Floral Formulas and Diagrams

Convenient shorthand methods of recording floral symmetry, number of parts, connation and adnation, insertion, and ovary position.

Floral Formulas

- A floral formula consists of five symbols indicating from left to right:
- Floral Symmetry
- Number of Sepals
- Number of Petals
- Number of Stamens
- Number of Carpels

Floral Formulas

- Floral formulas are useful tools for remembering characteristics of the various angiosperm families. Their construction requires careful observation of individual flowers and of variation among the flowers of the same or different individuals.

Floral Formula Symbol 1

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

  - **(*) Radial symmetry** – Divisible into equal halves by two or more planes of symmetry.
  - **(x) Bilateral symmetry** – Divisible into equal halves by only one plane of symmetry.
  - **($) Asymmetrical** – Flower lacking a plane of symmetry, neither radial or bilateral.

Floral Formula Symbol 2

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

Floral Formula Symbol 3

- The third symbol is the number of petals, with “C” representing “corolla”. Thus, C5 means a corolla of 5 petals.

Floral Formula Symbol 4

- The fourth symbol in the floral formula is the number of stamens (androecial items), with “A” representing “androecium”. **A∞** (the symbol for infinity) indicates numerous stamens and is used when stamens number **more than twelve** in a flower. **A10** would indicate 10 stamens.

Floral Formula Symbol 5

- The fifth symbol in a floral formula indicates the number of carpels, with “G” representing “gynoecium”. Thus, G10 would describe a gynoecium of ten carpels.

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)

Floral Formulas

- At the end of the floral formula, the fruit type is often listed.

- **<u>Example</u>**:
- *, K5, C5, A∞, G10, **capsule**

KNOW TO HERE

More on Floral Formulas

- Connation (like parts fused) is indicated by a circle around the number representing the parts involved. For example, in a flower with 5 stamens all fused (connate) by their filaments, the floral formula representation would be:

A $\bigcirc$5

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- The plus symbol (+) is used to indicate differentation among the members of any floral part. For example, a flower with five large stamens alternating with five small ones would be recorded as:
    - **A5 + 5.**

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- Adnation (fusion of unlike parts) in indicated by a line connecting the numbers representing different floral parts. Thus, a flower that has 4 fused petals (connate corolla) with 2 stamens fused (or adnate) to this corrola, is described as:
    - **C 4 , A 2**

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- The presence of a hypanthium (flat, cuplike, or tubular structure on which the sepals, petals, and stamens are borne usually formed from the fused bases of the perianth parts and stamens) is indicated in the same fashion as adnation:

  - **X, K 5, C 5, A 10, G 5**

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- Sterile stamens or sterile carpels can be indicated by placing a dot next to the number of these sterile structures. Thus, a flower with a fused (syncarpous) gynoecium composed of five fertile carpels and five sterile carpels would be represented as:

  - **G 5 + 5**

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- Variation in the number of floral parts within a taxon is indicated by using a dash (-) to separate the minimum and maximum numbers. For example a taxon that has flowers with either 4 or 5 sepals would be indicated as:
    - **K 4-5**

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- Variation with a taxon in either connation or adnation is indicated by using a dashed (instead of continuous) line:

  - **C 3, A 6**

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- The lack of a particular floral part is indicated by placing a zero (0) in the appropriate position in the floral formula. For example, a carpellate flower (flower with a gynoecium but no functional androecium) would be described as:
    - ***, K3, C3, A0, G2**

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- Flowers with a perianth of tepals (no differentation between calyx and corolla) have the second and third symbols combined into one. A hyphen(-) is placed before and after the number in this symbol. Example:
    - ***, T-5-, A 10, G 3**

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- A line below the carpel number indicates the **superior** position of the ovary with respect to other floral parts. **G3**

- A line above the carpel number indicates the **inferior** position of the ovary with respect to other floral parts. **G3**
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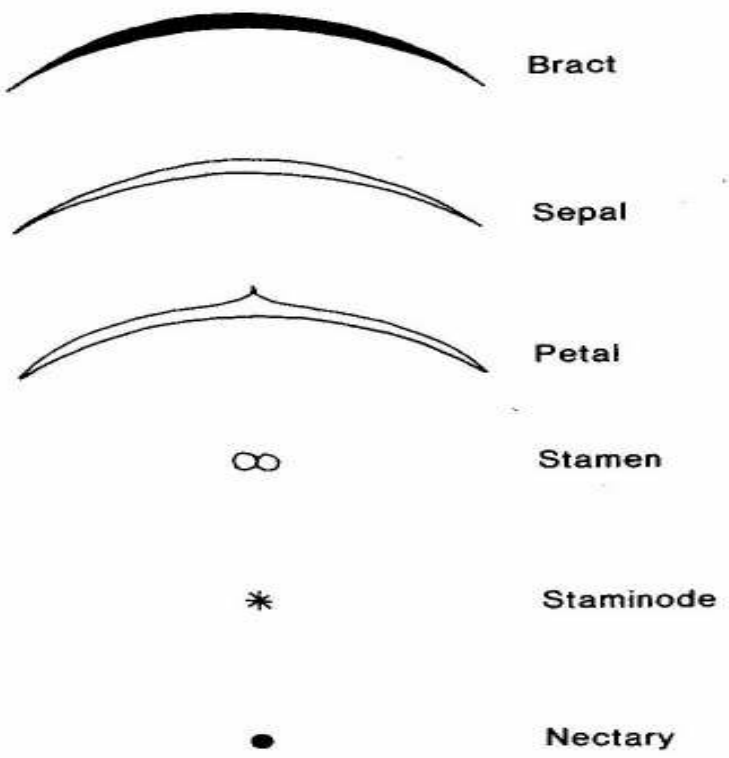
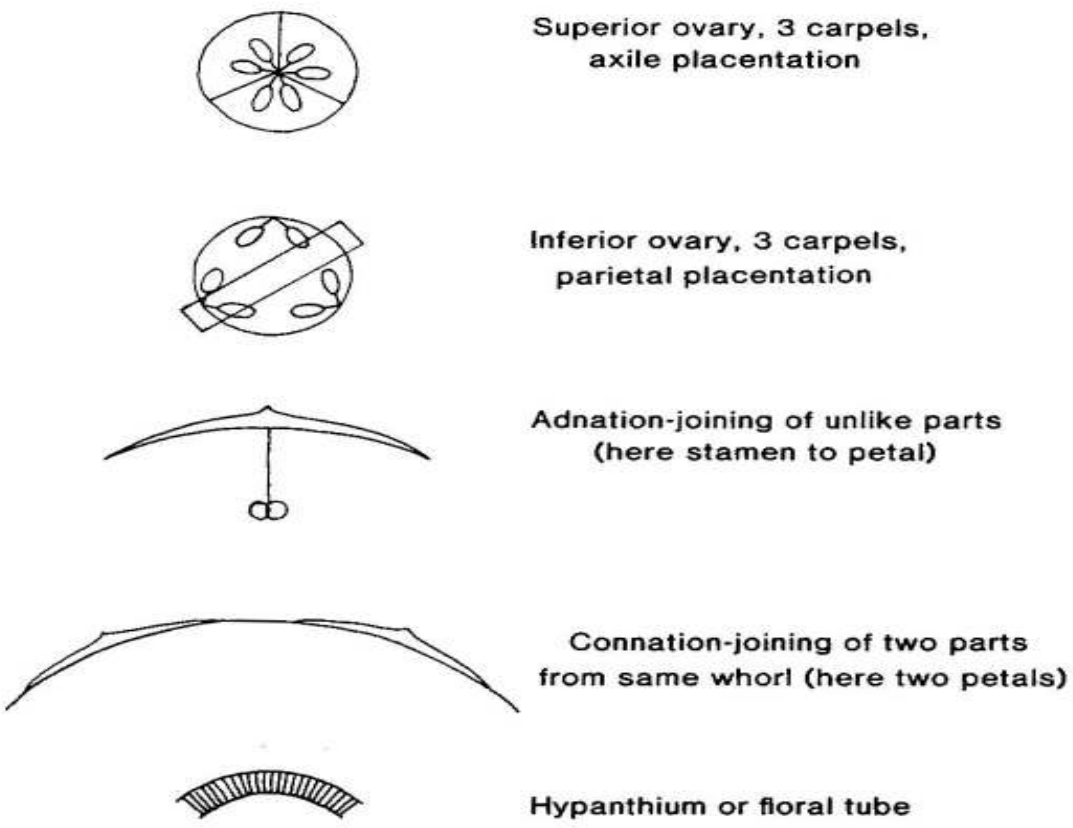
Floral Diagrams

- Floral diagrams are stylized cross sections of flowers that represent the floral whorls as viewed from above. Rather like floral formulas, floral diagrams are used to show symmetry, numbers of parts, the relationships of the parts to one another, and degree of connation and/or adnation. Such diagrams cannot easily show ovary position.

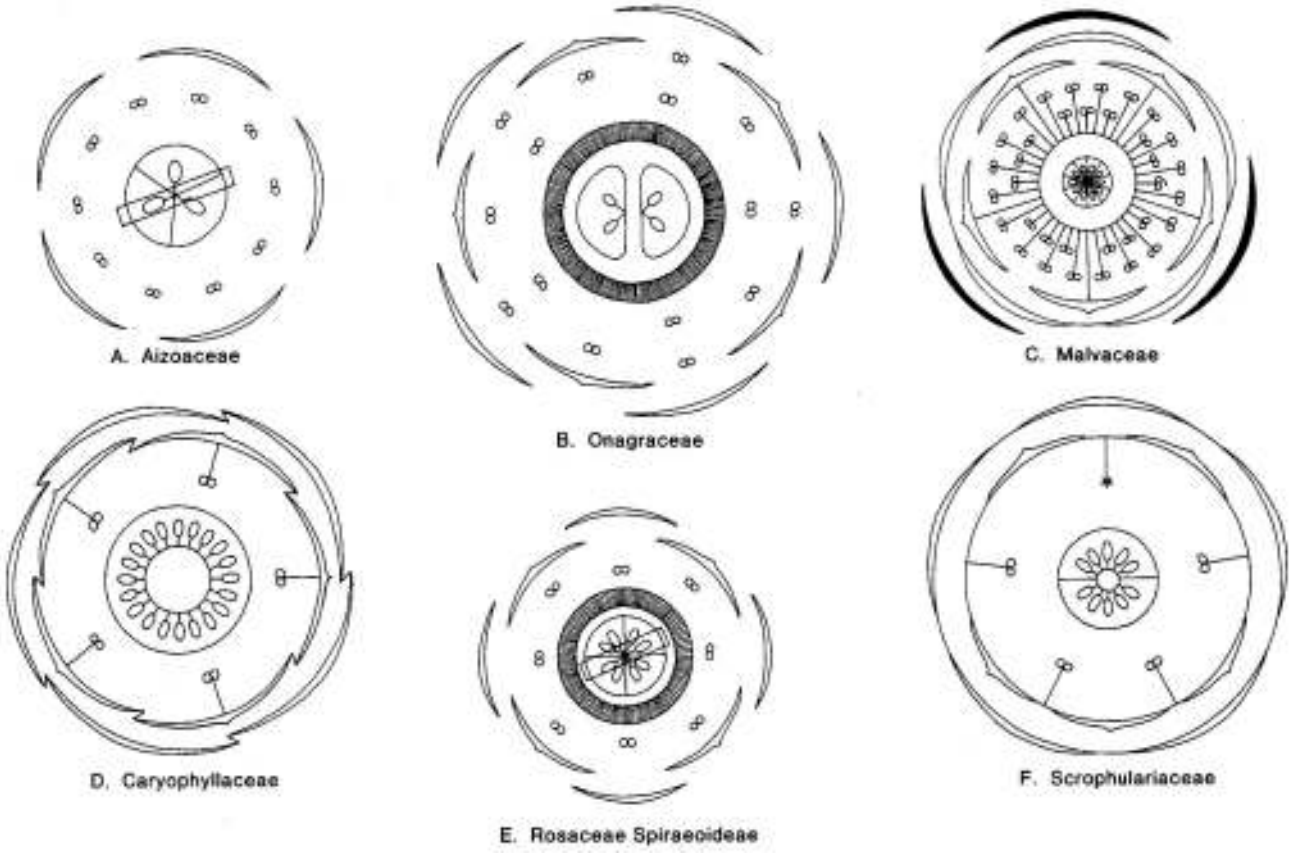
Floral Diagram Symbols I



Floral Diagram Symbols II



Sample floral diagrams



Sample Floral Diagrams Described

Sample floral diagrams. A. 5-merous apetalous flower with 3-carpellate inferior ovary with axile placentation (Aizoaceae). B. 5-merous perigynous flower with 2-carpellate apocarpous gynoecium (Rosaceae). C. 5-merous flower closely subtended by 3 bracts; sepals connate, petals distinct, adnate at base to connate filaments of the many stamens; ovary superior, 5-carpellate with axile placentation (Malvaceae). D. 5-merous flower with connate sepals and petals, 5 epipetalous stamens opposite the corolla lobes and a superior ovary with free-central placentation (Primulaceae). E. 4-merous flower with hypanthium and inferior 4-carpellate ovary and axile placentation (Onagraceae). F. 5-merous zygomorphic flower with connate sepals, connate petals, 4 epipetalous stamens and a staminode, alternate with the corolla lobes, and a 2-carpellate superior ovary with axile placentation (Scrophulariaceae).