

UNIT – 1

INTRODUCTION TO BIOLOGY

Q. 1.1: What do you know about science?

Ans: The organized study of “**nature**” is called science. The things present in this nature are beautiful, balanced and the activities occurring in it are highly co-ordinated these processes and activities occur under some defined principles.

Definition:

“**Science is the study in which observations are made, experiments are done and logical conclusions are drawn in order to understand the principles of nature.**”

All the scientific information was included under one head i.e. “**science**”

Divisions of Science :

With the passage of time **scientific information** increased many folds and this enormous scientific knowledge was then classified into different branches like;

(i) Biology (ii) Physics (iii) Chemistry (iv) Mathematics
e.t.c

Q.1.2: What is biology? Explain its different divisions and branches?

Ans: The word “**Biology**” has been derived from two “**Greek**” words:

Bios means **life**

Logos means **discussion, reasoning and thought.**

Definition:

“**Biology is the scientific study of living things in which all aspects of living organisms are discussed.**” To understand and appreciate nature, it is essential to study the structure, functions and related aspects of living organisms; the study of living organisms also provides information and remedies to human problems regarding health, food, environment etc.

Definition of Life:

“**Life is set of characteristics that distinguish living things from non-living objects.**”

Characteristics of Living-Organisms:

Characteristics of living organisms are as follows:

- | | |
|------------------|----------------------------|
| (i) Movement | (ii) Growth |
| (iii) Nutrition | (iv) Respiration Excretion |
| (v) Reproduction | (vi) Sensitivity. |

Divisions and Branches of Biology:

There are three major divisions of biology which study the different aspects of lives of the major groups of organisms.

(i) Zoology (ii) Botany (iii) Microbiology

(i) Zoology:

“The branch of biology in which we deal with the study of animals is called zoology.”

Example:

Study of frog

(ii) Botany:

“The branch of biology in which we deal with the study of plants is called botany”

Example:

Mustard plant

(iii) Microbiology:

The branch of biology in which we deal with the study of micro-organisms.

Example:

Bacteria, some fungi and protozoans etc.

Branches:

The divisions are further divided into different branches as define below:

Morphology: (Morph=Structure, Logy=Study)

This branch deals with the study of form and structures of living organisms known as morphology.

Types:

i. Internal Morphology ii. External Morphology

Example:

Study of structure of eye kidney and skin etc.

Anatomy:

The study of internal dissected structures is called anatomy or internal morphology.

Example:

Study of internal structure of stomach

Histology:

The microscopic study of tissues is called histology.

Example:

Xylem tissue, phloem tissue

Cell biology: (Cytology)

The study of the structure and function of cells and cell organelles is called cell biology.

This branch deals with the study of cell division.

E.g : Eukaryotic cell, prokaryotic cell.

Physiology:

The branch deals with the study of the functions of different parts of living organisms.

Example:

Function of eye (vision) etc.

Molecular biology/ biochemistry:

This branch, deals with the study of the molecules of life.

Examples:

water, proteins, carbohydrates, lipids and nucleic acids.

Genetics:

The study of genes and their role in inheritance is called genetics.

Example:

Human Genetics, mouse genetics.

Inheritance

Inheritance means the transmission of characters from one generation to the other.

Example:

Skin colour , eye colour etc.

Embryology:

It is the study of the development of an embryo to new individual.

Example:

Chick embryo, human embryo.

Taxonomy:

It is the study of the naming and classification of organisms into groups and sub-groups.

Example:

Living being classified in to kingdom, phylum, class, order, family, genus, species.

Paleontology: It is the study of fossils which are the remains of extinct organisms.

Types:

(i) **Paleobotany:** It is the study of plant fossils.

(ii) **Paleozoology:** It is the study of animal fossils.

Environmental biology/Ecology

It deals with the study of the interactions between the organisms and their environment.

Example:

Food chain

Socio-biology:

The branch deals with the study of social behaviour of the animals that make societies.

Example:

learning behavior.

Parasitology:

This branch deals with the study of parasite.

Parasites:

Parasites are the organisms that take food and shelter from living hosts and, in return harm them.

Example: Tapeworms, mosquitoes etc.

Bio-technology:

It deals with the practical application of living organisms to make substances for the welfare of mankind.

Example:

Insulin

Immunology:

It is the study of immune system of animals, which defends the body against invading microbes.

Example:

WBCs play role in body's defense by different ways.

Entomology:

It is the study of the insects.

Example:

Ant and Butterfly etc.

Pharmacology:

It is the study of drugs and their effects on the systems of human body.

Example:

Panadol

Major Biological issues: Today major biological issues are human population growth , infectious diseases, addictive drugs and pollution.

Q.1.3: What is the relationship of biology to other sciences?**Ans: Relationship of Biology to other Sciences:**

The interrelationship among different branches of science cannot be denied. Biology includes information on various aspects of living things but these information relate to the other branches of science as well. Each branch of science has relationship with all other branches. For example, when studying the process of movement in animals, the biologists have to refer to the laws of motion in physics. This forms the basis of **interdisciplinary sciences:**

1. Biophysics:

It deals with the study of the principles of physics which are applicable to biological phenomena.

Example:

There is a similarity between the working principles of lever in physics and limbs of animals in body.

2. Biochemistry:

It deals with the study of chemistry of different compounds and processes occurring in living organisms.

Example:

The study of basic metabolism and photosynthesis and respiration involves the knowledge of chemistry.

3. Biomathematics/Biometry:

It deals with the study of biological processes using the mathematical techniques and tools.

Example:

To analyze the data gathered after experimental work, biologists have to apply the rules of mathematics.

4. Biogeography:

It deals with the study of occurrence and distribution of different species of living organisms in different geographical regions of the world.

Example:

It applies the knowledge of the characteristics of particular geographical regions to determine the characteristics of living organisms found there.

5. Bioeconomics:

It deals with the study of organisms from economical point of view.

Example:

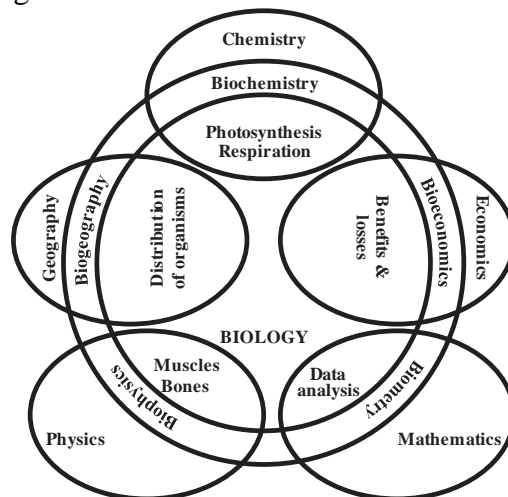
The cost value and profit value of the yield of wheat can be calculated through bioeconomics and benefits or losses can be determined.

Q.1.4: Which careers can be adopted after studying biology?**Ans: Careers in Biology:**

It is essential that students of today, who will occupy positions of leadership tomorrow, have the background of the modern and forward-looking branches of science.

An accurate and modern knowledge of biology, will promote a comprehension of both science and scientific research projects. It will benefit the learners in diverse list of careers.

The following are the careers that a student of biology can plan to adopt.



Relationship of biology with other sciences.

1. Medicine/ Surgery:

The profession of “**medicine**” deals with the diagnosis and treatment of diseases in human .

In “**Surgery**” the parts of body may be repaired, replaced or removed.

Example:

Lithotripsy is used to remove kidney stone and transplantation of kidney, liver etc.

When these professions are studied?

Both these professions are studied in the same basic course (MBBS) and then students go for specializations.

2. Fisheries:

Fisheries is the professional study of fish production. There are departments in Pakistan where professionals of fisheries are employed.

Importance:

They serve for enhancing the quality and quantity of fish production.

When this profession can be adopted?

In Pakistan, this profession can be adopted after the bachelor or masters levels study of zoology and fisheries.

3. Agriculture:

This profession deals with the food crops and animals which are the source of food.

Importance: An agriculturist works for the betterment of crops like wheat, rice, corn etc and animals like buffalo, cow etc from which we get food.

When this profession can be adopted?

In Pakistan there are many universities which offer professional courses of agriculture after the higher secondary education in biology.

4. Animal Husbandry:

It is the branch of agriculture concerned with care and breeding of domestic animals (livestock)

Example:

cattle, sheep etc.

When this profession can be adopted?

Professional courses in animal husbandry can be adopted after the higher secondary education in biology.

5. Horticulture:

It deals with the art of gardening.”

Importance:

A horticulturist works for the betterment of existing varieties and for ornamental plants and fruit plants.

When this profession can be adopted?

Biology students can adopted this professions after their higher secondary education.

6. Farming:

It deals with the development and maintenance of different types of farms.

Example:

In some farms animal breeding technologies are used for the production of animals which are better protein and milk source. In “Poultry farms” chicken and eggs are produced.

Similarly in “Fruit farms”, different fruit yielding plants are grown.

When this profession can be adopted?

A student who has gone through the professional course of agriculture, animal husbandry or fisheries etc, can adopt this profession.

7. Forestry:

In forestry, professionals look after natural forests and advise to the government for planting and growing artificial forests.

When this profession can be adopted?

Many universities offer professional courses in forestry after the higher secondary education in biology or after bachelor level study of zoology and botany.

8. Biotechnology:

It is the latest profession in the field of biology. Biotechnology study and work for the production of useful products through micro-organisms.

When this profession can be adopted?

Universities offer courses in biotechnologists after the higher secondary education in biology and after the bachelor level studies of botany and zoology.

Q.1.5: What is the relation of Quran and study of biology?**Ans: Quran and Biology:**

At many places in Holy Quran, Allah hints about the origin and characteristics of living organism.

Creation of Living Things:

Not only plants, animals and non-livings but also the universe has been created by Allah.

وَجَعَلْنَا مِنَ الْمَاءِ كُلَّ شَيْءٍ حَيٍّ ۝

“We made every living thing from water.”

(Sura: Ambia, Verse: 30)

We know that water makes the 60-70% of the composition of protoplasm of all living things the above verse hints at the common origin of living things in water.

Creation of Man:

خَلَقَ الْإِنْسَانَ مِنْ صَلْصَالٍ كَالْفَخَّارِ ۝

“He made man from clay like the potter.”

(Sura: Rehman, Verse: 14)

Quranic Verses about Methods of Reproduction:

Allah implemented the process of reproduction for the continuity of races of animals.

ثُمَّ خَلَقْنَا النُّطْفَةَ عَلَقَةً فَخَلَقْنَا الْعَلَقَةَ مُضْغَةً
فَخَلَقْنَا الْمُضْغَةَ عِظْمًا فَكَسَوْنَا الْعِظْمَ لَحْمًا ۝

“Then fashioned We the drop a clot, then fashioned We the clot a little lump, then fashioned We the little lump bones, then clotted the bones with flesh”

(Sura: Al-Mominoon, Verse: 14)

When we think at the hints given in both these Verses, we find the events that occurred in the creation of human beings. Allah also hints at the method of the development of animals including human beings.

Creation of Diverse Species:-

وَاللَّهُ يَخْلُقُ كُلَّ دَابَّةٍ مِّن مَّاءٍ فَمِنْهُمْ مَّن يَمْشِي عَلَىٰ رِجْلَيْنِ
وَمِنْهُمْ مَّن يَمْشِي عَلَىٰ أَرْبَعٍ يَخْلُقُ اللَّهُ مَا يَشَاءُ ۚ إِنَّ اللَّهَ عَلَىٰ كُلِّ شَيْءٍ قَدِيرٌ ۝

“Allah hath created every animal from water. Then some of them creep up over their bellies, others walk on two legs, and others on four. Allah creates what He pleases.”

(Sura: Al-Nur, Verse: 45)

This verse describes the common origin and modification of organism and also supports the modern concept of classification.

Q 1.6: What is the contribution of different Muslim scientists in the field of biology?**Ans: Muslim Scientists:**

Muslim scientists have made great contribution to the study of science and we are aware of their success in different fields of science.

Jabir Bin Hayan

His period extends from 721-815AD. He was born in Iran and practiced medicine in Iraq. He introduced experimental investigation in chemistry and also wrote a number of books on plants and animals. His famous books are “Al-Nabatat” and “Al-Haywan.”

Abdul Malik Asmai

He was born in 740 and died in 828 AD. He is considered the “first Muslim scientist” who studied animals in detail. His famous writings includes “Al-Abil”(camel) “Al-Khail (horse) “Al-wahoosh” (animal), and “Kalq-al-ansan”.

Bu Ali Sina

He was born in 980 and died in 1037 AD. He is honored as the founder of medicine and called as Avicenna in the west. He was physician, philosopher, astronomer and poet. One of his books, “Al- Qanun-fial-Tib,” is known as the canon of medicine in west.



Jaber Bin Hayan



Photograph of Bu Ali Sina commemorated on a ticket in Poland.

Q.1.7: What are different levels of organization? Explain it in detail.

Ans: Levels of Organization:

In order to understand the various phenomena of life, organization at different levels, which are follows:

1. Sub-atomic and Atomic Level:

Atoms:

“All types of matter are made up of element and each element contains a single kind of atoms.”

OR

“All living and non-living things are formed of simple units called atoms.”

The atoms are actually made up of many “sub-atomic particles. Which are “Electrons”

“Protons” and “neutrons”

Recalling:

Protons and neutrons are located inside nucleus of atom while electrons orbit in energy levels (electrons shells) around the nucleus. The number of electrons in the outermost shell determines the manner in which atoms react with each other.

Elements:

“The living substances are formed of a large number of elements.” **OR**

The substance which have single kind of item is called of element.

Bioelements:

The elements which take part in making the body mass parts of living organisms.

There are about **92element** that occur in nature.16 elements out of 92 naturally occurring element are called bio-elements. Only six (O, C, H, N, Ca& P) make 99% of the total mass. Other ten (K, S, Cl, Na, Mg, Fe, Cu, Mn, Zn, I) collectively make 01% of the total mass.

2. Molecular Level:

“A molecule is a smallest (particle) part of a compound that retains the properties of that compound.”

Bio-molecule:

In organisms bio elements usually do not occur in isolated forms rather they combine to form ionic or covalent bonding. “The stable particle formed by such bonding is called bio molecule.”

Types:

An organism is formed by enormous number of bio molecules of hundreds of different types.

(i) **Micro-Molecule** (ii) **Macro-Molecule**

(i) Micro-Molecule

“The molecule with low molecular weight are called micro-molecules.”e.g Glucose, water etc.

(ii) Macro-Molecule

“The molecules with high molecular weight, are called macromolecule”.e.g Starch, Protein, Lipids etc.

3. Organelles and Cell Level:**Organelles:**

“A large number of biomolecules are associated in particular way and form organelles.”

Each type of organelles is specialized to perform a specific function.

The organelles are the sub-cellular structures and when they assemble together form cells.

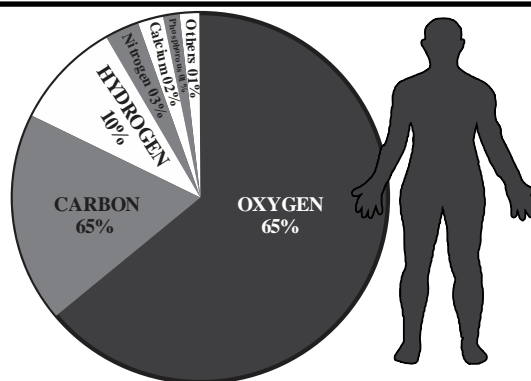
Example:

(i) **Mitochondria:** are specialized for cellular respiration.

(ii) **Ribosomes:** are specialized for protein synthesis.

Cell level:

Cell is the basic structural and functional unit of life. Different organelles combined to form cell level.



Percentage composition (by mass) of bio elements in the protoplasm of living organisms.

Example:

Prokaryotic cells and Eukaryotic cells.

Note:

In case of prokaryotes and most protists, the entire organism consist of single cell. In case of most fungi, all animals and all plants, the organism consist of up to trillions of cells.

4. Tissue Level:**Tissue:**

Multicellular organisms, similar cells (Performing similar function) are organized into groups, called tissues.

OR

“A tissue is a group of similar cells specialized for the performance of a common function”

Each cell in a tissue carries on its own life processes (like cellular respiration, protein synthesis) but it also carries on some special processes related to the function of the tissue.

Plant Tissue:

There are different types of tissues in plant.

(a) Meristematic tissue (b) Permanent tissue

The permanent tissue is subdivided into three types:

- i. Epidermal tissue.
- ii. Ground tissue
- iii. Vascular tissue.

Animal Tissue:

- i. Epithelial tissue
- ii. Connective tissue
- iii. Nervous tissue
- iv. Muscle tissue.

5. Organ and Organ System Level:**Organ:**

“In higher multicellular organisms more than one type of tissue having related functions are organized together and make a unit, called **organ**.”

Function:

Different tissue of an organ perform their specific functions and these functions collectively becomes the functions of that organ.

Example:

Stomach is an organ specialized for the digestion of proteins and for storing food.

Two major type of tissue are present in its structure.

- (a) Epithelial tissue.
- (b) Muscular tissue.

i. Epithelial tissue:

Epithelial (glandular) tissue secretes gastric juice for the digestion of proteins.

ii. Muscular tissue:

Muscular tissue performs contractions of stomach walls for grinding of food and moving food to posterior end so, the tissue perform their specific functions, which collectively become the function of stomach.

Organ System level:

“Different organs performing related functions are organized together in form of an organ system.” In an organ system each organ carries out its specific function and the function of all organs appear as the function of the organ system.

Complexity:

The organ system level is less complex in plants (for Example Root system) as compared to animals. This is due to a greater range of functions and activities in animals than in plants.

Example:

Digestive system is an organ system that carries out the process of digestion.

Major organs in its frame work are:

- | | |
|--------------------|---------------------|
| i) Oral Cavity | ii) Stomach |
| iii) Liver | iv) Pancreas |
| v) Small Intestine | vi) Large Intestine |

6. Individual Level:

“Different organs and organ systems are organized together to form an individual or organism level.”

In organism the functions processes and activities of various organs and organ system are co-ordinate.

Example:

When a man is engaged in continuous and hard exercise, not only his muscles are working but also there is an increase in the rate of respiration and heart beat supplies more oxygen and food to the muscles which they need for continuous work.

7. Population Level:

“A population is a group of organisms of the same species located at the same place, in the same time, is known as population.”

Example:

Human population in Pakistan in 2010 comprises of 173.5 million individuals (according to the Ministry of population welfare, Govt. of Pakistan).

Species:

A species is defined as a group of organisms capable of interbreeding and producing fertile offspring.

Habitat:

Habitat means the area of the environment in which organisms lives.

8. Community Level:

“A community is an assemblage of different population, interacting with one another within the same environment known as community.”

Community is collections of organism, in which one population may increase and others may decrease.

Types of Community:

- i. Complex Community
- ii. Simple Community

i. Complex Community:

“The type of community in which number and size of populations is unlimited.”

Example:

A forest community and a pond community etc.

ii. Simple Community:

“The type of community in which number and size of populations is limited.”

Example:

A fallen log with various populations under it.

Note: So any change in biotic or abiotic factors may have drastic and long lasting effect.

9. Biosphere Level:

“The part of Earth inhabited by organism’s community is known as Biosphere.” It constitutes all ecosystems and is also called the **zone of life** on earth. The length of biosphere from earth is 20 km.

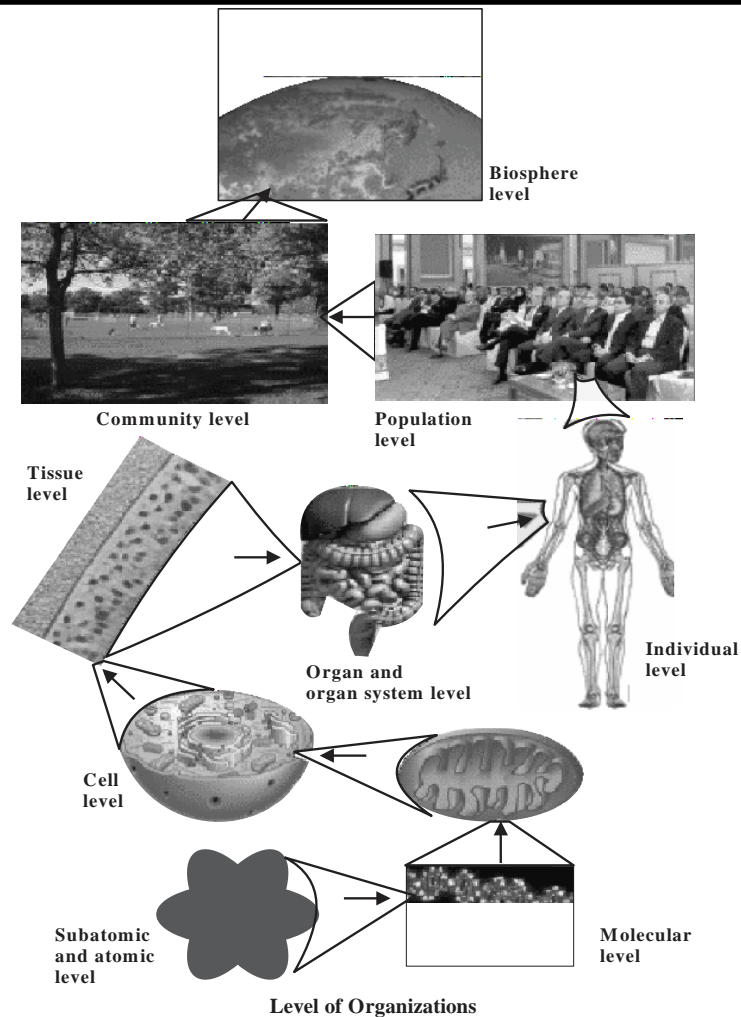
Ecosystem:

Areas where living organisms interact with the non- living components of the environment is called ecosystem.

Components of Ecosystem:

There are two types of components of ecosystem.

- 1. Biotic (Living)
- 2. Abiotic (non-Living)



Q.1.8: What is cellular organizations? Explain its types?

Ans: Cellular Organizations:

The ways in which cells are organized to form complete organism are called cellular organization.

There are mainly two types of cells on the basis of the presence or absence of nucleus.

Example:

Prokaryotic and Eukaryotic cells.

All organisms have been divided into five major groups.

- | | |
|-----------------|---------------|
| (i) Prokaryotes | (ii) Protists |
| (iii) Fungi | (iv) Plants |
| (v) Animals | |

Types of Cellular Organizations:

There are mainly three ways in which the cells organize to make the bodies of living organisms. These include:

- i. Unicellular organization
 - ii. Colonial organization
 - iii. Multicellular organization
- i. Unicellular Organization:**

“This is the simplest type of organization in which only one cell make the life of an organism all the life activities are carried out by the only cell. The organisms formed through this organization are called unicellular.”

Example: Amoeba, Paramecium, Euglena.

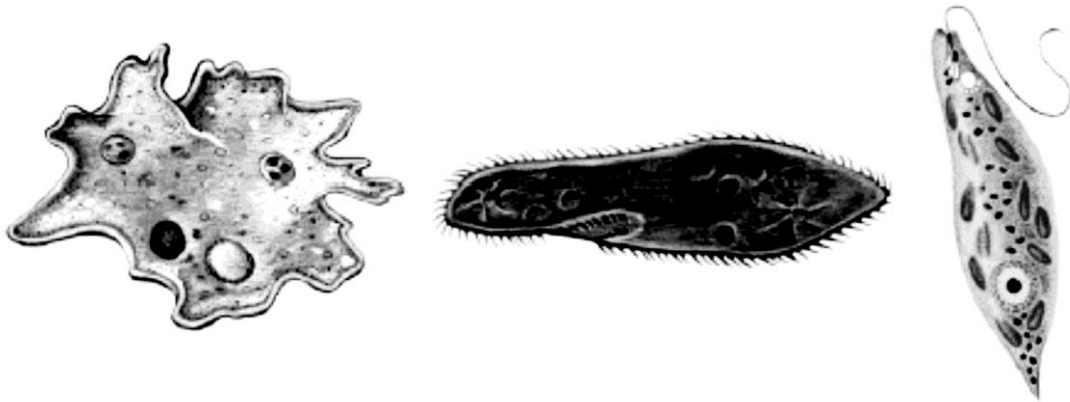
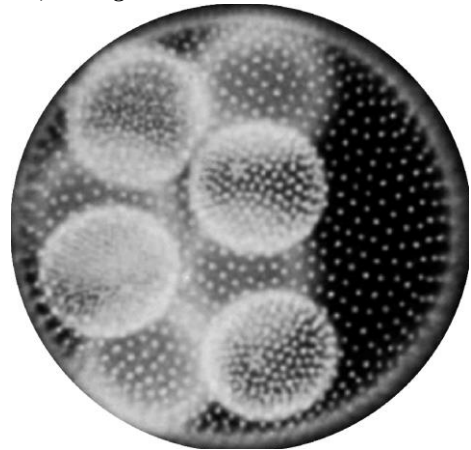


Fig: Amoeba, Paramecium, & Euglena.

ii. Colonial Organization:

“The type of organization in which unicellular organism live together but do not show any division of labour among them. The organisms formed through this organization are called colonial organization.”

Each unicellular organism in a colony lives its own life and does not depend on other cells for its vital requirements.



Volvox

Example:

Volvox is green algae found in water that shows colonial organization. Hundreds of volvox cells make a colony.

iii. Multicellular Organization:

The cells are organized to form tissue, organs and organ systems in an organism are called multicellular-organization.

Example:

Mustard plant and frog are the familiar example of multicellular organization.

a. Mustard Plant:

The scientific name of mustard plant is **Brassica campestris**. This plant is sown in winter and it produces seeds at the end of winter.

Uses:

- i. The plant body is used as vegetable.
- ii. Its seed are used for extracting oil.

Plant body:

The organs of the body can be divided into two groups on the basis of their function

i. Vegetative Organs ii. Reproductive Organs

i. Vegetative Organs:

“The organ which does not take part in the sexual reproduction is known as vegetative organs.”

Example:

Root, Stem, Branches and leaves.

ii. Reproductive organs:

“The type of organ which takes part in sexual reproduction of the plant is known as reproductive organ.”

Example:

Flowers are the reproductive parts of the plant and produce fruit and seeds.

b. Frog: The scientific name of frog is “**Rana tigrina.**”**Body Structure:**

The body is made of organ system and each organ system consists of related organs all the organs are made of specific tissues (epithelial, glandular, muscular and nervous etc).

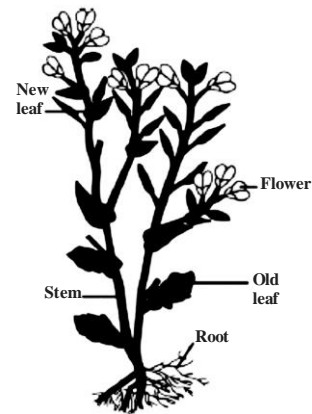
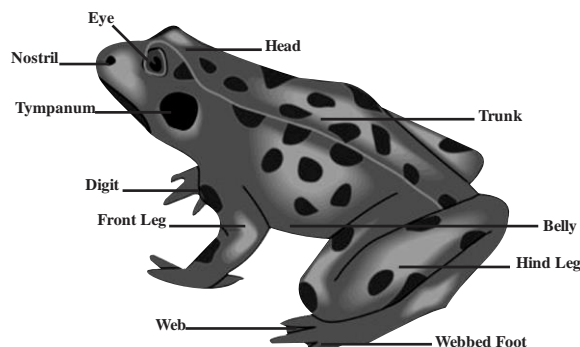


Fig: Mustard

MORPHOLOGY OF A FROG

SHORT QUESTIONS

1. Define biotechnology.

Ans: It deals with the practical application of living organisms to make substances for the welfare of mankind.

Example: Insulin

2. What do mean by horticulture and how is it related agriculture?

Ans: Horticulture

It deals with the art of gardening. A horticulturist works for the betterment of existing varieties and for the production of new varieties of ornamental plants and fruit plants.

Agriculture

This profession deals with the food crops and animals which are the source of food. Agriculturists works for the betterment of crops like wheat, rice, corn etc. and animals like buffalo, cow etc.

3. Define science.

Ans: Science is the study in which observations are made, experiments are done and logical conclusions are drawn in order to understand the principles of nature.

Divisions: Biology, Physics, Chemistry etc.

4. Define biology.

Ans: Biology is the scientific study of life. The word biology has been derived from two Greek words, “bios” meaning ‘life’ and ‘logos’ meaning ‘thought or reasoning’.

5. What are different groups of living organisms?

Ans: There are five groups of living organisms.

(i) Prokaryotes (ii) Protist (iii) Fungi
(iv) Plants (v) Animals

6. Write names of three main divisions of biology,

Ans: The name of three main division of Biology is given below:

(i) Zoology (ii) Botany (iii) Microbiology

7. Define prokaryotes.

Ans: The unicellular organism that do not have distinct nucleus are grouped as prokaryotes

Example: Bacteria.

8. What are protists?

Ans: Protists are eukaryotic organisms whose cell contains a nucleus and are capable of photosynthesis.

Example: Euglena, green algae etc.

9. Define microbiology.

Ans: The division of biology, which deals the study of microorganisms such as bacteria, is called microbiology.

10. Differentiate between morphology and anatomy.**Ans:**

Morphology	Anatomy
The branch of biology, which deals with the study of the structures and forms of living organisms is called morphology. Example: Study structure of eye etc.	The study of internal structures of living organisms is called anatomy. Example: Study of internal structure of stomach etc.

11. Define molecular biology (biochemistry).**Ans:** This branch, deals with the study of the molecules of life e.g. water, proteins, carbohydrates, lipids and nucleic acids.**12. Define genetics.****Ans:** The study of genes and their roles in inheritance is called genetics. Inheritance means the transmission of characters from one generation to the other.**Example:** Eye colour, height**13. Define embryology.****Ans:** It is the study of the development of an embryo to new individual.**Example:** Human embryo, Chick embryo.**14. Define taxonomy.****Ans:** The study of the naming and classification of organisms into groups and sub groups is called taxonomy.**15. Define paleontology.****Ans:** The study of fossils is called paleontology. The remains of extinct organisms are called fossils**16. What are fossils?****Ans:** The remains of extinct organisms are called fossils.**Example:** Dinosaurs.**17. Define environmental biology****Ans:** The branch of biology, which deals with the study of the interactions between the organisms and their environment. **Example:** Food chain**18. Name the major biological issues of modern age.****Ans:** Human population growth, infectious disease, addictive drugs and pollution are the major biological issues today.**19. Define parasitology?****Ans:** The branch of biology, which deals with the study of parasites is called parasitology.**Example:** Worms, Leech**20. What is parasite?****Ans:** The organisms that take food and shelter from living hosts and in return harm them are called parasites.**Example:** Tapeworm

21. Define sociobiology.

Ans: This branch deals with the study of social behavior of the animals that make societies.

Example: Learning behavior of animals.

22. Define immunology.

Ans: The study of the immune system of animals which defends the body against invading microbes is called immunology.

Example: WBCs play role in body's defense by different ways.

23. Define pharmacology.

Ans: The branch of biology in which we study drugs and their effects on system of human body is called pharmacology. **Example:** Panadol, Aspirin

24. How are basis of interdisciplinary science formed?

Ans: Each branch of science has relationship with all other branches. For example, when studying movements in animals, the biologists have to refer to laws of motion in physics. This formed the basis of interdisciplinary science.

25. Define biophysics.

Ans: It deals with the study of the principles of physics, which are applicable to biological phenomena.

Example: There is a similarity between the working principles of lever in physics and limbs of animal in biology.

26. Define biochemistry.

Ans: It deals with the study of chemistry of different compounds and processes occurring in living organisms. For example; study of basic metabolism of photosynthesis and respiration involves the knowledge of chemistry.

27. Define biomathematics/biometry.

Ans: It deals with the study of biological processes using mathematical techniques and tools.

Example: to analyze the data gathered after experimental work, biologists have to apply the rules of mathematics.

28. Define biogeography.

Ans: It deals with the study of the occurrence and distribution of different species of living organism in different Geographical regions of the world. It applies the knowledge of characteristics of particular geographical regions to determine the characteristics of organism found there.

29. Define bioeconomics.

Ans: It deals with the study of organism from economical point of view. For example the cost value and profit value of the yield of wheat can be calculated through bioeconomics and benefits or losses can be determined.

30. Which careers can be adopted by students of biology?

Ans: (i) Medicine/Surgery (ii) Animals husbandry (iii) Fisheries
(iv) Agriculture (v) Horticulture (vi) Farming
(vii) Forestry (viii) Biotechnology

31. What is medicine and surgery?

Ans: The profession of medicine deals with the diagnosis and treatment of diseases in human

In surgery the body parts may be repaired, replaced or removed.

32. What is studied in profession of farming?

Ans: It deals with the development and maintenance of different types of farm. For example in some farms:

Animals breeding technologies are used for the production of animals which are better protein and milk sources.

In poultry farms chicken and eggs are produced.

33. Define forestry.

Ans: In forestry, professional look after natural forests and advises to the government for planting and growing artificial forests.

34. What is done in the professional study of biotechnology?

Ans: It is the latest profession in the field of biology. Biotechnologists study and work for the production of useful products through microorganisms e.g. enzymes, antibiotics etc.

35. Describe major contributions of Jabir Bin Hayan.

Ans: Jabir Bin Hayan introduced experimental investigation in chemistry and also wrote a number of books on plants and animals. His famous books are “Al-Nabatat” and “Al-Haywan”.

36. Write down the contributions of Abdul Malik Asmai.

Ans: Abdul Malik Asmai is considered the first Muslim scientist who studied animals in detail. His famous writing include Al-abil(camel)”, “Al-Khail (horse)”, “Al-Wahoosh (animal)” and “Kalq-al- ansan.

37. What are the contributions of Bu Ali Sina?

Ans: He is honoured as the founder of medicine and called as Avicenna in the west. He was a physician, philosopher, astronomer and poet. One of his books “Al-Qanun fial- Tib” is known as the canon of medicine in West.

38. Name different levels of biological organization.

Ans: Biologists study biological organization at different levels, which are as follows.

- | | |
|----------------------------------|------------------------|
| (i) Subatomic and Atomic level | (ii) Molecular level |
| (iii) Organelle and cell level | (iv) Tissue level |
| (v) Organ and organ system level | (vi) Individual level |
| (vii) Population level | (viii) Community level |
| (ix) Biosphere level | |

39. What is an atom and sub-atomic particles?

Ans: Smallest particle of an element which can take part in a chemical reaction is called an atom. Sub-atomic particles are those particles by which atoms are made e.g. electron, proton & neutron.

40. What are elements?

Ans: Elements are pure substances, which are made up of same kind of atoms having same atomic numbers. **Example:** Carbon, Nitrogen, Calcium

41. How many elements are found in nature?

Ans: There are 112 elements in nature out of which 92 different kinds of elements are naturally occurring.

42. What is meant by bioelement?

Ans: The elements, which take part in making body mass of living things are called bioelements. There are 16 bioelements.

43. List sixteen bioelements.

Ans: Only six (O, C, N, H, Ca & P) make 99% of the total mass. Other ten (Cu, Mg, Na, Cl, Mn, Zn, K, S, I & Fe) collectively make 01% of the total mass.

44. Define molecules.

Ans: Atoms of different elements combine with each other through ionic or covalent bonding to make a stable particle, which is called molecule.

Example: Protein, Lipid and water.

45. Define biomolecule.

Ans: The stable particle which is made by atoms of bioelements i.e. carbon, nitrogen, sulphur etc. through ionic or covalent bonding is called biomolecules.

Types: 1. Micromolecules 2. Macromolecules

46. Differentiate between micromolecules and macromolecules

Ans:

Micromolecules	Macromolecules
The molecules with low molecular weight are called micro-molecules Example: glucose, water etc.	The molecules with high molecular weight are called macromolecules Example: protein, carbohydrates, lipids etc.

47. Define organelle.

Ans: Biomolecules assemble in a particular way and form organelles. These are sub-cellular structures.

Example: mitochondria, nucleus, ribosomes etc.

48. Define cell.

Ans: Cell is the basic structural and functional unit of living things. It is made by many organelles.

Example:

- i. Prokaryotic cell
- ii. Eukaryotes cell

49. What are the functions of organelles?

Ans: Each type of organelle is specialized to perform a specific function.

Example:

- i. Mitochondria specialized for cellular respiration.
- ii. Ribosomes are specialized for protein synthesis.

50. What is meant by division of labour in a cell?

Ans: Each organelle in a cell has been assigned a specific function which it has to perform, so all activities of a cell are divided among many organelles, this is called division of labour.

51. What are eukaryotes?

Ans: The organisms whose cells do have distinct nucleus, membrane bounded structures and large number and types of organelles.

Example:

Animal cell

52. Which membrane is present both in prokaryotes & eukaryotes.

Ans: Cell membrane (outer covering of cell).

53. Differentiate between unicellular and multicellular organisms.

Ans: Differentiate between Unicellular and Multicellular

Unicellular	Multicellular
An organism which is made up of one cell is called unicellular organism. Example: paramecium, amoeba etc.	An organism which is made up of many cells is called multicellular organism Example: mustard plant, frog etc.

54. Define tissue.

Ans: We can define a tissue as a group of similar cells specialized for the performance of a common function.

Example:

Animal tissue and plant tissue.

55. Name some plant tissue.

Ans: (i) Epidermal tissue (ii) Ground tissues.

56. Name major types of animal tissues.

Ans: There are four major types of animal tissues.

- (i) Epithelial tissues
- (ii) Connective tissues
- (iii) Nervous tissue
- (iv) Muscular tissue

57. Define organ.

Ans: In higher multicellular organisms, more than one types of tissues having related functions are organized together to make a unit, called organ.

Example: Stomach and liver etc.

58. How do different types of tissues function in one organ?

Ans: In stomach (organ) two major tissue are present.

- (i) Epithelial tissues, which secrete gastric juice, and
- (ii) Muscular tissues perform contraction of stomach walls for grinding of food, and moving food to posterior end.

59. Define organ system.

Ans: Different organs performing related functions are organized together in the form of an organ system. In organ system each organ performs a specific function

Example: Digestive system, circulatory system.

60. Which organs make digestive system?

Ans: (i) Oral cavity (ii) Stomach (iii) Liver
(iv) Pancreas (v) Small intestine (vi) large intestine.

61. Why organ system in animals is more complex than plants?

Ans: The organ system level is less complex in plants (e.g. root system) as compared to animals. This is due to a greater range of functions and activities in animals than in plants.

62. Explain with an example that in organism, the functions, processes and activities of various organs and organ systems are co-ordinated.

Ans: Explanation with Example:

When a man is engaged in continuous and hard exercise not only his muscles are working but also there is an increase in the rate of respiration and heartbeat. This accelerated rate of the respiration and heart beat supplies more oxygen and food to the muscles which they need for continuous work.

63. Define population/ Difference between population and community?

Ans: A population is defined as a group of organisms of the same species located at the same place, in the same time.

Example:

Human population in Pakistan in 2010 comprises of 173.5 million individuals.

64. Define community.

Ans: A community is the assemblage of different populations, interacting with one another with in the same environment.

Example:

A forest may be considered as a community. It includes different plants, micro-organisms, fungi and animal species.

65. Give names and example of complex and simple communities.

Ans: Complex Communities: A forest community, a pond community.

Simple Communities: A fallen log with various populations under it.

66. Name three types of cellular organizations?

Ans: These are

- (i) Unicellular organization
- (ii) Colonial organization
- (iii) Multicellular organization

67. Explain colonial type of cellular organization.

Ans: In colonial type of cellular organization, many unicellular organisms live together but also do not have any division of labour among them. Each unicellular organism in a colony lives its own life and does not depend on other cells for its vital requirements.

Example: Volvox

68. What is the scientific name of mustard plant and frog?

Ans: Scientific name of mustard plant is *Brassica campestris* and of frog is *Rana tigrina*.

69. Name different parts of mustard plant? And write its uses.

Ans: Mustard plant has two parts.

(i) Vegetative part (root, stem, leaves, branches) It is use as vegetable.

(ii) Reproductive parts (flowers which produce fruits and seeds) seeds are used for extracting oil.

70. What is the function of reproductive part of plant?

Ans: Flowers take part in sexual reproduction and produce fruits and seeds.

71. What is volvox?

Ans: Volvox is a green algae found in water that shows colonial organization. Hundreds of volvox cells make a colony.

72. Write a note on animal husbandry.

Ans: Animal husbandry:

It is the branch of agriculture concerned with the care and breeding of domestic animals (livestock) e.g. cattle, sheep etc. Professional courses in animal husbandry can be adopted after the higher secondary education in biology.

73. Name famous books of Jabar Bin Hayan and Abdul Malik Asmai.

Ans: Al-Nabatat, Al-Haywan, Al-Abil(Camel), Al-Khail (Horse), Al-Wahoosh (Animal) and Khalq al-Ansan.

74. Name any four unicellular organisms.

Ans: (i) Amoeba (ii) Paramecium (iii) Euglena (iv) Bacteria

75. Write two advantages of Brassica plant/mustard plant

Ans: Advantages of Brassica Plant is

(i) The plant body of Brassica is used as vegetable.

(ii) Its seeds are used for extracting oil.

76. Where does Frog live and what is its scientific name?

Ans: Frog lives in the both water and terrestrial medium. It belongs to class Amphibian, its scientific name is *Rana tigrina*.

77. How Tissues are different from Organs?

Ans: Tissues and organ are different from each other due to following reason.

(i) Similar cells performing similar functions are organized into groups called tissue while more than one types of tissues having related function are organized together and make a unit called organ.

(ii) Tissue is made up of cells while organs are made up of tissues.

78. What is the difference between Zoology and Botany?

Ans:

Zoology	Botany
This division of biology deals with the study of animals. Example: The study of Frog, human etc.	This division of biology deals with the study of plants. Example: The study of Rose, mustard plant etc.

79. Differentiate between cell biology and histology

Ans

Cell biology	Histology
The study of the structures and functions of cell and cell organelles is called cell biology. This branch also deals with the study of cell division.	The microscopic study of tissues is called histology. Example: Animal tissue and plant tissue

80. Differentiate between morphology and physiology.

Ans:

Morphology	Physiology
The branch of biology, which deals with The study of the structures and forms of living organisms is called morphology. Example: Study structure of eye etc.	The branch of biology, which deals with the study of the functions of different parts of living organisms is called physiology. Example: Study of function of eye.

81. What is habitat and how it is different from community?

Ans: Habitat:

It means the area of the environment in which organism lives. **Example:** Water

Community:

In community different populations interacting with each other, live within the same environment, but in habitat we talk about an organism's living area.

Example: Forest

82. Describe any two applications of Horticulture in daily life.

Ans: (i) Betterment of existing varieties of plants.

(ii) Production of new varieties of ornamental plants and fruits.

83. Define species.

Ans: A species is defined as a group of organisms capable of interbreeding and producing fertile offspring.

Example: Human

84. What is the biosphere level or zone of life on earth.

Ans: The part of the Earth inhabited by organisms' communities is known as biosphere.

It constitutes all ecosystems (areas where living organisms interact with the nonliving components of the environment).

It is also called the zone of life on Earth.

85. Compare cell level and tissue level.

Ans:

Cell level	Tissue level
Cell is the basic structural and functional unit of life. Different organelles combined to form cell level. Example: Prokaryotic cells and Eukaryotic cells.	Tissue: Multicellular organisms, similar cells (Performing similar function) are organized into groups, called tissues. Example: Animal Tissue, Plant Tissue

MULTIPLE CHOICE QUESTIONS

1. **Members of the same species living in the same place at the same time make a;**
(a) habitat (b) biosphere (c) community (d) population
2. **Scientist is studying the methods of inserting human insulin gene in bacteria, which branch of biology may this be?**
(a) anatomy (b) physiology (c) biotechnology (d) pharmacology
3. **Which one will be the correct sequence of the levels of organization of life?**
(a) cell, organelle, molecule, organ, tissue, organ system, individual
(b) molecule, tissue, organelle, cell, organ system, organ, individual
(c) molecule, organelle, cell, tissue, organ, organ system, individual
(d) organ system, organ, tissue, cell, molecule, organelle, individual
4. **Which of these major bioelements is in the highest percentage in protoplasm?**
(a) carbon (b) hydrogen (c) oxygen (d) nitrogen
5. **Which of the following group includes organisms all of which are absorptive in their nutrition?**
(a) protists (b) animals (c) bacteria (d) fungi
6. **Similar cells organized into groups and performing same functions, are known as;**
(a) organelle (b) tissue (c) organ (d) organ system
7. **Which of these tissues also makes the glandular tissue in animals?**
(a) epithelial tissue (b) muscular tissue
(c) connective tissue (d) nervous tissue
8. **The level of organization that is less definite in plants is;**
(a) tissue level (b) organ level
(c) organ system level (d) individual level
9. **What is true about volvox?**
(a) unicellular prokaryote (b) unicellular eukaryote
(c) colonial eukaryote (d) multicellular eukaryote
10. **When we study the feeding relations among different animal of a species of a forest at what level of organization we are studying?**
(a) individual (b) population (c) community (d) biosphere
11. **Botany include the study of:.....**
(a) animals (b) plants (c) Viruses (d) Micro-organism
12. **The branch of biology, microbiology is the study about**
(a) Botany (b) Micro-organism
(c) Zoology (d) Physiology
13. **The study of structure and function of cells is called**
(a) Morphology (b) cell biology
(c) Physiology (d) Histology

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14. **Microscopic study of tissues is called.**
 (a) microbiology (b) cell biology (c) histology (d) biology
15. **The branch of biology in which we study about inheritance is called**
 (a) Geology (b) Genetics
 (c) Biolo-technology (d) Information
16. **The system which defends the body against invading microbes is called.....**
 (a) Immune system (b) Circulatory system
 (c) Digestive system (d) Respiratory system
17. **The study of drugs is**
 (a) pharmacology (b) botany (c) microbiology (d) morphology
18. **It deals with the study of organisms from economical point of view.**
 (a) bio mathematics (b) bio physics (c) bio economics (d) biology
19. **..... branch deals with the study of occurrence and distribution of different species of living organisms in different geographical region of the word.**
 (a) Bio-Geography (b) Entomology (c) bioeconomics (d) forestry
20. **It deals with the compounds of living organisms.**
 (a) biochemistry (b) biophysics (c) biometry (d) biology
21. **.....profession can be adopted after the bachelor or masters levels study of zoology.**
 (a) phycology (b) fisheries (c) matching (d) journalist
22. **Water makes the of the composition of protoplasm.**
 (a) 70-75% (b) 75-80% (c) 60-70% (d) 60-80%
23. **The famous book of Jabir-bin-Hayan is**
 (a) Al-Haywan (b) Al-Nabatat (c) Kalq-al-Ansan (d) Both a,b
24. **..... is the canon of medicine in west.**
 (a) Al-Abil (b) Al-Haywan
 (c) Kalq-al-Ansan (d) Al-Qanun-fial-Tib
25. **..... make 99% of the total mass of body.**
 (a) O,C,H,N,Ca,P (b) P,CH,Cu,N,S
 (c) S,P,Ca,I,Zn (d) Na,Ca,C,H,N
26. **The number of bioelements in nature is**
 (a) 10 (b) 16 (c) 14 (d) 35
27. **Example of macro molecules:**
 (a) Amino acid (b) Guluose (c) Fatty acid (d) starch
28. **Forest is example of**
 (a) Organism (b) Population (c) community (d) ecosystem
29. **Example of simple community is**
 (a) A fallen log with various populations under it
 (b) Pond (c) forest (d) All of these
30. **The portion of earth inhabited by organisms communities is known as.**
 (a) habitat (b) biosphere (c) ecosystem (d) population
-

- 31. is the simplest type of organization in which only one cell make the life of an organism.**
 (a) Unicellular organization (b) Colonial organization
 (c) Multicellular organization (d) all of these
- 32. are major type of tissue present in stomach.**
 (a) Epithelial tissues & Connective tissues
 (b) Epithelial tissues & muscular tissues
 (c) Muscular and nervous tissues
 (d) Epithelial and Nervous tissues
- 33. organizations do not show any division of labour**
 (a) Unicellular organization (b) Multicellular organization
 (c) Colonial organization (d) both a,c
- 34. The reproductive organ of the plant is.**
 (a) root (b) stem (c) leaf (d) flower
- 35. The author of al-qanoon-fil-tib is:**
 (a) Aristotle (b) abu Usman (c) Al- Jahiz (d) bu-ali-sena
- 36. The study of fossils is called**
 (a) paleontology (b) Phamacology
 (c) Immunology (d) Embryology
- 37. Histology is the study of.....:**
 (a) cells (b) muscles (c) tissues (d) organs
- 38. The study of the functions of different parts of living organisms is called.....:**
 (a) physiology (b) histology (c) anatomy (d) morphology
- 39. The study of animals is called/ study of living thing is called.....:**
 (a) Farming (b) Biology (c) Chemistry (d) Physics
- 40. There are types.....of biomolecule:**
 (a) five (b) four (c) three (d) two
- 41. Brassica compestris is the scientific name of the plant:**
 (a) Melon (b) Apple (c) mustard (d) mango
- 42. Unicellular is.**
 (a) Frog (b) horse (c) Euglena (d) Rabbit
- 43. The book "Al-nabatat" belongs to the muslim scientist:**
 (a) Ibn-al-nafees (b) Bu-ali-sina
 (c) Abdul malik asmi (d) Jabir bin hayan
- 44. Mustard plant is sown in:**
 (a) autumn (b) spring (c) summer (d) winter
- 45.Is the study of insects:**
 (a) Pharmacology (b) Parasitology
 (c) embryology (d) entomology

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46. **Jabir Bin Hayyan was born in:**
(a) Egypt (b) Iran (c) Saudi Arabia (d) Iraq
47. **From which language the word biology is derived?**
(a) English (b) Greek (c) Italian (d) German
48. **In 2010 the population of human in Pakistan was (million):**
(a) 117.5 (b) 173.5 (c) 176.3 (d) 198.5
49. **Book of Bu Ali Sina on medicine is:**
(a) Al-nabatat (b) Al-Wahoosh
(c) Al-Qanoon-fial-tib (d) Al-Haywan
50. **The first muslim scientist who studied animals in detail is**
(a) Abdul Malik Asmai (b) Bu Ali Sina
(c) Ibn-e-Nafees (d) Jabir bin Hayan
51. **The highest level of biological organization is**
(a) Biosphere (b) Ecosystem (c) tissue (d) species
52. **Gardening relates to profession.**
(a) Farming (b) Argriculture (c) Forest (d) Horticulture
53. **Example of micromolecule is**
(a) water (b) starch (c) lipids (d) proteins
54. **.....is bioelement.**
(a) carbon (b) bromine (c) cobalt (d) Aluminum
55. **The area where living organism interact with the non-living component of the environment**
(a) Species (b) ecosystem (c) community (d) Husbandary
56. **Cow breeding belongs to**
(a) genetic (b) morphology (c) Animal Husbandary (d) Farming
57. **Transplantation of kidney is**
(a) Surgery (b) Physiology (c) Morphology (d) Medicine
58. **..... branch deals with classification and also traces the evolutionary history of organisms.**
(a) Bioinformatics (b) Genetics (c) systematics (d) Taxonomy
59. **Example of multicellular organisms**
(a) Bacteria (b) Frog (c) Amoeba (d) Euglena
60. **Which organism has colonial organization.**
(a) volvox (b) Amoeba (c) frog (d) mustard plant
61. **Example of multicellular organization.**
(a) Bacteria (b) Frog (c) Amoeba (d) Euglena
62. **Study of form and structure of living organisms.**
(a) Anatomy (b) Morphology (c) Histology (d) Physiology
63. **Entomology is the study of which organisms.**
(a) Birds (b) Insect (c) Mammals (d) Fish
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- 64. The branch which deal with study of internal structure.**
 (a) Anatomy (b) Morphology (c) Histology (d) Physiology
- 65. volvox is an example of:**
 (a) Green alga (b) Blue alga (c) red alga (d) yellow alga
- 66. “We make every living things from”:**
 (a) water (b) soil (c) air (d) fire
- 67. Frog has two eyes each has _____:**
 (a) 1 papota (b) 2 papota (c) 3 papota (d) None
- 68. Brach which deals with study of nucleic acid is called:**
 (a) embryology (b) socio biology (c) taxonomy (d) molecular biology
- 69. Book of Jabir Bin Hyan.**
 (a) Al- Abil (b) Al-Khail (c) Al-Nabatat (d) Al-Wahoosh
- 70. Logos means:**
 (a) activity (b) structure (c) thinking (d) function

MCQS KEYS

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