

PREFACE

Biology is a natural science concerned with the study of life and living organisms, including their structure, function, growth, origin, evolution, distribution and taxonomy. It provides detailed information about the zoological as well as botanical aspects of life with intensive study of different species of plants and animals, internal structure of human body, physical and chemical functions of tissues, organs and organ systems, and many other aspects.

Practical application of biology is of utmost importance in the field of physiology, neurology, biochemistry, cardiology, zoology, pisciculture, apiculture, sericulture etc. Therefore it is necessary to have a firm grip over such an extensive subject and its practical application. Hence we bring to you “**Std. XII Sci. : BIOLOGY PRACTICAL HANDBOOK**” a handbook which is a complete and thorough guide for the effective preparation.

This handbook is written according to the needs and requirement of the board exam and helps the student to score high. It covers the entire syllabus with different sets of practical written in a systematic and comprehensive manner. The diagrams included are neat, labeled and well drawn to provide an imagination of what they look like in real. The handbook also includes all the necessary information regarding the practical.

And lastly, we would like to thank all those who have helped us in preparing this book. There is always room for improvement and hence we welcome all suggestions and regret any errors that may have occurred in the making of this book.

A book affects eternity; one can never tell where its influence stops.

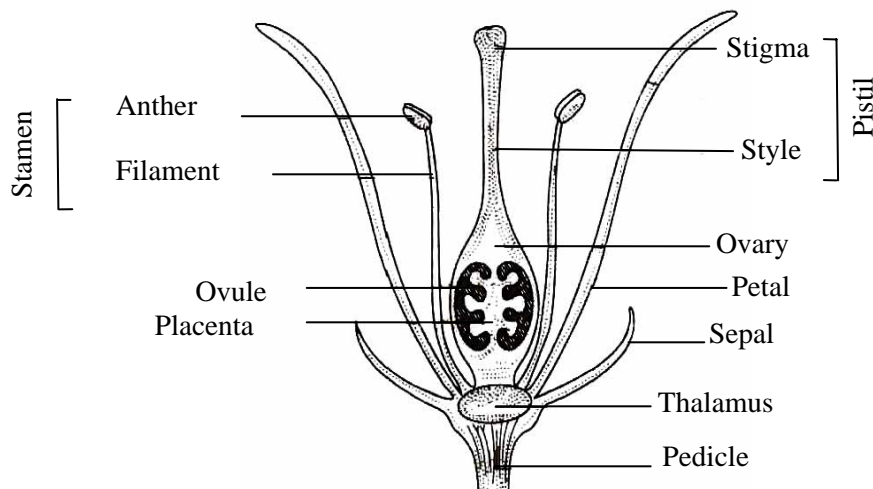
Best of luck to all the aspirants!

Yours faithfully
Publisher

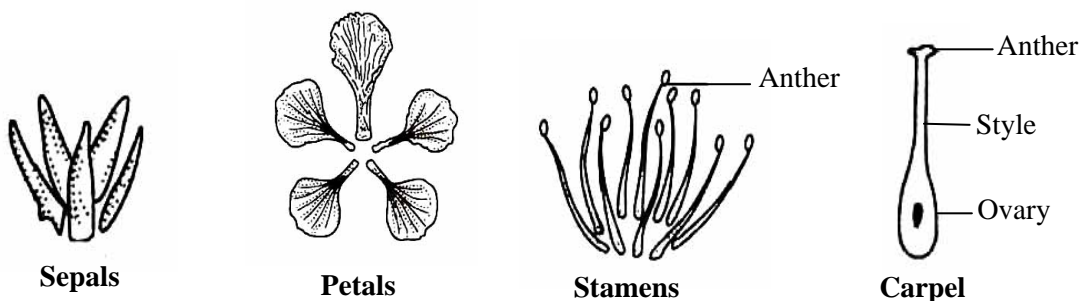
A-01 To dissect the given flowers and display different whorls

Introduction

A modified shoot meant for reproduction is called flower. A flower consists of receptacle on which its four whorls are born. These are calyx, corolla, androecium and gynoecium.



Parts of a typical flower



Dissected parts of a flower

A. Study the following terminology.

- i. **Bracteolate:** flower with bracteoles
- ii. **Bracteoles:** leaf like appendage in the axil of a flower
- iii. **Bract:** leaf like appendage at the base of the flower
- iv. **Ebracteate:** flower without bract
- v. **Bracteate:** flower bearing bract.
- vi. **Sessile flower:** flower without stalk

- vii. **Pedicellate:** flower with stalk
- viii. **Incomplete:** does not have all the four whorls
- ix. **Trimerous:** floral leaves of each whorls are three or in multiple of three
- x. **Tetramerous:** floral leaves of each whorls are four or in multiple of four
- xi. **Pentamerous:** floral leaves of each whorls are five or in multiple of five

B. Symmetry of flower

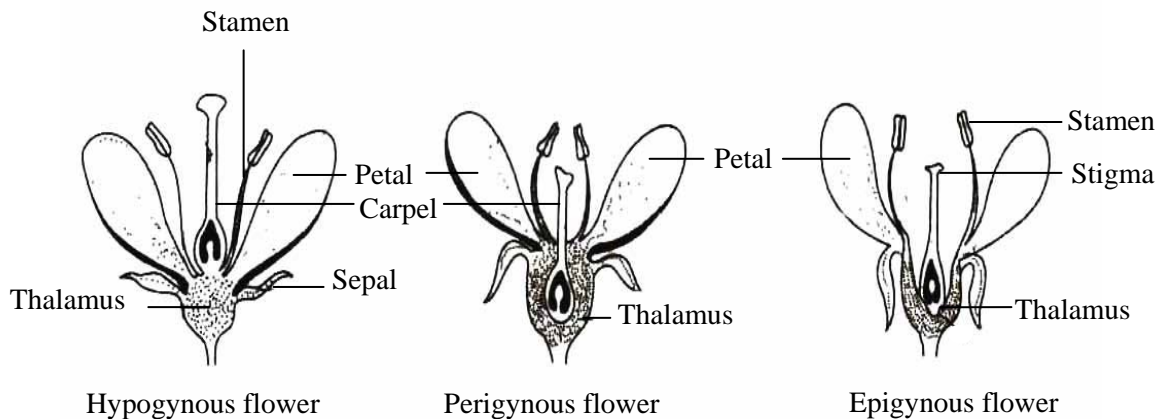
- i. **Actinomorphic:** A flower can be divided into two equal halves when cut through any radial plane passing through the centre of the flower.
- ii. **Zygomorphic:** A flower can be divided into two equal halves by only one plane which passes radially through the centre.
- iii. **Asymmetrical:** A flower which cannot be divided into two equal halves by any plane.

C. Bisexual and Asexual

- i. **Bisexual:** flower with both male and female sex organs
- ii. **Unisexual:** flower with either male or female flowers.
- iii. **Staminate:** flower with only male sex organ.
- iv. **Pistillate:** flower with only female sex organ.

D. Insertion of floral leaves of thalamus

- i. **Hypogynous:** When the ovary positioned above receptacle of a flower, it is called superior ovary. Having the floral part such as sepal, petals and stamen born on the receptacle beneath the ovary.
- ii. **Perigynous flower:** Flower having sepals, petals and stamens around the edge of a cuplike receptacles. Ovary is semi inferior.e.g. rose and cherry.
- iii. **Epigynous flower:** Flower having sepals, petals and stamens above the ovary. Ovary is inferior ovary.



Hypogynous, perigynous and epigynous flowers

E. Cohesion of sepals

- i. **Polysepalous:** Sepals are free from each other
- ii. **Gamosepalous:** Sepals are fused with each other

F. Cohesion of corolla

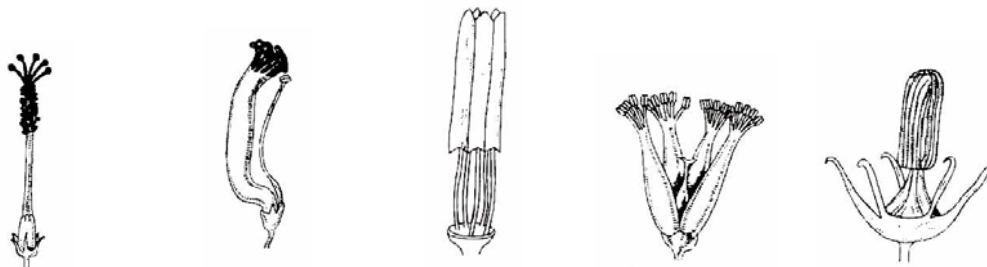
- i. **Polypetalous:** Petals are free from each other
- ii. **Gamopetalous:** Petals are united with each other

G. Perianth: Calyx and corolla are not differentiated and called as perianth. Individual members of perianth is called tepal.

- i. **Gamophyllous:** Tepals are fused
- ii. **Polyphyllous:** Tepals are free

H. Cohesion of stamens

- i. **Monoadelphous:** When filaments are fused together and form a tube like structure e.g. *Hibiscus*
- ii. **Diadelphous:** When filaments of all the stamens are fused in two groups. e.g. Pea.
- iii. **Polyadelphous:** When filaments are united in many groups.e.g. Lemon
- iv. **Syngenesious:** When anthers of all the stamens are fused and filaments are free. e.g. Sunflower
- v. **Synandrous:** When all the stamens as well as filaments are united to form a compound structure. e.g. *Cucurbita*



Monoadelphous Diadelphous Polyadelphous Syngenesious Synandrous

Different types of cohesion of anthers

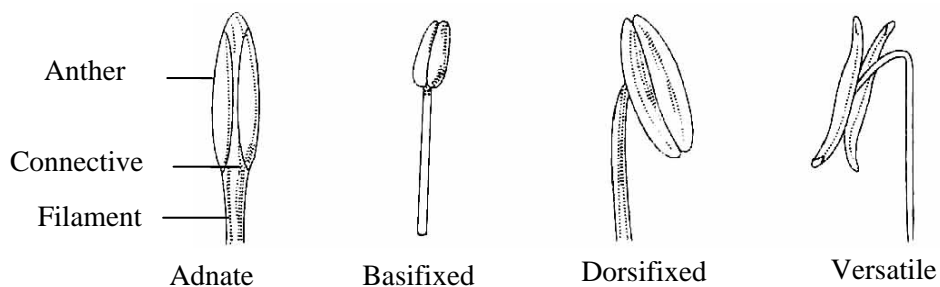
I. Adhesion of stamen

- i. **Epipetalous:** When the stamens are fused with the petals e.g. *Petunia*
- ii. **Epiphyllous:** When the stamens are fused with perianth e.g. *Asphodelus*

- iii. **Gynandrous:** When the stamens are fused with gynoecium *e.g. Calotropis*

J. Attachment of anther to the filament

- i. **Basifixed:** Filaments attached to the base of anther lobes.
- ii. **Dorsifixed:** Filaments attached to the dorsal side of anther
- iii. **Adnate:** Filaments runs up from base to the apex i.e throughout the length of anther.
- iv. **Versatile:** Filament is attached to the back of anther at a single point only so that it can swing freely in the air as in many grasses.



Attachment of anthers to the filament

K. Number of anther lobe

- i. **Monothealous:** When there is only one anther lobe.
- ii. **Dithealous:** When there are two anther lobes.

L. Gynoecium

Number of carpels

- i. **Monocarpellary:** flower with one carpel
- ii. **Bicarpellary:** flower with two carpels
- iii. **Tricarpellary:** flower with three carpels
- iv. **Tetracarpellary:** flower with four carpels
- v. **Pentacarpellary:** flower with five carpels
- vi. **Multicarpellary:** flower with numerous carpels

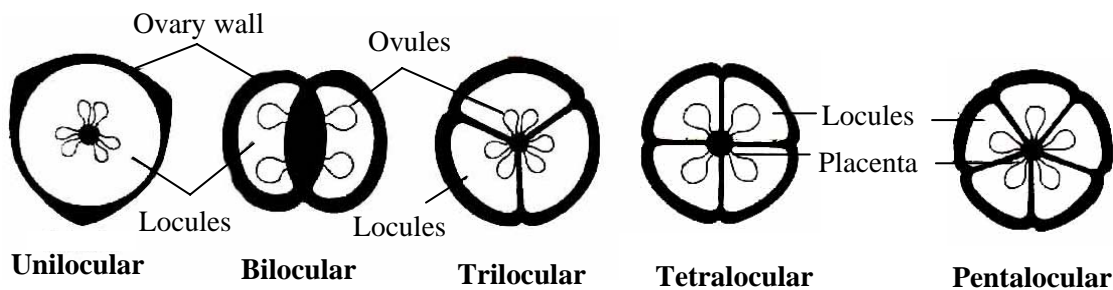
M. Position of carpels

- i. **Superior:** When ovary is born below the other floral whorls
- ii. **Inferior:** When ovary is born above the other floral whorls

N. Locules in the ovary

- i. **Unilocular:** with one locule
- ii. **bilocular:** with two locules
- iii. **Trilocular:** with three locules
- iv. **Tetralocular:** with four locules

- v. **Pentalocular:** with five locules
- iv. **Multilocular:** with many locules

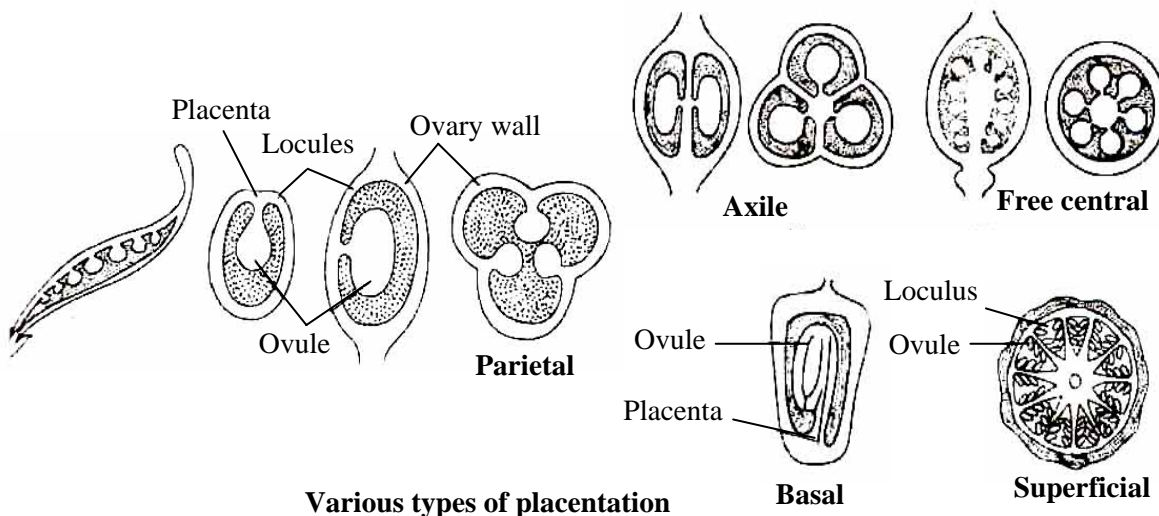


Types of ovaries based on the number of locules

Placentation:

The arrangement of ovules in the chamber of the ovary is called placentation.

- i. **Marginal:** Ovary unilocular and placenta develops along the ventral suture e.g. Pea.
- ii. **Axile:** Ovary many chambered, syncarpous and placenta develop from the central axis e.g. *Hibiscus*
- iii. **Central:** Ovary multi carpellary, syncarpous but one chambered and placenta develop from the central axis e.g. *Dianthus*
- iv. **Parietal:** Ovary multi carpellary, syncarpous but one chambered and the placenta arises from the inner wall of the ovary e.g. *Poppy*
- v. **Basal:** Ovary monocarpellary, with one locule and the placenta develops at the base of the ovary e.g. Sunflower
- vi. **Superficial:** Ovary polycarpellary, syncarpous and with many locules and the placenta develop all around the inner surface of the partition wall e.g. Water lily.



Various types of placentation

Aestivation:

Arrangement of accessory whorls in relation to one another in the floral bud.

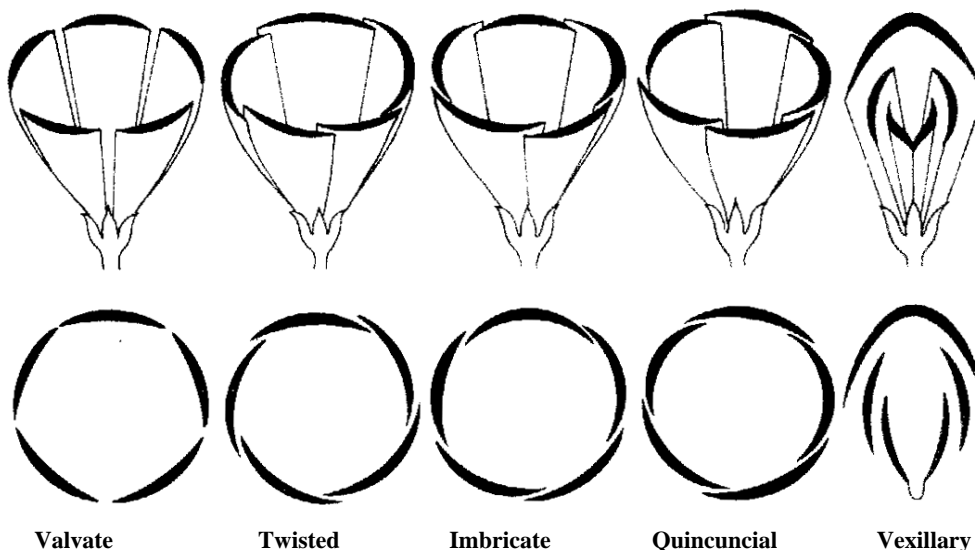
Valvate: Petals just meet each other at their edges but do not overlap e.g. *Anona*

Twisted: Margins of petals overlap each other e.g. *Hibiscus*.

Imbricate: Margins of petal overlap each other in such a way that one petal is completely external, one petal is completely internal e.g. *Cassia*, *Bauhinia*.

Quincuncial: Margins of petal overlap each other in such a way that two petals are completely external, two petals are completely internal e.g. *Psidium guajava* (Guava).

Vexillary: Typical aestivation of papilionaceous corolla. Posterior petal is external and largest, it almost covers two lateral petals and lateral petals in turn overlap two smallest anterior petals e.g. *Pisum sativum*



Different types of aestivation in floral members

Stigma:

It is the apical end of the style

- i. **Plumose:** when feather like
- ii. **Discoid:** when disc shaped
- iii. **Bifid:** when divided into two
- iv. **Capitate:** when knob-shaped

Study of different whorls of a flower and the chamber of anther and ovary**Aim:**

To study/ To dissect the given flowers to display different whorls and to dissect anther and ovary to show number of chambers.

Requirement:

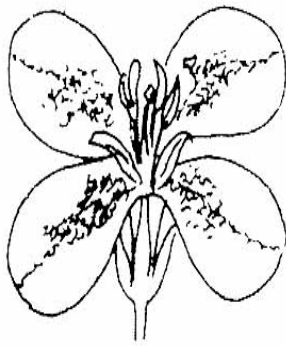
Flower (such as *Brassica*, *Lathyrus*, *Petunia*, *Hibiscus*), forceps, blade, slides, two needles, coverslips, dissecting microscope, white paper.

Procedure

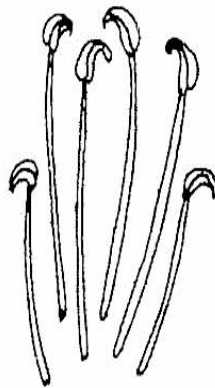
- i. Take the given flower.
- ii. Observe the presence of different whorls of floral leaves. i.e calyx, corolla, androecium and gynoecium.
- iii. Take out floral leaves of each whorl and place them whorl wise on a white paper
- iv. Arrange them according to following order;
epicalyx (if present), sepals, petals, stamen and carpels.
- v. Count the number of floral leaves of each whorl and observe the cohesion or adhesion.
- vi. Take the section of ovary with the help of a blade.
- vii. Mount the section on a slide in a drop of water.
- viii. Observe the section under dissecting microscope.
- ix. Count the number of chambers in ovary.
- x. Draw the diagram of floral leaves of each whorl and transverse section of anther and ovary of the given flower.

Following features can be seen in the given flower:

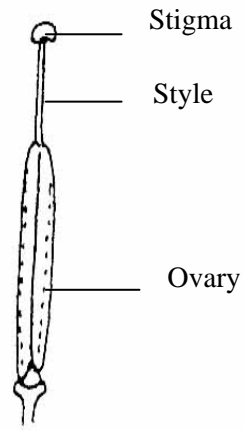
1. ***Brassica*** (mustard)
 - i. **Family:** Cruciferae
 - ii. **Flower:** Pedicellate, Actinomorphic, Hermaphrodite, Complete.
 - iii. **Epicalyx:** Absent
 - iv. **Calyx:** Sepals 4, polysepalous, petaloid
 - v. **Corolla:** Petals 5, polypetalous, cruciform
 - vi. **Androecium:** Stamen 6, tetradynamous, Anther bithecous
 - vii. **Gynoecium:** bicarpellary, syncarpous ovary.
 - viii. **Ovary:** Bilocular with parietal placentation.



Complete flower



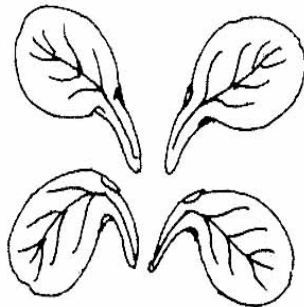
Stamens



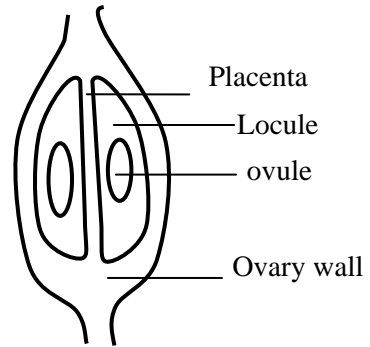
Carpel



Sepals



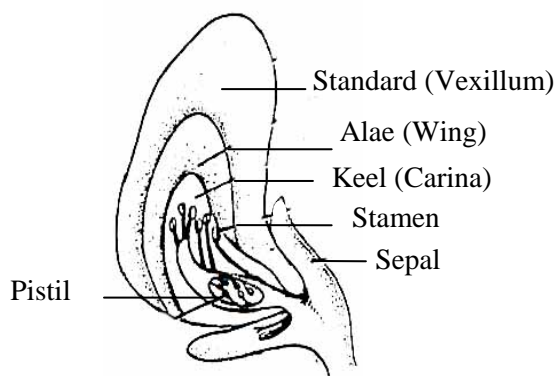
Petals



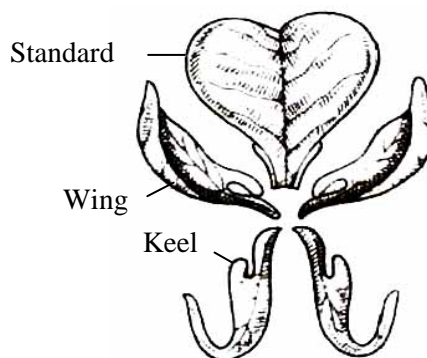
T.S. ovary

2. *Lathyrus* (sweet pea)

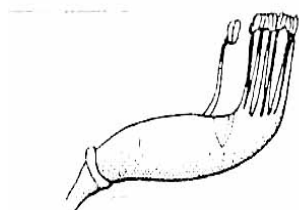
- i. **Family:** Leguminosae, sub family: Papilionaceae.
- ii. **Flower:** Pedicellate, zygomorphic, hermaphrodite, complete, irregular, hypogynous and papilionaceous, white or pink colour.
- iii. **Epicalyx :** Absent
- iv. **Calyx :** Sepals 5, gamosepalous
- v. **Corolla:** Petals 5, polypetalous, papilionaceous,
 - a. large upper posterior petal – standard or vexillum
 - b. two lateral petals-wings or alae
 - c. two anterior or innermost petal – keel or carina
- vi. **Androecium:** Stamens 10, diadelphous
 - a. Anther–bithecos
- vii. **Gynoecium:** Monocarpellary
 - a. ovary – superior, unilocular with marginal placentation
 - b. style – long and bend at base, stigma – flattened and hairy.



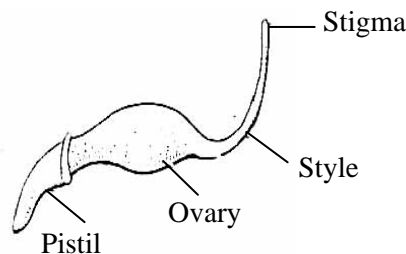
V.S. of flower



Opened Corolla



Stamens
(9)+1(Diadelphous)



Gynoecium