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UNIT-1

2020-2021

Zoology

Website : www.tcaexamguide.com Mobile App : tcaexamguide

ZOOLOGY - SYLLABUS

UNIT-I

Classification Binomial Nomenclature – Invertebrate and Chordata – Structure and life history of pathogenic Protozon Entamoeba histoytica Plasmodium viva P.Ovale P.Malariae P.falciparum, Trypanosoma gambiansi; and Leishmania donovoni, Structure and life history of Helminth parasites; Taenia solium, Fasciola hepattca Schistosoma Ascaris lumbricoides.

Structure and life history of Amphioxus Balanoglospus Ascidian and their evolutionary significance, vertebrate comparative anatomy; Integument, Brain; Heart and Urinogenital organe. Economically important vertebrates and vertebrate pests. Fishery resources of India.

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UNIT – I

Binomial Nomenclature Definition

Binomial nomenclature is the system of scientifically naming organisms developed by Carl Linnaeus. Linnaeus published a large work, *Systema Naturae (The System of Nature)*, in which Linnaeus attempted to identify every known plant and animal. This work was published in various sections between 1735 and 1758, and established the conventions of binomial nomenclature, which are still used today. Binomial nomenclature was established as a way to bring clarity to discussions of organisms, evolution, and ecology in general. Without a formalized system for naming organisms the discussion of them, even between peers that speak the same language, becomes nearly impossible. The number of different colloquial names for a single species can be staggering.

Each scientific name in binomial nomenclature consists of two names, also called descriptors or epithets. The first word is the *generic epithet* and describes the genus that an animal belongs to. The second word is the *specific epithet* and refers to the species of the organism. Typically, the words have a Latin base and describe the genus or species with references to traits that are specific to the group. When written, the text of a scientific name is usually italicized or underlined, to clarify that it is a scientific name written in binomial nomenclature. The generic epithet is always capitalized, while the specific epithet is written in lower-case. In some older documents, both may be capitalized. Typically, the full name should be written out. However, when discussing many species of the same genus, the generic name is sometimes abbreviated to the first letter, still capitalized.

The generic epithet of binomial nomenclature refers to the taxonomic hierarchy of organisms, genus, of each organisms. This is a clue as to the origins, evolution, and life-history of the organism. Genera, which reside in families, share the traits of those families. In turn, families reside within orders, which also have their own characteristics. This continues up the hierarchy,

all the way to the 4 domains of life, which are each distinguished by their own characteristics. Although a species may lose some or most of its ancestral characteristics, binomial nomenclature makes it easier to keep track of these relationships in the larger context of taxonomy.

In some organisms, the species are divided into even smaller *subspecies*, which are presented after the species name. While this adds to the number of names, it can create even more specificity when the need arises. Many organisms are currently evolving, and fast enough that the need for multiple subspecies designations may exist.

In scientific literature, the first scientist to describe the species is often noted after the scientific name. This practice increases the "authority" over a scientific name, and increases the clarity with which scientists can describe and discuss organisms in the literature. This practice even documents when names have been changed, which helps avoid confusion and uncertainty in papers.

Examples of Binomial Nomenclature

Felis concolor

Whether you know it as the puma, cougar, mountain lion, painter, or catamount, you are talking about the same animal. All of these words describe a large, single-colored predatory cat. Not only are there many versions of the name for this animal in English, but also in Spanish. In South and Central America, this cat is also known as leóncolorado, onça-vermelha, poema, guasura, and yaguá-pitá. Scientists wishing to discuss this animal with an international audience need a way to cut through all the different colloquial versions of the animals. Therefore, the scientific name *Felis concolor* is used in the conventional binomial nomenclature. *Felis* describes the genus that the cats belong two, while *concolor* describes their uniform color.

Homo sapiens

The scientific name *Homo sapiens* is used to describe the human species. It combines parts of the Latin words *hom*, meaning human, and sapien, meaning wise. This descriptor of humans tells us many things about the species. First and foremost it defines humans as part of the genus *Homo*, which includes several extinct species of early humans and modern humans. While we are the only living species in the genus *Homo*, the specific epithet describes our supposed separation from other species in the genus.

Homo neaderthalensis for example, is hypothesized to have gone extinct because of competition from *Homo sapiens*, or modern humans. Many theorize that it was advanced tool use and language in *Homo sapiens* that gave them an edge. Modern DNA analysis has shown that Neanderthal genes still exist within the human population, suggesting the two may have interbred

at certain points. The binomial nomenclature used here serves to clarify between different forms of organisms through evolutionary time, as well as clarify that all humans are being discussed.

Rules of Binomial Nomenclature

A Biologist from all over the world follows a uniform set of principles for naming the organisms. There are two international codes which are agreed upon by all the biologists over the entire world for the naming protocol. They are:

- International Code of Botanical Nomenclature (ICBN) – Deals with the biological nomenclature for plants.
- International Code of Zoological Nomenclature (ICZN) – Deals with the biological nomenclature of animals.

These codes make sure that each organism gets a specific name and that name is globally identified.

The naming follows certain conventions. Each scientific name has two parts:

- Generic name
- Specific epithet

The rest of the **binomial nomenclature rules** for writing the scientific names of organisms include the following:

1. All the scientific names of organisms are usually Latin. Hence, they are written in italics.
2. There exist two parts of a name. The first word identifies the genus and the second word identifies the species.
3. When the names are handwritten, they are underlined or italicized if typed. This is done to specify its Latin origin.
4. The name of the genus starts with a capital letter and the name of the species starts with a small letter.

Why is Binomial Nomenclature Important?

As stated previously, there are millions of species of organisms distributed throughout the world. Furthermore, the same organisms are known by different names around the world and this can cause confusion when trying to identify or classify. Hence, binomial nomenclature was seen as a viable solution to this problem

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1. A group of plants and animals with similar traits of any rank is

A. Taxon

B. Species

C. Genus

D. Order

2. Which is less general in characters as compared to genus

A. Family

B. Division

C. Class

D. Species

3. What is the correct sequence?

A. Genus-species-order-kingdom

B. Species-order-phylum-kingdom

C. Species-genus-order-phylum

D. Kingdom-phylum-class-order

4. *Nicotiana* is a ————-

A. Species

B. Sub-species

C. Genus

D. Class

5. What is nomenclature?

A. Genus name is written after species

B. Genus and species names are written in italics

C. Genus and species have the same name

D. The first letter of genus and species name is capital

6. The term phylum was coined by

A. Linnaeus

B. Cuvier

C. Haeckel

D. Theophrastus

7. Binomial nomenclature was given by

A. Linnaeus

B. Hugo De Vries

C. John Ray

D. Huxley

8. Species found in different geographical locations are called

A. Sympatric species

B. Allopatric species

C. Sibling species

D. Morphospecies

9. What is a homonym?

A. Identical name of two different taxa

B. Two or more names of same taxon

C. Name given to a taxon in local language

D. Species name repeats the generic name

10. The biologically cohesive unit of taxa is

A. Phylum

B. Order

C. Genus

D. Species

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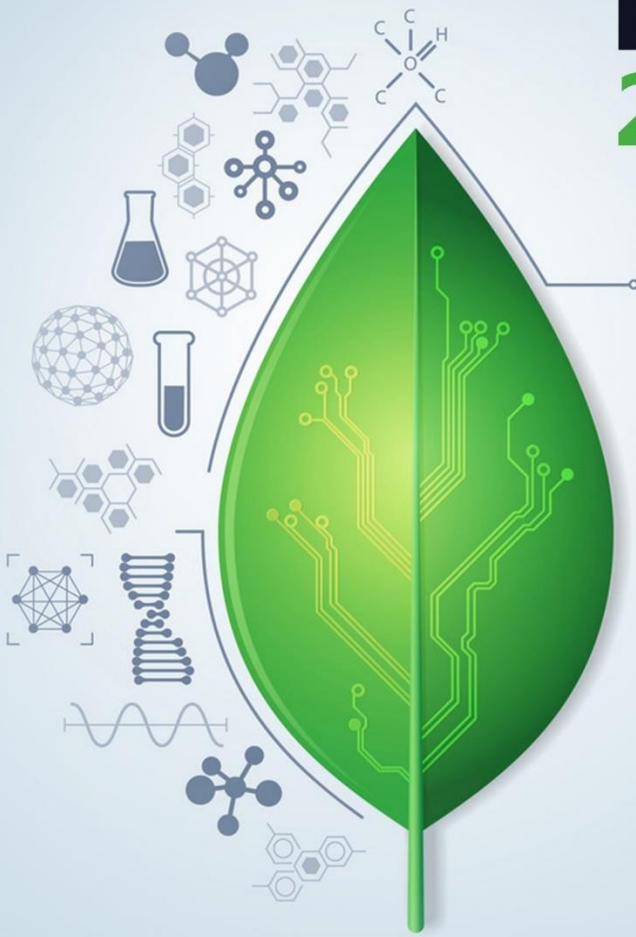

UNIT-2

Zoology
Biological Chemistry

ZOOLOGY SYLLABUS

UNIT-II

Biological Chemistry – Structure of atom valencies molecular and structural formula of biochemical compounds. Isomerism Oxidation and reduction. Redox potential (Eh): RH Determination of EH and PH. Buffers Biologically important properties of water. Energy metabolism of carbohydrates. Lipids proteins and Nucleic Neids. Oxidative Physphorylation.

Role of major (Na, K, Ca and P) and minor (trace) elements in metabolism enzymes, their nature, classification of enzymes Coenzymes and cofactors, Mechanism of action of enzymes Inhibitions of enzyme actions.

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UNIT – II

Biological Chemistry

Biochemistry is a science which deals with the over-all study of the chemical processes which occur in the living tissues at molecular level. Broadly, it is divided into Plant Biochemistry and Animal Biochemistry, but because of recent researches many new branches have emerged out such as molecular biology, neurobiology, cytochemistry, enzymology, nutrition chemistry, etc.

The elements that give rise to life can be grouped into two categories:

1. Major Elements:

The elements which are found in large quantities in the human body are major elements. They include—carbon (C), hydrogen (H), oxygen (O), nitrogen (N), phosphorus (P), sulphur (S) and calcium (Ca).

2. Minor Elements:

The elements which are found in lesser quantities in the human body are minor- elements.

They are further classified into two groups:

(a) Macro-elements:

They include the elements that are present in relatively appreciable amounts in the body, viz., iron (Fe), sodium (Na) and potassium (K).

(b) Micro-elements:

They include the elements that are present in minute quantities in the body, viz., cobalt (Co), copper (Cu), magnesium (Mg), manganese (Mn), arsenic (As), lead (Pb) and iodine (I).

These elements combine in different ratios and proportions to make a molecule. For instance C, H, and O combine in 1:2:1 ratio to make carbohydrates. Similarly, C, H, O and N combine to form proteins and lipids. Nucleic acids are the result of combination of C, H, O, N and P. Carbohydrates, proteins, lipids and nucleic acids, grouped under a category called macromolecules, form the basic components that make life possible.

In addition to these molecules there are micro-molecules like hormones, vitamins and minerals that also play a vital role in the process of life. Among the macromolecules, proteins and nucleic acids are known as informational macromolecules and the other two, viz., carbohydrates, lipids are non-informational macromolecules. The areas of study of Biochemistry are the study of structure of these molecules, their properties, their functions, their inter-relationship and their metabolism.

In order to study these characters it becomes necessary to isolate them, separate them, purify them and bring them into a suitable form so that it can easily be analysed and characterized. Hence, Biochemistry also deals with methods and techniques to isolate, purify and characterize various compounds.

Biochemistry deals not only at the molecular level but also at the level of the cell. A cell can suitably be defined as the theatre of life, where each and every artist (molecules) play their role (functions) exactly as the director (DNA) wants, and the director directs exactly as that appreciated and enjoyed by the audience (cell organelles).

Biochemistry has proved that the above cooperation exists well for normal functioning of a cell and thereby of a living organism. A little misunderstanding between them leads to disturbances in the cell and finally may lead to death of the living organism.

STRUCTURE OF ATOM VALENCIES MOLECULAR

The Structure of the Atom

Atoms are made up of particles called protons, neutrons, and electrons, which are responsible for the mass and charge of atoms.

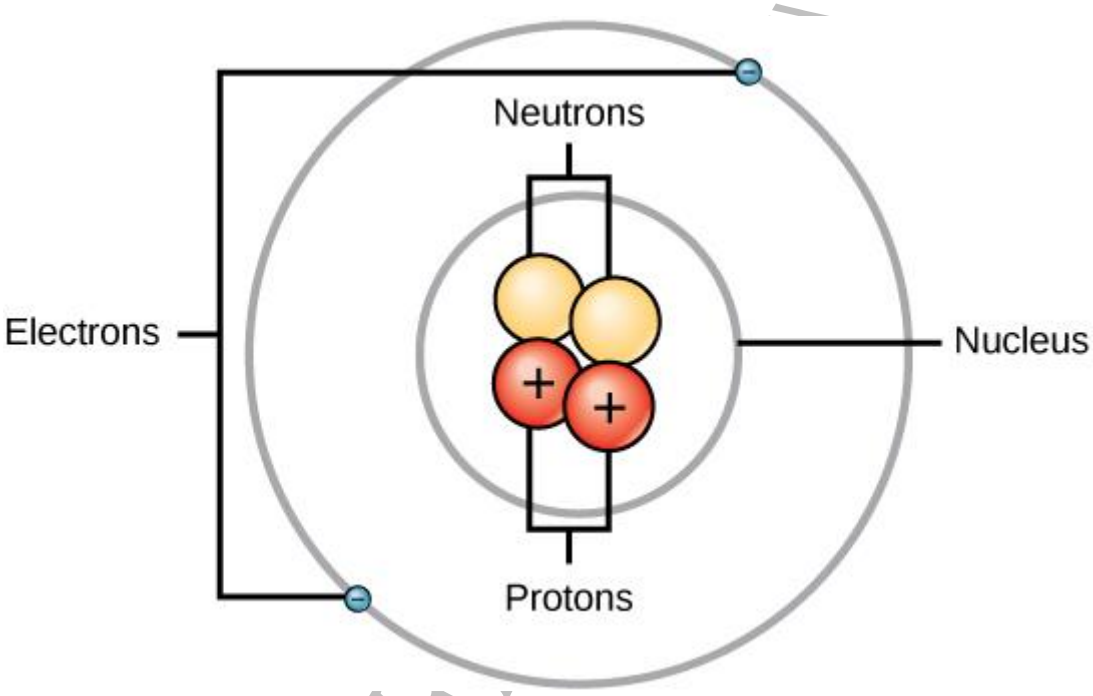
An atom is the smallest unit of matter that retains all of the chemical properties of an element. Atoms combine to form molecules, which then interact to form solids, gases, or liquids. For example, water is composed of hydrogen and oxygen atoms that have combined to form water

molecules. Many biological processes are devoted to breaking down molecules into their component atoms so they can be reassembled into a more useful molecule.

Atomic Particles

Atoms consist of three basic particles: protons, electrons, and neutrons. The nucleus (center) of the atom contains the protons (positively charged) and the neutrons (no charge). The outermost regions of the atom are called electron shells and contain the electrons (negatively charged). Atoms have different properties based on the arrangement and number of their basic particles.

The hydrogen atom (H) contains only one proton, one electron, and no neutrons. This can be determined using the atomic number and the mass number of the element (see the concept on atomic numbers and mass numbers).



Structure of an atom: Elements, such as helium, depicted here, are made up of atoms. Atoms are made up of protons and neutrons located within the nucleus, with electrons in orbitals surrounding the nucleus.

Atomic Mass

Protons and neutrons have approximately the same mass, about 1.67×10^{-24} grams. Scientists define this amount of mass as one atomic mass unit (amu) or one Dalton. Although similar in mass, protons are positively charged, while neutrons have no charge. Therefore, the number of neutrons in an atom contributes significantly to its mass, but not to its charge.

PG TRB 2020 – 21 ZOOLOGY UNIT – 2 - QUESTIONS

1. The control and regulation of biological processes involve some enzymes. They are known as

(a) inhibitors

(b) regulators

(c) allosteric enzymes

(d) activators

2. What are the non-substrate molecules binding to the allosteric sites called?

(a) allosteric substrate

(b) reactants

(c) allosteric modulators

(d) inhibitors

3. Allosteric enzymes are

(a) smaller than simple enzymes

(b) larger than simple enzymes

(c) smaller than simple enzymes but not complex

(d) larger and more complex than simple enzyme

4. Allosteric enzymes consist of several

(a) polypeptide chains

(b) inhibitors

(c) temperature ranges

(d) active sites

5. Allosteric enzymes possess

(a) Three types of allosteric sites

(b) Active site and three types of allosteric sites

(c) Active site and two types of allosteric sites

(d) Active site and an allosteric site

6. Enzymes that are involved in the feedback inhibition are known as

(a) Apoenzymes

(b) Holoenzymes

(c) Allosteric enzymes

(d) Coenzymes

7. Blocking of enzyme action by blocking its active sites is

(a) feedback inhibition

(b) allosteric inhibition

(c) competitive inhibition

(d) non-competitive inhibition

8. The "Lock and key" theory of enzyme action was put forward by

(a) Koshland

(b) Fischer

(c) Kuhne

(d) Arrhenius

9. The fastest enzyme is

(a) carbonic anhydrase

(b) pepsin

(c) DNA polymerase

(d) DNA gyrase

10. The allosteric enzymes on the top of active sites contain

(a) substrate

(b) inhibitors

(c) polypeptide chains

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Zoology

UNIT-3

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ZOOLOGY SYLLABUS

UNIT-III

Collection of data-primary and secondary, Methods of Classification and tabulation of data.

Diagrammatic and graphic representation – Rules of constructing diagrams – Types of diagrams – Bar diagram-Pie diagram, graphs-construction of graphs – Types: Frequency distribution – Histograms – Frequency Polygon—Smooth frequency curve-cumulative frequency curve of 'Ogives'.

Measures of central value – Average-Median-Mode-Measures of dispersion-Mean deviation-coefficient of variation-variance-Standard deviation and standard error.

Correlation Types – Methods of studying correlation co-efficient of correlation – Regression analysis.

Statistical inference – Procedure of testing hypothesis – Standard error test of significance for attributes – Test of significances for large and small samples – Student 't' distribution.

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UNIT – III

STATISTICS

Statistics is concerned with scientific methods for collecting, organising, summarising, presenting and analysing data as well as deriving valid conclusions and making reasonable decisions on the basis of this analysis. Statistics is concerned with the systematic collection of numerical data and its interpretation. The word 'statistic' is used to refer to

1. Numerical facts, such as the number of people living in particular area.

2. The study of ways of collecting, analysing and interpreting the facts.

Statistics may be defined as the science of collection, presentation analysis and interpretation of numerical data from the logical analysis. It is clear that the definition of statistics by Croxton and Cowden is the most scientific and realistic one. According to this definition there are four stages:

1. Collection of Data:

It is the first step and this is the foundation upon which the entire data set. Careful planning is essential before collecting the data. There are different methods of collection of data such as census, sampling, primary, secondary, etc., and the investigator should make use of correct method.

2. Presentation of data:

The mass data collected should be presented in a suitable, concise form for further analysis. The collected data may be presented in the form of tabular or diagrammatic or graphic form.

3. Analysis of data:

The data presented should be carefully analyses for making inference from the presented data such as measures of central tendencies, dispersion, correlation, regression etc.,

4. Interpretation of data:

The final step is drawing conclusion from the data collected. A valid conclusion must be drawn on the basis of analysis. A high degree of skill and experience is necessary for the interpretation.

COLLECTION OF DATA

Introduction

Everybody collects, interprets and uses information, much of it in numerical or statistical forms in day-to-day life. It is a common practice that people receive large quantities of information everyday through conversations, televisions, computers, the radios, newspapers, posters, notices and instructions. It is just because there is so much information available that people need to be able to absorb, select and reject it. In everyday life, in business and industry, certain statistical information is necessary and it is independent to know where to find it how to collect it. As consequences, everybody has to compare prices and quality before making any decision about what goods to buy. As employees of any firm, people want to compare their salaries and working conditions, promotion opportunities and so on. In time the firms on their part want to control costs and expand their profits. One of the main functions of statistics is to provide information which will help on making decisions. Statistics provides the type of information by providing a description of the present, a profile of the past and an estimate of the future. The following are some of the objectives of collecting statistical information.

1. To describe the methods of collecting primary statistical information.
2. To consider the status involved in carrying out a survey.
3. To analyse the process involved in observation and interpreting.
4. To define and describe sampling.
5. To analyse the basis of sampling. 6. To describe a variety of sampling methods.

Statistical investigation is a comprehensive and requires systematic collection of data about some group of people or objects, describing and organizing the data, analyzing the data with the help of different statistical method, summarizing the analysis and using these results for making judgments, decisions and predictions. The validity and accuracy of final judgment is most crucial and depends heavily on how well the data was collected in the first place. The quality of data will greatly affect the conditions and hence at most importance must be given to this process and every possible precautions should be taken to ensure accuracy while collecting the data.

Categories of Data

Any statistical data can be classified under two categories depending upon the sources utilized. These categories are, 1. Primary data 2. Secondary data

Primary data:

Primary data is the one, which is collected by the investigator himself for the purpose of a specific inquiry or study. Such data is original in character and is generated by survey conducted by individuals or research institution or any organization.

Example: If a researcher is interested to know the impact of noon- meal scheme for the school children, he has to undertake a survey and collect data on the opinion of parents and children by asking relevant questions. Such a data collected for the purpose is called primary data. The primary data can be collected by the following five methods.

1. Direct personal interviews 2. Indirect Oral interviews 3. Information from correspondents 4.Mailed questionnaire method 5. Schedules sent through enumerators

1. Direct personal interviews:

The persons from whom information's are collected are known as informants. The investigator personally meets them and asks questions to gather the necessary information's. It is the suitable method for intensive rather than extensive field surveys. It suits best for intensive study of the limited field.

Merits:

a) People willingly supply information's because they are approached personally. Hence, more response noticed in this method than in any other method.
b) The collected information's are likely to be uniform and accurate. The investigator is there to clear the doubts of the informants.
c) Supplementary information's on informant's personal aspects can be noted. Information's on character and environment may help later to interpret some of the results.
d) Answers for questions about which the informant is likely to be sensitive can be gathered by this method.
e) The wordings in one or more questions can be altered to suit any informant. Explanations may be given in other languages also. Inconvenience and misinterpretations are thereby avoided.

Limitations:

a) It is very costly and time consuming.

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1. A statement made about a population for testing purpose is called?

A) Statistic

B) Hypothesis

C) Level of Significance

D) Test-Statistic

2. If the assumed hypothesis is tested for rejection considering it to be true is called?

A) Null Hypothesis

B) Statistical Hypothesis

C) Simple Hypothesis

D) Composite Hypothesis

3. A statement whose validity is tested on the basis of a sample is called?

A) Null Hypothesis

B) Statistical Hypothesis

C) Simple Hypothesis

D) Composite Hypothesis

4. A hypothesis which defines the population distribution is called?

A) Null Hypothesis

B) Statistical Hypothesis

C) Simple Hypothesis

D) Composite Hypothesis

5. If the null hypothesis is false then which of the following is accepted?

A) Null Hypothesis

B) Positive Hypothesis

C) Negative Hypothesis

D) Alternative Hypothesis.

6. The rejection probability of Null Hypothesis when it is true is called as?

A) Level of Confidence

B) Level of Significance

C) Level of Margin

D) Level of Rejection

7. The point where the Null Hypothesis gets rejected is called as?

A) Significant Value

B) Rejection Value

C) Acceptance Value

D) Critical Value

8. If the Critical region is evenly distributed then the test is referred as?

A) Two tailed

B) One tailed

C) Three tailed

D) Zero tailed

9. The type of test is defined by which of the following?

A) Null Hypothesis

B) Simple Hypothesis

C) Alternative Hypothesis

D) Composite Hypothesis

10. Which of the following is defined as the rule or formula to test a Null Hypothesis?

A) Test statistic

B) Population statistic

C) Variance statistic

D) Null statistic

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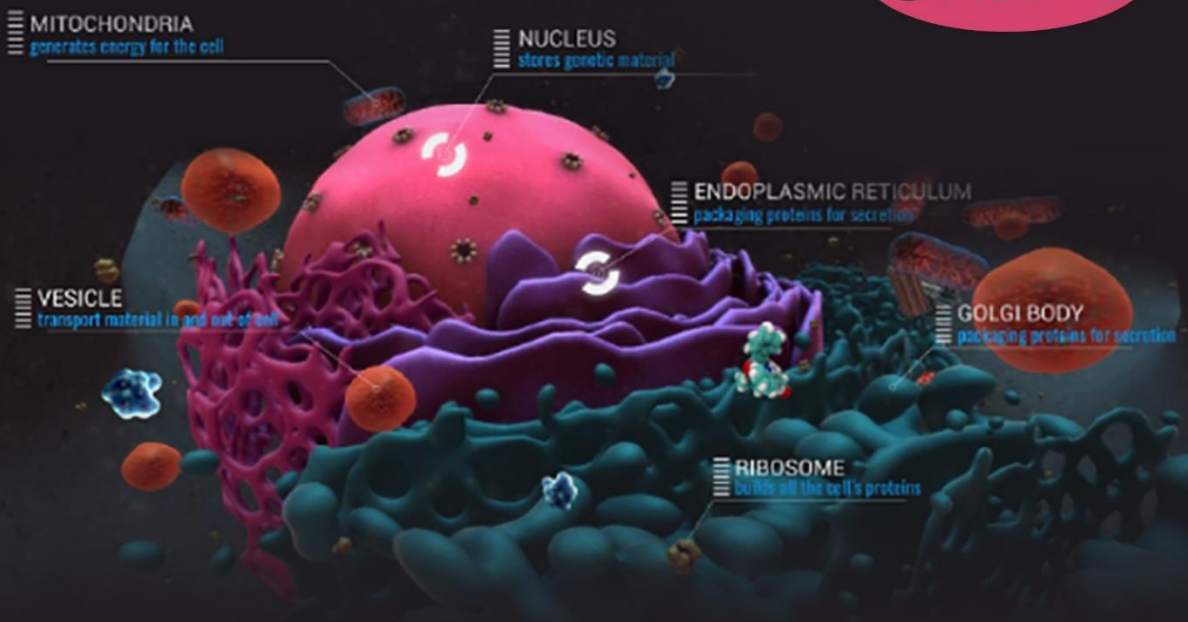
UNIT-4



Zoology

ZOOLOGY SYLLABUS

UNIT-IV

Cell and Molecular Biology – Prokaryotic and Eukaryotic cells. Ultra structure, Organisation and functions of cell membrane, Endoplasmic reticulum, golgibody, Lysosome, Mitochondrion; Ribosome structure of DNA, A,B,C and Z forms of D.N.A. Transcription – mRNA tRNA and rRNA and their functions. Synthesis of eukeryotic RNAS Structure and functions of nucleolus, D.N.A. replication D.N.A. repair, Microtubules cilia and flagella carcinogenic agents, Genetic basis of malignant transformation.

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UNIT – IV

CELL AND MOLECULAR BIOLOGY

PROKARYOTIC AND EUKARYOTIC CELLS

Eukaryotic Cell:

In addition to the nucleus, the cytoplasm of the cell usually contains a number of distinct bodies or structures that presumably carry out one or more rather specific functions.

The components of the cytoplasm may be broadly classified, on the basis of light and electron microscope studies as follows:

(1) Mitochondria

(2) Plastids

(3) Lysosomes

(4) Endoplasmic reticulum

(5) Microsomes

(6) Cytoplasmic matrix

(7) Golgi complex

(8) Cell membrane

(9) Vacuoles, and

(10) Cytoplasmic inclusions.

In principle, protoplasm may be considered to be primarily proteinaceous, and many of its properties are similar to those of colloidal dispersions of complex proteins.

A colloid may be defined as the dispersion of one substance in another, with chemical properties intermediate between those of true solutions and suspensions. Most of their reactions are surface rather than molecular and depend primarily on size, shape, and type of dispersion as well as electrical charge.

The most important type of colloid in living cells is apparently the coacervate, which may be somewhat over simply defined as a semi-flocculated colloid in which the dispersed particles tend to occur in aggregates. Most biologically important coacervates appear to be those which result from the interaction of two hydrophilic (water-loving) colloids of opposite charge, as, for example, histones and nucleic acids

It would be a mistake to assume, however, that the properties of protoplasm in general could be duplicated by any test-tube colloidal complex. While certain kinds of colloidal systems may be used as models to demonstrate different protoplasmic properties especially with respect to flow phenomena and sol-gel transformations, protoplasm as already noted has structural qualities and organization not matched by any of the known synthetic colloids.

All structures, or organelles, of the cell have their own, important functions. These functions depend upon types of organelles.

The nucleus performs two important roles:

(i) To store and carry hereditary information from generation to generation of cells and individuals; and

(ii) To translate genetic information into the kind of protein characteristic of a cell and thus determine the cells specific role in the life process.

The nucleolus which remains present inside the nucleus contains ribonucleic acid (RNA) and may act as an intermediate between the code of the chromosomes and the execution of the code in the cytoplasm. In the mitochondria the energy-yielding oxidations from the breakdown of complex organic compounds are localized. This energy is stored in high-energy phosphate bonds and is utilized in biologic activities as needed.

The double-layered membranous endoplasmic reticulum (ergastoplasm) is supposed to contain enzymes that synthesize cholesterol and other non-proteins. Often associated with the

endoplasmic reticulum are found granules (ribosomes). Actually these are sites of protein synthesis under the influence of RNA, which receives its coded genetic information from deoxyribonucleic acid (DNA) of the chromosomes.

The centrioles helps in determine the orientation of the plane of cell division probably, it also supply the basal granules, or kinetosomes, which are concerned with the formation of motile fibrillar structures, such as cilia and flagella at the surface of cells. Another type of granules is lysosomes which are somewhat larger than ribosomes. Lysosomes provide the sites of certain hydrolytic enzymes.

The Golgi complex represents the primary site for the packaging of the secretory products that are synthesized on the ribosomes. Here also carbohydrate molecules formed by the Golgi complex are added to the protein secretions to for glycoproteins before they are discharged for their various functions.

Plastids, found in plants, these are present some other organelles which are called plastids. These plastids serve as sites of synthesis of complex organic compounds from simpler substances, such as the formation of sugar from carbon dioxide and water.

The structure of every cell consists of chemical compounds, whatever function a cell may have depends on the properties of cellular compounds. With the electron microscope, it has been possible in recent years in learn a great deal about subcellular organization and to explain the relations between structure and function in terms of the interactions of macromolecules.

The following points highlight the two main types of cell. The types are: 1. Eukaryotic Cell 2. Prokaryotic Cell.

Type # 1. Eukaryotic Cell:

In addition to the nucleus, the cytoplasm of the cell usually contains a number of distinct bodies or structures that presumably carry out one or more rather specific functions.

For purposes of discussion, the components of the cytoplasm may be broadly classified, on the basis of light and electron microscope studies as follows:

(1) Mitochondria

(2) Plastids

PG TRB 2020 – 21 ZOOLOGY UNIT - 4 - QUESTIONS

1. This is cancerous state of blood

(a) Uremia

(b) Chloremia

(c) Leukemia

(d) Proteinemia

2. Benign tumour is the one which

(a) differentiated and capsulated

(b) shows metastasis

(c) differentiated and non capsulated

(d) undifferentiated and non capsulated

3. If a muscle fails to give stimulation action and there is much ingestion of lactic acid, the conduction is termed as

(a) Fatigue

(b) Tonus

(c) Paralysis

(d) Tetanus

4. A patient is suspicious of having breast cancer. What type of test will a physician conduct to diagnose the cancer

(a) blood test

(b) mammography

(c) CT scan

(d) pap test

5. Rheumatoid arthritis is different from some other forms of arthritis as it

(a) occurs below the waist

(b) is more painful than other forms

(c) generally occurs above the waist

(d) is symmetrical, affecting the right and the left sides of the body

6. Chemicals, that can induce cancer are called

(a) Carcinogens and produce malignant tumour

(b) carcinogens and produce non-malignant tumour

(c) mutagenic agents and do not produce malignant tumour

(d) mutagenic agents and produce benign tumour

7. A painful disorder of the joints, Gouts is due to

(a) inflammation of synovial membrane

(b) deposition of uric acid at joints

(c) injury to tendon

(d) damage caused to ligaments

8. Cancerous cells are more easily damaged by radiation than normal cells as they

(a) differ in structure

(b) undergo rapid division

(c) are nutrition-starved

(d) none of these

9. Cancer is related to

(a) Non-malignant tumor

(b) uncontrolled growth of tissues

(c) controlled division of tissues

(d) none of the above

10. The nucleus of cancerous cells becomes

(a) Unchanged

(b) Degenerated

(c) Abnormally large

(d) Hypertrophied

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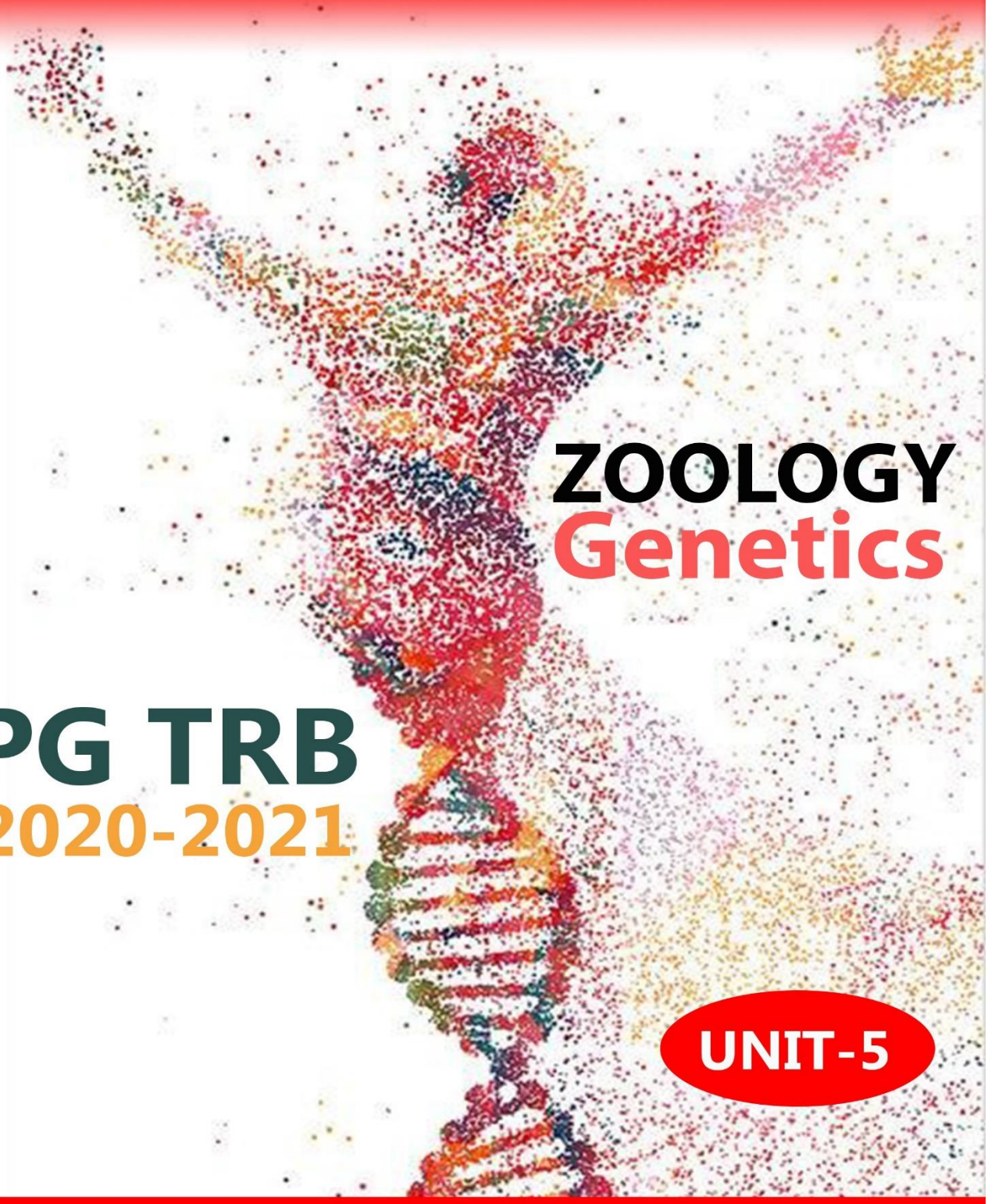

ZOOLOGY
Genetics

PG TRB
2020-2021

UNIT-5

ZOOLOGY SYLLABUS

UNIT-V

Genetics-Gene Interactions, Multiple alleles, Recombination and its molecular mechanism. Linkage, crossing over, chromosome, mapping. Cytoplasmic genes and their expression. Mitochondrial DNA its transcription code and translation, Population genetics Genetic organisation of a Mendelian population. Hardy-Weiberg Law. Derivation of Hardy – Weinberg equilibrium. Animal breeding and human genetics – Inbreeding outbreeding Heterosis. Expression of Eukaryotic genes in bacterial cells. Transfer of genes into Eukaryotic cells. Genetic Engineering and its applications in Agriculture Animal Husbandry and Medicine. Inborn errors of metabolism.

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UNIT – V

GENETICS

Gene Interactions

1. Introduction to Gene Interaction:

Mendelian genetics does not explain all kinds of inheritance for which the phenotypic ratios in some cases are different from Mendelian ratios (3:1 for monohybrid, 9:3:3:1 for di-hybrid in F_2). This is because sometimes a particular allele may be partially or equally dominant to the other or due to existence of more than two alleles or due to lethal alleles. These kinds of genetic interactions between the alleles of a single gene are referred to as allelic or intra- allelic interactions.

Non-allelic or inter-allelic interactions also occur where the development of single character is due to two or more genes affecting the expression of each other in various ways.

Thus, the expression of gene is not independent of each other and dependent on the presence or absence of other gene or genes; These kinds of deviations from Mendelian one gene-one trait concept is known as Factor Hypothesis or Interaction of Genes (Table 7.1).

Table 7.1 : Different types of allelic and non-allelic gene interactions

Type	Ratio	Interaction	Example
A. Allelic interactions			
1. Incomplete dominance			
(a) Monohybrid	1 : 2 : 1	Partial dominance.	Flower colour in snap-dragon.
(b) Dihybrid	1:2:1:2:4:2:1:2:1	Partial dominance at both the gene pairs.	Human blood group (ABO and MN).
	3:6:3:1:2:1	Complete dominance at one gene pair and partial dominance at the other.	Cattle (horn and hair colour).
2. Lethal factor	2:1/3:0	Homozygous condition causes death.	Yellow coat colour in mice, albino seedling in barley.
3. Multiple alleles	—	Occurrence of more than two alleles in a single locus.	ABO blood group system in human, self sterility in tobacco.
B. Non-allelic interactions			
4. Simple interaction	9:3:3:1	New phenotypes resulting from interaction between two dominants and also between two recessives.	Comb types in fowl, Streptocarpus flower colour.
5. Complementary factor	9:7	Two dominant genes are complementary to each other in their effect.	Flower colour in sweet pea.
6. Epistasis			
(a) Recessive	9:3:4	A homozygous recessive gene is epistatic to other gene.	Coat colour in mice, grain colour in maize.
(b) Dominant	12:3:1	A dominant gene is epistatic to other gene.	Fruit colour in summer squash.
7. (a) Inhibitory factor	13:3	One dominant gene inhibits the expression of the other.	Leaf colour in rice.
(b) Inhibitory factor with partial dominance	7:6:3	One dominant gene partially inhibits the expression of the other.	Hair direction in guinea-pig.
8. Polymorphic gene	9:6:1	New phenotype from interaction between two dominant genes.	Awn length in barley.
9. (a) Duplicate gene	15:1	Dominant allele of either gene pair, alone or together, are similar in phenotypic effect.	Capsule shape in Shepherd's purse.
(b) Duplicate gene with dominance modification.	11:5	Dominance due to two non-allelic or allelic dominant alleles.	Pigment glands in cotton.
10. Multiple factors		A quantitative trait controlled by several genes having cumulative effect.	Kernel colour in wheat, skin colour in human.
(a) Two loci	1:4:6:4:1		
(b) Three loci	1:6:15:20:15:6:1		

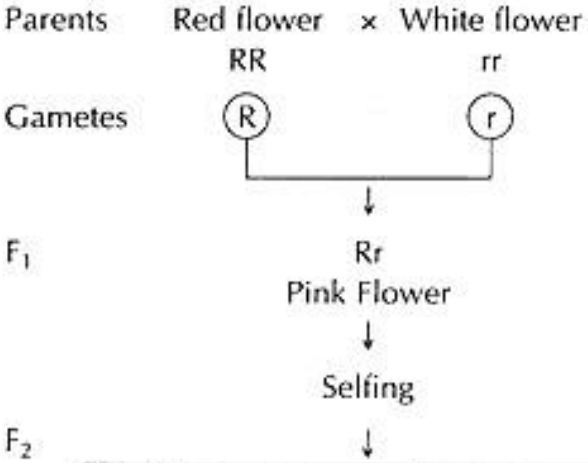
2. Allelic Gene Interactions:

Incomplete Dominance or Blending Inheritance (1:2:1):

A dominant allele may not completely suppress other allele, hence a heterozygote is phenotypically distinguishable (intermediate phenotype) from either homozygotes.

In snapdragon and Mirabilis jalapa, the cross between pure bred red-flowered and white-flowered plants yields pink-flowered F_1 hybrid plants (deviation from parental phenotypes), i.e.,

intermediate of the two parents. When F_1 plants are self-fertilized, the F_2 progeny shows three classes of plants in the ratio 1 red: 2 pink: 1 white instead of 3:1 (Fig. 7.1).



♂ / ♀	R	r
R	RR Red	Rr Pink
r	Rr Pink	rr White

Genotype	Phenotype	Ratio
RR	Red	1
Rr	Pink	2
rr	White	1

Fig. 7.1: Inheritance of flower colour in snapdragon

Therefore, a F_1 di-hybrid showing incomplete dominance for both the characters will segregate in F_2 into (1 :2 : 1) X (1 :2 : 1) = 1 :2 : 1 : 2 : 4 : 2:1 : 2 : 1. And a F_1 di-hybrid showing complete dominance for one trait and incomplete dominance of another trait will segregate in F_2 into (3:1) x (1 :2:1) = 3:6:3:1 :2:1.

Co-dominance:

Here both the alleles of a gene express themselves in the heterozygotes. Phenotypes of both the parents appear in F_1 hybrid rather than the intermediate phenotype. In human, MN blood group is controlled by a single gene.

Only two alleles exist, M and N. Father with N blood group (genotype NN) and mother with M blood group (genotype MM) will have children with MN blood group (genotype MN). Both phenotypes are identifiable in the hybrid. F_2 segregates in the ratio 1M blood group: 2 MN blood group : 1 N blood group.

PG TRB 2020 – 21 ZOOLOGY UNIT - 5 - QUESTIONS

1. The low RBC count is seen in anaemia and _____.

A) Myxoedema

B) Influenza

C) Typhoid

D) Leukaemia

2. A child is suffering from Kwashiorkor and if this child is compared with other marasmus children then what additional symptoms are present in Kwashiorkor child?

A) Oedema

B) Wasted muscles

C) A decrease in body weight

D) Impaired physical growth

3. Chronic anaemia and multiple sclerosis are

A) Allergic diseases

B) Hormonal diseases

C) Autoimmune diseases

D) Hereditary diseases

4. Which one of the following statements is correct about T-lymphocytes in mammals?

A) These are produced in the thyroid

B) These are originated in lymphoid tissues

C) They scavenge damaged cells and cellular debris

D) There are three main types – cytotoxic T-cells, helper T-cells and suppressor T-cells

5. The antibody-dependent cytotoxicity is seen in _____.

A) Local anaphylaxis

B) Generalise anaphylaxis

C) Immune complex reaction

D) Non-compatible-blood transfusion

6. Which of the following protein causes the dilation of blood vessels?

A) Histamine

B) Pyrogens

C) Interferon

D) None of these

7. Parkinson's disease is caused due to deficiency of _____.

A) Dopamine

B) GABA

C) Acetylcholine

D) Endorphins

8. Gaucher's disease is linked with_____.

A) Malnutrition

B) Abnormal fat metabolism

C) Abnormal protein metabolism

D) Abnormal carbohydrate metabolism

9. LSD is obtained from _____.

A) Cannabis Sativa

B) Claviceps purpurea

C) Papaver somniferum

D) Erythroxylon coca

10. Infectious proteins are present in _____.

A) Prions

B) Viroids

C) Gemini viruses

D) Satellite viruses

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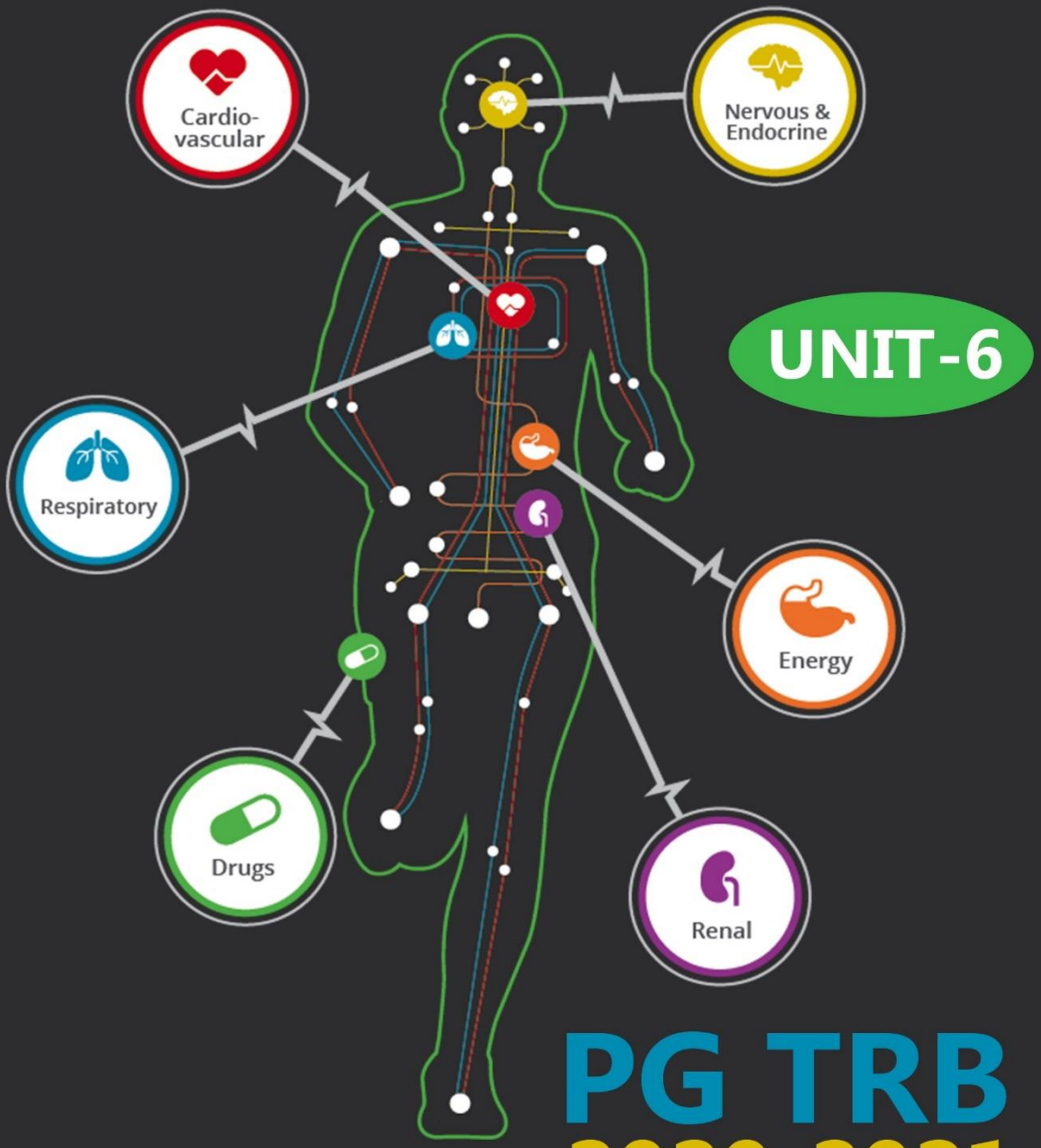
Zoology



UNIT-6

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ZOOLOGY SYLLABUS

UNIT-VI

Physiology – Nutrition – Essential aminoacids, vitamins, minerals and Trace elements required by men. Digestion, Digestive enzymes, digestion, absorption and assimilation of carbohydrates, proteins and lipids. Intermediary metabolism, Respiration – Transport of respiratory gases by blood. Circulation: Types of heart.

Movement – Types of muscle cells, Ultra structure of muscle cells. Muscle contraction and types of contraction. Osmo-iono regulation: Maintenance of water and electrolyte Balance in equatic and terrestrial vertebrates. Excretion: Vertebrate kidney and formation of urine. Excretion of nitrogeneous products. Renal regulation of acid-base balance. Thermoregulation: Temperature and rates of bio-logical activities.

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UNIT – VI

PHYSIOLOGY

Physiology is the science of life. It is the branch of biology that aims to understand the mechanisms of living things, from the basis of cell function at the ionic and molecular level to the integrated behaviour of the whole body and the influence of the external environment. Research in physiology helps us to understand how the body works in health and how it responds and adapts to the challenges of everyday life; it also helps us to determine what goes wrong in disease, facilitating the development of new treatments and guidelines for maintaining human and animal health. The emphasis on integrating molecular, cellular, systems and whole body function is what distinguishes physiology from the other life sciences.

Physiology is an experimental science. Research in physiology advances our understanding of the detailed mechanisms that control and regulate the behaviour of living things. We continue to learn more about fundamental processes, such as the control of heart rate or the sense of vision, through comprehensive exploration of the multiple processes involved.

NUTRITION

Nutrition is about eating a healthy and balanced diet. Food and drink provide the energy and **nutrients** you need to be healthy. Understanding these **nutrition** terms may make it easier for you to make better food choices.

Types of Nutrition

Term Paper # 1. Autotrophic Nutrition:

In autotrophic nutrition, an organism makes its own food from simple raw materials. Carbon and energy requirements of the autotrophic organism are fulfilled by photosynthesis.

Photosynthesis- Green plants, which are autotrophic, synthesize food through the process of photosynthesis. Photosynthesis is a process by which green plants, having chlorophyll, synthesize the simple sugar (glucose) from the simple raw materials, water and carbon dioxide using the energy of sunlight. Oxygen is released in this process.

The overall equation of photosynthesis is:

All green parts of a plant are capable of performing photosynthesis, the leaves photosynthesize the most. The cells of the leaves contain special organelles called chloroplasts, which are the main sites of photosynthesis. These are plastids which contain the light-absorbing green pigment chlorophyll.

The chloroplasts in leaves contain closely packed flattened sacs, called thylakoids, arranged in piles, called granum. Granum lies in a colourless ground substance, called stroma. Thylakoids contain green pigments, called chlorophyll, which trap solar energy.

Carbon Dioxide is inhaled by stomata. Stomata are tiny pores present on the surface of the leaves. Massive amounts of gaseous exchange takes place in the leaves through these pores for the purpose of photosynthesis.

However exchange of gases occurs across the surface of stems, roots and leaves as well via stomata. Since large amounts of water can also be lost through these stomata, the plant closes these pores when it does not need carbon dioxide for photosynthesis.

The opening and closing of the pore is regulated by guard cells. The guard cells swell when water flows into them, causing the stomatal pore to open. Similarly, the pore closes if the guard cells shrink.

Water required for photosynthesis is absorbed from the soil by the roots in terrestrial plants. Other materials like nitrogen, phosphorus, iron and magnesium are mixed in water in the soil.

Nitrogen is an essential element used in the synthesis of proteins and other compounds which is taken up in the form of inorganic nitrates or nitrites, or it is taken up as organic compounds which have been prepared by bacteria from atmospheric nitrogen.

Term Paper # 2. Heterotrophic Nutrition:

The word 'heterotroph' is derived from two Greek words—hetero (other) and trophe (nutrition). Heterotrophic organisms obtain food from other organisms. Thus, they are also called as consumers. All animals and non-green plants like fungi come under this category.

All organisms are not capable of eating complete food and breaking it inside the body like multicellular animals. Hence, fungi like bread mold, yeast and mushrooms break down food outside and absorb nutrients decaying food.

Some other organisms derive nutrition from plants or animals without killing them. This parasitic nutritive strategy is used by a wide variety of organisms like cuscuta (amar-bel), orchids, ticks, lice, leeches and tape-worms.

The Nutrition in unicellular organisms like Amoeba and Paramecium is Holozoic.

Amoeba:

Amoeba takes in food using temporary finger-like extensions of the cell surface which fuse over the food particle forming a food-vacuole. Inside the food vacuole, complex substances are broken down into simpler ones which then diffuse into the cytoplasm. The remaining undigested material is moved to the surface of the cell and excreted.

Paramecium

In Paramecium, the cell has a definite shape and food is taken in from a specific spot. Cilia which cover the entire cell surface move the food to the entry spot. The food in the food vacuoles of the Amoeba and Paramecium is digested by lytic enzymes.

Nutrition in Human Being:

Humans eat food that has many complex materials to be broken down filtered and separated in the body for proper use. The process of breaking down complex molecules into simple molecules is called digestion. The digestive system is made of the alimentary canal or digestive tract, which is a long tube and runs from the mouth (where food enters) to anus (where indigestible waste leaves).

The mouth, buccal cavity, pharynx, oesophagus, stomach, intestine, rectum and anus are parts of the alimentary canal. The digestive glands are the salivary glands, the gastric glands, the liver, the pancreas and the intestinal glands.

PG TRB 2020 – 21 ZOOLOGY - UNIT - 6 - QUESTIONS

1. Liver functions are pivotal to

A) osmoregulation

B) thermoregulation

C) homeostasis

D) all of these

2. During catabolism of amino acids, the release of the amino group is known as

A) deamination

B) hydrolysis

C) ammunition

D) hydration

3. The only treatment in case of uremia is

A) dialysis

B) lithotripsy

C) lung transplant

D) kidney transplant

4. This type of nephron is best to conserve water in body

A) Juxtamedullary nephrons

B) cortical nephrons

C) both (A) and (B)

D) serotical nephrons

5. This is responsible for production of concentrated urine

A) proximal tubule

B) cortical nephrons

C) distal tubule

D) juxtamedullary nephron

6. This nephron segment is not permeable to water even in the presence of ADH

A) Collecting duct

B) descending limb of loop of Henle

C) ascending limb of loop of Henle

D) both (B) and (C)

7. Leaves fall of helping in plant to get rid of accumulated wastes hence known as

A) ebony

B) sacrifice

C) excretophore

D) helper

8. Active uptake of sodium is promoted by action of enzyme known as

A) adrenatrone

B) aldosterone

C) antidiuretic

D) diuretic

9. The vertebral column provides more strength as a result of 4

A) burantals

B) appendanges

C) frontals

D) curvatures

10. Dogs have specialized evaporative cooling in the respiratory tract by

A) woofing

B) licking

C) panting

D) sleeping

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UNIT-7

Zoology

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ZOOLOGY SYLLABUS

UNIT-VII

Sensory physiology: Chemo-reception. Mechano-reception, Thermo-reception, Photoreception. Nervous coordination's: Transmission of impulses in nerve cells. Central Nervous system. Autonomic Nervous System. Memory and learning, Chemical coordination: Endocrine glands and harmones. Endocrine Interrelations. Neure endocrine reflexes. Growth and reproduction: Growth moulting and metamorphesis in crustaceans, Insects and vertebrates. Pheremones in reproduction. Physiology of human reproduction.

Developmental Biology and Immunology-Gametogensis – Organisation of egg cytoplosm. Fertilisation- Biochemical and Electron-Microscopic studies, Partherogenesis-Cleavage and Metphegenetic movements – Fate maps – presumptive. Organ forming areas – Formation of Primary organ rudiments – Gradients in the determination of organ rudiments – involvement of genes in developmental process – General Metabolism during gastrulation – Integration of gastrulation.

Organizer: Organogenesis with reference to heart, eye, brain and kidney. Cell differentiation – The chemical basis of cell differentiation Selective action of genes in differentiation – Control of differentiation by the intraorganic environment. Extra embryonic membranes. Placenta-Sex differentiation and godadial hormones, congenital abnormalities in humans Growth, aging and senescence.

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UNIT – VII

CHEMORECEPTION

Chemoreception, process by which organisms respond to chemical stimuli in their environments that depends primarily on the senses of taste and smell. Chemoreception relies on chemicals that act as signals to regulate cell function, without the chemical necessarily being taken into the cell for metabolic purposes. While many chemicals, such as hormones and neurotransmitters, occur within organisms and serve to regulate specific physiological activities, chemicals in the external environment are also perceived by and elicit responses from whole organisms. All animals and microorganisms such as bacteria exhibit this latter type of chemoreception, but the two commonly recognized chemosensory systems are the senses of taste, or gustation, and smell, or olfaction.

The Senses of Taste and Smell

Taste

In terrestrial vertebrates, including humans, taste receptors are confined to the oral cavity. They are most abundant on the tongue but also occur on the palate and epiglottis and in the upper part of the esophagus. The taste receptor cells, with which incoming chemicals interact to produce electrical signals, occur in groups of 50–150. Each of these groups forms a taste bud. On the tongue, taste buds are grouped together into taste papillae. On average, the human tongue has 2,000–8,000 taste buds, implying that there are hundreds of thousands of receptor cells. However, the number of taste buds varies widely; some humans have only 500, whereas others have as many as 20,000. Healthy humans may have anywhere from three to several thousand taste buds per square centimetre on the tip of the tongue, and this variability contributes to differences in the taste sensations experienced by different people.

The taste buds are embedded in the epithelium of the tongue and make contact with the outside environment through a taste pore. Slender processes (microvilli) extend from the outer ends of the receptor cells through the taste pore, where the processes are covered by the mucus that lines the oral cavity. At their inner ends the taste receptor cells synapse, or connect, with afferent sensory neurons, nerve cells that conduct information to the brain. Each receptor cell synapses with several afferent sensory neurons, and each afferent neuron branches to several taste papillae, where each branch makes contact with many receptor cells. Unlike the olfactory system, in which input to the brain involves a single nerve, the afferent sensory neurons occur in three different nerves running to the brain—the facial nerve, the glossopharyngeal nerve, and the vagus nerve. Taste receptor cells of vertebrates are continually renewed throughout the life of the organism.

The taste receptor system of terrestrial vertebrates is concerned with the detection of chemicals that are taken into the oral cavity and are present at relatively high concentrations. In humans, five different classes, or modalities, of taste are usually recognized: sweet, salt, sour, bitter, and umami. But this is an anthropocentric view of a system that has evolved to give animals information about the nutrient content and the potential dangers of the foods they eat. The major nutrient requirements of all animals are carbohydrates, which act principally as a source of energy. Many lipids can be synthesized from carbohydrates, and animals use proteins derived from carbohydrates to assemble their own body proteins. In general, animals are unable to taste proteins, but they do taste amino acids (from which proteins are made). Some of the amino acids taste sweet to humans, whereas others taste sour, and umami taste, which is meatlike, is a response to glutamic acid and its derivatives, such as monosodium glutamate (MSG). Sweet taste comes mainly from sugars (carbohydrates), and bitter taste derives from potentially harmful chemicals present in food, especially plants, which produce thousands of chemicals that offer the plants some protection from herbivores. The constituents of inorganic salts, such as sodium chloride, potassium chloride, and calcium chloride, are essential nutrients, but the quantities required to fulfill animal nutrient requirements are relatively small. It is possible that the salt taste reflects an animal's need to avoid ingesting too much salt, which would increase the osmotic pressure in body tissues, producing adverse effects on cell metabolism. Animals experiencing a salt deficit actively seek out and eat sodium chloride, but the sensory basis for this salt appetite is not understood. Minor essential nutrients, such as sterols and vitamins, are not known to be tasted by animals. They are probably of such widespread occurrence that an animal's normal food contains

sufficient quantities, which is true for inorganic salts. However, associative learning may also have an important role in ensuring that appropriate levels of these compounds are obtained (*see below* Behaviour and chemoreception: Associative learning). Except for bitter-tasting substances, the chemicals that stimulate taste receptors are generally water soluble.

Humans do not make further distinctions within the five modalities. For example, different sugars may have different degrees of sweetness, but they do not have distinct tastes. Similarly, bitter-tasting substances, such as quinine or caffeine, taste bitter but do not induce separate tastes, despite great differences in their molecular structures. However, the umami receptor does give the ability to distinguish between naturally occurring amino acids and is sensitive to MSG. Natural foods contain many different chemicals; for example, the taste of an apple may stimulate all the different types of receptors to different degrees.

There is evidence that all taste buds exhibit sensitivity to all taste sensations. However, in humans and some other mammals, there are certain taste papillae with receptor cells highly sensitive to sweet taste, as well as receptors preferentially tasting salt and receptors preferentially tasting bitter substances. The taste receptor cells of other animals can often be characterized in similar ways to those of humans, because all animals have the same basic needs in selecting food. In addition, some organisms have other types of receptors that permit them to distinguish between classes of chemicals not directly related to diet and that enable them to make further distinctions within the modalities.

Smell

The olfactory system is concerned with the detection of airborne or waterborne (in aquatic animals) chemicals that may be present in very low concentrations. Olfactory receptor cells are present in very large numbers (millions), forming an olfactory epithelium within the nasal cavity. Each receptor cell has a single external process that extends to the surface of the epithelium and gives rise to a number of long, slender extensions called cilia. The cilia are covered by the mucus of the nasal cavity. Unlike taste receptor cells, olfactory receptor cells have axons that connect directly to the brain. Olfactory receptor cells are continually replaced, with new cells developing from basal cells in the olfactory epithelium. In humans the receptor cells are replaced about every 60 days.

PG TRB 2020 – 21 ZOOLOGY UNIT - 7 - QUESTIONS

1. The study of different aspects of ageing is known as

A) Gerontology

B) Gynaecology

C) Odontology

D) Chronology

2. This theory states that the accumulation of particular waste products leads to ageing

A) immunity theory

B) metabolic theory

C) waste product theory

D) all of the above

3. The human body loses cells regularly in this area

A) red blood cells

B) lining layer of the gut

C) surface of skin

D) all of these

4. This characterizes ageing

A) increase in the consumption of oxygen

B) increased anabolism

C) increased metabolic activity

D) a decrease in the metabolic activity

5. This is known as the "Clock of ageing"

A) Pituitary

B) Thymus

C) Thyroid

D) Adrenal

6. In many mammals, even humans, ageing can be due to

A) malnutrition and stress

B) interaction between hereditary factors and the environment

C) adverse alterations in the environment

D) all of these

7. The activity of collagen protein is affected badly in old age. This is due to

A) diffusion that becomes very high

B) diffusion that becomes very slow

C) permeability which becomes very high

D) permeability which becomes very low

8. Brain and Thymus are the main factors in the ageing process

A) Mutation theory

B) Pacemaker theory

C) Gene theory

D) Stress theory

9. Which of the following theory states that accumulation of errors in cellular molecule affects the ageing process?

A) Gene theory

B) Environmental theory

C) Error catastrophe theory

D) Mutation theory

10. Degenerative changes take place during

A) ageing only

B) metamorphosis only

C) both in ageing and metamorphosis

D) parthenogenesis

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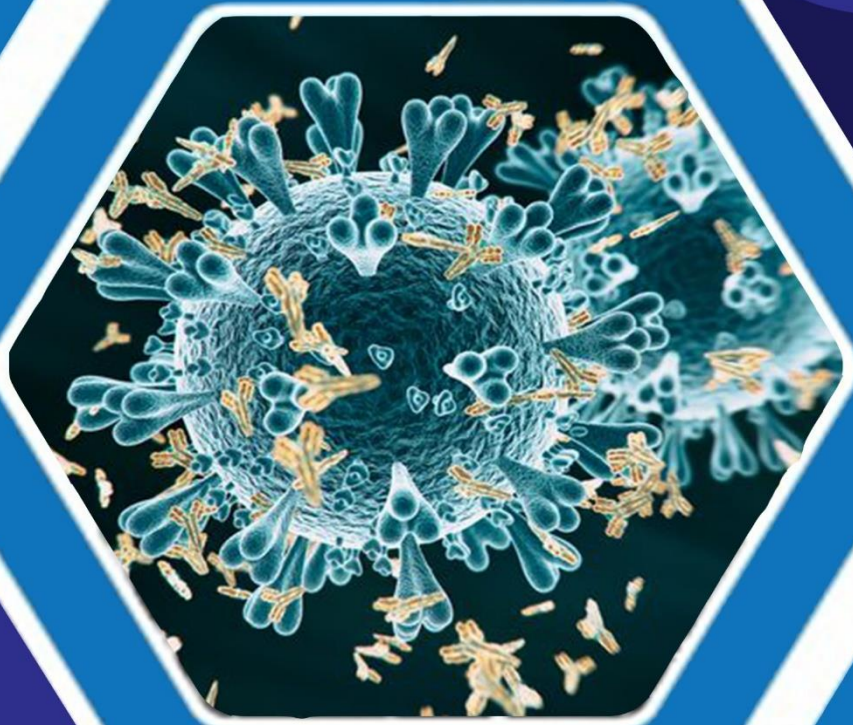
UNIT-8



Zoology

ZOOLOGY SYLLABUS

UNIT-VIII

ANTIGEES AND ANTIBODIES – Specific and non-specific immune mechanism – Immunity (innate and acquired) – Antigenes – Heptens – Antigenic determinants – Adjuvants. Immunoglobulin molecules as antigenes – allotypes Immune system and lymphoid organs. Macrophages – T-Cell and B Cell Antibodies production Immune response: Humoral and cell mediated immunity – regulation of immune response – Tolerance – Antigen and antibody reaction – Physical and Biological – Vaccination – Allergy – AIDS – Congential immunodeficiencies.

Environmental Biology – Biotic and abiotic factors of the environment Biogeochemical Cycles – Eco System – Concepts. Resource Management – Ecological energetics; energy transformation, productivity - food chain – Food webs, Pyramids.

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UNIT – VIII

IMMUNOLOGY

Definition

Immunology is a branch of biomedical sciences that covers the study of all aspects of the immune system in all organisms.

INTRODUCTION

The latin term immunis, meaning "exempt", is the source of the English word immunity, meaning the state of protection from infectious diseases. Thucydis, the great historian describing a plague in Athens, he wrote in 430 B.C, that only those who had recovered from the plague could nurse the sick because they would not contract the disease for second time. In 1798, Edward Jenner, an English physician created immune response to small pox from mild cowpox disease.

Specific and non-specific immune mechanism

Nonspecific protective **mechanisms** repel all microorganisms equally, while the **specific immune** responses are tailored to **particular** types of invaders.

These **immune mechanisms** also help eliminate abnormal cells of the body that can develop into cancer.

IMMUNITY

Definition:

Immunity is defined as resistance against the pathogenic microorganisms (infections). When the infection or disease occurs our body eliminates the pathogen by immunity.

Types:

i) Innate immunity (Natural or Non specific immunity)

ii) Acquired immunity (Adopted or specific immunity)

INNATE IMMUNITY

Definition:

Innate immunity is defined as the state of protection from infectious agents by specific mechanisms without the production of antibodies. Ex: Physiological and Anatomical barriers.

The innate immunity exists from birth onwards and it does not depend on previous exposure to any particular microorganisms or immunization. Also it is not developed during the lifetime of an individual. It is non specific and can act against a wide range of potentially pathogenic microorganisms.

DETERMINANTS OF INNATE IMMUNITY

Some factors that determines the effectiveness and nature of the innate immunity are as follows:

- Species resistane
- Racial reistance
- Individual resistance
- Age
- Hormonal influence
- Nutrition

Species resistance

Innate immunity mainly depends on the species. One species is susceptible to a particular disease, whereas another is resistant to it. Species that control the innate immunity depends on

- ✓ Basic physiological characteristics and Biochemicla differences, Ex: Frogs (cold blooded animal) are naturally resistant to antrhrax caused by *Bacillus anthrasis*, but become susceptible to anthrax when its body temperature rises above 27°C.
- ✓ Anatomical charecteristics, Ex: Human beings (soft skin) are highly susceptible to common cold in contrast to animals (thick skin) which are not susceptible to cold virus.

Racial resistance

Racial background of human population also determines the ability resist infectious virus. Ex: Negroes are highly susceptible to tuberclosis caused by *Mycobacterium sp***,** whereas Americans alone are highly susceptible to African sleeping sickness caused by *Tryponosomabrusei*, when compare to other races.

Individual resistance

Some individuals are highly susceptible to some infections. Moreover genetic makeup of the individuals make them susceptible or resistance to infections or diseases. In addition personal

hygiene also plays a major role in innate immunity. So the lack of hygiene makes the individual susceptible to infections.

Age:

From birth onwards, immunity begins to mount against pathogens. Children are more or less resistance to many infectious diseases; the power of innate immunity reaches peak during teen ages and there is an equilibrium during the age from 24-30 years approximately; after 30 the immunity gradually becomes declined.

Hormonal influence

Endocrine disorders such as diabetes mellitus, hypothyrioidism and adrenal dysfunction are associated with increased susceptibility to infections. In the case of females, they are all highly susceptible to infectious diseases because of hormonal imbalance due to menstrual cycle.

Nutrition

The necessary micro and macro elements which should be present in the food stuffs taken up by an individual also play an important role in innate immunity. Malnutrition leads to more infections when compared to nourished individuals.

MECHANISM OF INNATE IMMUNITY

1. Physical defense
2. Chemical defense
3. Cellular defense
4. Inflammatory response
5. Fever response

Physical defense (First line defense)

Various factors that physically prevent the entry and multiplication of microbes in our body constitute physical defense. They act like physical barriers which includes:

a) Skin
b) Mucus
c) Cilia
d) Hairs in the nasal cavity
e) Fluid flushing

PG TRB 2020 – 21 ZOOLOGY UNIT – 8 - QUESTIONS

1. Ecology deals with the study of:

a) Living beings

b) Living and non living components

c) Reciprocal relationship between living and non living components

d) Environment

2. Autoecology deals with

a) Ecology of species

b) Ecology of many species

c) Ecology of community

d) All the above

3. Synecology deals with

a) Ecology of many species

b) Ecology of many populations

c) Ecology of community

d) None of the above

4. Ecotype is a type of species in which environmentally induced variations are

a) Temporary

b) Genetically fixed

c) Genetically not related

d) None of the above

5. The term 'Biocoenosis' was proposed by

a) Transley

b) Carl Mobius

c) Warming

d) None of the above

6. The pyramid of energy in any ecosystem is

a) Always upright

b) May be upright or invented

c) Always inverted

d) None of the above

7. Energy flow in ecosystem is

a) Unidirectional

b) Bidirectional

c) Multidirectional

d) None of the above

8. An ecosystem must have continuous external source of

a) minerals

b) energy

c) food

d) All of the above

9. The source of energy in an ecosystem is

a) ATP

b) Sunlight

c) D.N.A

d) R.N.A

10. Trophic levels are formed by

a) Only plants

b) only animals

c) Only carnivorous

d) Organisms linked in food chain

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Zoology

UNIT-9

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2020-2021

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ZOOLOGY SYLLABUS

UNIT-IX

Zoogeography of Indian wild mammals. Indian primates – Natural Resources – Conversation of natural resources and wild life (Protection) Act. Wild life - Sanctuaries of Tamil Nadu. Environmental degradation - factors affecting environment. Patterns of Behaviour – Instinctive and learning behaviour – social behaviour – social organisation – Social behaviour in mammals – Aggression and courtship.

EVOLUTION: Origin of life – Theories of evolution evidences for evolution – Natural selection – Micro evolution – Hardy - Weinberg Equilibrium – genetic draft. Speciation – Mechanism of speciation – Phyletic and sudden speciation modes of gradual speciation – Incomplete species – Species problems – Allopatric and sympatric speciation.

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UNIT – XI

ZOOGEOGRAPHY OF INDIAN WILD MAMMALS

Zoogeographical Region of India

India falls under the Oriental Zoogeographical Region of the World. This region includes the Indian Subcontinent, Southern China, Malaysia, Phillipines, and the islands of and around Indonesia.

The majority of the areas denoted under this region are Tropical Forests, with considerable dry and partially desert areas in the North-western region where highly specialised adaptions are seen in species.

Species overlap in these regions across various orders and families, yet the taxonomical difference between them is not very dissimilar.

Sub-regions of the Oriental Region :

- **Indian** : From the foot of the Himalayas, across the Western & Eastern Ghats till the southernmost tip upto Mysore.
- **Indo-Ceylonese** : Sri Lanka and Southern India
- **Indo-Chinese** : Burma, Thailand, Laos, Vietnam and parts of Southern China
- **Indo-Malayan** : Malayan Peninsula, islands of the Malay Archipelago and Indonesia.

Bio-geographic Classification of India

India comprises of just 2.4% of the Earth's landmass, and it hosts biodiversity which amounts to 8% of the Earth's species known to man today. India is considered a mega-diverse nation. The reasons for this are the unique geographical features which shape the landscape.

The 10 Bio-geographic Regions of India are

1. Trans-Himalayan Region

This is the high-altitude rain-shadow area of the Himalayan Mountains which display cold and arid conditions. These are unique cold deserts comprising of bare hills and sparse alpine steppe vegetation.

Tibetan Wild Ass or Kiang	Tibetan Argali
Tibetan Gazelle	Tibetan Antelope or Chiru
Asiatic Ibex	Black-necked Crane
Ladakh Urial	Tibetan Wolf
Wild Yak	Snow Leopard
Wildlife of Trans-Himalayan Region	

2**. Himalayan Zone**

These are the youngest, yet highest mountains in the world. They form the Northern Boundary of the Indian Subcontinent. This area contains Tropical Forests, Deciduous Forests, Mixed Forests, Alpine Meadows, Oak, Rhododendron, Coniferous Forests and Snow-capped peaks. Massive biodiversity exists here.

Snow Leopard	Ghoral
Clouded Leopard	Urial
Himalayan Brown Bear	Himalayan SerowRed Panda
Asiatic Black Bear	Himalayan Vulture
Tibetan Wolf	Lammergeier
Musk Deer	Ibisbill
Hangul	Tragopan birds
Himalayan Tahr	Monal birds
Takin	Marmots
Wildlife of the Himalayan Region	

3. Desert Region

In the West of India, in the Aravalli Hills, lies the Desert landscape of India. A land once submerged underwater. These are :

1. The Thar Desert of Rajasthan
2. The Salt Desert of Kutch in Gujarat.

Indian Wild Ass or Khur	Indian Hedgehog
Blackbuck	Flamingoes
Indian Grey Wolf	Indian Desert Gerbil
Desert Fox	Falcons
Great Indian Bustard	Eagles

Wildlife of Desert Region of India

4. Semi- Arid Region

Adjoining the Desert Region are the semi-arid areas mostly comprising of thorny Scrub, Dry Deciduous Forests and sparse Grasslands. Hill areas and rocky outcrops provide shelter for a variety of animals.

Asiatic Lion	Indian Spiny- tailed Lizard
Indian Leopard	Macqueen’s Bustard
Striped Hyaena	Indian Spotted Creeper
Indian Wolf	Indian Start Tortoise
Desert Fox	Wheatears
Caracal	Falcons Cream-coloured Courser
Desert Cat	Falcons
Indian Desert Gerbil	Eagles

Wildlife of Semi-arid Regions of India

PG TRB 2020 – 21 ZOOLOGY UNIT – 9 - QUESTIONS

1. What stops a new chromosome variant appearing as a unique mutation from increasing in frequency?

(a) It is because polyploidy is a rare process

(b) it will interbreed with majority form causing heterozygotes to be inferior

(c) allopatric speciation does not necessitate reinforcement

(d) all of these

2. This is the key to speciation of populations

(a) reproductive health

(b) reproductive isolation

(c) population growth

(d) extinction

3. This can cause a steeper cline

(a) Extensive migration

(b) Strong selection against heterozygotes

(c) Stabilizing selection throughout the region

(d) All of these

4. The reproductive isolating factor occurring when a sperm and an egg are incompatible is

(a) temporal isolation

(b) ecological isolation

(c) gametic isolation

(d) behavioural isolation

5. Species, the biological concept is applicable only to the breeding populations

(a) that are adequately large to constitute a viable reproductive group

(b) that are adequately uniform to be recognized by observation

(c) in experimental conditions

(d) in nature

6. Which of the following is included in the concept of genetic bottlenecks?

(a) a loss of genetic diversity in descendent populations

(b) sharing genetic material between two populations

(c) extensive gene flow

(d) increased ability to resist new diseases

7. This type of speciation enables production of hybrids between two species

(a) allopatric speciation

(b) parapatric speciation

(c) bottleneck

(d) sympatric

8. This is not a reproductive isolating mechanism

(a) ecological isolation

(b) individual isolation

(c) temporal isolation

(d) behavioural isolation

9. In this kind of speciation, evolution can be expected to be faster whilst the speciation between the speciating events

(a) Peripheral speciation

(b) Hybridization

(c) Sympatric speciation

(d) Both (b) and (c)

10. A new species emerges from this geographic range of its ancestor as per this theory of speciation

(a) Sympatric speciation

(b) Parapatric speciation

(c) Allopatric speciation

(d) None of these

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2020-2021

UNIT-10

Zoology

ZOOLOGY – SYLLABUS

UNIT-X

Macro evolution: Geological records – Fossils and fossilization – evolutionary trends – Parallel evolution – Progressive and retrogressive trends – Rates of evolution.

Course of evolution: Chemical evolution – evolution of prokaryotic cells. Speculative origin of Eukaryotic cells – Origin of Metazea. Primate and Human Evolution – Human racial diversity – Theories of human racial origins – Future evolution of man.

MAN AND BIOSPHERE - Man's role in conservation of natural resources. Biosphere. Human activities that modify the biosphere. Human resource management. Tribals and biosphere. Future of man and biosphere.

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UNIT - X

MACROEVOLUTION

Macroevolution Definition

Macroevolution refers to the concept of large-scale evolution that occurs at the level of species and above.

Macroevolution can be used to describe the differences between two closely related but distinct species, such as the Asian Elephant and the African Elephant, which cannot mate due to the barriers imposed by *reproductive isolation*. This is the process of *speciation*, which can be driven by a number of different mechanisms. Additionally, macroevolution can describe differences between that organisms belonging to larger *clades* of organisms, for example the different taxonomic groups within the primates.

The term macroevolution can also be used to explain the shared common ancestry between all living organisms, a concept known as *Universal Common Descent*. This describes the derivation of all existent and extinct life forms from a single origin, and includes evolutionary milestones such as the origins of plants, mammals, reptiles, birds, fish, non-avian dinosaurs and more.

The term 'macroevolution' is often used in contrast to the within-species genetic changes that relate to *microevolution*, although the two concepts are fundamentally the same, albeit on different time scales; each of the evolutionary mechanisms—*mutation*, *gene flow*, *genetic drift* and *natural selection*—that alter the *gene pool* of a population through microevolution, will accumulate over a long time period, resulting ultimately in macroevolution. In the case of Universal Common Decent, microevolution has been driving the macroevolution of living organisms for 3.8 billion years (that's 3,800,000,000 years!).

While macroevolution can occur due to an accumulation of micro-evolutionary changes, a random event that somehow separates a population into two different populations may also be responsible for the formation of new species. This is called *allopatric speciation*. For example, individuals in a population of lizards that live in a valley may become separated by the flow of newly formed river. The river makes it impossible for the individuals on each side to interact and breed. Due to the climate and landscape, one side of the valley is lush green vegetation; the other is hot and arid. Over time, each lizard population will adapt to the conditions on each side of the valley. If the interactions between them continue to be restricted, the two populations could become so different that if they were able to reunite, they could no longer breed. The two populations of lizards would be classed as new species and would have increased to the world's biodiversity through macroevolution.

Creationists more commonly dispute the factual legitimacy of macroevolution than microevolution because microevolution is demonstrable within a lab, whereas macroevolution cannot be observed within the lifetime of a human. There are, however, many ways to observe macroevolution using the evidence available from fossils, geology and radiometric dating, genetics, and the ecology, morphology and behavior of living organisms.

Evolution is not progress. The popular notion that evolution can be represented as a series of improvements from simple cells, through more complex life forms, to humans (the pinnacle of evolution), can be traced to the concept of the scale of nature. This view is incorrect.

All species have descended from a common ancestor. As time went on, different lineages of organisms were modified with descent to adapt to their environments. Thus, evolution is best viewed as a branching tree or bush, with the tips of each branch representing currently living species.

No living organisms today are our ancestors. Every living species is as fully modern as we are with its own unique evolutionary history. No extant species are "lower life forms," atavistic stepping stones paving the road to humanity.

A related, and common, fallacy about evolution is that humans evolved from some living species of ape. This is not the case—humans and apes share a common ancestor.

Both humans and living apes are fully modern species; the ancestor we evolved from was an ape, but it is now extinct and was not the same as present day apes (or humans for that matter). If it were not for the vanity of human beings, we would be classified as an ape. Our closest relatives are, collectively, the chimpanzee and the pygmy chimp. Our next nearest relative is the gorilla.

Microevolution can be studied directly. Macroevolution cannot. Macroevolution is studied by examining patterns in biological populations and groups of related organisms and inferring process from pattern. Given the observation of microevolution and the knowledge that the earth is billions of years old — macroevolution could be postulated. But this extrapolation, in and of itself, does not provide a compelling explanation of the patterns of biological diversity we see today.

Evidence for macroevolution, or common ancestry and modification with descent, comes from following fields of study:

i. Comparative biochemical and genetic studies.

ii. Comparative developmental biology.

iii. Patterns of biogeography.

iv. Comparative morphology and anatomy and the fossil record.

Closely related species (as determined by morphologists) have similar gene sequences. Overall sequence similarity is not the whole story, however. The pattern of differences we see in closely related genomes is worth examining.

All living organisms use DNA as their genetic material, although some viruses use RNA. DNA is composed of strings of nucleotides. There are four different kinds of nucleotides adenine (A), guanine (G), cytosine (C) and thymine (T). Genes are sequences of nucleotides that code for proteins. Within a gene, each block of three nucleotides is called a codon. Each codon designates an amino acid (the subunits of proteins).

The three letter code is the same for all organisms (with a few exceptions). There are 64 codons, but only 20 amino acids to code for; so, most amino acids are coded for by several codons. In many cases the first two nucleotides in the codon designate the amino acid. The third position can have any of the four nucleotides and not affect how the code is translated.

A gene, when in use, is transcribed into RNA — a nucleic acid similar to DNA. (RNA, like DNA, is made up of nucleotides although the nucleotide uracil (U) is used in place of thymine (T). The RNA transcribed from a gene is called messenger RNA.

Messenger RNA is then translated via cellular machinery called ribosomes into a string of amino acids—a protein. Some proteins function as enzymes, catalysts that speed the chemical reactions in cells. Others are structural or involved in regulating development.

Gene sequences in closely related species are very similar. Often, the same codon specifies a given amino acid in two related species, even though alternate codons could serve functionally as well.

PG TRB 2020 – 21 ZOOLOGY UNIT – 10 - QUESTIONS

1. Biosphere is defined as

(A) Part of the earth water and atmosphere which inhabits living organism

(B) Part of the soil where animals and plants are found

(C) Atmosphere in which life exists

(D) None of the above

2. Biosphere consists of

(A) Lithosphere

(B) Atmosphere

(C) Hydrosphere

(D) All the above

3. Component of biosphere related with soil is

(A) Lithosphere

(B) Hydrosphere

(C) Atmosphere

(D) None of the above

4. Phenomenon of rain, dew, snow i.e., different forms of water coming to earth under force of gravity is called

(A) Geotropism

(B) Climatic factors

(C) Precipitation

(D) Calcification

5. Process of evapo-transpiration and precipitation is called

(A) Carbon cycle

(B) Nitrogen cycle

(C) Hydrological cycle

(D) All the above

6. Agents which make free atmospheric nitrogen available to plants are

(A) Lightening

(B) Free living nitrogen fixing bacteria

(C) Symbiotic nitrogen fixing bacteria

(D) All the above

7. Maintenance of soil fertility without addition of nutrition is due to

(A) Floods

(B) Crop residue

(C) Favourable temperature

(D) Microbial activity

8. A logical sequence of carbon cycle is

(A) Producer – Consumer – Decomposer

(B) Decomposer – Producer – Decomposer

(C) Consumer – Producer – Consumer

(D) Producer – Decomposer – Consumer

9. Rise of atmospheric temperature because of high concentration of carbon dioxide is known as

(A) Green house effect

(B) Biomagnification

(C) Pollution

(D) Ecotone

10. Source of energy in the biosphere is

(A) Producer

(B) Decomposer

(C) Sunlight

(D) Heat of earth

ZOOLOGY