



Plant reproduction

DICOT and

MONOCOT Flowers

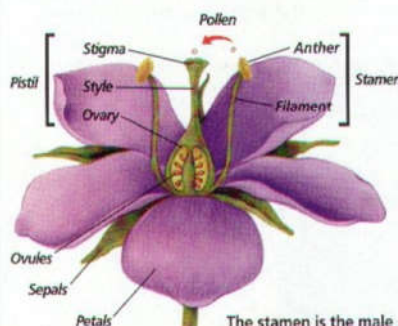
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Angiosperms or Flowering plants

The pistil is the female reproductive organ. Inside the ovary at the base of the pistil are the ovules. Ovules contain the female gametophyte generation of the plant. Female gametes—egg cells—form in each ovule.



The stamen is the male reproductive organ of a flower. Pollen grains containing male gametes form inside the anther.

- ✓ Bright colors, attractive shapes, and fragrant aromas help flowering plants **attract their pollinators (insects, birds, mammals...)**
- ✓ Flowers without bright colors and pleasing odors are usually **wind or water** pollinated (grasses)
- ✓ **Flowers**, the reproductive part of a plant, have a swollen base or **receptacle** to attach to the stem
- ✓ Flowers have 4 whorls (modified leaves) attached to the receptacle: **petals, sepals, pistils, and stamen**
- ✓ **Pistils (innermost whorl)** are the female part of the flower, while **Stamens** are the male part

In DICOTS:

- ✓ **Sepals (outermost whorl)** are found **below the petals** and may look leaf-like (some may be the same color as petals)
- ✓ **Sepals enclose** the flower **bud** before it opens
- ✓ **Sepals** are collectively called the **calyx**
- ✓ **Petals** are often **colorful** to attract pollinators
- ✓ **Petals** are collectively called the **corolla**

IN MONOCOTS:

- ✓ **Tepals** are collectively called the **perigone**

- ❖ **Monocot flower** parts are arranged in **multiple of THREES**, while dicots are in multiples of **FOUR or FIVE**
- ❖ **Perfect flowers** have both **stamens & pistils** (rose)
- ❖ **Imperfect flowers** are either a **male** (pistillate) or **female** (staminate) **flower** (pumpkin or melons)
- ❖ Some angiosperms have both **male & female flowers** on the **SAME** plant (**monoecious**)
- ❖ Other angiosperms have **entire male OR female** plants (**dioecious**)
- ❖ **Hermaphrodite (Monoclin) flowers**: each flower of each individual has both male and female structures, i.e. it combines both sexes in one structure. Flowers of this kind are called **perfect**, having both **stamens** and **carpels**.
- ❖ **Diclinous flowers**: having either functionally male or functionally female flowers

2. Diclinous

1. Hermaphrodite: flower has both sexes



Male flowers

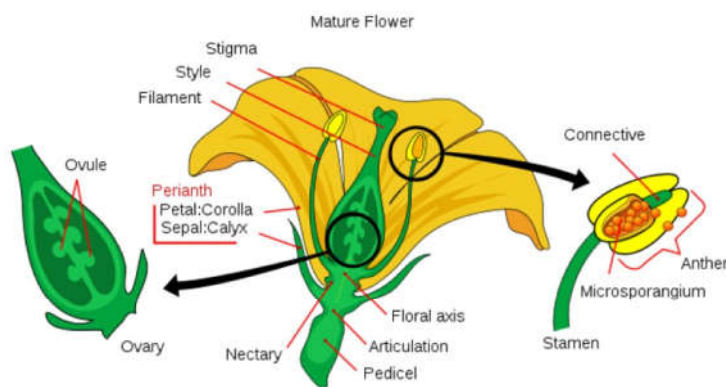
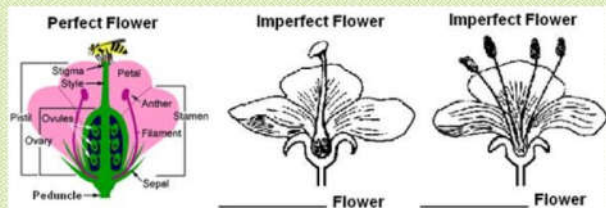
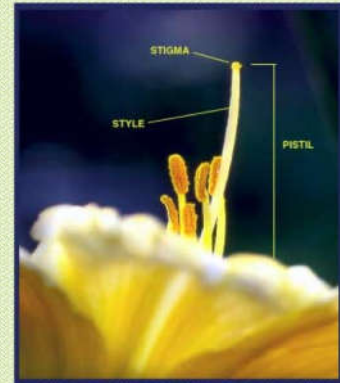


Diagram showing the parts of a mature flower. In this example the perianth is separated into a **calyx** (sepals) and **corolla** (petals)

A **Lilium** flower showing the six **tepals**: the outer three are sepals and the inner three are petals.

Female Reproductive Structures:

- ✓ Called carpals
- ✓ Carpals may be fused to form the pistil
- ✓ Produce eggs
- ✓ Composed of 3 parts --- stigma, style, and ovary
- ✓ Stigma is located at the top and may be sticky or have hairs to hold pollen grains landing there
- ✓ Style is a stalk-like connection between the stigma and the ovary
- ✓ Ovary is the enlarged base containing ovules with eggs



Male Reproductive organs:

- ✓ Called stamens
- ✓ Produce pollen
- ✓ Composed of 2 parts --- filament & anther (pollen sac)
- ✓ Anthers produce pollen grains containing sperm
- ✓ Filament is stalk-like & supports the pollen sacs

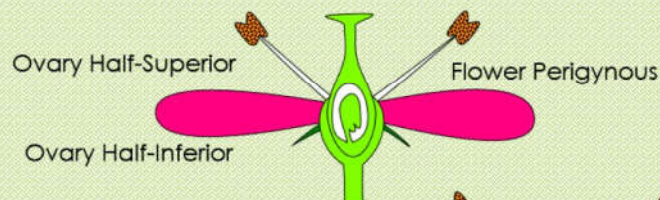


Ovulatory position



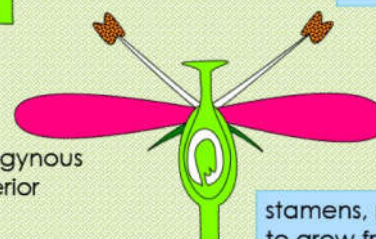
Ovary Superior
Flower Hypogynous

other floral organs attached below the gynoecium on the receptacle.



Ovary Half-Superior
Ovary Half-Inferior
Flower Perigynous

sepals, petals & stamens arise from a tubular extension of the receptacle called the hypanthium which surrounds the ovary but is NOT fused to the ovary wall.



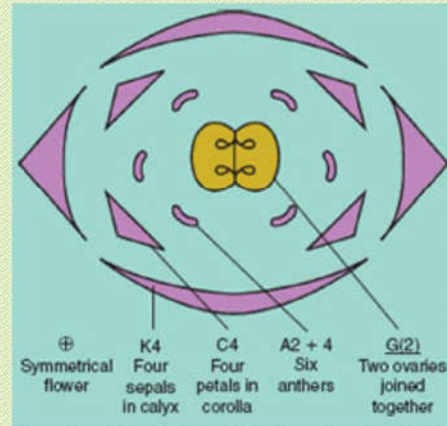
Flower Epigynous
Ovary Inferior

stamens, petals & sepals appear to grow from the top of the ovary

Floral Formula

The first symbol in a floral formula describes the symmetry of a flower.

- (* or \ast) **Radial symmetry** – Divisible into equal halves by two or more planes of symmetry (**actinomorphic** flower).
- (+) **Bilateral symmetry** – Divisible into equal halves by only one plane of symmetry.
- (\$) **Asymmetrical** – Flower lacking a plane of symmetry, neither radial or bilateral.
- If there is only one plane of symmetry, then the flower is **zygomorphic** and is represented by \uparrow

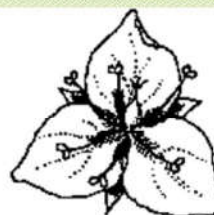


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Floral Formula

The second major symbol in the floral formula is the number of sepals, with "K" or "Ca" representing "calyx". Thus, K5 would mean a calyx of five sepals.

$CA^3 CO^3 A^6 \underline{G}^{\textcircled{3}}$ 3 sepals, 3 petals,
6 stamens, gynoecium
of 3 fused carpels,
ovary superior

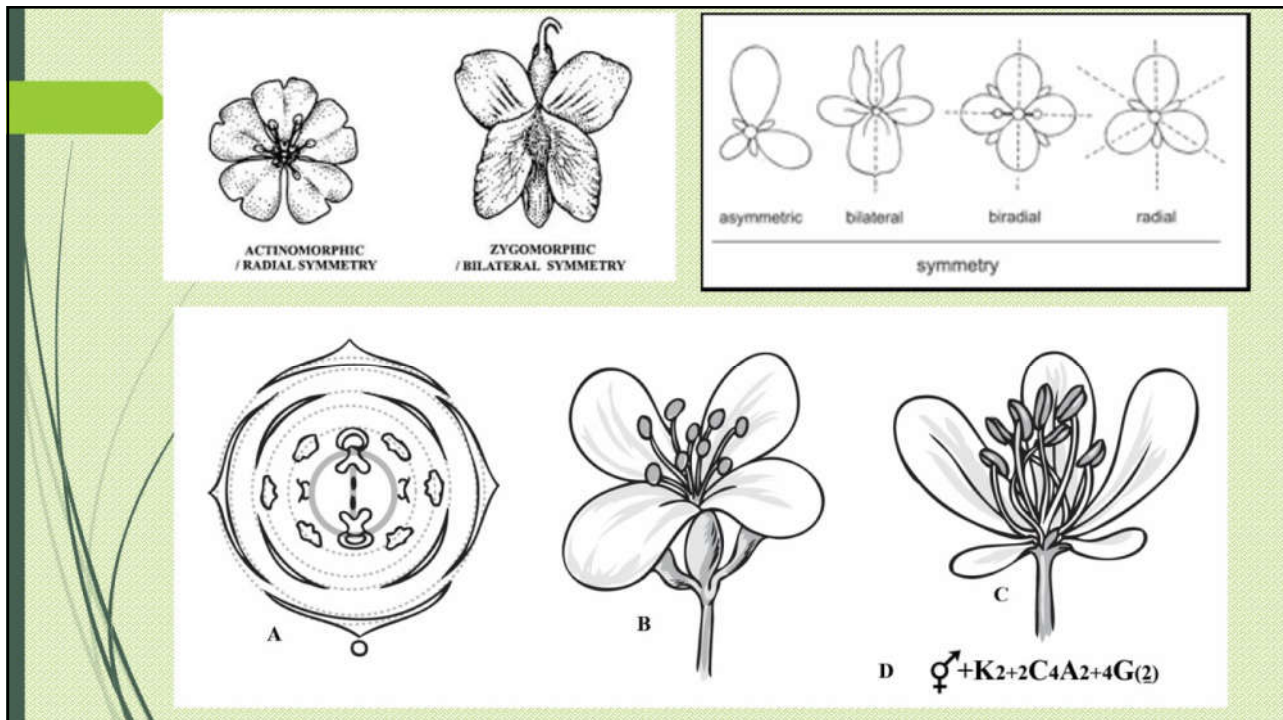


Tradescantia

Basic Floral Formula

*K5, C5, A ∞ , G10

Radial symmetry (*),
5 sepals in the calyx (K5)
5 petals in the corolla (C5)
Numerous (12 or more) stamens (A ∞)
10 carpels (G10)



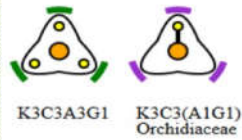
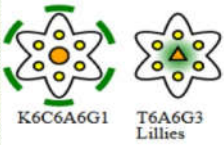
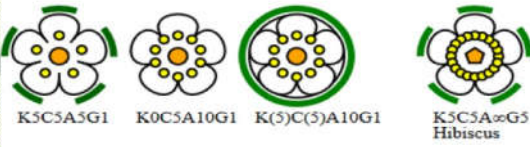
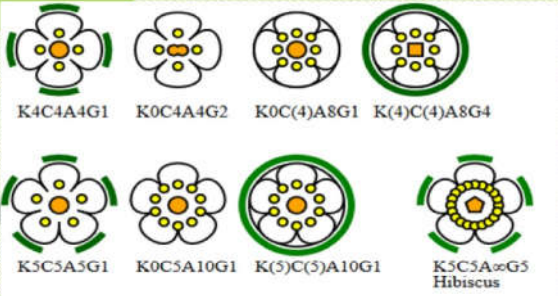
Symmetry

- * Polysymmetric (actinomorphic)
- ↓↑↔↗↘↙↚ monosymmetric (zygomorphic; orientation of arrow corresponds to orientation of the flower)
- ∪ spiral
- ↔ disymmetric
- ↓ asymmetric

Floral organs

- P perigon (no differentiation between calyx and corolla)
- K calyx (sepals)
- C corolla (petals)
- A androecium (stamens)
- G gynoecium (carpels): superior (\underline{G}); half-inferior ($-G-$); inferior (\check{G})
- A° staminode (sterile stamen)
- G° pistillode (sterile carpel)
- [...] fusion between whorls of different organs
- (...) fusion within a whorl or between the same organs
- + more than one whorl can be distinguished
- :
- ∞ number of organs is numerous or indefinite

More examples



*K₄C₄A₂₊₄G₍₂₎: flower actinomorphic, with four sepals, four petals and six stamens in two whorls, ovary superior, with two fused carpels

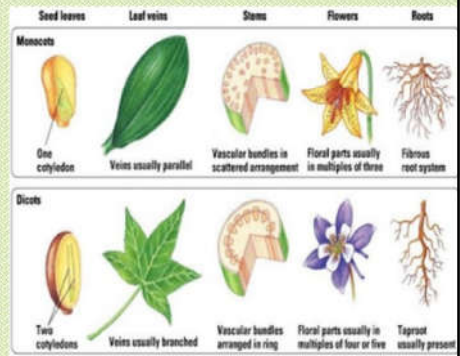
†K₍₅₎[C_(1,2,2)A_{2,2}]G_(2x2): flower zygomorphic, with five fused sepals, five unequal fused petals, two-paired stamens attached to petals, superior ovary with two subdivided carpels

*K₍₅₎C₍₅₎[A₅G₍₃₎]: actinomorphic flower with five fused sepals and five fused petals, five stamens attached to pistil, ovary inferior, with three fused carpels

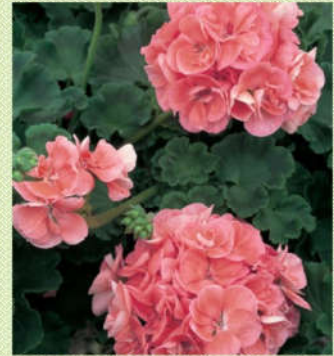
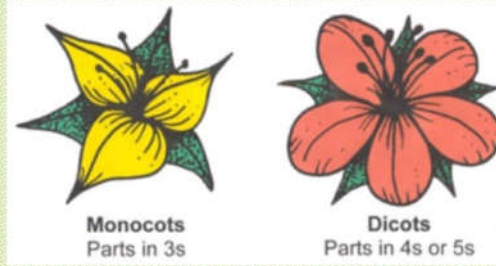
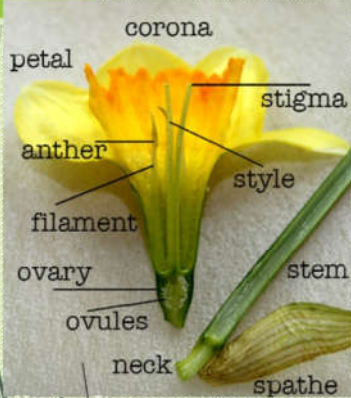
DICOTS VS. MONOCOTS

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	Seed	Root	Stem	Leaf	Flower
Monocots	 One cotyledon in seed	 Root xylem and phloem in a ring	 Vascular bundles scattered in stem	 Leaf veins form a parallel pattern	 Flower parts in threes and multiples of three
Eudicots	 Two cotyledons in seed	 Root phloem between arms of xylem	 Vascular bundles in a distinct ring	 Leaf veins form a net pattern	 Flower parts in fours or fives and their multiples



Monocot vs. Dicot flowers



Subject: **Plant reproduction**
 Sub topic: **Monocot flowers diagram**
 Fam: Amaryllidaceae
 Sp.: *Narcissus sp.*
 Formula: $[T_{3+3} A_{3+3}] G_3$

Subject: **Plant reproduction**
 Sub topic: **Dicot flowers diagram**
 Fam: Geraniaceae
 Sp.: *Pelargonium sp.*
 Formula: $K_5 C_5 A_{10} \bar{G}_{(5)}$