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# FLOWER FORMULAS

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# Chapter 1

## Basics

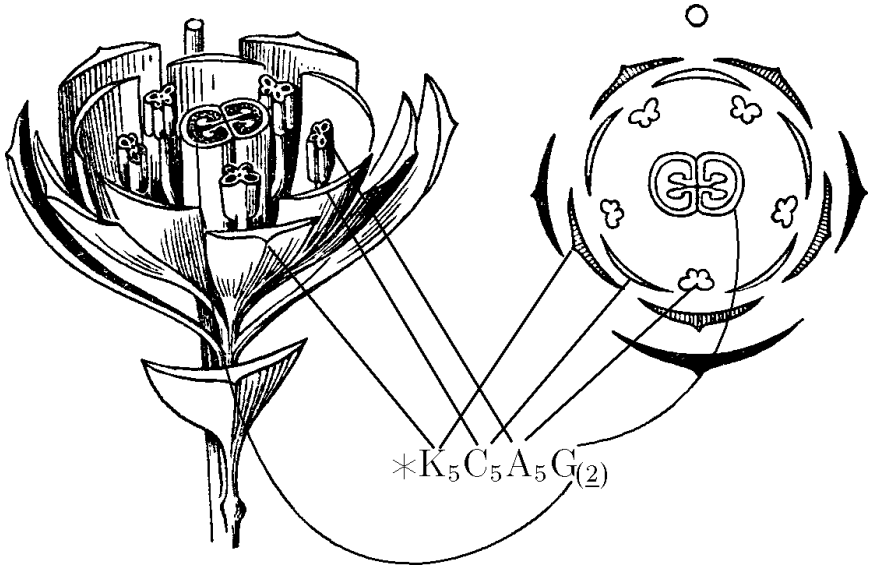


Figure 1.1: Relations between flower, its diagram and its formula

## 1.1 Most frequent symbols

*	actinomorphic (radial, star-shaped) flower
↑	zygomorphic (bilateral) flower
⚡	asymmetric flower. Sometimes, if flower is too small and/or perianth significantly reduced, symmetry was skipped in the formula.
♂	male flower (without fertile pistil)
♀	female flower (without developed stamens)
♂♀	bisexual flower
K	calyx, consists of sepals
H	calycle, or epicalyx (Malvaceae, Rosaceae)
E	external calyx (Caprifoliaceae)
C	corolla, consists of petals
S	staminodes (petal-like stamens)
P	simple perianth (i.e., perianth which is impossible to classify into calyx and corolla), consists of tepals
A	androeceum (all stamens together)
G	gynoeceum (all pistils of carpels together)
$G_{(2)}$	inferior ovary (here with two carpels)—perianth and stamens attached to the tip of the pistil
$G_{(5)}$	superior ovary (here with five carpels)—perianth and stamens are attached to the basement of pistil
$G_{-(3)-}$	half-inferior ovary (here from three carpels)—perianth and stamens attached to the middle of pistil
∨	“or”, e.g. $K_{3\vee5}$ means three or five but not four sepals
–	variation of part numbers, e.g. $K_{3-5}$ means three, four or five sepals
( )	fusion
+	separate flower circles
×	splitting or sometimes (like $A_{\infty\times5}$ ) fusion in several bundles
,	some divergence between otherwise similar flower parts (cf. Leguminosae petals: $C_{1,2,(2)}$ )

- ∞ indefinite (typically, more than 12 and also variable between flowers)
- [ ] separate groups of flower parts to which symbols “√” or “+” are applied

# Chapter 2

## Examples

### 2.1 Complicated flower formulas

$P_{0\vee 2\vee(4)}A_{4-12} \vee P_{0\vee(\infty)}G_{(\overline{2})}$  (birch family, Betulaceae): unisexual flowers, male without perianth or with perianth of 2 free or 4 fused tepals, stamens from 4 to 12; female flowers without or with perianth of indefinite number of tepals, pistil with two carpels, ovary inferior.

$\uparrow \vee * K_{(4\vee 5)}C_{([2,3]\vee 4\vee 5)}A_{[2,2]\vee 2\vee 5}G_{(\overline{2})}$  (mint family, Labiatae s.l.): flowers bisexual, zygomorphic or actinomorphic, perianth double (with calyx and corolla): calyx with 4 or 5 fused sepals and corolla with 4 or 5 fused petals where 2 petals are different from other three (two lips); stamens 4, sometimes 5 or 2, in the first case one pair is different from another; pistil with 2 carpels, ovary superior.

$* H_{(5\vee 4\vee 0)}K_{(5\vee 4)}C_{5\vee 4\vee 0}A_{4-\infty}G_{\overline{1-\infty}}$  (part of the rose family, Rosaceae): flowers bisexual, actinomorphic, there is a sub-calyx of 5 or 4 lobes, sometimes sub-calyx wanted; double perianth—calyx

has 5 or 4 fused sepals whereas corolla has 5 or 4 free petals (sometimes corolla absent); stamens from 4 to indefinite; pistils from one to indefinite, ovary superior.

\*  $\vee \uparrow K_{(5)} C_{(5)} A_5 G_{(2 \times 2)}$  (forget-me-not family, Boraginaceae): flowers bisexual, actinomorphic or sometimes zygomorphic, double perianth—calyx with 5 fused sepals and corolla with 5 fused petals; 5 stamens; pistil has 2 carpels and each of them splits in two parts, ovary superior.

## 2.2 Formulas for different plant families

Family	Formula
Acoraceae	$\ast P_6 A_6 G_{(3)}$
Actinidiaceae	$\ast K_5 C_5 A_\infty G_{(\infty)}$
Adoxaceae ( <i>Adoxa</i> )	$\ast [K_2 C_4 A_{4 \times 2}] \vee [K_3 C_5 A_{5 \times 2}] G_{-(2)-}$
Adoxaceae ( <i>Sambucus</i> )	$\ast K_{(5)} C_{(5)} A_5 G_{-(2)-}$
Aizoaceae ( <i>Mollugo</i> )	$\ast P_{(5)} A_5 G_{(3)}$
Alismataceae	$\ast K_3 C_3 A_{6 \vee \infty} G_{\infty}$
Amaranthaceae	$\ast P_{3-5} A_{3-5} G_{(2)}$
Amaryllidaceae	$\ast P_{3+3} A_{3+3} G_{(\bar{3})}$
Anacardiaceae	$\ast K_5 C_5 A_{10-5} G_{(1-3)}$
Apocynaceae	$\ast K_{(5)} C_{(5)} A_5 G_2$
Araceae ( <i>Calla</i> )	$\ast A_6 G_{(3)}$
Araliaceae	$\ast K_5 C_5 A_5 G_{(\overline{1-5})}$
Aristolochiaceae	$\uparrow P_1 (A_6 G_{(\bar{3})})$
Asaraceae	$\ast P_{(3)} A_{12} G_{(\bar{3})}$
Asparagaceae	$\ast P_{4 \vee (6)} A_{3+3} G_{(3)}$
Balsaminaceae	$\uparrow K_{1,2} C_{1,2,2} A_{(5)} G_{(\underline{5})}$

Family	Formula
Begoniaceae	$P_{2-6}G_{(\bar{3})} \vee P_{2\vee[2+2]}A_{\infty}$
Berberidaceae	$*K_{3+3}C_{3+3}A_{3+3}G_{\underline{1}}$
Betulaceae	$P_{0\vee2\vee(4)}A_{4-12} \vee P_{0\vee(\infty)}G_{(\bar{2})}$
Boraginaceae	$*\vee\uparrow K_{(5)}C_{(5)}A_5G_{(\underline{2\times 2})}$
Bromeliaceae	$*K_3C_3A_{3+3}G_{\bar{3}}$
Butomaceae	$*K_3C_3A_9G_{\underline{6}}$
Cactaceae	$*K_{\infty}C_{\infty}A_{\infty}G_{(3)}$
Callitrichaceae	$A_1 \vee G_{(\underline{2\times 2})}$
Campanulaceae (most)	$*K_{(5)}C_{(5)}A_5G_{(\underline{2\vee3\vee5})}$
Campanulaceae ( <i>Lobelia</i> )	$\uparrow K_{(5)}C_{(2,3)}A_{(5)}G_{(\bar{3})}$
Cannaceae	$K_3C_3S_{2\frac{1}{2}}A_{\frac{1}{2}}G_{(\bar{3})}$
Caprifoliaceae	$*\vee\uparrow K_{(5)}C_{(5)}A_{5\vee4}G_{(\bar{2})}$
Caprifoliaceae ( <i>Linnaea</i> )	$\uparrow K_{(5)}C_5A_{2,[3\vee2]}G_{(\bar{2})}$
Caryophyllaceae	$*K_{5\vee(5)}C_{5\vee0}A_{5\vee10}G_{(\underline{3\vee5})}$
Celastraceae	$*K_{(4)}C_4A_4G_{(2)}$
Ceratophyllaceae	$*P_{12}A_{\infty} \vee *P_{8-12}G_{\underline{1}}$
Chenopodiaceae	$*P_{3-5}A_{1-5}G_{(2)}$



Family	Formula
Cistaceae	$\ast K_{2+3}C_5A_\infty G_{(3)}$
Commelinaceae	$K_3C_{1,2}A_3G_{(3)}$
Compositae	$\ast \vee \uparrow K_{0\vee 5}C_{(5\vee 3)}A_{(5)}G_{(\bar{2})}$
Convolvulaceae	$\ast K_{(5\vee 4)}C_{(5\vee 4)}A_{5\vee 4}G_{(2)}$
Cornaceae	$\ast K_{(4)}C_4A_4G_{(\bar{2})}$
Crassulaceae	$\ast K_{(5-20)}C_{5-20}A_{10-40}G_{\underline{5-20}}$
Cruciferae	$\ast K_4C_4A_{2+4}G_{(2)}$
Cucurbitaceae	$\ast K_{(5)}C_{(5)}A_{(5)}\vee \ast K_{(5)}C_{(5)}G_{(\bar{3-5})}$
Cyperaceae	$\uparrow \vee \ast P_{0-6}A_{3\vee 2}G_{(\underline{3\vee 2})}$
Dipsacaceae	$\uparrow E_{(4\vee 8)}K_{(5\vee 3)\vee 0}C_{(4\vee 5)}A_4G_{(\bar{2})}$
Droseraceae	$\ast K_5C_5A_5G_{(3)}$
Elaeagnaceae	$\ast P_{(2-4)}A_4G_{(\bar{2})}$
Elatinaceae	$\ast K_{2-4}C_{2-4}A_{3-8}G_{(\underline{2-4})}$
Empetraceae	$\ast K_3C_3A_3G_{(3)}$
Ericaceae	$\ast K_{(4\vee 5)}C_{[(4\vee 5)]\vee 5}A_{4\vee 5+4\vee 5}G_{(4\vee 5)} \vee G_{(4)}$
Ericaceae (Pyroloideae)	$\ast K_{(5)}C_5A_{10}G_{(\underline{5})}$
Ericaceae ( <i>Oxycoccus</i> )	$\ast K_4C_{(4)}A_{4+4}G_{(\bar{4})}$

Family	Formula
Ericaceae ( <i>Monotropa</i> )	$\ast K_{4\vee 5} C_{4\vee 5} A_{4\vee 5+4\vee 5} G_{(4\vee 5)}$
Ericaceae ( <i>Vaccinium</i> )	$\ast K_{(5)} C_{(5)} A_5 G_{(\bar{4})}$
Euphorbiaceae	$A_1 \vee G_{(3)}$
Fagaceae	$\ast P_{(5-9)} A_{5-10} \vee \ast P_{\infty} G_{(\bar{2})}$
Gentianaceae	$\ast K_{(5\vee[4-7])} C_{(5\vee[4-7])} A_{4-7} G_{(2)}$
Geraniaceae	$\ast K_5 C_5 A_{[5+5]\vee(5)} G_{(5)}$
Gramineae	$\uparrow P_{2\vee 3} A_{[3-1]\vee 6} G_{(2)}$
Haloragaceae	$\ast K_4 C_4 A_{4+4} \vee \ast K_4 C_4 G_{\bar{4}}$
Hippuridaceae	$\uparrow (A_1 G_{\bar{1}})$
Hydrangeaceae ( <i>Philadelphus</i> )	$\ast K_{4\vee 5} C_{4\vee 5} A_{\infty} G_{(\bar{4})}$
Hydrocharitaceae ( <i>Hydrocharis</i> )	$\ast P_{3+3} A_{3+3+3} \vee \ast P_{3+3} G_{\bar{6}}$
Hydrocharitaceae ( <i>Stratiotes</i> )	$\ast K_3 C_3 A_{\infty} G_{\bar{6}}$
Hydrocharitaceae ( <i>Elodea</i> )	$\ast K_{(3)} C_3 S_{1-3} G_{\bar{3}}$
Hydrophyllaceae ( <i>Phacelia</i> )	$\ast K_{(5)} C_{(5)} A_5 G_{(2)}$
Hypericaceae	$\ast K_5 C_5 A_{3\times\infty} G_{(3)}$
Iridaceae	$\ast \vee \uparrow P_{(3+3)} A_3 G_{(\bar{3})}$
Juglandaceae	$P_{3-6} A_{3-40} \vee P_4 G_{(\bar{1})}$

Family	Formula
Juncaceae	$* P_{3+3} A_{[3+3] \vee 3} G_{(3)}$
Labiatae	$\uparrow K_{(5)} C_{(2,3)} A_{[2,2] \vee 2} G_{(2 \times 2)}$
Lauraceae	$* P_{3+3} A_{3+3+3} G_{\underline{1}}$
Leguminosae	$\uparrow K_{(5 \vee 3)} C_{[1,2,(2)] \vee (1,2,2)} A_{[1,(4+5)] \vee (10)} G_{\underline{1}}$
Lemnaceae	$A_1 \vee G_{\underline{1}}$
Lentibulariaceae ( <i>Pinguicula</i> )	$\uparrow K_{(2)} C_{(2)} A_2 G_{\underline{1}}$
Lentibulariaceae ( <i>Lentibularia</i> )	$\uparrow K_{(2)} C_{(2)} A_2 G_{(2)}$
Liliaceae	$* P_{3+3} A_{3+3} G_{(3)}$
Linaceae	$* K_{4 \vee 5} C_{4 \vee 5} A_{4 \vee 5} G_{(\underline{4 \vee 5})}$
Lythraceae ( <i>Peplis</i> )	$* K_{(6+6)} C_{0 \vee 6} A_6 G_{(2)}$
Lythraceae ( <i>Lythrum</i> )	$* K_{(6+6)} C_6 A_{[6+6] \vee 6} G_{(2)}$
Magnoliaceae	$* P_{3+3+3+3} A_{\infty} G_{\infty}$
Malvaceae	$* H_{0 \vee 3-8 \vee (3-8)} K_5 C_5 A_{(\infty)} G_{(\infty) \vee \infty}$
Melanthiaceae ( <i>Veratrum</i> )	$* P_{3+3} A_{3+3} G_{\underline{3}}$
Menyanthaceae ( <i>Nymphoides</i> )	$* K_{(5)} C_{(5)} A_5 G_{(2)}$
Menyanthaceae ( <i>Manyanthes</i> )	$* K_{(5)} C_{(5)} A_5 G_{(2)}$
Moraceae	$P_4 A_4 \vee P_4 G_{(2)}$

Family	Formula
Musaceae	$\uparrow P_{5,1}A_{5,1} \vee G_{\bar{3}}$
Myrtaceae	$\ast K_{4-5}C_{4-5}A_{\infty}G_{\bar{2}}$
Najadaceae	$P_1A_1 \vee G_{\underline{1}}$
Nitrariaceae	$\ast K_5C_5A_{5+5}G_{(\underline{3})}$
Nyctaginaceae	$P_5A_{1-\infty}G_{\underline{1}}$
Nymphaeaceae	$\ast K_{4-6}C_{\infty}A_{\infty}G_{(\infty)} \vee G_{-(\infty)-}$
Oleaceae	$\ast K_{(4)}C_{(4)}A_2G_{(2)}$
Oleaceae ( <i>Fraxinus</i> )	$K_{0\vee 4}A_2G_{(2)}$
Onagraceae	$\ast K_{2\vee 4}C_{2\vee 4}A_{2\vee [4+4]}G_{(\bar{2}-5)}$
Onagraceae ( <i>Chamaenerion</i> )	$\uparrow K_4C_{1,3}A_{4+4}G_{(\bar{2})}$
Orchidaceae	$\uparrow P_{3\vee [(2),1]+2,1}(A_{1\vee 2}G_{(\bar{3})})$
Oxalidaceae	$\ast K_5C_5A_{(5+5)}G_{(\underline{5})}$
Paeoniaceae	$K_5C_5A_{\infty}G_{(\underline{2-4})}$
Palmae	$\ast P_{3+3}A_{3+3} \vee G_{\underline{3}}$
Papaveraceae (Fumarioideae)	$\uparrow K_2C_{(1,3)}A_{2\times 3}G_{(2)}$
Papaveraceae (Papaveroideae)	$\ast K_2C_4A_{\infty}G_{(2)}$
Parnassiaceae	$\ast K_{(5)}C_5S_5A_5G_{(\underline{3})}$

Family	Formula
Plantaginaceae	$* K_{4\vee 3} C_{(4)} A_4 G_{(2)}$
Plumbaginaceae	$* K_{(5)} C_{(5)} A_5 G_{\underline{1}}$
Polemoniaceae	$* K_{(5)} C_{(5)} A_5 G_{(3)}$
Polygalaceae	$\uparrow K_{2,3} C_{([1,2]\vee[1,4])} A_{(8)} G_{(2)}$
Polygalaceae	$\uparrow K_{2,3} C_{[1,2]\vee[1,4]} A_{(8)} G_{(2)}$
Polygonaceae	$P_{(4\vee 5)\vee 3-6} A_{5-9} G_{(3)}$
Portulacaceae ( <i>Montia</i> )	$* K_{(2)} C_{(5)} A_3 G_{(3)}$
Potamogetonaceae	$* P_4 A_4 G_{\underline{4}}$
Primulaceae	$* K_{(5\vee 4\vee 7)} C_{(5\vee 4\vee 7)} A_{5\vee 4\vee 7} G_{(\underline{5\vee 4\vee 7})}$
Primulaceae ( <i>Trientalis</i> )	$* K_7 C_7 A_7 G_{(\underline{7})}$
Primulaceae ( <i>Hottonia</i> )	$* K_5 C_{(5)} A_5 G_{(\underline{5})}$
Ranunculaceae	$* \vee \uparrow [K_{3-15} C_{2-25}] \vee [P_{5-6}] A_{5-\infty} G_{\underline{1-\infty}}$
Ranunculaceae ( <i>Batrachium</i> )	$* K_5 C_5 A_{\infty} G_{\infty}$
Ranunculaceae ( <i>Atragene</i> )	$* K_4 C_4 A_{\infty} G_{\infty}$
Resedaceae	$\uparrow K_{4-6} C_{4-6} A_{10-\infty} G_{(3)}$
Rhamnaceae	$* K_{(4\vee 5)} C_{4\vee 5} A_{4\vee 5} G_{(2)}$
Rosaceae	$* K_{(5)} C_5 A_{\infty} G_{\underline{1}} \vee G_{(\underline{2-5})}$

Family	Formula
Rosaceae (Rosoideae)	$* H_{(5\vee 4\vee 0)} K_{(5\vee 4)} C_{5\vee 4\vee 0\vee 6} A_{4-\infty} G_{\underline{1-\infty}}$
Rosaceae ( <i>Alchemilla</i> , <i>Sanguisorba</i> )	$* H_{0\vee 4} K_4 A_4 G_{\underline{1}}$
Rubiaceae	$* K_{0\vee (4\vee 5)} C_{(4\vee 3\vee 5)} A_{4\vee 3\vee 5} G_{(\bar{2})}$
Rutaceae	$* K_{4-5} C_{4-5} A_{[4-5]\vee [8-10]} G_{(\underline{4-5})}$
Salicaceae	$A_{3-20} \vee G_{(2)}$
Santalaceae ( <i>Viscum</i> )	$* P_{2+2} A_{2+2} \vee * P_{2+2} G_{(\bar{2})}$
Santalaceae ( <i>Thesium</i> )	$* P_{(5\vee 4)} A_{5\vee 4} G_{(\bar{2})}$
Sapindaceae	$* \vee \uparrow K_5 C_5 A_{5-12} G_{(2)}$
Sapindaceae ( <i>Acer negundo</i> )	$* P_{(5)} A_{4-6} \vee * P_5 G_{(2)}$
Saxifragaceae ( <i>Saxifraga</i> )	$* K_5 C_5 A_{10} G_{(2)}$
Saxifragaceae ( <i>Chrysosplenium</i> )	$* P_{(4\vee 5)} A_8 G_{(\bar{2})}$
Saxifragaceae ( <i>Ribes</i> s.l.)	$* K_{(5\vee 4)} C_{5\vee 4} A_{5\vee 4} G_{(\bar{2})}$
Scheuchzeriaceae ( <i>Triglochin</i> )	$* P_3 A_3 P_3 A_3 G_{(3)}$
Scheuchzeriaceae ( <i>Scheuchzeria</i> )	$* P_{3+3} A_{3+3} G_{\underline{3}}$
Scrophulariaceae	$\uparrow \vee * K_{(4\vee 5)} C_{([2,3]\vee 4\vee 5)} A_{[2,2]\vee 2\vee 5} G_{(2)}$
Scrophulariaceae ( <i>Veronica</i> )	$\uparrow K_{(4)} C_{(4)} A_2 G_{(2)}$
Scrophulariaceae ( <i>Limosella</i> )	$* K_{(5)} C_{(5)} A_{4\vee 2} G_{(2)}$

<b>Family</b>	<b>Formula</b>
Solanaceae	$\ast K_{(5)}C_{(5)}A_5G_{(2)}$
Tamaricaceae	$\ast K_5C_5A_5Ge(1)$
Theaceae	$\ast K_5C_5A_\infty G_{(3)}$
Thymelaeaceae ( <i>Daphne</i> )	$\ast P_{(4)}A_8G_{(2)}$
Tiliaceae	$\ast K_5C_5A_\infty G_{(3)}$
Trapaceae	$\ast K_4C_4A_4G_{(2)}$
Trilliaceae ( <i>Paris</i> )	$\ast P_{4+4}A_4G_{(4)}$
Tropaeolaceae	$\uparrow K_{1,4}C_{2,3}A_8G_{(3)}$
Typhaceae	$P_{0\vee3-6}A_{3\vee(3)} \vee P_{0\vee3-6}G_{\underline{1}}$
Typhaceae ( <i>Sparganium</i> )	$\ast P_{3-6}A_3 \vee \ast P_{3-6}G_{\underline{1}}$
Ulmaceae	$\ast P_{(4-6)}A_{4-6}G_{\underline{1}}$
Umbelliferae	$\ast \vee \uparrow K_5C_5A_5G_{(2)}$
Urticaceae	$\ast P_{4\vee5}A_{4\vee5} \vee \ast P_{4\vee0}G_{\underline{1}}$
Valerianaceae	$\zeta K_0C_{(5-3)}A_3G_{(2)}$
Violaceae	$\uparrow K_5C_{[1,4]\vee0}A_{2,3}G_{(3)}$
Vitaceae	$\ast K_5C_{(5)}A_5G_{(2)}$
Zannichelliaceae	$\uparrow P_1A_1G_{\underline{3-5}}$

Family	Formula
Zygophyllaceae	* $K_5 C_5 A_{5+5} G_{(5)}$

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