SURA'S

Target NEET Biology

Detailed Theory and Exhaustive MCQAs

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NEET Biology

CHAPTERS

NEET – National Eligibility cum Entrance Test

INTRODUCTION

The **Medical Council of India (MCI)** has restored the **National Eligibility cum Entrance Test (NEET)** to select the aspiring candidates, who are seeking higher education opportunities in Medical(MBBS) and Dental(BDS) Colleges/Universities across the country. This book with its extensive and accurate question bank and answers will enable students to understand the concept followed in the test thoroughly and enhance their scores.

TEST PATTERN

1.	**Number of Questions/ Subjects**	**:** The question paper will consist of a total of **180** Multiple choice questions with **45** questions from Physics and Chemistry **each** and **90** questions from Biology.
2.	**Scoring Pattern**	**:** **4 marks** will be **awarded** for each correct answer And **1 mark** will be **deducted** for each incorrect Answer. A maximum of **720 marks** has been set as the upper limit.
3.	**Duration and Mode**	**:** The test duration will be **3 hours** in Pen & Paper Mode.
4.	**Languages**	**:** The test will be conducted in **10 (TEN)** languages.
5.	**Core Syllabus**	**:** **The Medical Council of India (MCI)** Recommends the following syllabus for **NEET** for Admission to **MBBS/BDS** courses after reviewing Various State Board Syllabi and those of CBSE & NCERT.

Unit I

DIVERSITY IN LIVING WORLD

THE LIVING WORLD

Syllabus

What is living?; Biodiversity; Need for classification; Three domains of life; Taxonomy & Systematics; Concept of species and taxonomical hierarchy; Binomial nomenclature; Tools for study of Taxonomy – Museums, Zoos, Herbaria, Botanical gardens.

Five kingdom classification; salient features and classification of Monera; Protista and Fungi into major groups; Lichens; Viruses and Viroids.

Salient features and classification of plants into major groups - Algae, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms (three to five salient and distinguishing features and at least two examples of each category; Angiosperms-classification up to class, characteristic features and examples).

Salient features and classification of animals-non chordate up to phyla level and chordate up to classes level (three to five salient features and at least two examples.

In our Solar System, Earth is the only planet having a habitable nature for supporting life as it is situated at the correct, distance from the sun. The biodiversity of Earth is so vast from the perspective of both flora and fauna that so far, we have not completed the identification of all the life forms. According to an estimate made by **Robert May**, global species biodiversity is about 7 million. Of the total species discovered so far, 70% are animals and 22% are plants. Of the animals, 70% are insects. Three fourth of the planet is surrounded by water and one fourth by land due to which there are more diverse aquatic flora and fauna than terrestrial species. The aquatic biodiversity is very rich in the sense that many of them are still unscreened. Literature says only 15% of the bacteria known can be cultured in the laboratory indicating that we do not know the way of life of many of them. Nature displays countless relationships like cooperation, conflicts, nursing, predation, symbiosis, parasitism, amensalism and saprophytism among individuals at micro and macro levels and form a way for energy cycling/recycling through fixation or degradation process.

What is Life

We are trying to understand what is life and we could define life precisely as a complex organization of different molecules in a precise pattern to form its basic unit called 'cell'. The various chemical reactions which occur inside the cell which leads to the availability of energy, growth, development, responsiveness, metabolism and reproduction in living beings forms the basis for the power of organization to maintain and reproduce itself on earth.

Characteristics of Living Beings

Growth

- Growth is a fundamental characteristic of an organism.
- It can be clearly observed under a microscope in microbes when the cell enlarges in size and divides into two cells.
- In superior animals and plants it can be seen by the changes in their morphology, size etc.
- Cell division takes place to maintain the size and shape of the organisms and to replace the lost cells in tissues.
- Growth is irreversible and it implies both the increase in mass and number of cells within the organism.
- Growth occurs in non life forms - eg. piling up of ice bergs at poles and formation of sand dunes due to wind activity in deserts. It is a process of adding up of material externally (extrinsic) when compared to living beings where it is intrinsic i.e., takes place internally.
- Growth cannot be considered as a defining property of living organisms.

Reproduction

Reproduction is an exclusive characteristic of living organisms. It is defined as production of new individuals or offspring's from the existing organisms. There are two major types of reproduction.

1. Asexual Reproduction
2. Sexual Reproductiion

Asexual Reproduction

- New individuals are formed from particular or any parts of the body of a single parent.
- There is no involvement of sex or fusion of gametes.
- Organisms like bacteria or amoeba undergo cell enlargement and divide to form new cells so that the number of cells increases and they form colonies. It is identical to growth.
- Yeast and Hydra show budding as a mode of asexual reproduction.
- Fragmentation is common in algae (in Cyanophyta a long filament is broken into small filaments by the formation of dead cells or hormogonia in between.).
- Bryophytes and Fungi (at protonemal stage), Planaria (flat worms) show ability to form or regenerate the original filament through this type of reproduction.

Sexual Reproduction

- Production of sexual gametes from opposite sexes , fusion and formation of a diploid zygote which again divides by mitosis and forms a new individual.(In Plants and Animals)
- Lifeless objects and infertile organisms cannot reproduce and form new progenies.

Unit II

STRUCTURAL ORGANISATION IN ANIMALS AND PLANTS

PLANT ANATOMY

SYLLABUS

Structural Organisation in Animals and Plants

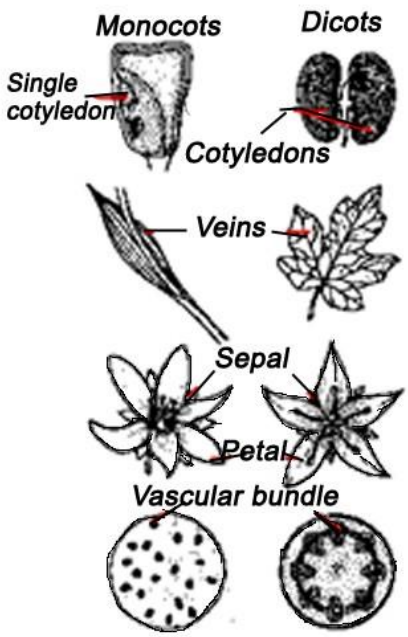
Morphology and modifications; Tissues; Anatomy and functions of different parts of flowering plants: Root, stem, leaf, inflorescence- cymose and racemose, flower, fruit and seed (To be dealt along with the relevant practical of the Practical Syllabus).

Animal tissues; Morphology, anatomy and functions of different systems (digestive, circulatory, respiratory, nervous and reproductive) of an insect (cockroach). (Brief account only).

MORPHOLOGY OF FLOWERING PLANTS

In the plant kingdom, the division Spermatophyta is divided into gymnosperms and angiosperms. The most diverse and dominant group of plants among the two are angiosperms, also referred to as magnoliophyta. In common terms, angio-sperms are all flowering plants. They are distinguished from gymnosperms, by their ability to flower and produce seeds enclosed in fruits. There are a few other characteristics that are discussed in the following paragraphs.

Basic Angiosperms Characteristics :



The first plants to make an appearance on the face of the Earth were gymnosperms. They are said to have given rise to flowering plants about 245 to 202 million years ago. The first flowering plants that deviate from the initial angiosperms are called basal angiosperms. Delving into the evolutionary past of basal angiosperms, one finds few groups that branch off, before the true 'dicots' appear. The basal angiosperms consisted of the Ambroella, Nymphaeales, and Austrobaileyales. These flowering plants were called Paleodicots that did not belong to either the eudicots or monocots. The basal characteristics show they had flattened laminar stamens with large filaments. They also had numerous tepals, separate carpels and spirally arranged leaves.

Features That Distinguish Angiosperms : Angiosperms have ovules that are enclosed in an ovary.

There are two subtypes of angiosperms: monocotyledons and dicotyledons. The most prominent features of angiosperms is the ability to flower and produce fruits.

There are over 2,50,000 species of angiosperms. Angiosperms are able to grow in a variety of habitats. They can grow as trees, shrubs, bushes, as well as herbs. These plants have diploid (2n) sporophytes.

Angiosperms have a distinctive underground root, as well as aerial shoot system. Angiosperms have very well-developed conducting tissues. These tissues include the xylem and the phloem arranged in form of vascular bundles. The xylem contains vessels. Similarly, phloem consists of sieve tubes and companion cells.

The vascular bundles of monocotyledons are arranged in stems, in a cross-section. The dicotyledons have vascular bundles organized in form of a ring. A pith for storage, as well as cortex for strength and structure are found in the stem tissues.

Growth of stem tissues takes place due to a layer of cambium cells. The outer part of the stem tissues is covered with a layer of epidermis.

The root system of angiosperms is also very complex. The roots also contain cortex, phloem, xylem, and epidermis. They have root hair that help in better absorption of water minerals from the soil. Absorption takes place by diffusion and active transport.

The leaves carry out photosynthesis and are covered with a waxy cuticle to avoid water evaporation from leaves. There is absence of stomatal openings in the upper epidermis. This helps in prevention of excess transpiration. The stomatal openings are present in the lower epidermis.

The flowers are one of the most differentiating features of angiosperms. They are the reproductive structures of angiosperms. The flower has a thalamus that is a short axis and four whorls of sporophylls arranged on the thalamus.

The four whorls of floral leaves include calyx, corolla, androecium and gynoecium. The sepals, petals, stamens and carpels make up the whorls.

The stamens produce pollen that helps in pollination when they reach the stigma. A pollen tube containing non-motile male gametes is produced after germination of a pollen grain. The pollen tube reaches the ovary through a style.

Ovaries of an angiosperm contain a nucellus and two integuments containing a micropyle. Closed carpels that enclose the ovules help in prevention of self-fertilization. Prime features that distinguish angiosperms also include double, as well as triple fusion. This leads to formation of a zygote (2n) and triploid endosperm cell (3n). Endosperm cell produces endosperm and zygote develops into a sporophyte.

Fertilization takes place by pollination, that includes insect pollination, wind pollination, etc.

Endosperm is produced after fertilization and before the zygote undergoes its first division. The endosperm helps in providing nutrition to the developing embryo, as well as the seedlings.

The fertilized ovule develops into seeds and then ripens into a fruit. The seeds are enclosed in the fruits and are dispersed by animals and humans who eat the fruit.

All angiosperms are dicots (flower with stamens and pistils in separate flowers on same or different plant) and monocots (stamens and pistils on the same flower).

The root and shoot system is the prime feature of angiosperms. They are the major food sources for animals as well as humans.

Unit III

CELL UNIT OF LIFE, STRUCTURES COMPONENTS AND ORGANISATION

CELL

Basis of all forms of life

- Coined by: **Robert Hooke** (1665): Major results published in Micrographia
- **Anton von Leeuwenhoek** (1683): First to observe cells (egs., Bacteria, Protozoan, RBC's sperms) in microscope.
- Invented simple light microscope
- Most advanced ones are, Electron microscope, Confocal microscope, super-resolution microscope, etc.

Cell Theory

- German botanist (plant cells) Matthias Schleiden (1838) and British zoologist (animal cells) Theodar Schwann (1839)
- Reason for failure: Fail to explain cell formation
- Current postulates:
  1. All organisms are composed of cells and its products
  2. Cells are formed from pre-existing cells (Omnis cellula-e-cellula – Rudolf Virchow)

Major lipid components of plasma membranes

Source	PC	PE+PS	SM	Cholesterol
Plasma membrane (Human RBC)	21	29	21	26
Plasma membrane (Human RBC)	0	85	0	0
Plasma membrane (Human RBC)	16	37	13	34

Composition is expressed in terms of %

PC: Phosphatidyl choline, PE: Phosphatidyl ethanolamine; PS: Phosphatidyl serine

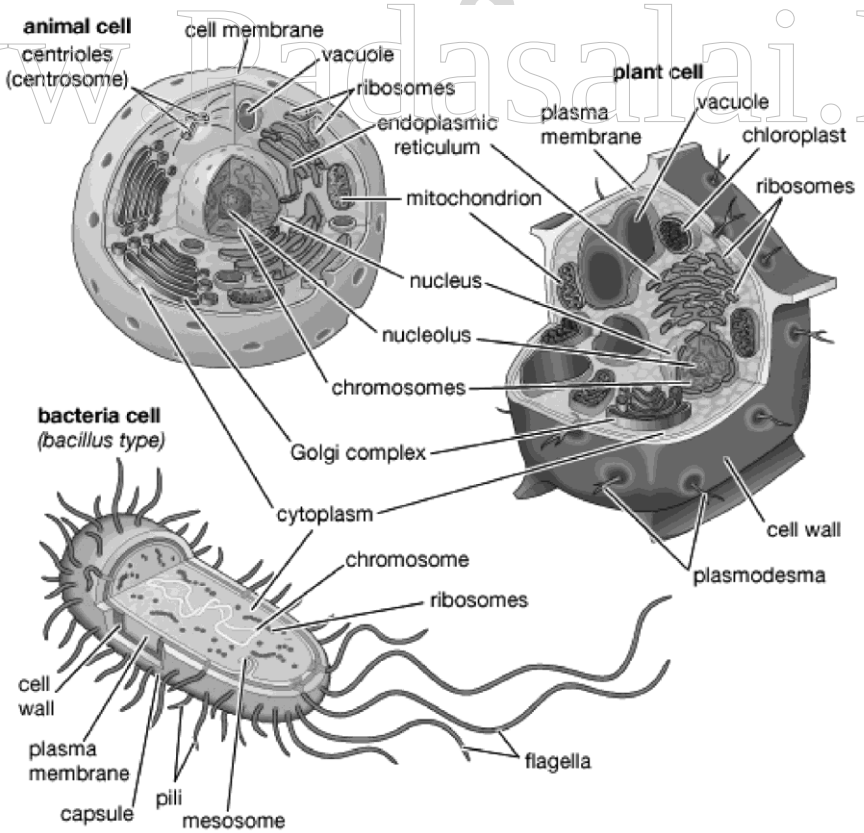
SM: Sphingomyelin

Major differences between Prokaryotic and Eukaryotic cell

Features	Prokaryote	Eukaryote
Examples	Bacteria	Plants, animals, protists and fungi
Cell size	Unicellular, average diameter (0.5-10 µm)	Mostly multicellular 10–100 µm Exception: Protists (unicellular)

Cell division	Mostly binary fission, no spindle formation during cell division	Mitotic and meiotic pattern. Spindle formation occurs
Genetic material	Circular DNA No nucleus DNA is not linked with proteins/RNA to form chromosomes	Linear DNA True nucleus DNA is linked with proteins/RNA to form chromosomes
Protein synthesis	70S ribosomes (smaller) 30S + 50S Absence of ER	80S ribosomes (larger) 40S smaller + 60S larger subunit Ribosomes attached to ER
Cell wall	Polysaccharides & Murein	Polysaccharides, Cellulose Animal cell-No cellulose
Flagella	Simple, lacking microtubules, not surrounded by cell membrane extracellular, 12nm in diameter	Complex, 9+2 microtubule arrangement, surrounded by cell membrane, 200nm in diameter
Respiration	Mesosomes- Bacteria Cytoplasmic membranes-Blue green algae	Mitochondria for aerobic respiration
Photosynthesis	No chloroplasts Photosynthesis takes places on membranes with no stacking	Chloroplast containing membranes stacked into lamellae or grana
N_2 fixation	Nitrobacter	None

Major differences between bacterial, animal and plant cells



Unit IV

PLANT PHYSIOLOGY

Transport in plants: Movement of water, gases and nutrients; Cell to cell transport-Diffusion, facilitated diffusion, active transport; Plant – water relations – Imbibition, Water potential, Osmosis, Plasmolysis; Long distance transport of water – Absorption, Apoplast, Symplast, Transpiration pull, Root pressure and Guttation; Transpiration-Opening and closing of stomata; Uptake and Translocation of mineral nutrients-Transport of food, Phloem transport, Mass flow hypothesis; Diffusion of gases.

Mineral nutrition: Essential minerals, Macro and Micronutrients and their role; Deficiency symptoms; Mineral toxicity; Elementary idea of Hydroponics as a method to study mineral nutrition; Nitrogen Metabolism-Nitrogen cycle, Biological Nitrogen Fixation.

Photosynthesis: Photosynthesis as a means of Autotrophic nutrition; Sites where photosynthesis takes place; pigments involved in Photosynthesis (Elementary idea); Photochemical and Biosynthetic phases of photosynthesis; Cyclic and Non-Cyclic and Photophosphorylation; Chemiosmotic hypothesis; Photorespiration C_3 and C_4 pathways; Factors affecting photosynthesis.

Respiration: Exchange gases; Cellular respiration-Glycolysis, Fermentation (Anaerobic), TCA cycle and electron transport system (Aerobic); Energy relations-Number of ATP molecules generated; Amphibolic pathways; Respiratory quotient. Plant growth and development: Seed germination; Phases of Plant growth and plant growth rate; Conditions of growth; Differentiation, dedifferentiation and redifferentiation; Sequence of developmental process in a plant cell; Growth regulators-Auxin, Gibberellin, Cytokinin, Ethylene, ABA; Seed dormancy; Vernalisation; Photoperiodism

Plant growth and development

Seed germination; Phases of Plant growth and plant growth rate; Conditions of growth; Differentiation, dedifferentiation and redifferentiation; Sequence of developmental process in a plant cell; Growth regulators-auxin,gibberellin, cytokinin, ethylene, ABA; Seed dormancy; Vernalisation; Photoperiodism.

TOPICS COVERED

1. Transport in plants
2. Mineral Nutrition
3. Photosynthesis in Higher Plants
4. Respiration in Plants
5. Plant Growth and Development

Transport in Plants

Introduction

- ¾ Means of Transport
- ¾ Plant-Water Relations

- ¾ Long Distance Transport of Water
- ¾ Transpiration
- ¾ Uptake and Transport of Mineral Nutrients
- ¾ Phloem Transport : Flow from Source to Sink
- ¾ Some Importance Definitions
- ¾ Quick Recap

Introduction

It is matter of great wonder how water reaches the top of tall trees, or for that matter how and why substances move from one cell to the other, whether all substances move in a similar way, in the same direction and whether any metabolic energy is required for moving substances.

Plants need to move molecules over very long distances, much more than animals do; they also do not have a circulatory system in place. Water taken up by the roots reaches each and every part of plant up to the tip of growing stem. The photosynthates or food synthesized by the leaves have also to be moved to all parts of plant including the root tips which remain embedded inside the soil. Short distance transport involves movement of substances within the cell, across the membranes and from cell to cell within the tissue.

To understand some of the transport processes that take place in plants, one would have to recollect one's basic knowledge about the structure of the cell and the anatomy of the plant body.

We also need to revisit our understanding of diffusion besides gaining some knowledge about chemical potential and ions.

Besides this, we need to know the kind of movement occurring and the type of substances transported by it. For instance, in a flowering plant the substances that would need to be transported are water, mineral nutrients, organic nutrients and plant growth regulators etc. Over short distances substances move by diffusion, and by cytoplasmic streaming supplemented by active transport while their long distance transport occurs through vascular system, i.e., Xylem, Phloem and is called translocation.

Another important aspect that needs to be considered while studying translocation is the direction of transport. As the direction of translocation is essentially unidirectional in case of water which is transported through Xylem from roots to the stem. It is multidirectional in case of minerals and organic solutes which occur through Phloem, as organic compound like Glucose synthesized in the green leaves are exported to all other parts of the plant including storage organs. From the storage organs they are later re exported. The mineral nutrients which are absorbed by the roots are transported upwards into the leaves, stem and the growing regions.

When any plant part undergoes senescence, nutrients may be withdrawn from such regions and moved to the growing parts. Plant hormones or growth regulators and other chemical stimuli are also transported in very small amounts, sometimes in a strictly polarized or unidirectional manner from where they are synthesized to other parts. Hence, in a flowering plant, there is a complex traffic of compounds (but probably very orderly) moving in different directions, each organ

Unit V

HUMAN PHYSIOLOGY

Digestion and Absorption

Synopsis

- ¾ Digestive systems in different animal groups.
- ¾ Human digestive system.
- ¾ Histology of alimentary canal.
- ¾ Digestive glands.
- ¾ Process of nutrition – ingestion, digestion, absorption, assimilation, and egestion.
- ¾ Hormonal control of digestion.
- ¾ Digestive disorders.

DIGESTION:

Food is one of the basic requirements of all living organisms. The major components of our food are Carbohydrates, Proteins and fats. Vitamins and Minerals are also required in small quantities.

Biomacromolecules in food cannot be utilised by our body in their original form. They have to be broken down and converted into simple substances in the digestive system.

This process of conversion of complex food substances to simple absorbable forms is called digestion and is carried out by our digestive system by mechanical and biochemical methods.

DIGESTIVE SYSTEMS IN DIFFERENT ANIMAL GROUPS

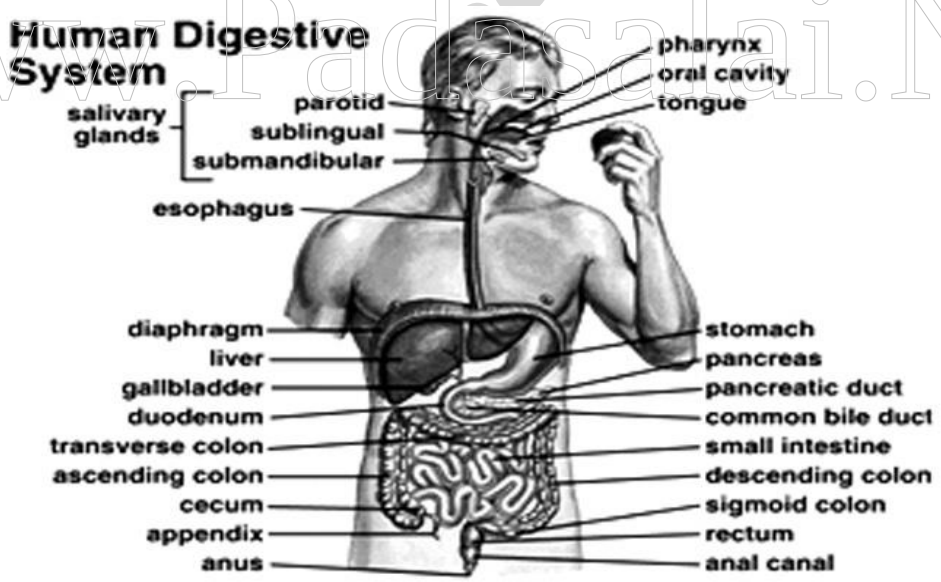
NO	ANIMAL GROUP	DIGESTION
1	Free-living Protozoans (e.g. Amoeba, Paramecium. Parasitic Protozoans - Plasmodium and Trypanosome.	Ingestion occurs with the help of Pseudopodia or Cilia. Digestion is intracellular. Food material is taken from the body of the host.
2	Sponges - Porifers	Digestion is intracellular.
3	Coelenterates	Partly extracellular and partly intracellular. (egestion through same opening).
4	Aschelminthes (eg: Ascaris)	Alimentary canal has two openings – mouth and anus. Body plan is tube – within – tube.

NO	ANIMAL GROUP	DIGESTION
5	Annelids (e.g. Earthworm)	Well-developed. Mouth-buccal cavity, pharynx, esophagus, gizzard, stomach, intestine (having typhlosole), rectum, anus.
6	Arthropods (Cockroach)	Mouth-buccal cavity, pharynx, esophagus, crop, gizzard, midgut, hindgut, anus.

ORGANS INVOLVED IN DIGESTIVE SYSTEM

In human beings, the digestive system consists of the alimentary canal and the associated glands (these glands help in the digestion of food).

- ¾ Mouth
- ¾ Buccal cavity – palate, teeth, salivary glands, tongue
- ¾ Pharynx.
- ¾ Oesophagus.
- ¾ Stomach.
- ¾ Small intestine.
- ¾ Large intestine.



Alimentary Canal

It starts with mouth (anteriorly situated) and opens outside through the anus (posteriorly situated). The mouth leads to the buccal cavity or oral cavity.

Buccal Cavity:

Buccal cavity consists of palate, tongue, salivary glands, teeth.

Unit VI

REPRODUCTION

REPRODUCTION IN ORGANISMS

Syllabus

Reproduction, a characteristic feature of all organisms for continuation of species; Modes of reproduction – Asexual and sexual; Asexual reproduction; Modes-Binary fission, Sporulation, Budding, Gemmule, Fragmentation; Vegetative propagation in plants.

Sexual reproduction in flowering plants: *Flower structure; Development of male and female Gametophytes; Pollination types, Agencies and examples; Outbreeding devices; Pollen-Pistil interaction; Double fertilization; Post fertilization events-Development of Endosperm and embryo, Development of seed and formation of Fruit; Special modes-Apomixis, Parthenocarpy, polyembryony; Significance of Seed and Fruit formation.*

Human Reproduction: *Male and female reproductive systems; Microscopic anatomy of testis and ovary; Gametogenesis-spermatogenesis & oogenesis; Menstrual cycle; Fertilisation, embryo development upto blastocyst formation, implantation; Pregnancy and placenta formation (Elementary idea); Parturition (Elementary idea); Lactation (Elementary idea).*

Reproductive health: *Need for Reproductive health and prevention of sexually transmitted diseases (STD); Birth control-Need and Methods, Contraception and Medical Termination of Pregnancy (MTP); Amniocentesis; Infertility and assisted reproductive technologies – IVF, ZIFT, GIFT (Elementary idea for general awareness.*

Reproduction is a biological process where new individuals are formed from parents. It is a multiplication process where a population of a species will be developed might look alike or vary a little and may have assumed new characters due to a perfect blending of both sexes. It is possible only in sexual reproduction but not in asexual reproduction because there is no involvement of sex in asexual reproduction .

All organisms survived in this planet for millions of years due to a continuity in their life cycle from one generation to another generation i.e., from Parent to Offspring. This continuity is called Reproduction. There are two types of reproduction .

1. Asexual reproduction
2. Sexual reproduction

Asexual reproduction is a method of quick multiplication of a species and its population. While sexual reproduction produces new varieties, forms and combinations. Thus there is a chance for adapting to the changes in the environment by a species and develop new Morphological, Anatomical, Physiological changes in their life.

Prokaryotes like bacteria show simple type of propagation called Binary fission and there is a tendency shown by them to attempt sexual reproduction by forming conjugation tubes through sex pili and transfer the nuclei between two different cells which we designate as + or - strains equivalent to male and female of higher organisms.

All other Eukaryotes show both asexual and sexual method of reproduction in their life cycle.

Reproduction in Plants

In plants asexual reproduction takes place by vegetative propagation like fragmentation, fission, Budding, Asexual spores, and Conidia. Sexual reproduction takes place by the formation of male and female gametes from male and female individuals and fusion of the both gametes to form a zygote.

In Algae, sexual reproduction takes place by union of cells called Plasmogamy followed by Karyogamy.

In Fungi also Plasmogamy and Karyogamy occurs (eg. Mucor - Zygomycetes)

In Bryophytes, formation of sex organs and fusion of Antheridium and Archegonium takes place. The resulting Zygote by repeated divisions produces the Sporophyte.

In Pteridiophytes the antherozoids fuses with egg cell and form the Zygote. The Zygote develops into a Sporophyte.

In Gymnosperms, Microspores (Pollen grains) and Megaspores (Embryosac) fuse to form new offsprings.

In Angiosperms pollen grain fuses with egg and forms the Zygote.

Vegetative Propagation

Here plants propagate through a part of their body other than seed. Every plant will have a period of vegetative growth. They enter into sexual phase in their life cycle after a successful period of vegetative growth. During this period many of them are known to propagate and multiply their population without involvement of sex. The part that is used for propagation is called Propagule.

There are two methods of Vegetative Reproduction.

1. Natural Vegetative Reproduction, 2. Artificial Vegetative Reproduction

1. NATURAL VEGETATIVE REPRODUCTION

In this method, a part of a plant body is removed from the main plant and develops naturally into a parent like plant. It may be a root, stem, underground stem, creeper, or a leaf of a plant.

Propagation by roots

Tuberous roots of Ipomea batatas – Sweet potato, Tapioca, Yam – Diascoreaceae, Dahlia, Tinospora, can be reproduced vegetatively when planted in soil.

Adventitious buds develop on the roots in some plants like Dalbergia sissoo – Indian rose wood, Fabaceae, Populus – Cotton wool , Salicaceae, Guava – Myrtaceae, Murraya , Albizzia lebbek – Native of Indo Malaya, tropical and subtropical silk plant, Fabaceae

Unit

VII GENETICS AND EVOLUTION

Syllabus

1. Heredity and variation: *Mendelian Inheritance; Deviations from Mendelism-Incomplete dominance, Co-dominance, Multiple alleles and Inheritance of blood groups, Pleiotropy; Elementary idea of polygenic inheritance; Chromosome theory of inheritance; Chromosomes and genes; Sex determination-In humans, birds, honey bee; Linkage and crossing over; Sex linked inheritance-Haemophilia, Colour blindness; Mendelian disorders in humans-Thalassemia; Chromosomal disorders in humans; Down's syndrome, Turner's and Klinefelter's syndromes.*

2. Molecular basis of Inheritance: *Search for genetic material and DNA as genetic material; Structure of DNA and RNA; DNA packaging; DNA replication; Central dogma; Transcription, genetic code, translation; Gene expression and regulation-Lac Operon; Genome and human genome project; DNA finger printing.*

3. Evolution: *Origin of life; Biological evolution and evidences for biological evolution from Paleontology, comparative anatomy, embryology and molecular evidence); Darwin's contribution, Modern Synthetic theory of Evolution; Mechanism of evolution-Variation (Mutation and Recombination) and Natural Selection with examples, types of natural selection;*

Gene flow and genetic drift; Hardy-Weinberg's principle; Adaptive Radiation; Human evolution.

GENETICS

Genetics is a branch of biology that deals with the study of heredity and variation.

Heredity is the study of characters which are transmitted from one generation to an other or parent to offspring . The characters transmitted in such a way are called hereditary characters.

Variations are the differences among individuals of a species or offsprings or siblings of a parent.

The term genetics was introduced by Bateson (1905).

Gregor John Mendel (1822-1884) is considered as Father of Genetics because he conducted experiments on pea plants to know the pattern of heredity

Archibald Garrod is called the father of human genetics.

Heredity based Terminologies

Gene is the factor that determines the character of an organism and is inherited from parent to offspring.

Allele or Allelomorph A pair of contrasting characters

Dominant Allele It is one of the factor of an allele that decides whether the pair should have homozygous (TT – tall plants, RR – Round seeds) or heterozygous alleles (Tt – Tall , Rr – Round).

Here whether it has homo or heterozygous status the tallness and roundness dominates the other allele.

Recessive Allele It is the factor present in the heterozygous pair of alleles which could not be expressed or dominated or masked by the other allelic factor of the pair of alleles. (tt – short plants, rr – wrinkled seeds, Tt and Rr).

Homozygous In the pair of alleles both of them are represented by the same factor eg. TT – Homozygous tall , RR – Homozygous Round, tt – homozygous recessive short, rr – homozygous recessive wrinkled.

Heterozygous In the pair of alleles one factor represents tallness and the other codes for shortness. It is the bright hybrid formed from two homozygous parents. TT RR x tt rr

Monohybrid Cross When one allelelic pair is taken for cross breeding experiments it is called Monohybrid cross. Eg. TT x tt

Dihybrid Cross When two allelic pairs are taken for cross breeding experiments it is called dihybrid cross Eg. TT RR x tt rr

Phenotype it deals with the external features of an organism

Genotype It deals with the genetical make up or hereditary characters of an organism

Punnet Square Board It is a checker board formed by R.C. Punnet to show the results of a cross between organisms.

Mendelism

Mendel was a Priest working in a church of Austria. He conducted his experiments on garden pea plants and published his theories as a paper "Experiments on Plant Hybridization" that was published in "Annual Proceedings of Natural History Society of Brunn" in 1856. His ideas were neglected in his times and later in 1900 three great scientists Hugo de Vries, Erich van Shermack, and Carl Correns got similar results and his theory was recognized and called as **Mendelism.**

The pea plant in which the experiments conducted by Mendel has 14 chromosomes but he selected only 7 contrasting characters. The reason for selecting the pea plant are

1. It has a number of well defined contrasting characters
2. It produces bisexual flowers
3. It has a preference for autogamy or self fertilization in which pure lines are available
4. Crossing is easy in Pea plants
5. It has a short life span, so that many generations can be observed in a short period.

Mendels experiments involved 4 steps.

1. Selection
2. Hybridization
3. Selfing
4. Calculation

Unit VIII

BIOLOGY IN HUMAN WELFARE

Syllabus

1. Health and Disease; Pathogens; parasites causing human diseases (Malaria, Filariasis, Ascariasis. Typhoid, Pneumonia, common cold, amoebiasis, ring worm); Basic concepts of immunology-vaccines; Cancer, HIV and AIDS; Adolescence, drug and alcohol abuse.
2. Improvement in food production; Plant breeding, tissue culture, single cell protein, Biofortification; Apiculture and Animal husbandry.

Microbes in human welfare: In household food processing, industrial production, sewage treatment, energy generation and as biocontrol agents and biofertilizers

HUMAN HEALTH AND DISEASE

Health is defined as a state of complete physical, mental and social well being. Good health is a state of physical fitness, mental ability and freedom from anxiety, social well being without any tension. Health is affected by genetic disorders, infections and life style.

Common Human diseases:

Human beings are affected by viruses, bacteria, fungi, protozoan and helminthes. The disease causing agents are called pathogens. They are of two types, acquired and congenital diseases. Congenital diseases are inborn and acquired diseases occur after birth and non-inheritable.

There are two types of acquired diseases, communicable and non-communicable.

Communicable diseases are infectious and non-communicable diseases are confined to the host.

Viral diseases:

Viral diseases are extremely widespread infections caused by viruses, a type of microorganism. There are many types of viruses that cause a wide variety of viral diseases. The most common type of viral disease is the common cold, which is caused by a viral infection of the upper respiratory tract (nose and throat). Other common viral diseases include:

- Chickenpox
- Flu (influenza)
- Herpes
- Human Immunodeficiency Virus (HIV/AIDS)
- Human Papillomavirus (HPV)

- Infectious mononucleosis
- Mumps, measles and rubella
- Shingles
- Viral gastroenteritis (stomach flu)
- Viral hepatitis
- Viral meningitis
- Viral pneumonia

Viral diseases are contagious and spread from person to person when a virus enters the body and begins to multiply. Common ways that viruses spread from person to person include,

- Breathing in air-borne droplets contaminated with a virus
- Eating food or drinking water contaminated with a virus
- Having sexual contact with a person who is infected with a sexually transmitted virus
- Indirect transmission from person to person by a virus host, such as a mosquito, tick, or field mouse
- Touching surfaces or body fluids contaminated with a virus

Viral diseases result in a wide variety of symptoms that vary in character and severity depending on the type of viral infection and other factors, including the person's age and overall health. Common symptoms of viral diseases include flu-like symptoms and malaise.

Common cold:

The common cold is a viral infectious disease that infects the upper respiratory system. It is also known as acute viral rhinopharyngitis, or acute coryza. Being the most common infectious disease in humans, the cold is mainly caused by corona viruses or rhinoviruses.

The human body can never build up resistance to all the viruses that can cause the common cold. It is for this reason that colds are so common and recurring. According to the CDC (Centers for Disease Control and Prevention) kinder garden children get an average of 12 colds per year, compared to adolescents and adults who catch about seven per year.

Experts say that going out when it is cold does not have any effect on the risk of catching a cold or spreading one. In addition, antibiotics do not cure a cold or speed up recovery.

Symptoms of a cold

A symptom is something the patient feels or reports, while a sign is something other people, including a doctor may detect. Pain could be an example of a symptom, while a rash could be a sign.

The body reacting to the cold virus is mainly what brings about the symptoms that you feel. A release of chemicals is triggered, making the blood vessels leak, causing the mucous glands to work harder.

Unit IX

BIOTECHNOLOGY AND ITS APPLICATIONS

Principles

Principles and process of Biotechnology: Genetic engineering (Recombinant DNA technology).

Application of Biotechnology in health and agriculture: Human insulin and vaccine production, gene therapy; Genetically modified organisms-Bt crops; Transgenic Animals; Biosafety issues-Biopiracy and patents.

BIOTECHNOLOGY

Biotechnology refers to the technology using biology, which has applications in agriculture, food processing industry, medicine diagnostics, bioremediation, waste treatment, and energy production.

The European Federation of Biotechnology (EFB) defines biotechnology as "the integration of natural science and organisms, cells, parts thereof and molecular analogues for products and services".

Basis of Modern Biotechnology

Genetic engineering – Introduction of foreign genetic material (DNA/RNA) into the host's genome and altering its phenotype

Aseptic techniques – Involves maintenance of contamination-free ambience in chemical engineering processes for manufacture of products such as antibiotics, vaccines, etc.This is done so as to enable the growth of only desired microbes responsible for a bioprocess.

Genetic Engineering

Asexual reproduction preserves the genetic information while sexual reproduction preserves variations.

Plant and animal hybridization procedures often result in introduction of undesirable genes along with desirable ones.

Genetic engineering overcomes this limitation.

Genetic engineering includes:

- ¾ Creation of recombinant DNA
- ¾ Gene cloning
- ¾ Gene transfer into host organism

The introduced piece of DNA does not replicate in the host unless it is integrated with the chromosome of host.

For getting replicated, the foreign DNA must integrate into the host DNA sequence having 'origin of replication'. When this integration occurs, foreign DNA is replicated and many copies are formed. This process is called cloning (the process of formation of multiple identical copies of DNA).

Construction of a Recombinant DNA

Plasmid (autonomously replicating, circular, extra-chromosomal DNA) is isolated.

Plasmid DNA acts as a vector since it is used to transfer the piece of DNA attached to it to the host.

Plasmid DNA also contains genes responsible for providing antibiotic resistance to the bacteria.

Plasmid DNA was cut with a specific restriction enzyme ('molecular scissors' — that cut a DNA at specific locations).

The DNA of interest (to be inserted) was also cut with the same restriction enzyme.

The DNA of interest is hybridised with the plasmid with the help of DNA ligase to form a **Recombinant DNA**.

Recombinant DNA is then transferred to a host such as E.coli, where it replicates by using the host's replicating machinery.

When E.coli is cultured in a medium containing antibiotic, only cells containing recombinant DNA will be able to survive due to antibiotic resistance genes and one will be able to isolate the recombinants.

Restriction Enzymes as Tools of RDT

Restriction enzymes are specialised enzymes that recognise and cut a particular sequence of DNA.

Nucleases are of two types:

- ¾ Endonucleases — Cut the DNA at specific positions within the DNA
- ¾ Exonucleases — Cut the DNA at the ends (Remove the nucleotides at the ends of the DNA)

Every restriction enzyme identifies different sequences (Recognition sequences). Over 900 restriction enzymes have been isolated, all of which recognise different sequences.

Recognition sequences are pallindromic- Pallindromes are the sequence of base pairs that read same both backwards and forwards (i.e., same $5' \rightarrow 3'$ in and $3' \rightarrow 5'$ direction).

Example:

$$5'-GAATTC-3'$$
$$3'-CTTAAG-5'$$

Restriction enzymes cut a little away from the centre of pallindrome site, but between the same two bases on the opposite strands.

$$\downarrow$$
$$5'-GAATTC-3'$$
$$3'-CTTAAG-5'$$
$$\uparrow$$

Unit X

ECOLOGY AND ENVIRONMENT

Ecology

Organisms and environment: Habitat and niche; Population and ecological adaptations; Population interactions-mutualism,competition, predation, parasitism; Population attributes-growth, birth rate and death rate, age distribution.

Ecosystem: Patterns, components; productivity and decomposition; Energy flow; Pyramids of number, biomass, energy;Nutrient cycling (carbon and phosphorous); Ecological succession; Ecological Services-Carbon fixation, pollination,oxygen release.

Biodiversity and its conservation: Concept of Biodiversity; Patterns of Biodiversity; Importance of Biodiversity; Loss of Biodiversity; Biodiversity conservation; Hotspots, endangered organisms, extinction, Red Data Book, biosphere reserves,National parks and sanctuaries.

Environmental issues: Air pollution and its control; Water pollution and its control; Agrochemicals and their effects; Solidwaste management; Radioactive waste management; Greenhouse effect and global warning; Ozone depletion;Deforestation; Any three case studies as success stories addressing environmental issues.

Organisms and Environment

Ecology deals with interactions among different organisms and their environment.

Organisms get adapted to their environment for their survival and reproduction.

The rotation of the earth about its axis brings about changes in the environment, leading to different seasons. This leads to the formation of various biomes such as desert, grassland, etc.

Life not only exists in favourable habitats, but also in harsh and extreme conditions.

The environment of an organism can be divided into:

- Abiotic factors
- Biotic factors

Abiotic Factors

Some of the major abiotic factors that interact with the organisms are:

Temperature — It is the most relevant abiotic factor since all organisms require an optimum temperature for their metabolism and other body functions. Depending upon their ability to tolerate temperature range, organisms are of two types- stenothermal (restricted to a narrow range of temperature) and eurythermal (can tolerate a wide range of temperature).

Water — Water also is a major influencing factor. Life on earth is impossible without water as it forms the major constituent of all living cells. In oceans where quantity of water is not a limitation,

the quality of water becomes one. Depending upon the ability to tolerate salinity, organisms can be stenohaline (restricted to narrow range of salinity) and euryhaline (tolerant to wider range of salinity).

Soil — The nature and composition of soil differs from one place to another depending upon the climate, weathering process, and soil development method. The characteristic features such as soil composition, grain size, percolation, water holding capacity, etc. determine the native of the organisms it can support.

Light — The major source of light on earth is the Sun. Light is essential for plants to perform photosynthesis. Certain plants become adapted to perform photosynthesis under very low light since they are constantly overshadowed by tall trees. Many plants also depend on light for their flowering (photoperiodism). The availability of light on land is comparatively higher than that in water.

Responses to Abiotic Factors

All organisms in order to sustain maximum functionality maintain a constant internal environment (homeostasis). An organism may adopt one of the following strategies for homeostasis:

Regulate — Certain animals have the ability to maintain a constant temperature and a constant osmolarity to keep up their homeostasis. Mammals have a constant body temperature (37°C) irrespective of the outside temperature. In summers, to maintain the temperature, we sweat and in winters we shiver, which produces heat.

Conform — Animals and plants except mammals do not have a constant body temperature and their body temperature changes in accordance with the outside temperature. Such organisms are called conformers. Conformers have not evolved. They have become regulators since regulation is energetically more expensive.

Migrate — The organism can move temporarily from stressful habitats to more hospitable areas and return once the period changes. Birds can migrate from cold regions to relatively warmer regions during winter and vice-versa during summers.

Suspend — Some organisms cease to be metabolically active during stressful period. They suspend all activity and enter a period of dormancy. For example — Spores in bacteria and lower plants; and hibernation (winter sleep) and aestivation (summer sleep) in animals. Similarly, zooplankton enter diapause, a stage of suspended development during unfavourable conditions.

Adaptations

Adaptations are certain characteristics that organisms develop in order to survive and reproduce better in their habitat.

These adaptations can be physiological, behavioural, or morphological.

Some of the adaptations are:

Desert plants have thick cuticle on their leaf surface and stomata arranged in deep pits to reduce water loss. Their special photosynthetic pathway CAM enables their stomata to remain closed during day time. Their leaves are reduced to spines and photosynthesis is carried out by flattened stems.

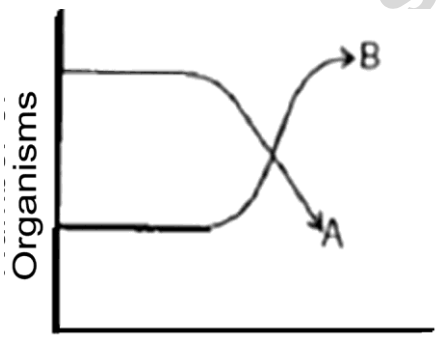
Previous Years Questions

1. **An association of individuals of different species living in the same habitat and having functional interactions is [Re-AIPMT-2015]**
   - **A)** Population
   - **B)** Ecological niche
   - **C)** Biotic community
   - **D)** Ecosystem

2. **Roots play insignificant role in absorption of water in [Re-AIPMT-2015]**
   - **A)** Wheat **B)** Sunflower
   - **C)** Pistia **D)** Pea

3. **In which of the following interactions both partners are adversely affected? [Re-AIPMT-2015]**
   - **A)** Mutualism **B)** Competition
   - **C)** Predation **D)** Parasitism

4. **The following graph depicts changes in two populations (A and B) of herbivores in a grassy field. A possible reason for these changes is that**



   - **A)** Population A consumed the members of population B
   - **B)** Both plant populations in this habitat decreased
   - **C)** Population B competed more successfully for food than population A
   - **D)** Population A produced more offspring than population B

5. **Most animal are tree dwellers in a**
   - **A)** Tropical rain forest
   - **B)** Coniferous forest
   - **C)** Thom woodland
   - **D)** Temperate deciduous forest

6. **Just as a person moving from Delhi to Shimla to escape the heat for the duration of hot summer, thousands of migratory birds from Siberia and other extremely cold northern regions move to**
   - **A)** Western Ghat
   - **B)** Meghalaya
   - **C)** Corbett National Park
   - **D)** Keoladeo National Park

7. **A sedentary sea anemone gets attached to the shell lining of hermit crab. The association is**
   - **A)** Symbiosis **B)** Commensalism
   - **C)** Amensaiism **D)** Ectoparasitism

8. **A biologist studied the population of rats in a barn. He found that the average natality was 250, average mortality 240, immigration 20 and emigration 30. The net increase in population is [NEET-2013]**
   - **A)** 15 **B)** 05
   - **C)** Zero **D)** 10

9. **Cuscuta is an example of**
   - **A)** Ectoparasitism **B)** Brood parasitism
   - **C)** Predation **D)** Endoparasitism

10. **People who have migrated from the planis to an area adjoining Rohtang pass about six months back**
    - **A)** Have the usual RBC count but their haemoglobin has very high binding affinity to O_2
    - **B)** Have more RBCs and their haemoglobin has a lower binding affinity of O_2

C) Are not physically fit to play games like football

D) Suffer from altitude sickness with symptoms like nausea, fatigue, etc.

11. The logistic population growth is expressed by the equation

A) dN/dt = rN B) dN/dt = rN

C) dt/dN = Nr D) dN/dt=rN

12. Large Woody Vines are more commonly found in:

A) Alpine forests

B) Temperate forests

C) Mangroves

D) Tropical rainforests

13. Which one of the following is categorised as a parasite in true sense?

A) The cuckoo (koel) lays its eggs in crow's nest

B) The female Anopheles bites and sucks blood from human

C) Human foetus developing inside the uterus draws nourishment form the mother

D) Head louse living on the human scalp as well as laying eggs on human hair

14. Consider the following four conditions (a - d) and select the correct pair of them as adaptation to environment in desert lizards. The conditions

A) Burrowing in soil to escape high temperature

B) Losing heat rapidly from the body during high temperature

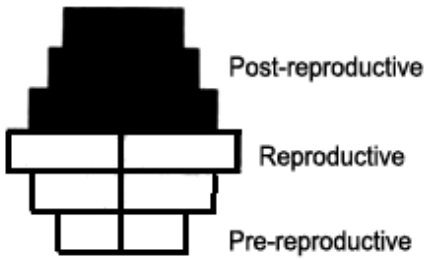
C) Bask in sun when temperature is low

D) Insulating body due to thick fatty dermis

A) (a), (b) B) (c), (d)

C) (a), (c) D) (b), (d)

15. What type of human population is represented by the following age pyramid?



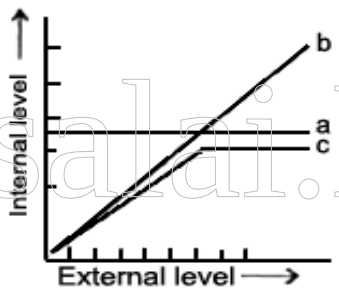
A) Expanding population

B) Vanishing population

C) Stable population

D) Declining population

16. The figure given below is a diagrammatic representation of response of organisms to abiotic factors. What do a, b and c represent respectively?



	(a)	(b)	(c)
A)	Conformer	Regulator	Partial regulator
B)	Regulator	Partial regulator	Conformer
C)	Partial regulator	Regulator	Conformer
D)	Regulator	Conformer	Partial regulator

17. Which one of the following is most appropriately defined?

A) Host is an organism which provides food to another organism

B) Amensalism is a relationship in which one species is benefited whereas the other is unaffected

C) Predator is an organism that catches and kills other organism for food

D) Parasite is an organism which always lives inside the body of other organism and may kill it

18. Which one of the following is one of the characteristics of a biological community?

A) Sex-ratio **B)** Stratification

C) Natality **D)** Mortality

19. Study the four statements (a-d) given below and select the two correct ones out of them

a) A lion eating a deer and a sparrow feeding on grain are ecologically similar in being consumers

b) Predator star fish Pisaster helps in maintaining species diversity of some invertebrates

c) Predators ultimately lead to the extinction of prey species

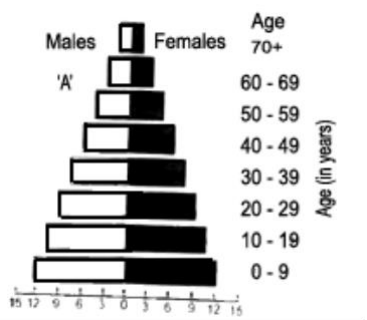
d) Production of chemicals such as nicotine, strychnine by the plants are metabolic disorders.

The two correct statements are

A) (a) and (b) **B)** (b) and (c)

C) (c) and (d) **D)** (a) and (d)

20. A country with a high rate of population growth took measures to reduce it. The figure below shows age-sex pyramids of populations A and B twenty years apart. Select the correct interpretation about them:



A) "B" is earlier pyramid and shows stabilized growth rate.

B) B is more recent showing that population is very young.

C) "A" is the earlier pyramid and no change has occurred in the growth rate.

D) "A" is more recent and shows slight reduction in the growth rate.

21. What is true about the isolated small tribal populations?

A) There is no change in population size as they have a large gene pool

B) There is a decline in population as boys marry girls only from their own tribe

C) Hereditary diseases like colour blindness do not spread in the isolated population

D) Wrestlers who develop strong body muscles in their life time pass this character on to their progony.

22. Quercus species are the dominant component in

A) Tropical rain forests

B) Temperate deciduous forests

C) Alpine forests

D) Scrub forests

23. Consider the following four statements (a-d) about certain desert animals such as Kangaroo rat.

A) They have dark colour and high rate of reproduction and excrete solid urine.

B) They do not drink water, breathe at a slow rate to conserve water and have their body covered with thick hairs.

C) They feed on dry seeds and do not require drinking water.

D) They excrete very concentrated urine and do not use water to regulate body temperature.

Which two of the above statements for such animals are true?

A) a and b **B)** c and d

C) b and c **D)** c and a

24. If the mean and the median pertaining to a certain character of a population are of the same value, the following is most likely to occur: [AIPMT (Prelims)-2007]

A) A skewed curve

B) A normal distribution

C) A bi-modal distribution

D) A T-shaped curve

25. The growth curve of bacterial population in lab is plotted against time. What will be the shape of graph?

A) sigmoid

B) hyperbolic

C) ascending straight line

D) descending straight line.

26. The population of an insect species shows an explosive increase in numbers during rainy season followed by its disappearance at the end of the season. What does this show?[AIPMT (Prelims)-2007]

A) The population of its predators increases enormously.

B) S-shaped or sigmoid growth of this insect.

C) The food plants mature and die at the end of the rainy season.

D) Its population growth curve is of J-type.

27. Geometric representation of age structure is a characteristic of

A) Ecosystem **B)** Biotic community

C) Population **D)** Landscape

28. In a food chain of grassland ecosystem, the apex consumers are:

A) Herbivorous

B) Carnivorous

C) Bacteria

D) Either Herbivorous or Carnivorous

29. Niche overlap indicates [AIPMT (Prelims) -2006]

A) Active co-operation between two species

B) Two different parasites on the same host

C) Sharing of one or more resources between the two species

D) Mutualism between two species

30. Annual migration does not occur in the case of: [AIPMT (Prelims)-2006]

A) Salmon **B)** Siberian crane

C) Salamander **D)** Arctic tern

31. The formula for exponential population growth is: [AIPMT (Prelims)-2006]

A) $dt/dN = rN$ **B)** $dN/rN = dt$

C) $rN/dN = dt$ **D)** $dN/dt = rN$

32. There exists a close association between the algae and the fungus within a lichen. The fungus: [AIPMT (Prelims)-2005]

A) Fixes the atmospheric nitrogen for the algae

B) Provides protection, anchorage and absorption for the algae

C) Provides food for the algae

D) Releases oxygen for the algae

33. Which one of the following pairs is mismatched? [AIPMT (Prelims)-2005]

A) Savanna — Acacia trees
B) Prairie— epiphytes
C) Tundra — permafrost
D) Coniferous forest — evergreen trees

34. Animals have the innate ability to escape from predation. Examples for the same are given below. Select the incorrect example: [AIPMT (Prelims)-2005]

A) Enlargement of body size by swallowing air in puffer fish
B) Melanism in moths
C) Poison fangs in snakes.
D) Colour change in chameleon

35. At which latitude, heat gain through insolation approximately equals heat loss through terrestrial radiation? [AIPMT (Prelims)-2005]

A) 66° North and South
B) 22½° North and South
C) 40° North and South
D) 42½° North and South

36. The basic unit of study in Ecology is

A) Population **B)** Organism
C) Community **D)** Species

37. The 'niche' of a species is meant for

A) Habitat and specific functions of a species
B) Specific place where an organism lives
C) Specific species function and its competitive power
D) None of these

38. In which one of the following habitats does the diurnal temperature of soil surface varies most?

A) Shrub land **B)** Forest
C) Desert **D)** Grassland

39. The abundance of a species population within its habitat, is called

A) Relative density
B) Regional density
C) Absolute density
D) Niche density

40. Plants such as Prosopis, Acacia and Capparis represent examples of tropical

A) Deciduous forests
B) Evergreen forests
C) Grass lands
D) Thorn forests

41. What is true for individuals of same species?

A) Live in same niche
B) Live in same habitat
C) Interbreeding
D) Live in different habitat

42. Consider the following statement (A)-(D) each with one or two blanks.

I) Bears go into (I) during winter to (II) cold weather

II) A conical age pyramid with a broad Base Represents (III) human population

III) A wasp pollinating a fig flower is an example of (IV)

IV) An area with high levels of species richness is known as (V)

Which one of the following options, gives the correct fill ups for the respective blank numbers from (1) to (5) in the statements?

A) (III) - expanding, (IV) - commensalism, (V) - biodiversity park
B) (I) - hibernation, (II) - escape, (III) - expanding, (V) - hot spot
C) (3) stable, (IV) - commensalism, (V) - marsh
D) (I) - aestivation, (II) - escape, (III) - stable, (IV) – mutualism

43. Which one of the following pairs is correctly matched?

A) Parasitism - intra-specific relationship

B) Uricotelism - aquatic habitat

C) Excessive perspiration - xeric adaptation

D) Stream lined body - aquatic adaptation

44. More than 70% of world's freshwater is contained in

A) Polar ice

B) Glaciers and mountains

C) Antartica

D) Greenland

45. Which of the following are likely to be present in deep sea water?

A) Eubacteria

B) Blue-green algae

C) Saprophytic fungi

D) Archaebacteria

46. Benthic organisms are affected most by

A) Water-holding capacity of soil

B) Light reaching the forest floor

C) Surface turbulence of water

D) Sediment characteristics of Aquatic Ecosystems

47. Which one of the following is not a parasitic adaptation?

A) Loss of unnecessary sense organs

B) Development of adhesive organs

C) Loss of digestive organs

D) Loss of reproductive capacity

48. In a lake, phytoplankton grow in abundance in

A) Littoral zone **B)** Limnetic zone **C)** Profundal zone **D)** Benthic region

49. Littoral zone is located along the

A) High mountains

B) Sea

C) Rivers

D) Desert

50. The age pyramid with broad base indicates

A) High percentage of young individuals

B) High percentage of old individuals

C) Low percentage of young individuals

D) A stable population

51. A population growing in a habitat with limited resources shows four phases of growth in the following sequence

A) Acceleration-deceleration-lag phase - asymptote

B) Asymptote-acceleration–deceleration – lag phase

C) Lag phase-acceleration–deceleration-asymptote

D) Acceleration- lag phase–deceleration – Asymptote

52. Sigmoid growth curve is represented by

A) $dN/dt = rN$

B) $dN/dt = rN (1 - N/K)$

C) $Nt = No + B + I - D - E$

D) $dN/dt = 1 - N/K$

53. Two opposite forces operate in the growth and development of every population. One of them is related to the ability to reproduce at a given rate. The force opposite to it is called

A) Fecundity

B) Environmental resistance

C) Biotic control

D) Mortality

54. The growth curve of bacterial population in lab is plotted against time. What will be the shape of graph?

A) Sigmoid **B)** Hyperbolic
C) Ascending straight line
D) J-shaped

55. Certain characteristic demographic features of developing countries are

A) High fertility, low or rapidly falling mortality rate, rapid population growth and a very young age distribution
B) High fertility, high density, rapidly Rising mortality rate and a very young age distribution
C) High infant mortality, low fertility, Uneven population growth and a very young age distribution
D) High mortality, high density, uneven population growth and a very old age distribution

56. Praying mantis is a good example of

A) Camouflage
B) Mullerian mimicry
C) Warning colouration
D) Social insects

57. Which type of association is found in between entomophilous flower and pollinating agent?

A) Amensalism **B)** Commensalism
C) Cooperation **D)** Co-evolution

58. Unrestricted reproductive capacity in a population is called as

A) Biotic potential
B) Fertility
C) Carrying capacity
D) Birth rate

59. What is a keystone species?

A) A species which makes up only a Small proportion of the total biomass of A community, yet has a huge impact on the community's organization and survival
B) A common species that has plenty of biomass, yet has a fairly low impact on the community's organization
C) A rare species that has minimal impact on the biomass and on other species in the community
D) A dominant species that constitutes a large proportion of the biomass and which affects many other species

60. In which one of the following pairs is the specific characteristic of a soil not correctly matched?

A) Laterite-Contains aluminium compound
B) Terra rosa - Most suitable for roses
C) Chernozems - Richest soil in the world
D) Black soil - Rich in calcium carbonate

ANSWERS

1. C)	2. C)	3. B)	4. C)	5. D)
6. D)	7. A)	8. C)	9. A)	10. B)
11. D)	12. D)	13. D)	14. C)	15. D)
16. D)	17. C)	18. B)	19. A)	20. B)
21. B)	22. B)	23. B)	24. B)	25. B)
26. D)	27. C)	28. B)	29. B)	30. C)
31. D)	32. B)	33. B)	34. C)	35. B)
36. A)	37. C)	38. C)	39. D)	40. D)
41. B)	42. B)	43. D)	44. B)	45. D)
46. D)	47. B)	48. B)	49. B)	50. A)
51. B)	52. B)	53. D)	54. B)	55. D)
56. A)	57. A)	58. A)	59. D)	60. D)