9. Take one flower each of the families Fabaceae and Solanaceae and write their semi-technical description. Also draw their floral diagram after studying them.
Solution:
Family Fabaceae (e.g., Pisum sativum) Systematic position:
Class - Dicotyledoneae
Subclass - Polypetalae
Series - Calyciflorae
Order - Rosales
Family - Fabaceae
Vegetative characters:
Habit: herb. Root: tap, branched, with root nodules.
Stem: herbaceous, climbing.
Leaves : pinnately compound, leaf base pulvinate, stipulate, venation reticulate.
Floral characters:
Inflorescence: racemose.
Flower : bisexual, zygomorphic, irregular, hermaphrodite, white or pink, complete, hypogynous to perigynous.
Calyx : sepals five, gamosepalous, ascending, imbricate aestivation, campanulate calyx tube.
Corolla : petals five, polypetalous, vexillary aestivation, papilionaceous, consisting of a posterior standard or vexillum two lateral wings or alae, two anterior ones forming a keel.
Androecium : 10 stamens in two bundles (diadelphous) of (9) + 1, anthers dithecous (bilobed), basifixed, introrse.
Gynoecium : ovary superior, monocarpellary, unilocular with many ovules, marginal placentation, style bent and long, stigma simple and-hairy.
Fruit : legume; seeds one to many, non- endospermic.
Family Solanaceae (e.g., Solanum nigrum) Systematic position:
Class Subclass Series Order Family
Vegetative characters:
Habit: herbs Stem : herbaceous, aerial, erect, cylindrical, branched.
Leaves: alternate, simple, exstipulate, venation reticulate.
Inflorescence: cymose.
Flower: ebracteate, ebracteolate, bisexual, actinomorphic, white, hypogynous.
Calyx: sepals five, gamosepalous, persistent, valvate aestivation.
Corolla: petals five, gamopetalous, valvate. aestivation.
Androecium: stamens five, epipetalous, polyandrous, anthers large, bithecous and basifixed.
Gynoecium: bicarpellary, syncarpous,
ovary, obliquely placed carpels in the flower, bilocular, axile placentation, placenta swollen with many ovules.
Fruits: berry with persistent calyx.

10. Describe the various types of placentations found in flowering plants.
Solution: Placenta is a parenchymatous cushion present inside the ovary where ovules are borne. The number, position, arrangement or distribution of placentae inside an ovary is called placentation. The placentation are of different types namely, marginal, axile, parietal, basal and free central.

- Marginal placentation : The placenta forms a ridge along the ventral suture of the ovary and the ovules are borne on this ridge forming two rows, e.g., pea.
- Axile placentation : When the placenta is axial and the ovules are attached to it in a multilocular ovary, the placentation is said to be axile, e.g., china rose, tomato and lemon.
- Parietal placentation : The ovules develop on the inner wall of the ovary or on peripheral part. Ovary is one-chambered but it becomes two-chambered due to the formation of the false septum, e.g., mustard and Argemone.
- Free central placentation : When the ovules are borne on central axis and septa are absent, as in Dianthus and primrose the placentation is called free central.
- Basal placentation: The placenta develops at the base of ovary and a single ovule is attached to it, as in sunflower, marigold.

11. What is a flower? Describe the parts of a typical angiosperm flower.
Solution:
Flower is the reproductive unit in the angiosperms. It is meant for sexual reproduction. A typical flower has four different kinds of whorls arranged successively on the swollen end of the stalk or pedicel, called thalamus or receptacle. These are calyx, corolla, androecium and gynoecium.
Calyx and corolla are accessory organs, while androecium and gynoecium are reproductive organs. In some flowers like lily, the calyx and corolla are not distinct and are termed as perianth. Some flowers have both androecium and gynoecium and are termed hermaphrodite flowers while some flowers have only one of these two whorls.
Calyx: The calyx is the outermost whorl of the flower and its units are called sepals. Generally, sepals are green, leaf like and protect the flower in the bud stage. The calyx may be gamosepalous (sepals united) or polysepalous (sepals free).
Corolla: Corolla is composed of petals. Petals are usually brightly coloured to attract insects for pollination. Like calyx, corolla may also be free (polypetalous) or united (gamopetalous). The shape and colour of corolla vary greatly in plants. Corolla may be tubular, bell-shaped, funnel-shaped or wheel-shaped.
Androecium: Androecium is the male reproductive part of the flower. It is composed of stamens. Each stamen which represents the male reproductive organ consists of a stalk or a filament and an anther. Each anther is usually bilobed and each lobe has two chambers, the pollen-sacs. The pollen grains are produced in pollen-sacs. A sterile stamen is called staminode.
Gynoecium: Gynoecium is the female reproductive part of the flower and is made up of one or more carpels. A carpel consists of three parts namely stigma, style and ovary. Ovary is the enlarged basal part, on which lies the elongated tube, the style. The style connects the ovary to the stigma. The stigma is usually at the tip of the style and is' the receptive surface for pollen grains. Each ovary bears one or more ovules attached to a flattened, cushion-like placenta. When more than one carpel is present, they may be free (as in lotus and rose) and are called apocarpous. They are termed syncarpous when carpels are fused, as in mustard and tomato. After fertilisation, the ovules develop into seeds and the ovary matures into a fruit.

12. How do the various leaf modifications help plants?
Solution: Leaves perform various functions besides photosynthesis and thus they are modified into different forms such as -

- Leaf tendrils: The different parts of a leaf are modified into tendrils which help the plant in climbing up. Parts of leaf modified into tendrils include stipules e.g., Smiiax ; petiole e.g.,

Clematis ; leaf apex e.g., Gloriosa ; leaflets e.g., Pisum; whole leaf e.g., Lathyrus.

- Leaf spines: Either for the protection of plant or to lessen the rate of transpiration in xerophytic plants, the leaves modify into sharp, pointed spines. Parts of leaf modified into leaf spines include stipules e.g., Zizyphus; leaf margins e.g., Argemone; leaf apex e.g.r Yucca; entire leaf e.g., Berberis.
- Phyllode: Petioles modify into leaf¬like green, photosynthesising structure e.g., Parkinsonia, Acacia auriculiformis.
- Scale or protective leaves : The leaves modify into hard scaly leaves which protect the vegetative bud by covering them, e.g., Ficus, Artocarpus, Casuarina, etc.
- Leaf hooks: They help in climbing e.g., Bignonia.
- Leaf roots: A leaf transforms into roots for balancing on water e.g., Salvinia.
- Leaf pitchers: Leaf is modified into pitcher e.g., Nepenthes (insectivorous), Dischidia (non-insectivorous).
- Leaf bladder: The leaves modify to form bladder like structure which trap insects and then it is closed by a valve present on the mouth of bladder e.g., Utricularia (bladderwort).
- Leaf tentacles: The leaf of sundew plant, Drosera bear minute hairs which have shinning, sticky substance at their tips (tentacles). When any insect sits on the leaf, it is covered by these hairs.

13. Define the term inflorescence. Explain the basis for the different types of inflorescence in flowering plants.
Solution: The arrangement of flowers on the floral axis is termed as inflorescence. A flower is a modified shoot wherein internodes do not elongate and the axis gets condensed. The apex produces different kinds of floral appendages laterally at successive nodes instead of leaves. When a shoot tip transforms into a flower, it is always solitary. Depending on whether the apex gets converted into a flower or continues to grow, two major types of inflorescence are defined - racemose and cymose. In racemose type of inflorescence the main axis continues to grow, the flowers are borne laterally in an acropetal succession. In cymose type of inflorescence the main axis terminates in a flower, hence is limited in growth. The flowers are borne in a basipeta! order.

14. Write the floral formula of an actinomorphic, bisexual, hypogynous flower with five united sepals, five free petals, five free stamens and two united carples with superior ovary and axile placentation.
Solution: The floral formula for actinomorphic, bisexual, hypogynous flower with five united sepals, five free petals, five free stamens and two united carples with superior ovary and axile placentation is:

15. Describe the arrangement of floral members in relation to their insertion on thalamus.
Solution: In a typical flower, the floral members like calyx, corolla, androecium and gynOecium are arranged over the thalamus! Based on the position of calyx, corolla and androecium in respect to ovary on thalamus, the flowers are described as hypogynous, perigynous and epigynous ones. In the hypogynous flower the gynoecium occupies the highest position while the other parts are situated below it. The ovary in such flowers is said to be superior, e.g., mustard, china rose and brinjal. If gynoecium is situated in the centre and other parts of the flower are located on the rim of the thalamus almost at the same level, it is called perigynous. The ovary here is said to be half inferior or sub superior, e.g., plum, rose, peach. In epigynous flowers, the margin of thalamus grows upward enclosing the ovary completely and gets fused with it; the other parts of flower arise above the ovary. Hence, the ovary is said to be

inferior as in flowers of guava and cucumber, and the ray florets of sunflower.

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