Chapter: 01

Introduction to Biology

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Objective

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1. The scientific study of living things is called:

Ⓐ Chemistry Ⓑ Botany Ⓒ Biotechnology **Ⓓ Biology**

2. The branch of Biology dealing with insects is:

Ⓐ Zoology Ⓑ Botany **Ⓒ Entomology** Ⓓ Cell Biology

3. The branch of Biology which deals with classification is called:

Ⓐ Flistology Ⓑ Physiology Ⓒ Anatomy **Ⓓ Taxonomy**

4. Study of drugs and their effects on human body is called:

Ⓐ Parasitology Ⓑ Entomology **Ⓒ Pharmacology** Ⓓ Socio-biology

5. The study of fossils is called:

Ⓐ parasitology Ⓑ immunology Ⓒ pharmacology **Ⓓ paleontology**

6. The word biology has been derived from two words:

Ⓐ French Ⓑ Latin **Ⓒ Greek** Ⓓ English

7. The study of internal structures is called:

Ⓐ Embryology **Ⓑ Anatomy** Ⓒ Physiology Ⓓ Genetics

8. Entomology is the study of:

Ⓐ Insects Ⓑ Bacteria Ⓒ Organelles Ⓓ Tissues

9. Meaning of "Logos" is:

Ⓐ Structure Ⓑ Function Ⓒ Activity **Ⓓ Thinking**

10. Which branch of biology deals with the study of forms and structure of living organisms?

Ⓐ Physiology Ⓑ Histology **Ⓒ Morphology** Ⓓ Anatomy

11. The branch of biology which deals with study of nucleic acid is called:

Ⓐ Taxonomy **Ⓑ Molecular biology** Ⓒ Socio-biology Ⓓ Embryology

12. The microscopic study of tissues is called:

Ⓐ Cell Biology **Ⓑ Histology** Ⓒ Morphology Ⓓ Physiology

13. The study of the functions of different parts of living organisms is called:

Ⓐ Physiology Ⓑ Morphology Ⓒ Anatomy Ⓓ Histology

14. Scientific study of animals is called:

Ⓐ Zoology Ⓑ Botany Ⓒ Microbiology Ⓓ Biology

15. Study of genes and their role in inheritance is called:

Ⓐ Anatomy Ⓑ Physiology Ⓒ Histology **Ⓓ Genetics**

16. Entomology is the study of which organisms:

Ⓐ Mammals Ⓑ Birds **Ⓒ Insects** Ⓓ Fish

17. This division of biology deals with the study of plants:

(A) Morphology (B) Botany (C) Microbiology (D) Zoology

18. Which Surah of the Holy Quran verifies the classification?

(A) AI-Noor (B) Al-Quresh (C) Yasin (D) Al-Baqra

19. "Scientific knowledge is the common heritage of mankind" is saying of:

(A) Dr. Atta ur Rehman (B) Dr. Abdul Salam
(C) Dr. Samar Mubarak Mand (D) R. Abdul Qadeer Khan

20. The study of the molecules of life is called:

(A) physiology (B) molecular biology (C) immunology (D) anatomy

21. Remains of extinct organisms are called:

(A) Fossils (B) Endangered (C) Corals reef (D) Corals

22. Transplantation of kidneys is example of:

(A) Medicine (B) Physiology (C) Surgery (D) Morphology

23. Liver transplantation belongs to:

(A) farming (B) surgery (C) animal husbandry (D) biotechnology

24. Which is the latest profession related to biology:

(A) Farming (B) Horticulture (C) Forestry (D) Biotechnology

25. The career related with gardening is:

(A) Forestry (B) Farming (C) Horticulture (D) Medicine

26. Which microorganism is used for preparation of insulin?

(A) Algae (B) Bacteria (C) Fungi (D) Virus

27. Breeding of cow belongs to:

(A) Animal husbandry (B) Genetics (C) Farming (D) Morphology

28. Horticulture deals with the art of:

(A) Domestic animals (B) Farming (C) Forestry (D) Gardening

29. The founder of medicine is:

(A) Al-Beruni (B) Bu Ali Sina (C) Abdul Malik (D) Jabir bin Hayan

30. Abdul-Malik Asmai was born in:

(A) 740 AD (B) 780 AD (C) 980 AD (D) 1080 AD

31. Famous book of Jabir-Bin-Hayan is:

(A) AI-Nabatat (B) Al-Kheil (C) Al-Wahoosh (D) Al-Abil

32. We make every living thing from:

(A) Fire (B) Air (C) Soil (D) Water

33. Jabir Bin Hayan was borm in:

(A) Iran (B) Pakistan (C) England (D) Iraq

34. The author of Al-Qanoon fil-Tib is:

Ⓐ Ali-lbne-Eisa Ⓑ Abdul Malik Asma Ⓒ Jabir bin Hayyan **Ⓓ Bu-Ali-Sina**

35. The book "A-Nabatat" belongs to the Muslim scientist:

Ⓐ Bu-Ali-Sina Ⓑ Ibn-Al-Nafees **Ⓒ Jabir bin Hayan** Ⓓ Abdul Malik Asmai

36. Name of the famous book of Bu Ali Sina is:

Ⓐ Al-Abil Ⓑ Al-Khail Ⓒ Al-Nabatat **Ⓓ Al-Qanun-fil-Tib**

37. The first Muslim Scientist who studied Animals in detail:

Ⓐ Alrazi Ⓑ Bu Ali Sina **Ⓒ Abdul Malik Asmai** Ⓓ Jabir bin Hyan

38. Famous book "Al-Abil" was written by:

Ⓐ Bu Ali Sina **Ⓑ Abdul Malik Asmai** Ⓒ Ibn e Nafees Ⓓ Jabir bin Hyan

39. Percentage of carbon in protoplasm of living organisms is:

Ⓐ 65 % Ⓑ 10 % Ⓒ 5 % **Ⓓ 18 %**

40. Bio element is:

Ⓐ Cobalt Ⓑ Aluminium **Ⓒ Carbon** Ⓓ Bromine

41. The number of Bio elements is:

Ⓐ 16 Ⓑ 17 Ⓒ 18 Ⓓ 19

42. The example of micro molecule is:

Ⓐ proteins Ⓑ lipids Ⓒ starch **Ⓓ glucose**

43. The element that makes 03% of the total mass of living organism is:

Ⓐ oxygen Ⓑ hydrogen **Ⓒ nitrogen** Ⓓ carbon

44. Which of these major bio elements is in the highest percentage in protoplasm?

Ⓐ Hydrogen **Ⓑ Oxygen** Ⓒ Nitrogen Ⓓ Carbon

45. How many elements make 99 % of the total mass?

Ⓐ 12 Ⓑ 10 Ⓒ 8 **Ⓓ 6**

46. The Number of elements found in nature are:

Ⓐ 88 Ⓑ 90 **Ⓒ 92** Ⓓ 94

47. Which bio element makes most of the composition of organism's body?

Ⓐ nitrogen **Ⓑ oxygen** Ⓒ carbon Ⓓ hydrogen

48. ..... water makes composition of the protoplasm of all living things.

Ⓐ 60- 70 % Ⓑ 70 - 80% Ⓒ 80 -90% Ⓓ 90 - 100 %

49. Percentage composition of hydrogen in protoplasm of living organisms is:

Ⓐ 65 % Ⓑ 18 % **Ⓒ 10 %** Ⓓ 5 %

50. Biomolecules are divided into how many groups:

Ⓐ 4 **Ⓑ 2** Ⓒ 6 Ⓓ 8

51. An example of macromolecule is:

Ⓐ Protein Ⓑ Sodium chloride Ⓒ Glucose Ⓓ Water

52. In 2010 population of Pakistan was ..... million.

Ⓐ 180.5 Ⓑ 173.5 Ⓒ 170.5 Ⓓ 160.5

53. Similar cells performing same function organize into group that is called:

Ⓐ Tissue Ⓑ Organ Ⓒ Organ-system Ⓓ Organelle

54. Organelles assemble to form:

Ⓐ Cells Ⓑ Organ Ⓒ Systems Ⓓ Tissues

55. The highest level of biological organization is:

Ⓐ tissue Ⓑ ecosystem Ⓒ biosphere Ⓓ species

56. Same species living in the same place at the same time make a:

Ⓐ biosphere Ⓑ population Ⓒ habitat Ⓓ community

57. The part of earth where communities of living organisms exist is called:

Ⓐ Biosphere Ⓑ Population Ⓒ Sphere Ⓓ Atmosphere

58. Area of the environment, where an organism lives is called:

Ⓐ ecosystem Ⓑ population Ⓒ biosphere Ⓓ habitat

59. The areas where living organisms interact with non-living components of the environment are called:

Ⓐ community Ⓑ species Ⓒ ecosystem Ⓓ population

60. The level of organization that is less definite in plant is:

Ⓐ Individual level Ⓑ Organ System level Ⓒ Tissue level Ⓓ Organ level

61. What is true about "Volvox"?

Ⓐ Unicellular eukaryote Ⓑ Unicellular prokaryote
Ⓒ Multicellular eukaryote Ⓓ Colonial eukaryote

62. Mustard plant is sown in:

Ⓐ In Autumn Ⓑ In Spring Ⓒ In Summer Ⓓ In Winter

63. Which of the following Organisms has Colonial Organization:

Ⓐ Frog Ⓑ Mustard Plant Ⓒ Volvox Ⓓ Amoeba

64. Frog has two eyes, each of which has:

Ⓐ No eyelid Ⓑ Three eyelids Ⓒ Two eyelids Ⓓ One eyelid

65. Volvox is example of:

Ⓐ Green alga Ⓑ Blue green alga Ⓒ Brown alga Ⓓ Red alga

66. Brassica compestris is the scientific name of the plant:

Ⓐ potato Ⓑ tomato Ⓒ mango Ⓓ mustard

67. Scientific name of mustard plant is:

Ⓐ Allium cepa Ⓑ Homo sapiens Ⓒ Brassica compestris Ⓓ Pisum sativum

68. Reproductive organ of plant is:

Ⓐ Stem Ⓑ Flower Ⓒ Leaf Ⓓ Root

Chapter : 01 Introduction to Biology

Subjective

Q1: ***What is meant by science?***

Ans: *Science:*

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.

Q2: ***Define biology.***

Ans: *Biology:*

The scientific study of life is called biology. The word "biology" has been derived from two Greek words. "Bios" meaning 'life' and "Logs" meaning thought or reasoning.

Q3: ***Define histology.***

Ans: *Histology:*

The microscopic study of tissues is called histology.

Q4: ***Differentiate between zoology and botany.***

Ans: *The difference between zoology and botany is:*

Zoology	Botany
This division of biology deals with the study of animals.	*This division of biology deals with the study of plants.*

Q5: ***Differentiate between molecular biology and microbiology.***

Ans: *The difference between molecular biology and microbiology is:*

Molecular Biology	Microbiology
Molecular Biology (Biochemistry) deals with the study of molecules of life; e.g. water, proteins, carbohydrates, lipids and nucleic acids.	*Microbiology is division of biology deals with the study of microorganisms such as bacteria etc.*

Q6: ***Differentiate between biochemistry and morphology.***

Ans: *The difference between biochemistry and morphology is:*

Biochemistry	Morphology
It deals with the study of the chemistry of different compounds and processes occurring in living organisms.	*This branch deals with the study of from and structure of living organisms.*

Q7: ***What are parasites? Define parasitology.***

Ans: *Parasites:*

Parasites are the organisms that take food and shelter from living hosts and in return, harm them e.g. viruses, bacteria and parasitic worms.

Parasitology:

This branch deals with the study of parasites.

Q8: ***Differentiate between environmental biology and cell biology.***

Ans: *The difference between environmental biology and cell biology is:*

Environmental biology	Cell biology
It deals with the study of the interactions between the organisms and their environment.	The study of the structures and functions of cells and cell organelles is called cell biology. This branch also deals with the study of cell division.

Q9: **Entomology, pharmacology and immunology.**

Ans: The difference between oxidation and reduction is:

Entomology:

It is the study of insects.

Pharmacology:

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

Immunology:

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

Q10: **Define anatomy and embryology.**

Ans: Anatomy:

The study of internal structures is called anatomy.

Embryology:

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

Q11: **Differentiate between physiology and taxonomy.**

Ans: The difference between physiology and taxonomy is:

Physiology	Taxonomy
This branch deals with the study of the functions of different parts of living organisms.	The branch of biology which deals with the study of scientific naming and the classification of organisms into groups and subgroups is called taxonomy.

Q12: **What is meant by genetics and fossils?**

Ans: Genetics:

The study of genes and their roles in inheritance is called genetics. Inheritance means the transmission of characters from one generation to the other.

Fossils:

Fossils are the remains of extinct organisms.

Q13: **What are major biological issues now days?**

Ans: Human population growth, infectious diseases, addictive drugs and the pollution are the major biological issues today.

Q14: **What is Biotechnology? Elaborate its usefulness.**

Ans: Biotechnology:

It is the latest profession in the field of biology. The experts of biotechnology study and work for the production of useful products through microorganisms.

Usefulness:

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

This diagram is just for information.

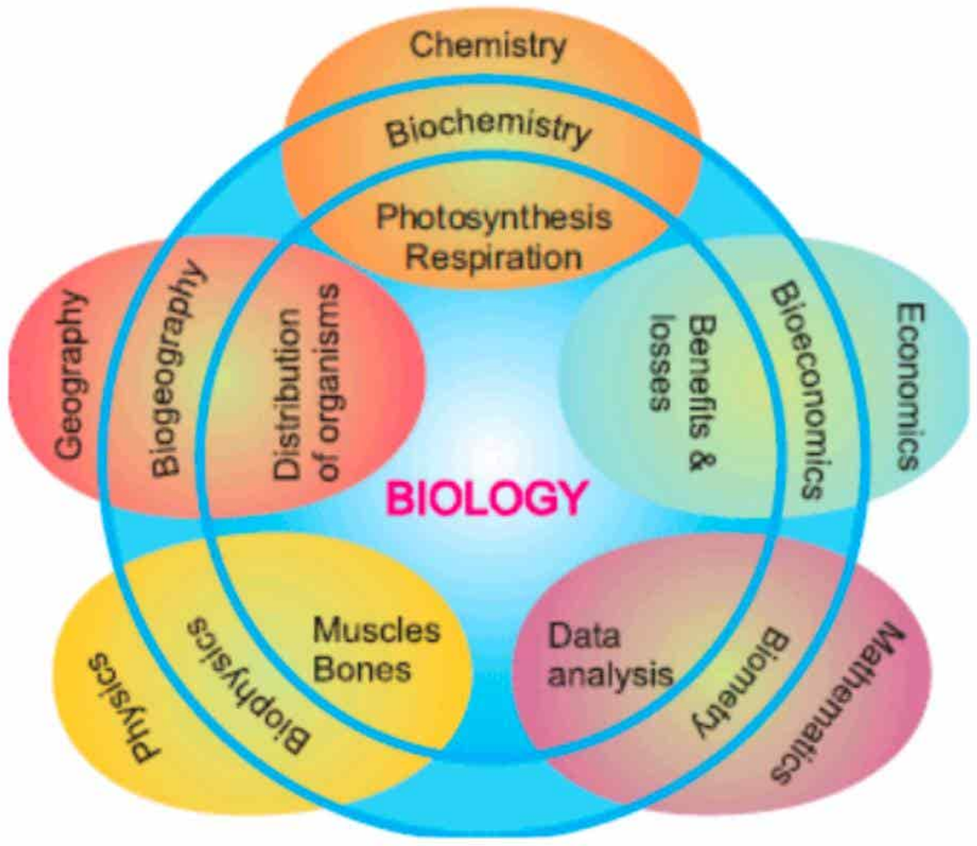


Figure Relationship of biology with other sciences

Q15: ***Define biophysics.***

Ans: *Biophysics:*

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

Example:

Similarity between the working principles of lever in physics and limbs of animals in biology.

Q16: ***What is meant by biogeography?***

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

Application of Biogeography:

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

Q17: ***Define biometry and bio economics.***

Ans: *Biomathematics / Biometry:*

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

Example:

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

Bio economics:

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

Example:

The cost value and profit value of wheat can be calculated through this branch and benefits or losses can be determined.

Q18: ***What is farming?***

Ans: *It deals with the development and maintenance of different types of farm.*

For 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. In fruit farms, different fruit yielding plants are grown.

This professional can be adopted after the course of agriculture, animal husbandry or fisheries.

Q19: ***Describe animal husbandry as career in biology.***

Ans: *It is the branch of agriculture concerned with the care and breeding of domestic animals (livestock) e.g. cattle, sheep etc.*

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

Q20: ***What is horticulture? Describe its two applications in daily life.***

Ans: *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.*

This professional course can be adopted after the higher secondary education in biology.

Q21: ***Write few uses of surgery.***

Ans: *The profession of medicine deals with the diagnosis and treatment of diseases in humans. In surgery the defective parts of the body may be repaired, replaced or removed.*

Some examples of surgery are given below:

- *The removal of stones by renal surgery.*
- *Transplantation of kidney.*
- *Transplantation of liver.*

The professions of medicines and surgery are studied in MBBS. After MBBS the students can go for specializations. The students can adopt this Medicine Field after F.sc.

Q22: ***What do you mean by Zone of Life?***

Ans: *The part of the Earth inhabited by communities of organisms is called biosphere. It consists of all ecosystems. This biosphere is also called the zone of life on Earth.*

Q23: ***Define Tissue.***

Ans: *The group of similar cells performing the similar function is called tissue. e.g. xylem tissue and phloeum tissue.*

Q24: ***The Holy Quran supports the modern concept of classification. Justify with a verse.***

Ans: *The Holy Quran has given us the concept of classification which is clear from the following verse of the Holy Quran:*

"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)

Q25: ***Name famous books of Jabar Bin Hayan and Abdul Malik Asmai.***

Ans: *Jabar Bin Hayan:*

AI-Nabatat, Al-Haywan.

Abdul Malik Asmai:

Al-Abil(Camel), AlI-Khail (Horse), Al-Wahoosh (Animal) and Khalq-al-Ansan.

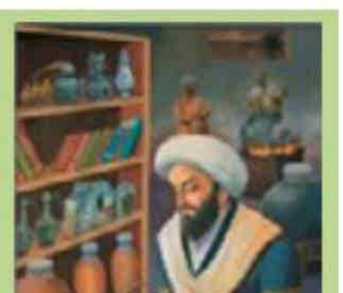
Q26: ***Write the contributions of Bu-Ali-Sina.***

Ans: *He is honored as the founder of medicine. Bu Ali Sina is called as Avicenna in the West. He was a physician, philosopher, astronomer and poet. One of his books "Al-Qanun -fi al-Tib" is known as the canon of medicine in West.*

Q27: ***Write a note on Jabir Bin Hayan.***

Ans: *He was born in Iran and practiced medicine in Iran. 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".*

Bu Ali Sina



Jabir Bin Hyan

Q28: ***Write down names of bio-molecules groups.***

Ans: *Micromolecules:*

The biomolecules with low molecular weight are called micromolecules.

For example glucose, water etc.

Macromolecules:

The bio- molecules with high molecular weight are called macromolecules.

For example starch, proteins, lipids etc.

Q29: ***Differentiate between population and community.***

Ans: *The difference between population and community is:*

Population	Community
"A group of organisms of the same species located at the same place, in the same time is called population".	*"A group of different populations interacting with one another within the same environment is called community".*

Q30: ***Write down the levels of organization in sequence.***

Ans: *Levels of Biological Organization:*

The study of biology at different levels is called biological organization.

Biological organization from simple to complex one is as under:

- *Subatomic and atomic level*
- *Organelle and cell level*
- *Organ and organ system level*
- *Population level*
- *Biosphere level*
- *Molecular level*
- *Tissue level*
- *Individual level*
- *Community level*

Q31: ***What is tissue level, also give examples?***

Ans: *In multicellular organisms, similar cells (performing similar functions) are organized into groups, called tissues. We can define a tissue as 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 Tissues:

There are different types of plant tissues e.g. epidermal tissue, ground tissue, etc.

Q32: ***Differentiate between species and habitat.***

Ans: *The difference between species and habitat is:*

Species	Habitat
A species is a group of organisms which can interbreed and have ability to reproduce new organisms called species.	*It is a part of environment where organisms live.*

Q33: ***The organ system level is less complex in plants as compared to animals, why?***

Ans: *The levels of biological organization is less complex in plants as compared to animals because in an organ system each organs performs its specific function and the functions of all organs appear as the function of organ system. In plants organ system is not complicated as compared to animals. Animals have to perform too many functions and activities at a time.*

Q34: ***What is meant by bio elements? What is their number? Give examples also.***

Ans: *The elements which make the body mass of living organisms are called bio-elements.*

Out of the 92 *elements,* 16 *elements are bio elements. Only six* (O, C, H, N, Ca & P) *make* 99 *% of total mass. These are known as major elements.*

Other ten (K, S, Cl, Na, Mg, Fe, Cu, Mn, Zn, & I) *collectively make* 1 *% of the total mass. These are called trace elements.*

Q35: ***Write the names of six important bio elements.***

Ans: *The names of six important bio elements are:*

- *Carbon (C)*
- *Hydrogen (H)*
- *Oxygen (O)*
- *Nitrogen (N)*
- *Calcium (Ca)*
- *Phosphorous (P)*

Q36: ***What is community level? Give example.***

Ans: *A community is an 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 plant, micro-organisms, fungi and animal species.

Q37: ***What do you know about simple and complex communities?***

Ans: *Simple communities:*

Some communities are simple e.g. a fallen log with various populations under it. Simple communities have limited number and size and any change in biotic or abiotic factors may have drastic and long lasting effects.

Complex communities:

Some communities are complex. They include forest and pond community.

Q38: ***Define highest level in levels of organization.***

Ans: *The highest level in levels of organization is called biosphere.*

The part of the earth inhabited by organism's communities is known as biosphere. It constitutes all ecosystems (area where living organisms interact with non-living components of the environment) and is also called zone of life on earth.

Q39: ***What is unicellular organization? Name any four unicellular organisms.***

Ans: *In unicellular organisms only one cell makes the life of an organism. All the life activities are carried out by one cell only. Amoeba, Paramecium, Euglena and Chlamydomonas are examples of unicellular organisms.*

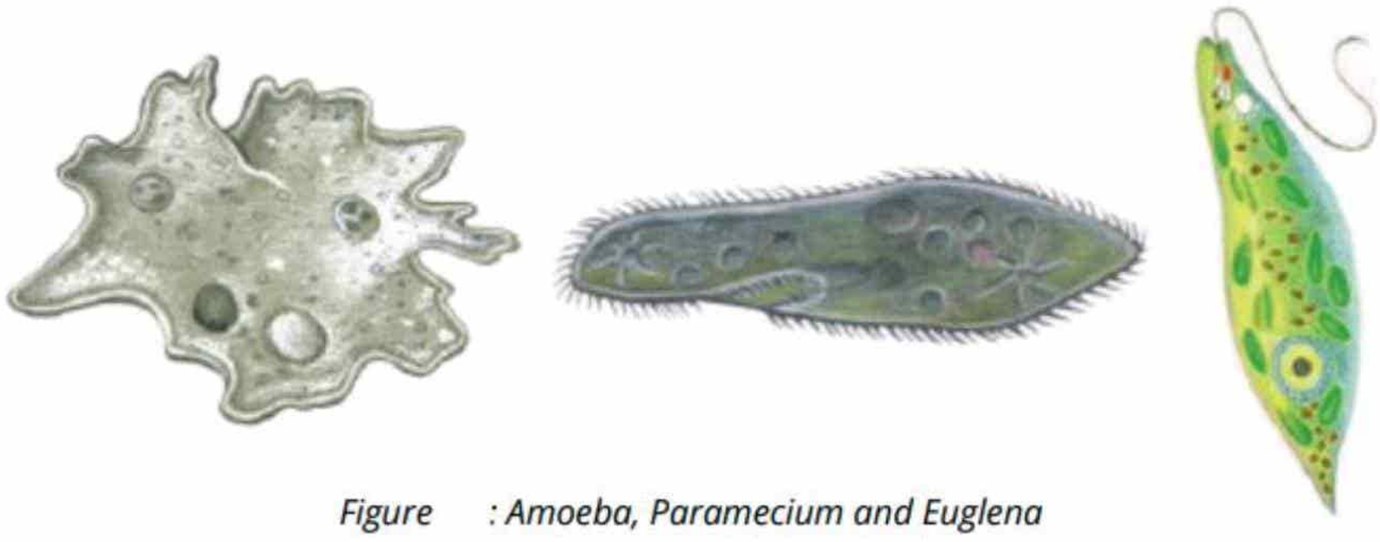


Figure : Amoeba, Paramecium and Euglena

Q40: ***What is meant by colonial and multicellular type of organization?***

Ans: *Colonial type of organization:*

In colonial type of cellular organization, many unicellular organisms live together but 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.

For example, volvox is a green alga found in water that shows colonial organization.

Multicellular type of organization:

In multicellular organization, cells are organized in the form of tissues, organs and organ systems.

For example, in mustard plant and frog multicellular organization is found.

Q41: ***Define vegetative and reproductive parts of plant.***

Ans: *Vegetative Parts:*

Vegetative Parts are those parts which do not take part in sexual reproduction. It includes roots, stems branches and leaves.

Reproductive Parts:

Reproductive Parts are those parts which take part sexual reproduction and produce fruits and seeds. Flowers are reproductive parts of plants.

Q42: ***Write the scientific name of mustard plant and Frog. And also write uses of Mustard plant.***

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

Uses of Mustard plant:

- *The plant body of Brassica is used as vegetable.*
- *Its seeds are used for extracting oil.*

Figure Frog

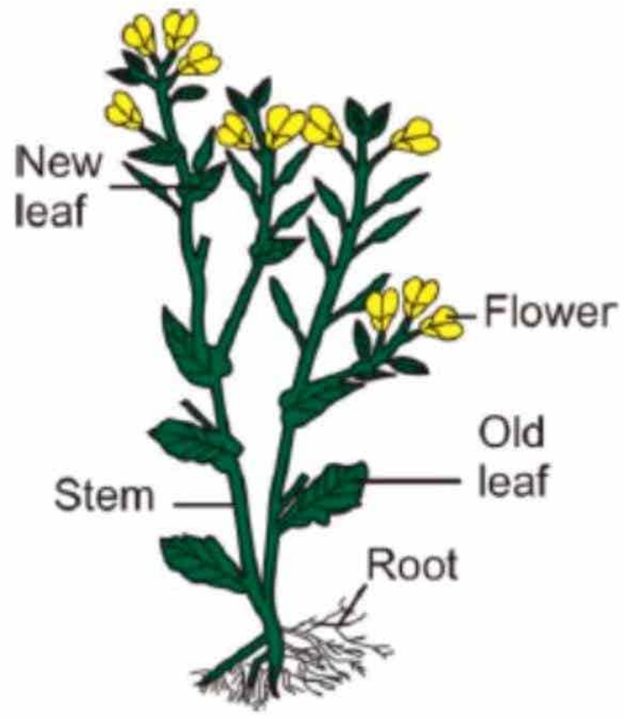


Figure Mustard

Chapter : 01	Introduction to Biology

Long Questions

Q1: *Define the terms science and biology also describe its three major divisions.* *OR*

Biology is divided into different branches. Explain any five.

Q2: *How Biology is related to other Sciences?* *OR*

Give points to advocate that Biology is linked with Physics, Chemistry, Mathematics , Economics and geography.

Q3: *What professions can be adopted after Biological Study? Explain any five.*

Q4: *Describe careers in biology including medicine, agriculture, farming and horticulture.*

Q5: Write the role of Muslim Scientists in the field of science. OR

Write down the contribution of Jabir Bin Hayyan and Bu Ali Sina in the Science.

Q6: Explain molecular level and tissue level in organisms.

Q7: Write a note on organization at organ and organ system level.

Q8: Explain the population level and community level. OR

Explain atomic and molecular level. OR

Describe Explain organism level and community level.

Q9: Describe organelle and cell level.

Q10: Write a note on cellular organizations. Explain its three types. OR

Write a note on Multicellular organization. Explain it with two Examples.

Q11: Write a note on frog.

Q12: Write a note on mustard plant.

Solved important long questions

Q1: **Describe any eight branches of biology.**

Ans: Biology:

The scientific study of life is called biology. The word "biology" has been derived from two Greek words. "Bios" meaning 'life' and "Logs" meaning thought or reasoning.

Branches of biology are:

Morphology:

The branch of biology that deals with the study of form and structures of living organisms is called morphology.

Anatomy:

The study of internal structures is called anatomy.

Histology:

The microscopic study of tissues is called histology.

Cell biology:

The study of the structure and functions of cells and cell organelles is called cell biology. This branch also deals with the study of cell division. Cell biology is also called cytology.

Physiology:

It is the study of the functions of different parts of living organisms.

Embryology:

The study of the development of an embryo to new individual is called embryology.

Taxonomy:

The study of naming and classification of organisms into groups and subgroups is called taxonomy.

Environmental biology:

The study of relationship of organisms to their environment environmental biology. It is also called ecology.

Q2: ***Describe molecular level of biological organization.***

Ans: *Molecular Level:*

"The smallest part of a compound that retains the properties of that compound is called molecule". OR

"The stable particle formed by bonding between different atoms of elements is called molecule or biomolecule". An organism is formed by large number of biomolecules of different types.

There are two groups of biomolecules:

- *Micromolcules*
- *Macromolecules*

Micromolecules:

The biomolecules with low molecular weight are called micromolecules.

For example, glucose, water etc.

Macromolecules:

The biomolecules with high molecular weight are called macromolecules.

For example starch, proteins, lipids etc.

Q3: ***Describe population community and biosphere level.***

Ans: *Population Level:*

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

Habitat:

Habitat is the area of the environment in which an organism lives.

Examples of population are given below:

- *Human population in Pakistan in 2010 was 173.5 million individuals.*
- *The number of students in biology class in any year.*

Community level:

"A group of different populations interacting with one another within the same environment is called community".

Example:

A forest is a community. It includes different species of plants, microorganisms, fungi and animals. In a community, one population may increase and others may decrease.

Types of Communities:

Simple community:

An isolated community is called simple community.

For example a fallen log with various populations under it.

Complex community:

Interrelated communities form a complex community.

For example forest, pond etc.

Biosphere Level:

The part of the Earth inhabited by communities of organisms is called biosphere. It consists of all ecosystems. Biosphere is also called the zone of life on Earth.

Q4: ***Explain Relationship of Biology to other Sciences.***

Ans: *The interrelationship among different branches of science cannot be denied. Biology includes information on various aspects of living things but this information relate to the other branches of science as well. Each branch of science has relationship with all other branches.*

Biophysics:

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

For example there is a similarity between the working principles of lever in physics and limbs of animals in biology.

Biochemistry:

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

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

Biomathematics / Biometry:

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

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

Biogeography:

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

Bio economics:

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

For example the cost value and profit value of the yield of wheat can be calculated through bio economics and benefits or losses can be determined

Q5: ***Explain any four careers in Biology.***

Ans: *Medicine / energy:*

The profession of medicine deals with the diagnosis and treatment of diseases in human. In surgery the parts of the body may be repaired, replaced or removed, for example the removal of stones through renal surgery, transplantation of kidney, liver etc. Both these professions are studied in the same basic course (MBBS) and then students go for specializations.

Fisheries:

Fisheries are the professional study of fish production. There are departments in Pakistan where professionals of fisheries are employed. They serve for enhancing the quality and quantity of fish production. In Pakistan, this profession can be adopted after the bachelor or masters level study of zoology and fisheries.

Agriculture:

This profession deals with the food crops and animals which are the source of food. An agriculturist works for the betterment of crops like wheat, rice, corn etc and animals like buffalo cow etc from which we get food. In Pakistan there are many universities which offer professional courses on agriculture after the higher secondary education in biology.

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.

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. Biology students can adopt this profession after their higher secondary education.

Q6: ***Explain molecular level and tissues level.***

Ans: *Molecular level:*

In organisms, bio elements usually do not occur in isolated forms rather they combine through ionic or covalent bonding. The stable particle formed by such bonding is called as molecule or biomolecule.

An organism is formed by enormous number of biomolecules of hundreds of different types. These molecules are the building material and are themselves constructed in great variety and complexity due to specific bonding arrangements. Biomolecules are classified as micro-molecules and macromolecules. Micro-molecules are with low molecular weight e.g. glucose, water etc. and macromolecules are with high molecular weights e.g. starch, proteins, lipids etc.

Tissue level:

In multicellular organisms, similar cells (performing similar functions) are organized into groups called tissues.

We can define a tissue as 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. There are different types of plant tissues e.g. epidermal tissue, ground tissue, etc. Animal tissues are also of different types e.g. nervous tissue, muscular tissues etc.

Q7: ***Explain the contribution of Muslim Scientists in Biology.***

Ans: *Jabir Bin Hayan* (721-815 AD):

He was born in lran 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 "AI-Haywan".

Abdul Malik Asmai (740-828 AD):

He is considered the first Muslim scientist who studied animals in detail. His famous writings include "Al-Abil (camel)", "Al-Khail (horse)", "Al-Wahoosh (animal)", and "Kalq al-ansan".

Bu Ali Sina (980-1037 AD):

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-fi al-Tib" is known as the canon of medicine in West.

Q8: ***Describe the organ and organ system level with examples.***

Ans: *In higher multicellular organism's more than one type of tissue having related functions are organized together and make a unit, called organ. Different tissues of an organ perform their specific functions and these functions collectively become the functions of that organ.*

For example stomach is an organ specialized for the digestion of proteins and for storing food.

Two major types of tissue are present in its structure. Epithelial (glandular) tissue secretes gastric juice for the digestion of proteins. Muscular tissue performs contractions of stomach walls for grinding of food and moving food to posterior end.

So two tissues perform their specific functions, which collectively become the function of stomach.

The next level of organization in multicellular organisms is the organ system level. Different organs performing related functions are organized together in the form of an organ system. In an organ system, each organ carries out its specific function and the functions of all organs appear as the function of the organ system.

For example, digestive system is an organ system that carries out the process of digestion.

Major organs in its framework are oral cavity, stomach, small intestine, large intestine, liver, and pancreas. All these organs help in the process of digestion. 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.

Chapter: 02

Solving A Biological Problem

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Objective

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1. To test the hypothesis biologists perform:

Ⓐ hypothesis Ⓑ observations Ⓒ experiments Ⓓ deduction

2. The first step in solving a biological problem is:

Ⓐ Observation Ⓑ Hypothesis Ⓒ Experiment Ⓓ Deduction

3. Biological Method comprises of ……. steps.

Ⓐ 7 Ⓑ 6 Ⓒ 5 Ⓓ 4

4. Biologists use discussion and reasoning procedure to formulate a:

Ⓐ Theory Ⓑ Hypothesis Ⓒ Data Ⓓ Law

5. The most basic step of biological method is:

Ⓐ Observation Ⓑ Deduction Ⓒ Hypothesis Ⓓ Experiment

6. Man has always been a:

Ⓐ Scientist Ⓑ Geologist Ⓒ Biologist Ⓓ Chemist

7. The logical results of hypothesis are called:

Ⓐ Experiment Ⓑ Problem Ⓒ Law Ⓓ Deduction

8. Which one of the characteristic is not in a good hypothesis:

Ⓐ Must be testable Ⓑ Must be consistent with available data
Ⓒ Must make prediction Ⓓ Must be correct

9. At which point is a biologist most likely to use reasoning:

Ⓐ During Hypothesis formulation Ⓑ During Data organization
Ⓒ Both A & B Ⓓ While taking observations

10. Number of sense organs are:

Ⓐ 2 Ⓑ 3 Ⓒ 5 Ⓓ 8

11. Freezing Point of Water is:

Ⓐ 37 °C Ⓑ 98 °C Ⓒ 100 °C Ⓓ 0 °C

12. "Freezing point of water is less than its boiling point." Which type of observation is it?

Ⓐ Non-competitive Ⓑ Competitive Ⓒ Qualitative Ⓓ Quantitative

13. Deductions are drawn from:

Ⓐ Hypothesis Ⓑ Theory Ⓒ Observation Ⓓ Experiment

14. In which step of biological method we use “if-then” logic:

Ⓐ Result Ⓑ Deduction Ⓒ Hypothesis Ⓓ Experiment

15. One liter of ethanol weighs ……. grams.

Ⓐ 600 Ⓑ 700 Ⓒ 789 Ⓓ 1000

16. The tentative explanation of observation is called:

Ⓐ Experiments Ⓑ Hypothesis Ⓒ Theory Ⓓ Deduction

17. "It should be a general statement" belongs to:

Ⓐ Deduction Ⓑ Theory Ⓒ Experiment Ⓓ Hypothesis

18. The Italian word “mala” means:

Ⓐ Air Ⓑ Bad Ⓒ Water Ⓓ Good

19. Female mosquitoes need the blood of ..... for the maturations of their eggs.

Ⓐ Reptiles Ⓑ Mammals Ⓒ Birds Ⓓ Mammals and Birds

20. Dengue fever is spread by:

Ⓐ Anopheles mosquito Ⓑ Female anopheles mosquito
Ⓒ Aedes mosquito Ⓓ Culex mosquito

21. Knowledge of ..... helps scientists for data analysis.

Ⓐ Economics Ⓑ Geometry Ⓒ Statistics Ⓓ Commerce

22. Proportion means to join two equal ratio by the sign of:

Ⓐ Division (÷) Ⓑ Equality (=) Ⓒ Subtraction (−) Ⓓ Addition (+)

23. Meaning of aria is:

Ⓐ Smell Ⓑ Adour Ⓒ Air Ⓓ Smoke

24. The bark of which tree was very suitable for curing malaria:

Ⓐ Cinchona Ⓑ Pinus Ⓒ Cactus Ⓓ Cedrus

25. The bark of plants contains quinine is:

Ⓐ Pinus Ⓑ Guava tree Ⓒ Mango tree Ⓓ Quina quina

26. Cinchona bark contains:

Ⓐ quinaquina Ⓑ basoquine Ⓒ Quinine Ⓓ resochine

27. The growth of plasmodium in human body takes place in:

Ⓐ In Kidneys Ⓑ In liver Ⓒ In Small intestine Ⓓ In Stomach

28. Plasmodium causes to spread the disease:

Ⓐ Malaria Ⓑ Polio Ⓒ T.B Ⓓ Yellow fever

29. Plasmodium is the cause of malaria. This statement is a:

Ⓐ Law Ⓑ Theory Ⓒ Deduction Ⓓ Hypothesis

30. Which scientist firstly observed microorganisms in the blood of malarial patient(1878)?

Ⓐ Robert Hooke Ⓑ A.F.A King Ⓒ Laveran Ⓓ Ronald Ross

31. Scientist who performed experiments of Malaria on Sparrows (1880)A. D:

Ⓐ Laveran Ⓑ Ross Ⓒ Bu Ali Sina Ⓓ A.F.A. King

32. A Physician A.F.A listed 20 observations in:

Ⓐ 1883 A.D. Ⓑ 1884 A.D. Ⓒ 1885 A.D. Ⓓ 1886A.D.

33. In mosquito, the plasmodium multiplies in:

(A) Stomach (B) Salivary glands (C) Intestine (D) Mouth

34. Female anopheles causes:

(A) Typhoid (B) Hepatitis (C) Dengue Fever (D) Malaria

35. The hypothesis that stand the test of time are called:

(A) Deductions (B) Experiments (C) Theories (D) Laws

36. The information such as names, dates or values made from observations and experimentations are called:

(A) Law (B) Theory (C) Bioinformatics (D) Data

37. A. F. A. King listed observation:

(A) 20 (B) 30 (C) 40 (D) 50

38. Malaria is caused by:

(A) E-Coli (B) Paramecium (C) Entamoeba (D) Plasmodium

39. A Scientific Law or Principle is an irrefutable:

(A) Experiment (B) Theory (C) Deduction (D) Hypothesis

40. A productive theory keeps on suggesting new:

(A) Hypothesis (B) Laws (C) Observations (D) Deductions

41. Cause of malaria in human beings is:

(A) Culex (B) Aphids (C) Anopheles (D) Dengue

42. In Sparrows, Malaria is spread by:

(A) Virus (B) Culex Mosquito (C) Anopheles Mosquito (D) Marshy Areas

Chapter : 02 Solving A Biological Problem

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Subjective

Q1: ***Define Science.***

Ans: *Science is a systemized knowledge derived from observations and experiments carried out to determine the principles how nature operates.*

Q2: ***What is meant by biological problem? Give an example.***

Ans: *A biological problem is a question about living organisms that is either asked by someone or comes in biologist's mind by himself.*

Q3: ***"Man has always been a biologist". Justify the statement.***

Ans: *Man has always been a biologist. He has to be a biologist in order to live. Early, in history he was a hunter of animals and a gatherer of fruits, seeds, roots etc. The more he knew about their habitat the more successful hunter he was. The more he knew about plants the better he distinguished between edible and non-edible plants.*

Q4: ***What is a Biological Method? Give its significance also.***

Ans: The scientific methods in which biological problems are solved, is termed as biological methods. It comprises of the steps a biologist adopts in order to solve a biological problem.

Significance of biological method:

Biological method has played an important part in scientific research for almost 500 years from Galileo's experiment to current research in the field of medicine, ecology, technology etc. Biological method has played an important role.

Q5: ***Write down names of different steps involved in solving biological problem.***

Ans: In order to resolve a specific biological problem, biologist takes following steps:

- *Observations*
- *Hypothesis formulation*
- *Deductions*
- *Experimentations*
- *Reporting the results*
- *Recognition of biological problem*
- *Summarization of results (create tables, graphics etc.)*

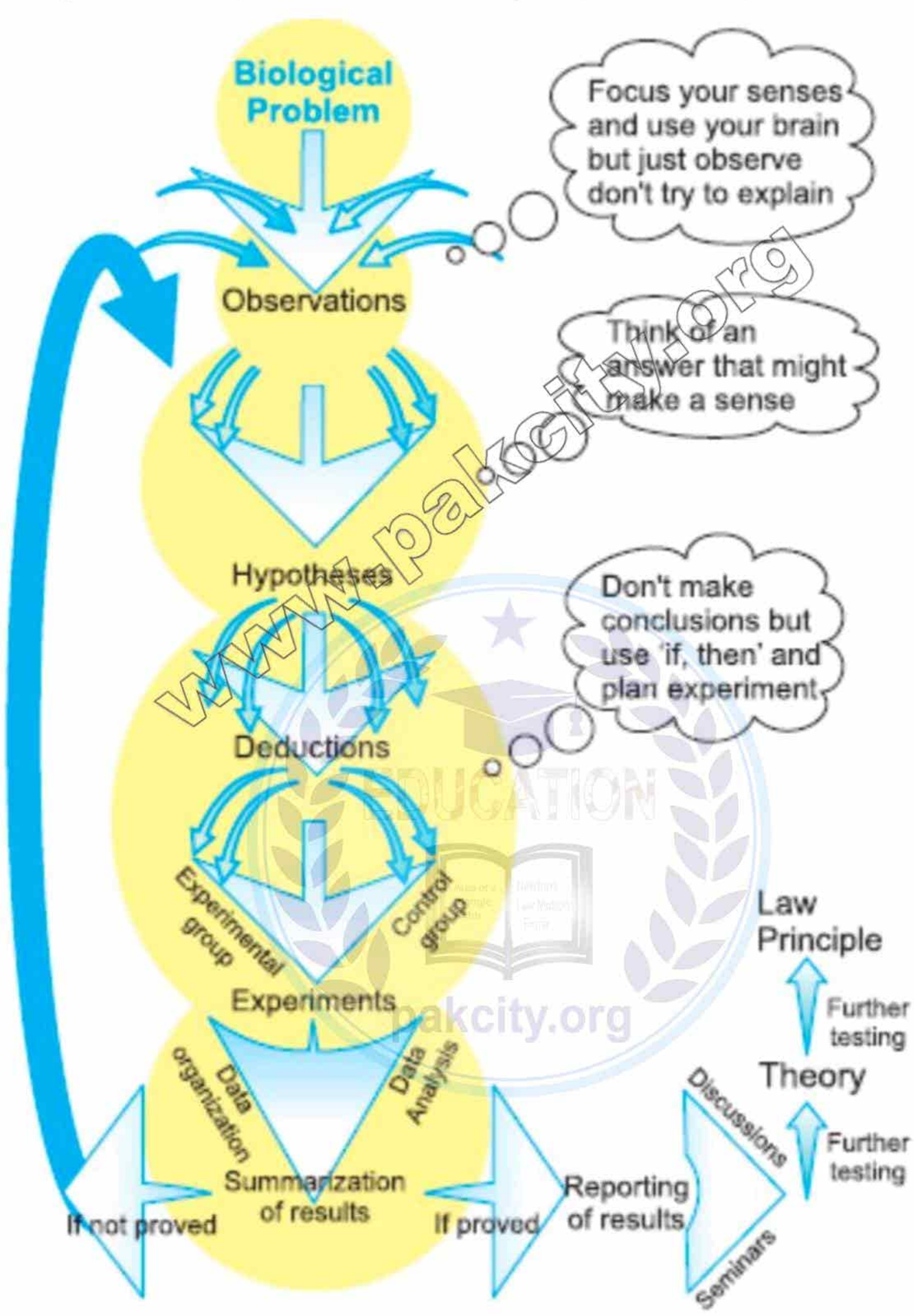

Figure : Biological method

Q6: ***Differentiate between scientific method and biological method.***

Ans: The difference between scientific method and biological method is:

Scientific method	***Biological method***
Any organized or systematic method which is used to resolve a scientific problem is called scientific method.	*The scientific method in which biological problems are solved is called biological method.*

Q7: ***How observations are made in biological method?***

Ans: Observations are made with five senses of vision, hearing, smell, taste and touch. Observations also include reading and studying what others have done in past.

Q8: ***How quantitative observations are better in biological method?***

Ans: Quantitative observations are considered more accurate than qualitative observations because the former are invariable and measureable and can be recorded in terms of numbers.

Q9: ***Define observation. How many types of it are there?***

Ans: Observation is the first step of biological method. Observations are made with five senses of vision, hearing, smell, taste and touch. Observations also include reading and studying what others have done in past.

There are two types of observations:

- *Qualitative Observations*
- *Quantitative Observations*

Qualitative observations	Quantitative observations
• The freezing point of water is colder than the boiling point. • A liter of water is heavier than a liter of ethanol.	• The freezing point of water 0 °C and the boiling point is 100 °C. • A liter of water weighs 1000 grams and a liter of ethanol weighs 789 grams.

Q10: ***Differentiate between qualitative and quantitative observations.***

Ans: The difference between qualitative and quantitative observations:

Qualitative Observations	Quantitative Observations
Qualitative observations are less accurate, variable and cannot be measured. These represent the quality of substance e.g. beauty, intelligence etc. *Examples:* ➢ *The freezing point of water is colder than the boiling point.* ➢ *A liter of water is heavier than a liter of ethanol.*	*Quantitative Observations represent quantity which can be measure in term of numbers and-are measurable and invariable.* *Examples:* ➢ *The freezing point or water is* 0 °C *and the boiling point is* 100 °C. ➢ *A liter of water weighs* 1000 *grams and a liter of ethanol weighs* 789 *grams.*

Q11: ***Write down four names of sense organs of human.***

Ans: Sense organs in human beings include eyes for vision, ear for hearing, nose for smell, tongue for taste and hands for touch.

Q12: ***Define Hypothesis. Describe its role.***

Ans: The tentative explanation of observations is called a hypothesis.

Hypothesis predicts the results of the future experiments. It also gives direction to investigator to find the solution of the scientific or biological problem.

Q13: ***How is Hypothesis formulated?***

Ans: A great deal of careful and creative thinking is necessary for the formulation of a hypothesis. Biologists use reasoning to formulate a hypothesis.

Q14: ***Describe any four properties of a good hypothesis.***

Ans: The properties of a good hypothesis are:

- *It should be a tentative idea.*
- *It should agree with available observations.*
- *It should be kept as simple as possible.*
- *It should be a general statement.*

Q15: ***How deductions are formed? Give an example.***

Ans: The logical conclusions drawn from hypothesis are called deductions.

For this purpose a hypothesis is taken as true and expected results (deductions) are drawn from it.

For example, in case of malaria the hypothesis was "Plasmodium is the cause of malaria". One of the deductions from this hypothesis was; "If plasmodium is the cause of malaria, then all person ill with malaria should have plasmodium in their blood".

Q16: ***What is meant by Deduction? Write down two words used for "Deduction".***

Ans: The logical conclusions drawn from hypothesis are called deductions. The deductions are tested through experiments. While making deductions we use "if-then" logic.

Q17: ***Write down two controls of malaria.***

Ans: The controls of malaria are:

- *Preventing mosquitoes from biting people.*
- *Killing adult mosquitoes before they bite people.*
- *Killing malaria parasites in the blood before they can cause malaria.*
- *Controlling mosquito breeding.*

Q18: ***Write the role of control group in experiments.***

Ans: A control group in an experiment is a group where factor being tested is not applied so that it may serve as standard for comparison against another group (experimental) group.

Q19: ***What is difference between experimental group and control group?***

Ans: The difference between experimental group and control group is:

Experimental group	Control Group
The group of those organisms who are, affected in some way and we do not know the real cause e.g. a group of malarial patients.	*It is the group of unaffected organisms i.e. group of healthy persons in case of malaria.*

Q20: ***How results are summarized?***

Ans: The biologist gathers actual and quantitative data from the experiments. To draw conclusions, the biologist also uses statistical analysis.

Q21: ***What is meant by reporting of results?***

Ans: Publishing of results in scientific journals and books is an essential part of the scientific method. It allows other people to verify the results or apply the knowledge to solve other problems.

Q22: ***Describe the meaning of words "mala" and "aria".***

Ans: Mala means bad. Aria means air. A disease of bad air.

Q23: ***What is the use of quinine?***

Ans: Quinine was the only effective remedy for malaria from 17th to 20th century.

Q24: ***What were the major observations of Malaria in the last part of 19th century?***

Ans: The major observations of Malaria in the last part of 19th century are:

- *Malaria and marshy areas have some relation.*
- *Quinine is an effective drug for treating malaria.*
- *Drinking the water of marshes does not cause malaria.*
- *Plasmodium is seen in the blood of malarial patient.*

Q25: ***Write contribution of French Army Doctor Laveran.***

Ans: He began to search for the cause of malaria. He took a small amount of blood, from a malarial patient and examined it under microscope. He noticed some tiny living creatures. The organism was given a name plasmodium.

Q26: ***Describe two important observations of A.F.A King about malaria.***

Ans: The important observations of A.F.A King about malaria are:

- *Individuals who slept near a smoky fire did not get malaria.*
- *People who slept out doors were more likely to get malaria then those who slept indoors.*

Q27: ***Why Ronald Ross used sparrow in his experiment?***

Ans: Ronald Ross used sparrow in his experiments because using human being for experiments was so serious for life.

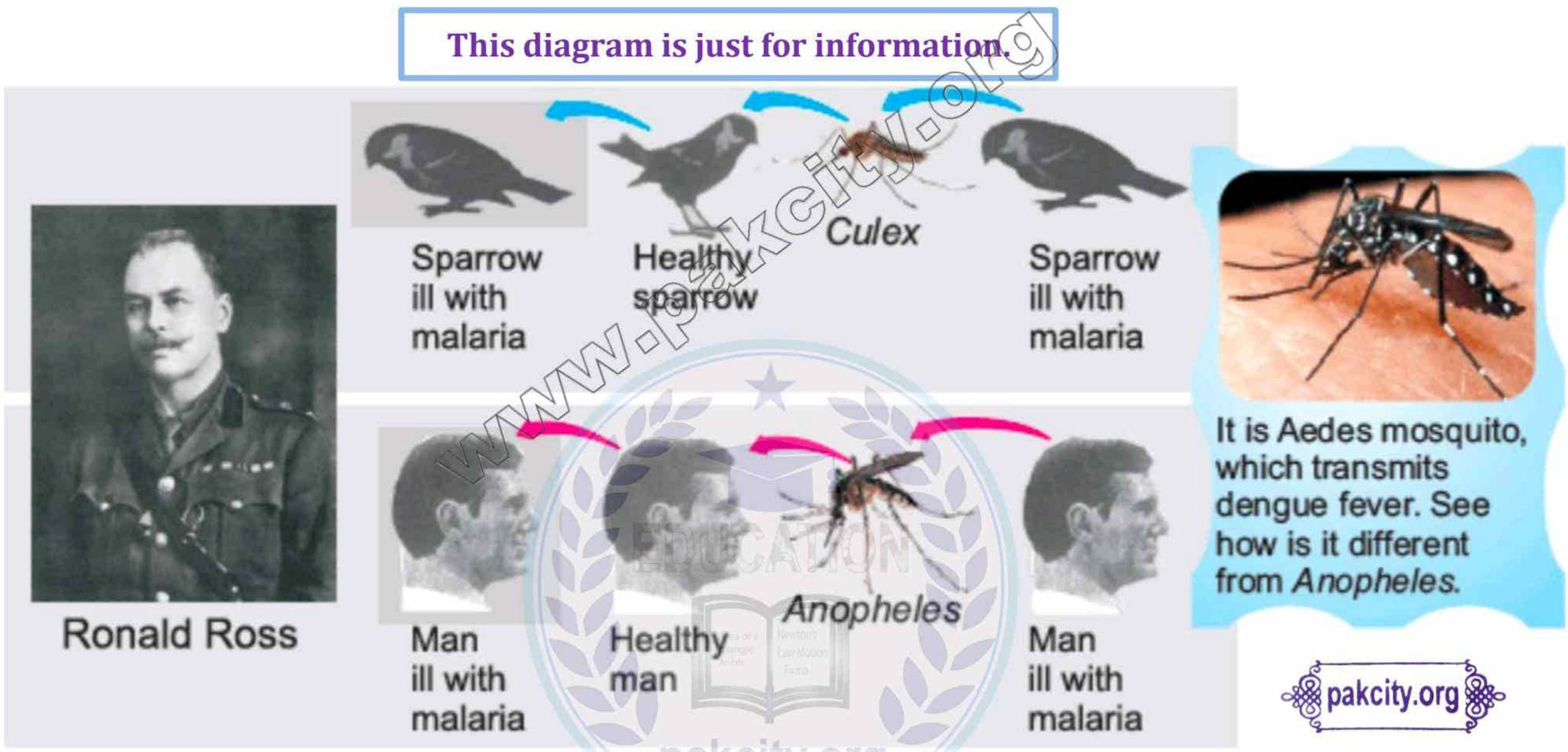

Figure : Malaria in sparrow and man is transmitted by *Culex* and *Anopheles* mosquitoes respectively

Q28: ***What is an incubation period?***

Ans: The period between the entry of parasite in host and the appearance of symptoms is called in incubation period.

Q29: ***Why Culex and Anopheles Mosquitoes are well known?***

Ans: Anopheles mosquito causes malaria in man while culex mosquito causes malaria in sparrows.

Q30: ***Why do we do itching after biting mosquito? OR***
Why do the welts appear after mosquito bites or leaves the skin?

Ans: The reason is that when mosquito bites, the red plumpness appear is not reaction to the wound but an allergic reaction to the saliva. In most cases itching, sensation and swellings subsides within the several hours.

Q31: ***Why female mosquito before drawing blood injects saliva in the body?***

Ans: When a female mosquito pierces the skin with her mouthparts, she injects a small amount of saliva into the wound before drawing blood. The saliva prevents the blood from clotting in her food canal.

Q32: ***How a theory is formulated?***

Ans: When a hypothesis is given a repeated exposure to experimentation and is not falsified, it increases biologists' confidence in hypothesis. Such well supported hypothesis may be used as the basis for formulating further hypothesis which are again proved by experimental results.

Q33: ***What is meant by productive theory?***

Ans: The theory which keeps on suggesting new hypotheses and testing goes on is called productive theory.

Benefits:

New hypotheses are suggested testing goes on such theories after experimental evidences give rise law or principle.

Q34: ***What is difference between theory and law?***

Ans: The difference between theory and law is:

Theory	***Law***
The hypothesis that stand the test of time (often tested never rejected), are called theories.	*If a theory survives doubtful approach and continues to be supported by experimental evidence, it becomes a law or principle.*

Q35: ***What is scientific Law? Give two examples.***

Ans: A scientific law is a uniform fact of nature. It is an irrefutable theory. Hardy Weinberg laws, Mendel's laws of inheritance are the examples of scientifically laws.

Q36: ***What is meant by data?***

Ans: Data can be defined as a single piece of information such as names, dates or values made from Observations and experimentations.

Q37: ***What is the difference between ratio and proportion?***

Ans: The difference between ratio and proportion is:

Ratio	***Proportion***
When a relation between two numbers e.g. 'a' and 'b' is expressed in terms of quotient (a/b), *it is called the ratio of one number to other.* *A ratio may be expressed by putting a division* (÷) *or colon* (:) *mark between two numbers.*	*Proportion means to join two equal ratios by the sign of equality* (=). a : b = c : d or a : b :: c : d

Q38: ***Define bioinformatics and describe role of mathematics in biological method.***

Ans: Bioinformatics:

Bioinformatics refers to the use of computational and statistical techniques for the analysis of biological data.

Role of mathematics in biological method:

Biological method also involves the use of applied mathematics to solve biological problems.

Major biological problem in which knowledge of mathematics is used including gene finding, protein structure and protein-protein interaction.

Q39: ***Describe importance of data analysis in biological method.***

Ans: *Data analysis is necessary to prove or disprove a hypothesis by experimentation. It is done through the application of statistical methods.*

Q40: ***What is meant by data organization?***

Ans: *In order to formulate and then to test the hypotheses, scientists collect and organize data. Prior to conducting an experiment, it is important for a scientist to describe the data collection methods because it ensures the quality of experiments. Data is organized in different formats like graphics, tables, flow charts, maps and diagrams.*

Chapter : 02 Solving A Biological Problem

Long Questions

Q1: *Describe various steps of biological method.*

Q2: *Write a note on theory and principle.*

Chapter: 07

Bioenergetics

Objective

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1. When was ATP discovered?

(A) 1929 A.D (B) 1939 A.D (C) 1915 A.D (D) 1902 A.D

2. The Covalent bond connecting two phosphates is indicated by the symbol:

(A) Proportion (B) Colon (C) Tilde (D) Ratio

3. Fritz Lipmann was awarded noble prize in:

(A) 1981 (B) 1941 (C) 1947 (D) 1927

4. Nitrogenous base of ATP molecule is:

(A) cytocine (B) adenine (C) thyamine (D) guanine

5. Number of phosphate groups in ATP molecule:

(A) 3 (B) 2 (C) 1 (D) 4

6. The example of a nucleotide is:

(A) DTP (B) AMP (C) ADP (D) ATP

7. ATP is an example of:

(A) Fatty acid (B) Nucleic acid (C) Nucleotide (D) Amino acid

8. In Ribose sugar number of carbon atoms is:

(A) 6 (B) 5 (C) 4 (D) 2

9. From which bonds of ATP molecules energy is taken?

(A) C–O bonds (B) P–P bonds (C) C–H bonds (D) C–N bonds

10. One mole of ATP release energy:

(A) 7.3 k cal (B) 6.3 k cal (C) 5.3 k cal (D) 4.3 k cal

11. The loss of electron from atom is called:

(A) Anabolism (B) Catabolism (C) Reduction (D) Oxidation

12. The energy currency of all cells is:

(A) ADP (B) glucose (C) ATP (D) protein

13. Food contains energy in its bonds:

(A) Solar (B) Heat (C) Kinetic (D) Potential

14. Each ATP molecule has the number of sub-units:

(A) 4 (B) 1 (C) 2 (D) 3

15. ATP molecule was discovered by:

(A) Calvin (B) Hamann (C) Karl Lohmann (D) Lipman

16. Raw Material for Photosynthesis is:

(A) Water, CO_2 (B) H_2O_2, O_2 (C) CO_2, O_2 (D) Glucose

17. Stomata cover the leaf surface:

Ⓐ 1 – 5% Ⓑ 1 – 4% Ⓒ 1 – 3% **Ⓓ 1 – 2%**

18. Light of which colour is more effective in photosynthesis?

Ⓐ Blue and Green Ⓑ Yellow and Blue **Ⓒ Blue and Red** Ⓓ Green and Red

19. Sun light is absorbed by:

Ⓐ Leaves **Ⓑ Chlorophyll** Ⓒ Stem Ⓓ Flower

20. The main photosynthetic pigment is:

Ⓐ Chlorophyll–a Ⓑ Chlorophyll–b Ⓒ Chlorophyll–ab Ⓓ Carotenoids

21. Temperature that causes closure of stomata:

Ⓐ 30 °C – 35 °C Ⓑ 20 °C – 25 °C **Ⓒ 40 °C – 45 °C** Ⓓ 10 °C – 15 °C

22. Byproduct of photosynthesis is:

Ⓐ CO **Ⓑ O_2** Ⓒ CO_2 Ⓓ N_2

23. Chlorophyll absorbs ……. type of light basically.

Ⓐ Blue and red Ⓑ Red and green Ⓒ Red and yellow Ⓓ Green and blue

24. In which process oxygen is released as a byproduct?

Ⓐ reproduction Ⓑ fermentation Ⓒ respiration **Ⓓ photosynthesis**

25. In which part of the leaf cells Chlorophyll is found:

Ⓐ Plasma Membrane Ⓑ Stroma Ⓒ Cytoplasm **Ⓓ Thylakoid**

26. Calvin got nobel prize in:

Ⓐ 1991 Ⓑ 1981 **Ⓒ 1961** Ⓓ 1951

27. The whole series of Light Reactions is called:

Ⓐ L–Scheme Ⓑ L–Scheme **Ⓒ Z–Scheme** Ⓓ Al of these

28. Dark reactions take place in:

Ⓐ Mitochondria **Ⓑ Stroma** Ⓒ Thylakoid Ⓓ Cytosole

29. Compounds produced during light reactions are:

Ⓐ NADPH, ATP Ⓑ $C_6H_{12}O_6$ Ⓒ $C_{12}H_{22}O_{12}$ Ⓓ FADH

30. Dark Reactions are part of:

Ⓐ Necrosis Ⓑ Metastasis Ⓒ Respiration **Ⓓ Photosynthesis**

31. Another name for the dark reaction of Photosynthesis is:

Ⓐ Water cycle Ⓑ Nitrogen cycle Ⓒ Carbon cycle **Ⓓ Calvin cycle**

32. In which part of chloroplast, light reactions of photosynthesis take place?

Ⓐ Thylakoid membranes Ⓑ Fatty acids and glycerol's
Ⓒ Inner membrane Ⓓ Outer membrane

33. Dark Reactions were studied by:

Ⓐ Robert Brown **Ⓑ Malvin Calvin** Ⓒ Schleiden Ⓓ Schwann

34. Which step of cellular respiration occurs in cytoplasm?

(A) Glycolysis (B) Lactic acid fermentation
(C) Electron transport chain (D) Krebs cycle

35. The greatest fuel of energy for cellular respiration is:

(A) Protein (B) Glucose (C) Lipids (D) Amino acid

36. The sites of aerobic respiration in cell are:

(A) Mitochondria (B) Golgi bodies (C) Ribosomes (D) Plastids

37. Chemical Formula of lactic acid is:

(A) C_2H_5OH (B) C_2H_2OH (C) $C_6H_{12}O_6$ (D) $C_3H_6O_3$

38. Chemical Formula of ethyl Alcohol is:

(A) $C_6H_{12}O_6$ (B) CH_3OH (C) D_2O (D) C_2H_5OH

39. The example of three carbon molecule is:

(A) Starch (B) Ribose (C) Pyruvic acid (D) Glucose

40. Glycolysis takes place in:

(A) Ribosomes (B) Cytoplasm (C) Mitochondria (D) Nucleus

41. Which of these can enter into Krebs cycle?

(A) Citric Acid (B) Glucose (C) Acetyl-CoA (D) Pyruvic acid (3C)

42. In which stage of respiration carbon dioxide gas is produced?

(A) Electron transport chain (B) Krebs cycle (C) Glycolysis (D) Both B & C

43. Nicotinamide adenine dinucleotide is a:

(A) Co-Enzyme (B) Enzyme (C) Co-Factor (D) Factor

44. How many ATP molecules are formed during cellular respiration?

(A) 24 (B) 28 (C) 32 (D) 36

45. During anaerobic oxidation of glucose molecule, ATP molecules are gained as net profit:

(A) 8 (B) 6 (C) 2 (D) 1

46. Each $FADH_2$ produces ATP:

(A) 8 (B) 2 (C) 6 (D) 4

47. Through which process organisms get energy?

(A) Transpiration (B) Evaporation (C) Respiration (D) Photosynthesis

48. In glycolysis, glucose (6C) molecule is broken into two molecules of:

(A) Pyruvic acid (3C) (B) Acetyl-CoA (C) $FADH_2$ (D) NADH

49. How many molecules of CO_2 are produced when Krebs cycle operates once?

(A) 6 (B) 5 (C) 3 (D) 2

50. Which is the final step of cellular respiration?

(A) Electron transport chain (B) Glycolysis (C) fermentation (D) Krebs cycle

Chapter : 07	Bioenergetics

Subjective

Q1: ***What is meant by bioenergetics?***

Ans: *Bioenergetics:*

Bioenergetics is the study of energy relationships and energy transformations (conversions) in living organisms.

Q2: ***What is role of bioenergetics and ATP?***

Ans: *Bioenergetics:*

Bioenergetics is the study of energy relationships and energy transformations (conversions) in living organisms.

Role of ATP:

Organisms obtain energy by metabolizing the food they eat or prepare. Food contains energy in its bonds. When these bonds are broken down, a large amount of kinetic energy is release.

Some of this energy is stored in the form of potential energy in the bonds of ATP molecules while the rest escapes as heat. The potential energy stored in ATP is again transformed into kinetic energy to carry out the life activities

Q3: ***How much forms of energy in living organisms exist?***

Ans: *In living organisms energy exists in two forms: Kinetic energy is actively involved in doing work and Potential energy is stored for future use. The potential energy is stored in chemical bonds and is released as kinetic energy when these bonds break.*

Q4: ***Explain with an example that electrons can be a source of energy release.***

Ans: *When electrons are present in oxygen, they make stable association with oxygen atom and are not good energy source. But if electrons are dragged away from oxygen and attached to some other atom e.g. carbon or hydrogen, they make unstable association.*

They try to move back to oxygen and when this happens, energy is released. In this way, electrons act as energy source.

Q5: ***What is difference between oxidation and reduction?***

Ans: *The difference between oxidation and reduction is:*

Oxidation	Reduction
➢ Addition of oxygen removal of hydrogen or the loss of electrons is called oxidation. ➢ Oxidation is energy yielding process.	➢ Addition of hydrogen, removal of oxygen or the gain of electrons is called reduction. ➢ Reduction is energy consuming process.

Q6: ***Why oxidation reduction reactions are called redox reactions?***

Ans: *In oxidation reduction reactions exchange of electrons occur simultaneously so these reactions are also called redox reaction.*

Q7: ***What is meant by redox reactions?***

Ans: *Redox reactions:*

Like always the oxidation reduction reactions run simultaneously and they are often called the Redox reactions.

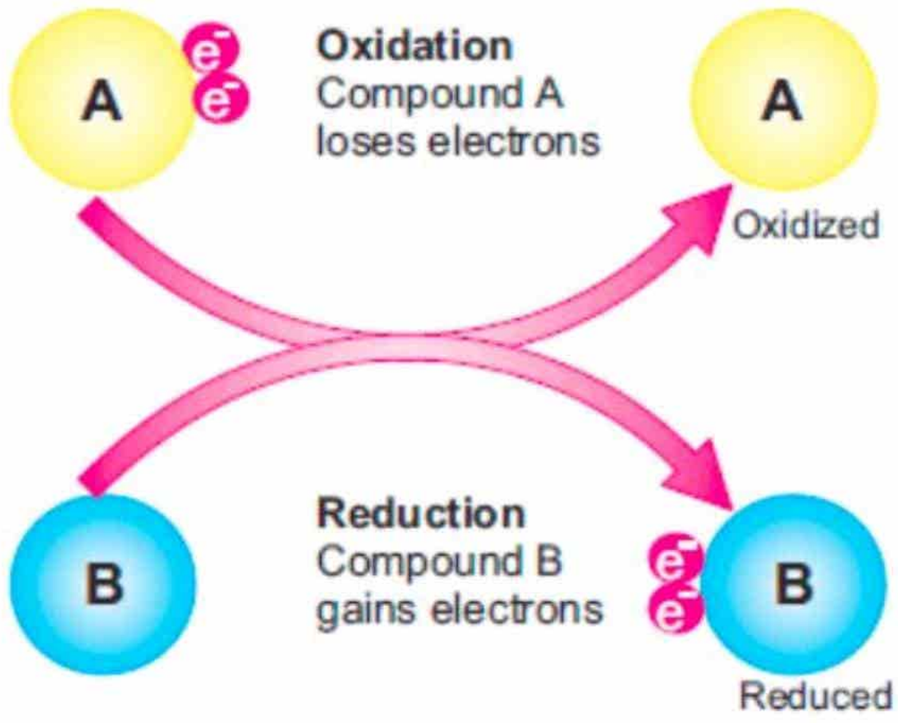

Figure : Redox reactions

Q8: ***Define two types of energy in living organisms.***

Ans: Energy exits in two forms in living organisms:

- *Kinetic energy*
- *Potential Energy*

Kinetic energy:

It is actively involved in doing work.

Potential Energy:

The potential energy is stored in chemical bonds. It is used for future use. It is released as kinetic energy when these bonds break.

Q9: ***Define ATP. Write its function in cell.***

Ans: The major energy currency of all cells is a nucleotide called ATP (Adenosine triphosphate).

ATP is the main energy source for majority of the cellular functions like:

- *Movement*
- *Transmission of nerve impulses*
- *Active transport*
- *Exocytosis and Endocytosis*
- *Synthesis of macromolecules (DNA, RNA, proteins)*

Q10: ***Why ATP is called the cell's energy currency?***

Ans: When cells use energy to build ATP from ADP, or ADP from AMP, they are really storing energy as we store money in a bank. Because ATP plays a central role in all living organisms it must have appeared in the early history of life.

Q11: ***What is NADP+?***

Ans: NADP+:

Nicotinamide Adenine Dinucleotide (NAD+) is a coenzyme that takes electrons and hydrogen ions and is thus reduces to NADH. One form of this enzyme also carries phosphate with it, so is called NADP+.

Q12: ***Define Osmosis.***

Ans: Osmosis:

Osmosis is the movement of water from a dilute solution to a concentrated one through a membrane.

Q13: ***How much area is covered by stomata?***

Ans: Stomata cover only 1-2% *of the leaf surface but they allow much gas to diffuse through them.*

Q14: ***Who discovered ATP and when he was awarded Nobel Prize?***

Ans: ATP was discovered by Karl Lohmann in 1929. *It was proposed to be the main energy transfer molecule in the cell by Nobel Prize winner, Fritz Lipmann in* 1941.

Q15: ***ATP stands for what? Write names of sub units of ATP.***

Ans: ATP stands for Adenosine Triphosphate.

Each ATP has three subunits:

- ***Adenine*** *a double ringed nitrogenous base.*
- ***Ribose*** *a five-carbon sugar.*
- ***Three phosphate groups*** *in a linear chain.*

Q16: ***How much energy is released from one mole of ATP?***

Ans: The breaking of one phosphate bond releases about 7.3 k cal (7300 calories) *per mole of ATP.*

$$ATP + H_2O \longrightarrow ADP + P_i + \text{energy (7.3 k cal mole}^{-1})$$

Q17: ***Show the diagram and structure of ATP.***

Ans:

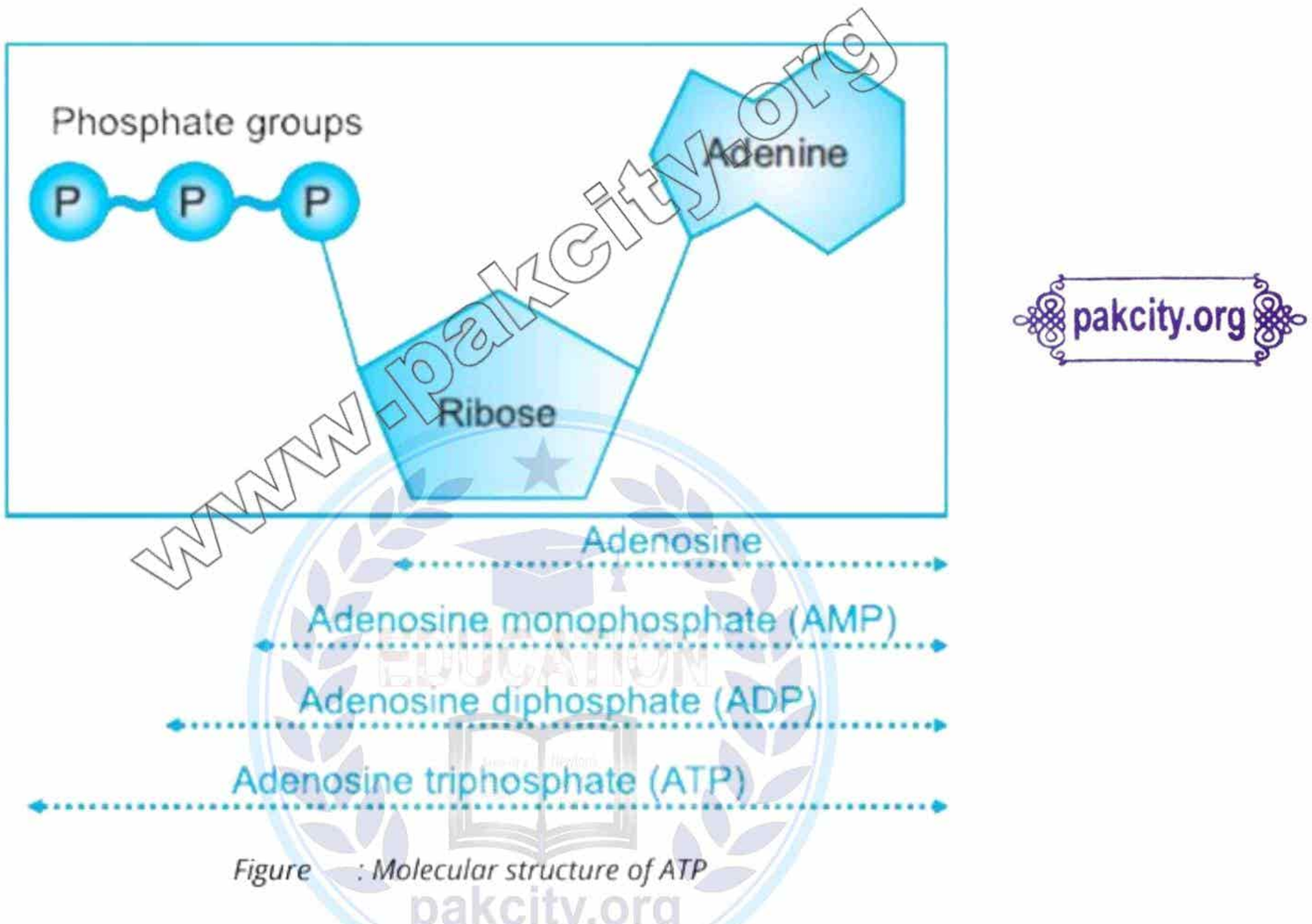

Figure : Molecular structure of ATP

Q18: ***Give the names of any four cellular functions in which ATP is source of energy.***

Ans: Majority of the cellular functions are carried out due to ATP like the synthesis of macromolecules (DNA, RNA, Proteins), movement, transmission of nerve impulses, active transport, exocytosis and endocytosis etc.

Q19: ***What is meant by photolysis?***

Ans: Light breaks water molecule and oxygen is released. This reaction is called photolysis. The hydrogen atoms of water give electrons to chlorophyll and become ions.

Q20: ***Why and when Calvin was awarded Nobel Prize?***

Ans: The details of dark reactions were discovered by Melvin Calvin and his colleagues at the University of California. Calvin was awarded Nobel Prize, in 1961.

Q21: ***What is difference between light reactions and dark reactions?***

Ans: The difference between light reactions and dark reactions is:

Light reactions	Dark reactions
➢ *In first phase of photosynthesis, light energy is captured and is used to make high energy molecules (ATP and NADPH).*	➢ *In second phase of photosynthesis carbon dioxide is reduced to make glucose. In this phase energy from high energy molecules (ATP and NADPH) is utilized.*
➢ *These take place on thylakoid membranes of chloroplast.*	➢ *It takes place in the stroma of chloroplasts.*
➢ *Since these reactions require light energy so they are known as light reactions.*	➢ *Since these reactions do not use light directly, they are known as dark reactions.*

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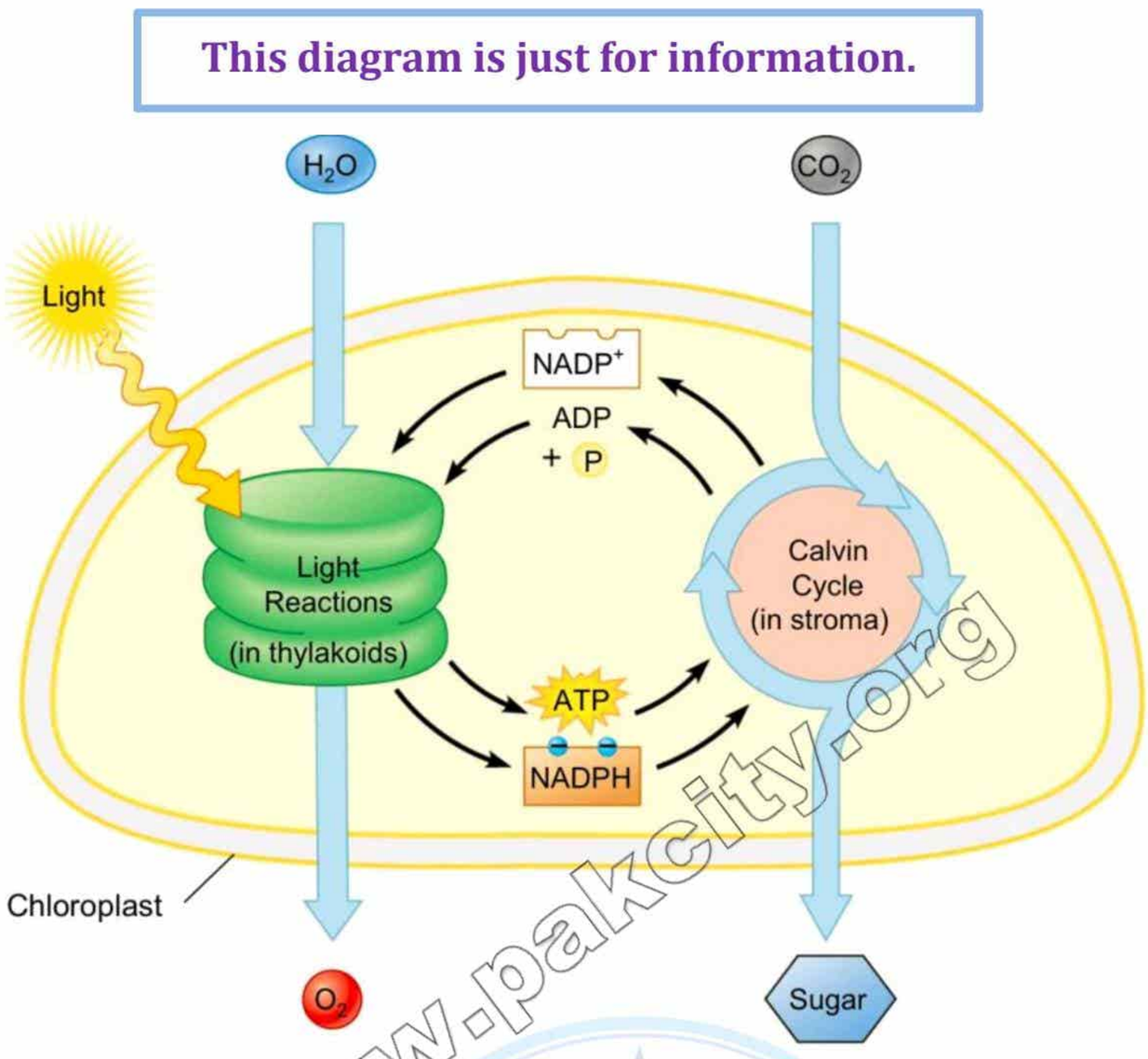


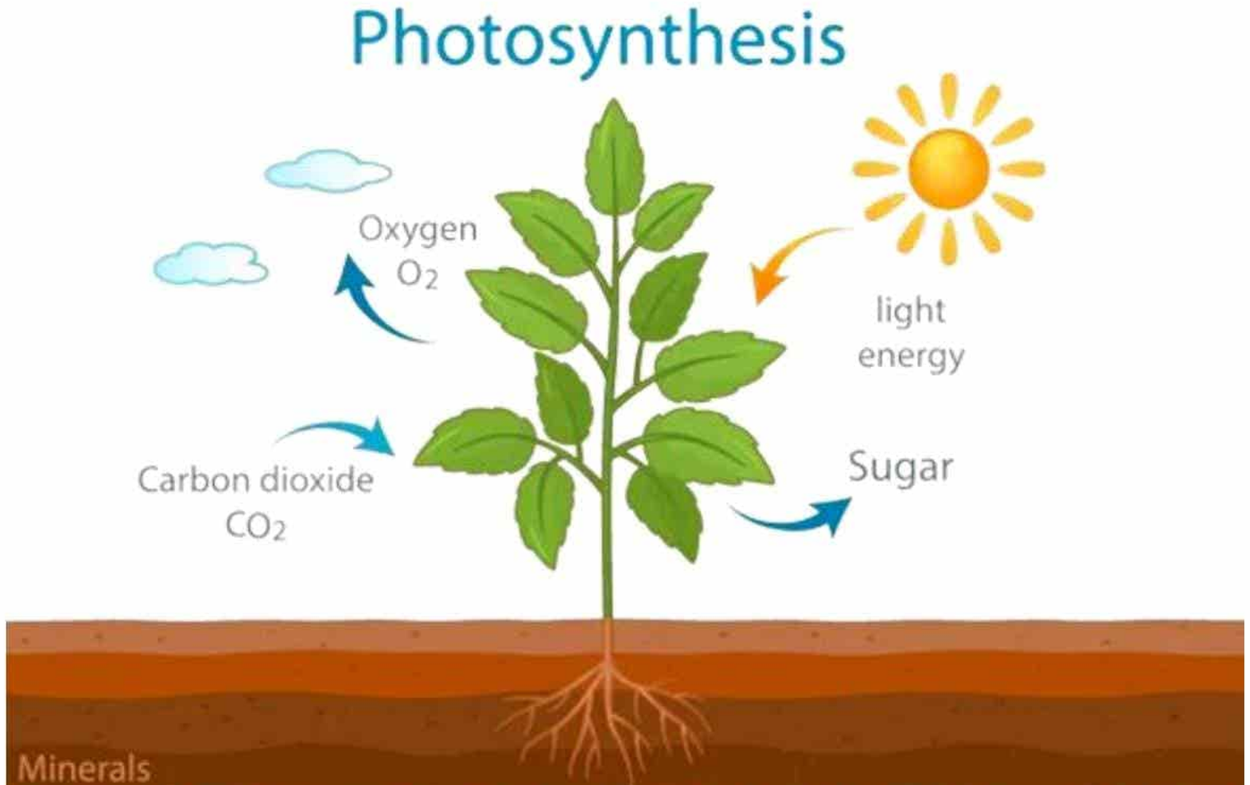
Q22: ***What is photosynthesis? Write its chemical equation.***

Ans: *The process by which plants and some other autotrophic organisms prepare their food (glucose) in the presence of sunlight and chlorophyll, with oxygen as a byproduct is called photosynthesis.*

Chemical Equation:

The chemical equation of photosynthesis is as follows:

$$6CO_2 + 12H_2O + \text{Light energy} \xrightarrow{\text{Chlorophyll}} C_6H_{12}O_6 + 6O_2 + 6H_2O$$



Q23: ***Write down two necessary conditions for photosynthesis.***

Ans: For photosynthesis carbon dioxide, water, chlorophyll and sun light are necessary.

Q24: ***What is the role of light in photosynthesis?***

Ans: Sunlight is absorbed by chlorophyll. It is then converted into chemical energy which drives the photosynthetic process. The blue and red lights carry out more photosynthesis which is absorbed by pigments.

Q25: ***State the importance of chlorophyll and pigments in photosynthesis.***

Ans: Sunlight is absorbed by chlorophyll. It is then converted into chemical energy which drives the photosynthetic process. The light rays of different wavelengths are not only differently absorbed by photosynthetic pigments but are also differently effective in photosynthesis.

The blue and red lights carry out more photosynthesis which is absorbed by pigments. There are two types of photosynthetic pigments which are called main and accessory pigments.

Q26: ***What are pigments and write down their colours in chlorophyll?***

Ans: Pigments are the coloured substances that absorb visible light. Different pigments absorb light of different wavelengths. Chlorophyll-a, chlorophyll-b and carotenes are pigments effective for photosynthesis.

Lights of different colours are absorbed by these pigments.

Q27: ***What is meant by photo systems?***

Ans: The photosynthetic pigments are organized in the form of clusters, called photosystems, in thylakoid membranes of chloroplasts.

Q28: ***Write about accessory pigments with examples.***

Ans: In thylakoid membranes of chloroplasts additional pigments like chlorophyll-b and carotenoids are also present. These are called accessory pigments. Some wavelengths not absorbed by chlorophyll-a are very effectively absorbed by accessory pigments and vice versa.

Q29: ***Define Limiting Factor and name the limiting factors in Photosynthesis.***

Ans: Any environmental factor the absence or deficiency of which can decrease the rate of a metabolic reaction is called limiting factor.

Many factors like light intensity, temperature, concentration of $C0_2$ and availability of water act as limiting factors for photosynthesis.

Q30: ***What is the effect of $C0_2$ concentration on Photosynthesis?***

Ans: Carbon dioxide concentration raises the rate of photosynthesis. It goes on increasing until limited by others factors. Increase in CO_2 concentration beyond a certain level causes the closure of stomata and it decreases the rate of photosynthesis.

Q31: ***What is effect of light intensity and temperature on the rate of photosynthesis?***

Ans: Effect of light intensity:

The rate of photosynthesis varies with light intensity. It decreases with the decrease in light intensity. At much higher light intensity the rate of photosynthesis becomes constant.

Effect of Temperature:

The rate of photosynthesis decreases with decrease in temperature. It increases as the temperature is increased over a limited range. If light intensity is low increasing the temperature has little influence on the rate of photosynthesis.

Q32: ***What is the arrangement of stomata in terrestrial and aquatic plants?***

Ans: Terrestrial plants have more stomata in lower epidermis of leaves while aquatic plants (which have exposed leaves) have more stomata in the upper epidermis.

Q33: ***How in non-vascular plants water and salts reach the mesophyll cells of leaves?***

Ans: In non-vascular plants water and salts reach the mesophyll cells of leaves by the phenomena of osmosis, diffusion etc.

Q34: ***What is lactic acid fermentation?***

Ans: Lactic acid fermentation occurs in skeletal muscles of humans and other animals during extreme physical activities. This also happens in the bacteria present in milk.

In this type of fermentation each pyruvic acid molecule is converted into lactic acid ($C_3H_6O_3$).

Q35: ***Explain alcoholic Fermentation with the help of equation.***

Ans: It occurs in bacteria and yeast. In this type of anaerobic respiration, pyruvic acid is broken down into alcohol (C_2H_3OH) *and* CO_2.

$$\text{Pyruvic acid} \longrightarrow \text{Ethyl alcohol} + \text{Carbon dioxide}$$

Q36: ***How is soy sauce formed?***

Ans: Soya sauce is made by the fermentation by a fungus Aspergillus.

Q37: ***What is significance of anaerobic respiration (fermentation)?***

Ans: The significance of anaerobic respiration (fermentation) is:

Some existing bacteria and fungi live in oxygen free environment respire anaerobically and called anaerobes.

In some active tissues like skeletal muscles during exercise when oxygen supply cannot keep pace with energy demand so anaerobic respiration provides energy by break down of glucose into lactic acid.

Q38: ***Define Fermentation. Name its two types.***

Ans: Some organisms oxidize their food incompletely without using any molecular oxygen called anaerobic respiration or fermentation.

Types of anaerobic respiration (fermentation)

Anaerobic respiration is further classified as:

- *Lactic acid fermentation*
- *Alcoholic fermentation*

Q39: ***Write the uses of Fermentation in Yeast.***

Ans: Fermentation of yeast is used in brewing and baking industries.

Q40: ***Write the name of products of aerobic and anaerobic respiration.***

Ans: Products of aerobic respiration are carbon dioxide and water while Products of anaerobic respiration are ethyl alcohol, carbon dioxide and lactic acid.

Q41: ***Define aerobic and anaerobic respiration. Write chemical equations also.***

Ans: Aerobic respiration:

It is that type of respiration in which complete oxidation of glucose occurs with maximum release of energy in the presence of oxygen.

$$C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O + \text{Energy}$$

$$\text{Glucose} + \text{Oxygen} \longrightarrow \text{Carbon dioxide} + \text{Water} + \text{Energy}$$

Anaerobic respiration:

Some organisms oxidize their food incompletely without using any molecular oxygen called anaerobic respiration. Glucose is incompletely oxidized with less amount of energy release.

$$\text{Pyruvic acid} \longrightarrow \text{Ethyl alcohol} + \text{Carbon dioxide}$$

$$\text{Pyruvic acid} \longrightarrow \text{Lactic acid}$$

Q42: ***What is glycolysis? Where does this reaction occur?***

Ans: *It is a process in which glucose molecule is broken down into two molecules of pyruvic acids* (3C). *Glycolysis occurs in cytoplasm and oxygen is not involved at this stage so it occurs both in aerobic and anaerobic respiration.*

Q43: ***Write down names of two compounds produced during aerobic respiration.***

Ans: *Carbon dioxide and water are produced during aerobic respiration. Besides this energy are also released.*

Q44: ***What are the uses of respiration energy in living organisms?***

Ans: *The energy obtained from respiration is used for various life processes like growth, movement and reproduction etc.*

Q45: ***What is meant by Z–Scheme?***

Ans: *The whole series of light reactions is called Z-scheme due to its Z-shaped form.*

Q46: ***Give the full name of F.A.D and N.A.D.***

Ans: *F.A.D:*

Flavin Adenine Dinucleotide (FAD) is also a coenzyme like NAD^+ *it gets two hydrogen and reduces to* $FADH_2$.

N.A.D:

NAD (Nicotinamide adenine dinucleotide) is co-enzyme that takes phosphate and hydrogen ions and is thus reduces to NADPH.

Q47: ***Define respiration and cellular respiration.***

Ans: *Respiration (Cellular respiration):*

The cellular energy yielding process is called cellular respiration. During this process, oxidation reduction reaction breaks C – H *bonds and so carbon dioxide and water are also produced.*

This diagram is just for information.

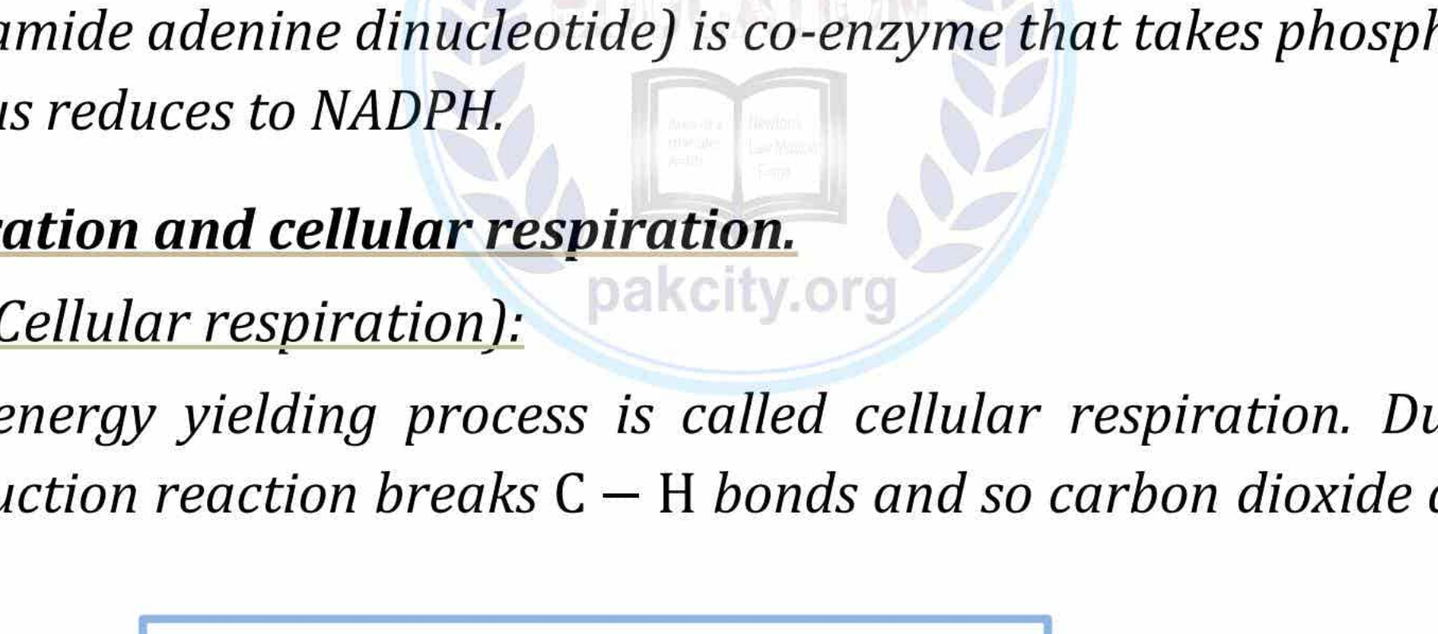


Figure Mechanism of respiration

Q48: ***Write names of main stages of aerobic respiration.***

Ans: *Aerobic respiration is a continuous process but we can divide it into three main stages:*

- *Glycolysis*
- *Krebs cycle*
- *Electron Transport chain*

Q49: ***What is meant by electron transport chain and Krebs cycle?***

Ans: *Electron Transport chain:*

It is the final step of cellular respiration. It is the transfer of electron in an electron transport chain.

Krebs cycle:

In Krebs cycle, pyruvic acid molecules are completely oxidized along with the formation of ATP, NADH and $FADH_2$. Before entering in Krebs cycle, pyruvic acid is changed into a 2-carbon compound called acetyl CoA.

Q50: ***Explain the mechanism of Electron transport Chain.***

Ans: *Electron transport Chain:*

- *The final step of cellular respiration is the transfer of electron on an electron transport chain. In this step the energy carried by electrons is used to synthesize ATP.*
- *In Electron transport Chain NAD and $FADH_2$ release electrons and hydrogen ions. These electrons are taken up by a series of electron carriers. When electrons move through series of electron carriers, they lose energy, which is used to synthesize ATP molecules.*
- *At the end of the chain electrons and hydrogen ions combine with molecular oxygen and form water.*

Q51: ***Why it is incorrect to say that energy relationship step of respiration is electron transport chain?***

Ans: *Energy is released in glycolysis and Krebs cycle in the form of NADH and $FAHD_2$. Electron transport chain transforms the energy present in these compounds to ATP. That is why it is incorrect to say that energy relationship step of respiration is electron transport chain.*

Q52: ***How many ATP are produced during aerobic and anaerobic respiration?***

Ans: *During aerobic respiration 36 ATP are produced while in aerobic respiration only 2 ATP are produced.*

Q53: ***Where all the enzymes of glycolysis are found?***

Ans: *All the enzymes of glycolysis are found in cytoplasm.*

Q54: ***Glycolysis produces ATP, but it cannot occur ATP. How is that?***

Ans: *The beginning of glycolysis requires two ATP, while 4 ATP are produced through last steps of glycolysis.*

Q55: ***Why is it incorrect to say that the energy releasing step of respiration is electron transport chain?***

Ans: *Energy is released in glycolysis and Krebs cycle in the form of NADH and $FADH_2$. Electron transport chain transforms the energy present in these compounds to ATP.*

Difference between photosynthesis and respiration

Characteristics	Photosynthesis	Respiration
Metabolism	Anabolism	Catabolism
Energy investment / production	Investment of light energy to store it in the form of bond energy	Bond energy transformed into chemical energy of ATP
Organisms capable of;	Some bacteria, all algae all plants	All organisms
Site of occurrence	Chloroplasts	In cytoplasm and mitochondria
Time of occurrence	In daytime only, in the presence of light	All the time

Difference between Aerobic and Anaerobic Respiration

Properties	Aerobic respiration	Anaerobic respiration
Presence of Oxygen	Yes	No
Number of ATP as net profit	36	2
Final products	CO_2 , H_2O	Lactic acid or Ethanol + CO_2
Site of occurrence	Gycolysis in cytoplasm and Krebs cycle and electron transport chain in mitochondria	In cytoplasm
Importance	Major source of energy for most organisms	• Source of energy for anaerobic organisms • Source of energy for aerobic organisms in short supply of O_2 • Source of many products (ethanol, cheese etc)

Chapter : 07	Bioenergetics

Long Questions

Q1: What is the difference between photosynthesis and respiration? OR

Define photosynthesis. Write its equation and describe the mechanism of photosynthesis.

Q2: Write a note on ATP. OR

Interpret that ATP is the chief energy currency of all cells. (V.Imp)

Q3: Write down a comprehensive note on oxidation reduction reactions.

Q4: Write down the summary of light reactions in plants. OR

Describe different events of light and dark reaction. OR

What are dark reactions? Describe events of dark reactions? (V.Imp)

Q5: What is Photosystem? Explain the Calvin Cycle.

Q6: Explain the effect of intensity of light, CO_2 concentration and temperature on photosynthesis. OR

Explain the role of chlorophyll and light in photosynthesis.

Q7: Write note on limiting factors of photosynthesis.

Q8: Describe the importance of anaerobic respiration or fermentation. OR

What is meant by fermentation? Explain its types. (V.Imp)

Q9: What is meant by respiration? Explain its types.

Q10: Define aerobic respiration and explain its mechanism. (V.Imp) OR

What is the difference between aerobic and anaerobic respiration?

Q11: Illustrate respiratory energy budget by a chart.

Q12: Electron transport chain is the final step of cellular respiration. Explain it.

Chapter: 09

Transport

Objective

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1. Most of the transpiration occurs through:

Ⓐ Cuticle Ⓑ Lenticels Ⓒ Mesophyll **Ⓓ Stomata**

2. Stomata cover the leaf surface only:

Ⓐ 3 - 4% Ⓑ 1-3% **Ⓒ 1-2%** Ⓓ 2-3%

3. Outside the conducting tissues there is a narrow layer of thin walled cells, which is called:

Ⓐ Phloem Ⓑ Xylem **Ⓒ Pericycle** Ⓓ Endodermis

4. Guard cells belong to:

Ⓐ Stomata Ⓑ Cortex Ⓒ Endodermis Ⓓ Pericycle

5. What is called the layer of cutting in plants?

Ⓐ Cortex Ⓑ Root Hairs Ⓒ Epidermis **Ⓓ Cuticle**

6. Stomata close when Guard Cells:

Ⓐ Gain Potassium Ions **Ⓑ Lose Water** Ⓒ Become Turgid Ⓓ Gain Chloride ions

7. Regulate the opening and closing of stoma:

Ⓐ phosphorus Ⓑ sulphur **Ⓒ potassium** Ⓓ calcium

8. Force that is responsible for the conduction of water and salts from soil by the roots is called:

Ⓐ Respiration **Ⓑ Transpiration Pull** Ⓒ Osmosis Ⓓ Diffusion

9. Rate of transpiration decreases by the increase of:

Ⓐ air humidity Ⓑ leaf surface area Ⓒ air movement Ⓓ temperature

10. Transpiration rate does not depend upon:

Ⓐ CO_2 Ⓑ Air movement Ⓒ Temperature Ⓓ Leaf diameter

11. The temperature range at which transpiration stops and stomata are closed:

Ⓐ 10 °C– 20 °C Ⓑ 20 °C– 40 °C Ⓒ 20 °C– 45 °C **Ⓓ 40 °C– 45 °C**

12. Transpiration takes place through:

Ⓐ Cuticle Ⓑ Lenticels **Ⓒ All of these** Ⓓ Stomata

13. Evaporation of water from the surface of plant is called:

Ⓐ transportation **Ⓑ transpiration** Ⓒ translocation Ⓓ guttation

14. The stomata open when guard cells:

Ⓐ Become turgid Ⓑ Loose water Ⓒ Gain chloride ions Ⓓ Become Flaccid

15. The transpiration is regulated by:

Ⓐ 0.12 D Ⓑ 0.95 D Ⓒ 1.61 D **Ⓓ 1.85 D**

16. In phloem, transport of food is:

Ⓐ One way Ⓑ Four way Ⓒ Three way **Ⓓ Two way**

17. In most plants food is transported in the form of:

Ⓐ Proteins Ⓑ Starch **Ⓒ Sucrose** Ⓓ Glucose

18. Water enters into Root Hairs by means of:

Ⓐ Osmosis Ⓑ Diffusion Ⓒ Active Transport Ⓓ Passive Transport

19. Which part of plant is responsible for transporting food?

Ⓐ Phloem Ⓑ Root Ⓒ Leaf Ⓓ Xylem

20. A tissue which is responsible for the transport of water in plant:

Ⓐ Phloem Ⓑ Pericycle Ⓒ Cortex **Ⓓ Xylem**

21. Volume of plasma in the blood is:

Ⓐ 60% **Ⓑ 55%** Ⓒ 45% Ⓓ 40%

22. The production of great number of immature and abnormal white blood cell disease is known as:

Ⓐ Leukaemia Ⓑ Myocardial Infarction Ⓒ Thalassaema Ⓓ Haemophilia

23. Number of White Blood Cells in one cubic millimeter of blood:

Ⓐ 7000- 8000 Ⓑ 6000 - 7000 Ⓒ 5000 -6000 Ⓓ 4000 - 5000

24. Water constitutes about of plasma:

Ⓐ 90%-92% Ⓑ 80% - 90% Ⓒ 70% -92% Ⓓ 72% - 80%

25. The average adult body has about volume of blood:

Ⓐ 8 liters Ⓑ 7 liters Ⓒ 6 liters **Ⓓ 5 liters**

26. The protein which maintains the water balance of blood is:

Ⓐ fibrin Ⓑ haemoglobin **Ⓒ albumin** Ⓓ fibrinogen

27. Percentage of salts in plasma is about:

Ⓐ 0.9 % Ⓑ 1.1% Ⓒ 1.0 % Ⓓ 0.8 %

28. The size of red blood cells is:

Ⓐ 12 µm Ⓑ 4 µm Ⓒ 2 µm **Ⓓ 8 µm**

29. Average life duration of a platelet is ..... days.

Ⓐ 6-7 Ⓑ 7-9 **Ⓒ 8-9** Ⓓ 7-8

30. In adult human red blood cells are produced in:

Ⓐ Liver **Ⓑ Ribs** Ⓒ Lungs Ⓓ Spleen

31. ..... prevents blood clotting.

Ⓐ Basophils Ⓑ Eosinophils Ⓒ Monocytes Ⓓ Neutrophils

32. The average life span of RBC is about:

Ⓐ five months **Ⓑ four months** Ⓒ three months Ⓓ two months

33. What percentage of plasma weight consists of protein?

(A) 7-9 % (B) 5-9% (C) 2-5 % (D) 1-2%

34. When Fibrinogen makes blood clot it separates from Blood and the remainder is called:

(A) Puss (B) Lymph (C) Plasma (D) Serum

35. When blood cells are removed from blood, remaining part is:

(A) water (B) protein (C) plasma (D) serum

36. Blood cells involved in blood clotting:

(A) plasma (B) platelets (C) red blood cells (D) white blood cells

37. Normal pH of blood is:

(A) 7.9 (B) 7.7 (C) 7.4 (D) 7.1

38. The protein which helps in blood clotting is:

(A) haemoglobin (B) Fibrinogen (C) Antigen (D) Albumin

39. Blood Cancer is:

(A) Arthritis (B) Pneumonia (C) Thalassaemia (D) Leukaemia

40. Which cell play role in body's defence:

(A) Thrombocytes (B) Basophils (C) Leukocytes (D) Erythrocytes

41. Which Blood Group contains Antigen "A":

(A) A (B) AB (C) O (D) B

42. A patient with blood group "A" can be given the blood of donor who has:

(A) Blood group A or O (B) Blood group A or AB
(C) Blood group B only (D) Blood group A only

43. ABO blood group system was introduced by:

(A) Robert Brown (B) Schwann (C) Robert Koch (D) Karl Landsteiner

44. The Universal Recipient has Antigen:

(A) Rh (B) A (C) A & B (D) B

45. Which one of the following blood groups is universal donor:

(A) B (B) A (C) O (D) AB

46. A person with blood group "AB" can donate blood to group:

(A) O (B) AB (C) A (D) B

47. A person having none of the antigen "A" and "B" has blood group:

(A) A (B) O (C) B (D) AB

48. Individuals having "AB" blood group are called:

(A) universal recipient (B) necrosis (C) universal donor (D) hypotonic

49. There are how many chambers in the Human heart:

(A) Six (B) Five (C) Three (D) Four

50. The largest artery is called:

Ⓐ Hepatic artery Ⓑ Renal artery **Ⓒ Aorta** Ⓓ Intercostal artery

51. In normal adult human, the weight of heart is:

Ⓐ 100–200 gram **Ⓑ 250–350 gram** Ⓒ 200–250 gram Ⓓ 150–200 gram

52. These are smallest blood vessels:

Ⓐ Arteries Ⓑ Lymph vessels Ⓒ Capillaries Ⓓ Veins

53. The largest and strongest chamber in heart is:

Ⓐ Right ventricle Ⓑ Right atrium Ⓒ Left atrium **Ⓓ Left ventricle**

54. The heart beat rate of healthy person is:

Ⓐ 85 beats/min Ⓑ 80 beats/min **Ⓒ 70 beats/min** Ⓓ 75 beats/min

55. The scientist who discovered the pumping action of heart was:

Ⓐ William Harvey Ⓑ Robert Brown Ⓒ Schwan Ⓓ Linnaeus

56. An artery that supplies blood to liver:

Ⓐ Coronal v artery Ⓑ Renal artery Ⓒ Femoral artery **Ⓓ Hepatic artery**

57. Exchange of materials only takes place between blood and surrounding tissues through:

Ⓐ Veins **Ⓑ Capillaries** Ⓒ All of these Ⓓ Arteries

58. The heartbeat of healthy woman per minute is:

Ⓐ 75 Ⓑ 70 Ⓒ 80 Ⓓ 85

59. Hepatic portal vein carries blood from small intestine to:

Ⓐ Colon **Ⓑ Liver** Ⓒ Heart Ⓓ Kidney

60. The blood vessels which carry blood back to the heart are called:

Ⓐ Veins Ⓑ Arterioles Ⓒ Arteries Ⓓ Capillaries

61. Which of the following blood vessel carry deoxygenated Blood:

Ⓐ Pulmonary Vein Ⓑ Renal Artery Ⓒ Aorta **Ⓓ Pulmonary Artery**

62. Which of the following tissue layer is found in all blood vessels?

Ⓐ connective tissue Ⓑ skeletal muscles **Ⓒ endothelium** Ⓓ smooth muscles

63. Ventricular systole lasts about in:

Ⓐ 0.4 sec **Ⓑ 0.3 sec** Ⓒ 0.2 sec Ⓓ 0.1sec

64. Human Heart is enclosed in Double Membranous sac called:

Ⓐ Peritonium Ⓑ Pericarp Ⓒ Pleura **Ⓓ Pericardium**

65. The blood vessels that carry blood away from heart:

Ⓐ capillaries Ⓑ lymph **Ⓒ arteries** Ⓓ veins

66. Angina pectoris is what type of pain?

Ⓐ Gastric Pain **Ⓑ Chest pain** Ⓒ Lungs pain Ⓓ Kidney pain

67. Which disease is the leading cause of death all over the world?

Ⓐ Heart attack Ⓑ AIDS Ⓒ Polio Ⓓ Cancer

68. World heart day is celebrated on:

(A) 28 September (B) 30 December (C) 28 May (D) 23 March

69. Which cells are shortened in dengue fever?

(A) chondryocytes (B) R.B.C (C) W.B.C (D) platelets

70. About what percentage of our population is diabetic?

(A) 25% (B) 20% (C) 10% (D) 5%

71. Myocardium means:

(A) Ambulus (B) Chyme (C) Muscles of heart (D) Death of tissue

72. Death of heart tissues is called:

(A) Thalassaemia (B) Myocardial infarction (C) Arteriosclerosis (D) Atherosclerosis

Chapter : 09 — Transport

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Subjective

Q1: ***Define transpiration.***

Ans: *Transpiration:*

The loss of water from plan surface through evaporation is called transpiration.

Q2: ***What is difference between transpiration and stomatal transpiration?***

Ans: *The difference between transpiration and stomatal transpiration is:*

Transpiration	Stomatal transpiration
The loss of water from plan surface through evaporation is called transpiration.	*Most of the transpiration occurs through stomata and is called stomatal transpiration.*

Q3: ***Describe the events of transpiration.***

Ans: *Transpiration:*

Transpiration is the loss of water from plant surface through evaporation.

Functions of cuticle and lenticels:

This loss may occur through stomata in leaves, through the cuticle present on leaf epidermis, or through special openings called lenticels present in the stems of some plants.

Stomatal Transpiration:

Most of the transpiration occurs through stomata, and is called stomatal transpiration.

Function of Mesophyll Cell in Transpiration:

The mesophyll cells of leaf provide enormous surface area for the evaporation of water. Water is drawn from the xylem into mesophyll cells, from where it comes out and makes a water film on the cell walls of the mesophyll.

From here water evaporates into the air spaces of the leaf. By diffusion, water vapours then move from the air spaces towards the stomata and then pass to the outside air. Roughly 90% of the water that enters a plant is lost via transpiration.

This diagram is just for information.

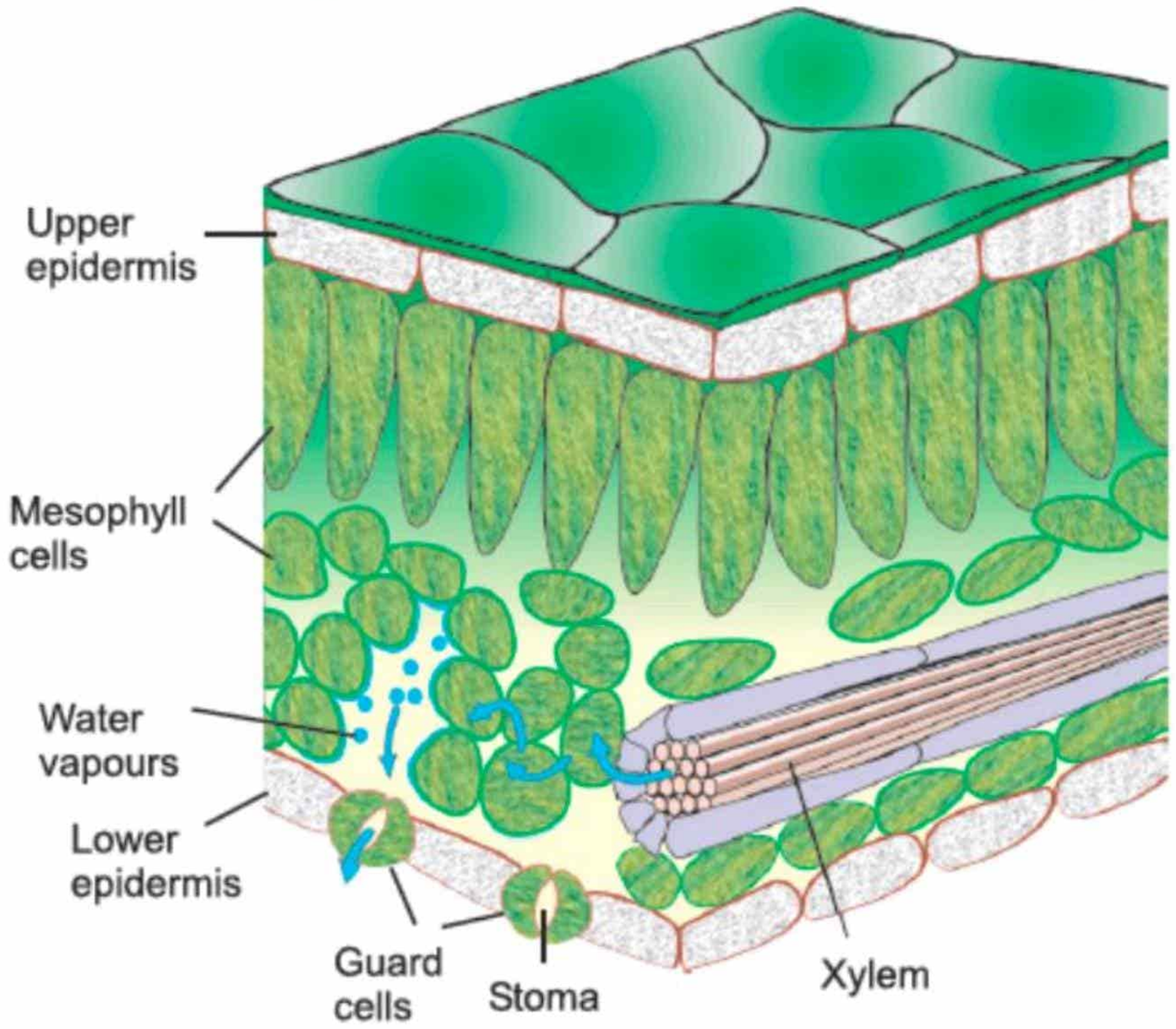


Figure Events of transpiration shown in the section of a leaf

Some plants open their stomata during night when overall water stress is low.

Q4: ***Write down the four factors affecting the rate of transpiration.***

Ans: Factors affecting the rate of transpiration include:

- *Light,*
- *Temperature,*
- *Air humidity,*
- *Air movement*
- *Leaf surface area.*
- *Gaining electrons*
- *Losing electrons*

Q5: ***Why Diffusion can work only in unicellular and simple multicellular organisms?***

Ans: One-way molecules move is by diffusion but it alone cannot supply the need. It takes much time for materials in solution to diffuse even a few inches.

Diffusion can work only in unicellular and simple multicellular organisms because every corner of their body is in close and direct contact with environment. In complex multicellular bodies, cells are far apart from the environment and such bodies need a comprehensive system for the transport of materials.

Q6: ***Why Water is vital to plant life?***

Ans: Water is vital to plant life. It is necessary not just for photosynthesis and turgor, but much of the cellular activities occur in the presence of water molecules and the internal temperature of the plant is also regulated by water.

Land plants get water and minerals from soil. After absorption by the roots, these water and minerals have to be transported to the aerial parts of the body.

Q7: ***Why Plants form beneficial relationships with soil bacteria and fungi?***

Ans: *Plants also form beneficial relationships with soil bacteria and fungi in order to increase absorption of minerals.*

Q8: ***According to the pressure–flow mechanism what is the actual force behind the movement of food in phloem?***

Ans: *Drop in the pressure at the Sink end.*

Q9: ***What is the effect of humidity and temperature on the rate of transpiration?***

Ans: *Higher temperature reduces the humidity of the surrounding air and also increases the kinetic energy of water molecules. In this way, it increases the rate of transpiration.*

The rate of transpiration doubles with everyone rise of 10 °C *in temperature. But very high temperature i.e.*40–4 5°C *causes closure of stomata, so that transpiration stops.*

Q10: ***What is effect of wind on transpiration?***

Ans: *When air is dry, water vapours diffuse more quickly from the surface of mesophyll cells into leaf air spaces and then from air spaces to outsides. This increases the rate of transpiration. In humid air, the rate of the diffusion of water vapours is reduced and the rate of transpiration is low.*

Q11: ***What is difference between lenticels and stomata?***

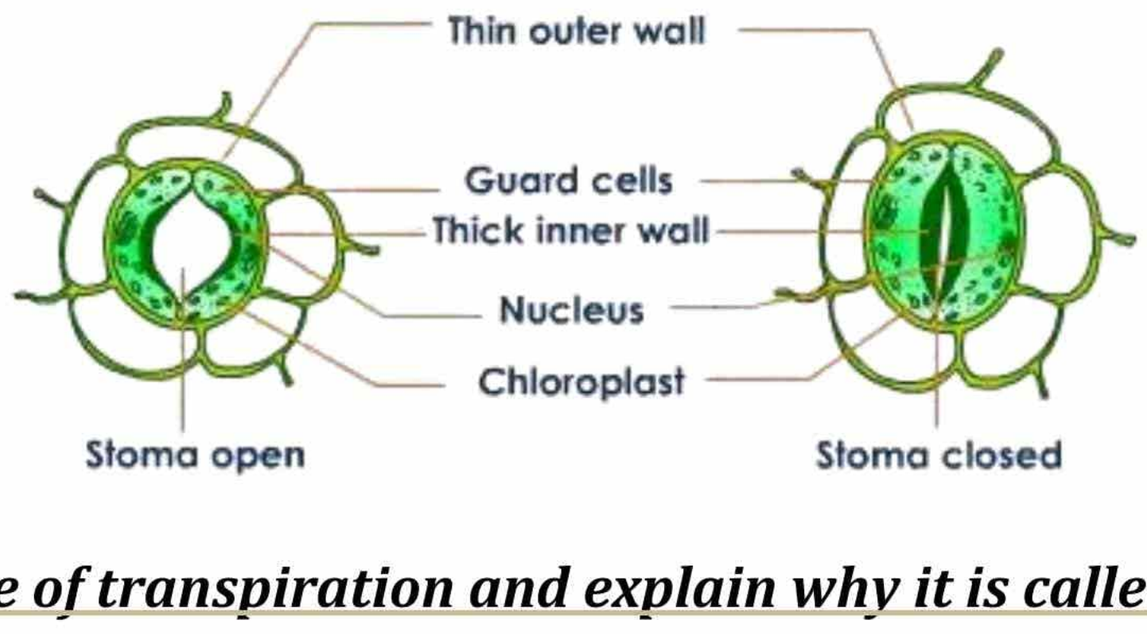
Ans: *The difference between lenticels and stomata is:*

Lenticels	***Stomata***
Lenticels are small opening for the loss of water, present in the stems of some plants.	*Stomata (singular: stoma) are minute openings in the lower epidermis of leaves guarded by guard cells. Stomata help in exchange of gases.*

Q12: ***Explain the opening and closing of stomata in leaves of plants.***

Ans: *It is responsibility of stomata to regulate transpiration via the action of guard cells. Two guard cells of stomata are attached to each other at their ends. The inner concave sides of guard cells that enclose a stoma are thicker than the outer convex sides.*

When these guard cells get water and become turgid, their shapes are like two beans and the stoma between them opens. When the guard cells loose water and become flaccid, their inner sides touch each other and the stoma close.



Q13: ***Describe importance of transpiration and explain why it is called a necessary evil?***

Ans: *Transpiration is a potentially harmful process but is unavoidable too. Transpiration may be a harmful process in the sense that during the conditions of drought, losses of water from plants result in serious desiccation, wilting and often death of the plant. It creates a pulling*

force called transpiration pull which is principally responsible for the conduction of water and salts from root the aerial parts of the plants body.

When water transpires from the surfaces of the plant, it leaves a cooling effect on plant. This is especially important in warmer environments. Wet surfaces of leaf cells allow gaseous exchange.

Q14: ***Describe the relationship between the concentration of solute and water potential.***

Ans: *Water always moves from an area of higher water potential to an area of lower water potential. The difference in the water potentials depends upon the differences in the concentrations of solute and the amounts of water.*

The relationship between the concentration of solute and water potential is inverse i.e. where there is a lot of solute the water potential is low.

Q15: ***Define cohesion-tension theory.***

Ans: *According to this theory, the mechanism by which water (along with dissolved materials) is carried upward through the xylem is called transpiration pull. Transpiration creates a pressure difference. It pulls water and salts up from the roots.*

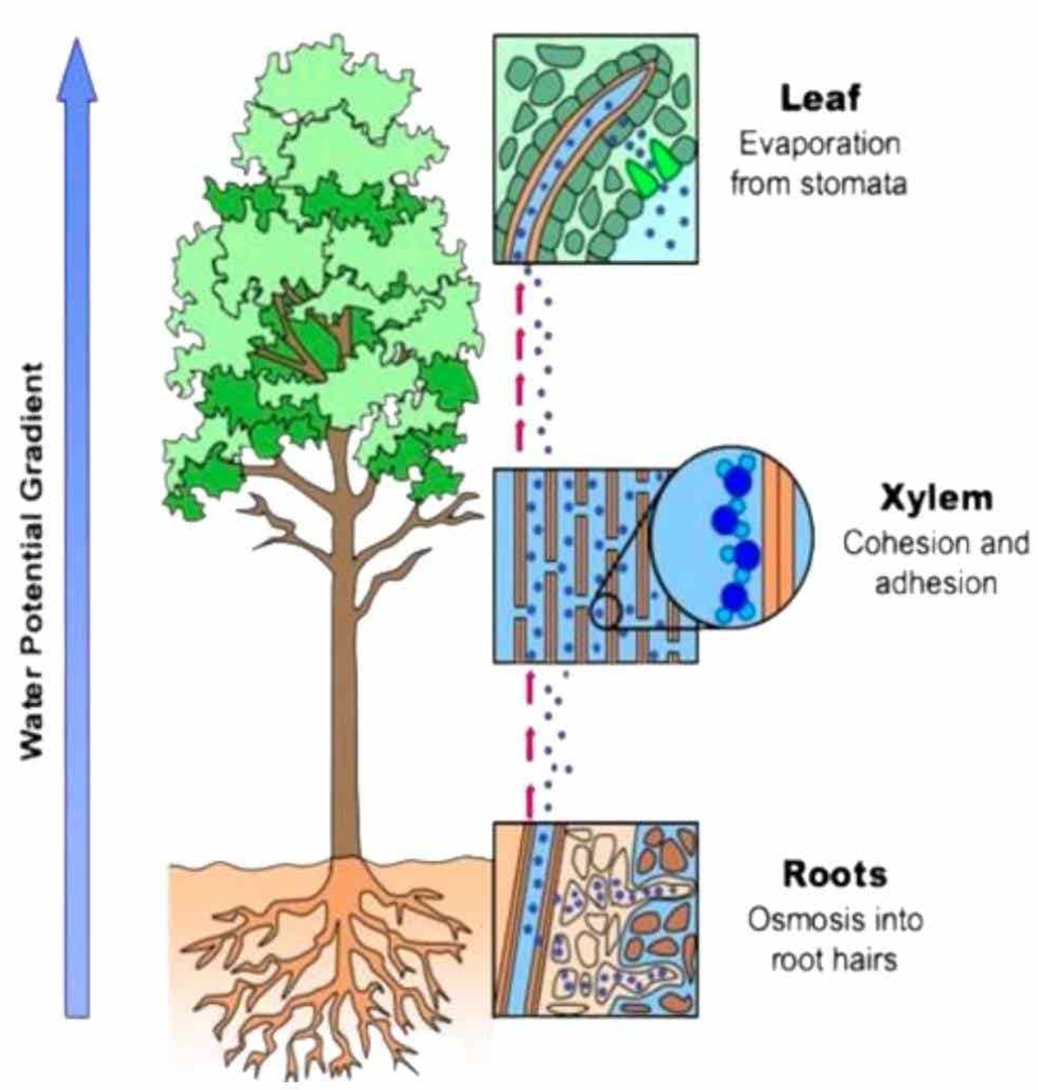
Q16: ***What is transpiration pull?***

Ans: *Transpiration creates a pulling force called transpiration pull which is principally responsible for the conduction of water and salts from root the aerial parts of the plants body.*

Reasons for the creation of the transpiration pull:

- *Water molecules adhere to the walls of xylem tube (adhesion).*
- *Water molecules cohere to each other (cohesion).*
- *Water is held in a tube (xylem) that has small diameter.*

This diagram is just for Understanding.



Q17: ***Write down the functions of root and root hair in plants.***

Ans: *The functions of root and root hair in plants are:*

Functions of Root:

- *They absorb water and salts from the soil.*
- *Roots anchor the plant in the soil.*

- *They provide conducting tissues. These tissues help in the transport of water, salts and food.*

Functions of Root Hair:

Root hairs provide large surface area for absorption water and salts. Water moves by osmosis into the root hairs. Salts enter root hairs by diffusion or active transport.

Q18: ***Differentiate between function of xylem and phloem.***

Ans: The difference between function of xylem and phloem is:

Xylem	***Phloem***
Xylem tissue is responsible for the transport of water and dissolved substances from roots to aerial parts. It consists of vessel elements and tracheids. Xylem is one way Street from roots to leaves for water and salts.	*Phloem tissue is responsible for the conduction of dissolved organic matter (food) between different parts of plant body. It consists of sieve tube cells and companion cells. Phloem is two way street for food.*

Q19: ***What is the difference between source and sink?***

Ans: The difference between source and sink is:

Source	***Sinks***
The source is exporting organ. It may be a mature leaf or storage organ.	*Sinks are the areas of active metabolism or storage.* *For example, roots, tubers, are developing fruits and leaves, and the growing regions.*

Q20: ***Define pressure flow mechanism.***

Ans: At the source, the food (sugar) is moved by active transport into the sieve tubes of phloem. Due to the presence of sugar in sieve tubes, their solute concentration increases and water enters from xylem via osmosis, this result in higher pressure in these tubes, which drives the solution towards sink.

At the sink end, the food is unloaded by active transport. Water also exits from the sieve tubes. This decreases the pressure in sieve tubes, which causes a mass flow from the higher pressure at the source to the now lowered pressure at the sink.

Q21: ***What is blood? Write the name of its parts.***

Ans: It is a specialized body fluid made up of connective tissue. It is composed of a liquid called blood plasma and 'blood cells.

Q22: ***Illustrate the functions of human blood circulatory system and its main components.***

Ans: Functions of Human Blood Circulatory System (cardiovascular system):

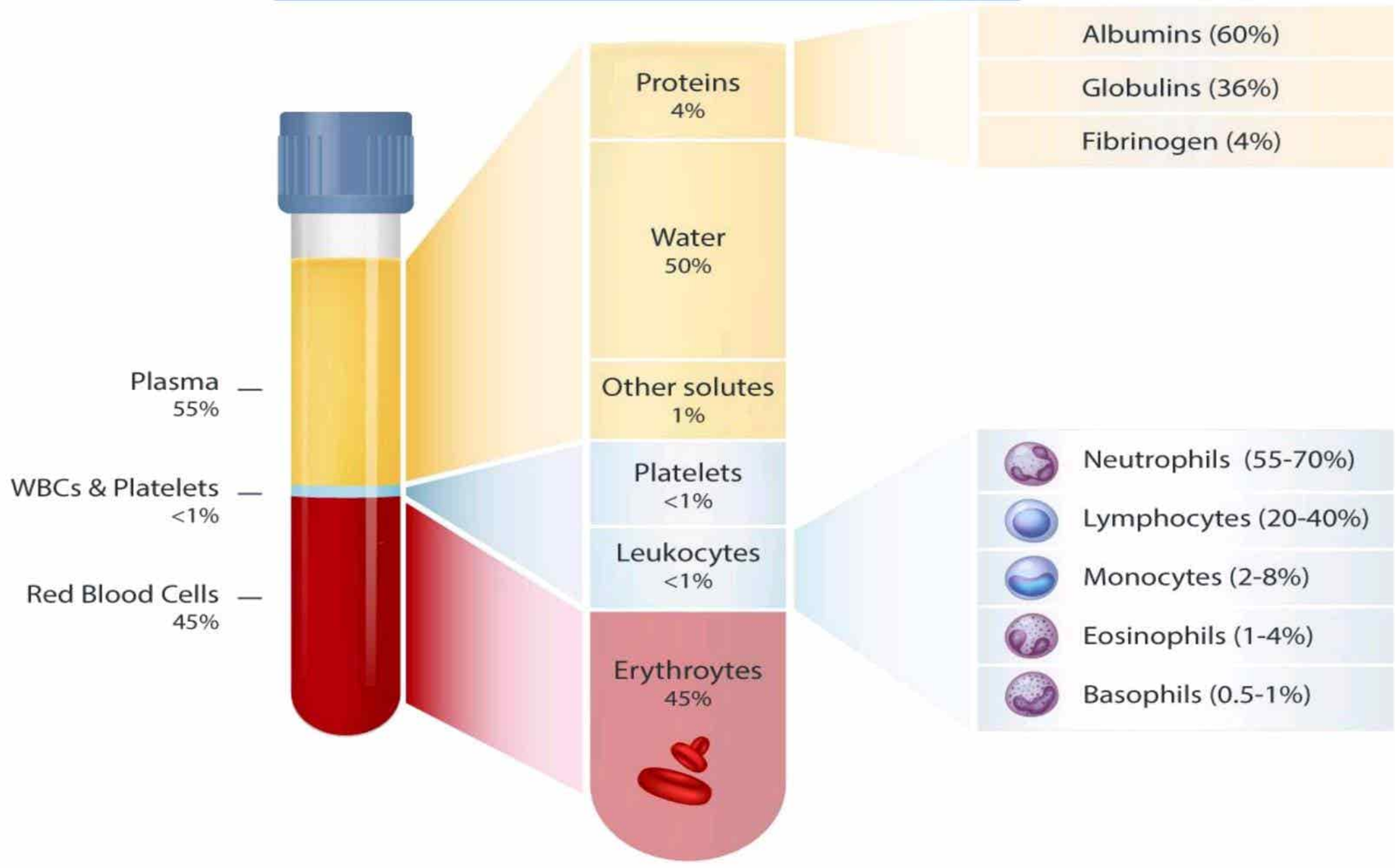
It transports nutrients, gases, hormones and wastes to and from cells, helps fight diseases and helps stabilize body temperature and pH to maintain homeostasis.

Like other vertebrates, humans have a closed blood circulatory system (meaning that the blood never leaves the network of arteries, veins and capillaries). The main components of the human blood circulatory system are the blood, the heart, and the blood vessels.

Q23: ***How many types of cells are found in blood? Write two names of these.***

Ans: Average adult body has about, 5 liters of blood. In healthy person, plasma constitutes about 55% and cell or cell like bodies constitute about 45% by volume of the blood.

This diagram is just for information.



Q24: ***State the composition of blood.***

Ans: *Composition of blood:*

Blood is a specialized bodily fluid (considered a specialized form of connective tissue) that is composed of a liquid called blood plasma and blood cells suspended within the plasma. The weight of blood in our body is about 1/12th *of our body. The average adult has a blood volume of roughly* 5 *liters.*

In a healthy person, plasma constitutes about 55 % *by volume of the blood, and cells or cell-like bodies about* 45 % *by volume of the blood.*

Q25: ***What is plasma? How is it separated from blood?***

Ans: *Plasma:*

Plasma is a part of blood. It is primarily water in which proteins, salts ions, metabolites and wastes are dissolved. Water constitutes about 90 – 92% *of plasma.* 8 - 10% *of plasma is dissolved substances.*

Separation of plasma from blood:

Blood is taken from an artery and an anticoagulant (a chemical that inhibits clotting) is mixed in it. After about 5 *minutes, plasma separate from blood cells. Plasma floats over blood cells.*

Q26: ***Write the name of any two plasma proteins.***

Ans: *Proteins make* 7–9% *by weight of plants. The important proteins present in plasma are antibodies, fibrinogen (blood clothing protein), albumin (maintains the water balance of blood) etc.*

Q27: ***Describe role of fibrinogen and albumin in blood.***

Ans: *Fibrinogen is a blood clotting protein while albumin maintains the water balance in the blood.*

Q28: ***Why the white substance called pus seen at infection sites?***

Ans: *Macrophages (produced by monocytes) and neutrophils die in the process of killing the germs. Their dead cells accumulate and make the white substance called pus, seen at infection sites.*

Q29: ***Which blood cells are the most numerous in healthy human blood?***

Ans: Red blood cells.

Q30: ***How much thalassemia patients that require blood transfusions for lifetime in Pakistan?***

Ans: There are about 60–80 million people in the world who carry the beta thalassemia, India, Pakistan and Iran are seeing a large increase of thalassemia patients that require blood transfusions for lifetime.

Q31: ***How many human blood group systems are now recognized by (ISBT)?***

Ans: A total of 29 human blood group systems are now recognized by International Society of Blood Transfusion (ISBT).

Q32: ***Why strict blood transfusion standards should be adopted?***

Ans: A number of infectious diseases (such as AIDS, hepatitis B and hepatitis C etc.) can be passed from the affected donor to recipient. Strict blood transfusion standards are observed e.g. screening of donors blood for the presence of germs etc.

Q33: ***What are red blood cells? Write their number in human blood.***

Ans: These are most numerous blood cells. These cells have nucleus when formed. In the mature RBCs of mammals, the nucleus, mitochondria, endoplasmic reticulum etc. are lost.

Number in human blood:

A cubic millimeter of contains 5 to 5.5 million red blood cells in males and 4 to 4.5 million in females.

Formation:

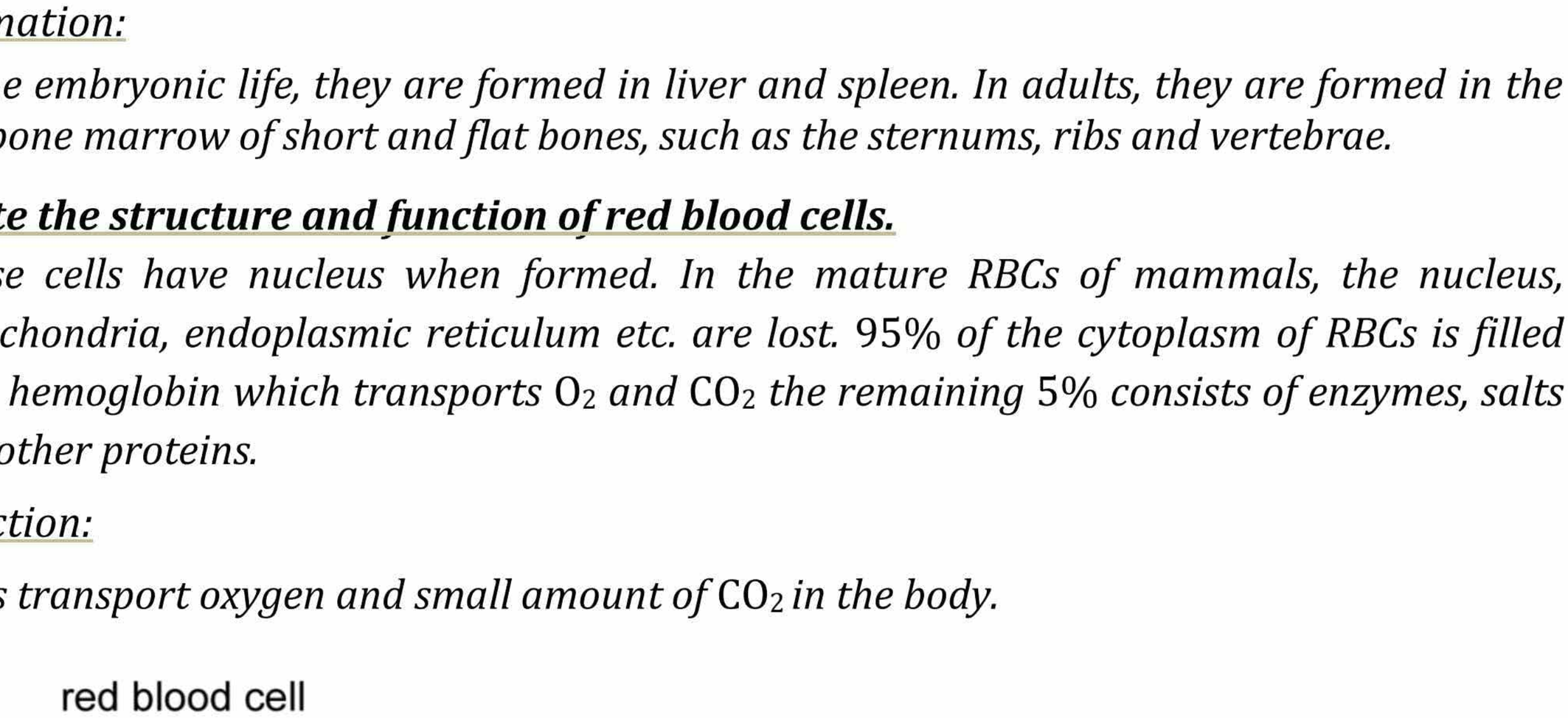
In the embryonic life, they are formed in liver and spleen. In adults, they are formed in the red bone marrow of short and flat bones, such as the sternums, ribs and vertebrae.

Q34: ***Write the structure and function of red blood cells.***

Ans: These cells have nucleus when formed. In the mature RBCs of mammals, the nucleus, mitochondria, endoplasmic reticulum etc. are lost. 95% of the cytoplasm of RBCs is filled with hemoglobin which transports O_2 and CO_2 the remaining 5% consists of enzymes, salts and other proteins.

Function:

RBCs transport oxygen and small amount of CO_2 in the body.



Q35: ***Name the muscles which are involuntary in action.***

Ans: Cardiac muscles are involuntary in action and are composed of branched striated cells, each with a single nucleus.

Q36: ***Why the heart is usually felt to be on the left side?***

Ans: *The heart is usually felt to be on the left side because the left chamber of the heart i.e. (left ventricle) is stronger (it pumps blood to all body parts).*

Q37: ***Gives evidence that the structures of the parts of heart are adaptive to their functions.***

Ans: *The walls of left ventricle are the thickest one. These are about a half- inch thick. They have enough force to push blood into the body. This gives evidence that the structures of the parts of heart are adaptive to their functions.*

Q38: ***How much white blood cells are present in the body and what are their functions?***

Ans: *The average number of white blood cells is* 7000 *to* 8000 *per millimeter cube of blood. They play important role in body's defense system by engulfing small particles, release anticoagulants or produce antibodies.*

Q39: ***Write two main types of white blood cells.***

Ans: *Leukocytes are divided into two main types.*

- *Granulocytes*
- *Agranulocytes*

Q40: ***What is difference between granulocytes and agranulocytes.***

Ans: *The difference between granulocytes and agranulocytes is:*

Granulocytes	***Agranulocytes***
Granulocytes are the leukocytes with granular cytoplasm. These include neutrophils, eosinophil and basophils.	*Agranulocytes are the leukocytes with clear cytoplasm. These include monocytes and lymphocytes (B & T lymphocytes).*

Q41: ***Write the function of neutrophils and basophils.***

Ans: *Neutrophils:*

They destroy small particles by phagocytosis.

Basophils:

The prevent blood clotting.

Q42: ***Write the function of* T *and* B *lymphocytes.***

Ans: *Lymphocytes are agranulocytes. They are of two types. These are* B *lymphocytes and* T *lymphocytes which produce antibodies and kill germs.*

Q43: ***You see pus at the site of infection on your skin. How is it formed?***

Ans: *White blood cells die in process of killing germs. These dead cells accumulate make with substance called pus.*

Q44: ***What are Platelets or mega karyocytes?***

Ans: *They are not cells, but are fragment of cells of bone marrow called mega karyocytes. They do not have any nucleus any pigment. Once cubic millimeter of blood contains* 250000 *platelets. The average life span of a blood platelet is about* 7 *to* 8 *days.*

They play an important role in blood clotting. The clot serves as a temporary seal at the damaged area.

Q45: ***What do you know about leukaemia?***

Ans: *Leukaemia is the production of great number of immature and abnormal white blood cells.*

Causes of leukaemia:

It is caused by a cancerous mutation in bone marrow or lymph tissue cells and results in uncontrolled production of WBCs.

Q46: ***What is thalassaemia?***

Ans: *It is also called Cooley's anaemia on the name of Thomas B, Cooley, and an American Physician. It is a genetic problem due to mutation in the gene of haemoglobin. Patient cannot transport oxygen properly. The mutation results in the production of defective haemoglobin.*

Treatment:

Blood of patients is to be replaced regularly with normal blood. It can be cured by bone marrow transplantation but it does not give 100% *cure rate.*

Q47: ***Describe the reason of production of defective leucocytes.***

Ans: *It is caused by a cancerous mutation in bone marrow or lymph tissue cells and results in uncontrolled production of WBCs.*

Q48: ***Write the names of two diseases of blood.***

Ans: *There are many types of blood disorders including:*

- *Bleeding disorders (Haemophilia)*
- *Leukaemia (Blood cancer)*
- *Thalassaemia (Cooley's Anaemia)*

Q49: ***When and who discovered ABO blood group system?***

Ans: *It was discovered by, the Austrian scientist Karl Landsteiner, in* 1900.

Q50: ***What is the difference between universal donors and universal recipients?***

Ans: *The difference between universal donors and universal recipients is:*

Universal donor	***Universal Recipients***
O blood group individuals are called universal donors, because they can donate blood to the recipients of every other blood group.	*AB blood group individuals are called universal recipients, because they can receive transfusions from the donors of every other blood group.*

Q51: ***Why O blood group individuals are called universal donors?***

Ans: *O blood group individuals are called universal donors because they can donate blood to the recipients of every other blood group.*

Q52: ***What is meant by blood group system?***

Ans: *Blood group systems are a classification of blood, based on presence or absence of antigens on the surface of RBCS. A total of* 29 *human blood group systems are now recognized by International Society of Blood Transfusion (ISBT).*

Q53: ***What is meant by ABO and Rh blood group system?***

Ans: *ABO:*

ABO blood group system was discovered by the Austrian scientist Karl Landsteiner in 1900.

There are four different blood groups in this system. These groups are distinct from each other on the basis of specific antigens (antigen A and B). These antigens are present on the surface of RBCs. After birth, two types of antibodies i.e. anti − A and anti − B, antibodies appear in the blood of individuals.

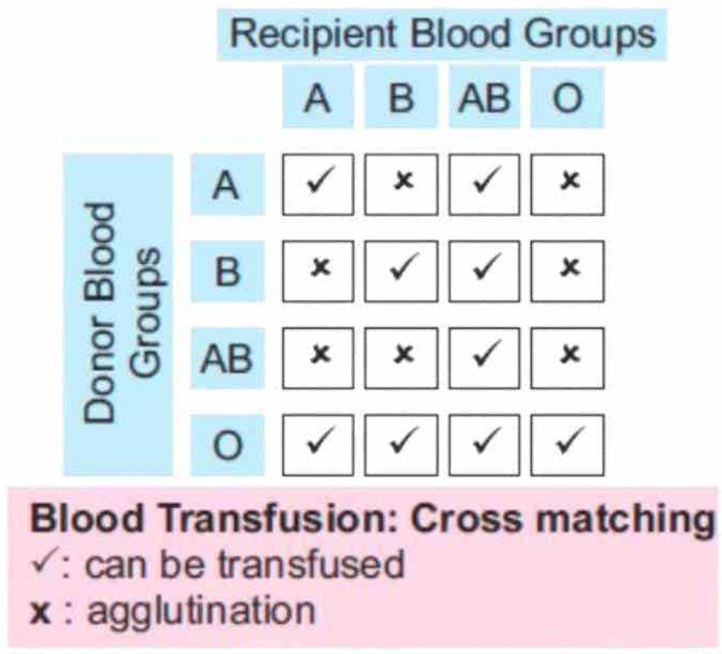
These antibodies are present according to the absence of corresponding antigen.

Rh blood group system:

In 1930's. *Karl Landsteiner discovered the Rh—blood group system.*

In this system, there are two blood groups, i.e. Rh^+ positive and Rh^- negative. These blood groups are distinct on the basis of antigens called Rh factor present on the surface of RBCs. Rh^+ positive blood group can be transfused to Rh^+ positive recipient and Rh^- negative blood group can be transfused to Rh^- negative recipient.

Rh^- Negative blood can be transfused to Rh^+ positive recipient, only if donor's blood (Rh^- negative) has never been exposed to Rh antigens and does not contain any anti Rh antibody.



Q54: ***Why AB blood group individuals are called universal recipients?***

Ans: *AB blood group individuals are called universal recipients, because they can receive transfusions from the donors of every other blood group.*

Q55: ***Differentiate between antigen and antibody.***

Ans: *The difference between antigen and antibody is:*

Antigen	***Antibody***
An antigen is a molecule that can stimulate an immune response (antibody production etc.).	*Antibody is a protective protein produced by the immune system in response to the presence of a foreign substance, called antigen.*

Q56: ***Define closed blood circulatory system and also write two main components of the human blood circulatory system.***

Ans: *A closed circulatory system means a circulatory system in which blood never leaves the network of arteries, veins and capilaries. Human body has closed circulatory system.*

Main components of human blood circulatory system:

- *Blood vessels*
- *The heart (Pumping organ)*
- *Blood (Medium)*

Q57: ***Write down names of two systems of transport of materials in human.***

Ans: *Transport in human body consists of two complex systems:*

- *Lymphatic system*
- *Blood circulatory system (cardiovascular system)*

Q58: ***Write mass and size of heart in normal adults.***

Ans: *In normal adults, mass of heart is* $250 - 350$ g *and size is equal to clenched fist.*

Q59: ***How does human heart work as a double pump?***

Ans: It works as a double pump. It receives deoxygenated (with less oxygen) blood from body and pumps it to lungs. At the same time, it receives oxygenated (with more oxygen) blood. From lungs and pumps it to the whole body.

Q60: ***What is pericardium and pericardial fluid?***

Ans: The heart is enclosed in a sac known as the pericardium. There is a fluid, known as pericardial fluid between the pericardium and the heart walls.

Function of Pericardial fluids:

It reduces friction between the pericardium and the heart during heart contractions.

Q61: ***Describe the location of heart in a human body. Also write the names of ifs chambers.***

Ans: In the human body, the heart is situated between the lungs, in the middle of the chest cavity (thorax) under the breast bone.

The human heart consists of four chambers:

Right and Left Atria:

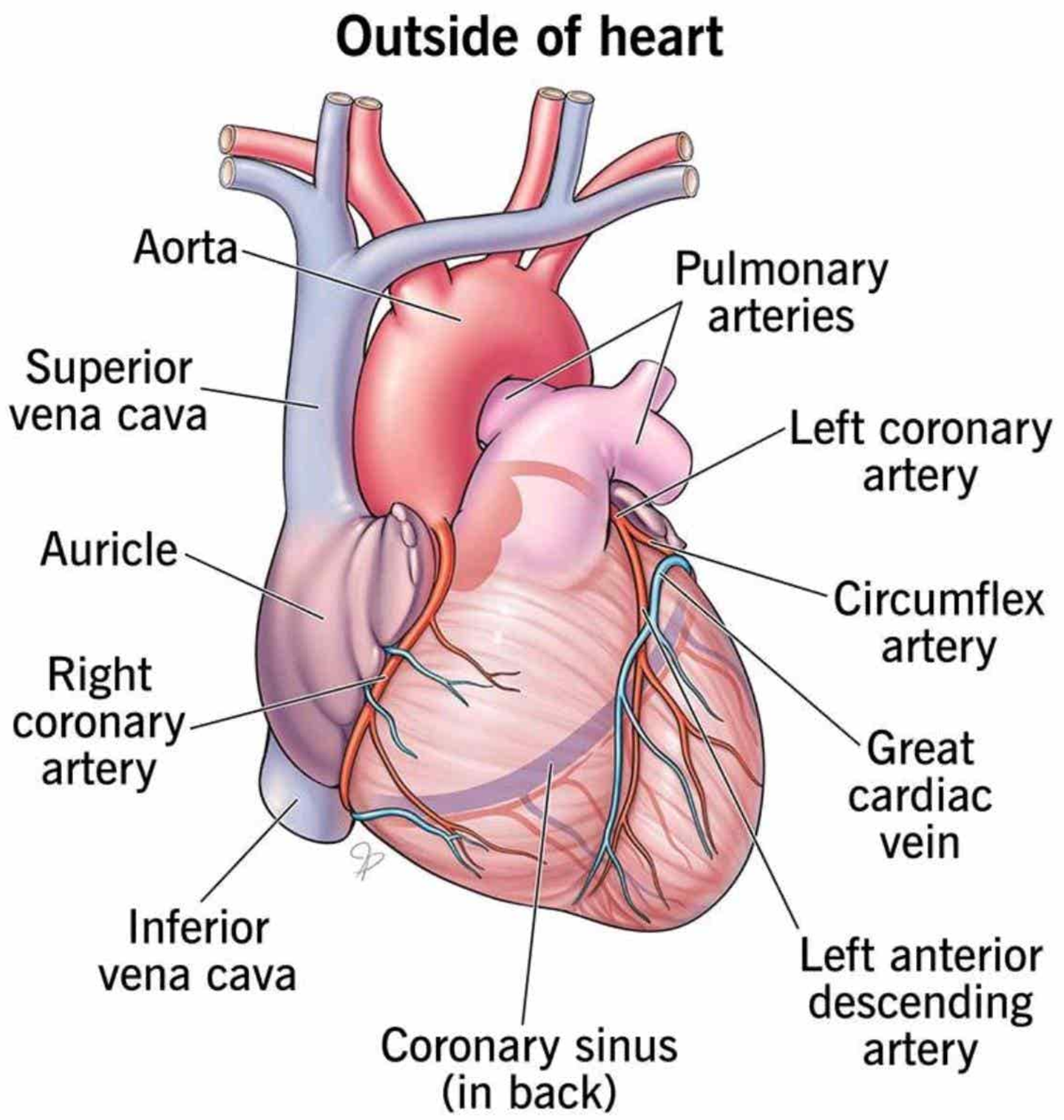
The upper thin walled chambers are called the left and right atria.

Both atria are filled simultaneously and they contract together to pump blood to ventricle.

Right and Left Ventricles:

The lower thick walled chambers are called the left and right ventricles.

The left ventricle is the largest and strongest chamber in heart. Both ventricles contract simultaneously to pump the blood out of heart.



Q62: ***Write two achievements of William Harvey.***

Ans: Achievements of William Harvey are:

- *He discovered the pumping action of heart.*
- *He also described the pathway of blood in major arteries and veins.*

Q63: ***Differentiate between bicuspid and tricuspid valve.***

Ans: The difference between bicuspid and tricuspid valve is:

Bicuspid valve	Tricuspid Valve
An opening is present between the left atrium and the left ventricle. It is guarded by a valve called bicuspid valve.	There is opening between the right atrium and the right ventricle. It is guarded by a valve called tricuspid valve. It has three flaps.

Q64: **Differentiate between systemic circulation and pulmonary circulation.**

Ans: The difference between systemic circulation and pulmonary circulation is:

Systemic circulation	Pulmonary circulation
The path way on which oxygenated blood is carried from the heart to the body tissues and in return deoxygenated blood is carried from the body tissues to the heart is called systemic circulation or circuit.	The path way on which deoxygenated blood is carried from the heart to the lungs and in return oxygenated blood is carried from the lungs to the heart is called pulmonary circulation or circuit.

Q65: **How "lubb–dubb" sound is produced during heart beat?**

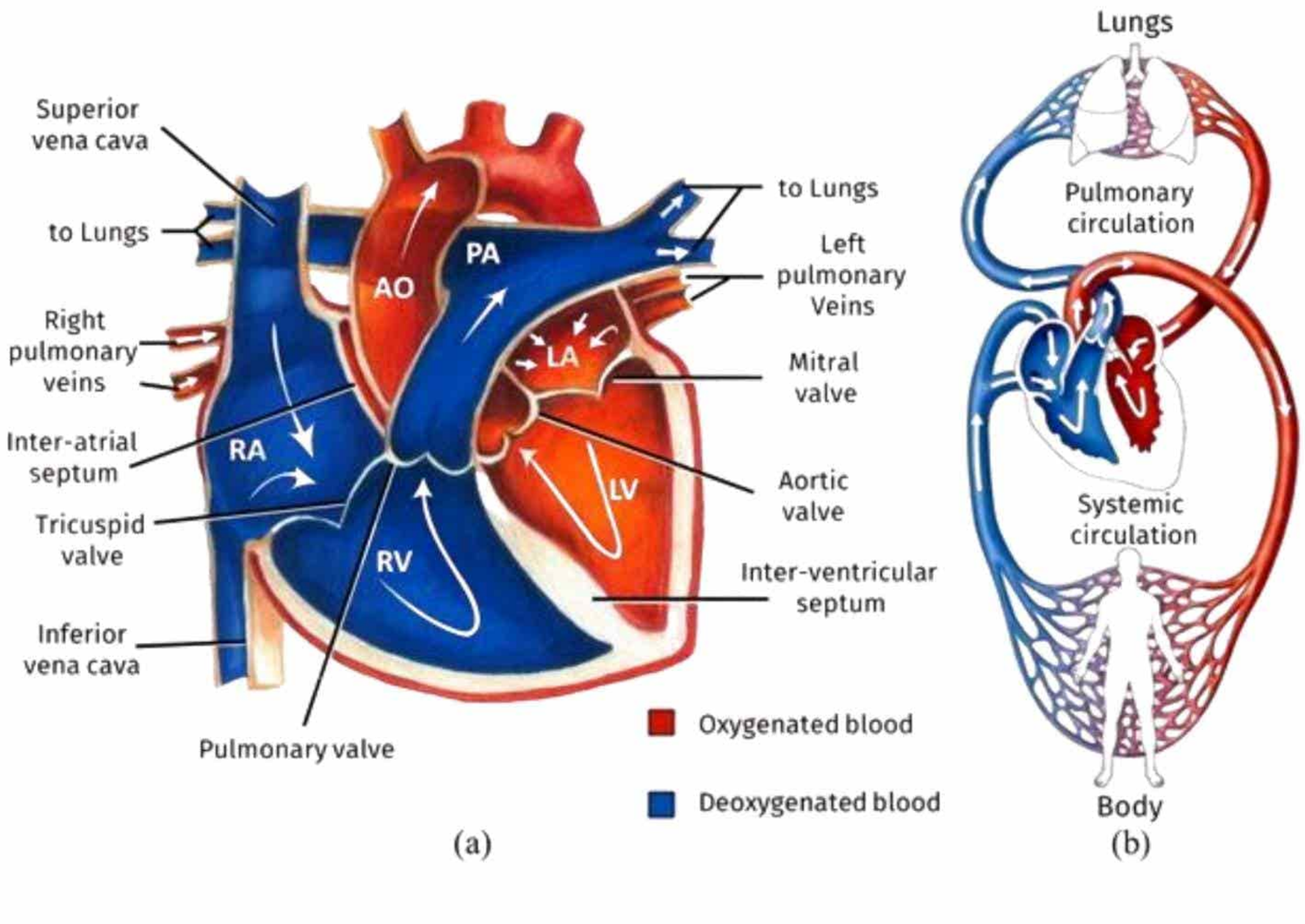
Ans: When ventricles contract, the tricuspid and bicuspid and bicuspid valves close and "lubb" sounds is produced.

Similarly when ventricles relax. The semi lunar valves close and "dub" sound is produced. "Lubb–dubb" can be heard with the help of a stethoscope.

Q66: **State the function of Heartbeat and explain the complete cardiac cycle.**

Ans: Heartbeat:

The relaxation of heart chambers fills them with blood and contraction of chambers propels the blood out of them. The alternating relaxations and contractions make up the cardiac cycle and one complete cardiac cycle makes one heartbeat.



Steps involved in complete cardiac cycle:

The complete cardiac cycle consists of following steps.

Cardiac diastole:

The atria and ventricles relax and blood is filled in aria this is called cardiac diastole

Atrial systole:

Immediately after the filling of atria, both atria contract and pump the blood towards ventricles. This period in cardiac cycle is called atrial systole.

Ventricular Systole:

When both ventricles contract and pump the blood towards body and lungs, the period of ventricular contraction is called ventricular systole.

Duration during one heartbeat:

In one heartbeat, diastole lasts about 0.4 *sec, atrial systole about* 0.1 *sec, and the ventricular systole lasts about* 0.3 *sec.*

Lubb–dubb:

When ventricles contract the tricuspid and bicuspid valves and "lubb" sound is produced. Similarly, when ventricles relax, the semilunar close and "dubb sound is produced. "Lubb–dubb" can be heard with the help of stethoscope.

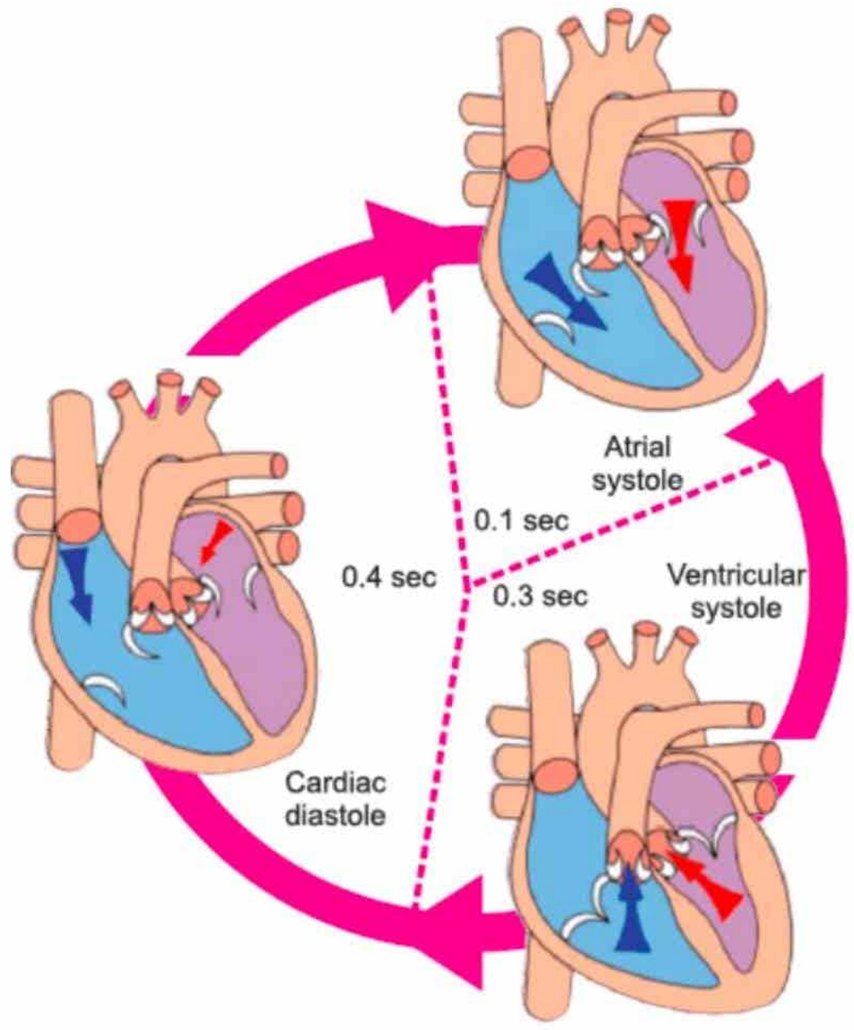


Figure One cardiac cycle

Q67: ***How can we measure the Heart rate and Pulse rate?***

Ans: *Heart rate and Pulse rate:*

The heart rate is the number of times the heart beats per minute. A resting heart rate anywhere between 60 *and* 90 *(*70 *is average) is considered in the normal range. The heart rate fluctuates a lot depending on factors such as activity level and stress level.*

Measurement of Heart rate and Pulse rate:

The heart rate can be measured by feeling the pulse. Pulse is the rhythmic expansion and contraction of an artery as blood is forced through it by the regular contractions of the heart. The pulse can be felt at the areas where to the skin for example at the wrist, neck, groin or top of the foot. Most commonly, people measure their pulse in their wrist.

Q68: ***Write function of stethoscope.***

Ans: *Stethoscope is medical instrument used for listening sounds produced within the body, chiefly in the heart or lungs.*

Q69: ***Differentiate between systole and diastole.***

Ans: *The difference between systole and diastole is:*

Systole	***Diastole***
Immediately after the filling of atria, both atria contract and pump the blood towards ventricles. This period in cardiac cycle is called atrial systole. When both ventricles contract and pump the blood towards body and lungs, the period of ventricular contraction is called ventricular systole.	*The atria and ventricles relax and blood is filled in atria. This period is called cardiac diastole.*

Q70: ***What is meant by pulse and pulse rate?***

Ans: *Pulse is the rhythmic expansion and contraction of an artery as blood is forced through it by the regular contractions of the heart.*

Measurement areas of Pulse:

The pulse can be felt at the areas where the artery is close to the skin for example at wrist, neck, groin or the top the foot. Most commonly, people measure their pulse in their wrist.

Q71: ***What is meant by heart beat?***

Ans: *The alternating relaxations and contractions of chambers of heart make up the cardiac cycle and one complete cardiac cycle makes one heartbeat.*

Q72: ***What is meant by cardiac cycle? Write the names of its main steps.***

Ans: *The alternating relaxations and contractions of chambers of heart make up the cardiac cycle and one complete cardiac cycle makes one heartbeat.*

Steps of Cardiac Cycle:

Cardiac cycle consists of following three steps.

- *Atrial Systole*
- *Ventricular Systole*
- *Cardiac diastole*

Q73: ***What are capillaries?***

Ans: *Capillaries are the smallest blood vessels which are formed by the divisions of arterioles. The walls of capillaries are composed of only a single layer of cells, the endothelium.*

Q74: ***State the function of blood vessels.***

Ans: *Blood vessels:*

The third part of the blood circulatory system is the blood vessels, which function to transport blood throughout the body. The most important vessels in the system are the arteries, veins, and capillaries.

This diagram is just for information.

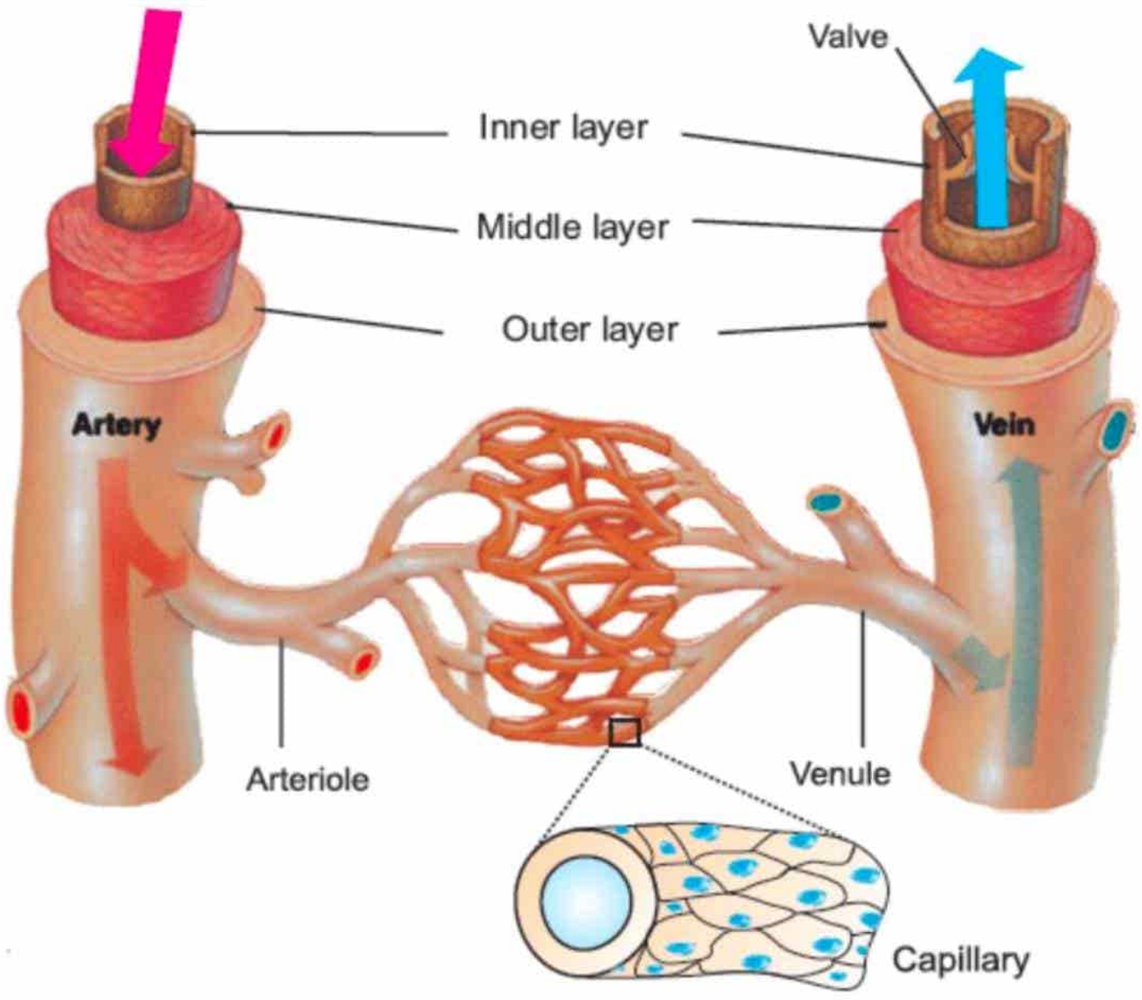


Figure Blood vessels

Q75: ***Write differences between arteries and veins.***

Ans: *The difference between arteries and veins is:*

Arteries	***Veins***
➢ *Arteries are carry blood away from heart.*	➢ *Veins are carry blood towards heart.*
➢ *Arteries have thickness and elasticity in walls.*	➢ *Veins are thin and less elastic.*
➢ *Muscles in arteries walls are thick.*	➢ *Muscles in veins walls are thin.*
➢ *In arteries blood pressure is high BP.*	➢ *In veins blood pressure is low BP.*
➢ *In arteries no valves.*	➢ *In veins vales present.*

Q76: ***Write down name of vessels found in vascular system.***

Ans: *Arteries, veins and capillaries are vessels found in vascular system.*

Q77: ***What is the function of vascular surgery?***

Ans: *Vascular surgery:*

Vascular surgery is a field in surgery in which diseases of arteries and veins (like thrombosis etc.) are managed by surgical methods. A vascular Surgeon treats the diseases of all parts of the vascular system except that of the heart and brain.

Q78: ***What is myocardial infarction?***

Ans: *The term myocardial infarction is derived from myocardium (heart muscle) and infraction (tissue death). It is commonly known as heart attack.*

Symptoms:

- *Severe chest pain is the most common symptom of heart attack.*
- *Loss of consciousness and even sudden death can occur in myocardial infarction.*
- *It often describes as a sensation of tightness, pressure of squeezing.*
- *Pain radiates, most often to left arm but may also radiate to lower jaw, neck, right arm and back.*

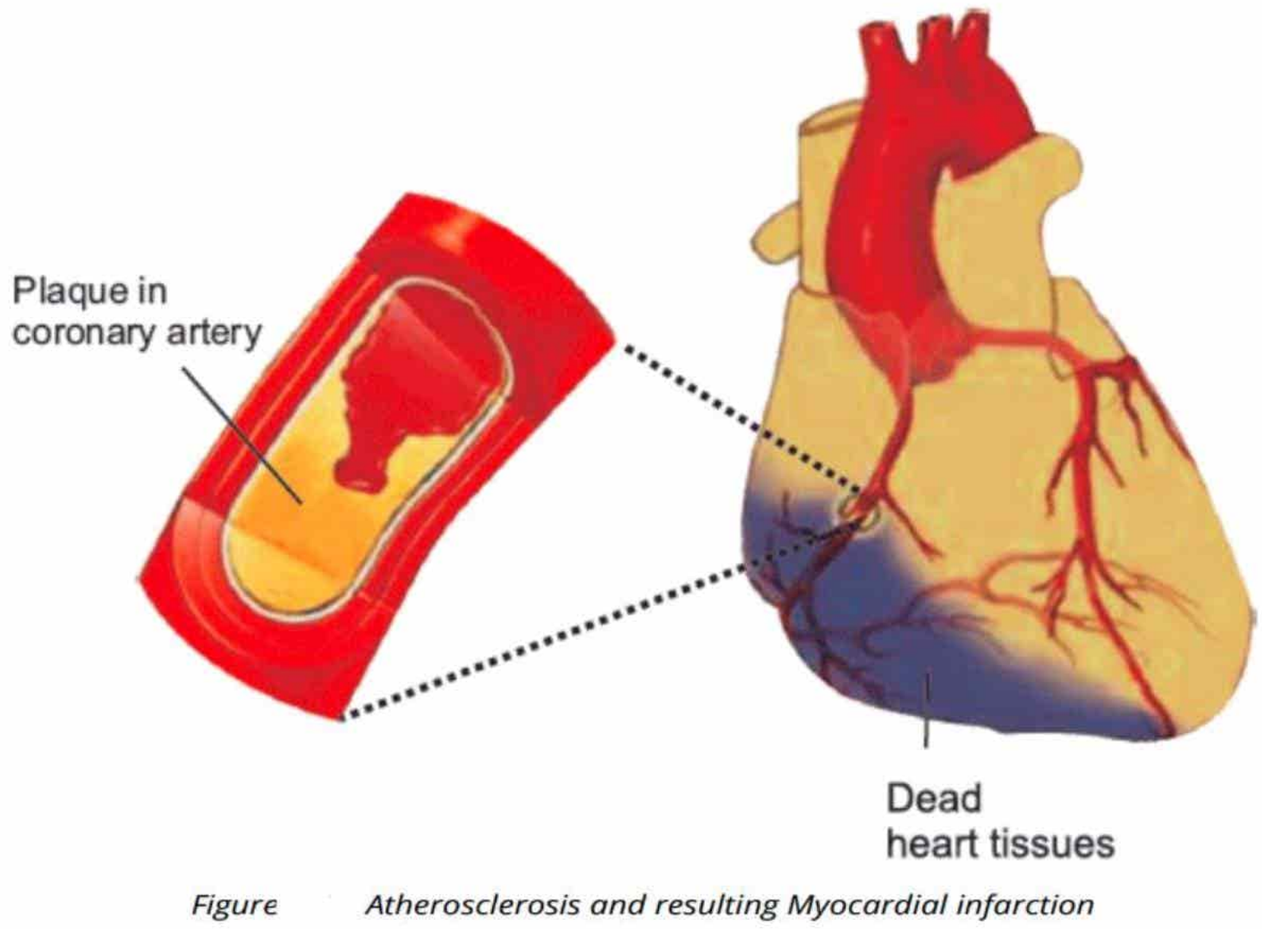


Figure Atherosclerosis and resulting Myocardial infarction

Q79: ***Write causes of cardio vascular disorders.***

Ans: *The causes of cardio vascular disorders:*

- *Diabetes*
- *Advanced age*
- *Tobacco smoking*
- *High blood pressure (Hypertension)*
- *Obesity*
- *Sedentary lifestyle*
- *High blood concentration of low density lipids (e.g. cholesterol) and triglycerides.*

Q80: ***What do you know about vascular surgeon and vascular surgery?*** ***OR***
Differentiate between vascular surgeon and vascular surgery.

Ans: *The difference between vascular surgeon and vascular surgery is:*

Vascular surgery	***Vascular Surgeon***
Vascular surgery is a field in surgery in which diseases of arteries and veins are managed by surgical methods.	*A vascular surgeon treats disease of all parts of blood circulatory system except that of heart and brain.*

Q81: ***What is angina pectoris? Write its symptoms.***

Ans: *Angina pectoris means "chest pain" occurs for reason similar of those which cause heart attack. But it is not as severe as heart attack.*

Symptoms angina pectoris:

The pain may occur in heart and often in left arm and shoulder. It is a warming sign that the blood supply to the heart muscles is not sufficient but the shortage is not enough to cause tissue death.

Q82: ***Differentiate between atherosclerosis and arteriosclerosis.***

Ans: *The difference between atherosclerosis and arteriosclerosis is:*

Atherosclerosis	Arteriosclerosis
Disease affecting arteries, commonly referred to as a narrowing of the arteries is called atherosclerosis.	*Arteriosclerosis is a general term describing any hardening of arteries. It occurs when calcium is deposited in the walls of arteries, it can happen when atherosclerosis is severe.*

Q83: ***Differentiate between thrombus and embolus.***

Ans: *The difference between thrombus and embolus is:*

Thrombus	Embolus
Cholesterol is accumulated in the vessels which results in the formation of multiple deposits called plaques. Plaques can form blood clots called thrombus within arteries.	*If a thrombus dislodges and becomes free floating it is called an embolus.*

Q84: ***What is the difference between angioplasty and bypass surgery?***

Ans: *The difference between angioplasty and bypass surgery is:*

Angioplasty	Bypass surgery
In most cases, myocardial infarction is treated with angioplasty. It is mechanical widening of a narrowed or totally obstructed blood vessel.	*In bypass arteries or veins from elsewhere in the patient's body is grafted to the coronary arteries to improve the blood supply to heart muscles.*

Q85: ***Describe the preventive measures about dengue fever.***

Ans: *Save your body from mosquito bites for this purpose, one should wear long sleeved shirts and trousers. Apply mosquito repellents on the body.*

Q86: ***Write the causes of dengue fever. And describe the symptoms of dengue fever.***

Ans: *Dengue fever is caused by any one of four types of dengue viruses spread by mosquitoes. When a mosquito bites a person infected with a dengue virus, the virus enters the mosquito. When the infected mosquito then bites another person, the virus enters that person's bloodstream.*

The symptoms of dengue fever:

- *Muscle and joint pain*
- *High fever*
- *Skin rashes*
- *Severe headache*

Q87: ***What is dengue fever? How can it be cured?*** ***OR***

Write down the name of mosquito which spread dengue fever.

Ans: Dengue fever is a viral infection transmitted through the mosquito "Aedes Aegypti".

Dengue fever is a viral disease, so there is no specific treatment or cure. However we treat this disease by controlling dehydration and using painkillers like paracetamol. Some time in severe cases intravenous (IV) fluid supplementation and blood transfusion is also required.

Q88: ***Why is dengue fever dangerous?***

Ans: Dengue fever is dangerous for human health because in dengue fever the level of blood platelets becomes low and it results in blood plasma leakage.

In some cases, the blood pressure falls ultimately low and it is risky for life.

Q89: ***What is effect of dengue fever on platelets? And in which regions of the world dengue fever is more common?***

Ans: In dengue fever, there is a sharp decrease in the number of platelets in bloods. Due to this reason, the patient bleeds from nose, gums and under the skin.

Dengue fever is common in tropical, subtropical and moderate climate regions including Philippine, Sri Lanka, Bangladesh, India and Pakistan. This disease has been increasing rapidly in Latin America and the Caribbean.

Q90: ***How does dengue fever spread?***

Ans: Dengue fever is caused by "Aedes Aegypti" mosquito.

This mosquito gets virus when it bites an infected person. Then this infected mosquito bites another person and virus enters in his body and attack white blood cells. In this way Dengue fever spread.

Q91: ***Describe the working of the scientists about the circulation of blood in human body.***

Ans: General plan of human blood circulatory system:

Many scientists worked for discovering the facts about the circulation of blood in human body. Two important scientists who revealed much knowledge of the blood circulatory system were Ibn-e-Nafees and William Harvey.

Ibn-e-Nafees (1210-1286) *was a physician and he is honored as the first scientists who described the pathway of blood circulation. William Harvey* (1578. 1657) *discovered the pumping action of heart and the pathway of blood in major arteries and veins.*

Q92: ***Explain the working of different arteries in arterial system.***

Ans: The Arterial System:

Functions of pulmonary arteries:

The large pulmonary trunk emerges from the right ventricle and divides into night and left pulmonary arteries, which carry the deoxygenated blood to the right and the left lungs.

Functions of aorta:

The oxygenated blood leaving the left ventricle of the heart is carried in a large artery, the aorta. The aorta ascends and forms an aortic arch. The arch curves left and descends interiorly into the body.

From the upper surface of the aortic arch three arteries emerge, which supply blood to head, shoulders and arms. As the aorta passes down through the thorax, it becomes the dorsal aorta. The dorsal aorta gives off many branches and the important ones are listed here.

Function of intercostal arteries:

Several intercostal arteries supply blood to the ribs.

Function of celiac artery and the superior mesenteric artery:

The celiac artery and the superior mesenteric artery supply blood to the digestive tract.

Function of the hepatic artery:

The hepatic artery supplies blood to the liver.

Function of renal arteries:

Inferior to these are a pair of renal arteries that supply the kidneys.

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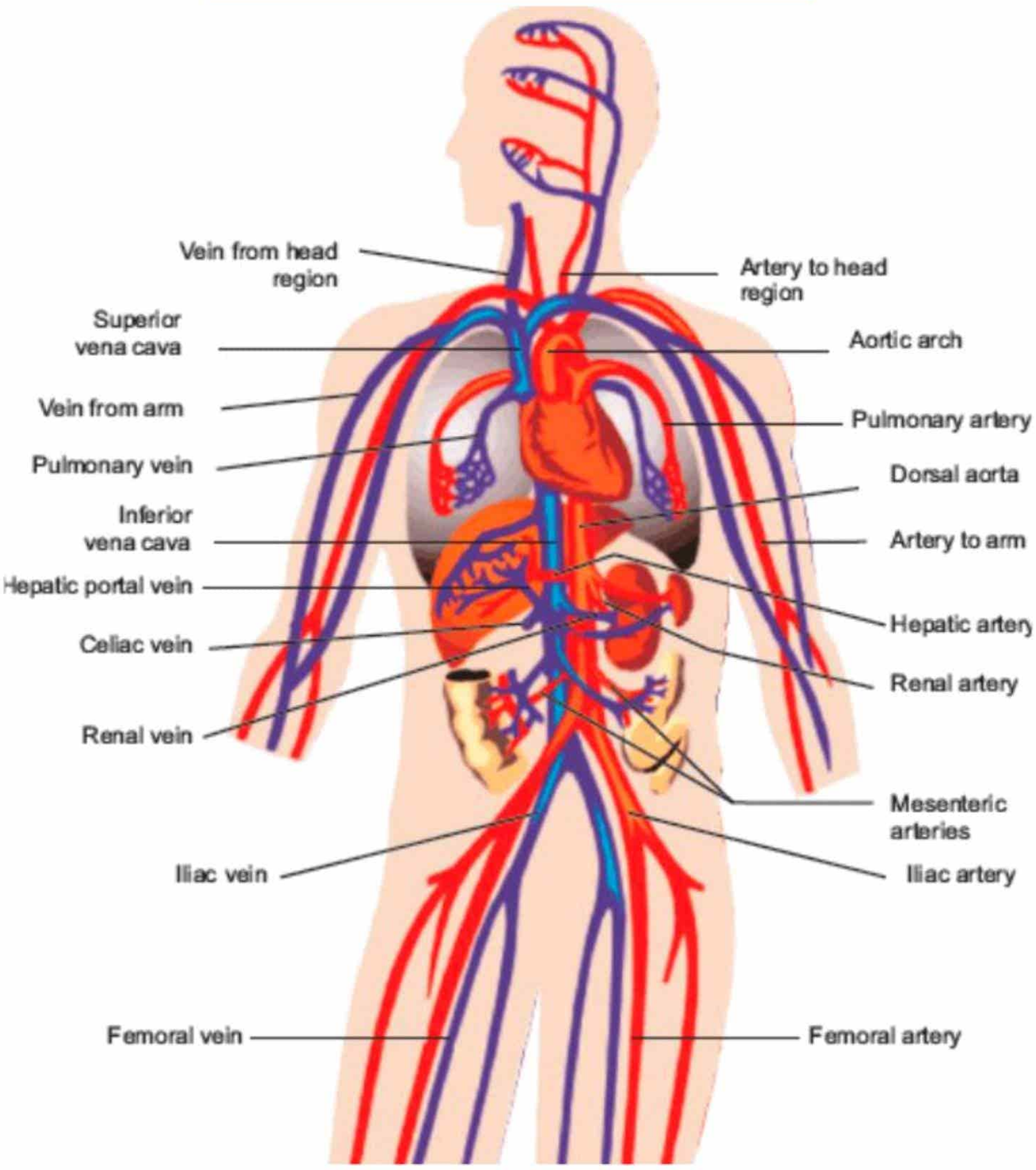

Figure : Major arteries and veins in human body

Chapter : 09 Transport

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Long Questions

Q1: Describe the significance of transpiration. OR
Define Transpiration. What are factors affecting the rate of transpiration? (V.Imp)

Q2: Explain the opening and closing of stomata.

Q3: Write a note on pressure-flow mechanism. OR
Explain source and sink in the light of pressure-flow mechanism. (V.Imp)

Q4: How do plants absorb water and ions? Explain. OR
How would you relate the internal structure of root with the uptake of water and ions?

Q5: Explain the movement of water in terms of transpiration pulls.

Q6: What do you know about ABO blood group system? (V.Imp)

Q7: Where red blood cells are formed in human? Describe their structure and function. OR
Describe red blood cells and white blood cells.

Q8: State the causes and symptoms of leukemia and thallassemia.

Q9: Write a note on blood plasma.

Q10: Write a detailed note on myocardial infarction. (V.Imp)

Q11: What do you know about artereosclerosis and arthereosclerosis?

Q12: Compare the structure and function of artery, vein and capillaries.

Q13: Explain the venous system of man in detail.

Q14: Write a brief note on human arterial system. OR
Write a detail note on blood vessels. (V.Imp)

Q15: Write a detailed note on structure and function of human heart. OR

Q16: What are the four chambers of the human heart? Describe the circulation of blood through these chambers. (V.Imp)

Q17: Human heart acts like a double pump. Explain it. OR

Q18: Write a note on pulmonary and systemic circulation.

Q19: Write a note on heartbeat.