

## VIVEKANANDA MATRICULATION HIGHER SECONDARY SCHOOL -SIRKALI BIOLOGY - CHAPTER WISE - 3 MARKS QUESTION AND ANSWER

### 1. What are the defects of artificial system of classification of plants?

- i) The main defect of this system is that totally unrelated plants are brought together in a single group and those that are closely related are placed in a widely separated groups.
- ii) Another defect of this system was that no importance was given to either natural or phylogenetic relationships amongst different groups of plants.

### 2. Define biosystematics.

Biosystematics may be defined as 'taxonomy of living populations' Camp and Gily coined the term biosystematics.

The characters from the various disciplines of science such as cytology, genetics, physiology, ecology, phytogeography, phytochemistry, numerical taxonomy and molecular biology are considered.

### 3. What is binomial nomenclature?

In binomial nomenclature, every plant is called by two names. i.e., genus name and species name.

For example, the binomial nomenclature of mango tree is *Mangifera indica*.

### 4. Write the objectives of classification of plants.

- i) The ultimate aim of classification is to arrange plants in an orderly sequence based upon their similarities. The closely related plants are kept within a group and unrelated plants are kept far apart in separate groups.
- ii) The other aim of classification is to establish phylogenetic relationships amongst the different groups of plants.

### 5. Write the aims of biosystematics.

- i) To delimit the naturally occurring biotic community of plant species.
- ii) To recognise the various groups as separate biosystematics categories such as ecospecies, ecotypes, cenospecies and comparium.

### 6. What is called Nomen ambiguum?

If naming the plant is from a source of error, it is regarded ambiguous name. It is also called nomen ambiguum and is complete ignored from use.

### 7. What is meant by polynomial? Give an example.

Polynomials were composed of several words in series constituting more or less the description of the plant. This can be illustrated with the example of *Caryophyllum*. The name given was *Caryophyllum saxatilis folis gramineus umbellatis corymbis* meaning *Caryophyllum* growing on rocks, having grass like leaves with umbellate corymbose inflorescence.

### 8. Define -Type specimen. (March '06)

When new names are given to any plant, then the herbarium preparation of the same specimen with its original description is preserved in any recognised herbarium. This specimen is denoted as type specimen. It is to be preserved on herbarium sheet.

**9. What is called author citation? Give an example. (june '09)**

The person who publishes the description of any plant for the first time or giving a new name to a plant should be considered as author. Thus, the name of the plant should bear the author's abbreviated name at the end of specific epithet. This is called author citation.  
Eg. *Malva sylvestris*, Linn.

**10. What is tautonym?**

If the generic and specific names are the same, it is called tautonym.  
E.g., *Sassafras sassafras*. Such names are not accepted in the system of nomenclature.

**HERBARIUM****1. Define herbarium.**

Herbarium is a collection of pressed, dried plants specimens mounted on specified sheets, identified and arranged in the order of an approved and well known system of classification. It also refers to the institution where dried plant specimens are maintained and studied. e.g., Herbarium of Botanical Survey of India, Coimbatore.

**2. Write the precautions or any measures to be taken to preserve herbarium.**

If the specimens in the herbarium are handled with special care, they will be in good condition for a long time. Precautions should be taken against attacks of fungi and insect. It is always better to use chemicals, which can repel the insects from herbarium specimens.

**BENTHAM AND HOOKER'S SYSTEM****1. Write the countries which still follow the Bentham and Hooker's classification of plants.**

Even today this system is being followed in India, United kingdom and several other Commonwealth countries.

**2. What are the three classes of phanerogams?**

The phanerogams are divided into three classes - Dicotyledons, Gymnospermae and Monocotyledons.

**3. Write the families of Gymnospermae as in Bentham and Hooker's classification of plants.**

Gymnospermae includes three families - Cycadaceae, Coniferae and Gnetales.

**4. What is polypetalae?**

Plants having flowers with free petals come under sub-class polypetalae. The flowers are with distinct calyx and corolla. It is further divided into three series - Thalamiflorae, Disciflorae and Calyciflorae.

**5. Write short notes on Monochlamydeae.**

Plants having flowers with single whorl of perianth are placed under Monochlamydeae. Flowers are incomplete. The sepals and petals are not distinct. Calyx or corolla is absent, sometimes both are absent.

**6. Briefly mention the systematic position of Laurineae.**

Class	:	Dicotyledons
Sub-class	:	Monochlamydeae
Series	:	Daphnales
Family	:	Laurineae

**7. Mention the deserving positions of podostemaceae and Laurineae.**

Podostemaceae of series Multiopvuatae aquaticae of Monochlamydeae deserves a place in Rosales of the series Calyciflorae of polypetalae. Similarly Laurineae of series Daphnales of Monochlamydeae deserves a place in Ranales of the series Thalamiflorae of polypetalae.

**8. Write any three merits of Bentham and Hooker's classification.**

1. Bentham and Hooker's classification is the most natural system, based on actual examination of specimens.
2. The description of plants is quite accurate and reliable.
3. As it is easy to follow, it is used as a key for the identification of plants in Kew herbarium and several other herbaria of the world.

**MALVACEAE**

**1. Mention the systematic position of Malvaceae.**

Systematic position :	Dicotyledons
Sub-class :	polypetalae.
Series :	Thalamiflorae
Order :	Malvales
Family :	Malvaceae

**2. What is epicalyx? Give examples.**

Bracteoles forming a whorl outer to calyx is called epicalyx. Bracteoles-3 in *Malva sylvestris*, 5 to 8 in *Hibiscus rosa-sinensis*, 10 to 12 in *Pavonia odorata* and absent in *Abutilon indicum*.

**3. Write note on androecium of Hibiscus rosa-sinensis.**

Numerous stamens, monodelphous, filaments are fused to form a staminal tube around the style. Staminal tube is red. Anthers are monothealous, reniform, yellow, transversely attached to the filament, dehisce transversely and extrose.

**4. Describe the gynoecium of Hibiscus rosa-sinensis.**

Hypogynous, Pentacarpellary, syncarpous, pentalocular with many ovules per locule on axile placentation. style simple, long, slender and passes through the staminal tube. Stigma 5, Captitate and coloured.

**5. Name any three fibre plants of Malvaceae.**

*Gossypium barbadense* (Egyptian cotton), *G. hirsutum*, *G. herbaceum* and several other species of *Gossypium* yield cotton fibres of commercial value. The fibres are obtained from the surface of seeds.

*Hibiscus cannabinus* (Deccan hemp) yields bast fibres which are used for making ropes.

**6. Mention the binomial of any two medicinal plants of Malvaceae.**

Abutilon indicum and Malva sylvestris – Roots and leaves of these plants are used against fever. Althea rosea – roots of this plant are used for treating dysentery.

**7. Mention any four food plants of Malvaceae.**

1. Abelmoschus esculentus – (Lady,s finger) tender fruits are used as vegetable
2. Hibiscus sabdariffa – leaves and sepals of these plants used for making pickles, jam and jelly.
3. H.Cannabinus and H.Sabdariffa- leaves and sepals of these plant are used for preparing delicious chutney.

**SOLANACEAE**

**1. Give the systematic position of Solanaceae.**

Systematic position:

Class	:	Dicotyledons
Sub-class	:	Gamopetalae
Series	:	Bicarpellatae
Order	:	Polemoniales.
Family	:	Solanaceae

**2. Write a note on the inflorescence of Solanaceae.**

Solitary, axillary cyme (e.g. Datura Stramonium) or extra axillary scorpioid cyme called rhipidium (fan shaped cyme) as in S. nigrum or helicoid cyme as in S. tuberosum or umbellate cyme as in withania somnifera.

**3. Describe the gynoecium of members of solanaceae.**

Hypogynous, bicarpellary, syncarpous, bilocular, carples, obliquely placed and ovules on axile placentation. In Datura species, bilocule becomes tetralocular by the formation of false septa. Style simple and undivided. Stigma bifid or capitate.

**4. Name the food plants of Solanaceae.**

1. Solanum tuberosum (potato)
2. Solanum melongena (brinjal)
3. Solanum lycopersicum (tomato)

**5. Mention any four medicinal plants of Solanaceae.**

Atropa belladonna	-	atropine
Datura stramonium	-	Stramonium
Solanum trilobatum	-	thoodhuvalai
Withania somnifera	-	ashwaganda

**6. What is atropine?**

Roots of Atropa belladonna yield a powerful alkaloid 'atropine' it is used for relieving muscular pain.

## EUPHORBIACEAE

### 1. Write the systematic position of Euphorbiaceae.

**Systematic position:**

Class	:	Dicotyledons
Sub-class	:	Monochlamydeae
Series	:	Unisexuales
Family	:	Euphorbiaceae

### 2. What is a cladode? Give examples.

In several species of Euphorbia, the stem is modified to perform photosynthesis. This modified stem is called cladode and it resembles cactus. E.g., E. tirucalli and E. antiquoerum

### 3. Write are the different types of inflorescences seen in Euphorbiaceae? Give example for each.

- |                  |   |                     |
|------------------|---|---------------------|
| 1. Panicle       | - | Ricinus communis    |
| 2. Simple raceme | - | Croton sparsiflorus |
| 3. Catkin        | - | Acalypha indica     |
| 4. Solitary      | - | Phyllanthus niruri  |

### 4. What is panicle? Give an example.

In Ricinus communis, it is a panicle where female and male flowers are arranged in racemose manner. Female flowers are at the top and male flowers below.

### 5. Describe the cyathium.

The characteristic inflorescence of Euphorbia is cyathium.

It is a collection of unisexual flowers arranged in cymose manner on a condensed axis and enclosed within a cup-shaped involucre.

Each cyathium has a single central female flower surrounded by two to many male flowers. Each male flower is represented by a single stamen. They are arranged in centrifugal manner. Nectar secreting gland is also located in the cyathium.

### 6. Describe the inflorescence of Ricinus communis.

Compound raceme or panicle and terminal. Male flowers are seen below and female flowers near the apex.

## MUSACEAE

### 1. Write the systematic position of Musaceae.

**Systematic position:**

Class	:	Monocotyledons
Series	:	Epigynae
Family	:	Musaceae

### 2. What is polygamous ? Give an example.

In Musa, the flowers are polygamous i.e. staminate flowers, pistillate flowers and bisexual flowers are present in the same plant. The male flowers lie within the upper bracts, the female flowers within the lower bracts and the bisexual flowers within the middle bracts.

### 3. What is monocarpic perennial ? Give an example.

Musa is a monocarpic perennial, because it produces flowers and fruits once during its life time.

### 5. Explain the gynoecium of *Musa paradisiaca*.

Ovary inferior, tricarpellary, syncarpous, trilocular, numerous ovules on axile placentation. The style is simple and filiform. The stigma is three lobed.

### 6. Draw the floral diagram of bisexual flower of *Musa paradisiaca* and write floral formula.

### 7. What is pseudostem? How is it formed in *Musa paradisiaca* ?

In *Musa* the real stem is underground called rhizome. The apparent, unbranched, erect and areal pseudostem is formed by the long, stiff and sheathy leaf bases which are rolled around one another to form an aerial pseudostem.

### 8. List out the economic importance of *Musa paradisiaca*.

#### 1. Food plants

The fruits of *Musa paradisiaca* (Banana) are edible. The tender green bananas, the shaft and the flowers are cooked and eaten as vegetable. The leaves are commonly used as plates on festive occasions. The sap obtained from the sheathy leaf bases is considered to be an antidote for cobra bite. The small fruits obtained from *Musa chinensis* (Dwarf banana) are sweet and edible.

#### 2. Fibre plant

The fibres obtained from sheathy leaf bases of *Musa textilis* (Manila hemp) are woven into Abaca cloth and used for cordage. It is also known as Manila hemp. This plant is extensively grown in Philippines.

#### 3. Ornamental plants

*Ravenala madagascariensis* (Traveller's palm), *Strelitzia reginae* (the bird of paradise flower) and *Heliconia* sp. are grown as ornamentals.

## UNIT - 2

### PLANT ANATOMY

#### 1. Define plant anatomy.

Plant anatomy is the study of internal structure and organization of plants, especially of their parts by means of dissection and microscopic examination. (Gr: Ana – as under, tamnein – to cut)

**2. Define a tissue.**

Morphologically, a tissue is a group of cells; which are similar in origin, form and function. Physiologically, a tissue is composed of dissimilar cells that perform a common function, for example phloem elements perform food conduction.

**3. What is a meristematic tissue?.**

A meristematic tissue is a group of identical cells that are in a continuous state of division. Some of the cells are changed to permanent tissue by a process called differentiation And other cells remain in meristematic activity.  
The meristematic cells are self perpetuating.  
The meristematic cells are closely arranged without intercellular spaces.They have dense of cytoplasm with large nucleus.

**4. What is differentiation?**

Some cells produced by meristematic tissue stop dividing and acquire certain changes to become permanent tissues of the plant. This change from meristematic to permanent tissue is called differentiation.

**5. Write about lateral meristem.**

The meristem that is present along the longitudinal axis of stem and root is called lateral meristem. Vascular cambium and cork cambium (phellogen) are examples for lateral meristem. It produces secondary permanent tissues, which result in the thickening of stem and root.

**6. What is a permanent tissue? Mention its types.**

The cells, which are formed by apical meristem are differentiated into different types of permanent tissues. These tissues have lost the power of dividing either permanently or temporarily. The permanent tissue is classified into two types - simple permanent tissue and complex permanent tissue.

**7. What are the types of simple tissues and complex tissues ?**

i) Simple tissue:

It is of three types - parenchyma, collenchyma and sclerenchyma.

ii) Complex tissue:

It is of two types - xylem and phloem

**8. Define - simple tissue.**

A tissue with the cells of similar structure and function is called simple tissue. It is of three types - parenchyma, collenchyma and sclerenchyma.

**9. What is a chlorenchyma?**

In green parts of the plants, the parenchymatous cells have chloroplasts. These cells are called chlorenchyma. Its important function is photosynthesis.

**10. Differentiate angular collenchyma from lacunate collenchyma.**

SL. NO.	Angular Collenchyma	Lacunate Collenchyma
1.	Cell walls are thickened at their angles	Cell wall thickening materials deposited on the walls bordering the intercellular spaces
2.	Eg., Hypodermis of Datura	Eg., Hypodermis of Ipomea and Nicotiana

**11. What is a stellate parenchyma?**

In the petioles of banana and Canna, star shaped parenchyma cells are found. These cells are called stellate parenchyma.

**12. What are brachy-sclereids?**

The isodiametric sclereids are called brachy-sclereids (stone cells). They are found in bark, pith, cortex, hard endocarp and fleshy portions of many fruits. E.g., pulp of pyrus.

**13. What are surface fibres?**

The fibres that are found in the seed coat of some seeds are called surface fibres. E.g., cotton.

**14. Differentiate sclereids from fibres.**

SL.NO.	Sclereids	Fibres
1.	Isodiametric or elongated	Long, narrow with pointed ends
2.	Lumen is very much reduced	Narrow lumen
3.	Pits are simple or branched	Pits are simple

**15. What is a complex tissue? Mention its types.**

A tissue that consists of several kind of cells but all of which function together as a single unit is called complex tissue. It is of two types i) xylem and ii) phloem

**16. What is callose?**

In mature sieve elements sometimes the pores in the sieve plate are blocked by a substance called callose.

**17. What are bast fibres?**

The fibres of sclerenchyma associated with phloem are called phloem fibres or bast fibres. They are narrow, vertically elongated cells with very thick walls and a small lumen (the cell cavity). Among the four kinds of phloem elements, phloem fibres are the only dead tissue. These are the strengthening and supporting cells.

**18. What are trichoblasts?**

Rhizodermis has two types of epidermal cells - long cells and short cells. The short cells are called trichoblasts. Root hairs are produced from these trichoblasts.

**19. What is periderm?**

The periderm is another protective tissue that supplants the epidermis in the roots and stems that undergo secondary growth.

**20. What is a rhizodermis?**

It is the outermost layer of the root. It consists of a single row of thin-walled parenchymatous cells without any intercellular space. Stomata and cuticle are absent in the rhizodermis.

**21. What are casparian strips?**

There is a band like structure made of suberin present in the radial and transverse walls of the endodermal cells. They are called Casparian strips named after Casparay who first noted the strips. The main function of casparian strips in the endodermal cells is to prevent the re-entry of water into the cortex once water entered the xylem tissue.

**22. What are called Passage cells?**

The endodermal cells, which are opposite to the protoxylem, elements, are thin-walled without casparian strips. These cells are called passage cells. Their function is to transport water dissolved salts from the cortex to the xylem.

**23. What is stele?**

All the tissues inside the endodermis comprise the stele. This includes pericycle, vascular system and pith.

**24. Write any two differences between dicot and monocot roots.**

SL.NO.	Monocot roots	Dicot roots
1.	Xylem is polyarch	xylem is usually tetrach
2.	Pith is usually large at the centre	Pith is usually absent
3.	Metaxylem vessels are generally oval or spherical in shape	metaxylem vessels are generally polygonal in shape

**25. What is a hypodermis?**

The cortex is differentiated into three zones. Below the epidermis, there are a few layers of collenchyma cells. This Zone is called hypodermis. It gives mechanical strength to the stem.

**26. What is protoxylem lacuna?**

In a mature bundle of monocot stem, the lowest protoxylem disintegrates and forms a cavity known as protoxylem lacuna.

**27. What is starch sheath?**

In the dicot stem, the innermost layer of the cortex is made up of cells that are barrel shaped and arranged compactly without intercellular spaces. Since starch grains are abundant in these cells, this layer is also known as starch sheath. This layer is morphologically homologous to the endodermis found in the root.

**28. What is eustele?**

In dicot stem, vascular bundles are arranged in a ring around the pith. This type of stele is called eustele. Eg. Sunflower stem

**29. Differentiate the vascular bundles of dicot stem and monocot stem.**

SL.NO	Dicot Stem	Monocot Stem
1.	Vascular bundles are open	Vascular bundles are closed
2.	Vascular bundles are arranged in a ring	Vascular bundles are scattered in the ground tissue
3.	bundle cap present	bundle cap absent
4.	bundle sheath absent	bundle sheath present.

**30. What is dorsiventral leaf? Give an example.**

A leaf showing the differentiation in mesophyll. i.e., having palisade and spongy parenchyma is known as dorsiventral. It is common in dicot leaves.

**31. Define - Isobilateral leaf.**

When the mesophyll of leaf is not differentiated and made of only spongy or palisade parenchyma as in monocots, it is called isobilateral leaf.

**32. What are stomata?**

The minute openings found on the epidermis of leaf are stomata. Stomata are more in number on the lower epidermis than on the upper epidermis. They help in gaseous exchange.

**33. What are guard cells?**

A stoma is surrounded by a pair of bean shaped cells called guard cells. They help in closing and opening of stoma.

**34. What is mesophyll?**

The ground tissue system that lies between the epidermal layers of leaf is known as mesophyll tissue. Often it is differentiated into palisade parenchyma on the adaxial (upper) side and spongy parenchyma on the abaxial (lower) side.

**35. Differentiate palisade and spongy parenchyma.**

SL. NO	Palisade	Spongy
1.	It is present below the upper epidermis	It is present below the palisade parenchyma
2.	Made of elongated cylindrical cells	Made of irregularly shaped cells
3.	Cells are compactly arranged	Cells are loosely arranged intercellular space
4.	Intercellular space is absent	Intercellular space is present
5.	More chloroplasts are present	Less chloroplasts are present

**36. Write about respiratory cavity.**

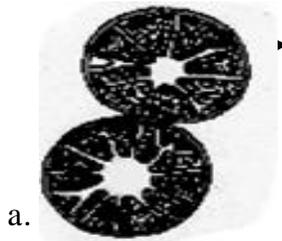
The air space that is found next to the stoma is called respiratory cavity or sub-stomatal cavity. It helps in gaseous exchange.

**37. What is a bundle sheath or border parenchyma in a leaf?**

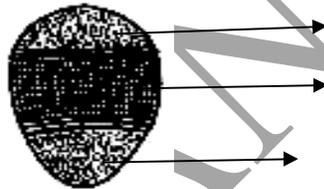
In dicot leaf, the vascular bundles are surrounded by a compact layer of parenchymatous cells called bundle sheath or border parenchyma.

**38. What are the functions of vein in a leaf?**

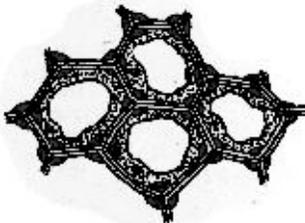
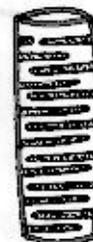
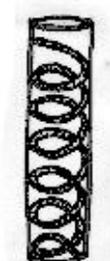
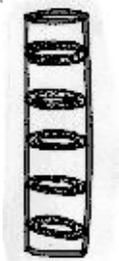
Veins form the skeleton of the leaf and supply water and minerals to the photosynthetic tissue. Thus the morphological and anatomical features of the leaf help in its physiological functions.

**39. Draw diagram, for Brachysclereids and label the parts.**

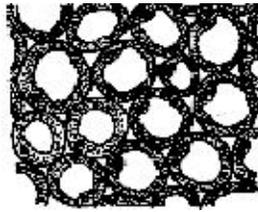
a.

**40. Draw the diagram of bicollateral vascular bundle.****41. Explain Bicollateral vascular bundle with example.**

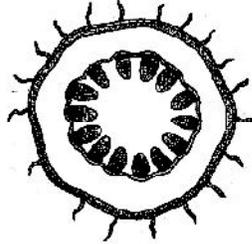
Phloem occurs on both the outer and inner sides of xylem, the bundle is called bicollateral. Bicollateral vascular bundles are most typically seen in Cucurbitaceae.

**42. Draw diagram for angular collenchymas and label its parts.****43. Draw any three types of secondary wall thickening in tracheids.**

44. Draw the structure of parenchyma. Label the parts.



45. Draw the ground plan for T.S. of Sunflower stem and label the parts.



46. Bring out the characteristics of meristematic cells.

The meristematic cells are round, oval, polygonal or rectangular in shape.

They are closely packed without any intercellular space.

They have dense cytoplasm and a large nucleus.

The cell wall is thin, elastic and made up of cellulose.

47. Explain exarch and endarch xylem with examples.

In roots, protoxylem vessels are present towards the periphery and the metaxylem vessels towards the centre. This arrangement of xylem is called exarch.

In stem, protoxylem vessels are present towards the centre, while metaxylem vessels towards the periphery. This condition is known as endarch.

### UNIT - 3

### CELL BIOLOGY AND GENETICS

1. What are autosomes?

Autosomes are present in all the cells of the organisms. They control the somatic characteristic of an organism. In the human diploid cell, 44 chromosomes are autosomes.

2. What are sex chromosomes?

In the diploid cells of animals and certain plants, one or more special chromosomes are different from the autosomes in their morphological structures and behaviour. These chromosomes are involved in the determination of sex. They are called sex chromosomes. In human being, male has XY and XX sex chromosomes.

3. What are unusual chromosomes?

These chromosomes are abnormal chromosomes. They differ from the basic structure of normal chromosomes. E.g., B-chromosome and Double minutes.

4. What are B-chromosomes?

B-Chromosomes are also called supernumerary and accessory chromosomes. They are additional chromosomes found in individuals in a population. E.g., Maize, They are common in plants and they reduce viability.

**5. What are 'Double minutes'?**

Double minutes are unstable chromosomes like structures. They have no centromere and formal telomeres. They occur in cancer cells which show resistance against drugs.

**6. What is a polytene chromosome?**

The characteristic feature of polytene chromosome is that along the length of the chromosome there is a series of dark bands alternate with clear zones called inter bands. The polytene chromosome has extremely large puff called Balbiani ring. It is also known as chromosomal puff. As the chromosome occurs in the salivary gland, it is known as salivary gland chromosomes.

**7. Define - Linkage.**

The genes that are carried on the same chromosome will not assort independently because of their tendency to remain linked together. This is called linkage.

**8. What is coupling?**

If dominant alleles or recessive alleles are present in the same plant, they tend to remain together resulting in increased parental forms. Thus, the two genes which inherit together are called linked genes. This aspect is called coupling. Ratio:7:1:1:7

**9. What is repulsion?**

In the dihybrid test cross, it is clear that if dominant alleles or recessive alleles are present in the different plants, they tend to remain separate resulting in increased parental forms. This aspect is called repulsion. Ratio: 1:7:7:1

**10. What is crossing over?**

The process, which produces recombination of genes by interchanging the corresponding segments between non sister chromatids of homologous chromosomes, is called crossing over. It takes place in pachetene stage of prophase of Meiosis.

**11. What is genetic map?**

The diagrammatic representation of location and arrangement genes and relative distance between linked genes of a chromosome called linkage or genetic map.

**12. Write the uses of gene mapping.**

1. It is useful to determine the location, arrangement and linkage or genes in a chromosome.
2. It is useful to predict the results of dihybrid and trihybrid crosses.

**13. Differentiate tightly linked genes and loosely linked genes.**

Gene pairs that had very low percentage of recombination are known as tightly linked genes. The gene pairs with higher percentage are termed as loosely linked genes.

**14. What is a mutation?**

Sudden change in the genetical set up of an organism is defined as mutation. Based on the molecular basis of heredity, mutation is defined as sudden change in the sequence of nucleotides of gene.

**15. What is a biochemical mutation? Give an example.**

Mutations that affect the biochemical reactions are called biochemical mutations. For example, biochemical mutants of Neurospora failed to synthesize certain aminoacids.

**16. What is lethal mutation?**

Some mutations drastically influence the genes and cause death to the individual. Such mutation is described as lethal mutation. For example, in the plant Sorghum, recessive mutant fails to produce chlorophyll and therefore they die in the seedling stage.

**17. Define a gene mutation.**

Gene mutation or point mutation is a sudden change in small segment of DNA either a single nucleotide or a nucleotide pair.

**18. Differentiate transition from transversion.**

When a purine or a pyrimidine is replaced by another purine or pyrimidine respectively, this kind of substitution is called transition.

When a mutation involves the replacement of a purine for pyrimidine or viceversa this is called transversion substitution mutation.

**19. What is a chromosomal aberration?**

In an organism, any visible abnormality in chromosome number or structure from the diploid set is known as chromosomal aberration.

**20. What is duplication?**

When a segment of a chromosome is present more than once in a chromosome then, it is called duplication. For example, the order of genes in a chromosome is a, b, c, d, e, f, g and h. Due to aberration, the genes 'g' and 'h' are duplicated and the sequence of genes becomes a, b, c, d, e, f, g, h, g and h. In Drosophila, corn and peas, a number of duplications are reported.

**21. What is hypoploidy?**

Decrease in one or two chromosomes from the diploid set described as hypoploidy. There are two types of hypoploidy-monosomy and nullisomy.

**22. Write any two significance of ploidy?**

1. Polyploidy plays an important role in plant breeding and horticulture.
2. Ploidy has more vigorous effect than the diploids and results in the production of large sized flowers and fruits. Hence, it has economical significance.
3. It plays significant role in the evolution of new species.

**23. What is a strain-S?**

Streptococcus causes pneumonia. The virulent strain synthesized a Smooth polysaccharide coat and produces smooth colonies. This strain was called strain-S.

**24. Differentiate nucleotide from nucleoside.**

The sub-unit of DNA containing only sugar and nitrogenous base is known as nucleoside. A nucleoside combines with phosphate to form a nucleotide.

**25. Write the functions of D.N.A.**

It controls all the biochemical activities of the cell. It carries genetic information from one generation to other. It controls protein synthesis and synthesizes RNAs.

**26. Write the Chargaff's law or Base pair rule.**

- i) The nitrogen bases pair in specific manner. Adenine always pairs with thymine and guanine pairs with cytosine.
- ii) The total amount of purine nucleotides is always equal to the total amount of pyrimidine nucleotides i.e.,  $[A] + [G] = [T] + [C]$ .
- iii) The proportion of adenine is equal to thymine and so also of guanine is equal to cytosine. But the  $[A] + [T]$  need not necessarily be equal to  $[G] + [C]$ .

**27. What are Okazaki fragment?**

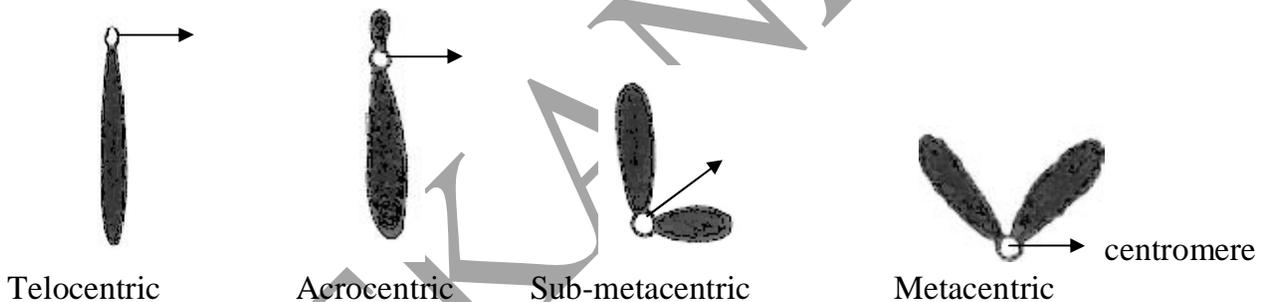
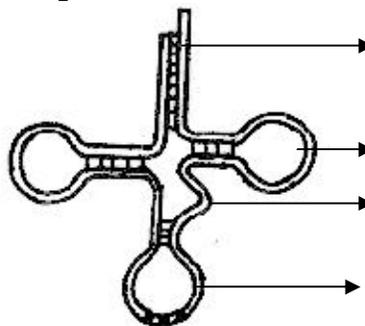
During the replication of DNA, one strand is formed continuous and the other strand is synthesized in small fragments. These are called Okazaki fragments. These fragments are linked by ligase.

**28. What are isoacceptor tRNAs?**

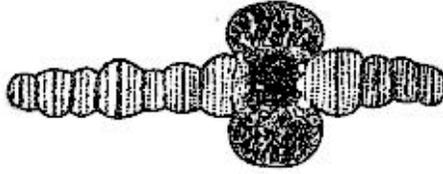
There are four or five tRNAs specific for a particular amino acid and these are called isoacceptor tRNAs.

**29. What are the four loops found in the clover leaf structure of tRNA?**

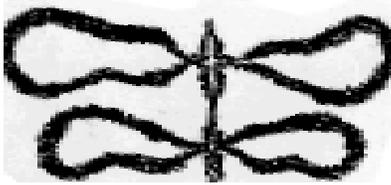
It has four loops namely anticodon loop, D loop, T<sup>Ψ</sup>C loop and aminoacid acceptor arm.

**30. Draw different types of chromosomes based on shape and position of centromere.****31. Draw the structure of chromosome and label its parts.****32. Draw the structure of t-RNA and label its parts.**

33. Draw the polytene chromosome and label the parts.



34. Draw and label the lambrush chromosome.



#### UNIT - 4 BIOTECHNOLOGY

**1. Define recombinant DNA.**

The process of manipulating DNA to form new genes or inserting altered genes in different organisms is called genetic engineering. Such genetically modified DNA fragments are termed recombinant DNA.

**2. Name the enzymes involved in the making of a DNA hybrid.**

1. Restriction endonucleases
2. DNA ligase

**3. What are endonucleases?**

Restriction enzymes are produced by the bacteria. These enzymes can cut DNA at specific places from chromosomes of nucleus. They also cut DNA of plasmid that serves as vector (carrier)

**4. What is the importance of Escherichia coli in biotechnology?**

Escherichia coli and many other bacteria contain a large, circular chromosomes and may also contain small circle of DNA called plasmids. These plasmids from bacterial cells are used as vectors for carrying the molecules of DNA from a donor cell.

**5. What is the role of restriction enzymes in bacteria?**

The restriction enzyme is used to cleave the plasmid rings at those places where the appropriate nucleotide sequence appears.

**6. What are plasmids?**

Escherichia coli and many other bacteria contain small circles of DNA called plasmids. These plasmids from bacterial cells are used as vectors for carrying the molecules of DNA from a donor cell.

**7. Define biopesticides.**

Transgenic plants were made to resist insect pests, viruses or herbicides through incorporation of foreign genes into DNA of host plant cells. These are called biopesticides.

**8. Define transgenic plants.**

Genetically engineered plant species are called transgenic plants. e.g., *Oryza sativa* and *Beta vulgaris*.

**9. What is the importance of *Agrobacterium tumefaciens*?**

*Agrobacterium tumefaciens* is a soil inhabiting bacterium and has Ti (tumor inducing) plasmid. This bacterium invades crops such as tomato, sunflower, brinjal and cotton and causes crown gall disease which is in the form of tumorous growth. The Ti plasmid carried by the pathogenic bacterium causes tumours.

**10. What is gene gun method of delivery of DNA?**

The mechanical particle delivery or gene gun methods deliver DNA on microscopic particles into target tissue or cells. The process is increasingly used to introduce new genes into a range of bacterial, fungal, plant and mammalian species. It is the main method of choice for genetic engineering of many plant species including rice, corn, wheat, cotton and soybean.

**11. What is Ti plasmid?**

Ti plasmid is the 'tumor inducing' plasmid. For example *Agrobacterium tumefaciens* with Ti plasmid causes crown gall disease in tomato, sunflower, brinjal and cotton.

**12. Name four transgenic dicot plants.**

- i) *Nicotiana tabacum*    ii) *Beta vulgaris*    iii) *Glycine max*    iv) *Helianthus annuus*

**13. Define plant tissue culture.**

Growing the plant cells, tissues and organs on an artificial, synthetic medium under controlled conditions is called plant tissue culture.

**14. Write a note on Totipotency.**

The inherent potential of any living plant cell to develop into entire organism. This is unique to plant cells and not seen in animal cells.

**15. Differentiate dedifferentiation and redifferentiation.****Dedifferentiation**

Reversion of mature tissue into meristematic state leading to the formation of callus is called dedifferentiation.

**Redifferentiation** : The ability of the callus to develop into shoot or embryoid.

**16. Name any four culture medium used in tissue culture.**

The important media used for all purpose tissue culture experiment are.

1. Murashige and Skoog medium (MS medium)
2. Gamborg medium (B5 medium)
3. White medium (W medium)
4. Nitsch medium

**17. What is sterilization?**

Sterilization is the technique employed to get rid of the microbes such as bacteria and fungi in the culture medium and plant tissues.

**18. Define inoculation.**

Transfer of explant (root, stem, leaves etc.,) on to a culture medium is called inoculation. The inoculation is carried out under aseptic condition for which an apparatus called laminar air flow chamber is used.

**19. What is a somatic embryo?**

Formation of embryos (i.e., bipolar structure having shoot and root) from the callus is called embryogenesis. These embryos arise from somatic callus tissue and are called somatic embryos or embryoids or somaclonal embryos.

**20. Define callus.**

The callus is an unorganized mass of undifferentiated tissue.

**21. What is somatic hybridization?**

A hybrid produced by fusion of somatic cells of two varieties (or) species is called somatic hybrid. This process of producing somatic hybrids is known as somatic hybridization.

**22. How do you remove cellwall from intact cells?**

Cells are kept in a suitable plasmolyticum (protoplast shrink away from cell wall in a plasmolysed cell) and cut with a fine knife, so that protoplasts are released from cells through the opening of the cell. For isolation of protoplast, peeled leaf segments are placed with their lower surface downwards in a petridish containing the enzyme mixture, which consists of 0.5 percent macerozyme, 2 percent cellulase in 13 percent sorbitol or manitol at pH 5.4. Finally, the protoplasts are released and are kept in the isotonic solution.

**23. What is PEG?**

PEG is Polyethylene glycol which is used to fuse the isolated parent protoplasts in a culture medium which results in a somatic hybrid.

**24. What is meant by single cell protein?**

Cells from a variety of micro-organisms like bacteria, yeasts filamentous fungi and algae, used as food or feed are called single cell protein (SCP). Early it was named as microbial protein. The term single cell protein was coined in 1966.

**25. What is a bioreactor or fermentor?**

In view of the insufficient world food supply and the high protein content of microbial cells, the use of biomass produced in the fermentor (special sterilized vessel) or bio-reactor would be an ideal supplement for conventional food.

**26. Why is SCP not popular for human consumptions?**

1. The high nucleic acid content (4 to 6 percent in algae, 6 to 10) percent in yeast of SCP) can cause health problems like uric acid formation, kidney stones and rheumatism in human beings.
2. Toxic or carcinogenic (cancer causing) substances absorbed from the microbial growth substrate may be present
3. Slow digestion of microbial cell in the digestive tract may cause vomiting, indigestion and allergic reaction.

**27. Name any four important centres to crop improvement/Biotechnology centres in India.**

- i) Biotechnology centre (IARI), New Delhi
- ii) Bhaba Atomic Research Centre (BARC), Bombay
- iii) Central Institute of Medicinal and Aromatic plants (CIMAP), Lucknow.
- iv) Dr. M.S. Swaminathan Research Institute (MSSRI), Chennai.

**28. Mention the names of any three algae used for SCP production.**

Chlorella, Spirulina and Chlamydomonas.

**29. Write any three monocot transgenic plants.**

I. Asparagus sp. II. Zea mays III. Oryza sativa IV. Avena sativum

**30. List down any three genetically engineered products and their functions.**

S.No	Products	Functions
1.	Human growth hormone	Promotes growth in children with hypopituitarism
2.	Interferon	Helps the cells resist viruses.
3.	Interleukin	Stimulates the proliferation of WBCs that take part in immunity
4.	Insulin	Treats diabetes
5.	Renin inhibitors	Decreases blood pressure.

## UNIT - 5 PLANT PHYSIOLOGY

**1. Define plant physiology.**

Plant physiology is the branch of biological science, which deals with the functioning and interrelationships of cells, tissues and organs of plants.

**2. Write the overall equation of photosynthesis.**



**3. Define light reaction.**

The reaction of photosynthesis involving pigments, solar energy and water that produce ATP and NADPH<sub>2</sub> are called light reactions.

**4. What are dark reactions?**

The photosynthetic reactions in which CO<sub>2</sub> is reduced to carbohydrates making use of ATP and NADPH<sub>2</sub> generated by light reactions are collectively called dark reactions.

**5. What are generally called accessory pigments?**

Photosynthetic pigments other than chlorophyll 'a' are generally called accessory pigments. E.g., chlorophyll 'b', carotenoids and xanthophyll.

## 6. What is photolysis of water?

The oxidised state of PS II creates a potential to split water molecules to protons, electrons and oxygen. This light dependent splitting of water molecules is called photolysis of water. Manganese, calcium and chloride ions play prominent roles in the photolysis of water.

## 7. Under what conditions cyclic photophosphorylation takes place?

Cyclic photophosphorylation takes place under the conditions of

- i) PS I only remains active
- ii) photolysis of water does not take place
- iii) requirement of ATP is more and
- iv) nonavailability of NADP<sup>+</sup>

## 8. What are dimorphic chloroplasts?

The C4 plants contain dimorphic chloroplasts i.e., chloroplasts in mesophyll cells are granal (with grana) Whereas in bundle sheath chloroplasts are agranal (without grana). The presence of two types of cells leads to segregation of photosynthetic work i.e., light reaction and dark reactions separately.

## 8. What is photorespiration?

Respiration that occurs in photosynthetic tissues in the presence of light and results in increased rate of carbon dioxide evolution is called photorespiration or light respiration. It occurs in Mitochondria, Peroxisome and Chloroplast.

## 9. Differentiate photorespiration from dark respiration.

SL.NO.	PHOTORESPIRATION	DARK RESPIRATION
1.	It takes place only in photosynthetic cells in the presence of light	It takes place in all living cells in the mitochondria
2.	It is light dependent and involves uptake of oxygen and evolution of carbon dioxide	It is independent of light and involves uptake of oxygen and evolution of carbon dioxide
3.	It is the function of chloroplast, peroxisomes and mitochondria	It is the function of mitochondria along.

## 10. What are called total parasites?

Some plants completely lack chlorophyll and do not grow in the soil. Therefore, it is totally dependent on the host stem for organic food materials, water and minerals. They are called total parasites. e.g., Cuscuta.

## 11. What is chemosynthesis?

Chemosynthesis is a process by which certain organisms synthesize carbohydrates by using the energy obtained by the oxidation of inorganic substances.

Eg. Beggiota and Nitrosomonas

## 12. Define - Respiration.

The phenomenon of release of energy by oxidation of various organic molecules is known as respiration. The compounds that are oxidised during this process are known as respiratory substrates.

**13. What is glycolysis?**

The process by which the glucose (6C compound) is split into two molecules of pyruvic acid (3C compound) is called glycolysis. It occurs in cytoplasm

**14. Write the overall reaction of glycolysis.****15. What is the function of aldolase in the process of glycolysis?**

Fructose 1, 6 - bisphosphate is cleaved by the enzyme aldolase to two molecules of 3C compounds - dihydroxy acetone phosphate (DHAP) and 3-phosphoglyceraldehyde. These two trioses are isomers.

**16. What is meant by Krebs's cycle?**

The series of cyclic reactions involved in converting pyruvic acid to carbon dioxide and water in mitochondria is called Krebs's cycle. It is also known as citric acid cycle or tricarboxylic acid cycle - TCA cycle. This was described by Sir Hans Adolf Krebs in 1937.

**17. What is the role of aconitase in Krebs's cycle?**

- i. Citric acid is dehydrated to form cis-aconitic acid in the presence of aconitase.
- ii. Aconitase catalyses the formation of isocitric acid from cis-aconitic acid by addition of one molecule of water.

**18. What is oxidative phosphorylation?**

Transfer of electrons and protons from  $NADH_2$  and  $FADH_2$  to oxygen through a series of components like flavoprotein, cytochrome is called electron transport chain. This process that leads to coupling of electrons to form high-energy phosphate bonds in the form of ATP from ADP is called oxidative phosphorylation.

**19. Explain anaerobic respiration.**

The respiration which takes place in the absence of free oxygen molecules is called anaerobic respiration. It occurs in yeast and some bacteria.

**20. Define respiratory quotient.**

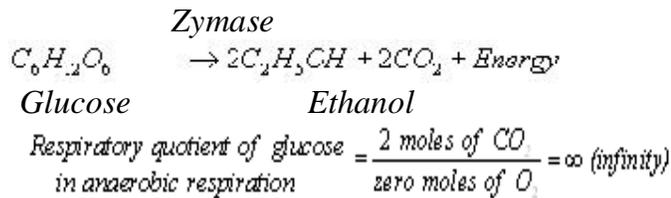
Respiratory quotient may be defined as "the ratio between the volume of carbon dioxide given out and oxygen consumed during respiration". This value depends upon the nature of the respiratory substrate and its rate of oxidation.

**21. What is fermentation?**

Fermentation literally means a chemical change accompanied by effervescence. The anaerobic breakdown of glucose to carbon dioxide and ethanol is a form of respiration referred to fermentation.

**22. The respiratory quotient for anaerobic respiration is infinity. Give reasons**

In anaerobic respiration, carbondioxide is evolved but oxygen is not consumed. Therefore, the respiratory quotient in such case is infinity. For example

**23. What is a growth inhibitor? Give an example.**

Some organic substances produced in the plant inhibit the plant growth. These substances are called growth inhibitors. They inhibit the elongation in roots, stems and leaves. For example, ethylene is a potent inhibitor of bud growth. ABA inhibits lateral bud growth in tomato.

**24. Write any two physiological effects of abscisic acid.**

1. As the name suggests abscisic acid is an hormone that stimulates abscission.
2. ABA controls geotropic responses of roots. It stimulates positive geotropism in roots.
3. Abscisic acid causes closure of stomata.

**25. What is Richmond Lang effect?**

Application of cytokinin delays the process of ageing in plants. This is also known as Richmond Lang effect.

**26. Define Bolting.**

Rosette plants usually show reduced internodal growth. These plants exhibit excessive internodal growth when they are treated with gibberellin. This sudden elongation of stem followed by flowering is called bolting.

**27. What is apical dominance?**

Suppression of growth in lateral bud by apical bud due to auxin produced by apical bud is termed as apical dominance

**28. Define growth regulator.**

It is a hormone like synthetic organic compound. In small amounts, it modifies the growth and development either by promoting or inhibiting the growth.

eg. Naphthalene acetic acid (NAA) and Indole 3-acetic acid (IAA).

**29. What are called phytohormones?**

These are organic substances produced by the plant. They are active in very minute quantities. They are synthesised in one of the parts of the plant and translocated to another part where they influence specific physiological, biochemical and morphological changes.

**30. Define photoperiodism.**

The response of a plant to the relative lengths of light and dark periods is known as photoperiodism

**31. What are called long day plants?**

The plants requiring longer exposure to light than their critical period are known as long day plants eg. wheat and oats.

**32. What is a short day plant?**

The plants requiring light for a shorter period than their critical period are known as short day plants eg. tobacco and Chrysanthemum

**33. Define vernalization.**

The term vernalization was first introduced by a Russian scientist T.D. Lysenko in 1920. Many species, especially biennials and perennials are induced to flower at low temperature range of 1°C to 10°C. This is known as vernalization.

**34. Write about the techniques of vernalization.**

The following are the steps to be taken to induce vernalization. Seeds are allowed to germinate and subjected to cold treatment for varying period of time depending on the species. Germinated seeds after this treatment are allowed to dry for sometime and then sown.

**35. What is devernalization?**

Reversal of the effect of vernalization is called Devernalization. Subjecting the plants to higher temperature after a cold treatment brings about devernalization.

**36. Write any two advantages of vernalization.**

- Crops can be produced earlier by vernalization.
- They can be cultivated in places where they naturally do not grow.
- Vernalization helps to accelerate the plant breeding.

**37. Explain long day plant and short day plants with examples.**

The plants requiring longer exposure to light than their critical period are known as long day plants eg. wheat and oats.

The plants requiring light for a shorter period than their critical period are known as short day plants eg. tobacco and Chrysanthemum.

**38. Write any three physiological effects of Gibberellin.**

1. Rosette plants usually show reduced internodal growth. These plants exhibit excessive internodal growth when they are treated with gibberellin. This sudden elongation of stem followed by flowering is called bolting.
2. Formation of seedless fruits without fertilization can also be induced by gibberellin treatment in many plants. eg. Tomatoes, apples, cucumbers, etc.,
3. Some of the light sensitive seeds can germinate by the treatment of gibberellic acid even in complete darkness. eg. barley,

**39. Write any three physiological effects of Cytokinin.**

- i. The most important function of cytokinin is the promotion of cell division.
- ii. In association with IAA, cytokinin initiates bud and root formation in callus tissue.
- iii. Cytokinin breaks the dormancy of many seeds and also promotes germination.
- iv. Application of cytokinin delays the process of ageing in plants. This is also known as Richmond Lang effect.

**40. State the condition which cyclic phosphorylation occur.**

Under the conditions of (i) PS I only remains active

(ii) photolysis of water does not take place

(iii) requirement of ATP is more and

(iv) nonavailability of NADP+ the cyclic photophosphorylation takes place.

**41. What are insectivorous plant? Give example.**

Though insectivorous plants are capable of manufacturing carbohydrates by photosynthesis, they are not able to synthesize enough proteins due to the deficiency of nitrogen. They overcome this deficiency by catching small insects and digesting them. Their leaves are modified in various ways for this purpose. Such plants are called insectivorous plants. Eg. Drosera.

**42. Write about the structure of ATP.**

ATP is described as energy currency of the cell. It is a nucleotide consisting of adenine, ribose sugar and three phosphate groups. It is an energy rich compound and contains two high energy terminal bonds. A large amount of free energy is liberated, when these bonds are broken by hydrolysis.

**43. What are dimorphic chloroplast?**

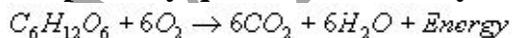
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**44. Explain total parasite plant with an example.**

Some plants completely lack chlorophyll and do not grow in the soil. Therefore, it is totally dependent on the host stem for organic food materials, water and minerals. They are called total parasites. eg. Cuscuta.

**45. List the photosynthetic pigments.**

Chlorophyll-a, Chlorophyll-b, Xanthophyll, Carotenoid and Phycobillins are the photosynthetic pigments.

**46. The respiratory quotient of carbohydrate is one. How?**

Glucose

$$\text{Respiratory quotient of glucose} = \frac{6 \text{ moles of } CO_2}{6 \text{ moles of } O_2} = 1$$

The amount of CO<sub>2</sub> consumed and amount of O<sub>2</sub> evolved is equal. So, the respiratory quotient is one.

**UNIT : 6 BIOLOGY IN HUMAN WELFARE****1. What are mutagens?**

The agents which induce mutations are called mutagens. Radiation induces mutation to develop new variety of crops. Now with newer and more powerful sources of radiations (UV shortwave, Xray, Alpha, Beta, Gamma waves) and many chemicals (mutagens) eg. Caesium, ethyl methane sulfonate, nitromethyl urea), we can increase the rates of mutation

**2. What is genetic engineering?**

Genetic engineering can be defined as the formation of new combinations of heritable material by the insertion of foreign nucleic acid molecule from other sources.

**3. Define biofertilizer.**

The term 'biofertilizer' denotes all the nutrient inputs of biological origin for plant growth. Biological origin refers to microbes producing nitrogen compounds. Bacteria and cyanobacteria are known to fix atmospheric nitrogen and are known as biofertilizers. Nitrogen fixing bacteria like Azotobacter, Bacillus and Rhizobium

**4. What is bioinsecticide?**

Biological agents that are used for control of insects, weeds and pathogens produced from living organisms are called biopesticides. Microorganisms such as viruses, bacteria, fungi, protozoa and mites may be used as biopesticides.

**5. Define biomedicine.**

Medicinal plants have curative properties due to presence of various complex chemical substances in different composition like alkaloids, glycosides, corticosteroids, essential oils, etc. Nowadays, these medicinally valuable compounds obtained from the medicinal plants are called "biomedicines".

**6. Write the medicinal value of Aegle marmelos.**

The unripe fruit is used to treat problems of stomach indigestion. It kills intestinal parasites. It is used also to cure chronic diarrhoea and dysentery. It is used as a tonic for the betterment of heart and brain.

**7. Write the medicinal uses of Solanum nigrum.**

The extract of this herb is effective in the treatment of liver disorders like cirrhosis of liver. This plant also cures fever, dysentery and promotes urination. Active medicinal compounds like solanin and saponin are extracted from this plant.

**8. What is humulin?**

Through genetic manipulation, and introduction of human gene for insulin production, the bacterium *E. coli* is articulated to produce human insulin called "humulin".

**9. What is bio-piracy?**

The clandestine exploitation and utilisation of bioresources from a country by several organisations and multinational companies without proper authorisation is known as Biopiracy.

**10. What are edible interferons?**

Interferons are the substances made of proteins and are anti-viral in nature. Scientists have successfully produced transgenic tobacco and maize plants that secrete human interferons. Today, rice crops have been enriched with vitamin A through gene manipulation.

**11. What is heterosis?**

The superiority of the F1 hybrid in performance over its parents is called heterosis or hybrid vigour. Vigour refers to increase in growth, yield, resistance to diseases, pests and drought.