

# CHAPTER 1

## BIOLOGY AND SOME MAJOR FIELDS OF SPECIALIZATION

Q.1: Define biology give its meaning.

→ What do you understand by the term "biology"?

Ans: **BIOLOGY**

It is defined as,

*"Scientific study that deals with living things is called biology"*

OR

*"Biology is the study of living things"*

A biologist deals with *living part* of nature and *non-living* things that affect the living things in any way.

By meaning, biology has been derived from two Greek words: "Bios" means Life and "Logos" means Study, Thought, and Reasoning. Thus the literal meaning of biology is the study of life.

Q.2: What is life discuss characteristics of life?

(MTN-2013, 16)

→ What is the meaning of life?

→ Why should be there life?

Ans: **WHAT IS LIFE?**

There is no definition of life because there are many aspects of life, which are beyond our reach. Life, for biologists, is a set of characteristics that distinguish living organisms from non-living objects (including dead organisms).

### Life and Living Organisms:

Living organisms have following characteristics:

- ⊙ They are highly organized complex entities
- ⊙ Composed of one or more cells
- ⊙ Contain genetic program of their characteristics
- ⊙ Can acquire and use energy
- ⊙ Can carry out and control numerous chemical reactions
- ⊙ Can grow in size
- ⊙ Maintain a fairly constant internal environment (homeostasis)
- ⊙ Produce offspring similar to them
- ⊙ Respond to changes (stimuli) in their environment

Any object possessing all these characteristics can be declared as living thing and is an object for biological studies.

Q.3: Define different branches of biology.

Ans: **BIOLOGY AND ITS DIVISIONS**

Science of biology includes every aspect of living things. Biology has been divided into a number of branches e.g.,

- **Morphology:** It deals with the study of form and structure of living organisms.  
Morphology has two branches:
  - (i) **External morphology:** Study of external features of an organism.
  - (ii) **Internal morphology (Anatomy):** Study of internal structure of an organism.
- **Paleontology:** A fossil is any remain or impressions of extinct organisms preserved in the rocks or layers of earth surface.  
Paleontology has two branches:
  - (i) **Paleobotany:** It is study of fossils of plant
  - (ii) **Paleozoology:** It is the study of fossils of animals
- **Histology:** It deals with the microscopic study of tissues
- **Evolution:** Study of changes in organisms with time or ancestral history of an organism.
- **Genetics:** Study of transmission of hereditary characters from parents to offspring.
- **Biogeography:** Study of distribution of animals and plants in different geographical regions or parts of planet earth.  
Biogeography has two branches:
  - (i) **Zoogeography:** Study of Geographical distribution of animals on earth.
  - (ii) **Phytogeography:** Study of distribution of plants on planet earth.
- **Ecology:** Study of inter-relationship between organisms themselves and their environment.
- **Embryology:** Study of development of embryo is known as embryo.
- **Physiology:** Study of functions of different organs and organelles of an organism.
- **Cell Biology / Cytology:** Study of structure and function of cells.
- **Taxonomy:** Study of naming and classification of organisms into various groups and subgroups on the basis of their similarities and differences.

Q: Define Physiology.

(LHR-G1)-15

Other branches of biology are defined as:

- (1) **Molecular Biology:**  
Molecular biology is a branch of biology, which deals with the study of organisms, the cells and their organelles at molecular level.
- (2) **Environmental Biology:**  
It is the study of organisms in relation to their environment. This includes interaction between the organisms and their inorganic and organic environment, especially as it relates to human activities.
- (3) **Microbiology:**  
It is the study of microorganisms, which include bacteria, viruses, protozoa and microscopic algae and fungi.
- (4) **Fresh Water Biology:**  
It deals with the organisms living in fresh water bodies i.e. rivers, lakes etc. and physical and chemical parameters of these water bodies.
- (5) **Marine Biology:**  
It is the study of life in seas and oceans. It includes the study of the marine life and the physical and chemical characteristics of the sea acting as a factor for marine life.



(6) **Parasitology:**

It deals with the study of **parasites**. The **structure**, mode of **transmission**, life histories and **host-parasite relationship** are studied in parasitology. **Parasite** is an organism which lives in or on another organism (its host) and benefits by deriving nutrients at the other's expense; it may or may not cause disease in human.

(7) **Human Biology:**

It deals with the study of man. It includes form, structure, function, histology, anatomy, morphology, evolution, genetics, cell biology and ecological studies of human being.

(8) **Social Biology:**

It deals with the study of **social behavior** and communal life of human beings.

(9) **Biotechnology:**

It deals with the use of living organisms, systems or processes in manufacturing and services industries.

Q: Define Microbiology and Biotechnology (AGK-G1)-15

Q: Define Parasitology.

(LHR-G1)-16

## LEVELS OF BIOLOGICAL ORGANIZATION

Q.4: What are bioelements? Give their features.

- Discuss different levels of Biological organizations?
- Differentiate between organ and organ system.
- Differentiate between population and community.
- Define population and give its attributes.
- Differentiate between micromolecules and macromolecules.
- Differentiate between organelles and organs.

Ans. **BIOELEMENTS**

**Definition:**

*"Elements, which occur in a particular organism, are called bioelements."*

OR

*"All living and non living organisms are composed of certain basic substances called elements"*

**Bioelements in Living Organisms:**

Out of 92 naturally occurring chemical elements, only 16 are commonly used in forming chemical compounds from which living organism are made. These 16 elements are **bioelements**. Properties of these bioelements differ from those present in non-living world and these properties make them particularly appropriate as basis for life.

**Bioelements in Humans:**

In the human body, only **six** bioelements account for **99%** of the total mass. Other **ten** bioelements form only **1%**.

99%	
Oxygen	65%
Carbon	18%
Hydrogen	10%
Nitrogen	3%
Calcium	2%
Phosphorus	1%

1%	
Potassium	0.35%
Sulphur	0.25%
Chlorine	0.15%
Sodium	0.15%
Magnesium	0.05%
Iron	0.004%
Copper, manganese, zinc, iodine in traces.	

Q: Describe the biological organization at organelles and cell level.

(LHR-2013, 14, 15)

Q: Describe briefly the biological organization up to organism level.

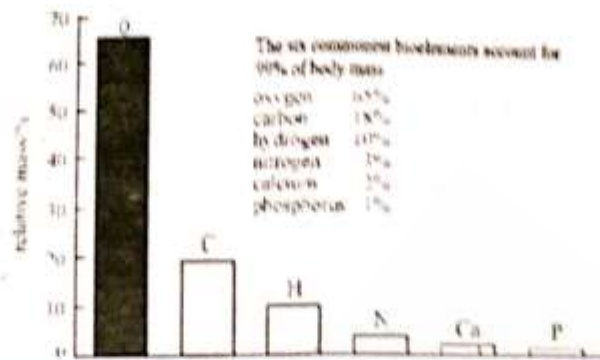
(RWP-GI-2015)

Q: Describe population and community levels of organization in Biology.

(DGK-GII-2016)

Q. Discuss the organs and system levels of Biological organizations.

(DGK-GII-2016)



Other bioelements includes (about 1%) – potassium (0.35%), sulphur (0.25%), chlorine (0.15%), sodium (0.15%), magnesium (0.05%), iron (0.004%), copper (trace), manganese (trace), zinc (trace), iodine (trace)

Fig: Percentage composition of bioelements by mass of a human being

## BIOLOGICAL ORGANIZATION

A living thing is composed of highly organized living substance or protoplasm.

### LEVELS OF BIOLOGICAL ORGANIZATION

These are presented in the following diagram:

Biosphere	That part of earth inhabited by living organisms; includes both the living and nonliving components.	
Ecosystem	A community together with its nonliving surroundings.	
Community	Two or more populations of different species living and interacting in the same area.	
Population	Members of one species inhabiting the same area.	
Species	Very similar, potentially interbreeding organisms.	
Multicellular Organism	An individual living thing composed of many cells.	
Organ System	Two or more organs working together in the execution of a specific body function.	
Organ	A structure normally composed of several tissue types that form a functional unit.	
Tissue	A group of similar cells that perform a specific function.	
Cell	The unit of life.	
Organelle	A structure within a cell that performs a specific function.	
Micro-molecules and Macro-molecules	A combination of atoms.	
Atom	The smallest particle of an element that retains the properties of that element.	
Subatomic Particle	Particles that make up an atom.	



### (i) ATOMIC AND SUBATOMIC LEVEL

- Atom is the smallest particle of matter that consists of three fundamental subatomic particles, electron, proton and neutron.
- All living and non-living things are formed of atoms and sub-atomic particles.

### (ii) MOLECULAR LEVEL

- In organisms, elements usually do not occur in isolated forms.
- The atoms of different elements combine with each other through ionic or covalent bonding to produce compounds.
- This stable form is called a molecule.

#### Biological Atoms Forming Molecules:

Hydrogen, carbon, oxygen, nitrogen, phosphorous and sulphur are the most common atoms found in biological molecules. A great variety of complex biological molecules are constructed on the basis of different types of bonding arrangement.

#### Biological Molecules:

An organism usually consists of enormous number of micro and macromolecules of hundreds of different types. These molecules are organic and inorganic compound.

An **organic molecule** is any molecule containing both hydrogen and carbon while **inorganic molecules** do not include carbon and hydrogen together in a molecule.

#### (i) Micromolecules:

These molecules are with low molecular weight. Some common examples are  $\text{CO}_2$ ,  $\text{H}_2\text{O}$  etc. Most of the micromolecules are inorganic.

#### (ii) Macromolecules:

These molecules are with higher molecular weight. Some common examples are starch, proteins, glucose, amino acids, fatty acids, glycerol, and nucleotides like ATP, ADP, and AMP etc. Most of the macromolecules are organic.

### (II) ORGANELLES AND CELLS

Different micromolecules and macromolecules arrange themselves in a particular way to form cells and their organelles.

#### Organelles:

Sub-cellular tiny structures of cell are called organelles e.g. mitochondria, Golgi bodies, endoplasmic reticulum, ribosomes etc. Functions of the cells are accomplished by these specialized structures comparable to the organs of the body. The arrangement of the organelles speaks of the division of labour within the cell.

#### Cell:

Cell is basic unit life. In case of simple organisms like bacteria and most protists, the entire organism consists of a single cell (**unicellular**). In most fungi plants and animals, the organism may consist of upto trillions of cells (**multi-cellular**).

Cells are of two types:

- (i) Prokaryotic cells combine to form prokaryotes. Prokaryotes have a limited number and type of organelles.
- (ii) Eukaryotic cells combine to form eukaryotes. Eukaryotes are rich in number and kind of membranous organelles.

A cell membrane is present in all cells whether prokaryotic or eukaryotic.

### (III) TISSUE LEVEL

- Group of similar cells organized into loose sheets and bundles' performing a specific function is called tissue.
- Each tissue has a particular function in the life of the organism.

#### Examples

**Muscle tissues:** Specialized for contraction.

**Glandular Tissue:** Specialized for secretion.

**Xylem tissue:** Specialized for conduction of water.

**Phloem tissue:** Specialized for conduction of food, sugar and proteins.

#### (IV) ORGAN AND ORGAN SYSTEM

##### ORGAN:

Different tissues having related functions, assemble together in a structure to perform its particular function with great efficiency is called organs.

The formation of organs also has a selective value because this lead to efficient compliment of their functions both quantitatively and qualitatively.

Different organs combine to form an organ system e.g. digestive system.

##### Organ Level in Animals and Plants:

In animals, organ formation is more complex and defined. In animals organs are the part of organ system where total functions are involved in one process. The complexity of the organ systems of animal is associated with great rate of functions and activities.

##### Examples

For example stomach, heart, lung etc.

##### Tissues in Stomach

- Stomach is an organ, which has a function of food digestion (protein part).
- It has **secretory epithelial tissue**, which secretes gastric juice.
- **Muscular tissues** (smooth) of stomach contract (grinding and pushing) to mix food to the enzyme thoroughly and move the food to posterior end.

In plants, organ level is less definite than animals. At most we might distinguish roots, stems, leaves and reproductive structures e.g.

- **Roots** are involved in anchoring the plant, storage of food and procuring water and minerals.
- **Shoot** supports the entire plant.
- **Leaves** are primary organs for food manufacture.
- **Flowers** or other reproductive structure are involved in reproduction.

#### ORGAN SYSTEM

##### Definition

Related organs combine to form organ system where total functions involved in one process or phenomenon are carried out.

##### Examples

Digestive system, respiratory system etc.

##### Complexity of an Organ System:

Complexity of organ system of animal is associated with wide range of functions and activities than is found in plants.

#### (V) INDIVIDUAL (WHOLE ORGANISM)

"Various organs in plants and various organ systems in animals are assembled to form an individual, the whole organism".

##### Individuality of an Organism:

The whole organism has its individuality as far as its characteristics are concerned. It is different from other members of same species in certain respects.

Q: Write relation between Organ and Organelles.  
(SWL-G1)-14



### Coordination in an Organism:

Various functions, processes and activities of an organism are coordinated. Coordination is the working together of different body parts in regular manner with timing and perfection. In animals, all the systems work in coordination with each other.

#### Example

If a man is engaged in continuous and hard exercise then muscles work actively and there is increase in rate of respiration, heartbeat and flow of blood to supply increased amount of oxygen and food to muscles. Thus muscular system, circulatory system and respiratory system work in coordination with each other.

In animals, coordination is achieved by:

- (i) Nervous system (ii) Endocrine system

In plants, only long term regulation of activities is brought about by hormones. Organism works as a whole and it interacts and responds to the environmental changes as a whole

### (VI) POPULATION & COMMUNITY

#### POPULATION

##### Definition

"A population is a group of living organisms of same species located at the same place in the same time."

Q: Define population.

(LHR-G2)-15, (RWP, AJK)-14-16

##### Examples

Examples are the number of rats in a field of rice, number of students in biology class, humans or population in a city.

##### Attributes of Population:

Population is a higher level of biological organization than individual as group of organism of the same species are involved. It has its own attributes, which are due to its members, living together. Some of the attributes are gene frequency, gene flow, age distribution, population density, population pressure etc.

#### COMMUNITY

##### Definition

"Population of different species (plants and animals) living in the same habitat form a community."

Q: Define Community.

(DGK-G2)-15

##### Some Features of Community:

- Communities are dynamic collection of organisms, in which one population may increase and other may decrease due to fluctuation in biotic factors.
- Some communities are complex and well interrelated.
- Some communities are simple in which any change can have drastic and long lasting effect.

##### Interaction in Organisms:

Interaction between organisms in an ecosystem can take many shapes. It may be predation (Predator-Prey relationship), parasitism (Host parasite relationship), commensalisms (One partner is benefited & other do not get benefit nor harmed), mutualism (Both partners get benefit) and competition.

**Q.5: What do you understand by the term "Living World in Space" how it is relates to biomes?**

→ **Define Biome and how they are named?**

**Ans. LIVING WORLD IN SPACE**

Living world of today is **enormous in size**. It has been reproducing and evolving since ongoing of earth. Today living organisms are present in almost every part of world. Their distribution in world can be studied through biomes.

**Biome:**

*"A biome is a large regional community, primarily determined by its climate"*

In biome, major type of plant determines the other kind of plants and animals.

##### Naming Biomes:

1. Major plants e.g., forest ecosystem, grass land ecosystem.
2. Major feature of ecosystem e.g., tropical rain forest, temperate deciduous forest.

**Q.6: What do you understand by the term "Living World in Time"?**

→ Define geological time scale or chart.

→ How the age of fossils can be determined?

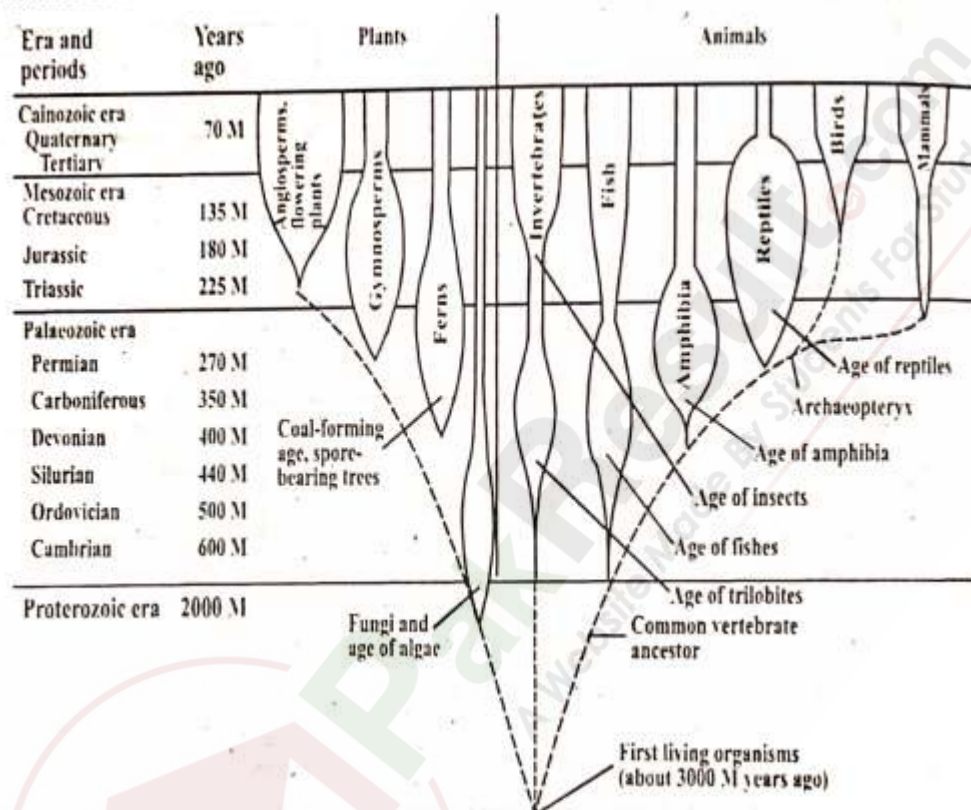
**Ans. LIVING WORLD IN TIME**

Since the time of origin of life on earth, various organisms were evolved and dominated during various periods of geological time chart or scale. A chart showing past history arranged in chronological order from its origin till today is shown as geological time scale or chart.

This has been found from the discovery and study of fossils and Sedimentation of earth.

**Q: Write names of four geological time era.**

(LHR-G2)-16



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

**How Age of Fossils can be determined?**

- During geological time, new layers of sediments are laid down. If sequence of layers has not been disturbed, the older organism should be in deeper layers.
- Age of rocks in layers can be determined or compared by amount of certain radioactive isotopes. The older sediment layers have less of these specific radioactive isotopes than the younger layers.
- A comparison of the layers gives an indication of the relative age of the fossils found in the rocks.
- Therefore, the fossils exists in the same layers must have been alive during the geological period.
- Above figure gives an idea about the temporal distribution of various forms of life both plants and animals in the various geological periods.



**Q.7: What is Biodiversity?**

- Define phyletic lineage gives its importance?
- Discuss briefly phyletic lineage in biological organization.

**Ans. PHYLETIC LINEAGE**

**Biodiversity:**

*"The number and variety of species in a place is called biodiversity."*

There are nearly **2,500,000 known species of organisms**. Out of them, there are nearly:

53.1% insects i.e. more than 50% of total known species.

19.9% animals other than insects.

17.6% vascular plants.

9.4% fungi, algae, protozoa and other prokaryotes.

This list is not complete. Total number of species to be estimated is between 5 to 30 million. Out of these only 2.5 million species have been identified so far.

**Increase in Biodiversity:**

An evolutionary change often produces new species and then increases diversity.

**PHYLETIC LINEAGE (EVOLVING POPULATIONS):**

**Definition**

*"A phyletic lineage is an unbroken series of species arranged in ancestor to descendant sequence with each later species having evolved from one that immediately preceded it."*

The life today has come into existence through phyletic lineage or evolving population of the organisms living in the remote past.

**Importance:**

If we had a complete record of history of life on earth, then every lineage would extend back in time to the common origin of all early life. We lack that record due to absence of fossils of many soft-bodied organisms.

**Q.8: Write a note on biological method.**

- Explain the biological method for solving a biological problem. How to deductive and inductive reasoning plays an important role in it?
- Differentiate between qualitative and quantitative observations.
- Differentiate between Deductive and Inductive reasoning.
- What are the other ways to form hypothesis? (DGK-G2)-15
- Differentiate between scientific law and theory.
- Differentiate between good theory and productive theory?
- Differentiate between hypothesis and theory?

**Ans. BIOLOGICAL METHOD**

**Introduction:**

Science is a systematized knowledge. Like other sciences, biological sciences also have a set methodology. It is based on experimental inquiry.

**Components:**

- |                 |            |                |
|-----------------|------------|----------------|
| (1) Observation | (2) Data   | (3) Hypothesis |
| (4) Tests       | (5) Theory | (6) Law        |

These are explained below:

(1) **Observations:**

Observations are made with *five senses* i.e., vision, hearing, smell, taste and touch, depending upon their functional ability. Observation can be *qualitative and quantitative*.

Quantitative observations have accuracy and are measurable in terms of numbers while Qualitative observations can't be measured and recorded in terms of numbers

(2) **Data:**

Observations made by observer are organized into data form

(3) **Hypothesis:**

Hypothesis is a tentative explanation of observations.

OR any statement given by the scientist as per experience and background knowledge of the event or biological problems.

**Ways of Devising Hypothesis:**

(i) Deductive reasoning

(ii) Inductive reasoning

(i) **Deductive Reasoning:**

**Principle:** In deductive reasoning, we move from general to specific. It involves drawing specific conclusion from some principle/assumption. Deductive logic "if to then" is frequently used to frame testable hypothesis.

**Example 1:**

For example:

If we accept that all birds have wings

And sparrows are birds

Then we conclude that sparrows have wings.

**Example 2:**

★ If all green plants require sunlight for photosynthesis.

★ Then any green plant when placed in dark would not synthesis glucose, the end product of photosynthesis.

(ii) **Inductive Reasoning:**

**Principle:** It is reasoning from specific to general. It begins with specific observations and leads to the formation of general principles.

**Example:**

If we know that sparrows have wings and birds.

And we know that eagle, parrot, hawk, crow are birds.

Then we induce (draw conclusion) that all birds have wings. Scientists mostly use inductive methods to generalize from specific events.

(iii) **Other ways:**

Some times, scientists also use some other ways to form a hypothesis, which may include:

(1) Intuition or imagination

(2) Esthetic preference

(3) Religious or philosophical ideas

(4) Comparison and analogy with other processes

(5) Discovery of one thing while looking for other thing.

Q: Define Biodiversity. (BWP-G1)-14

(RWP-G1)-17

Q: Give a detailed account of phyletic lineage.

(SGD-14) (LHR-G1)-15, (AJK-G1)-15 (LHR-G2)(DGK-G2)-16 (SWL-G1)-16 (LHR-G1)-17 (LHR-2007)

Q: Explain any three/ various steps in biological method.

(MTN-2013, 12: LHR-G1-15)

Q: Differentiate between deductive and inductive reasoning with examples. (LHR-G1)(GUJ-G1)-16,

(LHR-G1)-17 (DGK-G1-2015: LHR, BWP, MTN-G1-14)

Q: Write a note on deductive and inductive reasoning. (SWL-2014)



(4) **Experiments:**

Hypotheses are then subjected to rigorous testing called experiments. Any hypothesis that is tested again and again without ever being falsified is considered well supported and is generally accepted. It may be used as the basis for formulating further hypothesis.

**THEORY & SCIENTIFIC LAW**

(5) **Theory**

**Definition** A series of hypothesis supported by the results of many tests is called a theory.

(i) **Good Theory:** A good theory is predictive and has explanatory power.

(ii) **Productive Theory:** A good theory which may suggest new and different hypothesis is called as productive theory.

(6) **Scientific Law**

Many scientists take a productive theory as a charge and exert greater efforts to disprove it by performing different tests. If a theory survives this skeptical approach and continues to be supported by experimental evidences becomes a scientific law. A scientific law is a uniform or constant fact of nature; it is a virtually irrefutable theory. It is more general than theory and answers to even more complex questions.

**Laws of Biology:**

Biology is short in laws because of elusive nature of life. Examples of biological laws are **Hardy-Weinberg Law** and **Mendel's Law of Inheritance**.

Q: Define theory. (LHR-G1)-15

Q: How Theory differ from Law.  
(SWL-G1)-14, (MTN-G1)-16

**BIOLOGY AND SERVICE OF MANKIND**

Q.9: What is the role of the study of Biology in the welfare of mankind?

- Write a brief note on services of biology for betterment of the mankind.
- How knowledge of biology solves the problems of mankind?
- Enlighten the role of biology for the betterment of mankind.
- What are transgenic plants?
- What is integrated disease management?
- Explain hydroponic culture technique.
- Define pasteurization.
- Write a note on disease control. Write about vaccination.
- Differentiate between Radiotherapy and Chemotherapy.
- Define gene therapy and cloning, discuss cloning in detail.
- Define bioremediation.
- What are endangered species give their examples?

Ans. **BIOLOGY AND SERVICE OF MANKIND**

The science of biology has been helping mankind in many ways e.g.

- A- In increasing food production
- B- In combating / controlling diseases
- C- In protecting and conserving environment

**A: ROLE IN FOOD PRODUCTION**

Biology has played a tremendous role in food.

(1) **PRODUCTION OF DIFFERENT VARIETIES:**

Improving existing varieties and developing new high yield and disease resistant varieties of plants and animals have increased our food production. Different methods, which have been adopted in this context, are as under:

- (i) Plant and animal breeders have developed, through **selective breeding** using the principles of genetics, new better varieties of wheat, rice, corn, chicken, cow and sheep. Poultry breeders have developed broilers for getting quick and cheap white meat.
- (ii) Genes of disease resistant and other desirable characters are introduced into plants by using the techniques of **genetic engineering**. Plants having foreign DNA incorporated into their cells are called **transgenic plants**.
- (iii) Transgenic plants can be propagated by cloning (production of genetically identical copies of organisms/cells by asexual reproduction) using special technique such as **tissue culture techniques**.

## (2) PROTECTION OF PLANTS FROM DISEASES:

### (i) Integrated Disease Management:

Effective control of particular disastrous disease or all possible methods are used to control disease, called integrated disease management.

### (ii) Use of Chemical Pesticides:

Plant pathogenic fungi and insects (pests) of crops, which weaken the plants and reduce the yield and traditionally been controlled by using chemical fungicides and insecticides (pesticides). Some **disadvantages** of using chemical pesticides are:

- Use of these chemicals poses toxicity problems for human being as well as environmental pollution.
- There are chances of insects becoming resistant to the effects of these chemicals.

### (iii) Biological Control:

Control of diseases by some living organisms is called **biological control**. It eliminates all the hazards of chemical pesticides. In biological control, pests are destroyed by using some living organisms that compete or even eat them up. An aphid that attacks walnut tree is being controlled biologically by a wasp that parasites this aphid. Some bacteria are being used as bio-pesticides.

Q: Define Pesticides.

(SGD-G2)-15

Q: Write a note on protection and conservation of environment. (SWL-2013: LHR-16)

Q: Describe role of biology in the production of food. (FBD, RWP, MTN-2014: BWP-13, 14)

Q: Discuss the drug treatment gene therapy against the diseases. (FBD-2013)

Q: How study of Biology helped mankind to improved production of food?

(SGD-GII-2015: DGK, GUJ-GI-16)

Q: What is the role of study of Biology and the welfare of mankind in the field of protection and conservation of environment? (GUJ-GI-2016)

Q: Describe the role of Biology in the field of health? (MTN-GI-2016)

Q: What prevention measures should be observed to avoid diseases? (SGD-GI-2016)

Q: Describe the role of Biology in disease control.

(SGD-GI-2016)

## (3) HYDROPONIC CULTURE TECHNIQUE

Hydroponic culture Technique is used to the plants are grown in a recited water to which nutrient mineral salt have been added.

Soil is complex medium containing all nutrients required for plant growth. It is impossible to know nutrient requirements of plants by growing them in soil. A technique which is used to know, whether a nutrient is essential for a plant or not is known as **hydroponic culture technique**.

Hydroponic forming is not feasible but may be used by astronauts for growing vegetables.

## (4) PASTEURIZATION

Different techniques of food preservation have been developed for protecting food from spoilage and for its use and transport over long distances without damaging its quality. One of these is **pasteurization**, developed by Louis Pasteur 1822-1895. It is being widely used for preservation of milk and milk products at 65°C for 30 minutes or at 72°C for 15 minutes.

Q: What is hydroponic culture.

(FBD-G1)-16, (RWP, MTN-G1)-17

Q: Define Pasteurization. (SGD)-16



## B: COMBATING / CONTROLLING DISEASES

It is achieved by:

- (a) Preventive measures
- (b) Vaccination or immunization
- (c) Drug treatment & Gene therapy

**Q: Describe "Preventive measures" and "Vaccination" as the methods of disease control.**

**(SWL-GI-2014; LHR-10; MTN-GI-11)**

### (a) PREVENTIVE MEASURES:

The advances in biological science have provided us information about the causative agents of the diseases and their mode of transmission.

**Examples:**

- (i) The *AIDS (Acquired Immune Deficiency Syndrome)* is caused by HIV (*Human Immune Deficiency Virus*) and it spreads through:

Free sexual contact

Blood transfusion

Using contaminated syringes or surgical instruments etc.

Therefore doctors advise us to take precautions on these fronts so that we do not contract the disease, which is at present incurable.

- (ii) *Hepatitis* is caused by *H. Virus*, which is spread through blood transfusion by using contaminated syringes and surgical instruments etc. In this case also, doctors, advise us to be careful and avoid the point of contact.

**Q: How AIDS spreads.**

**(FBD-G1)-16**

### (b) VACCINATION / IMMUNIZATION:

It is a preventive measure by which immunity is produced against specific type of viruses and diseases.

**Q: Write short note on vaccination.**

**(MTN-G1), (GUJ-G1)-14**

### DISCOVERY:

Edward Jenner developed the technique of vaccination in 1796, and its name was given by Louis Pasteur because cowpox pus is known as vacca (from Latin vacca = cow).

### Importance:

- (i) Inoculation or vaccination is carried out to make people immune against exposure to viruses and bacteria at the time of epidemics or sometime in early life to make them immune to some common diseases.
- (ii) Many diseases such as polio, whooping cough, measles, mumps etc can be easily controlled by vaccination or "shots".
- (iii) It is claimed that small pox has been totally eliminated from the world by using this method. Scientists are making continuous efforts to develop vaccine against other diseases. Even vaccine against AIDs is being administered in humans on experimental basis.

### (C<sub>1</sub>) DRUG TREATMENT:

Drug treatment involves various ways e.g.

#### (i) Use of Antibiotics

After sickness from a disease, patients are usually given antibiotics. These are useful in bacterial diseases and only in those conditions in which bacteria have not developed resistance to antibiotics.

#### (ii) Radiotherapy and Chemotherapy

In cancer, radiotherapy and chemotherapy are also used.

In **radiotherapy**, the cancerous part is exposed to short wave radiations from the radioactive material repeatedly at regular intervals.

**Chemotherapy** consists of administering certain anticancer chemicals to the patients at regular intervals. These chemicals may kill both cancerous as well as normal cells.

**Q: What is Integrated disease Management.(SGD-G1), (DGK-G1)-15**

**(GUJ)-15, (MTN)-17**

### Integrated Disease Management:

Combating of disease by utilizing all methods as and when required and ensuring a participation of community in this program is known as integrated disease management. This requires an awareness of the community about the severity of the problem, its causes and its remedies. This is a very effective program for elimination and control of the dangerous disease from human society.

## (C) GENE THERAPY:

*"A new technique, which has been developed to repair the defective gene, involving isolation of normal gene and its insertion into the host through bone marrow cells is called gene therapy"*

### CLONING

Cloning is a technology for achieving eugenic aims (for the welfare of humans).

#### Clone:

A Clone is defined as,

*"A cell or individual and its asexually produced offspring"*

All members of a clone are genetically identical except when a mutation occurs. Generally no normal animal reproduces naturally by cloning. Several insects and many plants do, in some circumstances whereas few do so regularly.

Q: Define cloning. Discuss different mechanism of cloning.

(BWL-2014; LHR-10; MTN-11)

Q: Write a note on cloning.

(SGD, GUJ -2014; FBD-GI-16)

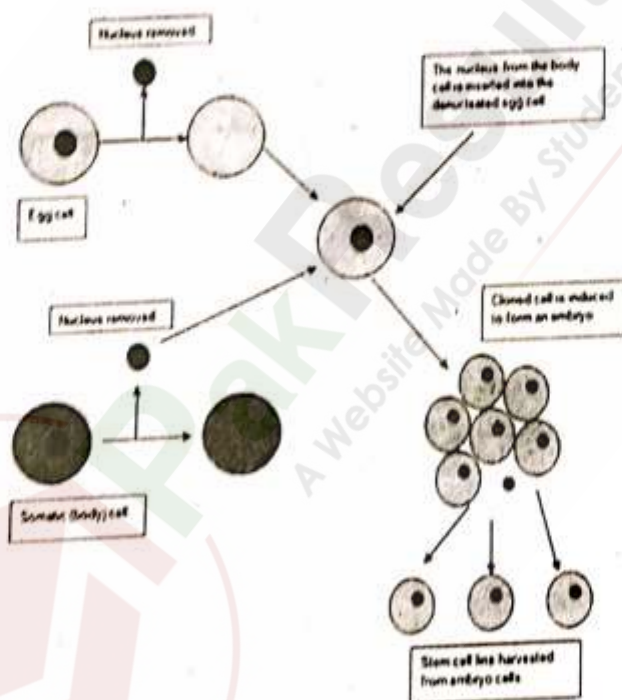
Q: What is cloning? Discuss in detail.

(GUJ-GI-2014; FBD-GI-16;

LHR-GI-16)

Q. Define cloning discuss its types and the commercial importance of the technique. (BWP-GI-2016)

Q. What is cloning? Describe its procedure. (LHR, RWP-GI-2016)



#### Types of Cloning:

In 1977 scientists in Scotland first time succeeded in cloning a sheep. Other mammalian species (mice and cows) have since been cloned. There are two types:

##### (i) Replacement of Nucleus:

Nucleus from a fertilized egg is removed and a nucleus from a cell of a fully developed individual is inserted in its place. The altered zygote is then implanted in a suitable womb where it completes its development. The new individual formed in this way is a genetically identical clone of the individual whose nucleus was used. This cloning could make multiple copies of a desired genotype.



(ii) **Separation of Cleavage Cells:**

Another type is the division of a single fertilized egg or early embryo into one or more separate embryos. This is the same process that normally creates identical twins. Off springs from this type of cloning are genetically identical but carry chromosomes from each of the two parents. This type of cloning has already been used to produce genetically identical cattle and other farm animals.

**Cloning and man:**

Man is likely to adopt cloning techniques for commercial production of valuable animals of known pedigree such as horse etc. At some places, scientists are making attempt to clone human embryo which they believe can serve as transplant donor but there is lot of controversy on this.

**Natural organism cloning**

No organism one naturally but some insects does in some circumstances.

**Q: Write examples of organisms which done naturally. (SGD)-16**

## PROTECTION AND CONSERVATION OF ENVIRONMENT

**Q.10: Describe protection and conservation of environment.**

→ **Suggest how Environment Pollution can be reduced?**

**Ans. PROTECTION AND CONSERVATION OF ENVIRONMENT**

Industrialization has helped mankind to raise the standard of living but has also destroyed our environments.

**Environmental Pollution:**

Environmental pollution has reached at alarming level in some countries. Tons of industrial wastes and effluents in solid, liquid or gas form are being injected into the environment by the industries.

- These effluents frequently contain sizeable amount of certain very toxic even carcinogenic (cancer causing) materials.
- Heavy metals like lead from automobiles, chromium from tanneries, are playing havoc to human health.

**Need of Control:**

Environmental pollution needs to be addressed. It will become out of control leading to irreparable loss of bio components of world ecosystem and loss of life from our planet.

**Q: What is the biological control? (DGK-G1)-16**

**Role of Biology:**

The biology has helped mankind in attracting attention to this problem and the biologists are trying to solve this problem:

- Several ways of **bioremediation** (removal or degradation of environmental pollutants or toxic material, by living organisms) are under investigation. For example algae have been found to reduce pollution of heavy metal by bio absorption.
- The biologists are also working out the list of **endangered species** of plants and animals. Those species which have danger to become extinct in near future are called endangered species. They have therefore stressed the needs for their protection e.g. black bear, pheasant, markhor etc.

**Environmental Pollution in Pakistan:**

It is our national problem. Our rivers, canals are polluted with city sewage and industrial wastes. Fresh water life especially fishes have been affected adversely. Exhaust from our vehicles is enormously adding lead into atmosphere. It can be controlled by using lead free petrol.