helminthes was proposed by Grover.

Triploblastic, Bilateral symmetrical, Pseudo Coelomates

Syncytial epiderm is present in Nematyhelminthes.

Worms without muscular layer are Nematy helminthes.

Excretory system of consists of "H" shaped intra cellular canals.

Eutely presence of limited & constant no of cells in different tissues in the body is present.

Fertilization is internal, cleavage is hobloblastic, spiral.

Development is indirect, with larval stages.

Classification of nematodes on the basis presence & absence of phasmids.

Most of Vertebrates parasite.

Ascaris lumbricoids	round worm	larva rhabiditiform larva	host – man
Wucheraria bancrofti	filarial worm	micro filarial	host – man & culex female
Ancylostma dudenale	hook worm		host – man
Trichuris trichuris			host – man
Loa loa		eye serpent worm	host - man & Cyclops
Dracunculus medinecis		guina worm or madina worm or serpent worm	host -man

ANNELIDA

Segmented bodied animals are called annelids, annelida is coined by lamarck.

Segments are two types, homonomous, heteronomous.

Homonomous segmentation – in which true metamerism is present, segment are equal in size, shape & in numbers.

Heteronomous segmentation, metamerism is not true, segments are not equal in size, shape & in numbers.

True metamerism is evolved first in annelids.

Annelids are triploblastic true coelomates(schizo coelomate) bilateral symmetrical & Protostomes.

Body wall is covered by cuticle locomotion is perform by setae (or) chaetae parapodia.

Caelomic fluid acts as hydraulic skeleton.

Alimentary canal with digestive glands firstly evolved in annelids.

Closed type of circulation first evolved in annelids blood appears red color first in annelids due to the presence of haemo globin dissolved in blood plasma.

In Earthworm excretory organs are nephridia these are three types pharyngeal septal, integumental nephridia.

Nervous system is well developed, central, peripheral, visceral nervous system is present.

Having well developed sense organs.

Photoreceptros (eyes) tangoreceptors, & Statocyst.

Trocophore is the larva of unisexual annelids, in earthworm development is direct.

Annelida is classified into four classes on the base of chaetae or seate, parapodia (locomotory organs)

Polychaeta – having numerous setae Eg. Neries & Aphrodite

Hetero neries – sexual phase of neries has two phases atoke & epitoke

Oligochaeta – only few seate are present Eg. Pheretima, Tubifex

Hirudinea – includes all types of leeches, (marine & acquatic)

Leeches are sanguivores, ectoparasites of vertebrates, Eg. Pontobdellida, Hirudinaria (cattle leech), Haemadipsa etc.

Archae Annelida primitive annelids Eg. Polygordius, Protodrilus.

100 to 120 segments are present in earthworm.

Friends of farmers are earthworms, development is direct, cocoon formation is the habitat of earthworm & leech during development.

Mucus glands are present over the cuticle hence earthworms are slimmy in nature, respiration is crutaneous by skin.

Food is depend on organic debris, the place of earthworm can be identified with the presence of worm castings.

Earthworms are nocturnal & burrowing in habitat.

Porous soil & fertility of soil increased by earthworms castings.

Earthworms are ureotelic, excrete urea, in rainy season earthworms come out to escape from endosmosis

Chlorogogan cells – having yellow granules also called yellow cells (or) xanthic cells

These are excretory in function, release excreta in alimentary canal, from where through septal nephridia excreted out.

Blood glands are present in4,5,6 segments over the Pharyngeal nephridia are known to produced Hb & blood cells.

Phaesosomes – L. shaped lense like structure present in the photoreceptor cells in pheretima.

Pheretima is hermaphrodite, self fertilization is prevented , due to protoandry.

Protoandry –male gonads (sperms) mature earlier than ova (female gonads)

Zoology Name	**Common Name**
Neries (neanthus)	clam worm, sand worm
Hirudinaria granulose	cattle leech
Hirudinaria medinencis	medicinal leech
Aphrodite	sea anemone
Chaetopterus	paddle worm
Pheretima	north Indian earthworm
Megascolex	south Indian earthworm

ARTHROPODA

- Jointed appendages animals are included in Anthropoda.
- Term Anthropoda was coined by Vansie bold
- Arthropods are Tripoblastic, Bilateral symmetrical & Schizocoelmates
- Metamerically segmented animals.
- Body cavity is Haemocoel.
- Head is distinct same head segments are modified in to mouth parts.
- In insects mouth parts are good example of adoptive radiation.
- Piercing & Sucking type of mouth part – Mosquito
- Sponging & Sucking type of mouth part – House fly

- Bitting & Chewing type of mouth part – Cockroach
- Siphoning type of mouth part – Butterfly
- Digestive system is complete with Digestive gland & Alimentary canal.
- Circulatory system is open type.
- Blood pigments are Haemo cyanin, Chloro crunin.
- Excretory organs are Malphigian tubules, Green glands & Coxal glands.
- Respiration through gills (prawn) Trachea (insects) Book gills (spiders) Book lungs (Scorpion)
- Nervous system consists brain, ganglia & double ventral nerve cord.
- Sense organs are compund eyes, statocysts & antennae.
- All are unisexual.
- Development direct & indirect.
- Larvae – Nauplis, Zoea, Mysis etc.
- Mosquito – Wriggler (larva)
- Musca domestica – Maggot
- Bombyxmori – Caterpillar

Zoological Name	**Common Name**
Palaemon	Fresh water prawn
Palamneous	Scorpion
Peripalanata	Cockroach
Apis indica	Indian Honey bee
Apis dorsata	Rock Honey bee
Bombyx mori	Silk worm
Musca domestica	House fly
Drosophila	Fruit fly
Lepisma	Silver fish
Pediculus	Head house

MOLLUSCA

- Study of Mollusca – Malacology
- Studyt of Molluscal shell – Conchology
- Soft bodied animas are named Mollusca.
- Molluses are unsegmented , Bilateral Symmetrical.
- Symmetry looses in torsian in gastropods.
- Shell is exoskeleton of mollusca. Some molluscs of Cephalopoda have internal shell & lack of shell.
- In cuttle fish internal shell is called cuttle bone.
- The soft skin covering to molluses is called mantle.
- Shell of mollusca is secreted from mantle.
- Rasping organ 'Radu' teeth are present in Mollusca in Buccal Cavity Except Bivalvia.
- Pearl can be culture in Bivalvia.
- First artificially pearl is invented by scientist hailing from japan is 'Kokichimikimoto'
- Culturing of pearl is called pearl culture.
- The largest invertebrate belongs to mollusca class Cephalopoda is Architeuthis (giant squid)
- Sense organs are ommatophore & Ospharadium etc.
- Nervous sytem consists of ganglia, Commissures & Connectives.

Zoological Names	**Common Names**
Unio	Fresh water mussel
Mytilus	Sea water mussel
Pila globusa	Apple snail
Limnea	Fresh water snail
Teredo	Ship worm
Pinctada	Pearl oyster
Loligo	Squid
Octopus	Devil fish

ECHINO DERMATA

- The term echino dermata was coined by Jacob. Klein.
- Phylum which includes exclusively marine animals is Echino dermata.
- Spiny skinned animals are named echino dermata.
- Exo skeleton of Echino dermata is made up of Calcareous plates or Dermal ossicle.
- Water vascular system is the chief system & deviates system from other phyla is present in echino dermata.
- Water enters in to Madre perite – Stone canal
- Lateral Canal – Longitudinal canal – Ambulacral Canal
- Ampulla & Tube feet
- Water vascular system performs locomotion in echinoderms.
- Echino derms are sluggish in movement.
- Lateral canals are also called podial canals.
- Water vascular system is also named Ambuliacral system.
- Tube feet perform locomotion & respiration.
- Pollion vesicles perform storage of sea water.
- Pedi cellaria performs protections of the body.
- Sedentary echinoderms are – Sea lilies
- Tubular echinoderms – Sea cucumbers

'S' jawed structure present in sea urchins – Aristotle, lanten

Zoological Names	**Common Names**
Astro pecten	Star fish
Antedon	Sea lily
Clypeaster	Cake urchin
Cucumaria	Sea cucumber
Ophio thrix	Serpent star
Ophiura	Brittle star
Penta ceros	Star fish
Solaster	Sun star

3. INVERTEBRATE PHYLA

1. The class to which radiolarian and foraminiferons belong is
   (1) Sporozoa (2) Suctoria
   (3) Sarcodina (4) Mastigophora

2. Match the following which one is correct.
   1. Cnidaria – Hydrozoa - Metridium
   2. Protozoa –Rhizopoda - Pelomyxa
   3. Porifera – Calcarea – Spongilla
   4. Protozoa – Ciliata - Giardia
   (1) 1 & 2 are correct
   (2) 2 is only correct
   (3) 1 is only correct
   (4) 3 & 4 are correct

3. One of the following set is related to same class.
   (1) Entameba, Ameba, Pelomyxa, Euglena
   (2) Trypanosoma, Leishmamia, Trychomonas
   (3) Eimeria, Monocystis, Giardia, Gregarina
   (4) Paramecium, Balantidium, Monocytis

4. The following set has similar mode of living.
   (1) Amoeba, Euglena, Trypanosoma
   (2) Trypanosoma, Leishmania, Plasmodium
   (3) Plasmodium, Trypanosoma, Monocystis
   (4) Monocystis, Acineta, Ephelota

5. If the fresh water protozoans are transferred to sea water, contractile vacuole
   (1) Works more (2) Lost
   (3) No change (4) Increase insize

6. One of the following is mismatch.
   (1) Phyllospongia – Leaf sponge
   (2) Euplectella – flower venus
   (3) Cliona – boring sponge
   (4) Euspongia – horse sponge

7. Regeneration in sponges is due to
   (1) Archeocytes (2) Trophocytes
   (3) Interstitial cells (4) Choanocytes

8. Most primitive canal system in
   (1) Ascon (2) Sycon
   (3) Leucon (4) Rhagon

9. Which of the following in sponges corresponds to the mouth of other animals.
   (1) Osculum (2) Incurrent canal
   (3) Ostia (4) Excurrent canal

10. Ostium in sponges is developed by
    (1) Porocyte (2) Pignocytes
    (3) Choanocyte (4) Archeocyte

11. Match the following:
    A. Trophocytes 1. Storing the food
    B. Thesocytes 2. Producing spicules
    C. Chaenocytes 3. Collar Cells
    D. Sclerocytes 4. Distributing the food.

	A	B	C	D
I)	2	1	4	3
II)	4	1	3	2
III)	4	3	1	2
IV)	2	4	1	3

12. Sollar included phylum perifera under separate branch of metazoan called
    (1) Eumetazoa (2) Parazoa
    (3) Protozoa (4) Parazoloogy

13. Match up:

A. Polypodial 1. Heliozoan
B. Foraminiferan 2. Paramecium
C. Suctorian 3. Ameba proteus
D. Holotrinches 4. Acineta
E. Actinosphaerium 5. Eliphidium

	A	B	C	D	E
I)	3	5	4	2	1
II)	2	1	3	5	4
III)	3	4	5	1	2
IV)	5	4	3	2	1

14. Which is correct for sponges.
(1) Single mouth & Innumerable exits
(2) Single exit & innumable mouths
(3) A true coelom
(4) Radial symmetry

15. Read the statement:
A. Cells in sponges exhibit division of labour.
B. Corals are produced by Anthozoans
(1) A and B are true
(2) A is correct, B is false
(3) A & B are incorrect
(4) B is true & A is false

16. Find out the coral secreted by Hydrozoa.
(1) Milliepora
(2) Corallium rubrum
(3) Gorgonia
(4) Pennatula

17. Match the following:

A. Medusoid 1. Gorgonia
B. Polypzooids 2. Sea blubber
C. Gorgonia 3. Sea Anemone
D. Adamsia 4. Aurelia
E. Cyanca 5. Sea fan

(1)	A	B	C	D	E
	5	4	3	2	1
(2)	A	B	C	D	E
	3	2	5	4	1
(3)	A	B	C	D	E
	4	1	5	3	2
(4)	A	B	C	D	E
	4	5	1	2	3

18. Pick up the animal which exhibits maximum polymorphism.
(1) Physalia (2) Halistemma
(3) Velella (4) Porpita

19. Unisexual cnidarians are
(1) Scyphozoans (2) Hydrozoans
(3) Actinozoans (4) Anthozoa

20. Velum will have
(1) Ectoderm (2) Endoderm
(3) 1 & 2 (4) Mesoderm

21. Producing many embryo from a single fertilized egg is
(1) Polygony
(2) Multiple embryony
(3) Pseudogony
(4) Erythrogony

22. Match up zone:

A. Rhabdites
B. Turbellaria
C. Liver Rot
D. Apolysis
1. Hymenolepis
2. Fasiola hepatica
3. Dibothriocephalus
4. Trematodes
5. Muller's larva

(1)	A	B	C	D
	3	2	1	5
(2)	A	B	C	D
	2	1	4	5
(3)	A	B	C	D
	5	4	2	1

(4) A B C D
4 5 2 1

23. Platy helominthes with photoreceptors
(1) Trematodes (2) Cestodes
(3) Turbellarions (4) 1 & 3

24. In flat worm parenchyma acts as
(1) Package tissue
(2) Hydraulic skeleton
(3) Gives rise to various organs
(4) All the above

25. The functional unit of muscle is
(1) Sarcosomere (2) Sarcosome
(3) Sarcoplasm (4) Sarcomere

26. In poriferans cross fertilization is common due to
(1) Protrandry
(2) Protogyny
(3) Protogamy
(4) 1 & 2

27. Spongocoel is a wide cavity found in poriferans. It opens out by
(1) Osculum (2) Ostia
(3) Aberal siphon (4) Pores

28. Of these the marine deep sea forms of poriferans belong to
(1) Hexactinellida (2) Hylospongea
(3) Calcarea (4) 1 & 2

29. Match the following:
A. Trophocytes 1. Digest the food
B. Archeocytes 2. Reserve food
C. Thesocytes 3. Reserve cells
D. Choanocytes 4. Distribute food
(1) A B C D
1 2 3 4
(2) A B C D
3 2 1 4
(3) A B C D
4 3 2 1
(4) A B C D
4 2 1 3

30. Which of the following require an invertebrate host.
(I) Dugesia
(II) Schistosoma
(III) Wuchereria
(IV) Ancylostoma
(1) III & IV (2) II & III
(3) III & V (4) I & IV

31. Lepidopleurus belongs to
(1) Polyplacophora
(2) Ehicinoidea
(3) Cephalopoda
(4) Asteroidea

32. The animals that have 19 body segments 6 pairs appendages & respires through trachea is
(1) Spider (2) Prawn
(3) Scorpion (4) Head louse

33. The following are the statements about parazoa
I. Includes red algae, fungi and spongies
II. Multicuellular animals
III. Tissues and organ systems are absent
(1) I & III only are correct
(2) I & II are only are correct
(3) All are correct
(4) II & III only are correct

34. Spicules made up of silica are found in
(1) Leucosolenia
(2) Sycon
(3) Hyalonema
(4) Grantia

35. In which group of animals blastocoel is persistent as body cavity in adult.
(1) Nematy helmiathes
(2) Arthropoda
(3) Annelida
(4) Platy helminthes

36. An example of Scyphozoa is
(1) Cuttle fish (2) Jelly fish
(3) Silver fish (4) Cat fish

37. A metazoan adult, whose body is covered by cilia is
(1) Dugesia (2) Paramoecium
(3) Amphiblastula (4) Fasciola

38. An annelid in which internal fertilization occurs is
(1) Neanther (2) Polygardius
(3) Hirudinaria (4) Eunice

39. Which one of the following in a molluscan larvae
(1) Lovens larva (2) Veligars
(3) Bipinnaria (4) Parenchymula

40. The Pentamerous symmetry is found in
(1) Sea mouse (2) Sea Urchin
(3) Sea pen (4) Sea horse

41. The earthworms insects and snail are
(1) Deuterostomes
(2) Protostomes
(3) Acoelomates
(4) Pseudocoelomates

42. The characteristic cells of Cnidaria are
(1) Statocysts (2) Sporocysts
(3) Cnidocytes (4) Spongocytes

43. One of the following larva is not a match to other three.
(1) Redia (2) Planula
(3) Cercaria (4) Sporocyst

44. These features appeared for the first time in platy helminthes
(1) Head-Eye-Mouth
(2) Pharynx-Head-Eyes
(3) Mouth-Pharynx-Head
(4) Acetabulum

45. The part of platy helminthes animal is comparable to the gastro vascular cavity of Cnidaria
(1) Lumen of the gut
(2) Flame cells
(3) Rhabdites
(4) Scolex

46. It is absent in Nematoda
(1) Muscle layer in body wall
(2) Circular muscles
(3) Longitudinal muscles
(4) Copulatory spicules

47. Protective tegument is present in
(1) Tape worms
(2) Round worms
(3) Polo worms
(4) Paddle worm

48. Which of the annelids are hermaphroditic
(1) Polychactes
(2) Oligochactes
(3) Both 1 & 2 above
(4) Oilgochactes & leeches

49. Coelom is filled with botroyoidal tissue in
(1) Chaetopterus (2) Eunice
(3) Hirudinaria (4) Tomopterus

50. The no of segments present in the prosoma and the opisthosoma respectively of scorpion is
(1) 6 + 10 (2) 6 + 13
(3) 6 + 3 (4) 13 + 6

51. (A) Larval forms of gastropoda are bilaterally symmetrical but the adults are asymmetrical.
(R) In the development of gastropods,torsion takes place.
(1) A & R are correct
(2) A is correct & R is wrong
(3) A & R are correct but R is not the correct explanation to A
(4) A & R are correct but R is correct explanation to A

52. The cuttle bone is the
(1) Shell of octopus
(2) Shell of nautilus
(3) Shell of loligo
(4) Shell of sepia

53. Foot is axe-shaped & helps in ploughing in
(1) Scaphopoda (2) Cephatopoda
(3) Pelecypoda (4) Gastropoda

54. Carona is present in
(1) Holo thuroidea (2) Asteroidea
(3) Crinoidea (4) Echinoidea

55. Select the phylum in which brain, heart and nerve cord are absent.
(1) Annelida
(2) Echinodermata
(3) Mollusca
(4) Anthropoda

56. Axopodia are present in
(1) Slime moulds
(2) Sarcodines
(3) Zoomastigophores
(4) Sprorozoans

57. One of the following is true match
(1) Ichthyology fishes
(2) Sericulture Honeybees
(3) Apiculture - Shrimps
(4) Psiculture – Domestic animals

58. Consider the following statements.
A. Artificial system of classification is based on one & 2 characters.
B. Natural system of classification is based on many characters.
(1) A is correct & B with partial explanation
(2) B is correct & A is wrong
(3) A and B are correct
(4) B is correct with 'B' partial explanation

59. Which of the following is not correctly matched.
(1) Rhizopoda - Pseudopodia
(2) Sporozoa - Parasites
(3) Mycetozoa - Aquatic
(4) Suctoria - Sedentary

60. Which is correct
(1) Cnidaria – Hydrozoa - Metridium
(2) Protozoa -Rhizopoda - Pelomyxa
(3) Porifera – Calcarea - Spongilla
(4) Protozoa – Ciliata - Giardia

61. One of the following set has similar mode of living.
(1) Amoeba, Euglena, Trypanosoma
(2) Trypanosoma, Leishmania, Plasmodium
(3) Plasmodium, Trypanosoma, Monocystis
(4) Monocystis, Acineta, Ephelota

62. One is mis matched.
(1) Phyllospongia – Leaf sponge

(2) Euplectella – Venus flower basket
(3) Cliona – Boring sponge
(4) Euspongia – Horse sponge

63. Unpolarised nerve cells are present in
(1) Obelia (2) Taenia solium
(3) Ascaris (4) Megascolex

64. Consider the statements.
A. Nematocysts of cnidarians helps in paralyzing the prey.
B. Cnidoblast cells of coelenterates help in performing the same.
(1) Both A and B are false
(2) A is false and B is true
(3) Both A and B are true and B is correct explanation
(4) Both A and B are true.

65. The following stages are noticed in the life cycle of flukes.
(1) Redia (2) Cercaria
(3) Sprotocyst (4) Metacercaria
(5) Miracidium
Arrange the correct sequence of these level forms.
(1) 2-1-3-4-5 (2) 5-3-1-2-4
(3) 2-4-1-5-3 (4) 1-2-3-4-5

66. The larval stage present in the life cycle of liver fluke, but absent in the life cycle of blood fluke is
(1) Miracidium (2) Mullers
(3) Redia (4) Gotte's

67. One is not correct.
(1) Ciliated epidermis - Turbellaria
(2) Non – muscular alimentary canal Nematoda
(3) Tegument around the body - Cestoda
(4) Pseudocoelomic fluid - Trematoda

68. Find the tubicolous polychaete
(1) Chaetopterus (2) Arenicola
(3) Nerels (4) Glycera

69. Consider the statements and identify the correct answer.
A. Lunar periodicity is a rhythm performed by an annelid.
B. During Lunar Periodicity. Tubifex (annelid) is found is helps near sea shores.
(1) A & B are false
(2) Both A and B are true & B is correct explanation to A
(3) Both A & B are true & B is not the correct explanation to A
(4) A is correct but B is false.

70. Carapace impregnated with $CaCo_3$ is the characteristic of
(1) Crustacca (2) Millipedes
(3) Unio (4) 1 & 3

71. One is true
(1) Four pairs of legs - Palamnaeus
(2) Three pairs of legs - Musca
(3) Five pairs of legs - Limulus
(4) All the above.

72. Identify the correct.
A. Kebers organ are the excretory organs in molluscans
B. Pericardial gland opens into pericardiumin mollus can's
(1) A is correct B is false
(2) A is correct and B is continuation
(3) B is related to A & A is false
(4) Both are true, but B is false explanation to A.

73. Identify the correct.
A. Gastropodes perform torsion due to which they are symmetrical.
B. All triploblastic animals except gastropods exhibit bilateral symmetry.
(1) A is correct & B is false
(2) A & B are true
(3) A is correct & Both in sufficient terms
(4) A & B are false.

74. Match the following.

A. Astropecten	1. Doliolaria		
B. Cucumaria	2. Bipinnaria		
C. Clypeaster	3. Auricularia		
D. Antedon	4. Echinopluteus		
(1) A	B	C	D
2	5	4	3
(2) A	B	C	D
5	3	4	1
(3) A	B	C	D
5	2	4	3
(4) A	B	C	D
2	3	4	1

75. Sedentary deep sea Echinoderm belong to the class.
(1) Holothuroidea (2) Crinoidea
(3) Ophiuroidea (4) Asteroidea

76. The sub class in the phylum nemathelminthes in which the representative animals don't have caudal sense organs
(1) Aphasmida (2) Phasmida
(3) Rotifera (4) Gastrotricha

77. One of the following is the characteristic of class nematode.
(1) Tegument around the body
(2) Only longitudinal muscles in body wall
(3) Parenchyma in the body cavity
(4) Parthenogenesis in the larva.

78. Match the following:

A. Nematomorpha	1. Trichuris		
B. Gstrotricha	2. Philodina		
C. Kinoryncha	3. Chaetonotus		
D. Rotifera	4. Gordius		
	5. Echinoderes		
A	B	C	D
(1) I	III	II	V
(2) III	IV	V	II
(3) IV	III	V	II
(4) IV	V	III	II

79. Illustrate the following:
A. Renette cell in nematodes develops into excretory system.
B. Excretory organs are protonephridia in all pseudocoelomates except nematodes
(1) A is incorrect & B is correct
(2) A is correct & B is correct explanation of A
(3) B is correct & A is also correct
(4) A is correct explanation to B

80. Match up:

A. Belly Hair worms	1. Rotifers		
B. Hair worms	2. Kinoryncha		
C. Wheel bearers	3. Nematoda		
D. Beak worms	4. Gastrotricha		
	5. Nematomorpha		
A	B	C	D
(1) III	V	I	II
(2) V	I	IV	II
(3) IV	V	I	II
(4) IV	III	II	I

81. In Molluscan animals the body is covered by
(1) Mantle fold (2) Shell
(3) Skin (4) None

82. Amphinura or Polyplacophora is enamphigied by
(1) Chiton (2) Dentalion
(3) Neopilina (4) Pila

83. A trilobed foot for burrowing is present in
(1) Dentalium (2) Chiton
(3) Pila (4) Unio

84. Razor shell is
(1) Pecten (2) Solen
(3) Unio (4) Pila

85. Devil fish is
(1) Octopus (2) Sepia
(3) Unio (4) Teredo

86. First formed shellin Mollusca
(1) Operculum (2) Protoconch
(3) Planospiral (4) Coni

87. Parastic larva of Mollusca
(1) Veliger (2) Glochidium
(3) Trocophore (4) 1 & 2

88. Byssus is useful for attachment; it is present in
(1) Sepia (2) Octopus
(3) Aplysia (4) Mytilus

89. The nervous system in Echinoderm is
(1) Primitive (2) Highly developed
(3) Less developed (4) All

90. Aristotles lantern is present around pharynx for mastication in
(1) Holothuroides (2) Echinoides
(3) Crinoides (4) Asteroids

91. The porous plate on the aboral side of starfish
(1) Umbilicus (2) Madreporite
(3) Genital pore (4) Mouth

92. Match the following:
A. Polian vesicles
B. Corona
C. Tiedmanns bodies
D. Ambulacral System
1. Sea urchin
2. Locomotion
3. Reproduction
4. Store sea water
5. Amebocytes

	A	B	C	D
(1)	V	IV	III	II
(2)	V	III	IV	II
(3)	IV	I	V	II
(4)	I	III	V	IV

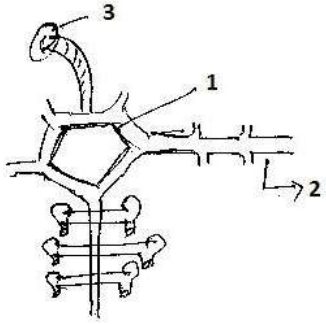
93) Match the following & choose the correct Answer

A.	Limulus	I. Palacemon
B.	Centipeds	II. Poison Claws
C.	Diplopda	III. Living fossil
D.	Cephalothorax	IV. Palamneous
		V. Millipede

	A	B	C	D
1)	I	II	III	IV
2)	IV	V	III	II
3)	III	II	V	I
4)	III	II	V	IV

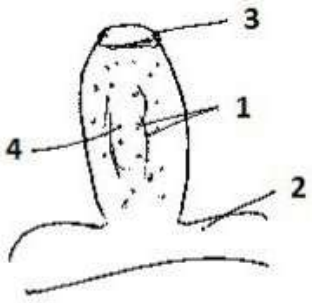
94) Find out the correct statement
A: In gastropoda uneven growth rotates the visceral moss up to 180^{o} & this process is called torsion.
B: During torsion gastropods becomes Asymmetrical
C: Redula is Absent in gastropuda
1) A + B and C are correct
2) B & C are correct & A is false
3) A + B are correct 'C' is false
4) A, B & C are false none is true

96) Look the Diagram & find out the correct series of names



1) Madreporite, Ambulacral Canal, Tube feet
2) Madreporite, Radial canal, Ambulacral Canal
3) Ambulacral Canal, Radial Canal, Madreporite
4) Ambulacral Canal, Radial Canal, Tube feet

95) Look the diagram & find the correct series of names?



1) Osculum, Dermal ostia, Spongocoel, Radial Canal
2) Dermal ostia, Osculum, Base, Prosopyle
3) Dermal ostra, Base, Osculum, Radial Canal
4) Dermal ostra, Base, Osculum, Spongocoel

KEY

1. 3	2. 2	3. 2	4. 2	5. 2
6. 4	7. 1	8. 1	9. 3	10. 1
11. 2	12. 2	13. 1	14. 2	15. 1
16. 1	17. 3	18. 2	19. 1	20. 1
21. 2	22. 4	23. 3	24. 4	25. 2
26. 2	27. 1	28. 4	29. 3	30. 2
31. 1	32. 4	33. 4	34. 3	35. 1
36. 2	37. 1	38. 3	39. 2	40. 2
41. 2	42. 3	43. 2	44. 2	45. 1
46. 2	47. 1	48. 4	49. 3	50. 2
51. 4	52. 4	53. 3	54. 4	55. 2
56. 2	57. 1	58. 3	59. 3	60. 2
61. 2	62. 4	63. 1	64. 4	65. 2
66. 3	67. 4	68. 1	69. 4	70. 1
71. 4	72. 2	73. 2	74. 4	75. 1
76. 1	77. 2	78. 3	79. 2	80. 3
81. 1	82. 1	83. 1	84. 2	85. 1
86. 2	87. 2	88. 4	89. 1	90. 2
91. 2	92. 3	93. 3	94. 3	95. 4
96. 3				

4. Pheritima Posthuma (Earthworm)

SYSTEMATIC POSITION :

Phylum	-	Annelida
Class	-	Oligocheate
Order	-	Opisthophora
Family	-	Megascolidae.

SPECIES

1. Largest earthworm in world is Megascolides autralis (2 Meters)
2. Largest earth worm in India is a Drawidia grandirs.
3. Largest genus in Oligochaeta is Pheretima.
4. Number of species of Pheretima found in India is 13.
5. Species of earth worms found all over the world are about 1800.
6. Earthworms found in India are Pheretima, Megascolex, Eutyphaeus, Dravida, Lampito, Octochaetus etc.
7. American EuRopean earthworm is Lumbricus.
8. Chaetogaster measures about 1 mm length.
9. Most common among earthworms is Pheretima posthuma.

HABIT AND HABITAT:

1. Earthworm is burrowing and Nocturnal.
2. Burrows of earthworm are lined with mucin to prevent collapsing.
3. Earthworms come out during day time also in rainy season for the respiration.
4. Presence of earthworms is detected bythe presence of worm – castings or pellets.
5. In summer earthworms burrows deeped into soil upto 2 to 3 meter.

ECONOMIC IMPORTANCE:

1. Once acre contains about 50,000 earthworms and bring out 8tons of sub soil to the surface annually.
2. Earthworms increase fertility of soil by turning upper soil to deeper regions and bringing deeper soil to the surface.

3. Earthworms are commonly described as farmers friends.
4. Earthworms also increase fertility of soil by mixing worm castings, having nitrogenous wastes with soil.
5. Earthworms increase aeration of soil by burrowing habit which helps in plant growth.
6. Earthworms used in aqyarium as feed for fishes are Echiterous albidus and Tubifex.
7. Earthworms are used as food Material by Newzeland Marios.

PHERETIMA POSTHUMA:

1. Pheretima posthuma is larger than Megascolex. It is found in North India and Kerala State.
2. Number of segment S vary between 100 – 120.
3. Dorsal surface is convex and dark brown or grey coloured.
4. The colour of the earthworm is due to presence of a pigment called porphyrin. It protects the body from harmful ultra violet rays.
5. Clitellum in Phetretima occurs in segments 14, 15 and 16. Gland cells abundant in clitellum region.
6. First dorsal pore in Pheretima is located on the inter segmental groove between 12 / 13 segments. The last inter segmental groove lacks dorsal pore.
7. Epidermis consists of supporting cells, gland cells, basal cells and receptor cells.
8. Epidermis is mainly composed of columnar supporting cells.
9. Small round basal cells are found in the spaces between the inner ends of supporting cells.
10. Gland cells include both mucous cells and albumen cells. Cuticle is secreted by albumen cells.
11. No inter segmental septa in the first 4 segments. First inter segmental septum lies between 4^{th} and 5^{th} segment. Septum between 9/10 is absent.
12. Adjasent coelomic chambers maintain continuity through apertures.
13. Coelomic fluid is alkaline,milky fluid containing water, salts, some proteins and four types of cells.
14. Buccal chamber extends upto the middle of the third segment.

DIGESTIVE SYSTEM:

1. Buccal chamber, pharynx, oesophagus, gizzard, stomach and intestine are the parts of alimentary canal.
2. Pharynx present next to buccal cavity extends upto the 4^{th} segment.
3. Salivary secreation containing mucus and proteolytic enzymes is produced by glandular pharyngeal mass containing chromophil cells.
4. Pharynx is divided into dorsal salivery chamber and ventral conducting chamber.
5. Behind the pharynx the oesophagus or gullet extends upto the seventh segments.
6. Thick walled, muscular organ Gizzard, internally lined with tough cuticle lies in 8^{th} segment.
7. Gizzard is followed by stomach which extends from 9^{th} segment to 14^{th} segment.
8. Calciferous glands are located in the wall of stomach. These are concerned with neutralisation of humic acids in food, removal of excess calcium in the form of calcities, excreation, regulation of water content, secreation of calcium compounds etc.
9. The region next to stomach is intemsive extending from 15^{th} to last segment.
10. Typholosolar region of intensive extends from 27^{th} segment upto 23 – 25 segment in front of the anus.
11. The first part of the intestine called pretyphlosolar region lies between segment 15 to 26.
12. The last part of the intestine is called post – typhlosolar region. It is known as rectum.
13. One pair of intestine caecae are given out from intestine in 26^{th} segment and extend anteriorly upto 22^{nd} or 23^{rd} segment. They are believed to secrete amylolytic enzymes.
14. Grinding machine is alimentary canal is Gizzad.

CIRCULATORY SYSTEM:

1. Nubmer of longitudinal blood vessels is 5.
2. The blood flows backward to forward in dorsal blood vessel.
3. The dorsal blood vessel in first 13 segments acts as disturbing vessel and behind the 13^{th} segment as collecting blood vessel.

4. Principal disturbing vessel is ventral blood vessel. Blood flows posteriorly in it.
5. One pair of lateral Oesophageals lie on ventrolateral side of the gullet. They run from the anterior end of the body upto 13th segment.
6. Sub neural vessel lies below the nerve cord extends from 14th segment upto the posterior en of the boby.
7. Sub neural vessel is formed by the union of two laterooesophageal vessels. The flow of blood is from anterior to posterior in sub neural blood vessel.
8. In each and every segment behind 13th, one pair of commissural vessel conveys blood from sub neural vessel to dorsal blood vessel.
9. Short collecting vessel lying above the stomach and confined to segments 9th to 13th is called supraoesophageal blood vessel.
10. Supra – oesophageal blood vessel is connected to latero – oesophageal blood vessel through the anterior loops.
11. Two pairs of anterior loops are present. One in 10th and 11th segments.
12. Supra oesophageal blood vessel is connected to ventral vessel through two pairs of latero oesophageal hearts.
13. Lateral hearts are found one pair in each segment 7,9,12 and 13.
14. The hearts connecting the dorsal and ventral blood vessels with ventral blood vessels are latero oesophageal hearts.
15. The hearts connecting both the dorsal and supra oesophageal blood vessels with ventral blood vessels are latero oesophageal hearts.
16. All the longitudinal blood vessels are interconnected with one another through numerous segamentally arranged vessels called transverse or lateral blood vesels.
17. Number of ring vessels per segment is about 12. They carry the blood from latero oesophageal vessels to supra oesophageal blood vessels.
18. One pair of ventro tegumentary vessel in each segment supply blood to body wall, septa, nephredia and reproductive organs. They arise from ventral blood vessel.
19. Septal nephridia behind 13th segment receive blood through through septo nephridial branch arising from ventro tegumentary vessel in each segment.
20. Number of dorso intestinal in each segment in intestinal region is 2 pairs. They carry blood from the intensive wall to the dorsal blood vessels.
21. In each segment in intestinal region, the intestine receives blood from vessel through ventro intestinals.

22. Blood glands in pheretima are found in segments 4,5 and 6. They manufacture blood corpuscles and hemoglobin. They are also regarded to be excretory structures by some workers.

EXCREATORY SYSTEM:

1. Excreation is performed by metanephridia. They are also useful in the reabsorption of salts, water and asmoregulation.
2. There are three types of modified metanephridia in pheretima. These are 1) Pharyngeal 2) Integumentary 3) Septal nephredia.
3. Pharynegal nephridia without nephrostomes and nephridiopores are found in 4^{th}, $5^{th\ and\ 6th}$ segments. They are also known as tufted nephridia
4. All the terminal ducts of each tuft unite to form common pharynx –geal nephridial duct.
5. Pharyngeal nephridia were previously called Peptonephridia as they were believed to be digestive glands.
6. Integumentary nephridia are found in all segments except first two segments. These are smallest V shaped nephridia in pheretima.
7. Integumentary nephridia lack nephrostomes, but possess nephridiopores.
8. Number of integumentary nephridia in each segment is 200 – 250. in segments of the clitellar region the number increases ten times (2000 – 2500) constituting the forests of nephridia.
9. Largest nephridia in pheretima are septal nephridia or mega nephridia. They are present from the septum between segments 15 and 16.
10. Septal nephridia are absent in first 14 segments.
11. Each row contains 20-25 nephridia, so number of nephridia in each coeiomic compartments is 80-100.
12. Nephrostome is found, but nephridiopore is absent in septal nephridia.
13. Each septal nephridium consist of 3 parts namely.
    a) Nephrostome b) Nephridial body and c) terminal duct.
14. Straight to be and twisted to be are the two parts of nephridial body.
15. Terminal ducts open into sepetal excreatory canals which in turn open into supra intestinal excreatory canal.
16. Earthworm is ureotelic animal. Excreatory wastes consists of 40 percent urea, 20 percent NHsdo4(3), 40percent aminoacids and other substances.

NERVOUS SYSTEM:

1. Earthworms contains solid ventral cord, Each segmental ganglion represents the fusion of a pair of ganglia.
2. Nerve cords consist of nerve fibres and nerve cells.
3. The nerve cord has 4 neurocords or giant fibres.
4. Special sense organs are absent, but epidermal, buccal and photo – receptors are present.
5. Epidermal receptors are tactile, abdundantly found towards ventral and lateral surfaces.
6. Buccal receptors are also known as chemoreceptors. They are both olfactory and gustatory in function.
7. Photoreceptors are found towards dorsal side, more numerous on protomium and peristomium, totally absent in clitellum.
8. Each photoreceptor cell consists of neurofibrillae and a transparent L – shaped lens called optic organel or phaeosome.
9. Earthworms avoid strong light, so they are negatively phototrophic.

REPRODUCTIVE SYSTEM:

1. Two pairs of testes are present , one pair each in segment 10^{th} and 11^{th}.
2. Testes in pheretima are enclosed by testes sacs, which are coelomic spaces. These are two testis sacs, one each in 10^{th} and 11^{th} segments.
3. Two pairs of spermiducal funnels are found one pair each in segments 10 and 11. These are also enclosed by testis sacs.
4. Two pairs of seminal vescicles are present one pair each in segments 11 and 12. Seminal vesicles of 11^{th} segment are also enclosed by testis sacs.
5. Sperm ducts or vasa deferentia are two pairs one pair on each side. They join the prostrate duct in 18^{th} segment.
6. One pair of prostrate glands extend from 16^{th} or 17^{th} segment uo to the 20^{th} and 21^{st} segment.
7. One pair of male genital apertures are situated towards ventral side of 18^{th} segment.
8. Penial setae are absent in pheretima.

9. Accessory glands are two pairs found in 17th and 19th segments respectively. They open on gential papillae situated externally upon the 17th and 19th segments.
10. Secretion of accessory glands help in uniting the worms during copulation.
11. Two oviducts arising from 13th segment pierce through the septum between 13th and 14th segments, and unites to form commen oviduct in the segment.
12. Single female gential aperture is midventrally situated in 14th segment.
    Four pairs of spermathecae are found, one pair in each of the segment 6,7,8 and 9. Spermathecal openings are situated ventro laterally on intersegmental grooves between 5/6, 6/7, 7/8 and 8/9.
13. Each spermathecum has one ampulla and one diverticulum. Sperms are stored in diverticulum.
14. Copulation takes place underground, during night time in rainy season.

4. Pheritima Posthuma (Earthworm)

1. Read the following:
   A. Annelids are schizocoelomate, metamerically segmented, thin soft cuticle (proteinaceous)
   B. Are Schizocoelomate, Unsegmented, thick hard cuticle.
   (1) Both are correct
   (2) A is true and B is false
   (3) Both A + B are false
   (4) A is false, B is correct.

2. In one of the following both external & internal segmentation can be observed.
   (1) Megascolex (2) Periplanata
   (3) Anphionus (4) All the above

3. Find the tubicolous polychaete
   (1) Chaetopterus (2) Arenicola
   (3) Nereis (4) Glycera

4. Lunar periodicity is exhibited by one of the following.
   (A) Eunice (B) Tubifex
   (C) Chaetopterus (D) Nais

5. Soft flexible cuticle in annelids helps in
   (1) Locomotion (2) Excretion
   (3) Peristalsis (4) All the above

6. Gonads are temporary and develop during breeding season in annelids.
   (1) Archiannelida (2) Myzostomida
   (3) Polycheta (4) Hirudinea

7. The earthworm move with the help of
   (1) Setae muscles and hydrostatic Skeleton
   (2) Setae alone
   (3) Muscles alone
   (4) Parapodia

8. Role of typhlosole in earthworm is to
   (1) Control flow of blood
   (2) Produce digestive enzymes
   (3) Increase absorptive surface area
   (4) Kill bacteria

9. Earthworms are generally
   (1) Aminotelic (2) Uricotelic
   (3) Ureotelic (4) 2 & 3

10. Flow of blood in dorsal vessel of earthworm is
    (1) Backwards (2) Forwards
    (3) Backwards in half of it & forwards in another half
    (4) 1 & 3

11. In earthworm T.S. of Typhlosole is found in which of the following segment.
    (1) 18^{th} (2) 20th
    (3) 28^{th} (4) 14th

12. Coelomic fluid of earthworm consists of
    (1) Eleocytes
    (2) Chlorogogen cells
    (3) Anterior loops
    (4) 1 & 2

13. Photoreceptors in earthworm occur in
    (1) Epidermis of ventral body wal
    (2) Skin of peristomium only

(3) Skin of prostomium
(4) Epidermis of dorsal body wall at anterior region.

14. Mature sperms in Pheretima are produced in
(1) Testis (2) Testis Sac
(3) Seminal vesicles
(4) Spermatheceae

15. In earthworm nephrostome is present in
(1) Pharyngeal nephridia
(2) Integnmentary
(3) Septal (4) 1 & 3

16. Read the following:
A. Dorsal blood vessel is collecting & distributing blood vessel.
B. Dorsal blood vessel is considered as true heart in earthworm
(1) A & B are false
(2) A is correct & B is correct Explanation to A
(3) A is false & B is true
(4) A is correct explanation to B

17. Chromophill cells in pheretima are present
(1) Around Pharynx
(2) Dorsal to Pharynx
(3) Around Oesophagus
(4) Dorsal to Oesophagus

18. Seminal vesicles in pheretina are present in
(1) 9,12 segments (2) 11,12
(3) 12,13 (4) 9,10

19. Calciferous glands in pheretina are present in
(1) Stomach
(2) Typhlosolar region
(3) Pretyphlosolar
(4) Post typhlosolar region

20. Three pairs of valves are present in
(1) Anterior loops
(2) Latero-oesophageal hearts
(3) Lateral hearts
(4) None of the above

21. Read the following:
A. Earthworms are triploblastic,metamericaly segmented and coelomate condition with ciliated ducts.
B. Earthworms are diploblastic, metamerically segmented and schizocoelomates.
(1) A & B are true
(2) A is true & B is false
(3) A & B are true, A is correct explanation to B
(4) A & B are incorrect

22. Match the following:
A. 9/10 segments
B. 5/6 segments
C. 10/11 segments
D. 1/4 segments
E. 1/9 segments
1. Without perforations
2. Without septal walls
3. Conical funnel like septals
4. Septal walls absent.
5. Oblique septal wall.

	A	B	C	D	E
(1)	IV	V	III	I	II
(2)	III	II	IV	I	V
(3)	I	V	III	II	IV
(4)	IV	III	V	II	I
(5)	II	IV	I	III	V

23. Illustrate the following:
    A. Setae arranged in two groups in each segment is called Perichaetine arrangement.
    B. 14, 15 and 16th segments form Cingulum helps in formation of cocoon.
    C. Anus is vertical slit like opening present at the end of last segment.
    (1) A & B are correct, C is false.
    (2) A is incorrect & B & C are true.
    (3) A is correct & B & C are false
    (4) All are true.

24. Each setum is present in an invaginatin of epidermis called
    (1) Setigarous Sac
    (2) Nodular Sac
    (3) Setal Sac
    (4) 1 & 3

25. An optic organelle present in the cells of epidermis acting as photoreceptor is
    (1) Phaesome (2) Chromosome
    (3) Porphyrin (4) None

26. The seat for intermediary metabolism in earthworm are
    (1) Dorsal blood vessel
    (2) Chlorogogen cells
    (3) Granulocytes
    (4) Albumen cells

27. Ring vessels are present in
    (1) 14 pairs each in 9-13 segs
    (2) 12 pairs each in 10 -12 segs
    (3) 12 pairs each in 10 -13 segs
    (4) 12 pairs each in 10 -14 segs

28. Pharyngeal nephridia are closed endonephric nephridia present in
    (1) 15 segment to last with 80 – 100 in each seg
    (2) 3rd seg to last with 200 - 250
    (3) 4,5,6th seg one pair each in seg
    (4) 1 & 3

29. Bundling the sperms into Spermatophores takes place with the help of
    (1) Bartholian gland
    (2) Prostate gland
    (3) Perineal gland
    (4) Muscus gland

30. Cocoons are laid from this month onwards
    (1) September - October
    (2) August to October
    (3) July to September
    (4) July to October

31. Gastrulation takes place during development with the help of a process known as
    (1) Invagination (2) Evagination
    (3) Emasculation (4) None

32. Which is the exo-nephric nephridum?
    (1) Pharyngeal nephridium
    (2) Integumentary nephridium
    (3) Septal nephridium
    (4) Meganephridium

33. Triploblastic coelomate condition and segmental metamerism are found in
    (1) Coelenterata (2) Mollusca
    (3) Annelida (4) Porifera

34. The lateral hearts in pheretima posthuma are present in segments

(1) 7, 8, 9, 10 (2) 8, 9, 11, 12
(3) 7, 9, 12, 13 (4) 7, 8, 12, 13

35. Haemoglobin is found dissolved in the plasma of
(1) Cockroach (2) earthworm
(3) frog (4) snail

36. Clitellum develops only during reproductive season in
(1) Nereis (2) leech
(3) earthworm (4) arenicola

37. Locomotion in earthworm is due to
(1) Tentacles (2) cilia
(3) cirri (4) setae

38. The function of porphyrin which imparts colour to the earthworm is
(1) to help in respiration
(2) to help in reproduction
(3) to protect against harmful light rays
(4) to protect against pathogens

39. The nitrogenous waste in earthworm consists about
(1) 40% urea and 40% uric acid
(2) 50% urea and 40% ammonia
(3) 40% urea and 40% amino acids 20% uric acid
(4) 60% ammonia and 20% amino acids

40. Which of the following is the correct matching set?
(1) pharynx – grinding food
(2) clitellum – copulation
(3) blood gland – respiration
(4) coelomic fluid – hydraulic skeleton

41. Larva of annelids is
(1) planula
(2) trochophore
(3) cydippid
(4) miracidium

42. Pheretima is
(1) uricotelic
(2) ureotelic
(3) ammonotelic
(4) guanotelic

43. The term 'annelida' was coined by
(1) Lankester (2) Lamarck
(3) Von Siebold (4)Aristotle

44. The pigment which protects earthworm from UV radiation is
(1) Porphyrin (2) keratin
(3) albumen (4) haemoglobin

45. Octochaetine arrangement of setae occurs in
(1) lumbricus, eutyphaeus
(2) megascolex
(3) pheretima
(4) megascolides

KEY

1. 2	2. 1	3. 1	4. 1	5. 1
6. 3	7. 1	8. 3	9. 3	10. 2
11. 3	12. 4	13. 4	14. 3	15. 3
16. 2	17. 2	18. 2	19. 1	20. 2
21. 2	22. 4	23. 2	24. 4	25. 1
26. 2	27. 3	28. 3	29. 2	30. 2
31. 1	32. 2	33. 3	34. 3	35. 2
36. 2	37. 4	38. 3	39. 3	40. 4
41. 2	42. 2	43. 2	44. 1	45. 1

5. ANIMAL DIVERSITY – II

CHORDATA

(Fishes, Amphibia, Reptilia)

CHORDATA

The phylum chordate is discovered by Balfour in 1880.

Definition:- Animals that possess a dorsal gelatinous rod like structure called notochord called chordates.

CHARACTERISTC OF CHORDATES

- Presence of Notochord.
- Pharyngeal gill slits are present.
- Dorsal tabular nerve cord is present.
- Metamenism is present.
- Chordatees are triploblastic body wall is made up of three germ layers. They are ectoderm, endoderm & mesoderm.
- Chordates are true coelomates formed from out pushing of archenteron through enterocoelic method. Coelom forming such a way is called enterocoelic coelom.
- Endo skeleton is made up bone or cartilage in some mixed.
- All the systems digestive. Circulatory, respiratory, excretory, nervous system are well developed.
- Sense organs are well developly present.
- Sexual dimorphism is present, sexes are separate fertilization is internal & externally present . Development is direct (without larval stage) & indirect comprises of larval stages a parental core is present.

ANCESTRY OF CHORDATA

Since 1818 several theories have been postulatied by different scientist from time to time. Two of them latest theories which appeared have gained acceptance by Zoologists are mentioned below.

1. NEOTENOUS LARVAL THEORY

Garstang (1894) proposed that the auricalaria larva of Holothuria (Echinodermata) might have been ancestor of chordates. He showed that if the ciliated bands on the auricularia larva were to become ridges leaving a groove between them and the ridges are to fuse eoncerting the groove into a tube a structure is formed similar to the vertebrate nervous system. Garstang's theory further states that if such a larva becomes sexually mature (Neotany) and reproduces (paedogenesis) is could be the basis of evolution of chordates.

2. ASCIDIAN TADPOLE THEORY

N.J. Berill (1955) suggested the sequence of evolutionary changes (Echinoderm – Auricularia – Hemi chordate – Tornaria – Proto chordate – Ascidian Tadpole – Permanently free swimming chordates) According to this latest theory the Ascidian tadpole by Suppression of meta morphosis & through further evolution gave rise to the vertebrates. This view places the Ascidian in the main line of chordate evolution.

The above two theories are supported by evidences obtained from a comparative study of the serum proteins & muscle phosphagons.

(a) SEROLOGICLAL EVIDENCE

There is a close resemblance between the body – fluid proteins of echinoderms & chordates. The chordates are closely related to echinoderms.

(b) PHOSPHO CREATINE

It is used in the energy cycle of muscle contraction of both echinoderms & chordates. Most animals belonging to the other phyla have phospho arginine as their echinoderms have both phospho creatine & phospharginine indicating that they are connecting links between chordates & echinoderms. However phosphocreatine & phosphoarginine occur separately in many invertebral phyla.

Because of the resemblance between echinoderms. Hemichordates & Chordates. Hyman (1959) & other workers concluded that all the three groups have evolved from a common ancestor. Probably a Ptero branch like (hemi chordate) individual & that echinoderms & hemi chordates has given rise to chordates.

CLASSIFICATION OF CHORDATA

Chordata — **Sub phyla**

Aeraniata

Protochordates

1. Hemichordata Eg. Balenoglasus
2. Uro – Chordata Eg. Ascidian
3. Cephalo Chordata Eg. Amphioxus

Craniata (Vertebrata)

Division

Agnatha

1. Petromyzontia Eg. Petromyzon
2. Myxinoidea Eg. Myxine

Gnathostoma

Super class

I

Pisces

1. Placodermi (Extinct)
2. Chondricthics Eg. Scoliodan
3. Osteicthies Eg. Labeorohita, (rohu)
   Ophio Cephalus (Murrel

II

Tetrapoda

Class

- Amphibia — Eg. Frog
- Reptilia — Eg. Crocodile,
- Aves — Eg. Pigeon
- Mamallia — Eg. Cat

PISCES (FISHES)

Placodermi	Chondricthyes	Osteicthies
(Extinct)	(Cartilagenous fishes)	(Bony fishes)
Eg. Climatius	Eg. Rhinodon (Whale shark)	Eg. (Flying fish)
	Scolidon (Dog fish)	Labeorohita (rohu)
	Pristis (Saw fish)	Ophio caphalus
	Sphyrna (Hammer headed fish)	(snake headed fish)
	Torpedo (Electric ray)	Clarias batracus
		Latimaria (living fossil or
		Coelacanth.

GENERAL CHARACTERS

Study of fishes is called Ichthiology.

- They are cold blooded vertebrates. Aquatic live in seas, rivers, canals, lakes, dams, ponds and almost every place where there is water.
- Body is usually stream lined, but some are elongated & snake like. While a few are flattened dorso ventrally.
- Neck is absent, There is an exoskeleton of scales, denticles. (or) Bony plates developed from mesoderm.
- The skin glands are mucus glands their secretion helps in reducing the friction during locomotion.
- They have paired & unpaired fins supported by soft or spiny rays. Dorsal, anal & caudal fins are unpaired. They help in maintaining the balance of the animal.
- The paired fins are pectoral & pelvic fins. They help in locomotion.
- The caudal fin present on the tail is helpful in propulsion & changing the direction of the animal during locomotion.
- Nostrils are paired. They do not open into pharynx except in lung fishes.
- Organs of respiration are gills, in certain fresh water bony fishes accessory respiratory organs are present in lung fishes lungs are present helpful to breath in drought condition. Gills are supported by Gill Arches.
- Heart is two chambered with one Auricle & one ventricle. The flow of the blood only towards the gills & hence the heart is called Bronchial heart. As the blood flow only in the respiratory organs (links) from the heart, the circulation is called single circulation.
- As the blood in the heart is always impure brought by veins. Hence heart is also called Venous heart.
- Excretory organs are mesonephric kidneys. The excretory product is Ammonia. Hence the fishes are called Ammonotelic. However cartilaginous fishes excretic urea are called ureotelic.
- Brain is covered by single membrane “Manix Primitive.
- Cranial Nerves are 10 pairs.
- Only internal ear is present serves balancing function eye lids are absent.
- Lateral line sense organ is the characteristic of fishes called Rheoreceptors. Helps the balance maintaining against the water currents.
- Sexes are separate fertilization is external or internal. Amnion is absent in the embryonic stage. Hence included in Anamniota.

CHONDRICTHIES (OR) ELASMOBRANCHI

- Endo skeleton is made up of cartilage without true bone. Hence called Cartilagenous fishes.
- Placoid scales form the exo skeleton. Scales are originated mesodermally.
- Mostly marine & predacious.
- Mouth is long, crescentic & ventral.
- Gill slits are usually five paris, naked & without any operculum.
- Air bladder is absent.
- Cloaca lies between two pelvic fins.
- Fertilisation is internal.
- Eg. Rhinodon (Whale shark) largest fish.

  Scolidan (Dog fish) common shark

  Pristis (Saw fish)

  Sphyrna (Hammer headed shark)

  Rays & skates.

OSTEICTHYES, (BONY FISHES)

- These are true bony fishes, living in both fresh & sea water.
- Scales are of three types,cycloid ganoid, ctenoid.
- Endo skeleton chiefly of Bone.
- Mouth is terminal
- Caudal fins are Homocercal or Diphycercal
- Respiration is takes place by gills are covered by an operculum on either side.
- Air bladder or swim bladder is present with a connection or no connection to the pharynx is known as Hydrostatic organ.

LATIMARIA CHALUMNAE (THE LIVING COELA CANTH)

Latimaria Chalumnae a coela canth fish is named after Mrs. C. Latimer who identified the fish. It is referred to as living fossil by Smith (1938).

The body of Latimania is covered with cosmoid scales. Latimania persist since Jurassic time with very little change.

DIPNOI FISHES (DI = DOUBLE + PNOI – BREATHING)

Dipnoi fishes are also called lung fishes. Lungs are single or paired. They exhibit discontinous distribution. They are only three living Genera that are existing today they are inhabit the rivers and the capable of breathing 'air' by lungs. Contains incomplete trichambered heart. Romer called them "Uncles of amphibia"

1) Neo ceratodus 2) Protopterus 3) Lepido siren

1) NEOCERATODUS (AUSTRALIAN LUNG FISH)

Restricted to Burnett and Many rivers of queensland of Australia, and attains a length of 1.5 metres is known as Burnett Salman contains single lung called Monopneumonas. It is in active and sluggish in habit. Aestivation is not performed.

2) PROTOPTERUS (SOUTH AFRICAN LUNG FISH)

It is found in the rivers of South Africa extends from senegal and the white nile on North of congo basin & Zambasi in South Africa. Dorsal & Caudal fins are united contains two lungs called Dipneumonas. During summer (Unfavourable condition) undergoes Aestivation.

3) LEPIDOSIREN (AMERICAN LUNG FISH)

Found in the Amazon River of America consists of two lungs. Dorsal & Caudal fins are united & form the principal organ of locomotion. Aestivation is also performed in unfavorable season.

AMBHIBIA

Anura	Urodela	Apoda
Eg. Frog.	Eg. Amblystoma	Eg. Icthiophis
Buffo	Amphiuma	Uroaeotyphlus
Rhacophores		

ORDER -1 (LIMB LESS AMPHIBIANS)

Gymnophiona (Apoda)

These limbless Amphibians are known as blind worms or caecilians found in tropical & sub tropical region of America, Africa & Asia. Burrowing forms with elongated snake like body. Tail is absent.

- Skin is transversely wrinkled.
- Limbs & limb girdles are absent.

- A small blood vessel called 'Ductus botalli' connects the systemic arch with pulmonary arch is present.
- Eyes are rudimentary & Non functional.
- Males have a protrusible copulatory organ. Parental care is common.
- Larva has 3 pairs of external gills. Eg. Icthyophis etc

ORDER – 2 URODELA (CAUDATA)

- Body lizard like with a distinct postanal tail.
- Most urodeles are found in North America. This country regarded as "Head quarters of Urodela".
- '2' pairs of weak & equal limbs are present.
- Skin is without exo skeleton. Teeth present on both the jaws.
- Tympanum is absent Eye lids are present or absent.
- Gill may be retained through out called Perinnibronchiata in some they are lost in the adults.
- Some are exhibit like Reptilion characters. Eg. Salamonders & Neuts, Amphiuma, Amblystoma, Siren.

Neotany Larva of Ambly stoma called Axoltle larva in cold season due to deficiency of Thyroxine or lack of Iodine larva do not metamorphose, but attain sexually maturation is called Neoteny (or) Paedogenesis.

ORDER – 3 ANURA

- Tail less Amphibians are called Anura.
- Limbs are strong but unequal hand limbs, are longer than fore limbs & helps in leaping & swimming forelimbs are for support. Hind limbs with web are useful for swimming.
- Adult without gill or gill openings.
- Well developed eyelids & tympanum.

- Head & trunk fused. Neck is absent. Vertebral column small with 5-9 procoelus vertebra & slender urostyle
- Fertilisation is always external. Eg. Frogs, Toads.

BATROCHOLOGY THE STUDY OF FROGS & TOADS

Bufo (common toad) contains poisonous glands in its skin are known as parotid glands.

Rhacopharus – Flying frog.

Alytes – Mid wife toad

Hyla – Tree frog

Rana tigrina – common frog.

REPTILIA

REPTILES

Reptiles are creeping animals.

Reptiles are known as the ' The first Terrestrial Amniotes'.

AMNIOTES: The animals contain as Embryonic membrane amnion along the chorion & yolk sac etc are known as Amniotes includes in Group Amniota.

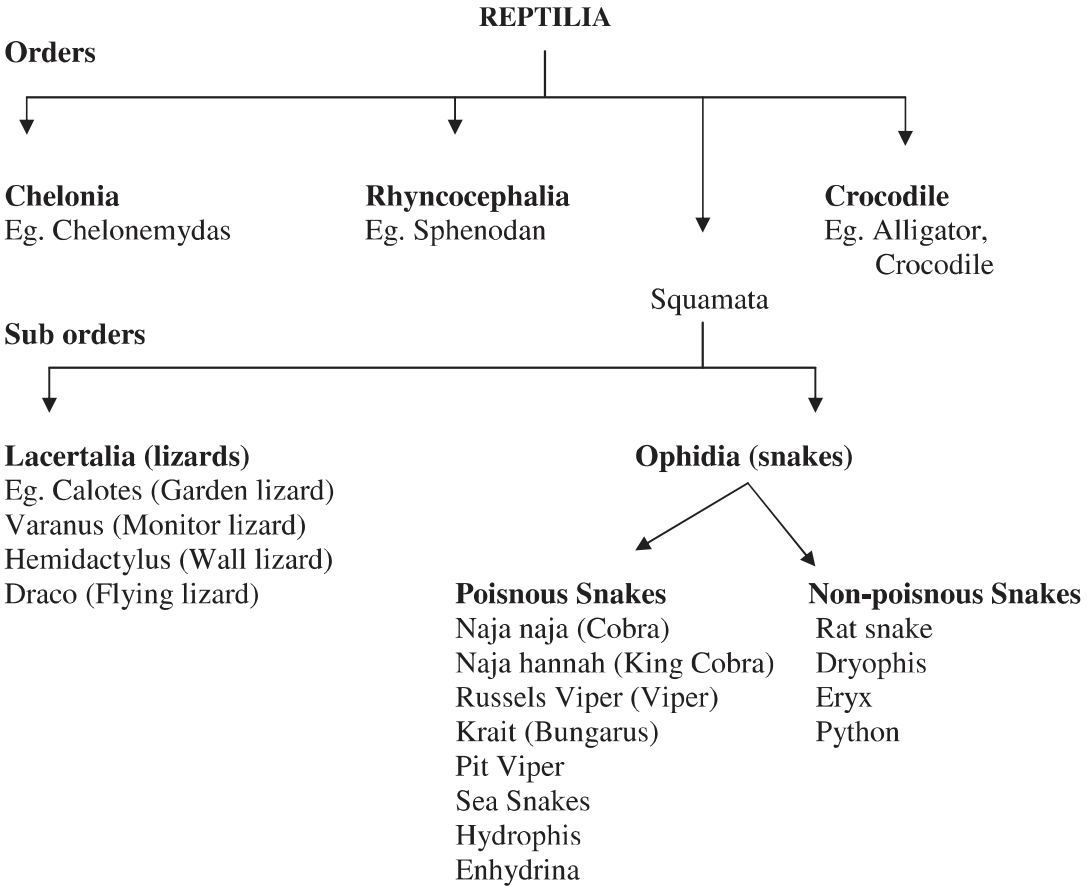
- Study of Reptiles is called Herpetology.
- Study of Lizards is called Saurology.
- Study of Snakes is called Ophiology.

GENERAL CHARACTERS

- Reptiles are ectothermal (or) cold blooded or poiklo thermic animals.
- Their skin is dry without any glands.
- Their body is covered by dr, cornified epidermal scutes or scales.
- The pentadactyl limbs end in clawed digits.
- Skull is monocondylic is provided with one or more temporal fossac.
- Sternam is well developed with ribs.
- 'T' shaped inter clavicle is present in the pectoral girdle.
- Teeth Homodont, Acrodont, or Pleurodont.

- Respiration takes place with the help of lungs. (pulmonary)
- Nervous system is well developed than Amphibia.
- Carnial nerves are '12' pairs in snakes. (10 pairs)
- Oviparous (Egg laying animals)
- Parental care is well developly present.

CLASSIFICATION OF REPTILES



Chelonia:I Chelones have a boxlike exo skeleton consisting of dorsal carapace & ventral plastron thoracic vertebrae & are usually to carapace.

- Limbs are clawed in terrestrial forms while paddle like in aquatic forms.
- Ducts botalli is present.
- Sternum is absent.
- Nasal opening is single

- Some aquatic forms like turtles have a vascular.
- Cloaca for aquatic respiration.
- Teeth are absent (edentate)
- They are said to be largest life span. Eg. Testudos Age is estimated 200 to 400 years.

ORDER -2 RHYNCOCEPHALIA

These animals are restricted to coastal islands of Newzeland.

- Skin covered by Granular scales & mid dorsal row of spines.
- Tail is bilaterally compressed.
- Parietal foreman with vestigial pineal eye is present.
- Eg. Sphenodon. (living fossil)

ORDER -3 SQUAMATA

Includes Lizards & Snakes.

Varanus: commonly called monitor lizard contains bifurcated tongue.

Draco: Flying lizard found in the forest of S. Africa.

Hemidactylus: Wall lizard. Autotomy is seen.

Autotomy: Hemidactylus selfly cut its tail to escape form predators. Predators attack on tail & lizard escapes.

CROCODILA -3

The Amphibians crocodiles & alligators their allies are the largest living reptiles.
They exhibit advance characters over reptiles.

- These are largest living reptiles. Carnivores & Amphibious.
- Tail is strong & laterally compressed.
- Limbs are powerful clawed & webbed there are five digits in fore limbs & four digits in hind limb.
- Skin bears scales & Scutes.
- A Pseudo palate is present.
- Ribs are double headed. Abdominal ribs are present
- Clavicles are absent.
- Teeth are thecodont, Nostrils are situated at the tip of the snout.
- Adiapgram separates the body cavity into upper thoracic & lower abdominal cavities.
- Heart is four chambered. The two systematic & pulmonary aorta are closed & twisted. Eg. Crocodiles, Gavial's, Alligator.

CHORDATA (FISHES, AMPHIBIA, REPTILIA)

1. Vestigeal thickenings of the notochord can be seen in
   (1) Fishes (2) Amphibia
   (3) Mammals (4) Aves

2. Which one of the following is absent in the tail of chordates.
   (1) Muscles (2) Nerve Cord
   (3) Notochord (4) Coelom

3. Pelagictunicate which exhibits neoteny is
   (1) Amblystoma (2) Salpa
   (3) Oikpleura (4) Botryllus

4. Mode of feeding in tunicates is
   (1) Nacrophagus (2) Parasitic
   (3) Ciliary feeder (4) Myxotrophic

5. Which one of the animal can be identified as chordate based on its larval features
   (1) Asymmetron (2) Ascidian
   (3) Amblystoma (4) Amia

6. It is unique in the adult urochordates
   (1) A test made up of tuniun
   (2) Atubular heart
   (3) A notochord made up of vacuolated cells
   (4) A nerve cord developed from the epidermis

7. The no of gill pouches in Myxine is
   (1) 6 pairs (2) 8 pairs
   (3) 10 pairs (4) 14 pairs

8. Alternation of generation is exhibited by
   (1) Thaliaceae (2) Ascidiacea
   (3) Larvacea (4) Cyclostomata

9. Following are the statements related to the subphylum, urochordata.
   (I) There is a covering of the body made up tunicine, hence they are tunicates.
   (II) Tail is absent in the adults, Hence they are called urochordates.
   (III) Flow of the blood is periodically reversed
   (1) All are correct
   (2) I & II are correct
   (3) II & III are correct
   (4) I & III are correct

10. Match the following.
    A. Urochordates
    B. Cephalochordata
    C. Placodermi
    D. Ostracodermi
    1. Pectoral fins
    2. Autostylic jaw suspension
    3. Periodical reversal
    4. Acraniates
    5. Neotenic forms

	A	B	C	D
(1)	IV	I	V	III
(2)	III	IV	II	I
(3)	IV	I	V	II
(4)	IV	I	III	V

11. **Statement:** Chordate characters are present in the class larvacea of the urochordates.
    Reason: Larvacea exhibit neoteny.
    (1) S & R are correct

(2) S is correct & R is wrong.
(3) S & R are correct R is not the correct explanation to S
(4) S & R are correct R is the correct explanation to S.

12. The aquatic organism with prehensile tail is
(1) Exocoetus (2) Hippocampus
(3) Maecs (4) Chameleons

13. The Salientia member with digits of fore & hind limbs webbed is
(1) Rana Pipiens (2) Rhacophorus
(3) Proteus (4) Hyla

14. The chordates with the persistent notochord are
(1) Amphioxus - Ascidian
(2) Ascidian - Oikopleura
(3) Amphioxus - Oikopleura
(4) Salpa - doliolum

15. Select the North American Fishes.
(1) Lepidosiren – Latimeria – Lepidosteus
(2) Protopterus – Polypterus Neoceratodus
(3) Chimera – Amia - Acipenser
(4) Amia – Acipenser - Lepidosteus

16. Unlike other elasmobranches operculum is present in
(1) Acipenser (2) Synaptura
(3) Anabas (4) Chimera

17. The fish, which has both eyes on one side of the head is
(1) Rastrelliger (2) Synaptura
(3) Sardinella (4) Harpadon

18. Marine bony fishes excrete excess sodium chloride through chloride cells in
(1) Intestinal epithelium
(2) Gill epithelium
(3) Cloacal epithelium
(4) Buccal epithelium

19. The smallest and largest anurans are
(1) Rana hexa dactyla - Alytes
(2) Phyllobates & R. Goliath
(3) Rahcophorus & Hyla
(4) Bufo & Hyla

20. The function of the spiral valve in cartilaginous fishes is
(1) To regulate the flow of food in the gut
(2) To regulate the blood flow in arteries
(3) To increase the surface area of absorption in intestine
(4) To produce enzymes and blood cells

21. The Vertebrae in Anura are typically
(1) Procoelaus (2) Amphicoelous
(3) Heterocoelous (4) Amphiplatyon

22. **A:** Hippocampus swims vertically
R: Tail fin is absent and pelvic fins are modified.
(1) A & R are correct.
(2) A & R are not correct
(3) A & R are correct & R is the correct explanation to A.
(4) A & R are correct & R is not the correct explanation to A.

23. Arrange the following classes of chordate in a sequence on the basis

of their evolutionary significance before quiz.

(a) Placodermi (b) Ostracodermi
(c) Thaliacae (d) Cyclostomata

(1) c,b,d,a (2) a,d,b,e
(3) c,b,a,d (4) b,c,a,d

24. Select the two correct combinations from the following:
I. Holostei
II. Chordrostei
III. Elasmoloranchi
IV. Osteichthyes
I. Lepidostus, Garpike
II. Lebeo, Sturgeon
III. Chimaera, Saw fish
IV. Synaptara, Flat fish
(1) I & IV (2) II & III
(3) I & III (4) III & IV

25. Elasmobranch fish with an eperuculum is
(1) Ghost fish (2) Flat fish
(3) Guitar fish (4) Saw fish

26. The animal unique to the country where members of ophidian are absent is
(1) Hatteria (2) Lepidosiren
(3) Latimeria (4) Tylatotriton

27. The reptile which lacks penis belongs to
(1) Gymnophiona (2) Ophidia
(3) Rhyncocephalia (4) Crocodilia

28. A haemolytic protenaceous secretion from a cold blooded anmniote is
(1) Lampredine (2) Viperdine
(3) Cobradine (4) Thriundin

29. The no of temporal fossae present in chelonia is
(1) One (2) Zero
(3) Two (4) None

30. **A:** Chelonians are said to have longest lifespan.
R: A testudo of Galapagos attains an estimated age of 200 to 400 years.
(1) A & R are correct
(2) A & R are wrong
(3) A & R are correct, R is the correct explanation
(4) A & R are correct R is not the explanation to A

31. Match the following:
(A) Naja Naja
(B) Brungarus Coerulus
(C) Echis Carinata
(D) Vipera Russeli
1. Fourth infra labial is largest.
2. Hood is absent
3. Third supra labial touches the eye & nostril
4. An arrow mark on the head.
5. Two rows of sub caudals scales.

	A	B	C	D
(1)	III	I	IV	V
(2)	II	III	IV	V
(3)	I	II	III	IV
(4)	V	IV	III	I

32. Chordates are called deuterostomes because
(1) blastopore becomes the anus

(2) blastopore becomes the mouth
(3) coelom formed from archenteron
(4) coelom formed by splitting of embryonic mesoderm

33. The phenomenon in which the larva becomes sexually mature is termed
(1) Neoteny
(2) Paedogenesis
(3) Polyembryony
(4) Parthenogenesis

34. During retrogressive metamorphosis of ascidians
(1) tail disappears
(2) notochord disappears
(3) dorsal tubular nerve cord is reduced to a mere ganglion
(4) all the above

35. The extinct jawless fishes are
(1) Placoderms
(2) Ostracoderms
(3) Cyclostomes
(4) Lancelets

36. Anamniotes are
(1) fishes and amphibians
(2) reptiles and birds
(3) birds and mammals
(4) amphibians and birds

37. Ammocoete is the larval form of
(1) Petromyzon (2) Myxine
(2) Ascidia (4) Branchiostoma

38. Golden age of fishes is
(2) Ordovician period
(3) Carboniferous period
(4) Devonian period
(5) Paleozoic period

39. Mystichthys lozerensis is the
(1) largest fish
(2) smallest fish
(3) longest amphibian
(4) smallest amphibian

40. Lateral line sense organs in fishes are
(1) Thermoreceptors
(2) Chemoreceptors
(3) Auditory receptors
(4) Rheoreceptors

41. The fish regarded as living fossil is
(1) Latimeria (2) Polypterus
(2) Neoceratodus (4) Acipenser

42. The fish which has prehensile tail is
(1) Exocoetus (2) Hippocampus
(2) Echeneis (4) Latimaria

43. Venous heart is found in
(1) Anura (2) Urodela
(2) Apoda (4) Teleostei

44. Pulmonary and systemic arteries in some amphibians are connected by
(1) Ductus Botalli
(2) Ductus Caroticus
(3) Ductus Deferens
(4) Stensen's duct

45. Flying frog is
(1) Rhacophorus (2) Hyla
(3) Pipa (4) Bufo

46. The cutaneous poison glands of toads are
(1) prostate glands
(2) parotid glands
(3) infra orbital glands
(4) none of the above

KEY

1. 3	2. 4	3. 3	4. 3	5. 2
6. 3	7. 1	8. 1	9. 4	10. 2
11. 4	12. 2	13. 2	14. 3	15. 4
16. 4	17. 2	18. 2	19. 2	20. 2
21. 1	22. 3	23. 1	24. 1	25. 1
26. 1	27. 3	28. 2	29. 2	30. 4
31. 1	32. 1	33. 1	34. 4	35. 2
36. 1	37. 1	38. 3	39. 2	40. 4
41. 1	42. 2	43. 4	44. 1	45. 1
46. 2				

AVES & MAMMALIA

AVES:

Birds are endo thermal (or) Worm Blooded Animals.

T.H. Huxley aptly called birds as " Glorified Reptiles"

Birds become modernized in the cretaceous period.

Young described birds as 'Masters or Air'.

Presently 8590 species are known to be as living birds.

The body of birds is stream lined and completely arranged to suit their adaptation for flight.

It is normally spindle shaped & light due to presence of air sacs. Forelimbs are modified as wings. Hind limbs are large and bear the weight of the whole animal. They are variously helpful for capture of food swimming perching etc.

- Body is covered by feathers. They form a part of the exo skeleton.
- Endo skeleton is modified (or) Adapted for flight.
- Bones are pneumatic without bone marrow.
- Skull is Monocondylic.
- Vertebrae are Hetercoelus, vertebral ribs are double headed.
- Few thoracic lumbor sacral & few caudal vertebrae fuse to form a syn sacrum.
- Tail vertebrae are few & fuse to form pygostyle.
- Sternum with mid ventral keel (or) carina for Acomodation of large flight muscles.
- Claricles on either side joint to form 'furcula' is called wish bone.
- The Muscular system is modified to meet the Aerial mode of life.
- The muscles concerned with the activity of the wings are called flight muscles.

Pectoralis Major: These constitute about 1/5 of the total body weight. Powerful musles cause down stroke.

Pectoralis Mnor: Situated on the dorsal side of the pectoralis major. They help in elevating the wings.

Coraco branchialis longues & coraco brachialis brevis. They rotate the wing in the Glenoid cavity.

Oesaphagus: is frequently dilated into a crop for storage. Stomach is divided into a Glandular proventriculus & muscular gizzard (ventriculus)

- Heart is '4' chambered sinus venosus & truncus anterioses is absent only Right artic arch present. Renal partial system is vestigeal.
- Pulmonary respiration takes place. Lungs are spongy. Non Alveolor contains '9' air sacs.

1) Cervical air sac-2
2) Anterior thoracic air sacs – 2
3) Posterior thoracic air sacs-2
4) Abdominal air sac – 2
5) inter clavicle air sac – 1

- In birds larynx does not perform the function of voice producing. But 'syrinx' is called voice box.
- Double respiration is present in flying birds.
- Kidneys are metamorphic & '3' lobed. Urinary Bladder is absent. Exretory product is uric acid (uricotelic)
- Brain is large & smooth cranial nerves are '12' pairs.
- Eyes are large & posses well developed nictitating membrane.
  A vascular plated projection into the cavity of the eye called pecten on retina serves the function of protection.

- Sexes are separate female has single functional left ovary & oviduct.
- Fertilisation is internal oviparous.

Feathers

Counter feathers **Quill feathers** **Filopelumes** **Down feathers**

Counter feathers: They form the general covering of the body. Each counter feather has a central axis & a vane. The barbs are free and there is no inter lacking mechanism. The feathers are arranged in regular tracks called pterylae. The arrangement of feathers is called pterylation.

Quill feathers: The quill feathers are present on tail & wings wing feather are called Remiges and the quill feathers are present on tail is called retrices.

The axis of the quill feathers is divided into a proximal hollow quill or calomus & a expanded portion. The vane has central axis or Rachis. Expanded part of feathers is composed of barbs, barbules. And barbicels with an interlocking mechanism.

Preen glands: There is single oil gland or preen gland on the tail. It provides waxy coating on the quill feathers.

Filopelumus: There are small delicate feathers with short calamus and weak barbs. They are sparsely distributed covering the inter spaces.

Down feathers: There are small, soft & wooly feathers which differ from contour feathers in the absence of Rachis. They form covering of new natal newly hatched birds & provide excellent insulation. Helping in heat retention & provide and protection.

MAMMALS

1. Primary character of class mammalian – presence of mammary glands.
2. The study of mmmary glands – Mastology.
3. The study of mammals – Mammology
4. Mammals were originated during – Triassic period.
5. Ancestors of mammals are – Theropsid reptiles.
6. Age of mammals – Coenozoic era (Tertiary period)
7. The body of mammals is externally covered with – Hairs.
8. Main chemical substance present in hair – Keratin.
9. The loss of heat from a mammalian body is prevented by hairy coat.
10. Hair in mammals arises from – Ectoderm.
11. Form of exoskeleton in mammals – Hairs, claws, nails, looves, horns etc.
12. Mammals without hairs – Cetacea (Aquatic mammals) Ex: Whales, Dolphins.
13. Mammals with sparcely distributed hair – Hippopotamus.
14. Mammal with hair in palm and sole – Seal
15. Vertebrates with ability to adopt any type of environment – Mammals.

16. The body temperature of mammals vary between – 98°F.
17. Highly evolved tetrapods – Mammals.
18. Division of the body of mammals – Head, Neck , Trunk and Tail.
19. Thick and water proof skin is characteristic feature of – Mammals.
20. Glands present in the skin of mammals – Sweat, Sebaceous, Scent and mammary glands.
21. Sweat gland are also called – Sudorific glands.
22. Sweat gland arises from – Epidermis
23. Sweat gland are present with in – Dermis.
24. The function of sweat gland – regulation of body temperature.
25. red Sweat is secreted by – Macropus Rufus (Marsupial Mammals)
26. The glands that opens into the hair follicles – Sebaceous glands.
27. The sebaceous glands produce - Sebum.
28. The skin of the mammal is kept soft and smooth by – Sebum.
29. The sebaceous glands of the pectoral region are modified into mammary glands (except in prototheria)
30. Mammals without sweat glands – Sea cow, Whales, Tachy – Glossus, Pangolians.
31. Body temperature in aquatic mammals is maintained by – Blubber.
32. The thick fatty in the subcutaneous layer of aquatic mammals.
33. Scent glands of mammals are the modification of – sweat sebaceous glands.
34. Scent glands are present near eyes in – Deer.
35. Scent glands are present near anus – Shunks.
36. The strong horn of Rhinoceros is modified – Tuft of hair of Keratinised skin.
37. Secondary function of sweat glands – Excretion.
38. Mammary glands of prototheria are modified – sweat glands.
39. Function of Mammary glands – Production of Milk.
40. The first formed milk – Colostrum
41. Colostrum is rich in – antibodies.
42. Number of limbs in mammals are adopted to – Walking, running, climbing, burrowing, swimming and flying.
43. The mammals without hind limbs – Sea cow, Whales.
44. The for limbs of aquatic mammals are modified into – flippers.
45. Number of eyes in mammals – a pair.
46. Eye of mammals are protected by – eye lids.
47. The hairy lining of eye lids of mammals – eye lashes.
48. The function of eye lid (nictitating membrane) of mammal keep the eye ball moist.
49. Vestigial third eye lid (nictitating membrane) of mammal plica semilunaris.
50. Glands present associated with the eyes of mammals – meibo main glands, harderian glands, lacrimal glands.

NAMES AND EXAMPLES OF THE ORDERS OF SUB CLASS EUTHERIA

S.No	Name of the Order	Examples
1.	Insectivora	Shrew (Sorex), Mole (Talpa)
2.	Chiroptera	Pteropus (flying foxfruit eating bat, desmodus
3.	Dermoptera	(vampla bat)
4.	Edentata	Cycocephalus (flying lemur)
5.	Pholiodota	Daypus (armadillo)
6.	Primates	Manis (scaly ant eater)
7.	Rodentia	Ape, man, loris, lemur, tar si.
8.	Logomorph	Rat (Rattus), Squirral (Funambuluo)
9.	Cetacea (aquatic	Rabbit (oryctolagus) Hare (lepus)
10.	mammals)	Mystacoceti (whalebone whale)
11.	Sirenia	Dugong, rhytina
12.	Cornivora	Dog, Cat, Tiger, Lion
13.	Hyracoidea	Conies
14.	Probascida	Elephas indicua, loxodontafricana
15.	Perissodactyle	Horse, Zebra, wild ass.
	Artiodactyle	Pig, Camel, Sheep, Goat.

AVES & MAMMALS

1. The National Bird of India
   (1) Corresplendens
   (2) Pisttacula
   (3) Pavocristasus
   (4) Columba

2. The gland whose secretions protect the feather from wetting is
   (1) Meibomian gland
   (2) Lacrimal gland
   (3) Sweat gland
   (4) Preen gland

3. Read the following statements & choose the correct answers.
   (A) Flying birds are having pneumatic bones
   (B) Ratitae bird are lack of pneumatic bones, because they are cursorial
   (C) In flying birds '9' extra airsacs are present in their respiratory system.
   (D) All Ratitae birds are monogamous
   (2) A & B are correct only
   (2) C & D are correct only
   (3) A ,B&C are correct
   (4) All of the above are correct

4. Match the following.
   A. Pavocrustasus
   B. Struthiocomalus
   C. Humming bird
   D. Archeopteryx
   I. The bird which can fly backward
   II. Largest mammal
   III. Largest bird
   IV. National bird of India
   V. Connecting link between Reptiles & Aves

	A	B	C	D
1)	II	III	IV	V
2)	IV	II	I	V
3)	IV	III	I	V
4)	IV	III	I	II

5. The Vertebrae of a birds are described as
   (1) Amphicoelous
   (2) Amphiplatyon
   (3) Heterocoeles
   (4) Acoelus

6. Spot out the Avian feature of Archeopteryx
   (1) Absence of Uncinate Processes
   (2) Presence of a keel
   (3) Presence of Abdominal ribs
   (4) Presence of a furcula

7. This organ is absent in bird.
   (1) Gall baldder
   (2) Urinary bladder
   (3) Swim bladder
   (4) All the above

8. Which one of the bird is viviparous
   (1) Ostrich
   (2) Eudynamous
   (3) Penguin
   (4) Albatross

9. The vision in birds is seen
   (1) Monocular Telescopic
   (2) Binocular, Myopic
   (3) Binocular, Telescopic
   (4) Monocular, Myopic

10. Presence of keel(on the sternum) is the characteristic feature of
    (1) All chordates
    (2) All vertebrates
    (3) Birds
    (4) Amniotes

11. These are absent in Modern birds
    (1) Scales
    (2) Feathers
    (3) Teeth
    (4) None

12. Remiges & Retrices are
    (1) Down feathers
    (2) Filope lumes
    (3) Quill feathers
    (4) Counter feathers

13. Four chamered heart is the chartericstics of
    (1) Birds
    (2) Crocodile
    (3) Mammals
    (4) All

14. The Migration in birds is initiated by
    (1) Shortage of food
    (2) Search of shelter
    (3) Purpose of breeding
    (4) Day light effecting the endocrine gland

15. Migration of bird is called
    (1) Migrinology
    (2) Orinthology
    (3) Phenology
    (4) Nidology

16. An ornithologist known as "Bird man of India"
    (1) Dr. M.S. Mani
    (2) Dr. Salim Ali
    (3) Dr. J.C. Bose
    (4) Huxley

17. In birds the R.B.C. are
    (1) Mono nucleate
    (2) Binucleate
    (3) Multi nucleate
    (4) Anucleate

18. In birds food is well pulverized in
    (1) Crop
    (2) Intestine
    (3) Gizzard
    (4) Proventriculus

19. The chief excretory product of birds is
    (1) Ammonia
    (2) Urea
    (3) Uric acid
    (4) Water

20. Syrinx is present in one of the following bird.
    (1) Rhea
    (2) Struthiio
    (3) Kiwi
    (4) None

21. The Mammary glands are the modifications of
    (1) Sudurifec glands
    (2) Sabacceous glands
    (3) Thorasic glands
    (4) Adrenal glands

22. The number of spinal nerves in rabbit
    (1) 33 pairs
    (2) 32 pairs
    (3) 37 pairs
    (4) 40 pairs

23. Acetyl choline is released by
    (1) Opthalmic Nerve
    (2) Sympathetic Nerve
    (3) Vagus Nerve
    (4) Olfactory Nerve

24. Match the following & choose the correct answer
    A. Meniges
    B. Corpus Collasum
    C. '33'pairs
    D. Rhinocoel
    I I ventricle
    II. Tri layered membrane covered to the brain
    III II ventricle of brain
    IV Spinal nerves in man
    V Connection between right & left cerebral hemisphere in mammals.

	A	B	C	D
I)	I	V	IV	III
II)	II	IV	III	V
III)	II	IV	II	III
IV)	II	V	IV	I

25. The egg of mammal is
    (1) Alecithal
    (2) Mesolecithal
    (3) Megalecithal
    (4) None of these

26. Which is the common character between all the mammals.
    (1) Viviparity
    (2) Herbivores
    (3) They have'7' cervical vertebrae
    (4) Carnivores

27. The cutting teeth of mammals are
    (1) Incisors
    (2) Canine
    (3) Premolar
    (4) Molar

28. The vertebrae of mammals are
    (1) Amphicoclous
    (2) Heterocoeles
    (3) Amphiplatyon
    (4) None

29. The largest mammal is known as
    (1) Dugong
    (2) Zirafee
    (3) Elephant
    (4) Balaenoptera

30. The diagnostic character of mammal is
    (1) Homeothermy
    (2) Diaphragm
    (3) Viviparity
    (4) Dicondyly

31. Mammals are evolved from
    (1) Reptiles
    (2) Birds
    (3) Amphibia
    (4) Fishes

32. Hairless mammal is
    (1) Bat
    (2) Monkey
    (3) Man
    (4) Whale

33. RBC do not have nucleus in
(1) Columba
(2) Catla
(3) Rhacophores
(4) Elephant

34. Which are the following is worm blooded animal
(1) Cockroach
(2) Whale
(3) Sea horse
(4) Snake

35. Dentition is man is
(1) Diphyodant, Thecodant & Heterodant
(2) Monophyodont, Thecodant & Heterodant
(3) Diphyodant, Acrodant & Homodant
(4) None of these

36. Dental formual of man is
(1) 2123 / 2123
(2) 2132 / 2132
(3) 2122 / 2122
(4) 2123 / 2124

37. The tusks of elephant are modified
(1) Incissors
(2) Canine
(3) Pre molar
(4) Molar

38. Connecting link between reptiles & mammals are
(1) Prototheria
(2) Metatheria
(3) Eutheria
(4) None

39. Hair in mammals are kept in healthy condition by
(1) Sweat gland
(2) Sabaceous gland
(3) Mucous gland
(4) None

40. Match the following & choose the correct answer.
A. Sweat glands
B. Mammary glands
C. Meibomion glands
D. Ceruminous glands
E Lacrimal glands
I. Lubricate the conjunctiva of eye
II. Secretion of tears
III. Wax glands of ear
IV Modified sebaceous glands
V. Performs homeothermy

	A	B	C	D	E
1)	I	II	III	IV	V
2)	V	IV	I	II	III
3)	V	IV	I	III	II
4)	IV	V	III	II	I

41. Identify the correct statement.
A. Protheria is the connecting link between reptiles & mammals
B. Mammals are evolved from fossil birds
C. Gynacomastism is the characteristic of prototheria
(1) A & B are correct
(2) B & C are correct
(3) A & C are true but B is false
(4) B & C are true but A is false

42. Land of Archiac mammals is called
(1) New Zealand
(2) Africa
(3) Australia
(4) Arabia

43. Mammary glands are without teats & nipples in
(1) Protheria
(2) Metatheria
(3) Eutheria
(4) None

44. An example of egg lying mammal
(1) Ostrich
(2) Kangaroo
(3) Platypus
(4) Elephant

45. One of the following is known as the 'National Animal of India'.
(1) Panthra leo
(2) Panthra tigris
(3) Equas zirafee
(4) Loxodanta

46. One of the following is known as the largest terrestrial mammal
(1) Equas zirafee
(2) Tiger
(3) Loxodanta Africana
(4) Ostrich

47. A mammal in which sweat glands are absent
(1) Monkey
(2) Cow
(3) Whale
(4) Pig

48. The gestation period in woman is
(1) 270 days
(2) 280 days
(3) 600 days
(4) 30 days

49. Placentalia is called
(1) Metatheria
(2) Eutheria
(3) Prototheria
(4) None

50. The mammalian embryo get its nourishment from its mother through
(1) Anmiotic Membrane
(2) Trophoblast
(3) Placenta
(4) Yolk sac

51. 'T' shaped interclavicle is a part of
(1) skull
(2) pectoral girdle
(3) pelvic girdle
(4) sternum

52. The skull of chelonians is
(1) Diapsid
(2) Synapsid
(3) Parapsid
(4) Anapsid

53. Cloacal respiration occurs in some
(1) sharks
(2) freshwater snakes
(3) marine snakes
(4) chelonians

54. Poisonous lizard is
(1) Hemidactylus
(2) Gecko
(3) Uromastix
(4) Heloderma

55. The glands modified into poisonous glands in snakes are
(1) Supralabial glands
(2) Parotid glands
(3) Supralingual glands
(4) Carotid glands

56. The snake whose venom damages the blood vascular system of the victim is
(1) Viper
(2) Krait
(3) Cobra
(4) Sea snake

57. Viviparous snake is
(1) Dryophis
(2) Natrix
(3) Rat sacks
(4) Bungarus

58. The mammalian character present in crocodiles is
(1) Thecodont teeth
(2) Presence of palate
(3) Presence of diaphragm
(4) All the above

59. The poison which causes respiratory paralysis
(1) Cobradine
(2) Hypnotoxin
(3) Viperine
(4) Cobradine and Viperine

60. In poisonous snakes, the fangs are modifications of
(1) Maxillary teeth
(2) Palatine teeth
(3) Mandibulary teeth
(4) Vomerine teeth

61. The statement "birds are glorified reptiles" was made by
(1) Henle
(2) Huxley
(3) Holmes
(4) Henry

62. The most important character of lungs of birds is
(1) high elasticity
(2) presence of alveoli
(3) presence of infundibula
(4) presence of air sacs

63. The sound producing organ in birds is
(1) Larynx
(2) Syrinx
(3) Trachea
(4) Bronchus

64. Type of vertebrae in modern birds is
(1) Amphiplatyan
(2) Procoelous
(3) Amphicoelous
(4) Heterocoelous

65. 'V' shaped furcula in birds is formed by the union of
(1) Scapula
(2) Pubis
(3) Ischia
(4) Clavicles

66. In birds, the feathers are arranged in regular tracts known as
(1) Apteria
(2) Pterylae
(3) Calamus
(4) Contour

67. Mammary glands are the modification of
(1) sweat glands
(2) parotid glands
(3) sebaceous glands
(4) lacrimal glands

68. The type of vertebrate in mammalia is
(1) Procoelous
(2) Amphicoelus
(3) Amphiplatyan
(4) Heteroceolous

69. The smallest bone is
(1) Malleus
(2) Quadrate
(3) Stapes
(4) Incus

70. In mammals the two cerebral hemispheres are connected by
(1) Corpora quadrigemina
(2) Aqueduct of sylvius
(3) Corpus Callosum
(4) Pons Varoli

71. Prototherians are described as 'unfinished mammals' by
(1) Colbert
(2) Huxley
(3) Romer
(4) Darwin

72. The distinctive feature of prototheria is
(1) presence of mammary glands without teats
(2) mammary glands are modified sweat glands
(3) gynaecomastism
(4) all the above

73. Remiges and retrices are
(1) Quill feathers
(2) Down feathers
(3) Filophumes
(4) Aftershafts

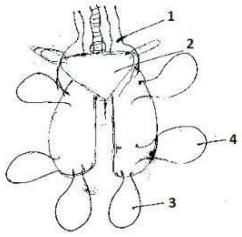
74) Match the following and choose the correct answer

A:	Kiwi	I. Mexican Ostrich
B:	Struthio comalus	II. Australian Ostrich
C:	Cassowary	III. Newzeland
D:	Tinamou	IV. Smallest bird
		V. African Ostrich

	A	B	C	D
1)	I	II	III	IV
2)	III	IV	V	I
3)	III	V	IV	I
4)	III	V	II	I

75) (Ascertain) A: In birds a muscular ventricles is called gizzard.
(Reason) R: Because it grinds the food.
1) A is true, R is false.
2) A is true, R is true, but R is not the correct explanation of A.
3) A is true, R is true and but R is the correct explanation.
4) A is false, R is false and R is the correct explanation of A.

76) Find at the correct series of names.



1) Posterior thoracic air sac, Cervical air sac, Abdominal air sac
2) Abdominal air sac, Cervical air sac, Inter clavicle
3) Cervical air sac, Abdominal air sac, Inter clavicle
4) Cervical air sac, Inter clavicle, Abdominal air sac

77) (Assertion) A: Birds are uricotelic.
(Reason) R: Because Urinary bladder is absent in flying birds
1) A is true, R is false.
2) A is true, R is true, but R is not the correct explanation of A.
3) A is false, R is true and R is the correct explanation of A.
4) A and R are true and R is the correct explanation of A.

78) Find out the correct statement.
A: T.H Huxley describe the birds as "Glorified Reptiles".
B: J.Z Young called them "Masters of Air".
C: Study of Birds is called Rhinology.
1) A is true, B is false, C is false.
2) A and C are true, B is false.
3) A and B are true, C is false.
4) A, B and C are true, none is false.

79) (Assertion) A: Gynacomastism is seen in prototheria.
(Reason) R: Mammary glands are functional in males.
1) A is true, R is false.
2) A is false, R is true.
3) A is true, R is true and R is the correct explanation of A.
4) A is true, R is true and R is the correct explanation of A.

80) (Assertion) A: Mammary glands are lactational glands.
(Reason) R: Mammary glands are modified sweat glands.
1) A is true, R is false.
2) A and R are true, but R is not the correct explanation of A.
3) A and R are false, but R is the correct explanation of A.
4) A is true, R is false, but R is the correct explanation of A.

KEY

1. 3	2. 4	3. 3	4. 3	5. 3
6. 4	7. 4	8. 3	9. 1	10. 3
11. 3	12. 3	13. 4	14. 4	15. 3
16. 2	17. 3	18. 3	19. 3	20. 1
21. 2	22. 3	23. 2	24. 4	25. 1
26. 3	27. 1	28. 3	29. 4	30. 2
31. 1	32. 4	33. 4	34. 2	35. 1
36. 1	37. 1	38. 1	39. 2	40. 3
41. 3	42. 3	43. 1	44. 3	45. 2
46. 3	47. 3	48. 2	49. 2	50. 3
51. 2	52. 4	53. 4	54. 4	55. 1
56. 1	57. 1	58. 4	59. 1	60. 1
61. 2	62. 3	63. 2	64. 4	65. 4
66. 2	67. 3	68. 3	69. 3	70. 3
71. 3	72. 4	73. 1	74. 4	75. 3
76. 4	77. 2	78. 3	79. 4	80. 2

6. Locomotion & Reproduction in Protozoa

SYNOPSIS

1. Protozoa which is the first phylum in invertebrate includes primitive unicellular animals.
2. They show more clear5 variation in locomotion and reproduction.
3. Locomotion means movement of organism in a medium.
4. Living organisms show locomotion.
5. If organisms change from one place to another place it is locomotion. If changes position of its body parts it is called movement.
6. Amoeboid movement is by pseudopodia.
   Ex:- Amoeba
7. Cilia and flagella bring swimming movement. Ex:- Paramoecium and Euglena.
8. Myonemes contraction bring metaboly or gliding movement.
   Ex:- Paramoecium and Euglena
9. Reproduction saves the species from extinction.
10. Reproduction ensures genetic continuity from generation to generation.
11. Reproduction in protozoa is by asexual and sexual methods.

STRUCTURE OF LOCOMOTORY ORGANELLES IN PROTOZOA:

Pseudopodia, cilla and flagella are the locomotory organelles of protozoa. They are useful in locomotion and food collection.

A. PSEUDOPODIA:

1. by the contraction of cytoplasm temporary projections from plasmalemma are formed.
   These are called pseudopodia.
2. These are the chief locomotary organelles of members of class Rhizopoda.
   Ex:- Amoeba
3. Certain flagellates also show pseudopodia.
4. Testaceans like Arcella also show Pseudopodia.
5. Four types of pseudopodia are seen:
   a) Blunt finger pseudopodia with ecto and endoplasm is Lobopodium. Ex:- Amoeba and Entamoeba.
   b) Filament like, with pointed tip and contain ectoplasm is Filopodium. Ex:- Euglypha and Lecithium.
   c) Filamentous, branched pseudopodia from a network is Reticulopodia (or) Myxopodia.

Their main function is food collection and also help in locomotion. Ex:- Elphidium and Chalmydophrys.

d) Spiny transparent filaments presents radially on the cell body is Axopodia. Their main function is food collection. Ex:- Actinosphaerium and Actinophrys.

B. CILIA:

1. Cilia are the chief locomotory organelles of class Ciliata. Ex:- Paramoecium, Vorticella.
2. Acineta of class Suctoria also show cilia in the young condition.
3. Cilia help in food collection, locomotion and also work as tactile sense organs.
4. Cilia number is unlimited.
   Ex:- Paramoecium – 10,000 to 14,000
   Prorodonteres – 11,600.
5. Basal granules present in the ectoplasm give rise to cilia.
6. Cilium contains axoneme with 11 longitudinal filaments (two central filaments and nine pairs (2+9) of pheripheral Filaments). These filaments are made by globular protein tubulin.

C. FLAGELLUM:

1. Super class Flagellate (or) mastigophora members show flagellum as locomotary organellae.
2. Flagellum arises from basal granule present in ectoplasm.
3. Flagellum resembles cilium in its structure and functions.
4. Flagellum differs from cilia in origin, number and arrangement.
5. Cilia are present all over the body but flagellum arises from a definite place of cell like anterior end.
6. Number of cilia is from 10 to 14 thousand where as flagella are 1 or 2.
7. Cilium is short but flagellum is whip like long structure.
8. Cilium has no flimmers but flagella show flimmers (or) mastigonems.
9. Cilium shows axoneme, with 9+2 arrangemnets and covered by protoplasmic sheath.
10. Based on the arrangement of filaments on the flagellum, they are classified in 4 types.
11. Flagellum with one lateral rows of flimmers – Stichonematic. Ex:- Eugelena, Astasia.
12. Flagellum with two or more rows of flimmers – Pentanematic. Ex:- Paranema, Monas socialis.
13. Flagellum without flimmers and end with naked axoneme as a terminal filament – Acronematic. Ex:- Chlamydomonas and Polystoma.

14. Flagellum with one or two rows of filaments and with one terminal filament – Pentaacronematic.

TYPES OF LOCOMOTION IN PROTOZOA:

Four types – Amoeboid, ciliary, flagellar and metaboly.

AMOEBOID MOVEMENT:

1. The locomotory organelles in Amoeba are **Pseudopodia.** It contains the protein **Actin.**
2. As the pseudopodia are blunt and finger shaped they are called **Lobopodia**.
3. Pseudopodia in Amoeba are useful for locomotion and food capturing.
4. Pseudopodia are temporary structure formed by sol gel trans – formation of cytoplasm.
5. The movement with pseudopodium is known as amoeboid movement, which is effected by streaming movement of endoplasm.
6. The movement of granules of endoplasm causing streaming is known as **Brownian movement**.
7. Pseudopodium in Amoeba are formed by both ectoplasm and endoplasm.
8. The thickened ectoplasm at the tip of the pseudopodium is called **Hyaline Cap**.
9. Several theories were proposed by Scientists to explain the formation pseudopodium and amoeboid movement.
10. **Contraction theory** was proposed by Dellinger. According to this theory the contraction of endoplasm at the posterior region of the pseudopodium attaches to the substratum, contracts and pulls the body forward.
11. **Surface tension theory :**
    It was proposed by **Berthold** and supported by **BUTCHILI AND Rhumbler.** According to this theory the protoplasm tends to become round or spherical due to the surface tension. If it reduced at any point, the protoplasm flows outwards and forms a pseudopodium at the region.
12. **Rolling movement theory** was proposed by **Jennings.** According to this theory Amoeba virrucosa rolls on the substratum like a water drop.
13. Sol gel theory or change of viscosity theory was proposed by **L.H.Hyman** and supported by **Pantin & Mast.**
14. According to sol gels theory was proposed by Allen, which is widely accepted.
15. Fountain zone theory was proposed by Allen, Which is widely accepted.
16. Gold Acre and Lorch proposed backward Contraction theory.
17. Allen proposed forward contraction theory
18. Gold Acre, Lorch and Allen found important proteins like Actomysin and ATP sensitive proteins in the protoplasm of Amoeba. Sol state is due to the folding of these proteins, get state is due to the unfolding of these proteins.

19. The most recent and widely accepted theory of amoeboid movement is sol-gel theory.
20. The pseudopodia in Amoeba are formed by Sol gel transformation of cytoplasm.

CILIARY AND FLAGELLAR MOVEMENT:

1. Cilia and flagella move backwards and forwards which bring swimming movement.
2. Cilia show collective movement.
3. Flagella show solitary movement.
4. In paramecium cilia are arranged in longitudinal and horizontal rows.
5. The collective movements of cilia are 2 types i.e. synschornus and metachronous movements. Ex:- Transverse row cilia
6. Movement of cilia [present in different axes one after another- Metachronous. Ex:- Cilia in a longitudinal row
7. Matachronous movement is like away movements in paddy field because of wind blows in one direction.
8. Neuromotor system in paramecium controls ciliary movements.
9. Basal granules, transverse and longitudinal fibrils constitute infraciliay system. It is connected to neuromotorium to become neuromotor system.
10. If neuromotor system is damaged ciliary movement is stopped.
11. Paramoecium move 1500 microns per second.
12. The energy required for ciliary movement is derived from ATP.
13. Cilia and flagella show effective and recovery strokes.
14. Cilium or flagellum bends backwards effective stroke. This makes body to move, it needs ATP
15. Cilium or flagellum comes to original position form backwards – Recovery stroke.
16. Recovery stroke keeps the body movement in an Order. ATP is not required.
17. Euglena moves 15 to 300 microns per second.

METABOLY:

1. Myonemal contraction bring zig–zag movement of the body called – Metaboly.
2. Flagellates and sporozoans show metaboly.
3. Euglena shows metaboly called Euglenoid Movement.
4. Monocystis (Gregarian) shows metaboly called " Gregarian Movement"
5. Body becomes thin and short and can pass through narrow passage due to metaboly.

PROTOZOA – REPRODUCTIVE METHODS

Asexual, sexual and encystment are 3 types of reproduction are seen in Protozoa.

A. ASEXUAL REPRODUCTION :

1 In asexual reproduction gametes are not formed. It takes place in favourable conditions.
2 Binary fusion is the most important asexual method in Protozoa.

BINARY FISSION :

1. Binary fission is either transverse or longitudinal.
2. Paramoecium reproduced by transverse binary fission. It is completed in 2 hours.
3. During binary fission paramecium stops feeding. Micronucleus undergoes mitosis. Macronucleus undergoes endomitosis or amitosis.
4. In endomitosis nuclear membrane will not disappear and macronucleus becomes long. It divides into two without any internal change.
5. In this binary fission contractile vacuoles and cytopharynx will not divide in paramoeclum.
6. Anterior daughter proter and posterior daughter opisthe are formed after binary fission in paramecium.
7. Proter gets parents anterior contractile vacuole and cytopharynx.
8. Opisthe receives posterior contractile vacuole of parent paramecium.
9. Opisthe develops new cytopharynx.
10. After developing second contractile vacuole proter and opisthe separate and lead independent life.
11. If temperature is 24 ^{0}C and sufficient food is available, paramecium can undergo 4 binary fissions in a day
12. Clone – a group of paramecia formed from a single parent. It represents one generation.
13. All the members of a clone show similar genotypeand phenotype.

LONGITUDINAL BINARY FISSION:

1. Euglena, Trypanosoma show anterior – posterior vertical division. It is called longitudinal binary fission.
2. In the binary fission nucleuse of euglena undergoes mitotic division. Its endosome and nuclear membrane divide horizontally into two.
3. At the anterior end of the cell a constriction appears before the completion of karyokinesis.
4. Stigma, basal granules, cytopharynx, reservoir and chromatophore undergo division. But flagellum does not divide but goes to one daughter Euglena. The other individual develop a new flagellum.
5. Daughter Euglenae are identical and symmetrical hence the division is called “Symmetrogenic division”

B. SEXUAL REPRODUCTION :

1. Union of male and female gametes is called sexual reproduction.
2. Most common and important sexual method is conjugation. Ex:- Paramoecium and Vorticella.
3. Conjugation is a temporary union between two ciliates, belonging to two different clones for exchange and reconstitution of nuclear material. This definition is given by Wichterman in 1953.
4. Unfavorable conditions, failure of macronucleus to perform its vegetation functions. Decrease of vitality, when organism becomes sexually mature etc.. are the conditions favorable for conjunction.
5. Fresh water ciliate vorticella is called bell animal cule.
6. Vorticella is stalked and sedentary animal.
7. Vorticella shows anisogametogony.
8. Vorticella shows unequal female or macro – gamont and male gamont or microgamont.
9. Male gamont is small free living and does not take food. It shows a ciliary band at the posteriors end. Its life span is 24 hours.
10. Female gamont is large stalked. Sedentary and it can attract male gamont for two hours only
11. In Vorticella hebulifera many male gamonts are formed but in V. campanula only one male gamont is formed .
12. Male gamont attaches to female gamont with its aboral end at 1/ 3 distance near posterior end of female gamont.
13. The micronuclei of both the gamonts disintegrate.
14. The prezygotic nuclear divisions in male gamont's micronucleus are two. First one is reductional and second is equational Hence 8 haploid nuclei are formed.
15. The prezygotic nuclear division in female gamont is one. It is reductional and 4 haploid nuclei are formed in it.
16. The haploid number of chromosomes is two in vorticella.
17. In male gamont 7 out of 8 and in female gamont 3 out of 4 micronuclei disintegrate.
18. These nuclei reach nearer than the membrane between two gamonts rupture. Cytoplasm of both gamonts merge.
19. Each nucleus divide into two. One will disintegrate.
20. The nucleus of microgamont becomes male pronucleus and the nucleus of macrogamont becomes female pronucleus.
21. Prezygotic nuclear divisions in macrogamont are i) Reduction division ii) Mitotic division.
22. Prezygotic nucleus divisions in microgamont are
    i) Reduction division

ii) Mitotic division and
iii) Meiotic division

23. Union of male pronucleus with female pronucleus and marger of two cytoplasms is called Amphimixis. It results in the formation of diploid synkaryon.
24. The macrogamont with synkaryon is called zygote.
25. After conjugation microgamont perishes.
26. In vorticella monilate in each gamont male and female pronuclei are formed. In both gamonts synkaryon is formed. Water microgamont with nucleus disintegrates.
27. The diploid synkaryon undergoes 3 post zygotic division. 8 nucleiare formed out of which 7 become macronuclei and 1 becomes micronucleus.
28. Then the zygote undergoes 3 post conjugant fissions with micronuclear divisions, at each fission 7 individuals are formed.

29. Significance of conjugation :

a) Conjugation brings vitality and rejuvenation.
b) New macronucleus is formed. It can perform vegetative functions more efficiently.
c) New variations develop. It leads to the formation of new species.
d) Nuclear and Cytoplasmic ratio is established.
e) 7 individulas are formed.

30 . Comparison of conjugation process of Vorticella with that of Paramoecium :

S.No.	Paramoecium	Vorticella
1.	Equal conjugants.	Unequal conjugants.
2..	They unite on their Ventral Side.	Male gamete attaches at the base of female.
3	Nuclear fusion only.	Nuclear and Cytoplas – mic fusions
4	Conjugants separates as Exconjugants	Do not separate.
5	Sexual dimorphism absent	Present
6	Adult become conjugant.	Binary fission gives male gamete.
7	Both conjugants are motile.	Male is motile. Female is stationary
8	8 individuals are formed.	7 Individuals are formed.

LOCOMOTION & REPRODUCTION

1. How many flagella are present in giardia lamblia.
   (1) 8 (2) 7 (3) 10 (4) 12

2. The daughter vorticella formed in longitudinal binary fission is
   (1) Mesotroch (2) Telotroch
   (3) Anterotroch (4) None

3. The structures that help in locomotion in most of the sporozoans.
   (1) Microtubules (2) Microtriches
   (3) Myonemes (4) Myocytes

4. Illustrate the following.
   A. In ceratium flagellum is laterally formed.
   B. Oblique binary fission takes place in ceratium.
   C. Ceratium is a bioluminicent protist.
   (1) A is incorrect, B & C are correct
   (2) A & B are correct, C is fasle
   (3) A, B & C are correct
   (4) C is correct explanation to A& B

5. The unity of the infraciliary system in ciliates is
   (1) Prototomy (2) Kinety
   (3) Isogamy (4) None

6. Beating of the flagellum in Euglena drags the body, hence it is called
   (1) Pulsellum (2) Rectellum
   (3) Tractellum (4) 1 & 2

7. Read the following:
   A. Macroconjugent swims freely in water in search of micro – conjugant.
   B. Microconjugant does not metamorphosis to become an adult.
   (1) A & B are true and B is correct explanation to A
   (2) B is incorrect, A is true
   (3) A & B are true, A is correct explanation to B
   (4) A is incorrect, B is true.

8. Name the binary fission in which plane of fission is a cross the kinety.
   (1) Symmetrogenic
   (2) Homothetogenic
   (3) Asymmetrogenic
   (4) None

9. The sexual reproduction (conjugation) in vorticella is called
   (1) Isogametogomy
   (2) Cytogametogony
   (3) Anisogametogony
   (4) Synagony

10. What type of cyst is secreted around Euglena
    (1) Gelatinous (2) Silicious
    (3) Calcified (4) None

11. Encystment in protozoans serves for
    (1) Dissemination (2) Peranniation
    (3) Protection (4) All the above

12. Asexual reproduction by parthenogenesis is in
    (1) Actinophrys (2) Plasmodium
    (3) Monocystis (4) Vorticella

13. Globigerina is characterized by bearing
(1) Reticulopodia (2) Filopodia
(3) Axopodia (4) Lobopodia

14. Hyaline cap is formed by
(1) Ectoplasm at advancing end
(2) Ectoplasm at opposite end
(3) Endoplasm at advancing end
(4) Endoplasm at opposite end

15. In an active Amoeba, the solation of plasmagel would normally occurs
(1) At the hinder end
(2) At the front end
(3) Around the food raise
(4) Slightly behind the front end

16. Acronematic type of flagellum is found in
(1) Chlamydomonas
(2) Euglena
(3) Peranema
(4) Astasia

17. Theory of pseudopodial movement is successfully explained by
(1) surface tension theory
(2) sol-gel theory
(3) rolling movement theory
(4) contraction theory

18. 'Zone of gelation' in the moving amoeba is always
(1) at the posterior end
(2) at the middle of the body
(3) at the anterior end
(4) around food vacuole

19. Sol-gel theory is explained on the basis of contraction of protein molecules by
(1) Hyman
(2) Berthold
(3) Goldfuss
(4) Gold Aere Lorsch

20. Symmetrogenic type of fission occurs in
(1) Paramoecium
(2) Euglena
(3) Vorticella
(4) Acenata

21. Match the following and choose the correct answer.

A)	Filopodia	I)	Chlamydophrys
B)	Axopodia	II)	Arcella
C)	Reticulopodia	III)	Mastigamoeba
D)	Lobopodia	IV)	Actinophrys
		V)	Lecithium

	A	B	C	D
(1)	V	IV	II	I
(2)	V	I	IV	II
(3)	V	IV	I	II
(4)	V	I	IV	III

22. Match the following and choose the correct answer.

A)	Isogamy	I)	Ceratium
B)	Autogamy	II)	Paramoecium
C)	Anisogamy	III)	Monocystis
D)	Oblique binary fission	IV)	Plasmodium

	A	B	C	D
(1)	III	II	IV	I
(2)	III	IV	II	I
(3)	III	II	IV	I
(4)	IV	I	III	II

23. Inter-convertibility of sol-gel is
(1) only a physical change
(2) only a chemical change
(3) physico-chemical change
(4) polymerization

24. Nuclear reorganization method but without genetic recombination is
(1) conjugation
(2) binary fission
(3) endomixis
(4) gemmation

25. Posterior daughter formed by binary fission of paramecium is called
(1) Opisthe
(2) Proter
(3) Conjugant
(4) Exconjugant

26. Mixing up of chromosomes of macro-conjugant and micro-conjugant is
(1) Hemixis
(2) Endomixis
(3) Autogomy
(4) Amphimixis

27) (Assertion) A: Flagella performs undular movement
(Reason) R: Cilia performs pendular movement
1) A is true, R is false and R is not the correct explanation of A.
2) A is false, R is true, but R is the correct explanation of A.
3) A and R are true, but R is not the correct explanation of A.
4) A & R are false, R is the correct explanation of A.

28) Match the following and choose the correct answer
A: Symmetro Genic Division I.Paramacium II. First daughter
B: Homotheto Genic Division Paramacium III. Euglena
C: Proter IV . Second daughter
D: Opisthe Paramacium V. Third daughter Euglena

	A	B	C	D
1)	I	V	IV	III
2)	I	II	III	IV
3)	II	III	IV	V
4)	III	I	II	IV

29) Find out the correct statement
A: The fusion of similar gamates is called Isogamy
B: Fusion of two mature organisms which do not form gamates but behave as gamates is called hologamy.
C: Union of pro nuclei of the gamates is called amphixis and the resultant nucleus is named synkaryon

1) A is true, B & C are false.
2) A is true, B is true, but C is false.
3) A, B & C are true, none is false
4) A, B & C are false, none is true.

30) Find the correct statement

A: Ciliary movement is the fastest movement performs by paramacium

B: Flagellar movement is the slowest movement performs by pseudopodia

C: Gliding movement performs by myonemes in Ciliates & Flagellates

1) A is true, B is false.
2) A & B are true, C is false.
3) A & C are true & B is false.
4) A, B & C are true, none is false.

KEY

1. 1	2. 2	3. 3	4. 3
5. 2	6. 3	7. 4	8. 2
9. 3	10. 1	11. 4	12. 1
13. 1	14. 1	15. 1	16. 1
17. 2	18. 3	19. 4	20. 2
21. 3	22. 1	23. 3	24. 3
25. 1	26. 4		