CLADOGRAM
DENDROGRAM

COMPUTER GENERATED VIA:

CLADOGRAM
DENDROGRAM

CLADOGRAM
DENDROGRAM

COMPUTER GENERATED VIA:
DATA MATRIX
&
CHARACTER POLARITIES

CLADOGRAM
DENDROGRAM

CLADOGRAM
DENDROGRAM

USING
APOMORPHIC CHARACTERS

CLADOGRAM
DENDROGRAM

O

CLADOGRAM

COMPUTER GENERATED

DATA MATRIX

SPECIES	CH-1	CH-2	CH-3	CH-4	CH-5
TAXON-E	+	+	+	+	+
TAXON-D	+	+	+	+	
TAXON-C	+	+	+		
TAXON-B	+	+			
TAXON-A	+				

CLADOGRAM

COMPUTER GENERATED

DATA MATRIX

SPECIES	CH-1	CH-2	CH-3	CH-4	CH-5
TAXON-E	+	+	+	+	+
TAXON-D	+	+	+	+	
TAXON-C	+	+	+		
TAXON-B	+	+			
TAXON-A	+	OUT-GROUP			

CLADOGRAM

COMPUTER GENERATED

DATA MATRIX

SPECIES	CH-1	CH-2	CH-3	CH-4	CH-5
TAXON-E	+	+	+	+	+
TAXON-D	+	+	+	+	
TAXON-C	+	+	+		
TAXON-B	+	+			
TAXON-A	+	OUT-GROUP			

TAXA B-E = IN GROUP

CLADOGRAM

DATA MATRIX

SPECIES CH-1 CH-2 CH-3 CH-4 CH-5

TAXON-A OUT-GROUP

+ = APOMORPHIC CHARACTER

PLT-TAXON-A

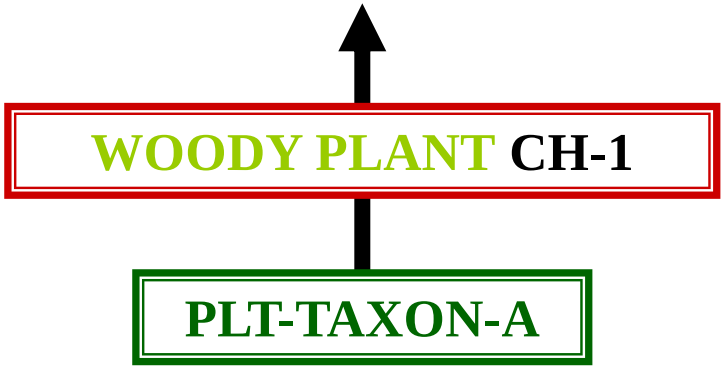
CLADOGRAM

DATA MATRIX

SPECIES CH-1 CH-2 CH-3 CH-4 CH-5

TAXON-A + OUT-GROUP

+ = APOMORPHIC CHARACTER



B

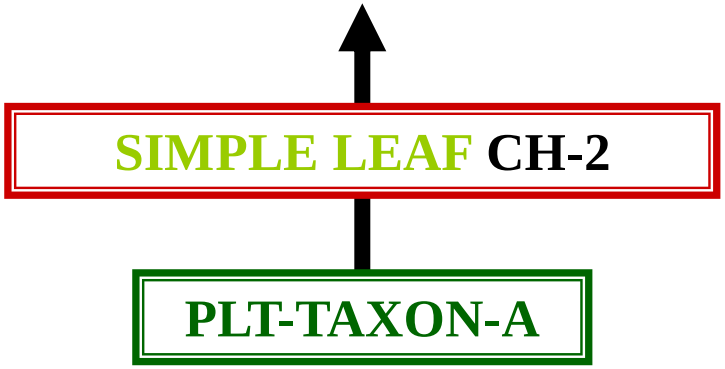
CLADOGRAM

DATA MATRIX

SPECIES CH-1 CH-2 CH-3 CH-4 CH-5

TAXON-A + OUT-GROUP

+ = APOMORPHIC CHARACTER



C

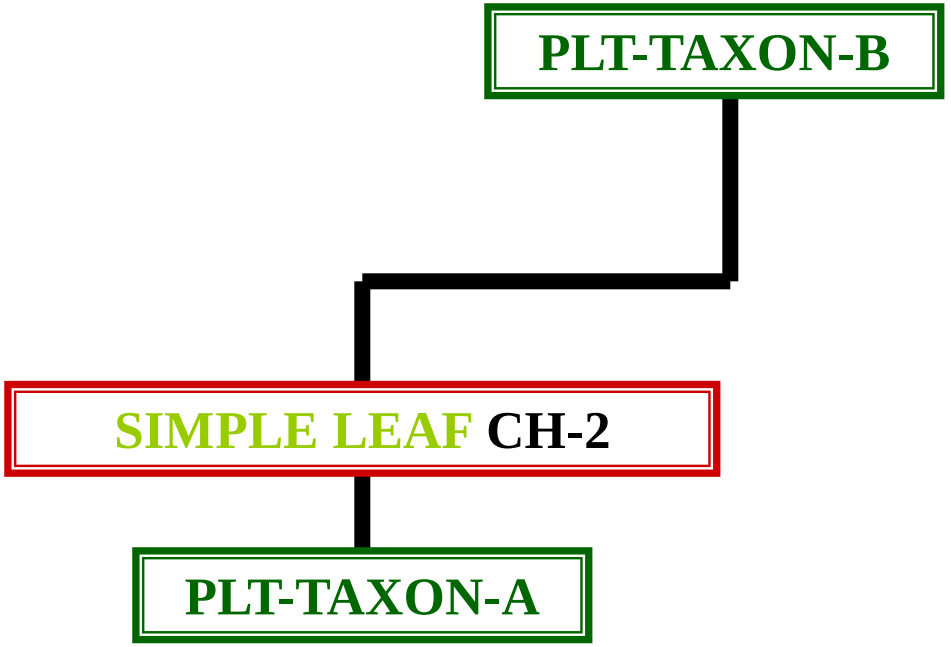
CLADOGRAM

DATA MATRIX

SPECIES CH-1 CH-2 CH-3 CH-4 CH-5

TAXON-A + OUT-GROUP

+ = APOMORPHIC CHARACTER



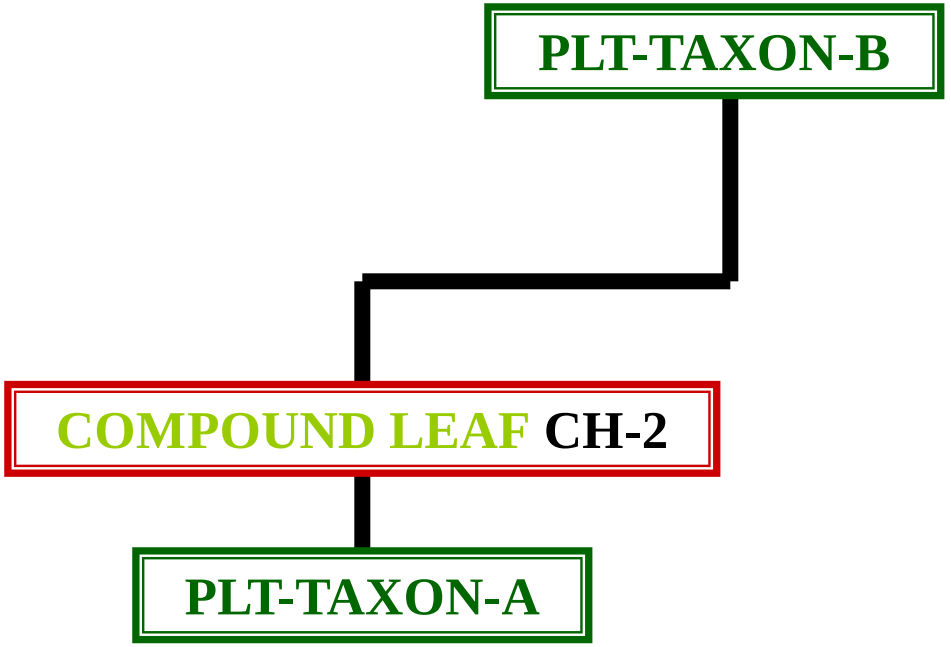
CLADOGRAM

DATA MATRIX

SPECIES	CH-1	CH-2	CH-3	CH-4	CH-5
TAXON-B	+	+			
TAXON-A	+				

OUT-GROUP

+ = APOMORPHIC CHARACTER



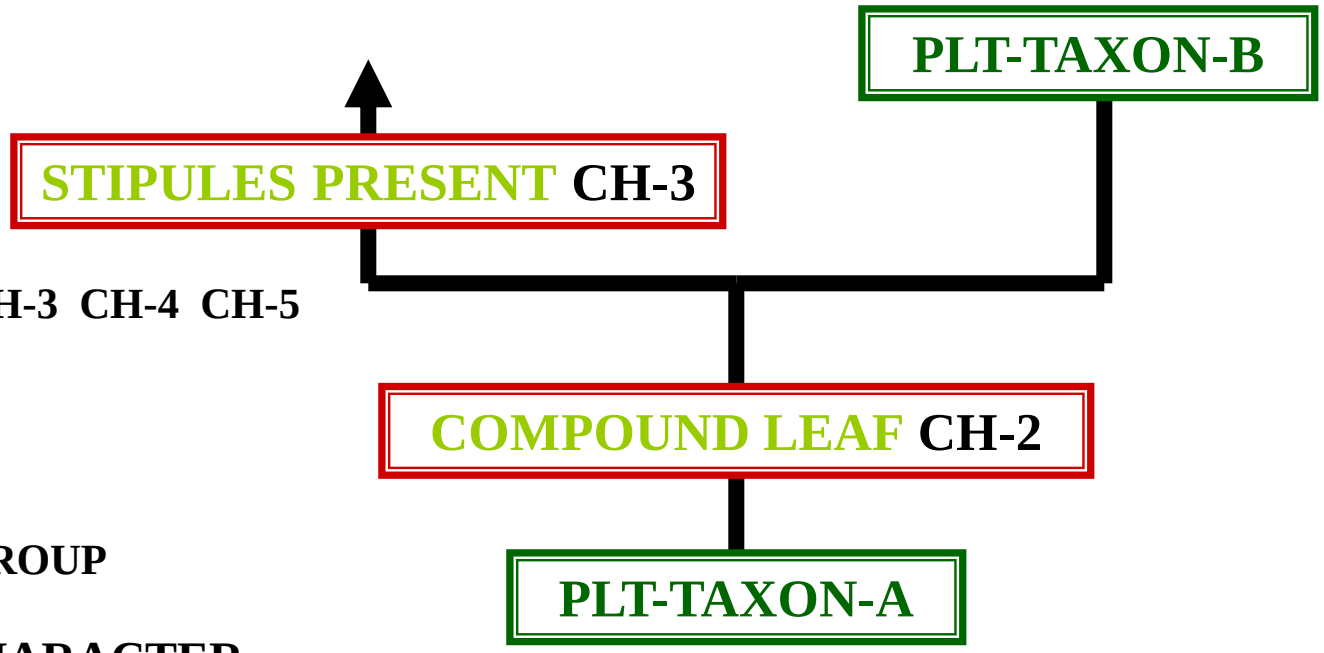
C

CLADOGRAM

DATA MATRIX

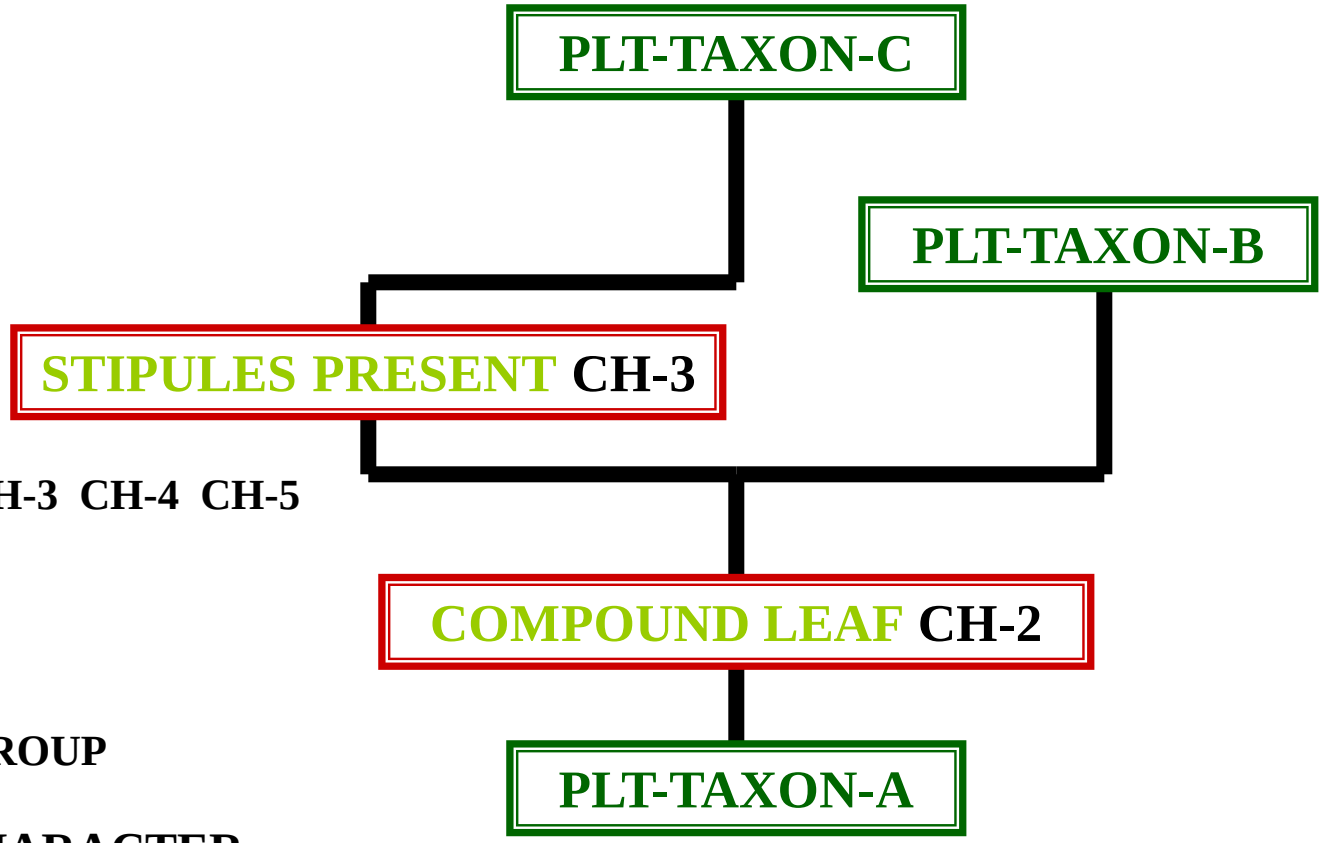
SPECIES	CH-1	CH-2	CH-3	CH-4	CH-5
TAXON-B	+		+		
TAXON-A	+		OUT-GROUP		

+ = APOMORPHIC CHARACTER



S

CLADOGRAM



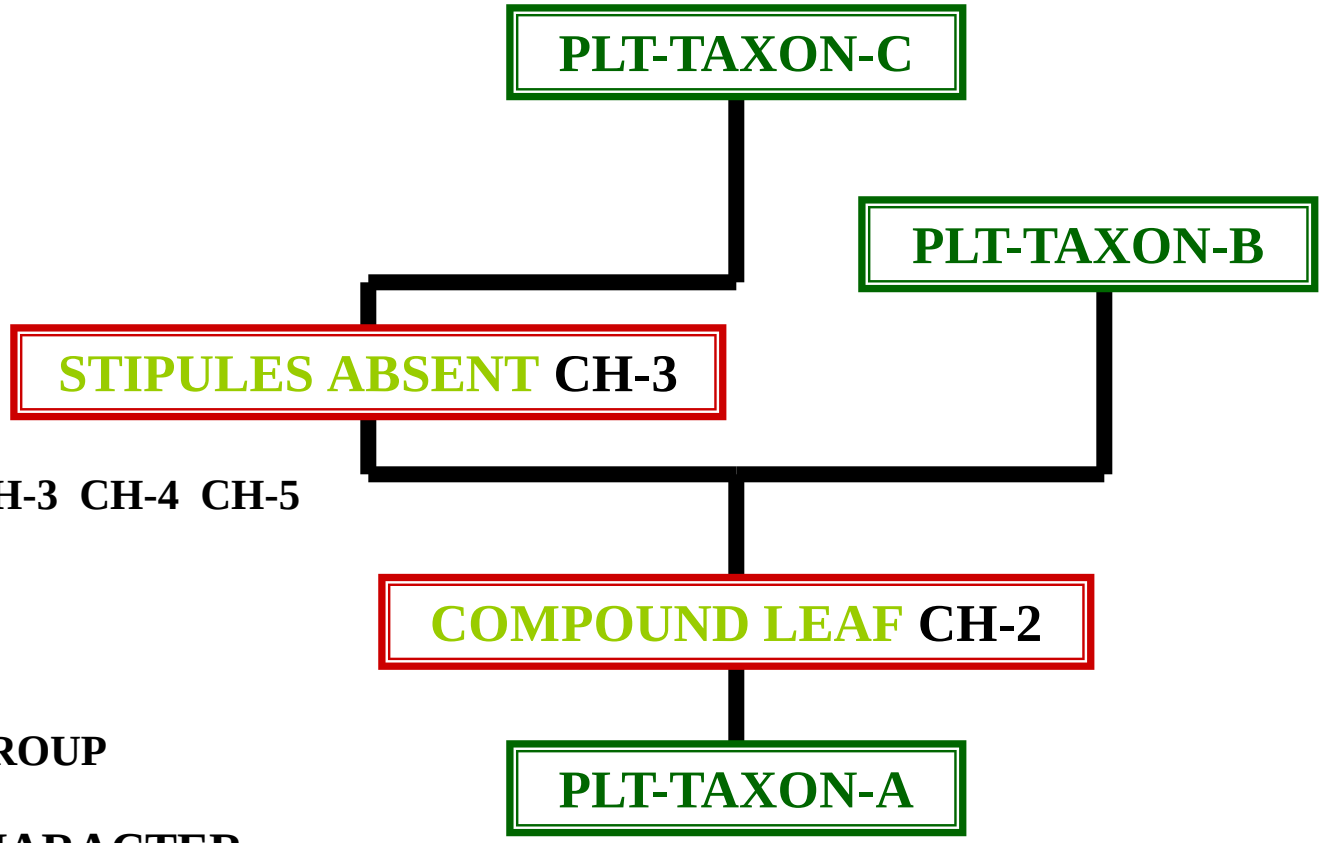
DATA MATRIX

SPECIES	CH-1	CH-2	CH-3	CH-4	CH-5
TAXON-B	+		+		
TAXON-A	+				OUT-GROUP

+ = APOMORPHIC CHARACTER

A

CLADOGRAM



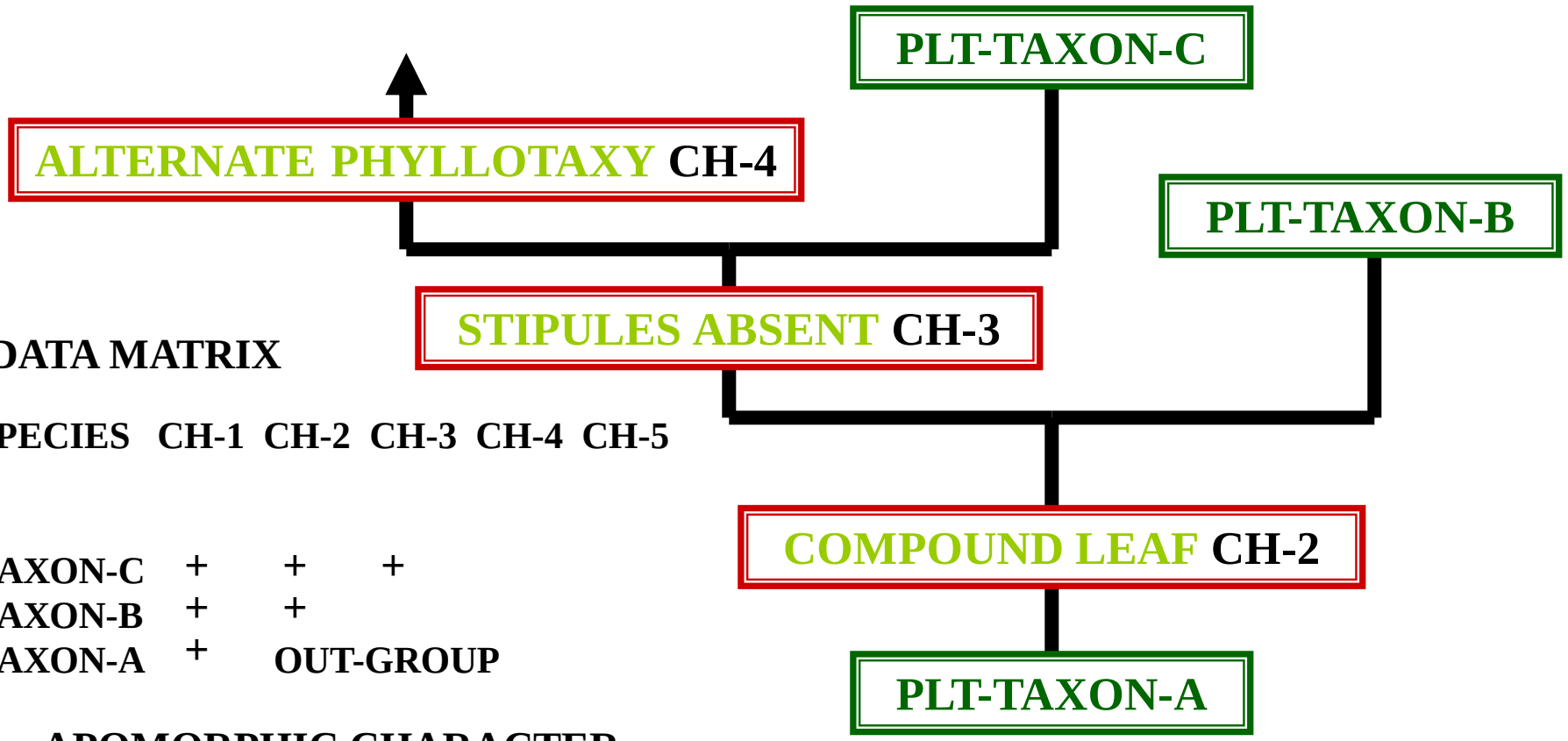
DATA MATRIX

SPECIES	CH-1	CH-2	CH-3	CH-4	CH-5
TAXON-C	+	+	+		
TAXON-B	+	+			
TAXON-A	+	OUT-GROUP			

+ = APOMORPHIC CHARACTER

D

CLADOGRAM

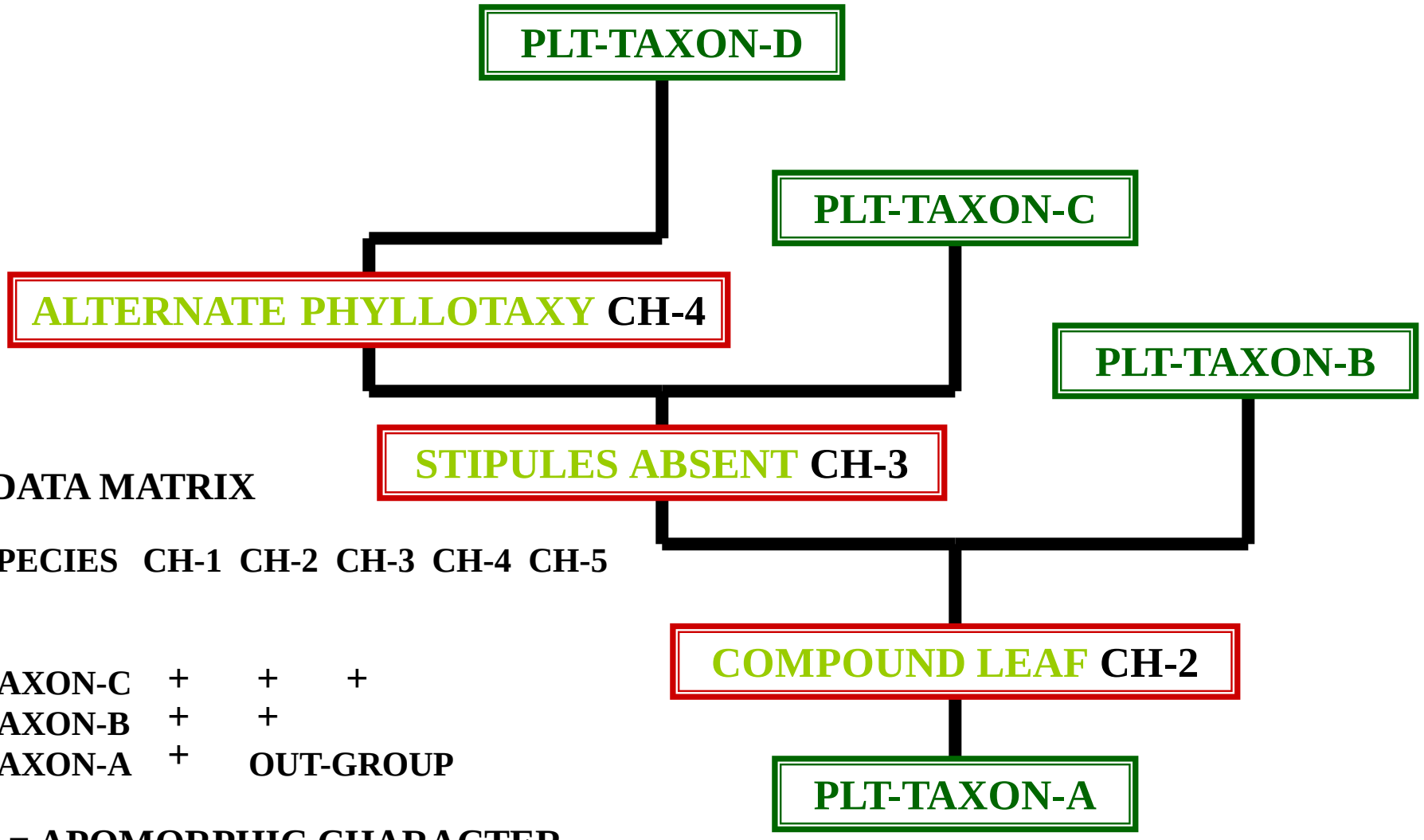


DATA MATRIX

SPECIES	CH-1	CH-2	CH-3	CH-4	CH-5
TAXON-C	+	+	+		
TAXON-B	+	+			
TAXON-A	+	OUT-GROUP			

+ = APOMORPHIC CHARACTER

CLADOGRAM



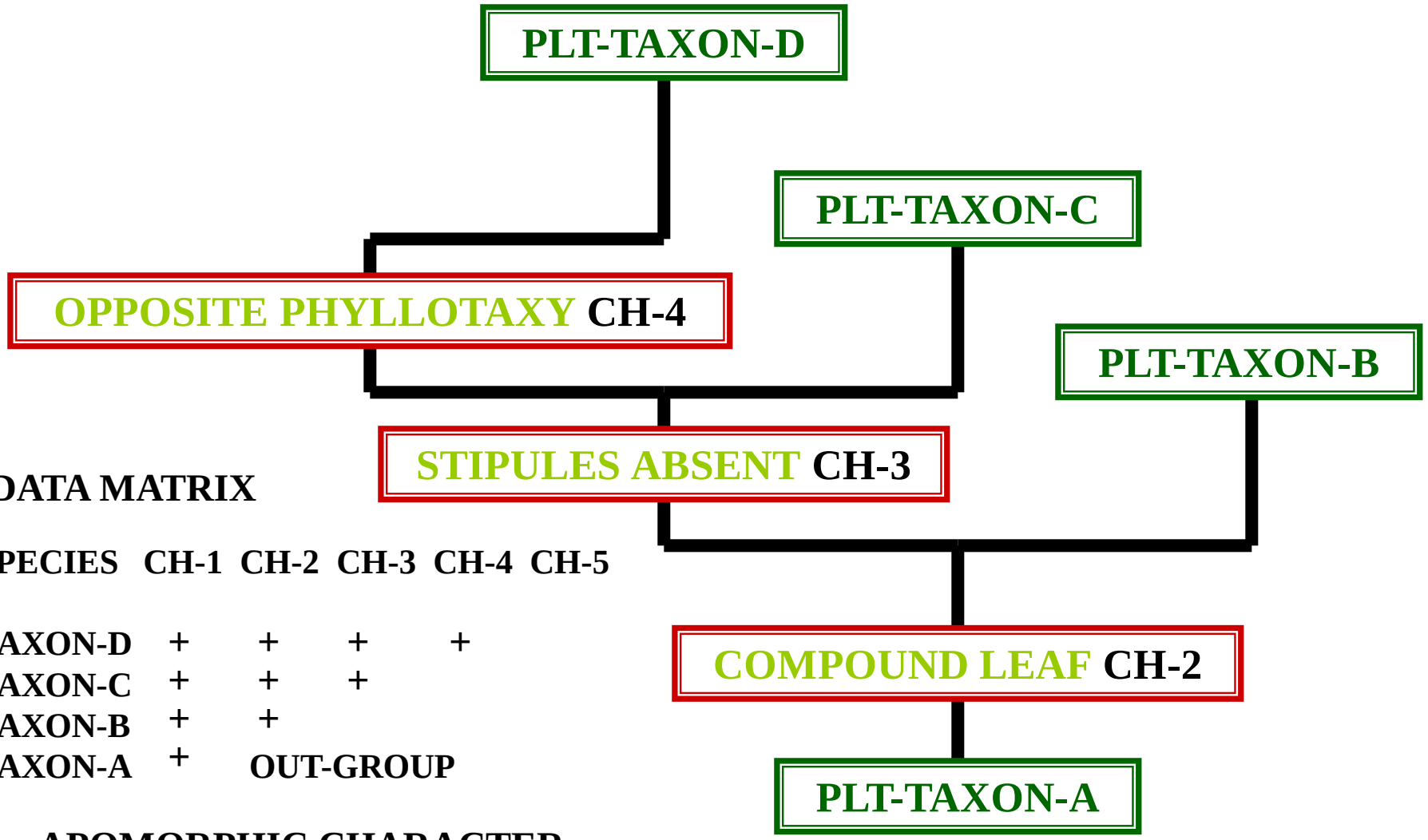
DATA MATRIX

SPECIES	CH-1	CH-2	CH-3	CH-4	CH-5
TAXON-C	+	+	+		
TAXON-B	+	+			
TAXON-A	+	OUT-GROUP			

+ = APOMORPHIC CHARACTER

A

CLADOGRAM



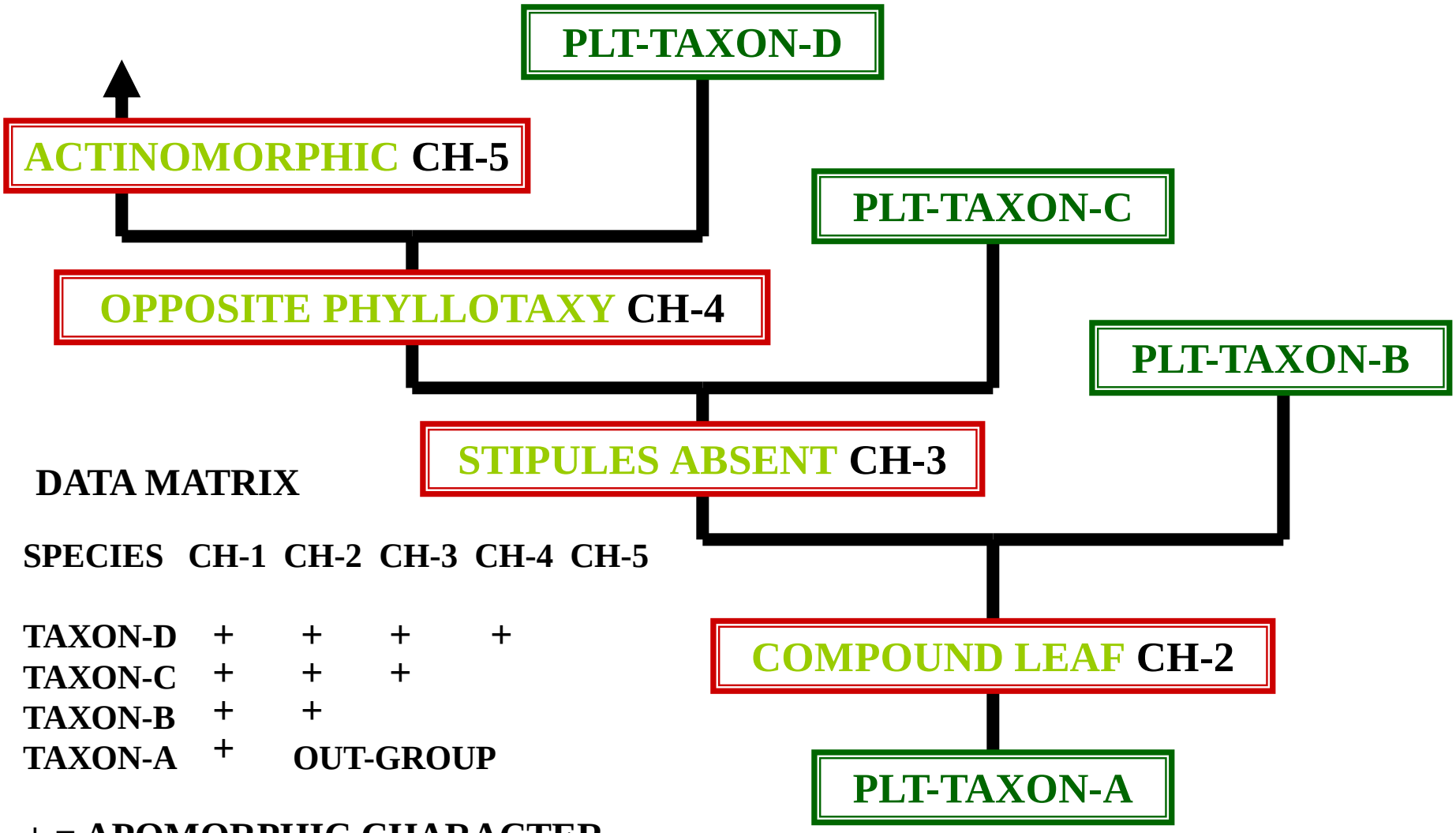
DATA MATRIX

SPECIES	CH-1	CH-2	CH-3	CH-4	CH-5
TAXON-D	+	+	+	+	
TAXON-C	+	+	+		
TAXON-B	+	+			
TAXON-A	+	OUT-GROUP			

+ = APOMORPHIC CHARACTER

E

CLADOGRAM

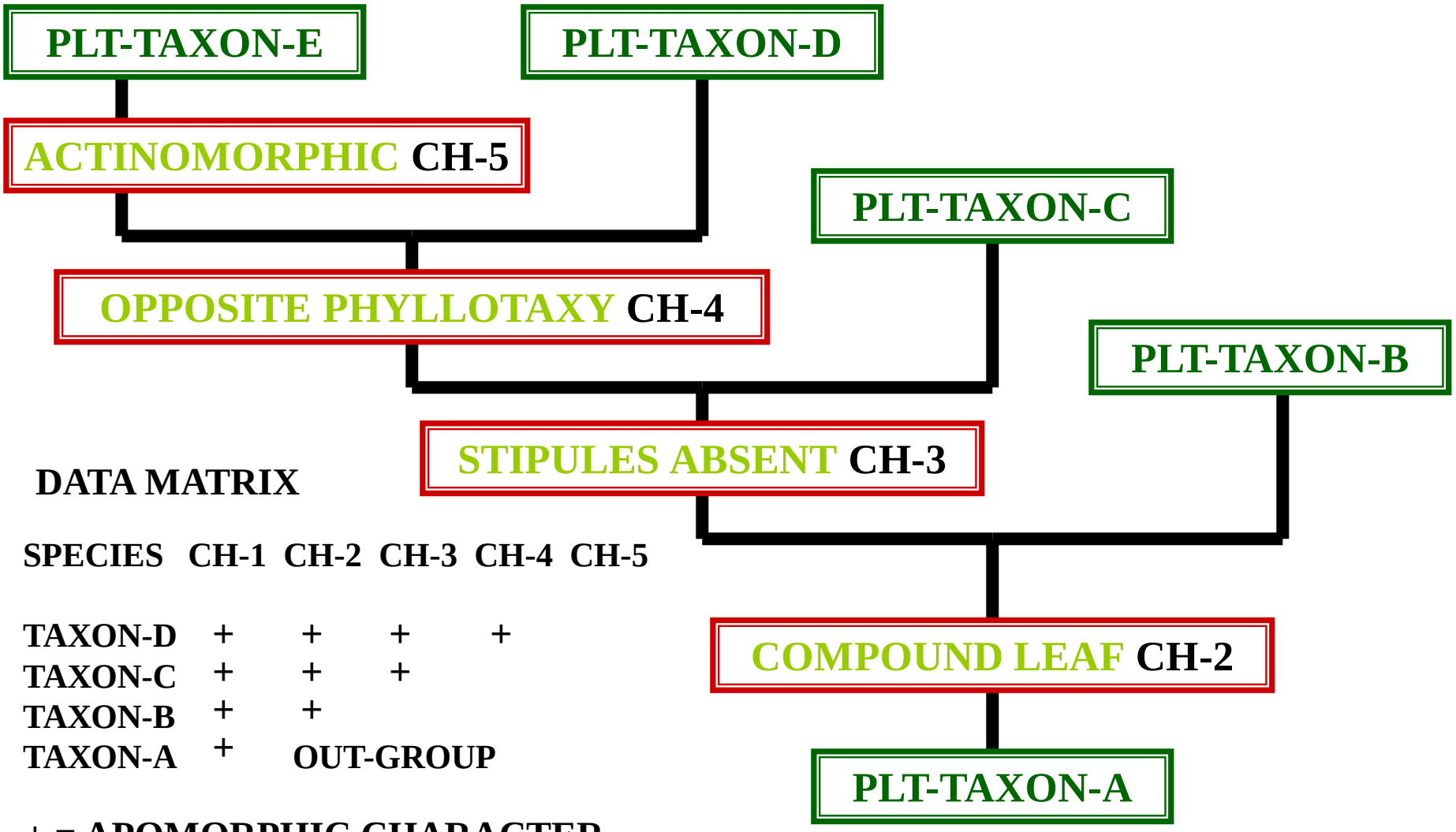


DATA MATRIX

SPECIES	CH-1	CH-2	CH-3	CH-4	CH-5
TAXON-D	+	+	+	+	
TAXON-C	+	+	+		
TAXON-B	+	+			
TAXON-A	+	OUT-GROUP			

+ = APOMORPHIC CHARACTER

CLADOGRAM

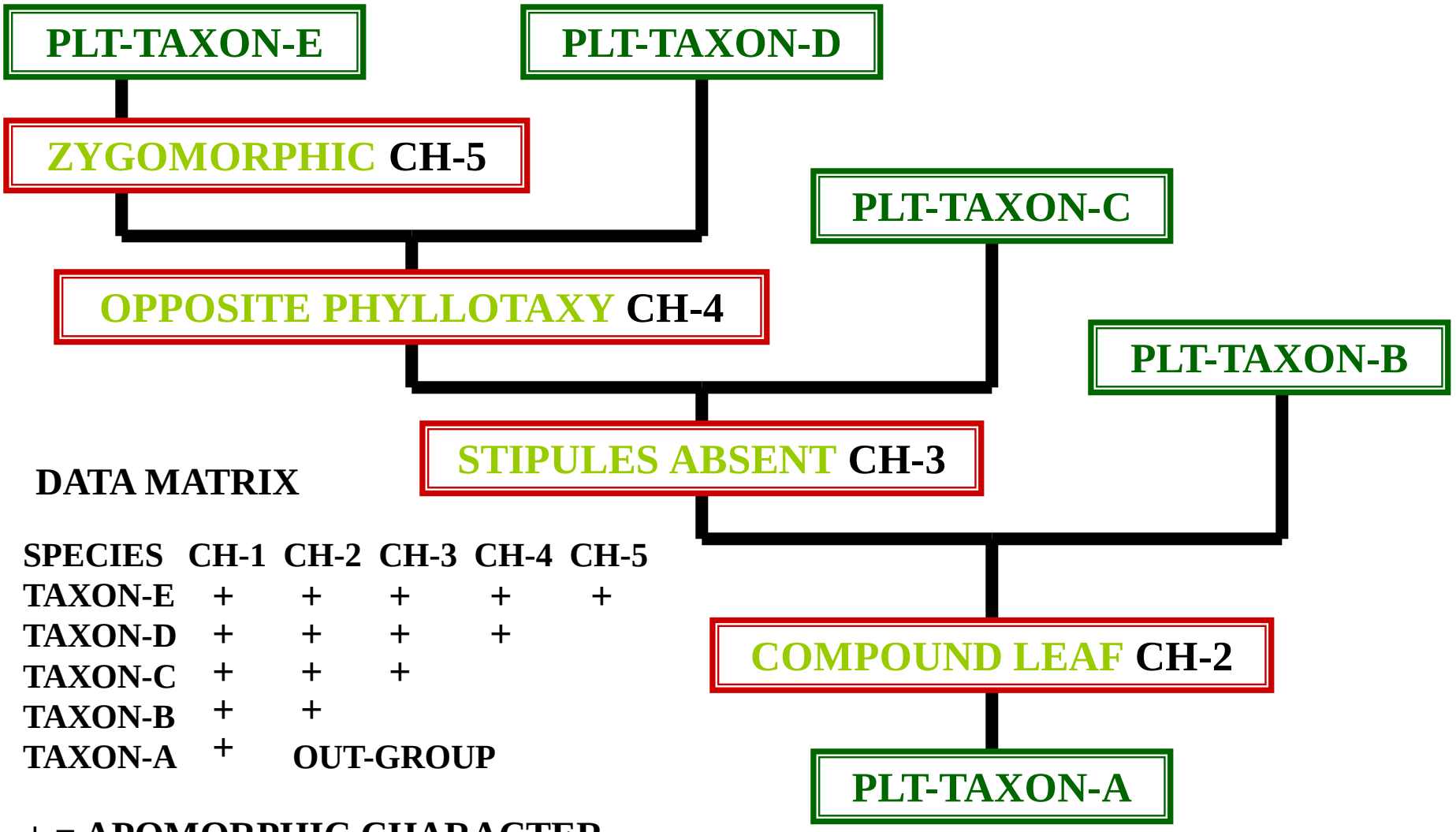


DATA MATRIX

SPECIES	CH-1	CH-2	CH-3	CH-4	CH-5
TAXON-D	+	+	+	+	
TAXON-C	+	+	+		
TAXON-B	+	+			
TAXON-A	+	OUT-GROUP			

+ = APOMORPHIC CHARACTER

CLADOGRAM

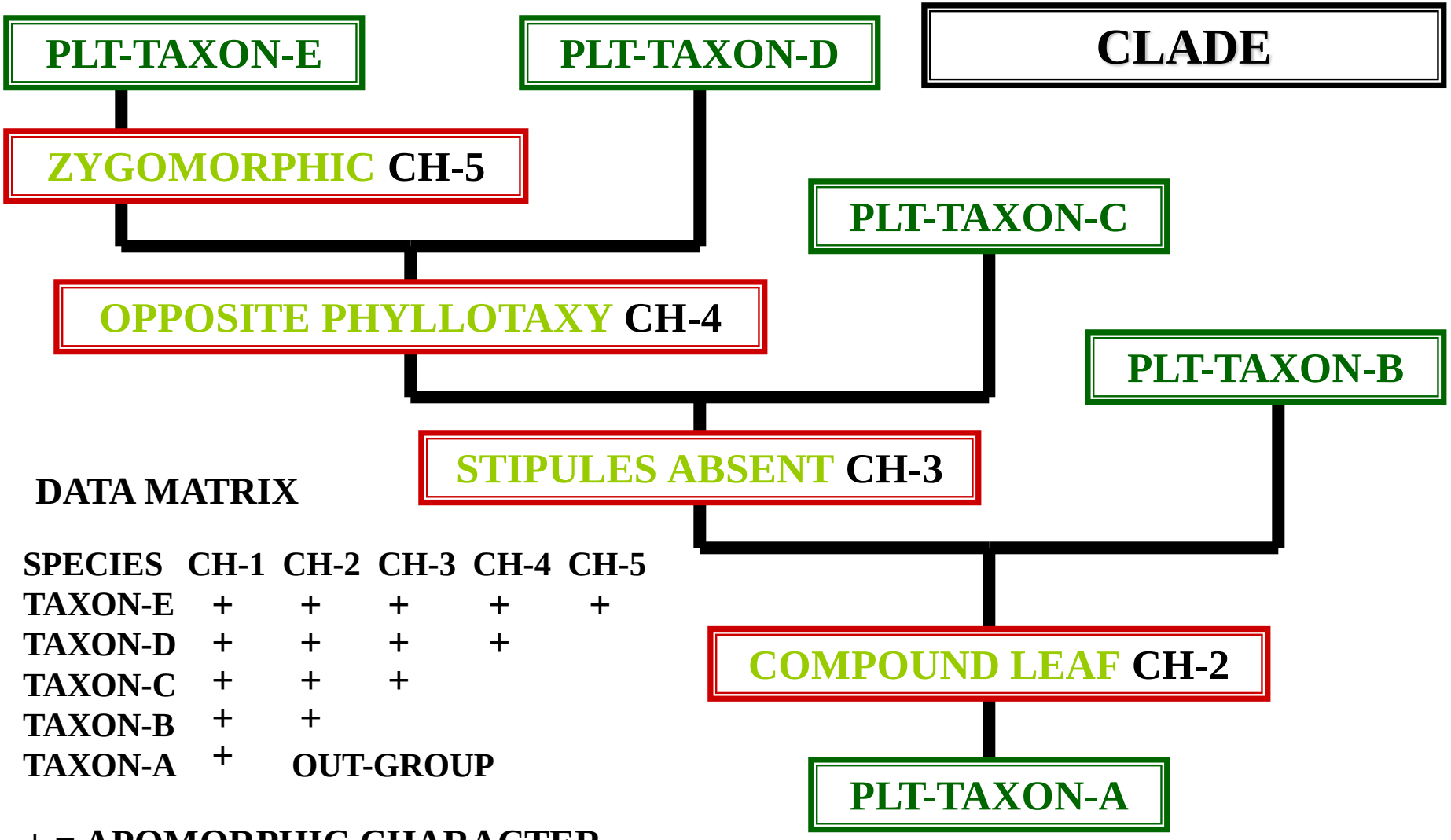


DATA MATRIX

SPECIES	CH-1	CH-2	CH-3	CH-4	CH-5
TAXON-E	+	+	+	+	+
TAXON-D	+	+	+	+	
TAXON-C	+	+	+		
TAXON-B	+	+			
TAXON-A	+	OUT-GROUP			

+ = APOMORPHIC CHARACTER

CLADOGRAM

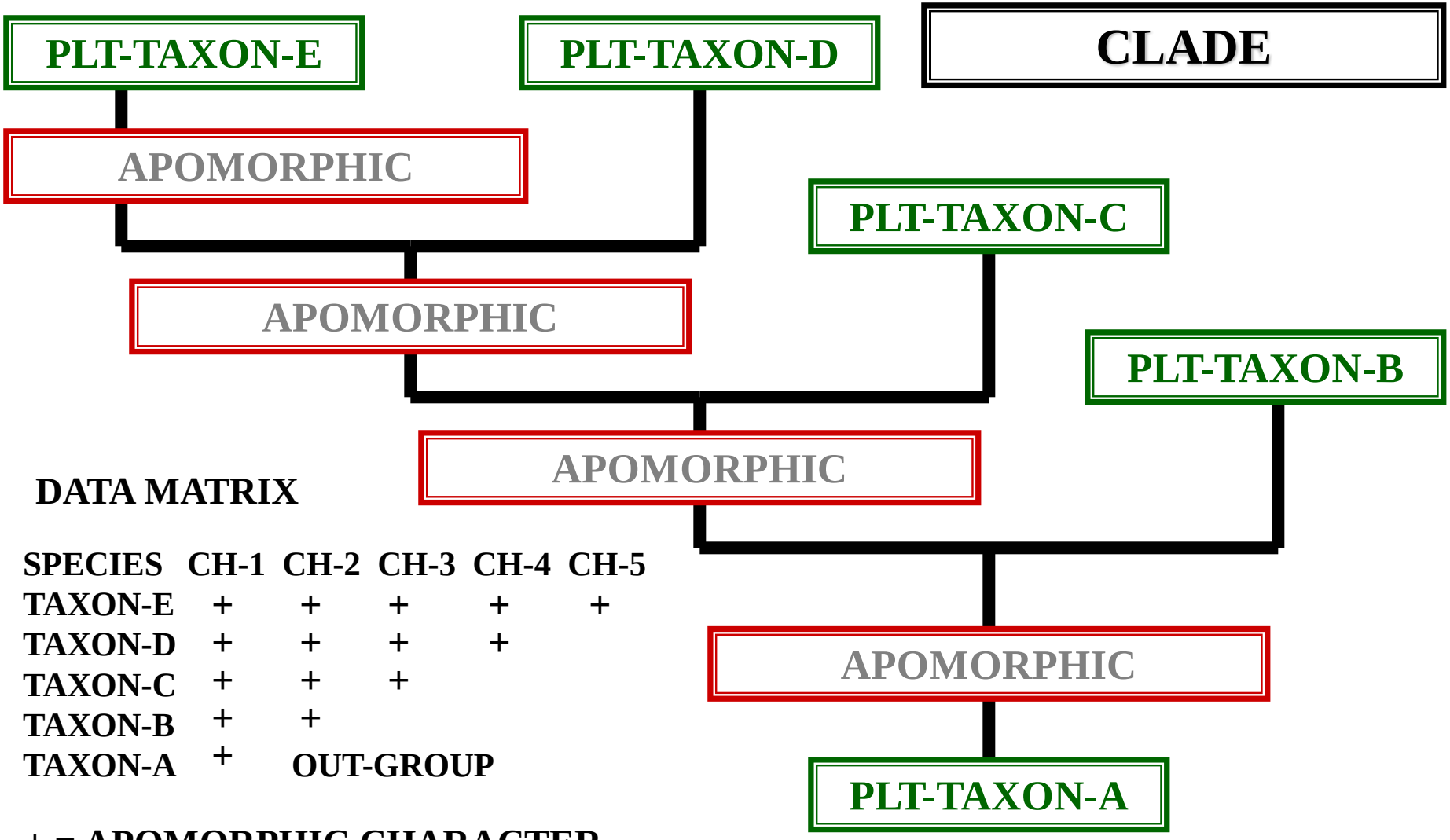


DATA MATRIX

SPECIES	CH-1	CH-2	CH-3	CH-4	CH-5
TAXON-E	+	+	+	+	+
TAXON-D	+	+	+	+	
TAXON-C	+	+	+		
TAXON-B	+	+			
TAXON-A	+	OUT-GROUP			

+ = APOMORPHIC CHARACTER

CLADOGRAM



DATA MATRIX

SPECIES	CH-1	CH-2	CH-3	CH-4	CH-5
TAXON-E	+	+	+	+	+
TAXON-D	+	+	+	+	
TAXON-C	+	+	+		
TAXON-B	+	+			
TAXON-A	+	OUT-GROUP			

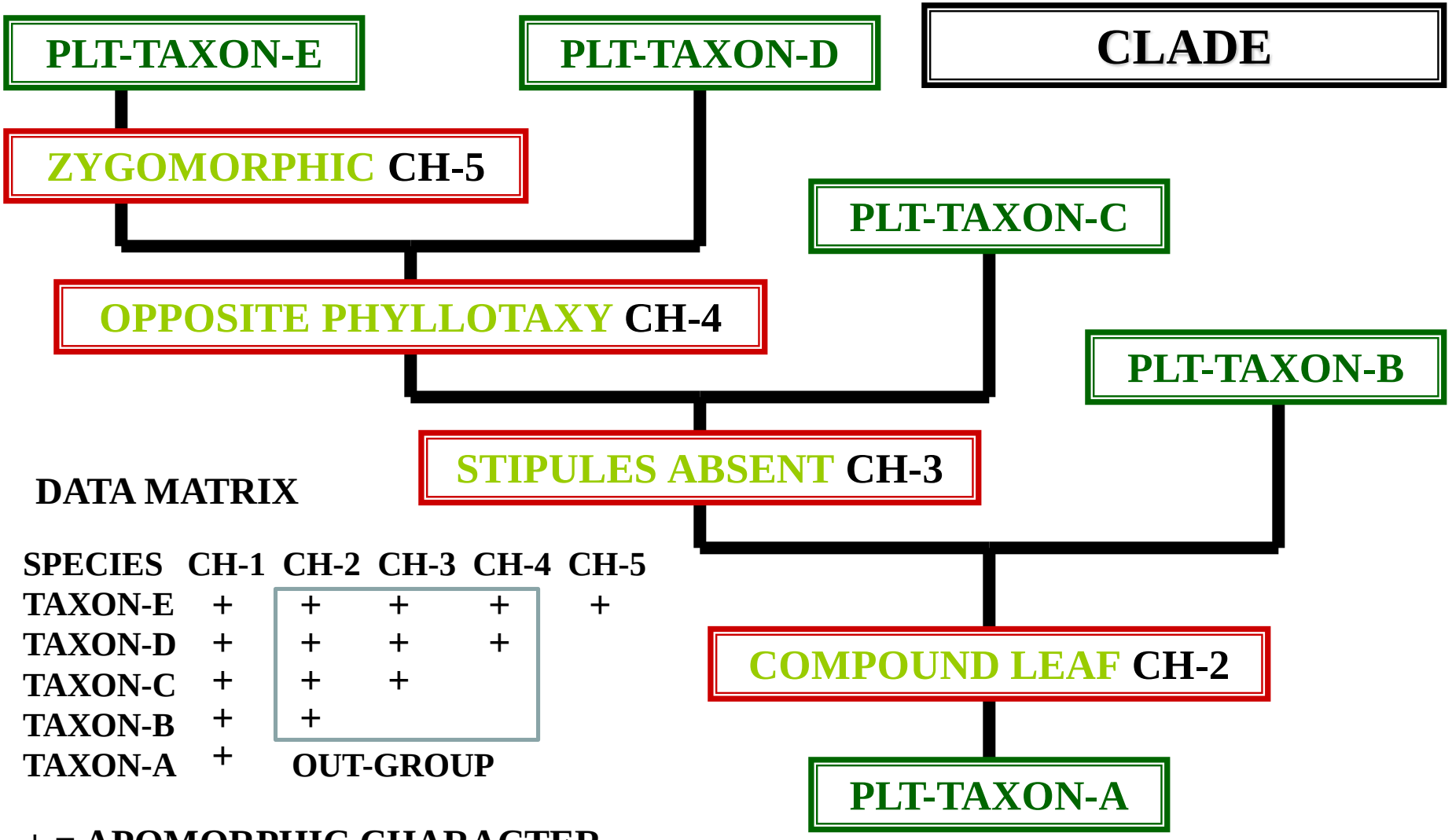
+ = APOMORPHIC CHARACTER

ANGIOSPERM CHARACTER POLARITY

CH-1	**WOODY**		
CH-2	**SIMPLE LEAF**	→	**COMPOUND LEAF**
CH-3	**STIPULES PRESENT**	→	**STIPULES ABSENT**
CH-4	**ALTERNATE LEAF**	→	**OPPOSITE LEAF**
CH-5	**ACTINOMORPHIC FLOWER**	→	**ZYGOMORPHIC FLOWER**

PLESIOMORPHIC → APOMORPHIC

CLADOGRAM

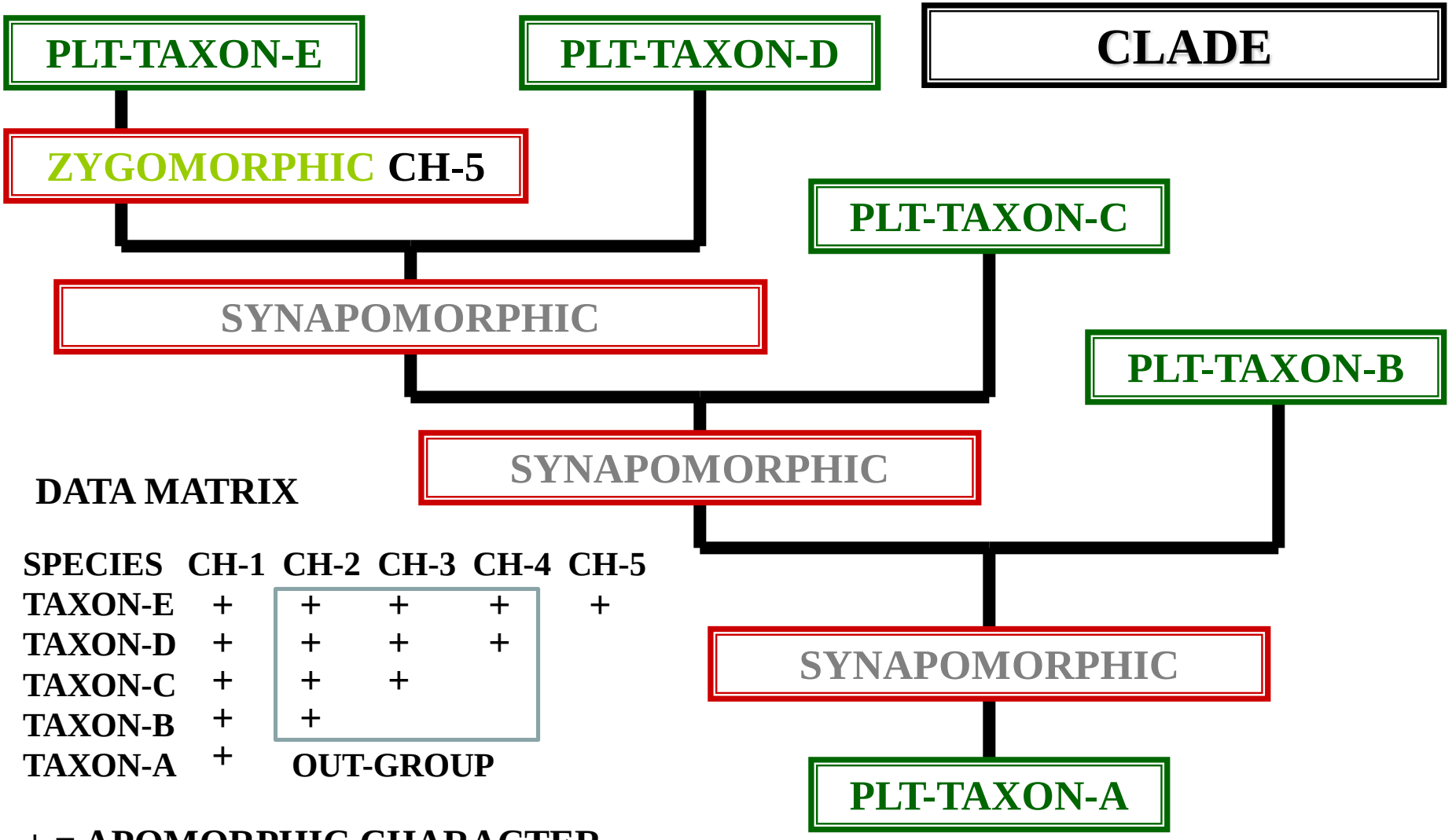


DATA MATRIX

SPECIES	CH-1	CH-2	CH-3	CH-4	CH-5
TAXON-E	+	+	+	+	+
TAXON-D	+	+	+	+	
TAXON-C	+	+	+		
TAXON-B	+	+			
TAXON-A	+	OUT-GROUP			

+ = APOMORPHIC CHARACTER

CLADOGRAM

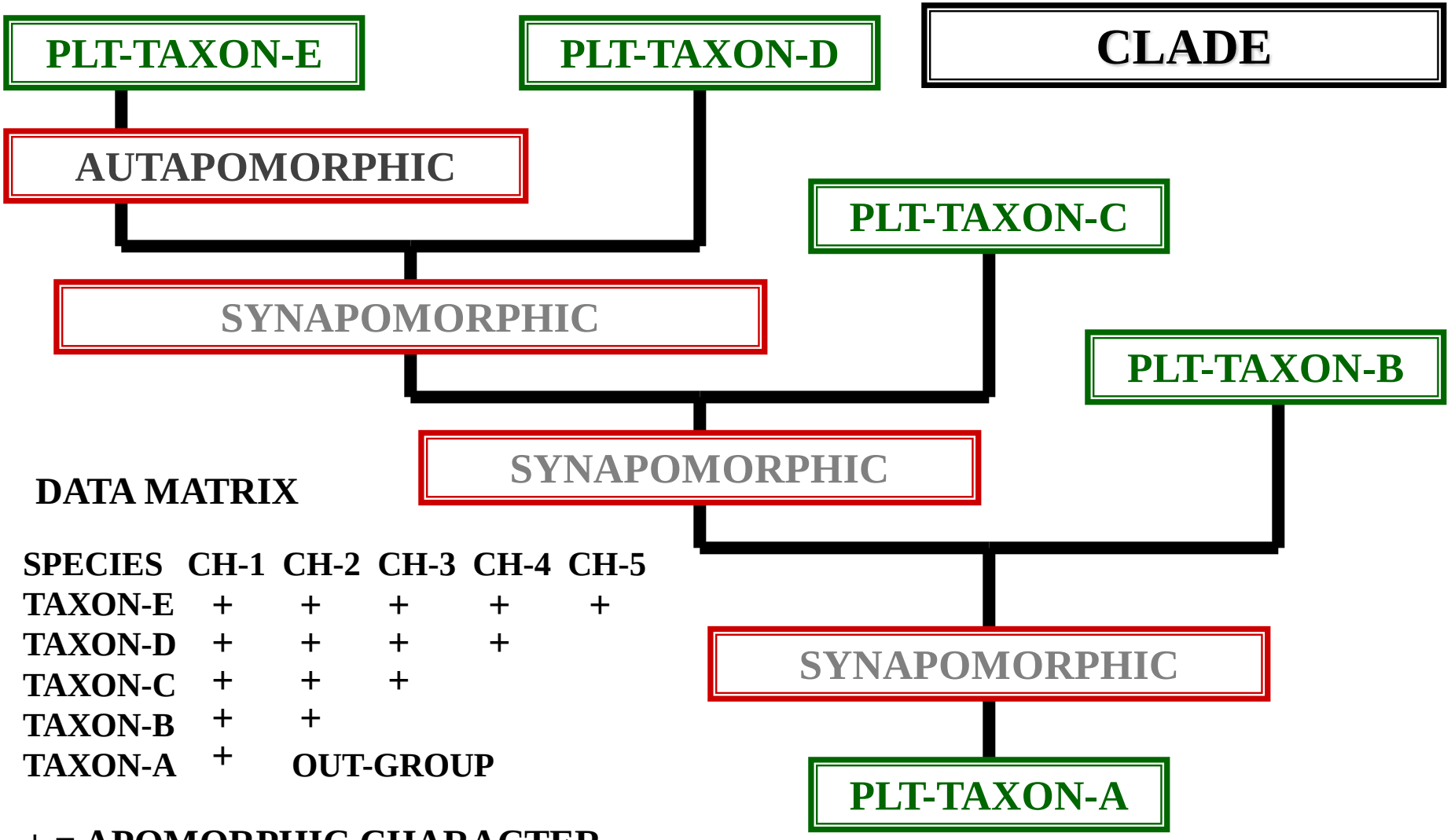


DATA MATRIX

SPECIES	CH-1	CH-2	CH-3	CH-4	CH-5
TAXON-E	+	+	+	+	+
TAXON-D	+	+	+	+	
TAXON-C	+	+	+		
TAXON-B	+	+			
TAXON-A	+	OUT-GROUP			

+ = APOMORPHIC CHARACTER

CLADOGRAM



DATA MATRIX

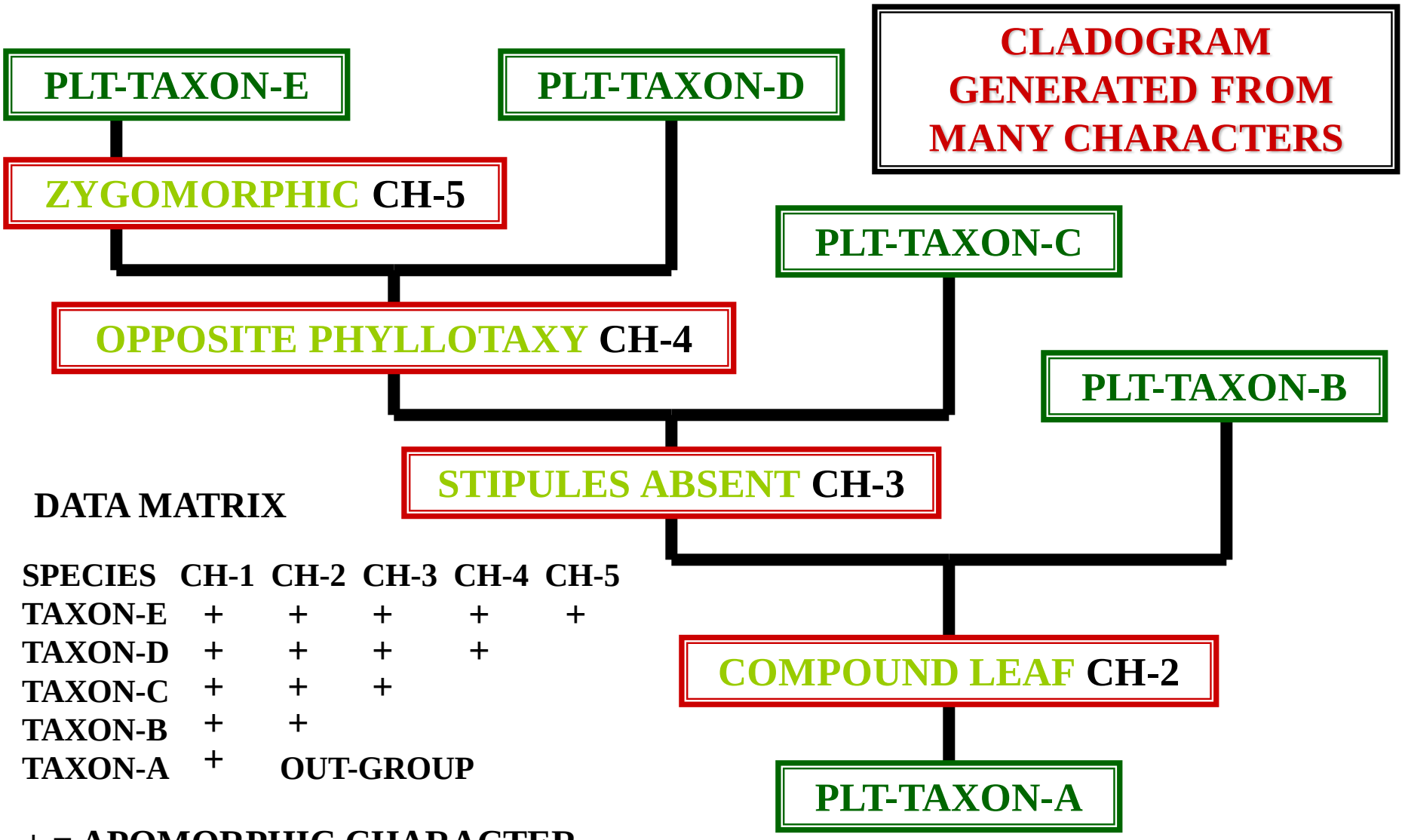
SPECIES	CH-1	CH-2	CH-3	CH-4	CH-5
TAXON-E	+	+	+	+	+
TAXON-D	+	+	+	+	
TAXON-C	+	+	+		
TAXON-B	+	+			
TAXON-A	+	OUT-GROUP			

+ = APOMORPHIC CHARACTER

CLADISTIC PHYLOGENETIC CLASSIFICATION ADVANTAGES

CLADOGRAM

C



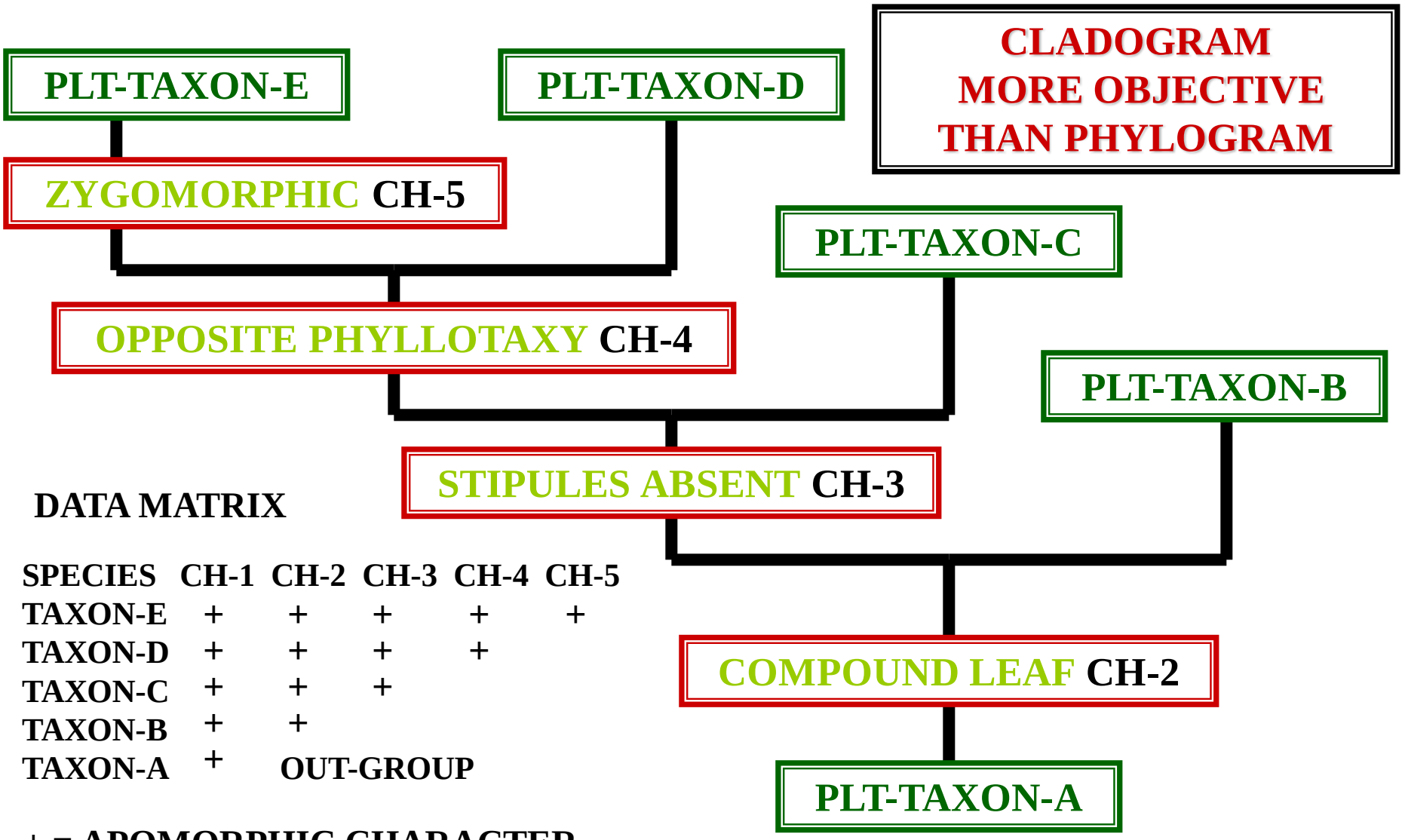
DATA MATRIX

SPECIES	CH-1	CH-2	CH-3	CH-4	CH-5
TAXON-E	+	+	+	+	+
TAXON-D	+	+	+	+	
TAXON-C	+	+	+		
TAXON-B	+	+			
TAXON-A	+	OUT-GROUP			

+ = APOMORPHIC CHARACTER

CLADOGRAM

D



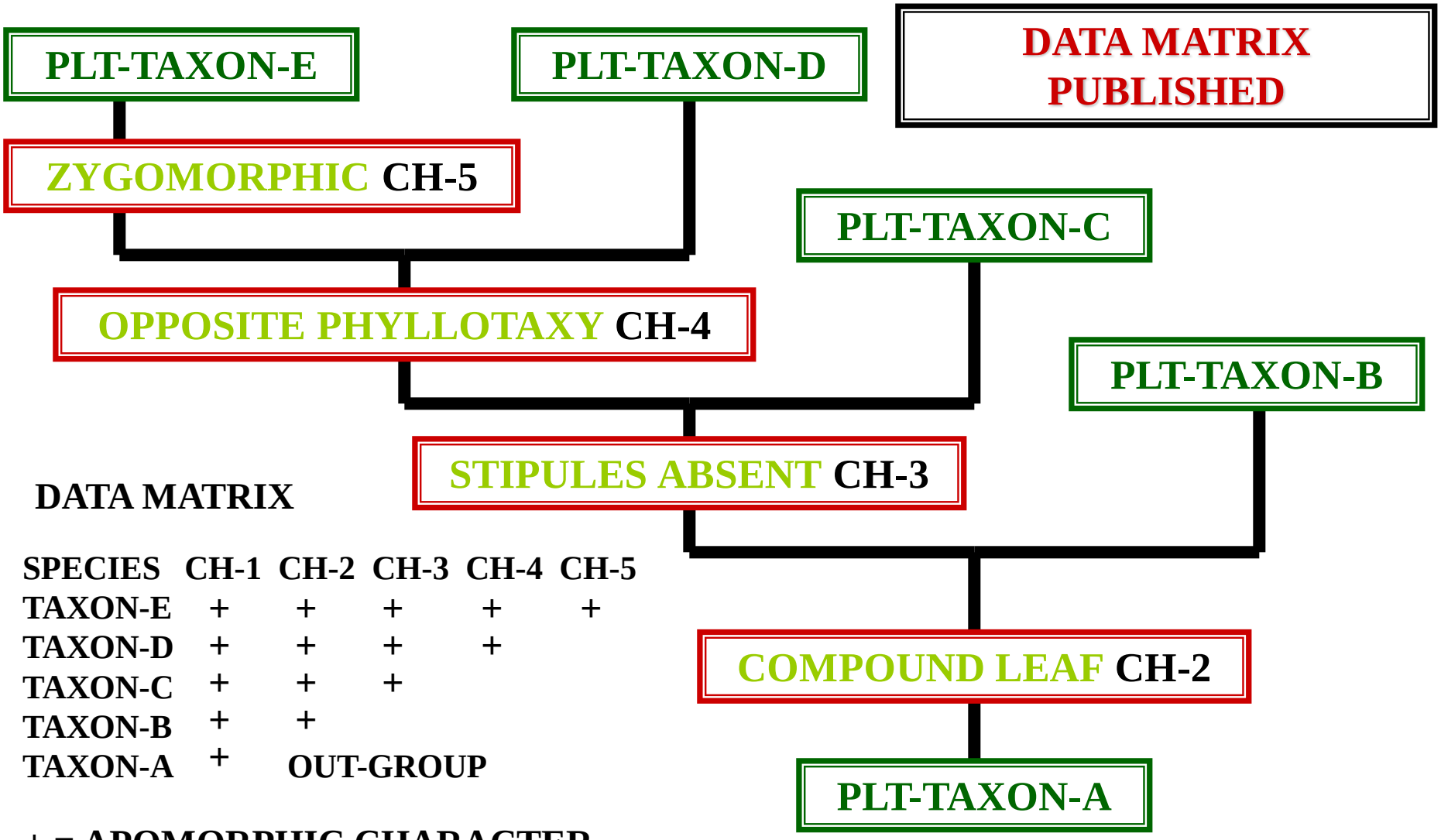
DATA MATRIX

SPECIES	CH-1	CH-2	CH-3	CH-4	CH-5
TAXON-E	+	+	+	+	+
TAXON-D	+	+	+	+	
TAXON-C	+	+	+		
TAXON-B	+	+			
TAXON-A	+	OUT-GROUP			

+ = APOMORPHIC CHARACTER

CLADOGRAM

DM



DATA MATRIX

SPECIES	CH-1	CH-2	CH-3	CH-4	CH-5
TAXON-E	+	+	+	+	+
TAXON-D	+	+	+	+	
TAXON-C	+	+	+		
TAXON-B	+	+			
TAXON-A	+	OUT-GROUP			

+ = APOMORPHIC CHARACTER

DATA MATRIX

P
+

PLT-TAXON	CH-1	CH-2	CH-3	CH-4	CH-5
PLT-TAXON-E	+	+	+	+	+
PLT-TAXON-D	+	+	+	+	-
PLT-TAXON-C	+	+	+	-	-
PLT-TAXON-B	+	+	-	-	-
PLT-TAXON-A	+	-	-	-	-

+ = CHARACTER PRESENT

DATA MATRIX

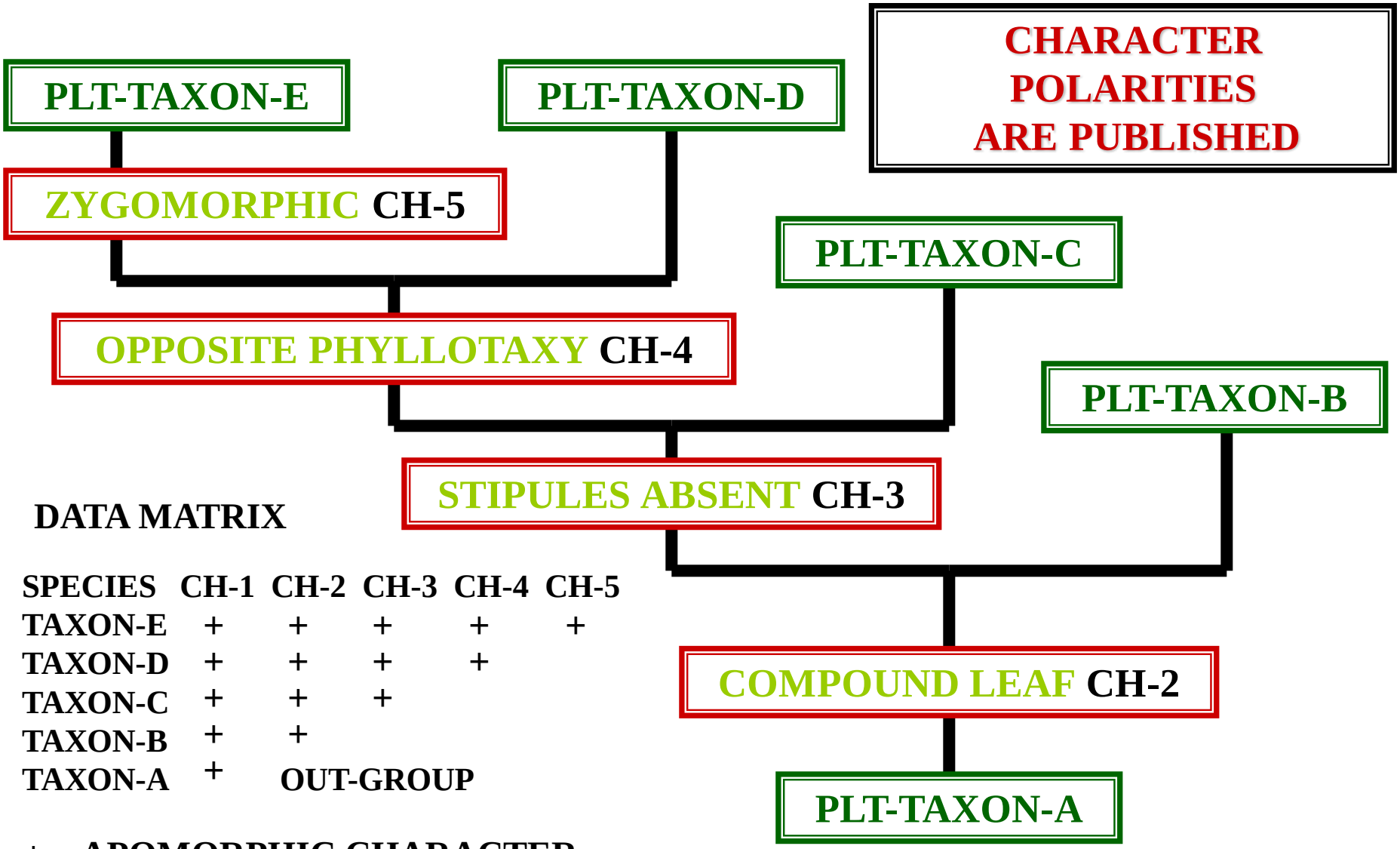
C
+

PLT-TAXON	CH-1	CH-2	CH-3	CH-4	CH-5
PLT-TAXON-A	+	-	-	-	-

DATA MATRIX IS PUBLISHED WITH CLADOGRAM

+ = CHARACTER PRESENT

CLADOGRAM



DATA MATRIX

SPECIES	CH-1	CH-2	CH-3	CH-4	CH-5
TAXON-E	+	+	+	+	+
TAXON-D	+	+	+	+	
TAXON-C	+	+	+		
TAXON-B	+	+			
TAXON-A	+	OUT-GROUP			

+ = APOMORPHIC CHARACTER

ANGIOSPERM CHARACTER POLARITIES

WOODY	→	**HERBACEOUS**
SIMPLE LEAF	→	**COMPOUND LEAF**
STIPULES PRESENT	→	**STIPULES ABSENT**
ALTERNATE PHYLLOTAXY	→	**OPPOSITE PHYLLOTAXY**
ACTINOMORPHIC	→	**ZYGOMORPHIC**
PRIMITIVE PLT	→	**ADVANCED PLT**

DATA MATRIX CHARACTER

CHARACTER POLARITIES ARE PUBLISHED WITH CLADOGRAM

ACTINOMORPHIC → ZYGOMORPHIC

PRIMITIVE PLT → ADVANCED PLT

CLADOGRAM

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PLT-TAXON-E

PLT-TAXON-D

CLADOGRAM DEBATE CONDUSIVE

ZYGOMORPHIC CH-5

PLT-TAXON-C

OPPOSITE PHYLLOTAXY CH-4

PLT-TAXON-B

STIPULES ABSENT CH-3

DATA MATRIX

SPECIES	CH-1	CH-2	CH-3	CH-4	CH-5
TAXON-E	+	+	+	+	+
TAXON-D	+	+	+	+	
TAXON-C	+	+	+		
TAXON-B	+	+			
TAXON-A	+	OUT-GROUP			

COMPOUND LEAF CH-2

PLT-TAXON-A

+ = APOMORPHIC CHARACTER

!
¿
CLADISTIC
CLASSIFICATION
DEBATE
CONDUSIVE

DATA MATRIX

PLT-TAXON	CH-1	CH-2	CH-3	CH-4	CH-5
PLT-TAXON-A	+	-	-	-	-

DATA MATRIX IS PUBLISHED WITH CLADOGRAM

+ = CHARACTER PRESENT

DATA MATRIX CHARACTER

CHARACTER POLARITIES ARE PUBLISHED WITH CLADOGRAM

ACTINOMORPHIC → ZYGOMORPHIC

PRIMITIVE PLT → ADVANCED PLT

A

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QUESTION

BOTANISTS PREFER CLASSICAL PHYLOGENETIC METHOD OR CLADISTIC PHYLOGENETIC METHOD?

QUESTION

BOTANISTS
PREFER
CLADISTIC
CLASSIFICATION

POLYPHYLETIC
VS
MONOPHYLETIC
VS
PARAPHYLETIC

P

POLYPHYLETIC TAXON

POLYPHYLETIC TAXON

POLYPHYLETIC TAXON

TAXON WITH RELATED & UNRELATED TAXA

POLYPHYLETIC TAXON

POLYPHYLETIC TAXON

TAXON WITH RELATED & UNRELATED TAXA

OCCURS WHEN ANALOGOUS CHARACTERS ARE UTILIZED → CONVERGENCE

POLYPHYLETIC TAXON

POLYPHYLETIC TAXON

TAXON WITH RELATED & UNRELATED TAXA

OCCURS WHEN ANALOGOUS CHARACTERS ARE UTILIZED → CONVERGENCE

REJECTED PHYLOGENETIC CLASSIFICATIONS

POLYPHYLETIC TAXON

M

MONOPHYLETIC TAXON

MONOPHYLETIC TAXON

MONOPHYLETIC TAXON

TAXON WITH RELATED TAXA ONLY

MONOPHYLETIC TAXON

MONOPHYLETIC TAXON

TAXON WITH RELATED TAXA ONLY

OCCURS WHEN HOMOLOGOUS CHARACTERS ARE UTILIZED → CONVERGENCE ABSENT

MONOPHYLETIC TAXON

^
P

MONOPHYLETIC TAXON

TAXON WITH RELATED TAXA ONLY

OCCURS WHEN HOMOLOGOUS CHARACTERS ARE UTILIZED → CONVERGENCE ABSENT

ACCEPTED WITH ALL CLASSIFICATIONS

MONOPHYLETIC TAXON

PARAPHYLETIC TAXON

PARAPHYLETIC TAXON

PARAPHYLETIC TAXON

MONOPHYLETIC TAXON WITH MISSING RELATED TAXA

PARAPHYLETIC TAXON

AP

PARAPHYLETIC TAXON

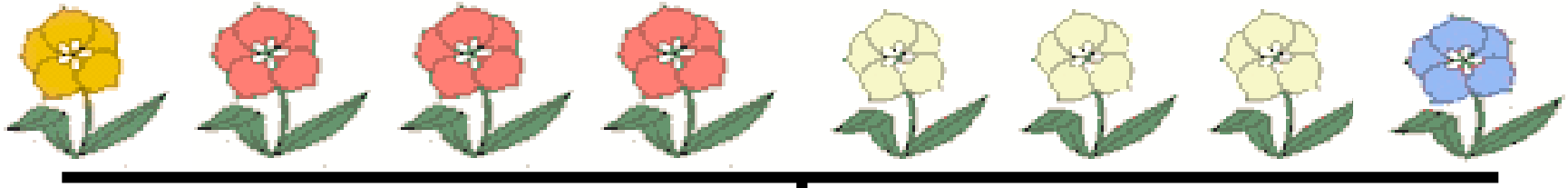
MONOPHYLETIC TAXON WITH MISSING RELATED TAXA

REJECTED W/ PHYLOGENETIC CLASSIFICATIONS

PARAPHYLETIC TAXON

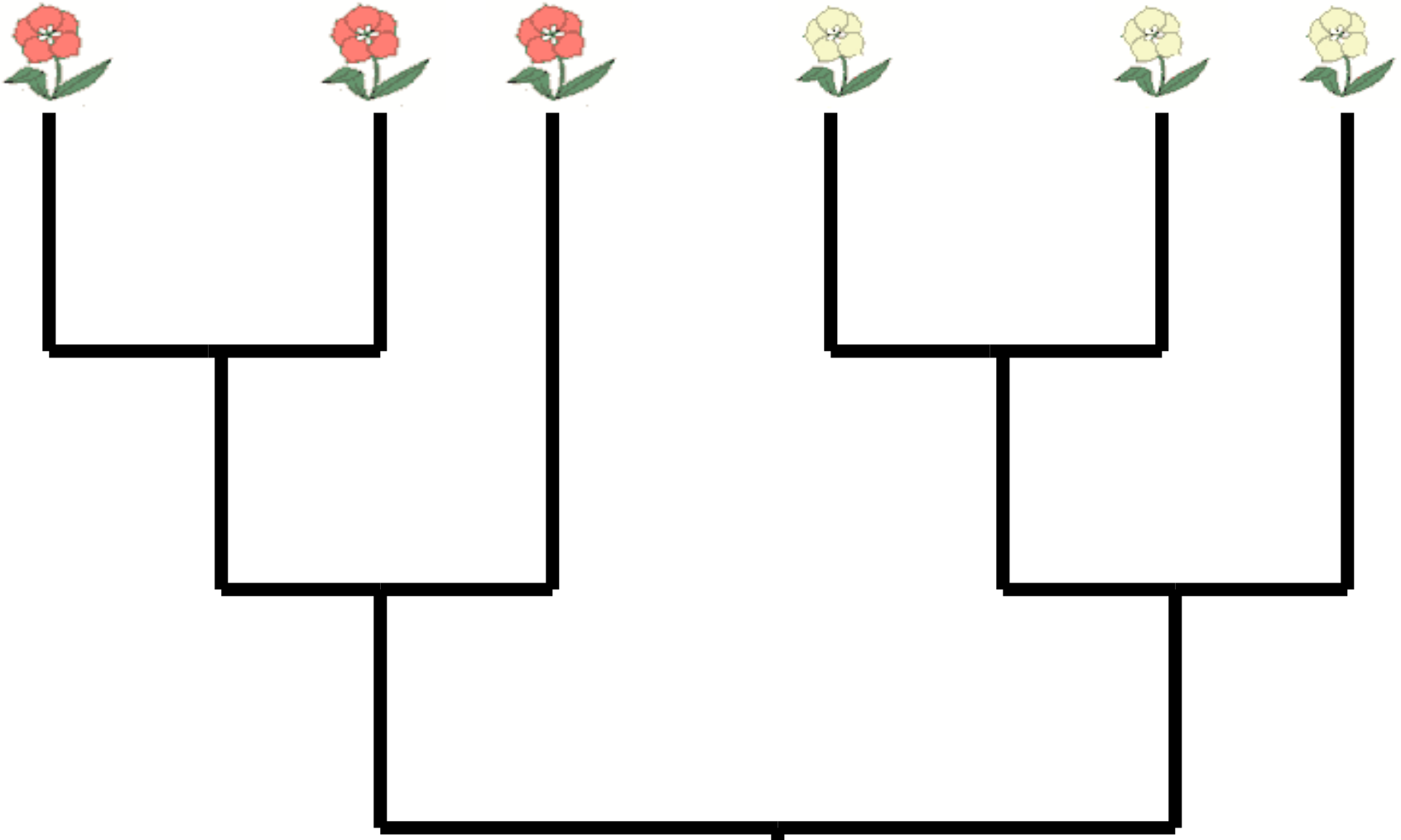
POLYPHYLETIC VS MONOPHYLETIC VS PARAPHYLETIC APPLIED

FLOWER COLOR EQUALS PHYLOGENETIC RELATIONSHIP



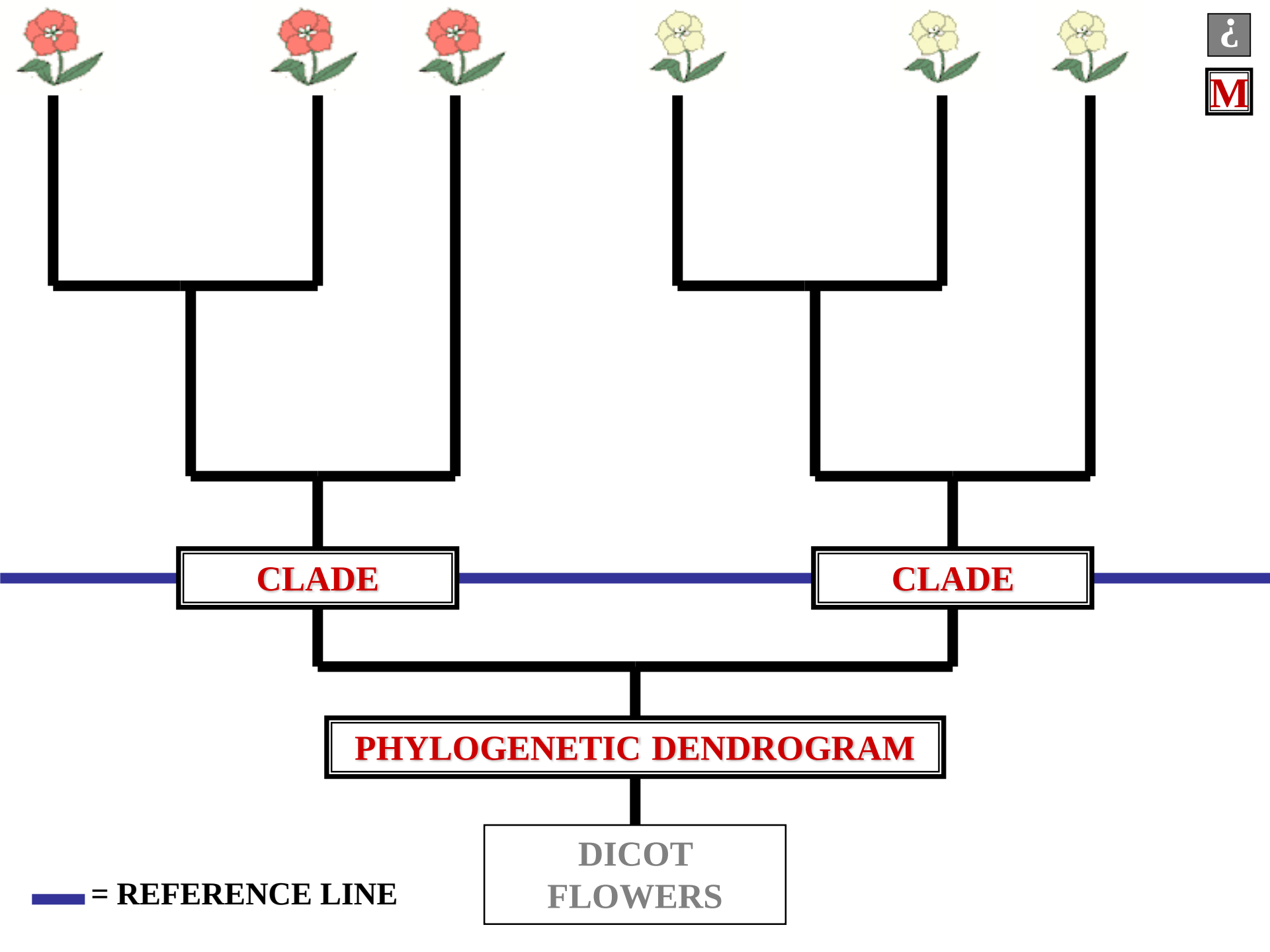
FLOWER COLOR = HOMOLOGOUS

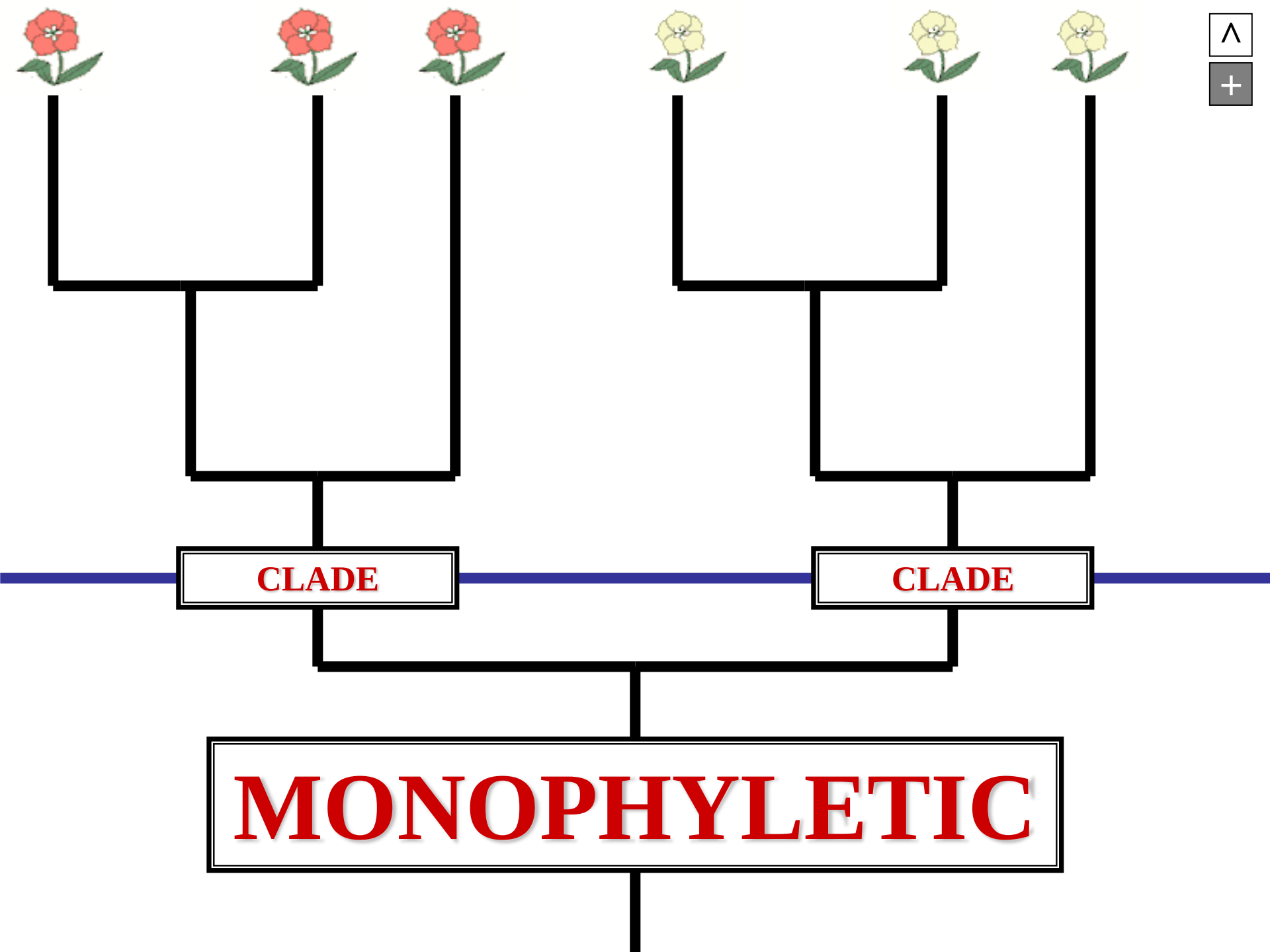
DICOT FLOWERS

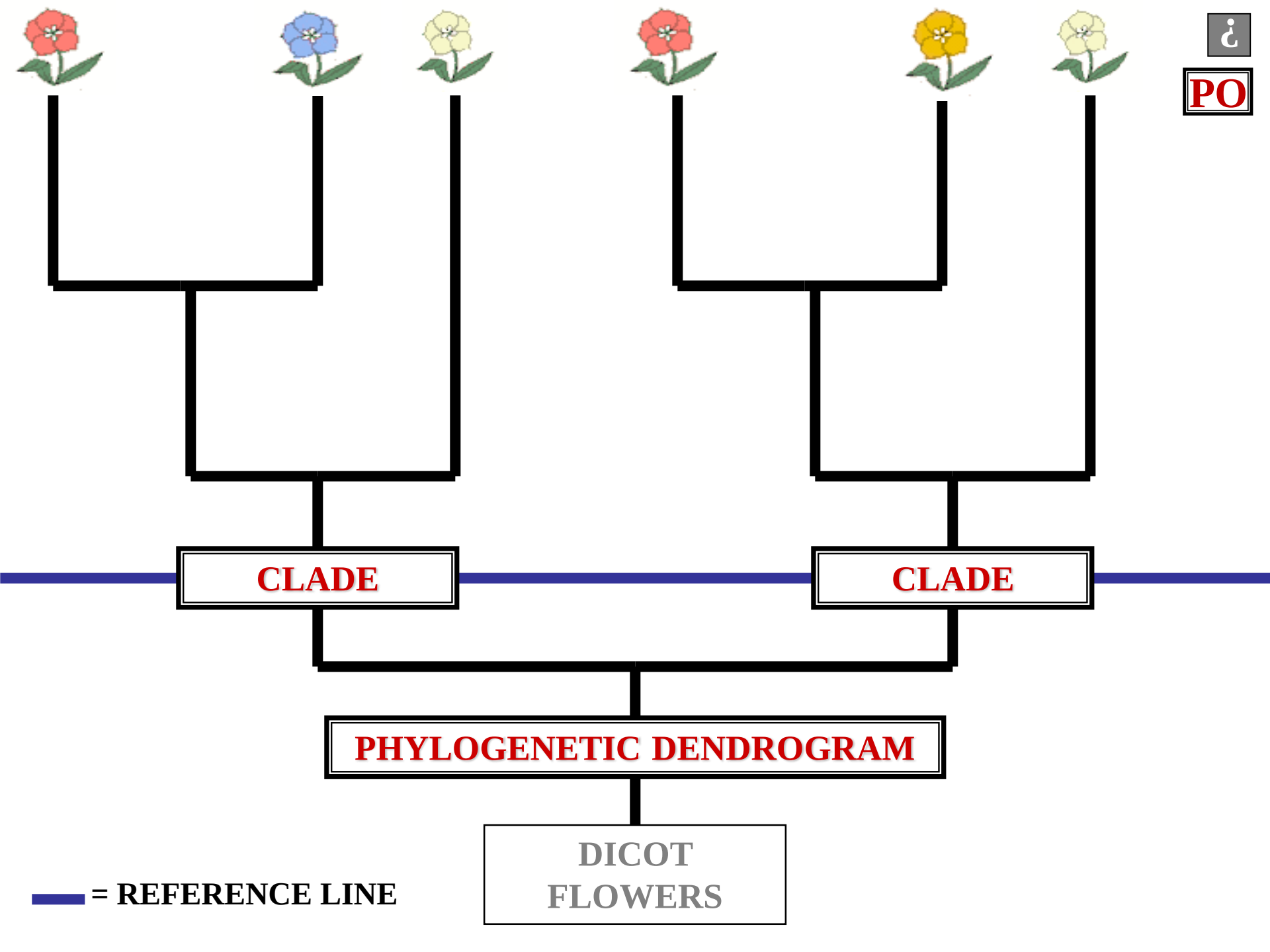


PHYLOGENETIC DENDROGRAM

DICOT
FLOWERS


CLADE
CLADE
PHYLOGENETIC DENDROGRAM
DICOT FLOWERS
= REFERENCE LINE


CLADE
CLADE
MONOPHYLETIC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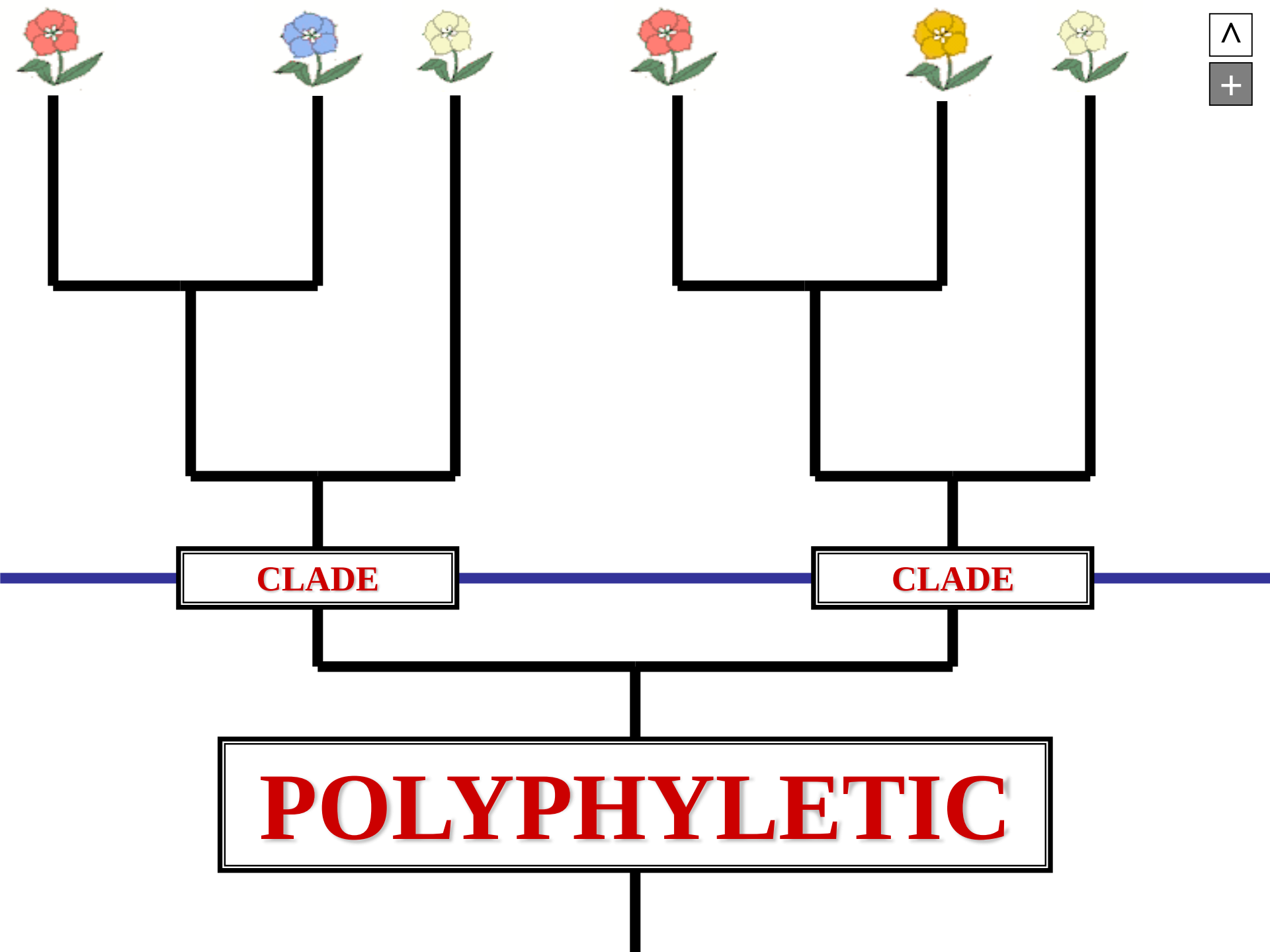
FLOWERS
= REFERENCE LINE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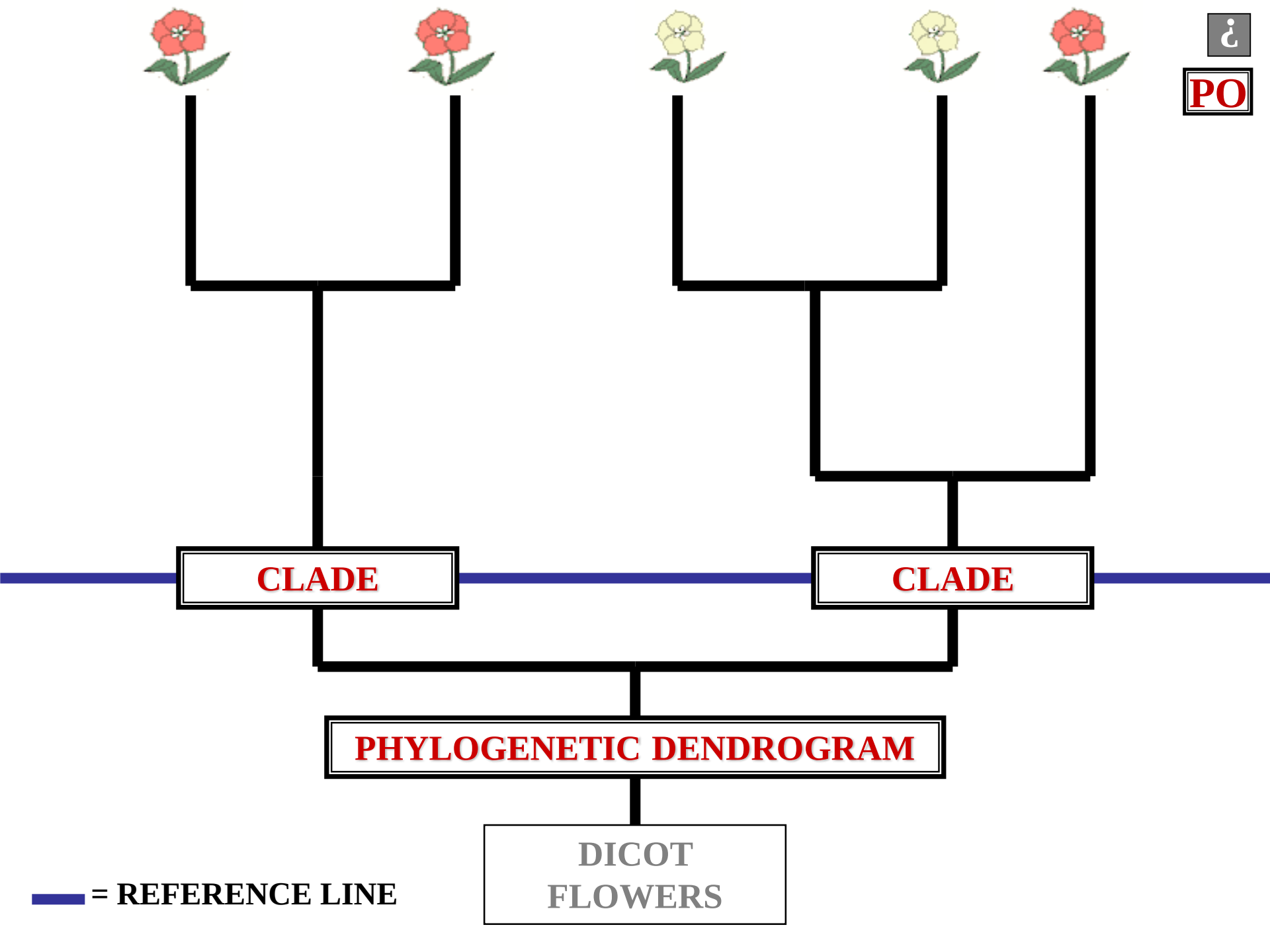
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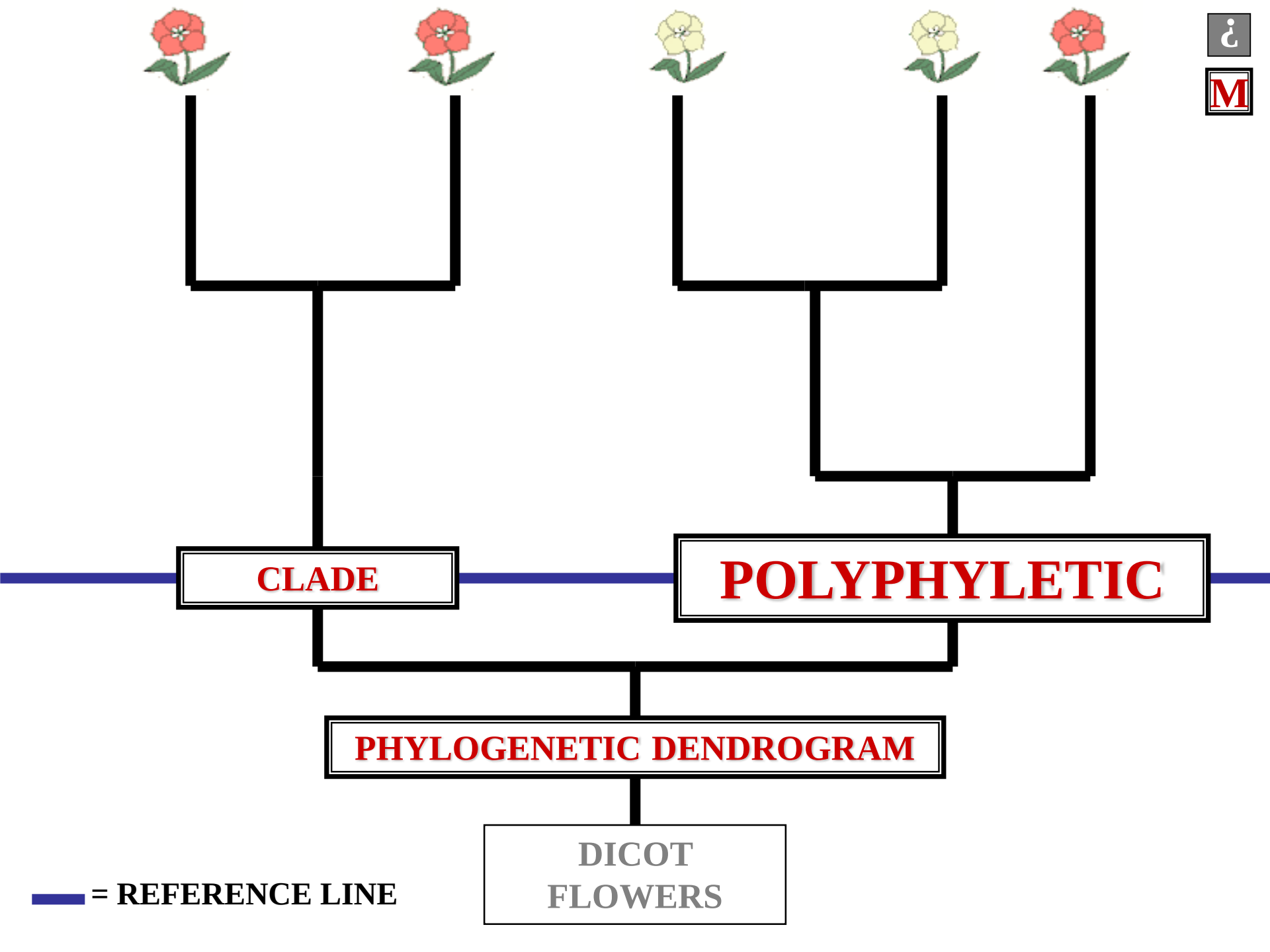
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MONOPHYLETIC

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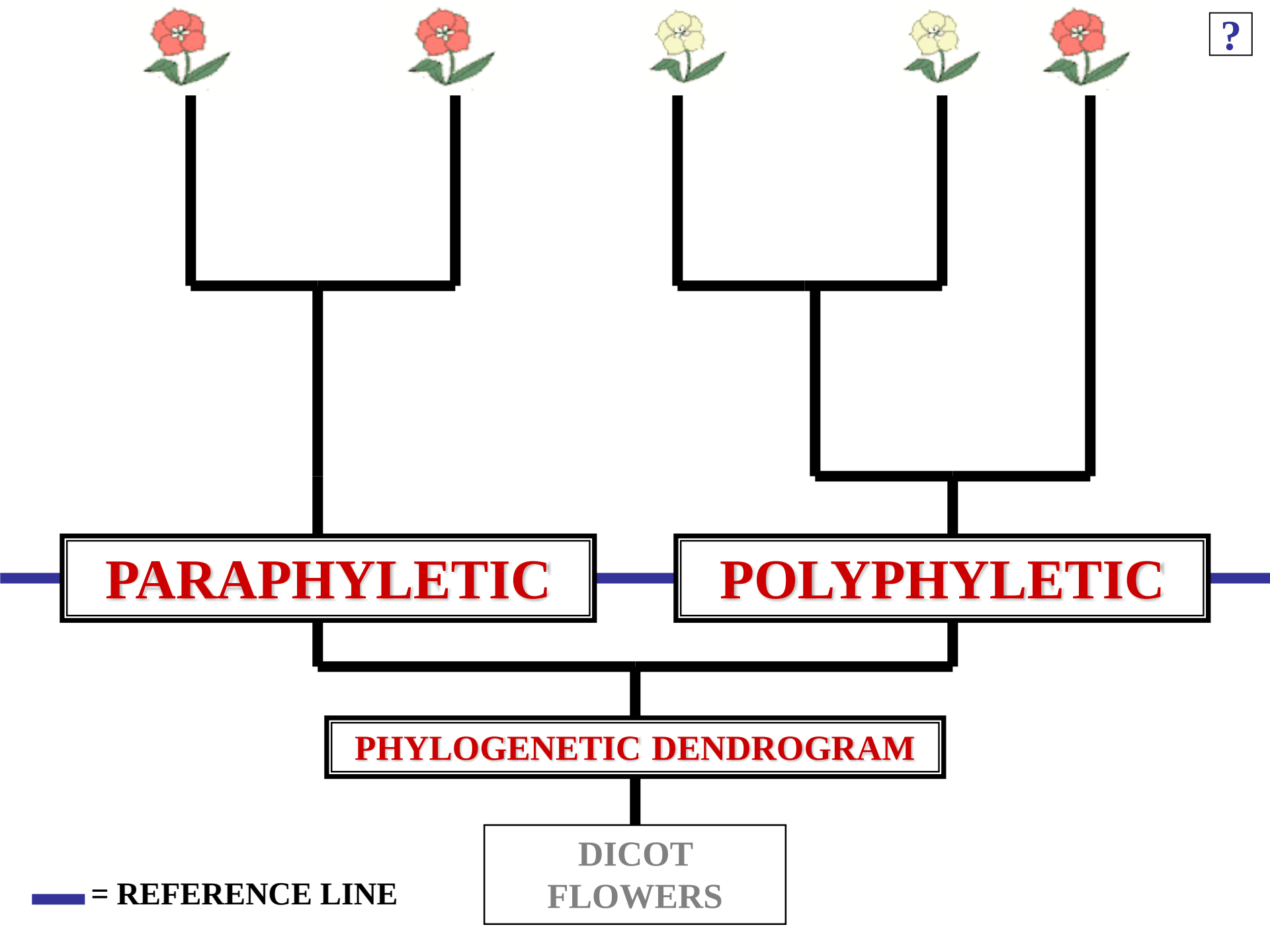
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PARAPHYLETIC
POLYPHYLETIC
PHYLOGENETIC DENDROGRAM
DICOT FLOWERS
= REFERENCE LINE

QUESTION

BOTANISTS PREFER MONOPHYLETIC OR POLYPHYLETIC TAXA?

QUESTION

BOTANISTS
PREFER
MONOPHYLETIC
TAXA

END MATERIAL FINAL EXAM