

# Chapter 1

## INTRODUCTION

- Q.1** (a) *Define Biology.*  
(b) *What are the general characteristics of life?*

**Ans.** (a) **BIOLOGY**

*"The study of living things is called Biology".* It is the science which helps to understand the different living things in the environment. In an environment, living and non living things have inter-relationship. This branch of science explains structure, activity, chemical nature and transmission of characters from generation to generation.

*"Bio" means life and "logy" means knowledge*

(b) **LIFE**

Life is not a subject of Biologist. The subject of biologist deals only with work of life. What is life? It is subject of philosophers and theologians.

### **Life, for Biologist:**

The field of biologist is first or ~~an~~ to distinguish between living and non-living. Secondly, the life is the normal activity of protoplasm. In other words, *"protoplasm is second name of life"*.

*An organism has certain characters* like respiration, growth, movement, intake of water, excretion, development, self regulation etc. It has well developed organization. All these activities must have protoplasm. Actually, *protoplasm is the seat of life*.

*Making a..... of molecules provide energy to organisms.* In case of reproduction, gene has important role. Volume or size depends on number of cells. Division of labour of cells is very important factor for organization in a complex organism. In unicellular cell, organelles are very important for regulations.

- Q.2** *What do you know about the major aspects of Biology? Define basic branches of Biology.*

**Ans.** **ASPECTS OF BIOLOGY**

A living thing has many aspects. Each aspect requires specific consideration due to its particular function in the body. Thus Biology is divided into different divisions and branches on the basis of different aspects. *The simplest organism like Amoeba and most complex organism man*, both have different aspects of like locomotion, digestion,

structure of cell and metabolic process. For example, disease, internal structure of any cell, tissue or organ, development of foetus or embryo, cell's organelles and cell's chemistry, function of different cells, tissue or organs etc. are different important considerations and aspects of every living body. These aspects are studied under certain field, branch or science:

### SOME BASICS

#### BRANCHES OF BIOLOGY

*The name of branches are mostly Greek and Latin words:*

**Ecology** is the branch of biology which deals with interrelationship between organism and environment. Embryo means early developmental stage, so, "The study of early developmental stage is called **Embryology**". Study of function is called **Physiology**. *Physio* means function. Study of structure and form is known as **Morphology**. *Morpho* means structure.

**Anatomy** is the study of internal structure of living things. The prefix "Palaeo" is for fossils. So, **Palaeontology** is the study of plant fossils and animal fossils. **Palaeobotany** and **palaeozoology** are further branches of **Palaeontology**. Study of cell is **Cytology** and study of tissue is known as **Histology**.

**Evolution** is the gradual changes in organisms with the passage of time.

**Biogeography**: The study of organism distribution on the earth is called **Biogeography**. **Zoogeography** means animal distribution on the earth so phytogeography means plant distribution on the earth.

**Genetics**, the study of inheritance in which transmission of characters from generation to generation are considered.

#### Q.3 Define the branches of Biology of broad spectrum and field level.

Ans.

#### BRANCHES OF BIOLOGY AT FIELD LEVEL AND BROAD SPECTRUM LEVEL

##### Molecular Biology:

The study of cell organelles, cells and organism on the basis of molecular level.

**Example:** Cell membrane is composed of *proteins* and *lipid* with specific arrangement.

##### Environmental Biology:

The study of the interrelationships between organisms and environment is called environmental biology. OR "The study of organisms in relation to inorganic and organic (abiotic) factors is called environmental biology or ecology".

A sum of effects of all external conditions on organism is environment.

**Microbiology:** (*micro means small*):

The study of microorganisms like *bacteria*, *virus*, *protozoa*, small algae and fungi is called microbiology.

**Fresh Water Biology:**

The biological study of the organisms which live in fresh water i.e. rivers, tanks, lakes etc.

**Marine Biology:**

The biological study of the organisms which live in seas and oceans on all aspects.

**Parasitology:**

The study of structure, transmission, life cycle and parasitism of a parasite is called parasitology.

**Human Biology:**

The study of man on structural, functional, cellular, histological, ecological, molecular and embryological basis is known as human biology.

**Social Biology:**

The study of social relationship or behavior of organisms in the community.

(OR)

The branch of biology which deals with the study of behavior of organisms on the basis of *physiological and psychological factors* is called social biology.

**Biotechnology:**

The branch of biology which deals with *manufacture of biological products* at industrial level. Antibiotics, enzymes, hormones and cheese from milk etc.

**Q.4** What type of elements are present in a cell? Write the %age of common elements.

Ans. **CHEMICAL REACTIONS AND BIOLOGY**

Many chemical reactions take place in a cell of an organism. Even a simplest unicellular organism has many hundred chemical reactions. **Almost 92 chemical elements are found in a cell.** Almost 16 elements are commonly used for preparation of different compounds. These elements are called Bioelements.

\* **The percentage of six commonest bio-elements.**

(1) Oxygen	65%	(2) Carbon	18%
(3) Hydrogen	10%	(4) Nitrogen	10%
(5) Calcium	02%	(6) Phosphorus	01%

\* **The elements below than 1%**

(7) K	0.035%	(8) S	0.25%
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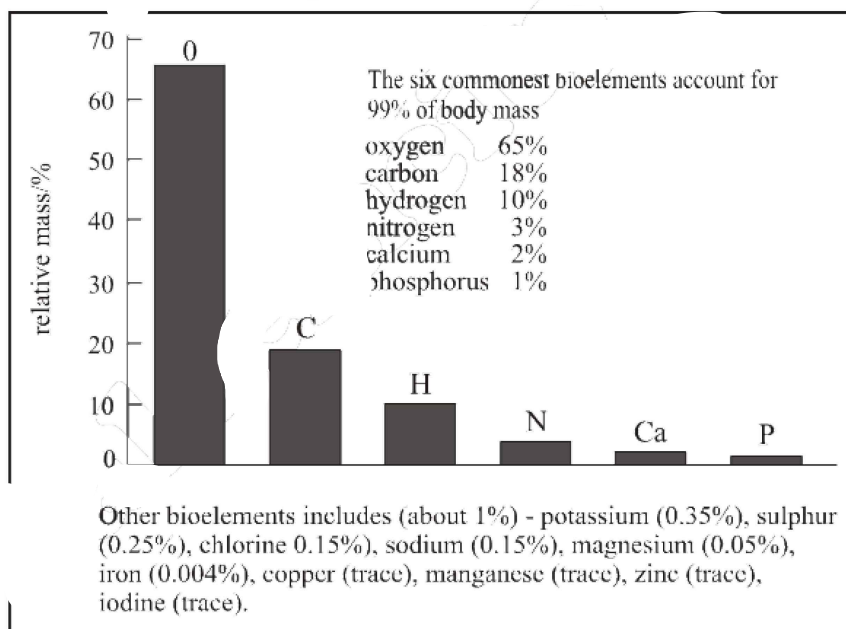
(9) Cl	0.15%	(10) Na	0.15%
(11) Mg	0.05%	(12) Fe	0.004%
(13) Cu	trace	(14) Mn	trace
(15) Zn	trace	(16) I <sub>2</sub>	trace

**Q.5** What is biological organization? Discuss subatomic, atomic, molecular, organelles, cell and tissue level organizations.

Ans. **BIOLOGICAL ORGANIZATION:**

Sixteen chemical elements are present in all cells. These sixteen elements have different properties in living, while in non-living play entirely different kind of role. Different type of processes in regular fashion are essential for living organism. Some very complex processes are routine of organism for structure and function. These reactions are also necessary for stability in environments.

*Protoplasm is a living substance.* Therefore, for the understanding of life the study of different steps, levels and phenomena is must



**Fig. Percentage composition of bioelements by mass of a human being**

**(i) ATOMIC AND SUB-ATOMIC LEVEL:**

Electrons, protons and neutrons are sub atomic particles. They form atoms. All living and non living things basically formed by atoms. *Atoms are basic simplest unit of living and non living matter.*

**(ii) MOLECULAR LEVEL:**

Different atoms combine and form molecules which are formed by ionic and covalent bonds. Molecule is a stable form in organism. There are great variety of molecules and complexity in organism. Two main kinds of molecules are micromolecules and macromolecules on the basis of molecular weight.

**Micromolecules:** The molecules with *low molecular weight* are called micromolecules i.e.  $\text{CO}_2$ ,  $\text{H}_2\text{O}$  etc.

**Macromolecules:** The molecules with *high molecular weight* are called macromolecules i.e. starch, proteins etc.

Another division of molecules is organic molecules and inorganic molecules:

**Organic Molecules:** If a molecule contains C and H, it is considered as organic molecule e.g.  $\text{CH}_3\text{OH}$ ,  $\text{C}_6\text{H}_{12}\text{O}_6$ ,  $\text{H}_2\text{N}-\text{C}-\text{COOH}$  etc.

**Inorganic Molecule:** When a molecule does not contain C and H together, it is inorganic molecule e.g.  $\text{CO}_2$ ,  $\text{H}_2\text{O}$ ,  $\text{NaCl}$ ,  $\text{HCl}$ ,  $\text{H}_2\text{SO}_4$ ,  $\text{NaOH}$  etc.

**(iii) ORGANELLES AND CELL LEVEL**








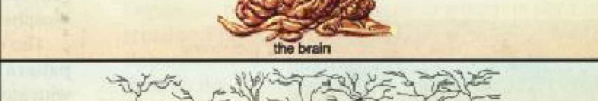
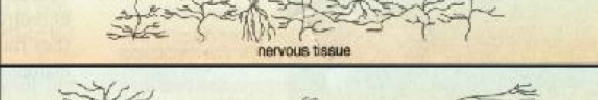
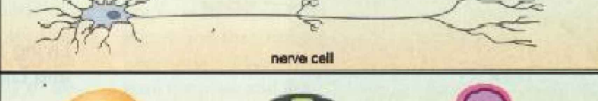

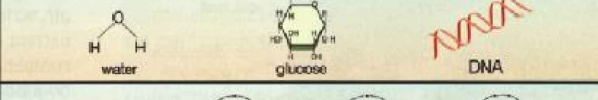
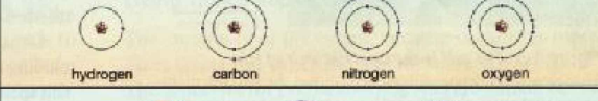

Cells and cell organelles are formed by the particular arrangements of micro-molecules and macromolecules.

**(a) Organelles or Subcellular Structures:** The small bodies inside the cells which perform specific functions as subunits are called organelles or sub cellular structure e.g. mitochondria, ribosomes, golgi bodies, endoplasmic reticulum etc. The overall activity of cell depends upon cell organelles.

**(b) Division of Labour of Organelles:** Each organelle has special role in the cell. *Mitochondria is power house, ribosomes produce the proteins and cell membrane provides support, protection and shape etc.*

Cell is the basic structural and functional unit of organism. It may be divided into prokaryote and Eukaryote on the basis of absence and presence of nucleus:

**Prokaryote:** Cell *without nucleus* is called prokaryote. It has limited organelles. Mitochondria, golgi bodies etc. absent in prokaryotes.

Biosphere	That part of earth inhabited by living organisms; includes both the living and nonliving components	 Earth's biosphere
Ecosystem	A community together with its nonliving surroundings	 snake, antelope, hawk, bushes, grass, rocks, stream
Community	Two or more populations of different species living and interacting in the same area	 snake, antelope, hawk, bushes, grass
Population	Members of one species inhabiting the same area	 herd of pronghorn antelope
Species	Very similar, potentially interbreeding organisms	 pronghorn antelope
Multicellular Organism	An individual living thing composed of many cells	 pronghorn antelope
Organ System	Two or more organs working together in the execution of a specific body function	 the nervous system
Organ	A structure normally composed of several tissue types that form a functional unit	 the brain
Tissue	A group of similar cells that perform a specific function	 nervous tissue
Cell	The unit of life	 nerve cell
Organelle	A structure within a cell that performs a specific function	 mitochondrion      chloroplast      nucleus
Micro-molecules and Macro molecules	A combination of atoms	 water      glucose      DNA
Atom	The smallest particle of an element that retains the properties of that element	 hydrogen      carbon      nitrogen      oxygen
Subatomic Particle	Particles that make up an atom	 proton      neutron      electron

**Eukaryote:** Cell with well defined nucleus is called eukaryote. Eukaryotes have many membranous organelles.

The simplest organisms like Amoeba, paramecium, volvox and chlamydomonas are unicellular. On the other hand multicellular organisms like fungi, algae, invertebrates and man are complex with large number of cells and cell division respectively.

(iv) **TISSUE LEVEL:** “A group of similar cells which performs a specific function is called Tissue”.

**Examples:**

**Epidermis** is a protective tissue.

**Xylem** is a water conducting tissue.

**Phloem** is a food transporting tissue.

**Muscle** is a contracting and relaxing tissue.

**Gland** is a secretory tissue.

In an organism, cells make tissue, and tissues construct organ.

**Q.6 Define organ and system, OR explain organ and system.**

**Ans. ORGAN AND SYSTEM**

**ORGAN:** “A specific structure of system which is formed by different tissues is called organ”.

Each organ of a system performs particular role. In other words, tissues have division of labour in organs and organs have division of labour in systems too.

**Examples:** *Stomach* is an organ of digestive system.

*Heart* is an organ of circulatory system.

*Lung* is an organ of respiratory system.

When stomach is considered as tissue level, there are secretory tissues (glands) and muscular tissues at different places in the stomach. Secretory tissues secrete enzymes and other chemicals for digestion. Muscular tissues help in contraction and relaxation for mechanical roles. Quality and quantity of organs depend upon efficiency of tissues. Thus performance of system depends upon the efficiency of organs.

Animals have well organized organs than plants. Any way, roots anchor the plants. Flower or cones are reproductive structures. Leaves manufacture food.

**SYSTEM:** “A system is established by the co-ordination of organs in an organism”.

For example, the sequence of buccal cavity, pharynx, oesophagus, stomach, small intestine and large intestine like organs form digestive system.

Higher animals (vertebrates) and higher plants (gymnosperm and angiosperms) have well developed systems than lower animals and lower plants. Complexity of organisms increase with increase of systems. Similar is the case of systems organs, the complexity of systems and organs depends upon number of organs and tissues respectively.

**Q.7 Write down the levels of individual, population, community and ecosystem.**

**Ans. ORGANISM AND INDIVIDUAL**

**“A living thing with particular systems and specific characters is called individual or organism”.**

An organism has unity of systems in the body for normal activities. Each organisms in its company has special characteristics or individuality. *“The group of closely resembled organisms freely interbreed and reproduce fertile off spring is called Species”*. So, the individuality of the organism of some species is VARIATION. It is due to gene's effect.

Coordination among different systems in an organism is surety of balance functions. When a man is busy in hard exercise, it needs a much energy because the muscular tissues get maximum business. The attains of energy depends upon respiration, so process of respiration increased. Process of respiration further depends upon oxidation reaction. On the other, supply of energy, food or oxygen depends upon circulatory system. In this way, chief organ of circulatory system i.e. HEART works according to demand of active muscle cells. Heart beat also increase. There is interdependence among different systems in an individual for proper function. Nervous system and endocrine system ensure the coordination among systems.

Neurons of nervous system and hormones of endocrine system coordinate the different systems of the body. The activities become regular, organized, balanced, united and timely by neurons and hormones. Some activities or changes occur by the interaction of environment.

### **POPULATION**

***“A group of the same species in an area is called population”.***

**Example:** Population means human beings in a city. Rats in the field of rice.

All human beings are a single species. The group of human beings will be population. In biological organization, population is a higher level.

**Explanation:** In a population the members of some species have specific characteristics like colors, height, eye color etc. These feature are considered as variation. *Variation* is related to gene. *Gene is a basic structural and functional unit of inheritance* (chemically, gene is a group of nucleotides of DNA in chromosome).

Gene frequency, gene flow age, population density and population pressure are factors involving in appearance and background of population in the habitat.

**COMMUNITY**

*“A group of organisms of different species with interactions in a habitat is called community”.*

Community has different kinds of population. A variety of plants and animals may be present in a community. *In a community, associations and competitions may develop among different populations. Actually, these associations, dependence or competitions are inter relationships.* Sometimes, certain species live as dominant in community. Less number of species means simple community and high number means complex community.

Keep in mind, at this level, only living things are considered. For consideration of non living (abiotic) factors, we study ecosystem.

**ECOSYSTEM**

*“The system which is established by the interactions between the physical factors (Abiotic) and living factor (Biotic) in an environment is called ecosystem.”*

Biotic factors mean plants and animals and abiotic factors mean H<sub>2</sub>O, soil, air, temperature, gravity, light etc.

**Q.8** *What is biome? Discuss interactions of organisms in a biome.*

Ans. **BIOME**

*“The assemblage of plants and animals in a geographical area is called Biome.”*

**Interactions among Organisms:**

In an environment, organisms associate to each other for nutrition and shelter. They also compete to each other for facilities. They co-operate and fight for both biotic and abiotic factors. The relationships are commonly of two types:

**Beneficial Relationship:** Mutualism and commensalisms

**Harmful Relationship:** Predation, parasitism and other competitions.

**Q.9** *What is geological time chart? Describe the time of the origin of living things according to chart.*

Ans. **GEOLOGICAL TIME CHART**

*“A chart which represents the placement of organisms in the sequence of past time is called geological time chart”.*

**Fossil Study:**

The study of fossils helps biologists to arrange the organism in a time sequence.

**Date/Age of Rocks:**

Firstly, date/age of rocks is determined. The age of rocks is determined by specific radioactive isotopes. The isotopes are found in these rocks. The old sediment layers of rocks have less isotopes than young layers. The indication of age is found by the comparison of rocks. The age of the rocks shows the age of fossils which are preserved in it.

**Era:** Geological time scale is divided into four era. Era are major divisions i.e. (1). Cainozoic era (2). Mesozoic era (3). Palaeozoic era and (4). Proterozoic era.

**Periods:** Periods are sub division of era.

**(1) Cainozoic Era:**

It is most advanced era. About recent 70 million years are considered in it. It has two periods i.e. *Quaternary and Tertiary*. Mammals and birds have peak in this era. Angiosperms are also on climax.

**(2) Mesozoic Era:**

It is the duration between 225-135 million years ago. *Cretaceous (135 M)*, *Jurassic (180 M)* and *Triassic (225 M)* are the periods of Mesozoic era. It was the ideal era for gymnosperms and reptiles. Birds and angiosperm were started in this era.

**(3) Palaeozoic Era:**

The time of this era was about 600-270 M years ago. (i). *Permian (270 M)*. (ii) *Carboniferous (350 M)*, (iii) *Devonian (400 M)*, (iv). *Silurian (440 M)*, (v) *Ordovician (500 M)* and (vi) *Cambrian (600 M)* are periods of palaeozoic era. It is the era of the beginning of gymnosperm (270 M), Ferns (400M), reptiles (350M), amphibian (400M) and Mammals (850M). Amphibia and Ferns were on climax. Fishes were originated about 500M years ago. The duration of the beginning of invertebrates was also 500 M years ago.

**Preterozoic Era:**

It is the *oldest era*. It was before 2000 million years (ago). Fungi and algae are belonging to this era. *“First living organisms about 3000 M years ago”*.

In short, *fungi and algae are oldest organism. Angiosperm, mammals and birds are most advanced. Man is the latest, most complex, most organized and most advanced.*

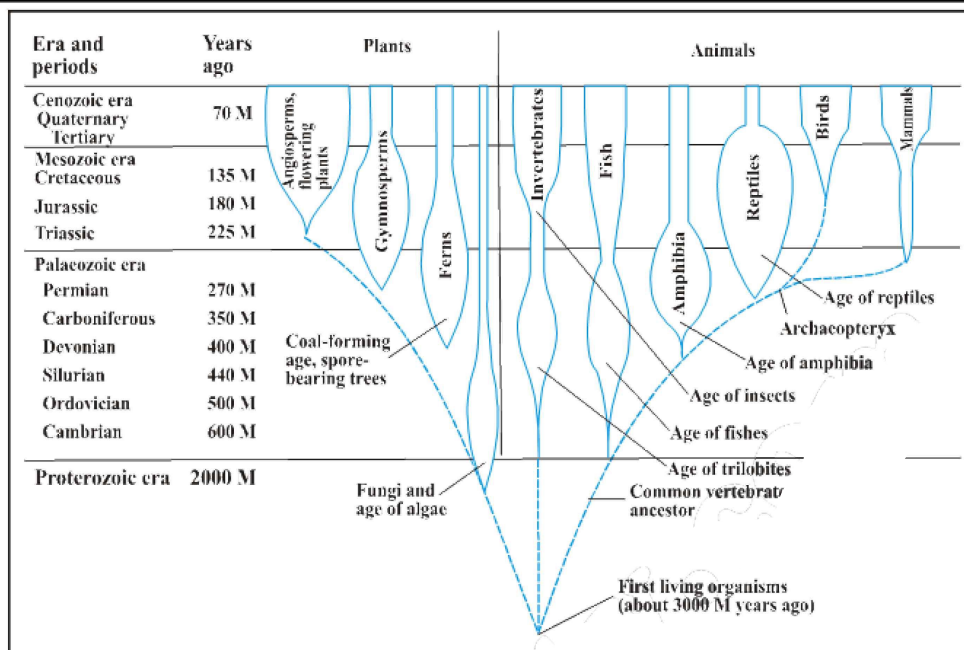


Fig. Fossil record of Plants and animals shown in a geological time chart

#### Q.10 What do you think about phyletic lineage?

Ans. **PHYLETIC LINEAGE:**

“The continuous sequence of evolution which shows that each species is evolved from the previous species or generation, known as phyletic lineage.”

About 2.5 million species of organism are known. Among them **53.1% species are insects**. Others animals except insects which are 19.9%. Known **vascular plants are 17.6%** on the earth. **Fungi, algae, protozoa and prokaryotes are 9.4%**.

Still, all species are not identified. According to biologists, the total species in the universe are between 5 and 30 millions. About 2.5 million out of these are identified.

The number and variety of species in an area is called **BIO DIVERSITY**. Evolution becomes the reason of production of new species. Number of species and new species increase at background level. Different species show the same ancestors. The history of organisms show the common origin of life. The past provides the evidences of common origin of all early life.

A phyletic lineage is an unbroken series of species which is arranged in ancestor to descendent sequence, while each later species is evolved from the previous generations.

**Q.11** *How are observations hypothesis, deductions, theory and law play role in biological methods?*

**Ans.** **BIOLOGICAL METHODS**

All sciences are based on experimental inquiries. For study or research the work is planned stepwise. The first step of the research or study is observation.

**Observation:**

*“The seeing and noting of the objects is called observation”.*

Observations depend upon five senses: Vision, Hearing, Smell, Taste and Touch. The utilizations of senses vary with the nature and function of object. Observations may be qualitative and quantitative.

**Data Formations:**

Observer arranges the data, then gives a statement as per experience and background knowledge of the event. So after observations the hypothesis step takes place.

**Hypothesis:**

*“A statement on the basis of available information is called hypothesis”*

Hypothesis is formulated by two ways i.e. (i) deductive reasons (ii) inductive reasons

**Deduction:**

*“A logical consequence result on the basis of available information is known deduction.”*

“If ... and “then ...” are frequently used to make testable hypothesis. Deduction means specific conclusion from general principle or assumptions.

**Example:**

**Wings and Birds:**

If we accept that all birds have wings. It is hypothesis-I. so sparrows are birds, it is hypothesis-II. if we know sparrow is bird then we will say eagle, parrot, hawk and crow are also birds. Thus we induced that all birds have wings. Considerable thing is this, *firstly, we moved from general to specific. It is deductive reasoning. Secondly, we moved from specific to general, it is inductive reasoning.*

**Theory:**

*“An opinion or idea supported by experimentations is called theory”.*

All hypothesis are not true. Sometimes, mistakes, personal interests or effects/cause the reasons of fault. At this stage further concentrations and study are required, so hypothesis are tested again and again. Tests are proceeded up to no chance of falsification. A theory is formulated on the basis of repeated experiments and conclusion. A theory has good predictiveness and power of explanation. Theory is a productive step of biological methodology.

**Law:**

*“The uniform or constant fact of nature is called law”.*

Work on theory and points of theory discussed and criticized by scientists. If all aspects of theory are checked repeatedly and ultimately no challenged aspect is found in it. Theory is survived, experiments support to theory thus it becomes scientific law.

Law has general ways of description. It affords good and suitable answers of complicated questions than theory. Mendel's law of inheritance and Hardy-Weinberg law are good examples in biological fields.

**IMPORTANT BASIC TERMS**

**Q.12** Define the following basic terms:

- |                           |                           |
|---------------------------|---------------------------|
| (i) <i>Stimulus</i>       | (ii) <i>Response</i>      |
| (iii) <i>Organism</i>     | (iv) <i>Translocation</i> |
| (v) <i>Organ</i>          | (vi) <i>Enzymes</i>       |
| (vii) <i>Hormones</i>     | (viii) <i>Gene</i>        |
| (ix) <i>Species</i>       | (x) <i>Evolution</i>      |
| (xi) <i>Phylogeny</i>     | (xii) <i>Ontogeny</i>     |
| (xiii) <i>Antibiotics</i> | (xiv) <i>Vaccination</i>  |
| (xv) <i>Cancer</i>        | (xvi) <i>Carcinogenic</i> |
| (xvii) <i>Disease</i>     |                           |

**TERMS TO REMEMBER**

**Ans.**

- (i) **Stimulus:** Any external or internal change detected by body is called stimulus.
- (ii) **Response:** The reaction to stimulus is called response.
- (iii) **Organism:** A living thing with particular system and specific characters is known as organism.
- (iv) **Translocation:** The transport of materials from one part to other body part is called translocation.
- (v) **Organ:** The specific arrangement of tissues forms a particular structure of a system is called organ. e.g., stomach, heart etc.
- (vi) **Enzyme:** A biochemical which speeds up chemical reaction without its own involvement is called enzyme. e.g. lipase, sucrase, maltase, pepsin etc.
- (vii) **Hormone:** An organic compound which is secreted by glands and transported to target tissues for specific functions. e.g. Insulin, parathormone, gastrin etc.
- (viii) **Gene:** The basic structural and functional unit of the inheritance is called gene.
- (ix) **Species:** The closely resembled organisms which freely interbreed and reproduce fertile offspring is known as species.

- (x) **Evolution:** The *gradual changes* of organisms with the passage of time is called evolution.
- (xi) **Phylogeny:** The *evolutionary history* of a group of individual is known as phylogeny.
- (xii) **Ontogeny:** The *developmental history* of an individual is called ontogeny.
- (xiii) **Antibiotics:** The chemicals which are obtained from the organisms and used to kill the disease causing (pathogen) organism as a medicine called antibiotics.
- (xiv) **Vaccination:** The supply of inactive pathogens into the body to create the immunity or antibodies for immediate defence against the disease causing organism is known as immunation or vaccination.
- (xv) **Cancer:** The disease due to false mitosis, in which dividing cells are not similar to parental cell, thus structural and functional abnormalities occur in the body.
- (xvi) **Carcinogenic:** The cancer causing substances or chemicals are called carcinogenic.
- (xvii) **Disease:** Any deviation in normal structure or function of any tissue or body part is called disease.

**Q.13 Enlist services of Biology.**

Ans. **BIOLOGY AND THE SERVICES OF MANKIND**

**Important Roles of Biology**

Biology is the science which facilitates to human beings in the fields of:

- (1) Improvement of health.
- (2) Cures of Diseases by:
  - (i) Gene Therapy
  - (ii) Chemotherapy
  - (iii) Radiotherapy
- (3) New varieties of plant and animals.
- (4) Biological control.
- (5) Addition of nutrients in the soil.
- (6) Protection of food.
- (7) Conservation of environment.

**Q.14 (a) What is the role of Biology in plant production?**

**(b) What do you know about Biological control?**

**Ans. (a) Plant Production**

Valuable plants are improved by scientists. In this way, *new varieties* are formed and *resistance* and *yield* are increased by the biologists. These projects depend on Genetics. Wheat, rice, corn, other fruits and crops etc. are improved by genetic engineering. "**Genetic Engineering** is the manipulation of genes by man"

Valuable gene is selected and transferred from one plant to other for required results. The plant in which gene is incorporated is called Transgenic Plants.

Another method for the production of better variety is cloning. A type of asexual reproduction in which similar cells or organism are produced is called **Cloning**. It is tissue culture technique.

**(b) Biological Control**

"The process by which harmful organisms are destroyed by other living organism is known as biocontrol".

It is an advanced way in which chemicals or toxic substances are not used. Because toxic substances are dangerous for human beings, become the source of pollution. *In biological control, pests etc are destroyed by competing or eating of other living bodies.* It is the way in which natural enemies used against to each other.

Some bacteria are also used as a biological control method. So these bacteria which decompose harmful organism are called *Bio Pesticides*. These modern ways are useful for plants.

**Example:** An *aphid* attacks walnut tree. So aphid is controlled by another organism i.e. *wasps*.

These approaches to kill the disease causing organisms is called **Integrated Disease Management**.

**Q.15 (a) How soil fertility is increased?**

**(b) What is the role of biology in food protection?**

**Ans. (a) Improvement of Soil**

Some nutrients are necessary for soil. Plants can not grow without the absorption of such nutrients. Nutrients requirements study is very difficult because soil is a complete medium. It is difficult to judge which nutrient is essential for plant and which is not essential.

**Hydroponic Culture Technique** is introduced by biologists to face such difficulties. Plants are cultivated in aerated water and then study which kinds of mineral nutrients or salts are essential. Hydroponic farming is yet impossible but some astronauts use it for growing vegetables.

**(b) Food Protection:**

**Milk and milk products are protected by PASTEURIZATION.** *Pasteurization is a process by which a liquid is heated to certain temperature and then chilled it to kill harmful organisms.*

Many other methods are also used to preserve the spoilage of food like drying, use of preservative (chemicals) etc.

**Q.16 Briefly discuss the cloning.**

Ans. **Cloning**

- ◆ A clone is a population of genetically identical cells or organisms.
- ◆ Clones of plants are easily produced by vegetative propagation or by tissue culture methods.
- ◆ Cloning is a method of preservation of superior genotype in organisms.
- ◆ The technique of cloning is applied successfully for production of nitrogen fixing bacteria, synthesis of antibiotics, preparation of Insulin and human growth hormones through the E. coli (bacterium).

*“The identical offspring from a single parent are referred to as a clone”.* The process of clone formation is cloning.

**Q.17 In which disease chemotherapy and radiotherapy are used?**

Ans. **CHEMOTHERAPY AND RADIOTHERAPY**

Chemotherapy and radiotherapy are used against the cancer. *Cancer is related to uncontrolled growth of tissues.* Generally, surgical methods, radiotherapy and chemotherapy are used for treatment of cancerous growth.

Radiotherapy involves burning and destroying the cancerous tissues by x-rays etc.

Chemotherapy includes drug treatments for cancer. Blood cancer is fatal i.e. not curable. Both these methods have adverse effects on the body.

**Q.18 What is the effective role of Gene Therapy?****Ans. GENE THERAPY**

*“Adding, removing or repairing a part of genetic material is gene therapy”.*

This method is the transfer of the purified genetic material from one organism to the other or from the test tube to the cell.

**EFFECTIVE ROLES:**

- (i) Cures may be possible of inherited diseases.
- (ii) Development of new forms of medicines may be possible.
- (iii) Transfer of nitrogen fixing genes from bacteria or blue green algae to major crops may be possible.

**Q.19 What is mutation?****Ans. MUTATION**

*“The sudden heritable change in the genetic material is known as mutation”.*

Mutation may be occurred in two ways:

**(i) Gene Mutation:**

The change in gene level i.e. sequence of nucleotide level.

*Example:* Haemophilia etc

**(ii) Chromosomal Mutation:**

This type of mutation involves change in chromosome number. Example: Down syndrome etc.

**Q.20 What do you know about AIDS? Brief it.**

**Ans. AIDS** is a disease caused by Human Deficiency Virus (HIV) which affects the immune system. Victims of the disease are unable to defend themselves against infections (pathogenic attack) and certain cancers. HIV is a latent and slow acting virus. It may be dormant for years.

**Transmission Ways:**

- (i) HIV found in semen and vaginal fluids and transmitted *by intercourse*.
- (ii) It may be spread *through blood*.
- (iii) Transfusion of HIV may be due to shared *needles of syringes* etc.

**Symptoms:** Headache, dizziness, loss of weight, purple patches on skin, whitish spots on tongue tip, difficulty in breathing.

**Q.21 How does law differ from theory?**

**Ans.** Theory is an opinion or idea supported by experimental results. In other words, the generalizations supported by experiments with repeatable results. "Deductions are tested again and again and supported by experiments and then theory is formed".

*Law is uniform and constant fact of nature.* Actually, law is a brief statement which based on a large number of data.

**Q.22 Define Predation, Parasitism, Commensalism, Mutualism, Competition and Biopesticides.****HELP LINES****Ans. PREDATION:**

The phenomenon in which one animal capture and killed other organism for its food i.e. predator, while killed and eaten i.e. prey, it is collectively called predation.

**Parasitism:** A harmful association between organism of different species as a parasite and host in which parasite is benefited and host is harmed.

**Commensalism:** The symbiotic association in which one partner gains benefits without harming and benefiting to other is called commensalism.

**Mutualism:** The beneficial relationship between two organisms is called mutualism. e.g., Lichen and Mycorrhiza.

**Competition:** The fight or interactions among the organisms for food and shelter is called competition.

**Biopesticides:** The organisms have the abilities to kill the harmful pesticides are called biopesticides.

**Q.23 What are the meanings of phyletic lineage?****Ans. MEANINGS OF PHYLETIC LINEAGE**

**Phyletic** means *evolutionary history*, linkage from generation to generation successively.

**Lineage** means "*the way in which members of a family are descended from other members*".

**Q.24 What do you know about endangered species?****Ans. ENDANGERED SPECIES**

“Those animals and plants species which are facing the problems and in dangers by other species or harmful environmental factors are called endangered species”.

*It is necessary to save these species, otherwise these may be extinct.* A biologist always busy in such try that each species must be live forever. Each existing species should be improved. In short, species with low population numbers that are in considerable danger of becoming extinct.

**Q.25 How a disease can be controlled by preventive measures?****Ans. PROTECTION FROM DISEASES****Avoid Pathogens:**

*Preventions are better than cures.* A healthy person must avoid the pollutions and infected persons or organisms. The contagious types of infectious disease are harmful because of transmission of pathogens from infected to healthy persons.

**Vaccination:**

Vaccination is a good method to prevent the health. A person must avoid to used the shared surgery tools, syringes and needles. We must be careful about transfusion of blood. HIV and H Virus may be transmit due to carelessness. Every body must be careful about food and places. DR. must be consulted immediately in case of any abnormality.

**Q.26 What is vaccine? How Vaccination (immunization) control the disease?****Ans. VACCINE**

*“A suspension of killed microorganisms like viruses and bacteria for prevention against infectious disease is called vaccine”.*

**VACCINATION:**

Scientists are struggling to develop the vaccine against AIDS.

Vaccine prepared from live microorganisms or viruses cultured under adverse conditions leading to loss of their virulence but retention of their ability to induce protective immunity.

The introduction of vaccine into the body to produce immunity is called Vaccination. In 1795, Jenner developed the technique of vaccination. *Vacca means cow.* So, first time cowpox pus famous as vacca.

Disease, like whooping cough, measles, mumps, small pox can be easily controlled by vaccination. Small pox has been eliminated from world by vaccination. Some vaccines in early life are enough for all life. Inoculation of vaccines activates the defence mechanism of the body. As soon as the pathogen i.e. virus or bacteria attack the certain already stimulated antibiotics defeat the pathogens.

**Q.27 Brief gene therapy as a disease controller.**

Ans. **GENE THERAPY**

*“The isolation of normal gene from a donor and insertion into host to replace defective gene is called GENE THERAPY”.*

Defective genes become the reason of different abnormalities like inherited diseases. In this case, defective gene may be replaced by genetic engineering. The production of medically valuable plant species by inserting the desirable gene is a tremendous drive of genetic engineering.

**Q.28 Write an account on cloning.**

Ans. **CLONING**

*Cloning is a nuclear transplantation technique in which nuclei were taken from the cells of the same animal and production of genetically identical organism occur.*

A group of genetically identical organism is called a *CLONE*. Cloning is a technique for developing large numbers of genetically identical cells or organisms. Any way, the normal reproductions by such method are not possible and regular. In some cases some insects and plants give somewhat positive results.

**Cloning of Sheep in Scotland in 1997:**

A success of cloning of sheep in 1997 became the history in cloning field. The scientists in Scotland applying the following methods:

- The nucleus from a fertilized egg is removed.
- The nucleus from a fully developed individual is inserted in its place.
- The altered zygote is then implanted in a suitable womb where it completes its development.

**Result:** The new formed individual was genetically identical clone of the individual whose nucleus was used. Thus multiple copies of desired genotypes are possible by cloning.

**Creation of Identical Twins:**

The division of single egg or embryo into one or more embryos is another type of cloning. By this process identical twins are created. These identicals or off spring have chromosome of two parents. In this way, farm animals or identical cattle are produced.

**Creation of Valuable Animals:**

On commercial basis, known pedigree of *valuable animals like horses* are projects of scientists. These animals may be cloned.

**Q.29** Discuss protection and conservation of environment, write down industrial effect on environment?

**Ans.** **PROTECTION AND CONSERVATION OF ENVIRONMENT**

Industrialization is raising the standard of man. But on the other hand, it is creating the problems for man by pollution. *The environmental pollution has been increased by industrial wastes.* Toxic substances in the environment have become carcinogenic.

Chromium from Tanneries and Lead from Automobiles creating the injurious problems for mankind. Solid, gas and liquid waste materials of industry are big source of environmental pollution.

**Role of Biology to Solve the Environmental Problems:** Biologists are searching the solution of environmental problems. They are working on the techniques by which removal or degradation of pollutants and toxic materials may be possible.

Bio remediation by several ways is under consideration. "The process in which unwanted and toxic materials are degraded by the organisms is called bioremediation.

**Example:** Algae may be used as bioremediation organism. It may reduce the heavy metals by Bioabsorption.

**Endangered Species:** These species of animals and plants may be extinct. So protection of endangered species is urgently needed. Biologists are working on this project.

**Pollution as a National Problem:** *City sewage* and *industrial wastes* mix as pollutants in rivers and canals. The living bodies of fresh H<sub>2</sub>O are rapidly reducing. The population of fish is facing dangerous condition. While atmosphere is disturbed by *exhaust* and *lead*, which is increased by *automobiles*.