For BioResire students

NEET Biology Material

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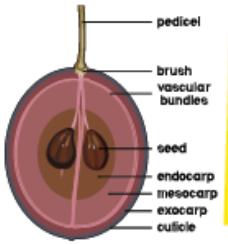
MORPHOLOGY OF FLOWERING PLANTS

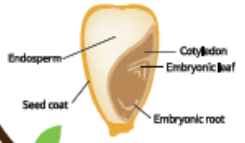


FRUIT

- Feature of flowering plants.
- Fruit is mature / ripened ovary (develops after fertilization)
- Fruit wall → Pericarp
- Pericarp divided into outer epicarp & inner endocarp & middle mesocarp
- Drupe → fruit of coconut & mango
- Parthenocarpic fruits that develop without fertilisation or ovary

SEED

- After fertilisation, ovules develop into seeds.
- Seed has Seed coat & embryo.
- Embryo has radicle, embryonal axis & cotyledons.
- One cotyledon – Monocot seeds (wheat, Maize)
- Two cotyledons – Dicot seeds (Gram & Pea).



TYPES

- Simple → Mango
- Compound → lamina dividived pinnately
- Compound → Neem, Palmately
- Compound → Silk, Cotton

STEM

- Ascending part of axis bearing branches, leaves, flowers, fruits.
- Develops from plumule of seed
- Bears nodes & internodes
- Has buds – terminal & auxiliary.

PHYLLOTAXY

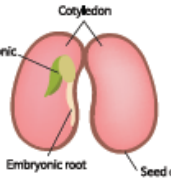
- Alternate – leaf at each node in alternate manner
- Opposite – leaf at each node in opposite manner
- Whorled – More than 2 leaves at a node & form a whorl.

ROOT

- Elongation of Radicle in plans forms primary root. Lateral roots from primary root form secondary.
- Tertiary roots.

FAMILIES

- FABACEAE – also called Papilionoidae (Sub family of Leguminosae). Pulses. Oil.
- FLORAL FORMULA– $\oplus\,\varphi\,K_{(5)}\,C_{1+2+(2)}\,A_{(9)+1}\,G_{1}$
- SOLANACEAE– Potato family" tomato, brinjal, potato, chilli.
- FLORAL FORMULA– $\oplus\,\varphi\,K_{(5)}\,C_{(5)}\,A_{5}\,G_{(2)}$
- LILIACEAE– "Lily family" (Tulips) Characteristic family of Monocots.
- Formal formula– $Br\,\oplus\,\varphi\,P_{(3+3)}\,A_{3+3}\,G_{(3)}$



ROOT SYSTEMS

- Primary roots & its branches form Tap root system .e.g mustard
- Roots coming from base of the stem form fibrous root system. E.g wheat
- Roots arising from other than radicle → adventitious roots. E.g Grass etc.

INFLORESCENCE

- Inflorescence – Arrangement of flowers on floral axis.
- Floral meristem is modified shoot apical meristem
- Racemose inflorescence – main axis grows; flowers in acropetal manner (Soybean)
- Cymose inflorescence – main axis terminates flowers in basipetal order (Tulip)

TYPES OF FLOWER

- Flower – reproductive unit of angiosperms.
- Flower arranged on thalamus

On the basis of position of ovary w.r.t all whorls	Hypogynous – Ovary highest Perigynous – all whorls same level. Epigynous – Ovary inferior
On the basis of Bracts	Bracteate Ebracteate
Presence of Stamen & Carpel	Bisexual (both present) Unisexual (only one)
On the basis of Symmetry	Actinomorphic (Radial Symmetry) Zygomorphic (Bilateral Symmetry)
On the basis of No. of floral appendages	Trimerous Tetramerous Pentamerous

Calyx	Corolla	Androecium	Gynoecium
Outermost whorl Sepals Green Protect the flower	Next to Calyx Petals Brightly coloured Attract insects for pollination	Inner to Corolla Stamens Male Reproductive Part Stamen has another & filament	Innermost whorl Carpel/ Pistil Female Reproductive part Carpel has Stigma, Style & ovary

MODIFICATION OF PARTS

Gamosepalous (Sepals united) Polysepalous (Sepals free)	Gamopetalous (petals united) Polypetalous (petals free)	Stamens united as one bundle (Monadelphous) Two bundle – (Diadelphous) More than two bundles (Polyadelphous) Epipetalous – Stamen fused with petal Epiphyllous – Stamen attached to perianth	Carpels fused (Syncarpous) Carpels free (Apocarpous)

AESTIVATION

- Arrangement of sepals or petals in a floral bud
- Valvate – No overlapping of whorls.
- Twisted – overlapping occurs
- Imbricate – overlapping present but not in particular direction
- Vexillary – One large petal overlaps other

PLACENTATION

- Arrangement of ovules in ovary
- Marginal – Pea
- Axile – China Rose
- Parietal – Mustard
- Free central – prime rose
- Basal – Sunflower Marigold

AERIAL

- Stem tendril for climbing – cucumber
- Stem thorn for protection → Citrus
- Phylloclade – for photosynthesis – opuntia
- Cladode – leaf-like structure – Asparagus

UNDERGROUND

- Bulb → Onion (Storage)
- Rhizome →ginger (Storage)
- Corm → Colocasia
- Tuber → Potato (Stroge)

SUB-AERIAL

- Offset → Pistia, Eicchornia
- Stolon → Strawberry
- Runner → Oxalis
- Sucker → Chrysanthemum banana (Vegetative Propagation)

LEAF

- Lateral, flattened structure on stem that develops at node.
- 3 main parts → leaf base, Petiole, lamina
- Performs photosynthesis

VENATION

- Arrangement of veins
- Reticulate → Network of veins
- Parallel → Veins are parallel

MODIFICATIONS

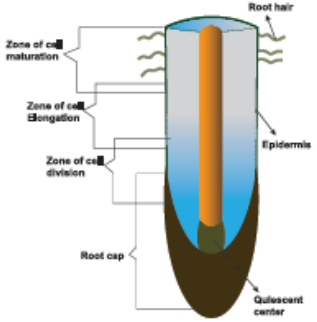
- Tendril → Pea
- Spine → opuntia
- Flesh leaves → Onion
- Succulent → Aloe
- Phyllode → Acacia
- Insectivorous → Venus – fly trap.

MODIFICATION OF ROOTS

- Strong Roots Turnip carrot
- Prop roots → Banyan tree (hanging roots)
- Stilt roots → Palm (Support)
- Pneumatophores → Mangroves (for oxygen / respiration)
- Nodulated Roots → Pea (for Nitrogen fixation)

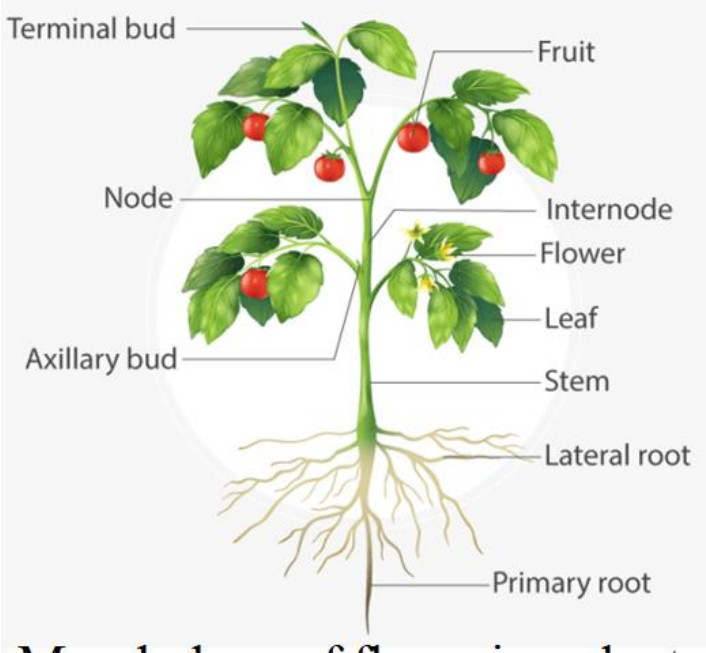
REGIONS OF ROOT

- Root cap → Protects the apex of Root.
- Region of meristematic activity → grow new cells.
- Region of elongation → lengthening of root
- Region of maturation → cells differentiates & mature



Morphology

Morphology is the branch of biological science that deals with the study of form, size, colour, structure and relative position of various parts of organisms.



Morphology of flowering plants

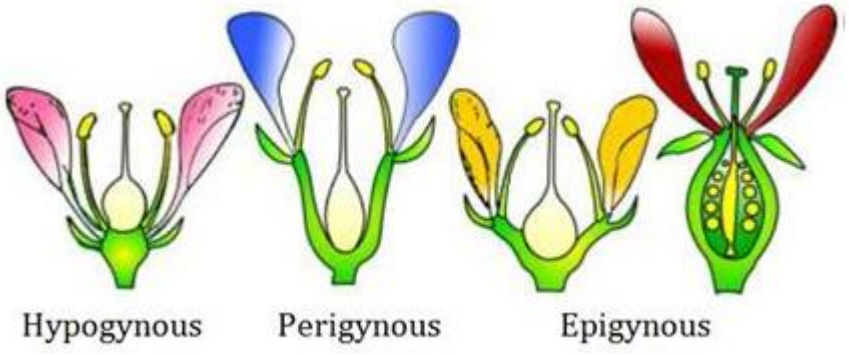
Morphology Flowering Plants

The plant body consists of a main axis, which may be branched or unbranched bearing lateral appendages.

The flower

1. Flower is the reproductive part of angiospermic plants for sexual means of reproduction.
2. A typical flower has four whorls arranged on a swollen end of stalk or pedicel called thalamus. They are Calyx, Corolla, Androecium and Gynoecium.
3. When a flower has both androecium and gynoecium, the flower is called bisexual and flower having either androecium or gynoecium only is called unisexual.
4. When flower can be divided into two equal radial halves in any radii passing through center the symmetry of flower is called actinomorphic (radial symmetry) as in Mustard, Datura, and Chili.
5. When flower can be divided into two similar parts only in one vertical plane it is zygomorphic as in Pea, Gulmohar, Cassia etc.
6. When Floral appendages are in multiple of 3, 4 or 5 they are called trimerous, tetramerous and pentamerous respectively. Flower with bracts are called bracteates and without it ebracteate.

   Based on the position of ovary with respect to other floral part on thalamus, flowers are of following types:



- **Hypogynous flower:** Ovary occupies the highest position. The ovary in such case is called superior. E.g., Mustard, brinjal and china rose.
- **Perigynous flowers:** If the gynoecium is situated at the center and other parts are on the rim at same height. Ovary is called half-inferior.
- **Epigynous flowers:** The margin of thalamus grows to completely cover the ovary. Ovary is said to be inferior.

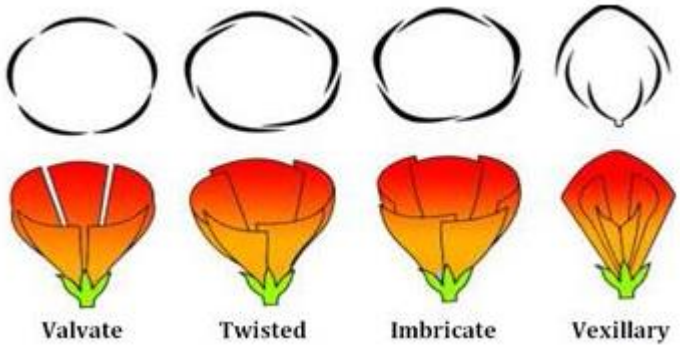
Calyx

Calyx is the outermost whorl of the flower; its members are called sepals. They are generally green and leafy; protect the flower in bud stage. It may be gamosepalous (sepals united) or polysepalous (sepals free).

Corolla

consists of petals, brightly colored to attract the insects for pollination. They may be gamopetalous or polypetalous.

- The mode of arrangement of sepals or petals in floral bud with respect to the other members of same whorl is called aestivation. In valvate, the whorls of sepals or petals touch each other as in Calotropis. In Twisted aestivation, the whorls overlap each other as in China rose.
- In Imbricate aestivation, margin overlap each other but not in particular fashion as in Gulmohur.
- In pea and bean flowers, there are five petals- the largest (standard) overlaps the two lateral petals (wings) which in turn overlap two smallest anterior petals (keel). This type of aestivation is known as vexillary or papilionaceous.



The Androecium

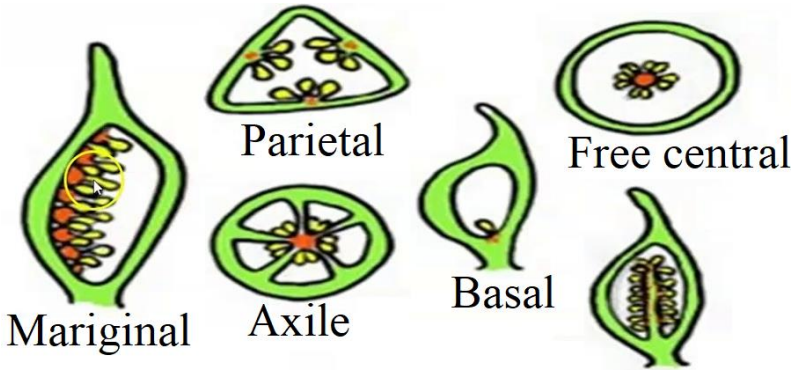
- Androecium represent the male reproductive parts of flower, consists of stamens. Each stamen consists of filament and anther. Pollen grains are

produced in pollen sac. Sterile stamen is called Stemenode.

- When stamens are attached with petals it is called epipetalous (Brinjal). Stamen may be free (polyandrous) or may be united in one bundle (monoadelphous), two bundles (diadelphous), more than two (polyadelphous).

Placentation

The arrangement of ovules within the ovary is called placentation.



The Gynoecium

- Female reproductive part of flower consists of one or more carpels. Each carpel is made up of stigma style and ovary.
- When more than one carpel is present, it may be free (apocarpous) as in lotus and rose or fused together (syncarpous) as in mustard and tomato.
- After fertilization, ovules change into seeds and ovary mature into fruits.

Flowers can either be:

- Complete
- Incomplete

A complete flower is the one that consists of sepals, petals, stamens and pistil. On the contrary, an incomplete flower is the one that lacks one or more of these structures.

A complete flower consists of two different parts

- Vegetative Part
- Reproductive Part

Vegetative Parts of a Flower

Petals: This is a bright-colored part that attracts bees, insects, and birds. Color of petals varies from plant to plant; some are bright while some are pale colored. Thus, petals help us to differentiate one flower from another.

Sepals: Sepal is the green-colored part beneath the petals to protect rising buds. Some flowers have fused petals-sepals while a few have separated petals-sepals.

Reproductive Parts of a Flower

Stamen: This is the male reproductive organ and is also known as Androecium. It consists of two parts namely: anther and filaments. the anther is a yellowish, sac-like structure, involved in producing and storing the pollens the filament is

a slender, threadlike object, which functions by supporting the anther.

Pistil: This is the innermost part and the female reproductive organ of a flower which comprises three parts -stigma, style and ovary. This is collectively known as the pistil.

1. **Stigma:** It is the topmost part or receptive tip of carpels in the gynoecium of a flower.
2. **Style:** It is the long tube-like slender stalk that connects stigma and the ovary.
3. **Ovary:** It is the ductless reproductive gland that holds a lot of ovules. It is the part of the plant where the seed formation takes place.

Carpels: The carpel is the fourth whorl of the flower present in the center. The carpels contain the pistil, the female reproductive part of the flower. It comprises the ovary, style, and stigma. The egg or the ovule is present in the ovary. After fertilization, sometimes the ovary turns into the fruit to keep the seed. At the top of the ovary is a vertical structure called style that supports the stigma. The dispersed pollens stick to the stigma and travel down to the ovary through the style.

Functions Of Flower

1. Gametophytes develop in the flowers.
2. The flowers can produce diaspores without fertilization.
3. After fertilization, the ovary of the flower develops into a fruit containing a seed.
4. The most important function of flowers is reproduction. They help in the union of male and female gametes.
5. Flowers provide nectar to certain birds and insects, which in turn help in the transfer of pollen from one flower to the other.
6. Flowers may promote selfing, i.e., the union of sperms and eggs from the same flower, or cross-fertilization, i.e., the union of sperms and eggs from different flowers.

Semi -Technical description of a typical flowering plant

The plant is described beginning with its habit, vegetative characters – roots, stem and leaves and then floral characters inflorescence and flower parts.

The floral formula is represented by some symbols. In the floral formula, Br stands for bracteate K stands for calyx, C for corolla, P for perianth, A for androecium and G for Gynoecium. Fusion is indicated by enclosing the figure within bracket and adhesion by a line drawn above the symbols of the floral parts.

Family Fabaceae

This family was earlier known as Papilionoideae. Herbs, shrubs or tree root with root nodules. Pinnately compound leaves with reticulate venation.

$$\textbf{Floral Formula: } \% \, ♂ ♀ \, K_{(5)} \, C_{1+2+(2)} \, A_{(9)+1} \, \underline{G}_1$$

Economic importance

Plants belonging to this family are sources of pulses like Gram, Arhar, Bean. Pea

etc. and edible oils like groundnut, soybean, etc.

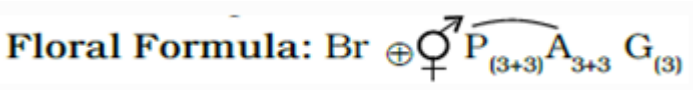
Family Solanaceae

Plant body herbs or shrubs, rarely small trees, commonly known as potato family. Leaves simple or pinnately compound. Reticulate venation.

Many of them are source of food (potato, tomato, Brinjal etc.), spices (Chilli) etc.

Family Liliaceae

- Commonly known as Lily family. Monocots, perennial herbs. Leaves alternate with parallel venation.
- Underground bulbs, corms or rhizomes.
- Flower bisexual, actinomorphic, sepals and petals are absent, having perianth.



It includes ornamental plants (Tulip), Medicine (aloe) and vegetable (colchicine).

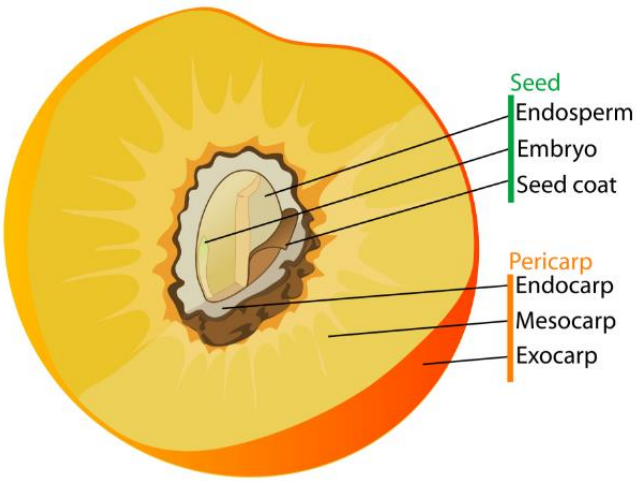
Pollination

Pollination is the process in which the pollens are transferred from anther to stigma. The process of pollination can occur through a different medium.

The fruit

Mature and ripened ovary developed after fertilisation is fruit. If a fruit is formed without fertilisation of ovary it is called parthenocarpic fruit.

Fruit consists of seeds and pericarp. Thick and fleshy pericarp is three layered called epicarp, mesocarp

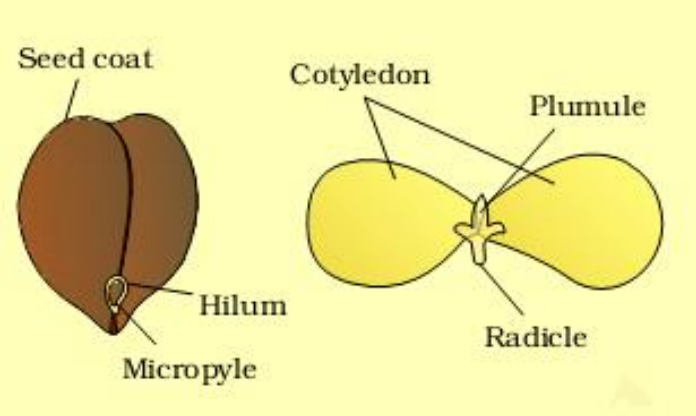


Dicotyledonous Seeds

Dicotyledonous Seed is made up of a seed coat and an embryo. Embryo is made up of embryonal axis, radicle and cotyledons.

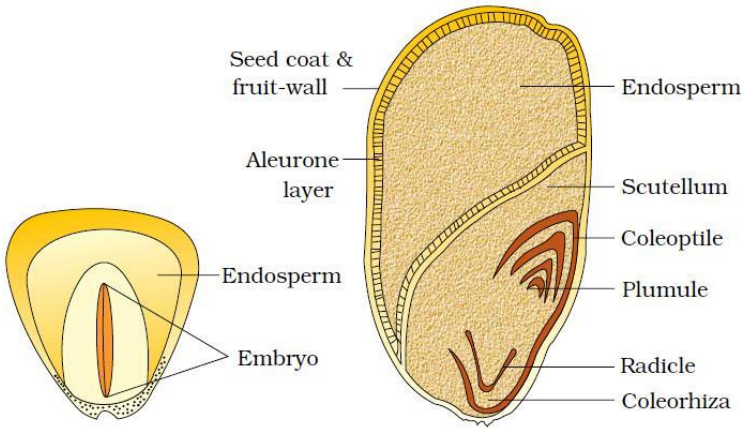
Seed coat has two layers outer testa and inner tegmen. Hilum is scar through which seed is attached to the ovary. Small pore above the hilum is called

micropyle.



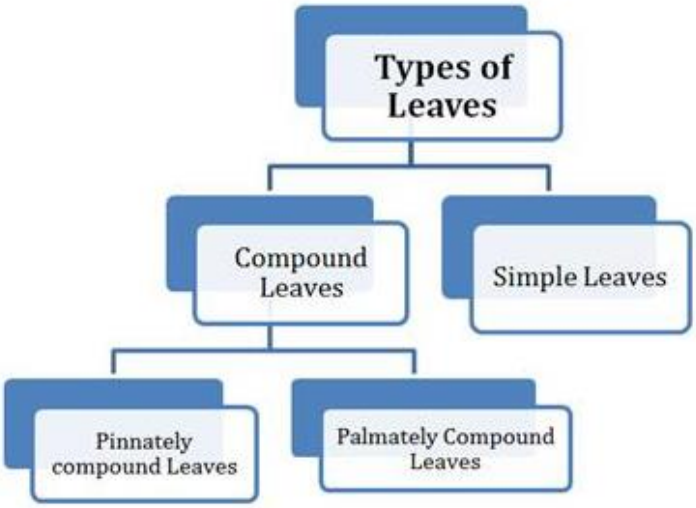
Monocotyledonous seeds

In monocotyledonous seed, outer covering of endosperm separate the embryo by a proteinous layer called aleurone layer. Single cotyledon is called as scutellum having a short axis bearing Plumule and radicle. Plumule and radicle are closed inside sheaths called as coleoptile and coleorhiza respectively.



The Leaf

Leaves originate from shoot apical meristem and are arranged in an acropetal order a typical leaf consists of three parts - Leaf base, Petiole, Lamina. Leaf is attached with stem by Leaf Base which may bear two small leaf like structure called stipule.



Simple Leaves

A leaf having a single or undivided lamina is called Simple leaf. The incisions do not touch the mid rib. Example- Mango, Guava etc.

Compound leaves

When the incision of lamina reach up to the midrib and breaking it into a number of leaflets, it is called Compound leaves.

Pinnately compound leaves: In a Pinnately compound leaves, a number of leaflets are present on common axis called rachis. Example- Neem.

Palmately compound leaves: In Palmately compound leaves, the leaflets are attached at common point. Example- Silk cotton.

Venation

The arrangement of veins and veinlets in the lamina of leaf.

Types of Venation:

Reticulate Venation: Veinlets form a network as in leaves of dicotyledonous plants (China rose, peepal).

Parallel Venation: Veins are parallel to each other as in leaves of monocotyledonous plants (grass, maize, sugarcane).

The Stem

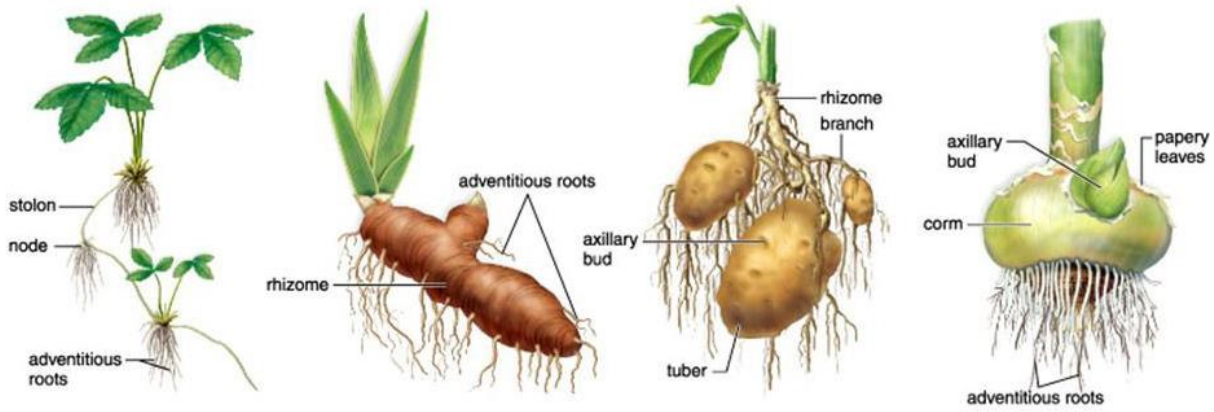
Stem is the aerial part of the plant and develops from plumule of the embryo. It bears nodes and internodes.

Functions of stem:

Exposure of leaves, conduction of water and minerals, translocation of food, exposure of flowers and fruits.

Modification of stems:

- Underground stem of potato, ginger and turmeric are modified to store food. They also act as organ of perennation in unfavorable conditions.
- Stem tendril help plants to climb as in cucumber, pumpkins, and grapes.
- Axillary buds of stem may modify into woody, straight and pointed thorns as in Citrus and Bougainvillea.
- Plants of arid regions modify their stem to flatted (Opuntia), fleshy cylindrical (Euphorbia) having chlorophyll for photosynthesis.



The Root

In plants, root is the non-green (due to absence of chlorophyll), cylindrical and descending part that normally grows downwards into the soil. It does not bear leaves, buds and not distinguished into nodes and inter nodes.

Functions of Roots:

The major functions of roots are as follows:

- Fixation Root provides fixation to the plants with soil.
- Absorption Roots absorb water and minerals from the soil and provide it to all parts of the body.
- Storage Roots of many plants store food for the use of other plant parts and for animals.
- Aeration Plants growing in waterlogged soil or marshy areas have special roots, i.e., pneumatophores for respiration.
- Conduction Roots transport water and minerals in upward direction for the uses of stems and leaves.

The main axis is divided into two parts:

- **Root system:** The underground root system develops from the radicle embryo and helps in fixation of the plant as well as absorption of water and minerals.
- **Shoot system:** The shoot system is the aerial part of the plant, which is found above the root and ground level. The shoot system includes the stem, leaves, bud, flower, fruits and the seeds. Shoot system is one of the important systems of a plant.

Main functions of root system:

- Absorption of water and minerals from the soil.
- Provides anchorage to plant parts.
- Stores reserve food material and synthesizes plant growth regulators.

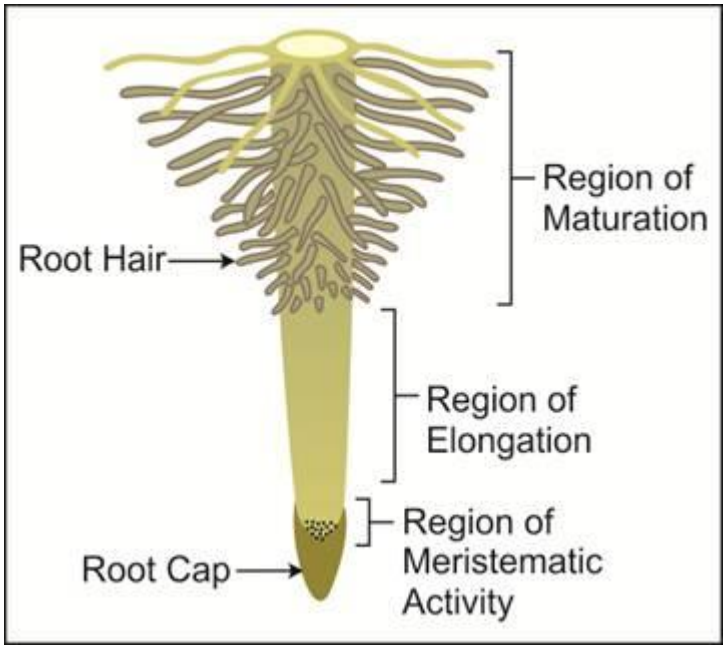
Various types of root:

- **Tap root:** Originates from radicle. Dicotyledonous plants e.g., mustard, gram, mango.
- **Fibrous root:** Originates from base of the stem. Monocotyledonous plants e.g., wheat, paddy.
- **Adventitious root:** Originates from parts of the plant other than radicle.

Banyan tree (Prop roots) Maize (Stilt roots).

Regions of Roots:

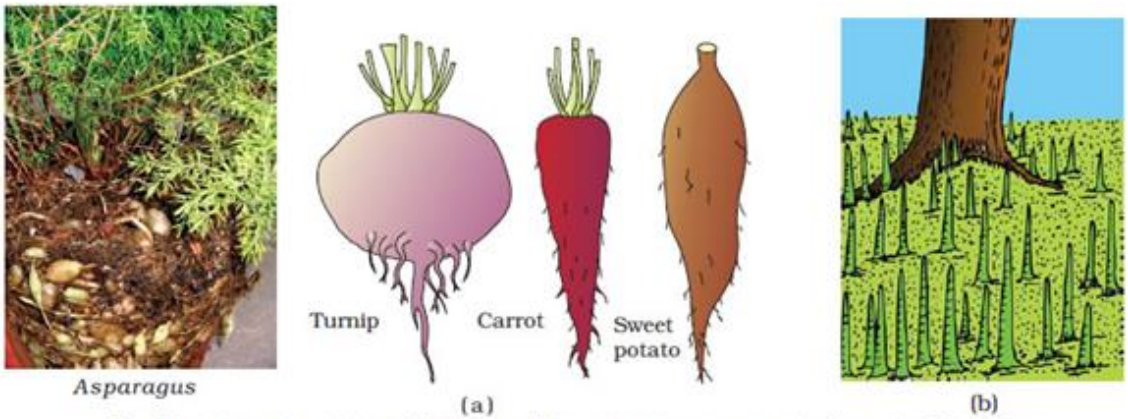
- The apex of root is covered by a thimble like structure called root cap, it protect the tender apex of root while making way through soil.
- Above the root cap is region of meristematic activity having small cells with dense cytoplasm.
- The part above the region of meristematic activity is region of elongation where cells under go elongation and enlargement to increase the length of root.
- Region of maturation contain root hairs that help in absorption of water and minerals.



Modification of roots:

Roots are modified for storage, nitrogen fixation, aeration and support.

- Tap root of carrot, turnip and adventitious root of sweet potato get swollen to store food.
- Prop root of Banyan and Stilt root of maize and sugarcane have supporting root coming out from lower node of stems.
- In Rhizophora, Pneumatophores help to get oxygen for respiration as it grows in swampy areas.



Modification of root for : (a) storage (b) respiration: pneumatophore in *Rhizophora*

Inflorescence

A flower is a significant part of a plant tailored for reproduction. In addition, it is an essential part of the bouquet, decorations, celebrations, garden, rituals, etc. Among different parts of a plant, the flower is the most attractive part due to its beauty and fragrance.

Racemose Inflorescence

In this type of inflorescence, the flowers branch laterally on the floral axis. Here the floral axis keeps on growing and the flowers develop in an acropetal pattern.

Racemose inflorescence

Cymose Inflorescence

In this type of inflorescence, the flower is the terminating point of each floral axis. In Cymose inflorescence, flowers follow the basipetal pattern of growth.

Cymose inflorescence

NCERT LINE BY LINE QUESITONS

Unit-2

1. Curly top virus spreads a plant via- **(Pg. 64, E)**
   A) Xylem B) Phloem C) Vascular bundle D) None of these
2. The book 'Plant Anatomy' was published by Esau in – **(Pg. 64, E)**
   A) Same year as she did her doctorate B) 1960
   C) 1954 D) 1957
3. Which of referred as 'Webster's of plant biology' – an encyclopedia **(Pg. 64, E)**
   A) Plant anatomy B) Anatomy of angiospermic plant
   C) Anatomy of seed plants D) A & B both
4. Esau was _____ woman to receive 'National Academy of science' **(Pg. 64, E)**
   A) 7th B) 6^{th} C) 5th D) 1th
5. Statement – I: Esau got National Academy of Science in 1957 Statement – II: In 1989, Esau received National Medal of Science in 1989. **(Pg. 64, E)**
   A) Statement – I & statement – II are both correct
   B) Statement – I & statement – II are both incorrect
   C) Statement – I is correct and statement – II is incorrect
   D) Statement – I is incorrect and statement – I is correct
6. Morphology is study of **(Pg. 65, E)**
   A) External structure of an organism B) Internal structure of an organism
   C) Systematics D) A & B booth

Paragraph – 5.1
The Root

7. Radical form- **(Pg. 65, E)**
   A) Root system of plant B) Floral part of plant
   C) Shoot system of plant D) A & B both
8. The lateral roots arise from primary root is- **(Pg. 65, E)**
   A) Primary root B) Secondary root
   C) Tertiary root D) A & B both
9. Choose the given statement which is suitable for following figure **(Pg. 66, E)**

   A) It comprises of primary & secondary root
   B) Such roots are observed in mustard
   C) These roots are replace by large number root

D) A & B both

10. From given set of example choose, how many of following are example of fibrous root and adventitious root respectively.
Sweet potato, carrot, turnip, wheat, grass, *Monstera,* banyan tree **(Pg. 66, E)**
A) 1, 4 B) 1, 3 C) 2, 3 D) 3, 2

11. Adventitious roots arise from- **(Pg. 66, E)**
A) Radicle B) Base of stem in tuft as in wheat
C) Part of plant other than radicle as in mustard
D) Secondary root

12. Root is characterized by **(Pg. 66, E)**
A) Presence of node & internode B) Mainly (-ve) phototropism
C) Mainly (-ve) geotropism D) Mainly (-ve) hydrotropism

13. Which of the following is not the main function of root system is/are **(Pg. 66, E)**
A) Absorption of sap from soil
B) Providing proper anchorage to plant parts.
C) Synthesis of plant growth regulators
D) None of these

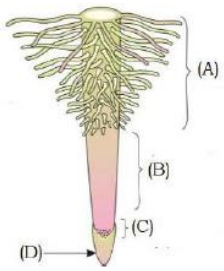
14. Identify given diagram **(Pg. 66, M)**

	A)	B)	C)
A)	Tap root	Fibrous root	Adventitio us root
B)	Tap root	Adventitious root	Fibrous root
C)	Adventitious root	Fibrous root	Tap root
D)	Fibrous root	Tap root	Adventitious root

Paragraph-5.1.1
Regions of the Root

15. In aquatic plant the apex of root is covered by **(Pg. 67, E)**
A) Thimble parenchymatous root cap B) Root pocket
C) Coleorhiza D) Coleoptile

16. Identify region of root tip **(Pg. 67, M)**



A) A = Region of maturation, B = Region of elongation, C = Region of meristematic activity, D = Root cap
B) A = Region of elongation, B = Region of meristematic activity, C = Root cap, D

= Protective covering
C) A = Region of meristem, B = Region of maturation, C = Region of elongation, D = Root cap
D) A = Region of growing cell, B = Region of mature cell, C = Region of dividing cell, (D = Protective covering

17. Root hair arise from – **(Pg. 67, E)**
A) Cortical cell of region of maturation
B) Epidermal cell of region of maturation
C) Cortical cell of region of elongation
D) Epidermal cell of region of elongation

18. Choose mismatch pair **(Pg. 67, H)**

Column – I	**Column – II**
A) Region of meristematic	- Small thin wall dense
B) Region of elongation	- Responsible for growth of root in length
C) Region of maturation	- Proximal to region of elongation
D) Root hair	- Differentiated and mature cell proximal to region of maturation

Paragraph-5.1.2
Modification of Root:

19. Pneumatophores are helpful in- **(Pg. 67, E)**
A) Transpiration B) Getting oxygen for respiration
C) Absorption of water D) Assimilation of food

20. Silt roots and pneumatophores are observed in- **(Pg. 67, E)**
A) Maize, *Rhizophora* B) Maize, *Rhizopus*
C) Sugarcane *Rhizopus* D) A & B both

21. Mechanical root observed in – **(Pg. 67, E)**
A) Sugarcane B) Maize
C) Banyan tree D) All of these

22. For food storage root get modified in – **(Pg. 67, E)**
A) Potato B) Sweet potato
C) Ginger D) A & B both

23. Match the following – **(Pg. 67, H)**

Column – I	**Column – II**
A) Conical root	(I) Raddish
B) Napiform root	(II) Turnip
C) Tuberous root	(III) Sweet potato
D) Fusiform root	(IV) carrot

a b c d	**a b c d**
A) IV II III I	B) IV III II I
C) III IV I II	D) III IV I II

24. Modification of root *Asparagus* is meant for – **(Pg. 67, E)**

A) Storage of food B) Mechanical support
C) Respiration D) Climbing support

25. Slit root arise from – **(Pg. 67, E)**
A) Lower nodes of Zea mays B) Lower internode of sugarcane
C) Lower internode of Zea mays D) Upper node of sugarcane

26. Pneumatophores are **(Pg. 67, E)**
i) Positive geotropism ii) Negative geotropism
iii) Grown in marshy area iv) Found in mangroves
v) Positive phototropism vi) Negative phototropism
A) i, iii, iv, vi B) ii, iii, iv, v C) i, iii, v D) ii, iv, vi

Paragraph-5.2
Stem:

27. Stem distinguish from root in – **(Pg. 68, E)**
A) Presence of node & internode B) Absence of node & internode
C) Presence of hairs for water absorption D) Absence of bud

28. Stem are develop from – **(Pg. 68, E)**
A) Radicle of germinating seed B) Plumule of germinating seed
C) Cotyledons of germinating seed D) Coleoptile

29. The region of stem where leaves are born are _____ **(Pg. 68, E)**
A) Nodes B) Internode
C) Both node & internode D) Floral bud

30. Stems are generally – **(Pg. 68, E)**
A) (+ve) geotropism, (-ve) hydrotropism, (+ve) phototropism
B) (-ve) geotropism, (-ve) hydrotropism, (+ve) phototropism
C) (+ve) geotropism, (+ve) hydrotropism, (+ve) phototropism
D) (+ve) geotropism, (-ve) hydrotropism, (- ve) phototropism

Paragraph-5.2.1
Modification of stem:

31. Underground modified stem of potato is known as- **(Pg. 68, E)**
A) Tuber B) Rhizome C) Corm D) Bulb

32. Stem store food for- **(Pg. 68, E)**
A) Favourable condition growth B) Unfavourable condition growth
C) Flowering condition D) A & C both

33. Choose odd on with respect to stem modification – **(Pg. 68, E)**
A) Zaminkand B) Colocasia C) Bougainvillea D) Turmeric

34. How many of following stem modification does develop from axillary buds **(Pg. 68, M)**
Colocasia, grapevines, cucumber, pumpkin, *Opuntia*, Citrus, Watermelon, *Bougainvillea*
A) 7 B) 6 C) 5 D) 4

35. Ginger and turmeric are example of – **(Pg. 68, E)**
A) Rhizome B) Rhizoid C) Corm D) Roots

36. Photosynthetic green flattened modified stem xerophyte is in – **(Pg. 68, E)**
A) *Acacia* B) *Euphorbia* C) *Opuntia* D) *Hydrilla*

37. Stem is modified for protection in – **(Pg. 68, E)**

A) Citrus thorn B) Bougainvillea spine

C) Opuntia thorn D) A and C

38. Statement – I: Some plants of arid region modify their stems into fleshy cylindrical structure as in *Euphorbia*

Statement – II: In grapevines, stem tendril are for help plant to climb **(Pg. 68, M)**

A) Statement – I and Statement – II are correct.

B) Statement – I is correct while statement – II is not correct

C) Statement – I is incorrect while statement – II is correct

D) Statement – I and statement – II are incorrect

39. Stem tendril of pumpkin develop from- **(Pg. 68, E)**

A) Accessory bud B) Axillary bud

C) Extra – axillary bud D) Floral bud

40. Choose the correct statement about stem modification of mint **(Pg. 69, E)**

A) A slender lateral branch arises from base of main axis and after growing underground for some time arch upward to touch the ground.

B) A slender lateral branch arises from base of main axis and after growing aerially for some time arch downwards to touch the ground.

C) Stem modification is same as in strawberries

D) Stem modification mint is known as sucker

41. Match the following: **(Pg. 69, H)**

Column – I	**Column – II**
I) Strawberry	A. Sucker
II) Jasmine	B. Offset
III) *Pistia*	C. Runner
IV) Pineapple	D. Stolon

A) I – C, II – D, III – B, IV – A B) I – B, II – C, III – A, IV – D

C) I – C, II – A, III – B, IV – D D) I – A, II – B, III – C, IV – D

42. Choose odd one with respect to stem modification- **(Pg. 69, E)**

A) Chrysanthemum B) Banana

C) Pineapple D) Strawberry

43. In pineapple – **(Pg. 69, E)**

A) The lateral branches originate from basal and underground portion of main stem, grow horizontally beneath the soil and then come out obliquely upward giving rise to leafy shoot.

B) The lateral branch arises time arch downward to touch the ground growing aerially for some time arch downward to touch the ground

C) A lateral branch with short internode and each node bearing a rosette of leaves and a tuft of roots.

D) None of these

44. In *Oxalis* stem is modified for – **(Pg. 69, E)**

A) Storage B) Support

C) Protection D) Vegetative propagation

45. Lateral branch with short internode & each node bearing a rosette of leaves and a tuft of root found in – **(Pg. 69, E)**

A) *Pistia* B) *Eichhornia* C) Grasses D) A & B both

Paragraph-5.3
The leaf

46. Choose the correct response: **(Pg. 69, E)**

A) Leaf develop at the node and bears a bud in its axile

B) Leaves originate from SAM are arranged in acropetal orders.

C) Leaf is lateral gernerally flattened vegetative structure for photosynthesis

D) All of these

47. Stipules are – **(Pg. 70, E)**

A) Two lateral small leaf like structure

B) Four lateral small leaf like structure

C) One lateral small leaf like structure

D) Many lateral small leaf like

48. The leaf base expanded into a sheath crossing the stem partially or wholly in– **(Pg. 70, E)**

A) Monocot B) Dicot

C) All angiosperms plant D) Gymnosperms

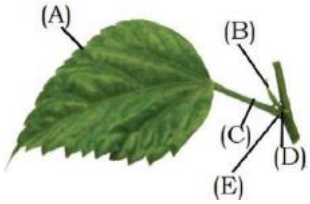
49. Pulvinus is – **(Pg. 70, E)**

A) Swollen leaf base of legume

B) Swollen petiole of legume and china Rose

C) Swollen lamina D) Swollen stipule

50. Label – A, B, C, D, E **(Pg. 70, M)**



	A	B	C	D	E
A)	Lamina	Stipule	Petiole	Axillary bud	Leaf base
B)	Lamina	Stipule	Petiole	Axillary bud	Leaf base
C)	Lamina	Pulvinus	Pedicel	Axillary bond	Leaf base
D)	Lamina	Stipule	Pedicel	Extraaxillary bond	Leaf base

Paragraph-5.3.1
Venation

51. Arrangement of vein & veinlet in lamina of leaf **(Pg. 70, E)**

A) Venation B) Phyllotaxy C) Aestivation D) None of these

52. Leaves of dicotyledonous plants generally characterized by - **(Pg. 70, E)**

A) Presence of parallel venation

B) Veins which are parallel to each other within a lamina.

C) Presence of reticulate venation

D) A & B both

53. Identify the leaf venation and type of leaf. **(Pg. 70, E)**

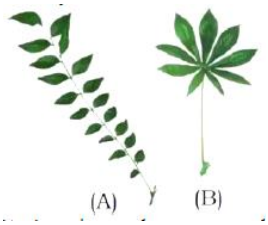
A) Parallel venation; monocot mainly
B) Parallel venation; dicot mainly
C) Reticulate venation; dicot mainly
D) Reticulate venation; monocot mainly

Paragraph-5.3.2 Types of leaves:

54. A leaf is simple **(Pg. 70, E)**
A) When its lamina is entire
B) When its lamina is incised, the incision do not touch the midrib
C) A & B both D) None of these

55. When the incisions of lamina reach to midrib breaking leaf into a number of leaflet is not- **(Pg. 70, E)**
A) Compound leaf B) Simple leaf
C) Pinnate leaf D) Palmate leaf

56. Identify A and B **(Pg. 70, M)**



A) A = pinnately compound leaf; Neem B = palmately compound leaf; Silk cotton
B) A = palmately compound leaf; Silk cotton B = pinnately compound leaf; Neem
C) A = pinnately compound leaf; Silk cotton B = palmately compound leaf; Neem
D) A = palmately compound leaf; Neem B = pinnately compound leaf; Silk cotton

57. Midrib of pinnately compound leaf is – **(Pg. 70, E)**
A) Mid-vein B) Rachis C) Petiole D) None of these

58. Leaflet of pinnately compound leaf arise on- **(Pg. 70, E)**
A) Common point i.e. at tip of petiole
B) Common axis
C) Common point i.e. at tip of rachis
D) A & C both

59. Leaflet of _____ arise on common point i.e. at tip of petiole **(Pg. 71, E)**
A) Pinnately compound leaf B) Palmately compound leaf
C) Simple leaf D) All of these

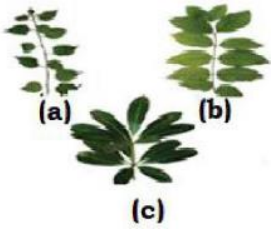
Paragraph-5.3.3 Phyllotaxy

60. Phyllotaxy is pattern of arrangement of ____ on the ____ **(Pg. 71, E)**

A) Leaf, stem B) Phloem, stem

C) Vein, leaf D) None of these

61. Identify types of phyllotaxy shown by given diagram **(Pg. 71, M)**



	A)	**B)**	**C)**
A)	Opposite	Alternate	Whorled
B)	Alternate	Opposite	Whorled
C)	Alternate	Whorled	Opposite
D)	None of these		

62. Choose correct statement – **(Pg. 71, E)**

A) In alternate type; a single leaf arises at each node.

B) In opposite type; a pair leaves arises at each node.

C) In whorled type; more than two leaves arises at each node.

D) All of these

63. Sunflower show- **(Pg. 71, E)**

A) Alternate phyllotaxy B) Opposite phyllotaxy

C) Whorled phyllotaxy D) None of these

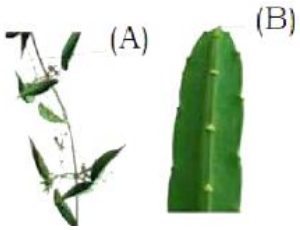
Paragraph-5.3.4
Modification of leaves:

64. In Australian acacia **(Pg. 71, E)**

A) Lamina modification B) Petiole modified

C) Stipule modified D) All of these

65. Select the correct option: **(Pg. 71, E)**



A) Both A & B are modified by leaves

B) A is tendrils for climbing

C) B is spines for defence D) All of these

66. Pitcher of pitcher plant is modified – **(Pg. 71, E)**

A) Leaf B) Stem C) Root D) Fruit

Paragraph-5.4
The inflorescence:

67. Flower is modified – **(Pg. 71, E)**

A) Node B) Internode C) Leaf D) Shoot

68. Choose the correct statement **(Pg. 71, E)**

A) In flower, SAM changes to floral meristem

B) In flower, internode do not elongate

C) The axis get condensed in flower.

D) All of these

69. The arrangement of flowers on the floral axis is – **(Pg. 71, E)**

A) Phyllotaxy B) Inflorescence

C) Aestivation D) Placentation

70. On the basis whether floral apex gets develop into flower or continues to grow, inflorescence are mainly of- **(Pg. 72, E)**

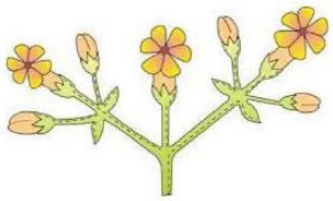
A) 3 types B) 4 types C) 2 types D) None of these

71. In racemose- **(Pg. 72, E)**

A) Main axis continues to grow B) Flower are in basipetal order

C) Main axis terminate into flower D) B & C both

72. Choose the correct statement about given figure **(Pg. 72, E)**



A) It is of racemose type inflorescence

B) Flowers are in basipetal order

C) Flowers are in acropetal order

D) Example of *Cassia*

73. Given diagram is of – **(Pg. 72, M)**

A) Racemose inflorescence B) Cymose inflorescence

C) Cymose inflorescence of Cassia D) B & C both

Paragraph-5.5

The flower:

74. A complete flower consist of – **(Pg. 73, E)**

A) One whorl B) Two whorls

C) Three whorls D) Four whorls

75. Flower stalk is known as – **(Pg. 72, E)**

A) Pedicel B) Thalamus C) Petiole D) Stipules

76. Thalamus is not – **(Pg. 72, E)**

A) Swollen end of pedicel B) Different whorl arranged on it

C) Accessory whorl D) Receptacle for different whorl

77. Choose the correct statement- **(Pg. 72, E)**
A) Calyx, corolla, are accessory organ
B) Androecium, gynoecium are reproductive organ
C) Perianth present in lily D) All of these

78. Perianth is **(Pg. 72, E)**
A) Indistinct calyx & corolla B) Fused corolla & androecium
C) Reproductive organ D) None of these

79. Bisexual flowers is – **(Pg. 72, E)**
A) When a flower has both androecium & gynoecium
B) Present in Solanaceae, Liliaceae
C) Present in mustard and Pea
D) All of these

80. How many of following show Actinomorphic, Zygomorphic respectively. **(Pg. 72, E)**
Mustard, datura, chilli, Pea, Canna, bean, gulmohur, Cassia
A) 3, 4 B) 4, 3 C) 4, 4 D) None of these

81. **Statement – I:** when a flower can be divided into two equal radial halves in any radial plane passing through the centre it is actinomorphic flower
Statement – II: when a flower can be divided into two similar halves only in one particular vertical plane, it is zygomorphic **(Pg. 72, E)**
A) Statement – I & II are correct B) Statement – I is correct
C) Statement – II is correct only D) Statement – I & II are incorrect

82. *Cassia* show - **(Pg. 72, E)**
A) Racemose inflorescence, zygomorphic
B) Racemose inflorescence, actinomorphic
C) Cymose inflorescence, actinomorphic
D) Cymose inflorescence, zygomorphic

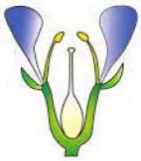
83. Flower with leaf that found the base of pedicel are – **(Pg. 72, E)**
A) Bracteate B) Ebracteate C) Petiolate D) Sessile

84. Flower with floral appendages 3 or multiple of 3 are said – **(Pg. 72, E)**
A) Tetramerous B) Trimerous
C) Triploid D) Pentamerous

85. In hypogynous flower which of following floral part takes highest position **(Pg. 73, E)**
A) Calyx B) Corolla C) Androceium D) Pistil

86. Which of following is mismatched **(Pg. 73, E)**

Column-I	**Column-II**
A) 	1. Mustard

B) 	2. Brinjal
C) 	3. Peach
D) 	4. Cucumber

87. Superior ovary found in – **(Pg. 73, E)**
A) Hypogynous flower B) Perigynous flower
C) Epigynous flower D) Cucumber

88. Choose the correct about perigynous flower – **(Pg. 73, E)**
A) Gynoecium is situated in centre
B) Apart from gynoecium, rest parts are located on rim of thalamus almost at same level
C) Ovary is half inferior D) All of these

89. How many of following are example of perigynous, hypogynous and epigynous respectively. **(Pg. 73, E)**
Mustard, china Rose. Brinjal, plum, peach, rose, guava, cucumber, ray floret sunflower, Pea, *Asparagus*
A) 3, 3, 5 B) 3, 3, 3 C) 3, 5, 3 D) 5, 3, 3

90. 
(Pg. 73, E)
A) Hypogynous flower B) Epigynous
C) Perigynous D) China rose

Paragraph-5.5.1
Parts of flower

91. Flower consist of – **(Pg. 73, E)**
A) Four reproductive whorl B) Four whorl
C) Four accessory whorl D) All of these

Paragraph-5.5.1.1 Calyx

92. The outermost whorl of flower is – **(Pg. 73, E)**
A) Calyx B) Corolla C) Bract D) Thalamus

93. Choose the correct statement- **(Pg. 73, E)**

A) Sepals are members of calyx B) Petals are members of calyx
C) Sepal are plural of corolla D) None of these

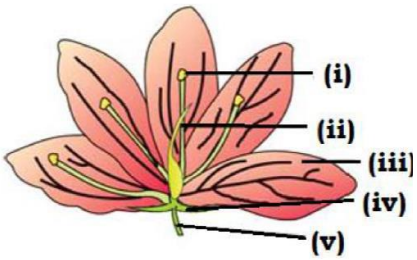
94. Sepals united in _____ and sepals are free in _____ condition **(Pg. 73, E)**
A) Gamosepalous, Polysepalous B) Polysepalous, Gamosepalous
C) Polysepalous, Polysepalous D) Gamosepalous, Gamosepalous

Paragraph-5.5.1.2 Corolla

95. Corolla are – **(Pg. 73, E)**
A) Composed of petal B) United by sepals
C) Composed of tepals D) Usually for bud protection

96. Polypetalous is condition with _____ while gamopetalous is for _____ **(Pg. 74, E)**
A) Free petal; fused petal B) Fused petal; free petal
C) Free petal; free petal D) Fused petal; fuced petal

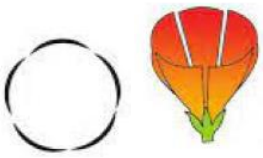
97. Label (i), (ii), (iii), (iv), (v) **(Pg. 74, M)**



	(i)	(ii)	(iii)	(iv)	(v)
A)	Gynoecium	Androecium	Pedicel	Corolla	Calyx
B)	Gynoecium	Androecium	Corolla	Calyx	Pedicel
C)	Androecium	Gynoecium	Calyx	Corolla	Pedicel
D)	Androecium	Gynoecium	Corolla	Calyx	Pedicel

98. The mode of arrangement of sepals or petals in floral bud with respect to the other members of same whorl is termed as– **(Pg. 74, E)**
A) Placentation B) Aestivation
C) Phyllotaxy D) Inflorescence

99. Given diagram represent – **(Pg. 74, E)**



A) Twisted aestivation B) Imbricate aestivation
C) Vexillary aestivation D) Valvate aestivation

100. In *Calotropis*- **(Pg. 74, E)**
A) Sepals or petals in a whorl just touch one another at the margin, without overlapping
B) One margin of the appendage overlaps that of the next one
C) Margin of sepals or petals overlap one another but not in particular direction
D) None of these

101. "Keel" present in – **(Pg. 74, E)**
A) Valvate B) Imbricate C) Papilionaceous D) Twisted

102. In Pea find odd one out – **(Pg. 74, E)**

A) 'Standard' is largest petals
B) 'Standard' overlaps the two lateral Keel.
C) 'Keel' are smallest anterior petals.
D) Keel are fused

103. The aestivation in gulmohur is – **(Pg. 74, E)**
A) Valvate B) Twisted C) Imbricate D) Vexillary

104. Find odd one with respect to aestivation **(Pg. 74, E)**
A) China rose B) Cassia C) Lady's finger D) Cotton

Paragraph-5.5.1.3 Androecium

105. Androecium composed of – **(Pg. 75, E)**
A) Sepals B) Petal C) Stamen D) Carpel

106. Each anther is usually _____ and each lobe has _____ chambers, pollen sacs **(Pg. 75, E)**
A) Bilobed; two B) Bilobed; four C) Tetralobed; four D) None

107. Staminode is – **(Pg. 75, E)**
A) Fertile stamen B) Sterile stamen C) Both A & B D) None of these

108. How many of following statements are true. **(Pg. 75, M)**
(i) Stamens united into one bundle i.e. monoadelphous
(ii) Monoadelphous is in china Rose, diadelphous is in Pea and polydephous is in Citrus
(iii) Variation in the length of filaments within a flower as in Salvia & mustard
(iv) Two bundle of stamens are diadelphous and when stamen are united into two or more bundle i.e. polyadelphous
A) 1 B) 2 C) 3 D) 4

Paragraph-5.5.1.4 Gynoecium

109. Female reproductive part of flower is – **(Pg. 75, E)**
A) Androecium B) Gynoecium C) Petal D) Sepal

110. Pollen grains receptive surface is – **(Pg. 75, E)**
A) Stigma B) Style C) Ovary D) Ovule

111. Placenta attach- **(Pg. 75, E)**
A) Ovule to ovary
B) Ovary to thalamus
C) Ovary and other floral part
D) None of these

112. Apocarpous is- **(Pg. 75, E)**
i) Free carpel
ii) Fused carpel
iii) Present in rose
iv) Present in lotus
v) Present in tomato
A) i, iii, iv B) i, iii, v C) ii, iii, iv D) ii, iv, v

113. After fertilization, the ovary develop into _____ and ovule matures into a _____. **(Pg. 75, E)**
A) Fruit; fruit B) Seed; fruit C) Fruit; seed D) Seed; seed

114. Placentation is arrangement of _____ within the _____. **(Pg. 75, E)**
A) Ovary; ovule
B) Placenta; embryosac
C) Ovule; ovary
D) None of these

115. **(Pg. 75, E)**

A) Such placentation seen in Argemone
B) The placenta is axial and the ovules are attached to it in an unilocular ovary
C) Such placentation seen in china rose
D) The placenta is axial and the ovules are attached to it in multilocular ovary as in *Dianthus*

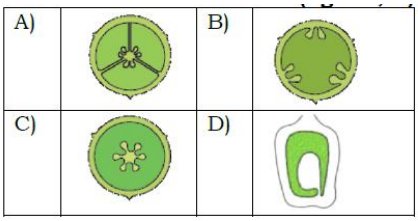
116. Match the column I and column II **(Pg. 75, E)**

Column I	**Column II**
1 Parietal	a. Pea
2 Axile	b. Lemon
3 Marginal	c. *Argemone*
4 Basal	d. *Primrose*
5 Free - central	e. Sunflower

A) 1 – c, 2 – b, 3 – a, 4 – e, 5 – d
B) 1 – d, 2 – c, 3 – a, 4 – b, 5 – e
C) 1 – e, 2 – d, 3 – a, 4 – c, 5 – b
D) 1 – b, 2 – e, 3 – a, 4 – d, 5 – c

117. Choose the correct statement – **(Pg. 75, M)**
A) Unilocular ovary becomes two chambered due to the formation of false septum as in mustard
B) In Argemone ovary is two chambered due to the formation of true septum
C) Axile placentation found in multilocular ovary as in tomato
D) A & C both

118. *Dianthus* have – **(Pg. 75, E)**



119. In Marigold – **(Pg. 75, E)**
A) Same placentation found in sunflower
B) Placenta develop at base of ovary
C) Single ovule is attached to ovary
D) All of those

Paragraph-5.6 The fruit

120. Parthenocarpic fruit is – **(Pg. 76, E)**
A) Develop after fertilization from ovary
B) Develop without fertilization
C) Develop after fertilization from thalamus
D) A & C both

121. Pericarp differentiated into – **(Pg. 76, E)**

A) Outer thin epicarp, middle fleshy edible mesocarp and an inner stony hard endocarp in Mango

B) Outer fleshy epicarp, middle stony hard endocarp in mango

C) Outer thin epicarp, middle stony hard mesocarp and an inner seed in mango

D) None of these

Paragraph-5.7 The seed

122. Seed of wheat is made up of – **(Pg. 76, E)**

A) A radicle, an embryonal axis & one cotyledon

B) A radicle, an embryonal axis & two cotyledon

C) Embryo only D) Only one cotyledon

Paragraph-5.7.1
Structure of a dicotyledonous seed

123. Find odd one with respect to endosperm **(Pg. 76, E)**.

A) Pea B) Gram C) Castor D) Bean

124. How many are correct statement about dicot seed? **(Pg. 77, E)**

i) Testa, an inner layer is one of two layers of seed coat

ii) Seed were attached to fruit by hilum

iii) Micropyle is small pore below hilum

iv) Castor is endospermic seed

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

Paragraph-5.7.2
Structure of monocotyledonous seeds

125. How many of following is wrong stated statement? **(Pg. 77, E)**

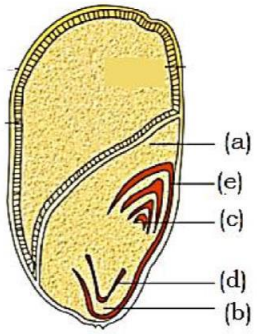
i) Generally monocot seeds are non-endospermic seed

ii) Orchid is example of dicot seed

iii) In maize, seed coat fused with fruit wall iv) Orchid is endospermic seed

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

126. Label a, b, c, d, e **(Pg. 77, M)**



	a	b	c	d	e
A)	Scutellum	Coleorhiza	Plumule	Radicle	Coleoptile
B)	Scutellum	Coleorhiza	Radicle	Plumule	Coleoptile
C)	Scutellum	Coleoptile	Radicle	Plumule	Coleorhiza
D)	Scutellum	Coleoptile	Plumule	Radicle	Coleorhiza

127. Aleurone layer is – **(Pg. 77, E)**

A) Carbohydrate enrich layer B) Proteinous layer

C) Lipid enrich layer D) A and B

128. Scutellum present in **(Pg. 77, E)**

A) Orchid B) Castor C) Pea D) Gram

Paragraph-5.8
Semi-technical description of a typical flowering plant-

129. Number of androecium in mustard is – **(Pg. 78, E)**

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

130. How many of following is incorrect about Brassicaceae (mustard) actinomorphic, zygomorphic, bisexual, K4, superior ovary, C2+2, C(4) **(Pg. 78, E)**

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

Paragraph-5.9 Description of some important family
Paragraph 5.9.1 Fabaceae

131. Fabaceae was earlier called as – **(Pg. 78, E)**

A) Leguminosae B) Papilionoideae

C) Both A & B D) Fabaceae

132. Given diagram is- **(Pg. 79, E)**

A) L.S of carpel of pea B) Fruit of pea

C) T.S. of carpel of pea D) Androecium of Pea

133. Calyx of fabaceae show- **(Pg. 79, E)**

A) Polypetalous B) Polysepalous

C) Valvate aestivation D) Both B & C

134. Androecium of Fabaceae is – **(Pg. 79, E)**

A) Ten in number B) 9 are united

C) 1 is free D) All of these

135. How many of following is endospermic seed- **(Pg. 79, E)**

Arhar, groundnut, Indigofera, muliathi, *Sesbania, Trifolium*

A) O B) 1 C) 2 D) 3

136. The correct floral formula of sunhemp is- **(Pg. 79, E)**

A) $\oplus$ ⚥ $K_{(5)}\ C_{1+2+2}\ A_{(9)+1}\ \underline{G}_1$

B) % ⚥ $K_{(5)}\ C_{1+2+(2)}\ A_{(9)+1}\ \underline{G}_1$

C) % ⚥ $K_{(5)}\ C_5\ A_{10}\ \underline{G}_2$

D) $\oplus$ ⚥ $\widehat{P_{3+3}\ A_{3+3}}\ \underline{G}_3$

Paragraph-5.9.2
Solanaceae

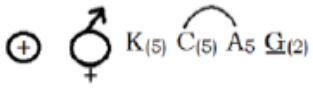
137. Which of the following is potato family? **(Pg. 79, E)**
A) Fabaceae B) Solanaceae C) Liliaceae D) Brassicaceae

138. Find out one with respect to Solanaceae **(Pg. 80, E)**
A) Alternate phyllotaxy B) Exstipulate
C) Reticulate venation D) Pulvinate

139. In *Solanum*, inflorescene is- **(Pg. 80, E)**
A) Racemose B) Cymose C) Solitary D) B and C

140. How many of following term is not correctly stated about tobacco's family.
Bicarpellary, obligately placed, apocarpous, superior ovary, bilocular, placenta swollen with many ovules, free – central placentation, drupe fruit **(Pg. 80, E)**
A) 0 B) 1 C) 2 D) 3

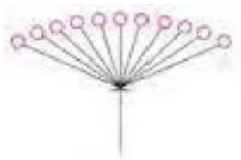
141. Persistant calyx found in- **(Pg. 80, E)**
A) Brinjal B) Pea C) Onion D) *Colchicine*

142. 

is floral formula of how many of following-
Aloe, belladonna, ashwagandha, muliathi, sunhemp, *Indigofera, Gloriosa* **(Pg. 80, E)**
A) 1 B) 2 C) 3 D) 4

143. Makoi plant – **(Pg. 80, E)**
A) *Solanum nigrum* B) *Solanum tuberosum*
C) *Allium* D) *Petunia*

Paragraph-5.9.3
Liliaceae

144. Given diagram is – **(Pg. 81, E)**

A) Flower of *Allium* B) Inflorescence of *Allium*
C) Inflorescence of dicot family D) Racemose

145. How many of following are endospermous seed.
Aloe, Asparagus, Tulip, Potato, Tomato, Pea, *Petunia*, Chilli, *Sesbania*, *Trifolium*, *Lupin*, Muliathi, Ashwagandha, *Colchicine*, *Gloriosa* **(Pg. 81, E)**
A) 10 B) 8 C) 15 D) 5

146. Onion show- **(Pg. 81, E)**
A) Axile placentation B) Parietal placentation
C) Free central placentation D) Basal placentation

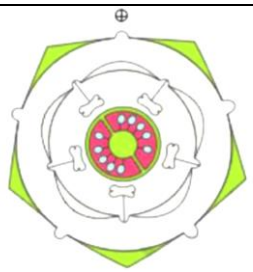
147. Gynoceium of Aloe is not- **(Pg. 81, E)**

A) Tricarpellary B) Apocarpous
C) Syncarpous D) Superior ovary

148. Floral formula of *Colchicum autumnale* does not show- **(Pg. 81, E)**

A) Br ⊕♂♀ B) $\overset{\frown}{P_{(3+3)}\ A_{(3+3)}}$ C) $\underline{G}(3)$ D) All of these

149. Choose mismatched – **(Pg. 81, H)**

Column-I	**Column-II**
 **A)**	*Asparagus* (vegetables)
 **B)**	Mustard
 **C)**	*Pisum sativum*
 **D)**	Brassicaceae

150. The floral feature of angiosperm represented in summarized form as- **(Pg. 81, E)**

A) Floral diagram B) Floral formula
C) A and B D) None of these

NEET PREVIOUS YEARS QUESTIONS

1. Sweet potato is a modified _____. **[2018]**
   (a) stem (b) adventitious root (c) rhizome (d) tap root
2. Pneumatophores occur in _____. **[2018]**
   (a) halophytes (b) free-floating hydrophytes
   (c) submerged hydrophytes (d) carnivorous plants
3. Plants which produce characteristic pneumatophores and show vivipary belong to _____. **[2017]**
   (a) halophytes (b) psammophytes (c) hydrophytes (d) mesophytes
4. In Bougainvillea, thorns are the modifications of _____. **[2017]**
   (a) adventitious root (b) stem (c) leaf (d) stipules
5. Which of the following is not a stem modification? **[2017]**
   (a) Pitcher of Nepenthes. (b) Thorns of citrus.
   (c) Tendrils of cucumber. (d) Flattened structures of Opuntia.
6. Coconut fruit is a _____. **[2017]**
   (a) Berry (b) Nut (c) Capsule (d) Drupe
7. The morphological nature of the edible part of coconut is _____. **[2017]**
   (a) cotyledon (b) endosperm (c) pericarp (d) perisperm
8. Stems modified into flat green organs performing the functions of leaves are known as _____ **[2016]**
   (a) cladodes (b) phyllodes (c) phylloclades (d) scales
9. The standard petal of a papilionaceous corolla is also called _____. **[2016]**
   (a) carina (b) pappus (c) vexillum (d) corona
10. Proximal end of the filament of stamen is attached to the_____. **[2016]**
    (a) anther (b) connective (c) placenta (d) thalamus or petal
11. Cotyledon of maize grain is called _____. **[2016]**
    (a) plumule (b) coleorhiza (c) coleoptile (d) scutellum
12. Tricarpellary syncarpous gynoecium is found in flowers of _____. **[2016]**
    (a) liliaceae (b) Solanaceae (c) fabaceae (d) poaceae
13. Which of the following pairs is not correctly matched? **[2015]**

	Mode of reproduction	Example
(a)	Rhizome	Banana
(b)	Binary fission	*Sargassum*
(c)	Conidia	*Penicillium*
(d)	Offset	Water hyacinth

14. Leaves become modified into spines in: **[2015]**
(a) Pea (b) Onion (c) Silk cotton (d) Opuntia

15. Flowers are unisexual in: **[2015]**
(a) Cucumber (b) China rose (c) Onion (d) Pea

16. Perigynous flowers are found in: **[2015]**
(a) Cucumber (b) China rose (c) Rose (d) Guava

17. Which one of the following fruits is parthenocarpic? **[2015]**
(a) Apple (b) Jackfruit (c) Banana (d) Brinjal

18. The wheat grain has an embryo with one, large, shieldshaped cotyledon known as _______. **[2015]**
(a) coleorrhiza (b) scutellum (c) coleoptile (d) epiblast

19. Axile placentation is present in _______. **[2015]**
(a) lemon (b) pea (c) Argemone (d) Dianthus

20. Among china rose, mustard, brinjal, potato, guava, cucumber, onion and tulip, how many plants have superior ovary? **[2015]**
(a) Six (b) Three (c) Four (d) Five

21. Coconut water from a tender coconut is **[2015]**
(a) free nuclear endosperm. (b) innermost layers of the seed coar.
(c) degenerated nucellus. (d) immature emryo.

22. $\oplus ⚥ K_{(5)} \overset{\frown}{C_{(5)} A_5} G_{\underline{(2)}}$ is the floral formula of _______. **[2015]**
(a) Sesbania (b) Petunia (c) Brassica (d) Allium

23. Keel is the characteristic feature of flower of :
[2015]
(a) Indigofera (b) Aloe (c) Tomato (d) Tulip

24. An example of edible underground stem is: **[2014]**
(a) Carrot (b) Groundnut (c) Sweet potato (d) Potato

25. When the margins of sepals or petals overlap one another without any particular direction, the condition is termed as: **[2014]**
(a) Vexillary (b) Imbricate (c) Twisted (d) Valvate

26. Placenta and pericarp are both edible portions in _______. **[2014]**
(a) apple (b) banana (c) tomato (d) potato

27. An aggregate fruit is one which develops from **[2014]**
(a) multicarpellary, syncarpous gynoecium. (b) multicarpellary, apocarpus gynoecium.
(c) complete inflorescence. (d) multicarpellary, superior ovary.

28. Which one of the following statement is correct? **[2014]**
(a) The seed in grasses is not endospermic. (b) Mango is a parthenocarpic fruit.
(c) A proteinaceous aleurone layer is present in maize grain.
(d) A sterile pistil is called a staminode.

29. Placentation, in which ovules develop on the inner wall of the ovary or in peripheral part, is **(NEET-2019)**
(1) Basal (2) Axile (3) Parietal (4) Free central

30. Which of the following shows whorled phyllotaxy ? **(NEET-2019 ODISSA)**
(1) Mustard (2) China rose (3) Alstonia (4) Calotropis

31. Bicarpellary ovary with obliquely placed septum is seen in **(NEET-2019 ODISSA)**
(1) Brassica (2) Aloe (3) Solanum (4) Sesbania

32. Match the placental types (column-I) with their examples (column-II) **(NEET-2019 ODISSA)**

Column-I	**Column-II**
(a) Basal	(i) Mustard
(b) Axile	(ii) China rose
(c) Parietal	(iii) Dianthus
(d) Free central	(iv) Sunflower

Choose the correct answer from the following options:
(1) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i) (2) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)
(3) (a)-(iv), (b)-(ii), (c)-(i), (d)-(iii) (4) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)

33. Which of the following is the correct floral formula of Liliaceae? **(NEET-2020 COVID)**
(1) $\% \, ♀ \, C_{1+2+(2)} \; A_{(9)+1} \; \underline{G}_1$ (2) $\oplus \, ♂ \, ♀ \, K_{(5)} \; \widehat{C_{(5)} \; A_5} \; \underline{G}_{(2)}$
(3) $\mathrm{Br} \oplus ♀ \; \widehat{P_{(3+3)} \; A_{3+3}} \; G_{(3)}$ (4) $\oplus \, ♀ \; K_{(5)} \; \widehat{C_{(5)} \; A_5} \; \underline{G}_{(2)}$

34. Correct position of floral parts over thalamus in mustard plant is :**(NEET-2020 COVID)**

(1) Gynoecium occupies the highest position, while the other parts are situated below it.
(2) Margin of the thalamus grows upward, enclosing the ovary completely, and other parts arise below the ovary.
(3) Gynoecium is present in the centre and other parts cover it partially.
(4) Gynoecium is situated in the centre, and other\ parts of the flower are located at the rim of the
thalamus, at the same level.

35. In some plants thalamus contributes to fruitformation. Such fruits are termed as **(NEET-2020 COVID)**
(1) False fruits (2) Aggregate fruits (3) True fruits (4) Parthenocarpic fruit

36. Identify the correct features of Mango and Coconut fruits. **(NEET-2020 COVID)**
(i) In both fruit is a drupe
(ii) Endocarp is edible in both
(iii) Mesocarp in Coconut is fibrous, and in Mango it is fleshy
(iv) In both, fruit develops from monocarpellary ovary
Select the correct option from below:

(1) (i), (iii) and (iv) only (2) (i), (ii) and (iii) only (3) (i) and (iv) only (4) (i) and (ii) only

37. The roots that originate from the base of the stem are **(NEET-2020)**
1) Lateral roots 2) Fibrous roots 3) Primary roots 4) Prop roots

38. Ray florets have: **(NEET-2020)**
1) Half inferior ovary 2) Inferior ovary 3) Superior ovary 4) Hypogynous ovary

39. The ovary is half inferior in **(NEET-2020)**
1) Plum 2) Brinjal 3) Mustard 4) Sunflower

40. Diadelphous stamens are found in: **[NEET-2021]**
1) Citrus 2) Pea 3) China rose and citrus 4) China rose

41. Match List – I with List – II **[NEET-2021]**

	List – I		List – II
a)	$\%\,\mathrm{K}_{(5)}\mathrm{C}_{1+2+(2)}\mathrm{A}_{(9)+1}\underline{\mathrm{G}}_{1}$	**i)**	**Brassicaceae**
b)	$\oplus\,\mathrm{K}_{(5)}\overset{\frown}{\mathrm{C}_{(5)}\mathrm{A}_{5}}\underline{\mathrm{G}}_{2}$	**ii)**	**Liliaceae**
c)	$\oplus\,\overset{\frown}{\mathrm{P}_{(3+3)}\mathrm{A}}_{3+3}\underline{\mathrm{G}}_{(3)}$	**iii)**	**Fabaceae**
d)	$\oplus\,\mathrm{K}_{2+2}\mathrm{C}_{4}\mathrm{A}_{2-4}\underline{\mathrm{G}}_{(2)}$	**iv)**	**Solanaceae**

	a	**b**	**c**	**d**
1)	i	ii	iii	iv
2)	ii	iii	iv	i
3)	iv	ii	I	iii
4)	iii	iv	ii	i

42. Which one of the following plants show vexillary aestivation and diadelphous stamens?
1) Colchium autumnale 2) Pisum sativum **[NEET-2022]**
3) allium cepa 4) Solanum nigrum

43. The flowers are Zygomorphic in: **[NEET-2022]**
a) Mustard b) Gulmohar c) *Cassia* d) *Datura*
e) Chilly
Choose the correct answer from the options given below:
1) a, b, c only 2) b, c only 3) d, e only 4) c, d, e only

44. Identify the correct set of statements: **[NEET-2022]**
a) The leaflets are modified into pointed hard thorns in citrus and Bougainvillea
b) Axillary buds form slender and spirally coiled tendrils in cucumber and pumpkin
c) Stem is flattened and fleshy in opuntia and modified to perform the function of leaves

d) Rhizophora shows vertically upward growing roots that help to get oxygen for respiration

e) Subaerially growing stems in grasses and strawberry help in vegetative propagation.

Choose the correct answer from the options given below

1) b and c only 2) a and d only

3) b, c, d and e only 4) a, b, d and e only

45. Match List I with List II

List I (Types of stamens)	**List II (Example)**
A. Monoadelphous	I. Citrus
B. Diadelphous	II. Pea
C. Polyadelphous	III. Lily
IV. China-rose	IV. China-rose

Choose the correct answer from the options given below:

(a) A-IV, B-II, C-I, D-III

(b) A-IV, B-I, C-II, D-III

(c) A-I, B-II, C-IV, D-III

(d) A-III, B-I, C-IV, D-II

[NEET 2024]

46 Match List I with List II

List I	**List II**
A. Rose	I. Twisted aestivation
B. Pea	II Perigunous flower
C. Cotton	III. Drupe
D. Mango	IV. Marginal placentation

Choose the correct answer from the options given below :

(a) A-II, B-IV, C-I, D-III

(b) A-I, B-II, C-III, D-IV

(c) A-IV, B-III, C-II, D-I

(d) A-II, B-III, C-IV, D-I

[NEET 2024]

47 In Calotropis, aestivation is:

(a) Valvate (b) Vexillary

(c) Imbricate (d) Twisted

[NEET 2023]

48 In a pea flower, five petals are arranged in a specialized manner with one posterior, two lateral and two anterior. These are named as _____, and _____ respectively.

(a) Keel, Wings and Standard

(b) Vexillum, Keel and Standard

(c) Keel, Standard and Carina

(d) Standard, Wings and Keel

[NEET 2023 Manipur]

49. Family Fabaceae differs from
Solanaceae and Liliaceae. With respect to the stamens, pick out the characteristics specific to family Fabaceae but not found in Solanaceae or Liliaceae.
(a) Polyadelphous and epipetalous stamens
(b) Monoadelphous and Monothecous anthers
(c) Epiphyllous and Dithecous anthers
(d) Diadelphous and Dithecous anthers

[NEET 2023]

50. Given below are two statements:
Statement I: In a floral formula ⊕ stands for zygomorphic nature of the flower, and G stands for inferior ovary.
Statement II: In a floral formula ⊕ stands for actinomorphic nature of the flower and G stands for superior ovary.
In the light of the above statements, choose the most appropriate answer from the options given below:
(a) Both statement I and statement II are correct
(b) Both statement I and statement II are incorrect
(c) Statement I is correct but statement II is incorrect
(d) Statement I is incorrect but statement II is correct

[NEET 2025]

51. Which of the following is an example of a zygomorphic flower?
(a) Petunia
(b) Datura
(c) Pea
(d) Chilli

[NEET 2025]

NCERT LINE BY LINE QUESTIONS – ANSWER

1) B	2) C	3) C	4) B	5) A	6) D	7) A	8) B	9) D	10) B
11) C	12) B	13) D	14) B	15) B	16) A	17) B	18) D	19) B	20) A
21) D	22) B	23) A	24) A	25) A	26) B	27) A	28) B	29) A	30) B
31) A	32) B	33) C	34) B	35) A	36) C	37) A	38) A	39) B	40) B
41) A	42) D	43) A	44) D	45) D	46) D	47) A	48) A	49) A	50) A
51) A	52) C	53) A	54) C	55) B	56) A	57) B	58) B	59) B	60) A
61) B	62) D	63) A	64) B	65) D	66) A	67) D	68) D	69) B	70) C
71) A	72) B	73) A	74) D	75) B	76) C	77) D	78) A	79) D	80) A
81) A	82) A	83) A	84) B	85) D	86) B	87) A	88) D	89) B	90) B
91) B	92) A	93) A	94) A	95) A	96) A	97) D	98) B	99) D	100) A
101) C	102) B	103) C	104) B	105) C	106) A	107) B	108) D	109) B	110) A
111) A	112) A	113) C	114) C	115) C	116) A	117) D	118) C	119) D	120) B
121) A	122) A	123) C	124) B	125) C	126) A	127) B	128) A	129) C	130) D
131) B	132) A	133) C	134) D	135) A	136) B	137) B	138) D	139) D	140) D

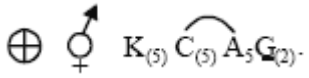
141) A	142) B	143) A	144) B	145) A	146) A	147) B	148) B	149) B	150) C

NEET PREVIOUS YEARS QUESTIONS -KEY

1 (b)	2 (a)	3 (a)	4 (b)	5 (a)	6 (d)	7 (b)	8 (c)	9 (c)	10 (d)
11 (d)	12 (a)	13 (b)	14 (d)	15 (a)	16 (c)	17 (c)	18 (b)	19 (a)	20 (a)
21 (a)	22 (b)	23 (a)	24 (d)	25 (b)	26 (c)	27 (b)	28 (c)	29 (3)	30 (3)
31 (3)	32 (3)	33 (3)	34 (1)	35 (1)	36 (1)	37 (2)	38 (2)	39 (1)	40 (2)
41 (4)	42 (2)	43 (2)	44 (3)	45(A)	46(A)	47(A)	48(D)	49(B)	50(d) 51(c) 52

NEET PREVIOUS YEARS QUESTIONS -Explanations

1. (b) Sweet potato is a modified adventitious root for storage of food. Rhizomes are underground modified stem. Tap root is primary root directly elongated from the radicle.
2. (a)
3. (a) Halophytes growing in saline soils show vivipary for seed germination and have pneumatophores for gaseous exchange.
4. (b) 5. (a)
6. (d) Coconut fruit is a drupe. A drupe is a fleshy fruit with thin skin and central stone containing the seed.
7. (b) The edible part of coconut is its endosperm. Coconut has double endosperm, liquid endosperm and cellular.
8. (c) 9. (c) 10. (d) 11. (d) 12. (a)
13. (b) Binary fission usually takes place in Amoeba, Paramecium and Euglena.
14. (d)
15. (a) The flowers of cucumber are unisexual, it means they have only male flowers or only female flowers.
16. (c) Ovary is partly superior and partly inferior in perigynous flower.
17. (c) Parthenocarpic fruits (e.g., banana) are produced without fertilisation of ovule.
18. (b)
19. (a)
20. (a) Superior ovary is found in china rose, mustard, brinjal, potato, onion and tulip. Guava and cucumber have inferior ovary.
21. (a) Coconut water is the free nuclear endosperm.
22. (b) Floral formula of Petunia (solanaceae) is



23. (a) Indigofera is a member of family fabaceae. It has keel type of floral structure in which two anterior fused petals are present.
24. (d)
25. (b) If the margins of sepals or petals overlap one another but not in any particular direction as in Cassia and gulmohur, the aestivation is called imbricate.
26. (c) In tomato, edible part is pericarp and placenta.

27. (b) Aggregate fruits (etaerio) develop from the multicarpellary apocarpous ovary. They are of following types- etaerio of follicles, etaerio of achenes, etaerio of berries, etaerio of drupes.

28. (c)

37. The roots that originate from the base of the stem are adventitious roots or fibrous roots

38. Ray florets are present in head inflorescence of asteraceae, these followers contains inferior ovary

39 Peach, Plum and rose shows half inferior ovary

40. Diadelphous stamens are found in Fabaceae members – pea

41. The floral formula of

Brassicaceae family – $\oplus \, ♂♀ \, K_{2+2} C_4 A_{2+4} \underline{G_{(2)}}$

Solanacae family – $\oplus \, ♂♀ \, K_{(5)} \overset{\frown}{C_{(5)}} A_5 \, \underline{G_{(2)}}$

Fabaceae family – $\% \, ♂♀ \, K_{(5)} C_{1+2+(2)} A_{(9)+1} \underline{G_1}$

Liliaceae family – $\oplus \, ♂♀ \, \overset{\frown}{P_{(3+3)}} A_{3+3} \underline{G}_{(3)}$

So a(iii), b(iv), c(ii), d(i) is correct matching.

42. *Pisum sativum* show vexillary aestivation and diadelphous stamens

43. In *Cassia* & *Gulmohar* flowers are Zygomorphic
In mustard, *Datura* and chilli the flowers are actinomorphic

44 B, C, D & E statements are correct
In citrus and *Bougainvillea* the stem is modified into pointed hard thorns

45 Ans. **(a)**

Explanation
In China rose monoadelphous androecium is present.
Diadelphous androecium is found in pea plant.
Polyadelphous androecium is found in citrus.
Epiphyllous androecium is found in lily.

46 Ans. **(a)**

Explanation
Rose have half-inferior ovary, thus it is known as Perigynous flower.
In Pea, the placenta form a ridge along the ventral suture of the ovary and ovules are borne on this ridge forming two rows.
In Cotton, twisted aestivation is present.
In Mango, fruit is drupe.

47Ans. **(a)**

Explanation
When sepals or petals in a whorl just touch one another at margin, without overlapping, as in Calotropis, it is said to be valvate.

Imbricate aestivation is exhibited by Cassia,
Twisted aestivation is exhibited by China rose,
Vexillary aestivation is exhibited by Pea.

48 Ans**. (d)**

Explanation
The correct answer is:
Option (d): Standard, Wings and Keel
In a typical pea flower, which is a type of papilionaceous flower, the petals are arranged in a specific pattern. The single large posterior petal, often larger and more visually striking than the others, is known as the 'standard' or 'banner'. The two lateral petals are referred to as 'wings'. The two anterior petals are usually fused at their edges and form a structure that looks like a boat's keel, which is why they are called the 'keel'. So, the arrangement is 'Standard, Wings and Keel'.

49 Ans **(b)**

Explanation
In fabaceae family the filaments of nine stamen are united into one bundle and tenth posterior stamen stand apart (diadelphous condition). Anther in fabaceae is of two lobes or two theca thus called dithecous anther. These two characteristics are present in the members of fabaceae family but not found in members of solanacea or liliaceae family. Androecium: ten, diadelphous, anther dithecous

50. Ans. **(d)**

Explanation
Statement I is incorrect while statement II is correct.
$\oplus$ for actinomorphic and % for zygomorphic nature of flower. $\underline{G}$ for superior ovary and $\bar{G}$ for inferior ovary.

51. Ans. **(c)**

Explanation
In symmetry, the flower may be actinomorphic (radial symmetry) or zygomorphic (bilateral symmetry). When a flower can be divided into two equal radial halves in any radial plane passing through the centre, it is said to be actinomorphic, e.g., mustard, datura, chilli. When it can be divided into two similar halves only in one particular vertical plane, it is zygomorphic, e.g., pea, gulmohur, bean, Cassia.

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