E Biological sciences, biology
E29 A . Social aspects
R . Research
E2M . Mathematics in biology, biometrics
E34 . Theoretical biology
* For taxonomy, see EJB Kinds of organisms.
E35 . Practical biology
E36 . . Experimental Ethics
E3B . . Equipment & materials.., Cultures..
E4 . . . Instrumentation
E62 . . Investigatory techniques
E64 C . . . Computer techniques
E67 . . . Microtechniques.., Ultramicrotechniques, nanotechniques
E69 . . . Measurement techniques, probe techniques, visualization techniques
E6B . . . . Physical methods.., Mechanical..
E6L . . . . Radiation.., Spectroscopy.., Microscopy..
E8C . . . . Chemical methods.., Preparative methods..
E9E . . . . Biological methods.., Immunological techniques..
E9P . Applied biology, biotechnology
* General works only; for specific applications, see the field of application (eg, agriculture, medicine, technology).

Biological sciences E
Applied biology E9P

E9T *Kinds & parts of organisms*
* The objects of enquiry, on which the various human activities in E2/E9S are used.
E9V . *Common properties/processes*
E9X . . Conditions, parameters.., Degrees of freedom.., Dimension..
EA . Biophysics & biochemistry
EB . . Biophysics, Biothermodynamics.., Radiation biophysics, radiobiology.., Molecular physical properties
EC . . Biochemistry, physiological chemistry
EC8 E . . . Preparative techniques
ECA . . . Physical biochemistry
BDH . . . . Kinetics.., Endergonic.., Exergonic.., Radiation chemistry..
C . . . . Chemical combination & structure.., Bonds.., Molecular physics in biochemistry.., Chains, rings..
Y . . . . Reaction biochemistry
* For biochemical cycles, see ECK; for metabolism, see ECM.
ECF . . . Mixed phase biochemistry.., Gases.., Solids..
ECK . . . Biochemical cycles, Carbon.., Carbon dioxide.., Silicon.., Nitrogen..
ECM . . . Metabolism
* For nutrition, see macroorganisms EGG.
BDH . . . . Kinetics
E . . . . . Bio-energetics, energy metabolism, Basal metabolism.. Catabolism, energy release.., Respiration.., Anabolism, biosynthesis
ECN . . . . Metabolic pathways.., Intermediary.., Secondary.., Metabolic cycles.., Krebs cycle..
ECP . . . *Special physiology.., Pathology*
ECQ . . . *Biochemistry of particular substances*
ECR . . . . Metabolites.., Salts/Acids/Bases.., Complexes..
ECS . . . . Inorganic biochemistry.., Calcium..
ECT . . . . Organic biochemistry.., Macromolecules.., Carbohydrates.., Lipids.., Amino acids.., Proteins.., Enzymes.., Nucleic acids.., Nucleosides.., Nucleic acids.., DNA.., RNA..

Biological structures

Biological sciences E
Biophysics & biochemistry EA
. . . Organic biochemistry.. ECT

EDA Biological structures
EDB . Anatomy, morphology
* Most of the literature relates to parts, organs and systems (EI/GR).
EDC . Subsystems Biological materials.., Fluids.., Solids.., Surfaces.., Walls.., Membranes.., Cavities.., Ducts..
EDK . Microsystems & microstructures
EDM . . Molecular biology.., Ultrastructure, fine structure
EDY . Cells & tissues
EE . . Cells, cytology
EEC P . . . Pathology
. . . Special physiological processes
* For the two central functions (cell maintenance & development, genetic inheritance), see EEM & EFV.
EED . . . . Development & growth.., Resting cell..
EEF . . . . Differentiation.., Regeneration.., Ageing.., Nutrition.., Endocytosis.., Exocytosis.., Replication.., Cell division.., Mitosis..
EEH . . . . Cell maintenance
. . . Morphology
EEJ . . . . Membranes.., Organelles..
EEK . . . . Nucleus.., Chromosomes.., Nucleolus.., Cytoplasm.., Mitochondria.., Lysosomes..
. . . *Kinds of cells*
EEP . . . . Procaryota.., Eucaryota..
EER . . Tissues, histology
. . . *Kinds*
N . . . . Parenchyma.., Stroma.., Contractile..
EFA . Macrosystems, organisms
EFB . . Development, biogeny (of individuals, species)
EFC . . . Ontogeny (individual development)
EFD . . . . Differentiation.., Neoteny, paedogenesis..
EFE . . . . Life cycles.., Growth & restitution..
EFG . . . . Embryology
EFN . . . Genetics, Biochemistry, DNA.., RNA.., Enzymes..
EFO . . . . Chromosomes, Genes..
. . . . . (Properties & interactions of genes) Linkage.. Penetrance.., Dominance..
EFR . . . . . Sequence.., Genetic code..
. . . . . *Kinds of genes, Alleles.., Control genes.., Dominant.., Recessive..*
EFT . . . . . *Kinds of chromosomes, Nonocentric.., Polytene.., Sex chromosomes..*
EFV . . . . Genetic variation, inheritance
D . . . . . Mutation.., Mendelian inheritance..
. . . . . *Kinds of organisms by inheritance factor*
EGA . . . . . Genotypes.., Phenotypes..
EGB . . . . . Populations, population genetics
EGE . . . . Evolution, phylogeny
* For palaentology, see EJU.

Biological sciences E
Biological structures EDA
Macrosystems EFA
. . Genetics EFN
. . . Evolution EGE

EGL . . Semophyleses
* Evolution of particular characteristics and parts.
* The preferred arrangement is to subordinate the evolution of particular organs, etc. to the latter. An * alternative is provided here for libraries wishing to collocate these with evolution in general. If this option is taken, proceed as follows:
* Add to EGL letters B/Y following EI e.g. Evolution of nervous system EGL J.
EGN . . . *Taxonomic phylogeny*
* The preferred arrangement is to subordinate the evolution of a particular organism to that organism. This position is an * alternative (not recommended) for libraries wishing to keep all the literature on evolution together. If this option is taken, proceed as follows:
* Add to EGN letters E/G.

EGO Ecology, Bionomics
* Interaction of organisms with their environment, abiotic and biotic. For ecosytems specifically,
* see EHI X.
* For environment in general and human ecology,
* see GY (and the notes there).
9D . *By place*
* This position allows the qualification by place of ecological phenomena other than organisms - e.g. ecology of Great Britain EGO 9E. For topographical distribution of organisms, * see EHE L.
* Other concepts of place (e.g. tropical) give rise to major facets (e.g. types of ecosystems) and these will be found below (at EHJ/EHR).
* Add to EGH 9 letters D/Z from Schedule 2.
AA . *Principles*
AC . *Research*
AE . . *Systemology*
AEX . . . System ecology
AGC . . *Sampling*
AGC 9G . . . Grid sampling (ecology)
AGC 9N . . . Permanent sample plots
AGC 9Q . . . Quadrants (ecology)
AM . . *Technical procedures, etc.*
. . . *Special environments*
ARY O . . . . Environmental chambers
ASN . . . *Measuring*
ASO . . . . *Biotelemetry*
AX . *Applications*
* This class takes general considerations of human intervention in biological phenomena, both conservatory and exploitative.
* For exploitation, * see classes GS/GW.

Dynamics of ecosystems

Biological sciences E
Biological structures EDA
Ecology EGO
Applications EGO AX

* The sole function of this class is to allow qualification of specific organisms (e.g. Birds - Habitat destruction). The general class for human actions in the environment is at GY.

EGO AXH . Conservation of ecosystem
AXN . . Protection of ecosystem
. *Destruction, damaging*
* See Dynamics of ecosystems EGS.
AY *Influencing factors*
Physiology in general
BB . Adaptive physiology
BFV *Gradients, sequences*
Time factors
BGV . *Periodicity*
BGW . . *Cycles*
BGW N . . . Phenology
* For cyclical features of a particular ecological process, * see - e.g. food cycle EGP.
. . (Circadian rhythm) * see EGW H
BKA *Regulation, control*
BKQ . *Homeostasis*
Response to environment
BLE . Adaptation (general)
* For adaptative behaviours narrowly,
* see Behaviour EHT BLE.
BN *Biophysics, biochemistry, special physiology*
* In the context of ecology, the primary role of these concepts is that of abiotic factors affecting the external interactive processes of the whole organism. These are located at EGT/EGU below. Purely physiological studies of the individual organism go in EB/EE. This class is unlikely to be used except in compounding.

K Ecosystems, biosphere
L . Dynamics of ecosystems
. . *Variation*
M . . . Ecoclines
N . . Energy systems in ecology
P . . . Productivity, biological productivity
PL . . . . Conversion rate
Q . . . . Biomass
* See also Population EHG J
QR . . . . Primary productivity
QS . . . . Secondary productivity
R . . . Flow of energy
S . . . Transfer of energy
W . . Ecological pyramids
EGP . . Food cycle, food web
EGQ . . . Food chains, trophic cycle
* For trophic levels, * see EHB IX.
OU . . . . Assimilation rate

Biological structures EDA
Ecology EGO
Ecosystems EGO K
Dynamics of ecosystems EGO L
Food cycle EGP
. . Assimilation rate EGQ OU

EGQ R Biogenchemical cycles
S . Carbon/oxygen cycle
T . . Carbon cycle
U . . Oxygen cycle
V . Nitrogen cycle
VR . . Fixation of nitrogen
VS . . Nitrification
W . Water cycle
X . Mineral cycle, sedimentary cycle
XR . . Calcium cycle
Y . . *Other, A/Z*
EGR Devlopment in ecosystems, succession
* This class is for the process; for communities defined by development stages, * see EHI.
RL . Establishment of ecosystems
RN . . Ecological amplitude
RO . . Oikesis, ecesis
RQ . Competition in ecosystems
RR . Reaction in ecosystems
S . Seres
T . Relicts
U . Climax
US . . Disclimax
UT . . Subclimax
V . Primary succession, autogenic succession
W . Secondary succession, allogenic succession
X . Zonation
XS . . Horizontal zonation
XT . . Vertical zonation
EGS . Destruction of ecosystem, damaging of ecosystem
* Succession implies a natural process of change & adjustment. This class is for external factors of an exceptional nature entering the process. These are usually activities of humans & are usually deleterious insofar as this term is applicable to ecological processes.
* Destruction of the ecosystem of particular organisms is usually considered destruction of their habitat & the latter class (EHE) should be used. But at the general level the terms habitat & ecosystem are hard to distinguish.
* If an effect is on the physiology of organisms rather than their behaviour & ecological interaction, use Physiology (EBB/EDL)
J . . *Agents*
. . . *Physical*
* See Components of ecosystems & the note, preceding EGT B. Also, note at EHB.
L . . . *Biotic*
M . . . . Consumption of food resources
N . . . . . Overconsumption
* E.g. overgrazing.

Abiotic components of ecosystems

Ecology EGO
Ecosystems EGO K
Dynamics of ecosystems EGO L
. . . Agents EGS J
. . . . Biotic EGS L
. . . . . Overconsumption EGS N

EGS P . . . . . Underconsumption
* E.g. undergrazings.

R . . . . *Human exploitative operations*
* Add to EGS R letters S/W following G

S . . . . *Technology*
* Add to EGS S letters D/Y following U in UD/UY (notation provisional)

V . . . . *Other/agencies*
* Add to EGS V numbers and letters 3/9, A/Z from the whole classification (except for G&U).

. . . *Processes*

X . . . . *Nudation*

XK . . . . Regeneration of ecosystem

XQ . . . . Failure of environment, death of environment

Components of ecosystems
* Interactions in ecology are generally cyclical. So the components below play a dual role in that they have simultaneously the nature of parts of the ecosystems and of agents stimulating ecological processes. It is not feasible to maintain the distinction in the literature.

EGT B . Abiotic components of ecosystems

D . . *Energy forms & interactions*
* Add to EGT letters D/H following ED in EDD/EDH; a selection is given below.

DL . . . *Mechanics*

DO . . . . *Motion*

DOB HM . . . . . Velocity, speed

DOB HN . . . . . Accelertion

DOB HP . . . . . Deceleration

DW . . . *Weight*

DX . . . *Gravity*

EC . . . *Pressure*

EG . . . *Loading*

EGH . . . . *Impact*

ER . . . *Vibration*

ET . . . . *Acoustics*

EW . . . . . *Intrasonic effects, subsonic effects*

EX . . . . . *Ultrasonic effects*

FB . . . Thermal phenomena in ecosystems
* See also Climatic conditions EGX H

FD . . . . *Temperature*

FEH . . . . *Heat transfer*

FK . . . . *Low temperature*

FLM . . . . . *Extreme cold*

FLP . . . . *High temperature*

FLR . . . . . *Extreme heat*

FN . . . Electrical phenomena in ecosystems

FO . . . . *Static electricity*

FT . . . . *Low voltage*

Ecology EGO
Ecosystems EGO K
Components of ecosystems
. . Energy forms & interactions EGT D
. . . Electrical phenomena in ecosystems EGT FN
. . . . Low voltage EGT FT

EGT FU . . . . *High voltage*

FV . . . . Lightning

FW . . . Magnetic phenomena in ecosystems

FWL . . . . Earth's field in ecosystems

FWP . . . . Polarity in ecosystems

G . . . Radiation phenomena in ecosystems, radioecology

GI . . . . *Atmospheric radiation*

GL . . . . *Radioactive materials*

H . . . . *Optical phenomena*

HK . . . . . *Ultra-violet radiation*

HL . . . . . Light in ecosystems

HLQ . . . . . Intensity of light

HLR . . . . . Direct light

HLS . . . . . Diffuse light

HLT . . . . . Shadow

HLV . . . . . *Daylight*

HM . . . . . *Sunlight*

HN . . . . . *Darkness*

HO . . . . . *Infra red radiation*

HV . . . . . *Colour*

P . . Chemical phenomena in ecosystems
* Add to EGT letters P/Y following EB.
* Add to EGU letters A/Y following EC.

. . . *Solution properties*

SCS . . . . Salinity in ecosystems

SCT . . . . Alkanity in ecosystems

SCU . . . . Acidity in ecosystems

. . . *Reactions*

TR . . . . Fire in ecosystems

TRT . . . . . Crown fires

TRU . . . . . Surface fires

TRV . . . . . Ground fires, burnt areas

EGU G . . . *Substances*
* For cycles (e.g. carbon cycle) * see EGQR.
* For water, * see EGYB.

EGV B Extraterrestrial factors

D . Space & the ecosystem

G . Sun & ecosystem

H . Moon & ecosystem

K . *Other factors*
* Further details may be added from Class D Astronomy.

Terrestrial factors

Biological sciences E
Biological structures EDA
Ecology EGO
Ecosystems EGO K
Extraterrestrial factors EGV B
. Other factors EGV K

EGV N Terrestrial factors
P . Geophysical processes
* For volcanoes * see Land ecosystem EHQD.
Q . . Earthquakes
R . . Erosion & deposition
S . . . Landslides
T . . Hot springs, geysers
EGW A . Atomsphere in ecosystems
. . *Composition*
C . . Upper atomsphere
D . . Troposphere
F . . Meteorological & climate conditions
FBG W . . . *Cyclical variations*
H . . . . Circadian cycle
I . . . . . Day, daily, diurnal
J . . . . . Night, nocturnal
L . . . . Seasonal variations
M . . . . . Prevernal
N . . . . . Vernal, spring
P . . . . . Aestival, summer
Q . . . . . Autumn
R . . . . . Hiernal, winter
S . . . . Annual
T . . . . *Longer periods*
EGX B . . . Meteorology, weather in ecosystem
C . . . . Climate, bioclimatology
C9A F . . . . . Regional climate
C9A J . . . . . Local climate
* E.g. of a woodland
C9A M . . . . . Microclimate
E . . . . Atmospheric pressure
G . . . . Wind, air circulation
GJ . . . . . Speed of wind
GL . . . . . Direction of wind
GN . . . . . Storms
GT . . . . . Orographics movement
H . . . . Thermal climate conditions in ecosystems
* See also Abiotic factors - Thermal radiation EGTFB
J . . . . . Temperature in ecosystems
K . . . . . Extremes of temperature
L . . . . . Warm climates
M . . . . . Temperate climates
N . . . . . Cold climates
QD . . . . Hydrometeorology
QF . . . . . Humidity
QH . . . . . Relative humidity
QJ . . . . . Evaporation power of air
QL . . . . . Saturation deficit
QN . . . . . Condensation
QP . . . . . Dew

Ecosystems EGO K
Terrestrial factors EGV N
Atomsphere in ecosystems EGW A
. Meteorological & climate conditions EGW F
. . . . Condensation EGX QN
. . . . . Dew EGX QP

EGX QR . . . . Mist, fog
QT . . . . Cloud
R . . . . Precipitation, rainfall
RBH R . . . . . *Distribution*
SD . . . . . Interception of rainfall
SG . . . . . Throughfall of rain
T . . . . . Sleet
U . . . . . Snow
V . . . . . Ice, hail
W . . . . . Frost
X . . . . . Drought
. (Radiation) * see EGTG
EGY B Hydrosphere, water relations
E . Flooding
G . Salt water, seawater, ocean
J . Freshwater
K . . Still waters, bodies of water
L . . Running water
N . Ground water
P . . Water table
X Lithosphere
EHA . Soil, edaphic ecology
* Details should be taken from Class D (soil science). A brief outline is given here for convenience (based on a classification by B.C. Vickery). Notation is provisional.
* In retroactive synthesis within EHA the first 3 letters (EHA) may be dropped; e.g. microbiology of clay soils EHA VLT.
. . *Processes*
JB . . . Formation of soil
JE . . . . Weathering of soil
JH . . . Compacting soil
JL . . . Loosening soil
JT . . . Erosion
. . *Properties*
KB . . . *Physical*
. . . *Physical properties*
KP . . . *Physico-chemical*
KQ . . . . Moisture content of soil
KS . . . . Salinity of soil
. . *Constituents*
LC . . . *Chemical*
LE . . . . Clay complex
LH . . . . Water in soil
LK . . . . Humus
LP . . . Parent material in soil
. . . Biological constituents of soil
LS . . . . Plant litter
LT . . . . Soil microbiology
LV . . . . . Bacteria in soil

Ecosystems

Ecology EGO
Ecosystems EGO K
Terrestrial factors EGV N
Lithosphere EGY X
. . Constituents
. . . . . Bacteria in soil EHA LV

EHA LW . . . . . Fungi in soil
. . *Stucture*
MB . . . Soil morphology
MD . . . . Profile of soil
MF . . . . Strata of soil
MG . . . . . Top soil
MH . . . . . Subsoil
MK . . . . Horizon of soil
MP . . . . Pans (soil)
MR . . . . Aggregates (soil)
MT . . . . Particles (soil)
. . *Types of soils*
N . . . *By rock or mineral origin*
. . . *By climatic vegetational zones*
OC . . . . Cold zone soils
OF . . . . Temperate zone soils
OJ . . . . Subtropical & tropical soils
OL . . . . . Laterite
ON . . . . Humid soils
OR . . . . Arid soils
P . . . *By physiography*
* Desert, prairie, etc.
. . . *By constitution*
QC . . . . Peat soils
QF . . . . Podzols
QT . . . . Gley
QV . . . . Saline & alkaline soils
. . . *By texture*
S . . . . Sand
T . . . . Loam
V . . . . Clay

EHB Biotic components
* * See note preceding EGTB (ecosystem components).
. *Particular organisms*
* This position is provided solely to allow qualification of a specific ecological phenomenon (including another organism) by organism when the latter is clearly the agent of an action on it. Do not use if no particular patient (thing affected) is considered; a document on the general role (as agent) of an organism in an ecosystem goes with that organism.
* See also Destruction of ecosystem EGS.
* Add to EHB letters E/G from the main classification.
IX . Tropic levels
* For role in ecology generally. For autotrophs & heterotrophs as types of organisms (their structure, functioning, etc.) * see Types of organisms EJRQ
J . . Autotrophs, producers
L . . Heterotrophs, consumers
M . . . Mass consumers, biophages
N . . . Micro consumers, decomposers
O . . . . Saprophytes

Biological sciences E
Biological structures EDA
Ecology EGO
Ecosystems EGO K
Terrestrial factors EGV N
. . . . . Saprophytes EHB O

EHB P . . . . . Saprophages
R Ecological interactions
* Primarily interactions between organisms which have direct or indirect effects upon the components of ecosystems given above.
S . Interspecific interactions
T . Intraspecific interactions
V . Attractive interactions
W . Neutral interactions
X . Replusive interactions, antagonism
EHC . Symbiosis
* The scope of this varies in definition and sometimes excludes parasitism and commensalism.
* Some of the terms are usually restricted to animals but are given here for convenience.
J . . Facultative symbiosis
* Not essential to partners.
K . . Obligatory symbiosis
L . . Disjunctive symbiosis
M . . Conjunctive symbiosis
N . . Individualism in symbiosis
P . . Commensalism
* One benefits, the other is neutral.
PS . . . Nutricism
Q . . Messmatism
R . . Mutualism
* Both benefit.
S . . . Trophobiosis
T . . . Parabiosis
V . . Metabiosis
EHD . . Parasitism (general)
L . . . Vectors (parasitism)
* For saprophytism, * see Nutrition.
* For parasitic organisms, * see organism - e.g. virus.
P . . . Hosts (parasitism)
Q . . . Endoparasitism
R . . . Ectoporasitism
S . . . Helotism, dulosis, slave making
T . . . Inguilinism
V . . . Breeding parasitism
. (Predation) * see Behaviour EHX Q and GHX Q
X . Competition (ecology)

Ecosystems

Biological sciences E
Biological structures EDA
Ecology EGO
Ecosystems EGO K
Ecological interactions EHB R
. Competition EHD X

Subsystems within ecosystems

EHE . Habitats
* Physical location of external environment in which organisms live and interact. In some cases, this is not easy to distinguish from ecosystem (see note at EGS).
* For ecosystems defined by habitat, * see EHI Y.
* See also Biotopes EHJ.

GS . . *Destruction*
* Use this construction only when a particular organism is cited first. * See note at EGS.

J . . Selection of habitats
K . . Capacity of habitats
L . . Spatial distribution of organisms
M . . Movement of organisms, change of habitat
. . . *Application*
* See note at EGO AX

MAX . . . . Introduction by humans
. . . *Migration*
* See Behaviour EHX G and GHX G

MR . . . Barriers to movement
N . . . Colonization
P . . Microtopography, surface features
* Of a given habitat (e.g. hummocks in a field).

Q . . Niche
* Position and status of organisms in the habitat.

R . . Ecotopes
* Particular types of habitats, within a region.

S . . Biotopes
* Microhabitats. For a different sense of biotope, * see EHJ

. *Individuals & species in relation to environment*

EHF . . Autoecology
EHG . . Populations, species-populations, biota
* Geographically localized associations of members of the same species.
* For demography, * see KB.

BGW . . . *Cycles*
BKA . . . *Regulation*
* For regulation of size, * see EHG M

FN . . . *Genetics*
* For population genetics, * see EGA.

. . . *General properties*
J . . . . Size
. . . . . (Biomass) see Productivity EGO Q.
JM . . . . Birth rate
JQ . . . . Death rate
K . . . Dynamics of population
L . . . . Development & growth
LP . . . . . Biotic potential
* Capacity to grow.

M . . . . . Regulation of growth
MP . . . . . Density independent control

Biological structures EDA
Ecology EGO
Ecosystems EGO K
Populations EHG
. Dynamics of population EHG K
. . . . Density independent control EHG MP

EHG MQ . . . . Density dependent control
MR . . . . . Intercompensation
N . Dispersion, distribution of population
P . . Density, pressure of population
Q . . . Overcrowding
QR . . Random distribution
QT . . Uniform distribution
QV . . Clumping
* For communities, see EHI.

QX . . Isolation
. (Migration) * see EHX G.
T . Composition, structure of population
TP . . Age-sex ratio
TQ . . Age ratio
TR . . Sex ratio
. *Types of populations*
U . . Social populations
V . . . Societies, groups
W . . . . *Special to species - e.g. troops, bands*
X . . Man-made, introduced

EHH Synecology
* Study of communities (of more than one species) in relation to environment

EHI . Communities, biocoenoses, biota, biotic communities
* For social behaviour * see GHV.
* See also Succession EGR.

. . *Processes*
J . . . Biocoenosis
M . . Colonies
N . . Seral communities
* For seres as process in succession, * see EGR S.

P . . Climax communities
Q . . Consociations
* Climax communities characterized by single dominant species.
* For associations, * see Plants FHI Q.

S . . . Societies (consociational)
* Minor climax communities within a consociation. For societies as populations * see EHG.

T . . Ecotones
* Transitional species and area between two communities.

U . . Edaphic communities

Aquatic ecosystems

Biological sciences E
Biological structures EDA
Ecology EGO
Ecosystems EGO K
Subsystems within ecosystems
. . . . Edaphic communities EHI U

Types of ecosystems

EHI X . Environments

. . *By habitat*
Y . . . Formational ecology
* For types of organisms defined by habitit,
* see Organisms EJN JR
EHJ . . . Biotopes
* Area in which main environmental conditions and the biotypes adapted to them are uniform.
* For biotopes as microhabitats, * see EHE S.
. . . *Habitat dominated by specific biota*
K . . . . *By organism, A/Z*
* E.g. mangrove swamp.
R . . . Aerial ecosystem
EHK . . . Aquatic ecosystems, water ecosystems, hydrobiology
LX . . . . Bodies of water
* There is very little literature on the generalized concept.
. . . . . *Processes*
M . . . . . Tides
N . . . . . Circulation of water
O . . . . . Currents in water
P . . . . . Temperature layering, stratification in water
. . . . . *Constituents*
QD . . . . . Salinity of water
QF . . . . . Detritus in water
. . . . . *Structure*
R . . . . . Floor (bodies of water), bed (bodies of water)
S . . . . . Fronts in water
* Boundary interfaces between currents.
ST . . . . . Layers in water
T . . . . . Surface of water
V . . . . . Water below ice
EHL . . . . Salt water ecosystems, marine biology, oceans, seas
KQD . . . . . *Salinity*
KQX . . . . . *Structure*
* Retroactive synthesis with EHK R/T is modified here.

Ecology EGO
Ecosystems EGO K
Environments EHI X
Aquatic ecosystems EHK
Salt water ecosystems EHL
. Structure EHL KQX

EHL KQZ . . *Bed*
KR . . . Benthic ecosystems
Q . . . . Sand banks
R . . . . Coral reefs
S . . . . Littoral zone, neritic zone
T . . . . . Seashore, beach
U . . . . . Pools
V . . . . . Rock crevices
W . . . . . Intertidal zone, foreshore
X . . . . . Continental shelf
EHM B . . . . Benthonic zone
C . . . . . Continental slope
D . . . . . Abyssal plain
* For Benthos organisms,
* see EJN LP.
. . . . *Body of ocean & its layers*
F . . . . . Pelagic zone
I . . . . . Photic zone
* For plankton * see EJN MG.
J . . . . . Epipelagic zone
K . . . . . Mesopelagic zone
L . . . . . Aphotic zone
M . . . . . Bathypelagic zone
N . . . . . Abyssal zone
O . Inlets, fjords, sea-lochs
P . Coastal waters
Q . High seas
R . Lagoons
T . *Individual oceans & seas*
* Add to EHN letters F/N following A in Schedule 2.
EHN Freshwater ecosystems, inland water
S . Standing water, lentic habitats
T . . Brackish water, stagnant water
U . . Lakes
UP . . . Open lakes
UR . . . Closed lakes
V . . Ponds
W . Runnlng water, lotlc habltats
EHO B . . Rivers, streams
BS . . . Banks
BW . . . Weed beds
C . . . Tidal rivers
E . . . . Estuaries, deltas
EW . . Wadis
F . Artificial lakes, reservoirs
FS . . Gravel pits
FV . Canals
G Underground waters

Land ecosystems

Biological structures EDA
Ecology EGO
Ecosystems EGO K
Environments EHI X
Aquatic ecosystems EHK
. Underground waters EHO G

EHO L Land ecosystems, terrestrial ecosystems
. *Landmasses by natural barriers*
M . . Biogeographic regions, faunal regions
N . . . World continent
O . . . . Holarctic, boreal ecosystem
P . . . . . Nearctic region
Q . . . . . Palearctic region
R . . . . Ethiopian region
S . . . . Oriantal region
T . . . Australian region
V . . . Neotropical region
. *By latitude*
EHP B . . Polar regions
C . . . Arctic regions
D . . . Antarctic regions
F . . Temperate regions
H . . Subtropical & tropical regions
J . . . Subtropical regions
K . . . Tropical regions
L . . . . Equatorial regions
. *By incidence of ocean*
M . . Continental environments
MS . . Land bridges
N . . Islands
O . . Wetlands
P . . Coastal areas
Q . . . Submerged at high tide, mudflats
* For seashore, * see Marine ecosystem EHL.
R . . . Marshlands
T . . . Reclaimed land
TS . . . Mudflats
U . . . Salt meadows
. . . (Seashore) * see EHL T
V . . . Supratidal habitats
W . . . Cliffs
WS . . . Sea caves
WV . . . Dunes
* See also Sand dunes EHQ ST
X . . Former river beds
EHQ B . . Inland habitats
. *By rock & soil formations*
D . . Volcanic regions
E . . Glaciers, moraines
F . . Adephic habitats
G . . . Acid soil habitats
H . . . Alkaline soil habitats
I . . . . Halic formations
J . . . Rock surface formations
K . . . . Igneous rock habitats
M . . . . Metamorphic rock habitats

Ecosystems EGO K
Environments EHI X
Land ecosystems EHO L
By rock & soil formations
. . Rock surface formations EHQ J
. . . Metamorphic rock habitats EHQ M

EHQ N . . . Sedimentary rock habitats
O . . . . Limestone regions, Karst regions
P . . . . Scree, talus
Q . . Clays
S . . Sands
T . . Loams
By altitude
EHR B . Highland, uplands
C . . Mountains
CS . . . Snowline zone
CV . . . Vegetation line zone
D . . Hills, downland, moors
E . Valleys, gorges, ravines
F . Lowland
G . Plains
H . Underground
I . . Caves (see also Sea caves EHP WS)
J . . Potholes
By climatic/vegetative regions
K . Biomes
* Large areas with uniformity of climate and vegetation.
L . . Tundra
LT . . Tree line zone
M . . Forest (general)
MS . . . Litter
MT . . . Trees
* Individual trees regarded as habitats.
MV . . . Thorny forests
N . . Taiga, evergreen forest
O . . Deciduous forest
OS . . . Woods
OT . . . Copses
OV . . Mesic environment
P . . Grass land, steppe, prairie, savannah, pampas, puszta
Q . . Heathland, moorland
R . . Scrub, bush, chapparal
S . . Desert, xeric environment
SS . . . Oases
SV . . Hygric environment
T . . Tropical rainforest, jungles
By origin
X . Natural environment, The wild
* Usually assumed. Use only if explicitly distinguished from man-made environment.

Biological structures

Biological sciences E
Biological structures EDA
Ecology EGO
. . . . . Land ecosystems EHO L
. . . . . Natural environment EHR X

EHS B . . . . . Man-made environments
* For artificial water environments * see EHO F.
C . . . . . Urban & industrialized areas
CT . . . . . Cities
D . . . . . Suburbs
DT . . . . . Parks & gardens
E . . . . . Pathways, verges
FM . . . . . Roads & roadsides
FN . . . . . Railways & cuttings
FT . . . . . Mines, quarries
FV . . . . . Refuse tips, spoil tips
FW . . . . . Wasteland, derelict land
G . . . . . *Other*
* Add to EHS G letters D/Y following U (notation provisional)
H . . . . . Rural areas
J . . . . . Farmland, cultivated land
K . . . . . Drained land
L . . . . . Irrigated land
M . . . . . Pastures, grazing lands
N . . . . . Arable land
O . . . . . Ploughed land
P . . . . . Fallow land
Q . . . . . Hedgerows (including field & hedgerow)
R . . . . . *Other*
* Add to EHT R letters A/C following U (notation provisional)
. . . . . (Conservation areas) * see GY
V . . . . . Confined environments, cages
. . . . . *Determined by organisms*
* Special to animals.
W . . . . . Breeding grounds
X . . . . . Wintering grounds
. . . . . *Territory home range*
* * See territorial behaviour GHY E.
. . . . . (Non-terrestrial habitats) * see Space biology EJO

EHT BEHAVIOUR, BEHAVIOURAL BIOLOGY
* The activities of organisms resulting from their interaction with the environment. But nearly all the literature is on animal behaviour, q.v.

BEHAVIOUR
* The relations of behaviour with ecology are discussed in the Introduction (Section 12.5) It can be seen as an extension of ecology in that it concentrates on the problems of responses to stimuli (external & internal) of the individual organism & groups of organisms & with particular reference to genetic, evolutionary & learned factors.
* For the structure & physiological mechanisms of functional parts, organs & systems regarded as subsystems of the whole organism, * see Parts, etc. (EI).

Biological sciences E
Biological structures EDA
BEHAVIOUR

* For ethology, * see Zoology (GHT). Although theoretically ethology is almost synonymous with behaviour, the term is usually restricted to animal behaviour (or even to a particular method of its study). * Add to EH letters T/Y following GH so far as applicable.

EHT BB . *Physiological factors*
* For neurophysiology (special to animal behaviour) * see GHU CI.
BLE . . *Adaptative behaviour*
. . *Hormones*
FN . *Genetic factors*
GO . *Ecological factors*
. . *Time*
. . . *Cycles*
GOB GW . . . . Phenology (behaviour)
GON . . *Energy systems*
GOO . . . Energy budget, time-energy budgets
* Amounts of time spent on particular activities.
. . (Population factors) * see EHG
I . *Psychological factors*
* These are largely confined to animals & a fuller schedule is given there. This position is for general concepts (e.g. sensory processes).
EHU P . *Concrete behaviour, forms & patterns of behaviour*
* Add to EH letters UP/Y following GH in GHU P/GHY with the additions below.
EHW . . *Movements*
. . . *Responses to specific stimuli*
L . . . . Orientation movements (general)
. . . . *Tropisms*
* Usually implies plants. * See Botany FHW L.
R . . . . Taxis, tactic movements
* Directed movements. A few of the concepts below apply only to plants or to animals, but are included here for convenience.
RP . . . . . Positive
RQ . . . . . Negative, avoidance reactions
RS . . . . . Klinotaxis
RT . . . . . Tropotaxis
RV . . . . . Telotaxis
S . . . . . Geotaxis
SP . . . . . Tonotaxis
SQ . . . . . Thigmotaxis
SS . . . . . Seisimotaxis
ST . . . . . Andiotaxis
T . . . . . Thermotaxis
U . . . . . Electrotaxis, galvanotaxis
V . . . . . Phototaxis
W . . . . . Chemotaxis
WP . . . . . Aerotaxis

Biological structures

Biological sciences E
Biological structures EDA
BEHAVIOUR
. . . . Taxis EHW R
. . . . . Chemotaxis EHW W
. . . . . Aerotaxis EHW WP

EHW WR . . . . . Hydrotaxis
WT . . . . . Rheotaxis
WV . . . . . Osmotaxis
. . . . (Kinesis) * see Animal behaviour GHW X

Parts, Organs, Systems
* Concrete subsystems of the organism, in which structural parts are defined by the functions they serve.
* For the external behaviour of the organism acting as a whole, * see Behaviour EHT. If a document deals with the structures & mechanisms (anatomy & physiology) underlying a specific behaviour as well as the external behaviour itself, prefer the behaviour class & qualify, if necessary by EHT BB (physiology)
* Most of the literature refers to particular types of organisms (plants, animals...) & only those very general concepts * applicable to all organisms are given here.

EIB . *Regional organs, systems*
* Organisms regarded topographically. For specific morphological concepts * see EDP.

. *Functional organs, systems*
EIC Y . . *Protection, support, locomotion*
EID . . . Support systems, frameworks
. . . . *Cytology*
ERS . . . . . Mechanocytes, fibrocytes
EIE . . . External coverings, integumentary systems in general
DI . . . . Pigmentation systems
DIN . . . . . Pattern-distribution (pigmentation)
DIQ . . . . . Variegation (pigmentation)
DIS . . . . . Albinism
R . . . . Epidermis
EIF . . . Locomotion systems
* For paratonic & autonomic movements (tropisms, taxes, etc.) * see Behaviour EHW.
R . . . . Amoeboid movement, protoplasmic streaming
S . . . . Ciliary movement, flagellary movement
. . . . (Muscular contraction) * see Zoology GIT U.
EIG . . Circulatory systems, transport mechanisms, translocation of substances
. . . (Transport processes) * Use EIG E
* Add to EIG E letters C/Y following EDD. Normal retroactive qualification is resumed at EIG G.
EC . . . . Cytoplasmic streaming, cyclosis
EF . . . . Diffusion
* In non-vascular systems

Biological sciences E
Biological structures EDA
Circulatory systems EIG
. (Transport processes) * Use EIG E
. . Diffusion EIG EF

EIG F . *Other special physiological processes of circulation*
* Normal retroactive synthesis is resumed here after the interruption at EIG DDC.
* Add to EIG F letters E/Y following ED in EDE/EDY
* Add to EIG G letters E/H following E in EE/EH
EIH Regulatory systems, coordination systems
R . Regulation & control
* Add to EIH R letters B/Y following EBK
S . Response
* Add to EIH S letters C/Y following EBL
SG . . Irritability, sensitivity
T . . Receptors
U . . Transmission of stimuli
V . . *Special stimuli*
W . . . Stress
EIJ . Electro-chemical control, nervous system
* Add to EIJ letters R/U following GIU so far as they apply.
EIK . Chemical control, secretory system
S . . Hormone systems
* Add to EIK letters B/D following GIW so far as they apply.
EIL Respiration systems, breathing systems
* Mechanisms for effecting energy release.
* For tissue respiration (internal respiration alone) * see Metabolism EBX T
. *Special processes*
* Add to EIM letters K/S following HWE D with the following modifications.
EIM DE . . Absorption
DF . . Diffusion
DP . . Transport
EC . . Pressure
M . . Ventilation, gaseous exchange, external respiration (narrowly)
N . . . Inhalation, inspiration
O . . . Exhalation, expiration
Q . Respiratory gases
R . . Oxygen
RX . . Expired air
S . . Carbon dioxide
. (Aerobic & anaerobic respiration) * see Metabolism EBX T.
EIN D . . Breathing surfaces
EIP Digestive systems, nutrition processes, food processing systems
* Procurement & digestion of nutrients (metabolites).
* This class deals only with the process of nutrition & digestion broadly & the parts & organs by which it is effected.
* For purely metabolic aspects, * see EBY Q.
* For transport of nutrients to site of metabolic activity, * see Circulation EIG. For feeding behaviour, * see EHX N.
R . Intake, ingestion

Reproductive cell systems

Biological sciences E
Biological structures EDA
Digestive systems EIP
. Intake EIP R

EIP S . Digestion
T . . Absorption
U . . Resorption
. . (Assimilation) * see Metabolism EBY M
W . . Intracellular digestion
X . . Extracellular digestion
EIQ . *Types of nutrition*
C . . *By energy source*
D . . . Phototrophic nutrition, photosynthetic nutrition, holophytic nutrition
F . . . Chemotrophic nutrition, chemosynthetic nutrition
. . *By food source*
G . . . Autotrophism
H . . . . Photolithotrophism
J . . . . Chemolithotrophism
L . . . Heterotrophism, holozoic nutrition
LEE . . . . *Cytology*
LER T . . . . . Protein secreting cells
LER U . . . . . Protein retaining cells
N . . . . Photoorganotrophism
P . . . . Chemoorganotrophism
Q . . . Saprophytic nutrition
S . . *Foods*
EIS Secretion and storage systems (together)
* For secretion as chemical control, * see EIK
* For intracellular secretion, * see Cytology EEE L.
V . Storage
EIT Waste disposal systems, excretion

EIX Reproductive systems
* Structures & mechanisms concerned with the production of new individual organisms up to the production of a zygote. For subsequent developments, * see Development & growth EFB and the notes there.
Q . Asexual reproduction, organic reproduction
R . . Vegetative reproduction
* Involving only mitosis.
* For regenerative reproduction, * see Growth EFD M.
S . . . Fission
SS . . . . Primary fission, simple fission, binary fission
ST . . . . Multiple fission
SV . . . . Transverse fission
T . . . Fragmentation
U . . . Budding
US . . . . Blastogenesis

Biological sciences E
Biological structures EDA
Reproductive systems EIX
Asexual reproduction EIX Q
. . . Blastogenesis EIX US

EIX UW Reproductive cell systems
* By spores or gametes.
* Add to EIX UW letters F/Q following EIY when applicable.
V . Sporulative reproduction
* Asexual; reproductive cell develops into new individual directly.
* For sporophyte generation, * see Development EFB S.
VDJ . . Sporulation
VE . . *Cytology*
VF . . . Spore mother cells
. . *Organs*
VS . . . Sporangia
. . *Types of spores*
WC . . . Merospores
WE . . . Holospores
WG . . . Sporangiospores
WJ . . . Zoospores, swarm spores
WM . . . Mitospores
WP . . . Meiospores
WS . . . *Special to particular types of organisms*
. . . . *Special to Monera & Protista*
WT . . . . . Aplanospores
. . . . *Special to fungi*
WV . . . . . Basidiospores

Y . Gametic reproduction
* Embraces sexual reproduction proper & apomixis.
* Reproductive cell requires sexual process before it develops into new individual.

EIY . . Sexual reproduction, amphimixis
DJ . . . *Sexual activity*
* Add to EIY DJ letters N/W following HXA DJ.
DL . . . *Pathology*
DLP V . . . . Infertility
DLP W . . . . Sterility
E . . . *Cytology*
EER T . . . . *Cells by function*
F . . . . . Gametes, germ-cells, sex cells
* The notation here is modified in order to give briefer classmarks for this class. Retroactive qualification of the sexual reproductive system by EES/ET is resumed at EIY M.
* Add to EIY F letters A/R following EE in EEA/EER.

Sexual reproduction

Biological structures EDA
Reproductive systems EIX
Reproductive cell systems EIX UW
Gametic reproduction EIX Y
Sexual reproduction EIY
Gametes EIY F

EIY FDJ Gametogenesis
FFG . Mitosis
FG . Meiosis
* * Alternative (not recommended) is to collocate with cytology at EEG.
FGF . . *Stages of first division*
FGG . . . Interphase
FGH . . . Prophase I
FGI . . . . Preleptotene
FGJ . . . . Leptotene, leptonema
FGK . . . . Zygotene
* For zygote cells * see EIY LZ.
FGL . . . . Pachytene
FGM . . . . Diplotene
FGN . . . . Diakinesis
FGO . . . Metaphase I
FGP . . . Anaphase I
FGQ . . . Teleophase
FGR . . *Stages of second division*
FGR S . . . Prophase II
FGR T . . . Anaphase II
FGR U . . . Teleophase II
. . *Other meiotic processes*
. . . (Crossing over) * see Chromosomes EFR J
FGS . . . Somatic reduction
Types of gametes
. *By relative size*
* See Types of sexual reproduction EJA.
. *By role*
* For sexually dimorphic organisms, the female & male gametes are subordinated to the female and male of the species. The classes below are not used when qualifying such organisms.
G . . Receptor, female gamete
GR . . . Ovum, egg-cell
GS . . . . Oogenesis
H . . Donor, male gamete
HR . . . Sperm
HS . . . . Spermatogenesis
. *Conjugated gametes*
J . . Release of gametes & union
* For sexual activity of whole organism, facilitating union, * see EIY DJ.
JR . . . Conjugation
L . . Fertilization, synagamy
LR . . . Karyogamy
LS . . . Plasmogamy
LT . . . Internal fertilization
LU . . . External fertilization
LV . . Pronuclei
LZ . . Zygotes

Reproductive systems EIX
Reproductive cell systems EIX UW
Gametic reproduction EIX Y
Sexual reproduction EIY
Cytology EIY E
. . . . . Zygotes EIY LZ

EIY M *Histology, development, variation*
* At this point, retroactive qualification of sexual reproductive systems by preceding classes EA/EH is resumed after the interruption at EIY F.
* Add to EIY M letters ES/H following E in EES/EH.
N *Constituent materials & general structures*
* Add to EIY N letters N/O following ED.
* Add to EIY O letters P/W following ED.
QT *Elements derived from other parts, organs, systems*
* Add to EIY Q letters T/Y following EI.
Facilitating structures & processes
S . Reproductive organs, sexual organs, genitalia
. . *Special processes*
* For processes at cellular level * see EIY E/EIY L.
. . . *Collateral system*
T . . . . Sexuality, sexual process
* Strictly speaking, this is quite distinct from reproduction; e.g. in syngamy and conjugation the result of sexual union of two cells is one cell and two (different) cells respectively. But in nearly all the literature reproduction and sexuality are treated together - hence their collocation here.
TF . . . . . Human sexuality (HXB)
TI . . . . *Psychological factors*
TR . . . Sexual activity
* If this is considered independently of reproductive demands.
U . *Special structures*
* These vary markedly from one type of organism to another. * See the particular types (plants, animals, etc.)
* Structures special to females & males in sexually dimorphic organisms are subordinated to females & males.
. . *By sex role*
* The two classes below are provided for organisms in which there is no or very slight sexual dimorphism. For sexually dimorphic organisms, use EJ.
W . . . Male
X . . . Female
EJA *Forms of sexual reproduction*
. *By relative size and state of gametes*
C . . Merogamy, microgamy
D . . Hologamy, macrogamy
E . . Isogamy
. . . (Zygospore) * see Development FFD V
F . . Anisogamy, heterogamy
G . . . Oogmy
* Receptor is large, non-motile ovum.
. *By origin, or mode of production of gametes*
J . . Allogamy, cross-fertilization
K . . Automixis, self-fertilization
L . . . Parthenomixis, parthenogamy
M . . . Autogamy

Reproductive systems EIX
Reproductive cell systems EIX UW
Gametic reproduction EIX Y
Sexual reproduction EIY
. . . Automixis EJA K
. . . . Autogamy EJA M

EJA N . . . Hermaphroditic reproduction, bisexual reproduction
. . . . *Allogamy*
O . . . . . Cross-fertilizing hermaphroditism
. . . . *Autogamy*
P . . . . . Self-fertilizing hermaphroditism, homothallism (in fungi)
Q Apomixis
* Asexual gametic reproduction, without fertilization and/or meiosis.
* See also Vegetative reproduction E IX R.
. *Apospory*
* Special to plants, * see FJA R.
. *Apogamy*
* Special to Pteridophyta: * see FJA S.
T . Agamospermy
* Embryos & seeds formed asexually.
U . . Pseudogamy
V . . Parthenogenesis, agamogenesis
W . . . Endomixis
X . . . Paedogenesis
* See also Neoteny EFB N.

Biological sciences E
Biological structures EDA
Parts, Organs, Systems
. . . . . Paedogenesis EJA X

TYPES OF ORGANISMS
* For Taxonomy * see Systematic biology EJT.
EJB C . *Non-taxonomic categories*
. . *By numbers*
D . . . *Common*
* Usually assumed
E . . . Rare
ET . . . . Threatened, endangered
. . . . *Extinct*
* See Fossil organisms by stratigraphic era EJV.
F . . *Fossil forms*
* The sole purpose of providing this location is to allow all non-taxonomic forms to be qualified by their fossil forms - e.g. Coelomates - Fossil forms. If this provision is used, proceed as follows (where hyphen represents the classmarks added to):
* Add to EJB F letters A/Y following EGF.
* Add to EJB G letters A/Y following EGG.
X . . *By sex*
* There is very little general literature on these - most of it refers to particular types of animals (see GJ B X).
* For sexual reproduction & sexuality, * see EIY.
Y . . . Sexual dimorphism
EJC . . . Males
EJE . . . Females
EJI . . *By application*
* * Alternative (not recommended) to collocating with applied biology GX or H.
* The major classes are given here also for convenience.
Q . . . Useful to humans
R . . . . Edible organisms
S . . . . Medical organisms
V . . . Harmful to humans
W . . . . Allergenic organisms
X . . . . Poisonous organisms
EJJ . . *By topographical distribution) Biogeography (general*
* Add to EJJ letters D/Z from Schedule 2 - e.g. flora & fauna of the British Isles EJJ E.
EJK B . . *By physiological characteristics*
* Add to EJK letters B/D following E
. . *By cell & tissue characteristics*
* See Structual characteristics EJQ E.
G . . *By developmental characteristics*
* Add to EJK letters G/W following EFB - e.g. diplontic organisms EJK V.
* Add to EJL letters CJ/L following EF - EJL E Embryonic forms.

Biological structures

Biological sciences E
Biological structures EDA
By developmental characteristics EJK G

. *By variation & genetic characteristics*
* For organisms classified by structural-cum-phylogenetic characteristics, * see taxa EK/EU, FK/FV, GK/GR.
* Add to EJL letters M/Y following EF - e.g. mutants EJL V.
* Add to EJM letters A/N following EG

By ecological factors
* This class is for organisms specified by these factors, not for the factors themselves. For ecological interactions * see Ecology EGO.
* Add to EJM letters O/Y following EG - e.g. nitrogen fixing organisms EJM QVR.
* Add to EJN letters A/Y following EH. A selection of prominent examples is given below.

. *By interaction*
EJN D . . Parasites
IM . . Colonial organisms
. *By habitat*
JR . . Aerial organisms
K . . Aquatic organisms
L . . . Marine organisms
LP . . . . Benthos
MF . . . . Pelagic organisms
MG . . . . . Plankton
MH . . . . . Nekton
N . . . Freshwater organisms
OL . . Land organisms
PB . . . Polar organisms
PF . . . Temperate zones organisms
PK . . . Tropical organisms
QF . . . Adephic organisms
RB . . . Highland organisms
RF . . . Lowland organisms
RK . . . *By biome*
SB . . *Organisms of manmade environments*
EJO . . Non-terrestrial organisms, space biology
EJP T *By behaviour*
* Add to EJP letters T/W following EH.
VY . Sessile organisms
W . Motile organisms

By structural characteristics
EJQ E . *Cytological & histological*
* Add to EJQ E letters E/X following EE.
. . (Unicellular organisms) * see Microorganisms EKQ RU.
. . (Procaryotae & Eucaryotae) * see EMW & EJY X.
EQY . . Multicellular organisms
G . Assymetrical organisms
H . Symmetrical organisms
J . Spherical organisms
K . Radial organisms
L . Bilateral organisms
N . Diploblastic organisms

Biological sciences E
Biological structures EDA
By structural characteristics
. Diploblastic organisms EJQ N

EJQ P . Triploblastic organisms
R . Coelomates
S . Pseudocoelomates
T . Acoelomates
X . *Other*
* Add to EJQ X letters P/W following ED.

EJR *By part, organ or system characteristics*
* Add to EJR letters B/Y following EI.
P . *Nutritional*
QG . . Autotrophic organisms
QL . . Heterotrophic organisms
EJS A . *By sexual reproduction method*
* Add to EJS A letters A/Y following EJA.
C . *Special groups within a taxon*
* This notation (EJS C/Q) allows for the insertion of such types as trees or herbaceous plants under flowering plants.

Biological structures

Biological sciences E
Biological structures EDA
Non-taxonomic categories EJB C
. . Special groups within a taxon EJS C

Taxonomic categories

EJS R . *Systematic biology*
S . . Systematics
* Taxonomy & nomenclature, identification & practical classification. But the term is sometimes used as a synonym for taxonomy alone.
EJT . . . Taxonomy, classification
. . . . *Characters, criteria*
BB . . . . . Monothetic groups
BC . . . . . Polythetic groups
* With multiplicity of characteristics.
. . . . . *Physiological, structural & other criteria*
* Some of the concepts below are special to particular types of classification (e.g. analogous similarities are special to phenetic classification). They are given together here for convenience of display & to give maximum facilities for qualifying.
* Add to EJT letters BF/I following E. A selection of major concepts is given below with some special additions.
BF . . . . . *Physiological criteria*
* See also Characteristics of parts, organs, systems EI
BP . . . . . Biochemical criteria
DP . . . . . *Morphological criteria in general*
DPG . . . . . Analogous similarities
DPH . . . . . *Shape*
DPJ . . . . . Symmetry
DPK . . . . . Bilaterality
DPL . . . . . *Other, A/Z*
EDY . . . . . *Cytological & histological*
EJ . . . . . Nucleus
FB . . . . . Developmental criteria (general)
FE . . . . . *Embryological*
FMV . . . . . *Variation criteria*
FN . . . . . Genetic criteria
FYT . . . . . Homologous similarities
FYU . . . . . Patristic similarities
FYV . . . . . Cladistic similarities
* Closeness of descent relationships.
FYW . . . . . Convergence
GO . . . . . *Biological criteria*
HT . . . . . *Behavioural criteria*
I . . . . . *Part, organ & system criteria*
IN . . . . . Serological criteria
IP . . . . . Nutritional criteria
. . . . *Elements of systems, levels, units*
LB . . . . . Taxon
LD . . . . . Kingdom
LF . . . . . Phylum, division (phylum)
LG . . . . . Class
LJ . . . . . Order
LM . . . . . Family

Biological sciences E
Biological structures EDA
Systematic biology EJS R
. . Taxonomy EJT
. . . Elements of systems, levels, units
. . . . Family EJT LM

EJT LP . . . . Genus
LS . . . . Species
LV . . . . . *Subspecies level*
* Varieties, strains, etc.
. . . *Types of classification*
* Each type of classification may be qualified as follows, (where hyphen represents its classmark):
* Add to - letters A/L following EJT.
M . . . . Artificial classification
N . . . . Natural classification
P . . . . Phenetic classification, classical taxonomy
* Based on affinity, on maximum observable similarities.
Q . . . . Phyletic classification, phylogenetic classification
* Based on evolutionary relationships.
R . . . . Numerical taxonomy
. . . . *Particular systems*
S . . . . . Pre-Linnaean classification
T . . . . . Linnaean classification
* For binomial nomenclature, * see EJT XY.
U . . . . . Post-Linnaean classification
US . . . . . Adansonian classification
V . . Identification of type
WB . . . Type specimens
X . . Nomenclature
XY . . . Binomial nomenclature
EJU *Fossil forms of organisms*
* For documents not confined to a particular type of organism. The preferred arrangement is to subordinate fossils of a particular type to the organism.
* An * alternative (not recommended) is to locate this class with Palaeontology, at EGF P/EGG. * See notes at EGF and EGF MY where further options are indicated.
B . *By non-taxonomic characters*
* Add to EJU letters B/R following EJ
. *By stratigraphic eras*
* The order below is taken from historical stratigraphy in Class D.
EJV B . . Pre-Cambrian, azoic
C . . . Archeozoic, archaen
D . . . Proterozoic, eozoic, Algonkian
E . . Palaeozoic
F . . . Cambrian
G . . . Ordovician
H . . . Silurian
I . . . Devonian
J . . . Carboniferous
K . . . Permian
L . . Mesozoic
M . . . Triassic
N . . . Jurassic

MICROORGANISMS

Biological sciences E
Biological structures EDA
Fossil forms of organisms EJU
. . Mesozoic EJV L
. . . Jurassic EJV N

EJV O . . . Cretaceous
P . . Cenozoic, neozoic
Q . . . Tertiary
R . . . . Palaeocene
S . . . . Palaeogene
T . . . . . Eocene
U . . . . . Oligocene
V . . . . Neocene
W . . . . Miocene
X . . . . . Pliocene
EJW . . . Quarternary
EJX . . . . Pleistocene
L . . . . . Interglacial
N . . . . . Late Pleistocene
R . . . . . Recent, post-glacial

By cell nucleus structure

EJY P . Procaryotae, monera (in general)
* With nucleoplasm devoid of basic protein, without nuclear membrane or sexual reproduction.
* All procaryotae are microorganisms but not all microorganisms are procaryotae. Therefore, an
* alternative (not recommended) is provided at EMW for libraries wishing to keep this general material with the other material on microorganisms.

U . Eucaryotae (general)
* With nucleus separated from cytoplasm by a nuclear membrane and the genetic material borne on chromosomes of DNA and protein. Comprise all microorganisms which are not procaryotae & all plants & animals.

Biological sciences E
Biological structures EDA
By cell nucleus structure
. Eucaryotae EJY U

EK MICROORGANISMS, MICROBIOLOGY, MICROBES
* This general class, and any particular type of microorganism may be qualified by all preceding classes so far as they apply. Certain modifications to these qualifying classes are noted below.
* For discussion of the taxonomic status of micro-organisms, * see Introduction Section (12.76/12.77).

EKD D . *Special physiological processes*
* See also Types of Microorganisms specified by these processes - e.g. thermoduric microorganisms EKM TFM.

DHU . . Bioluminescence

EKE . *Cytology*
* In these taxa the cell constitutes the whole organism and the sharp distinction drawn in general biology, botany and zoology between microsystems and macrosystems does not apply. Moreover, the procaryotic organization of many of them means that some of the structures and processes given in EE are not found in them. Nevertheless, many of these structures and processes do approximate to those in Monera and Protista and the greater detail found in EE allows nearly all of the relevant concepts to be obtained by a process of extraction. This is demonstrated by the selection given below. Unbracketed terms are special to microorganisms.

DJ . . *Development & growth of cells*
* For spore forms, * see EKI XV and EKL DR.

GY . . *Morphology*
HH . . . *Cell wall*
* For capsule, * see spores EKL DS.
HI . . . . *Membrane*
HKB . . . . . Coating
HKF . . . Mesosomes
* Infolding of plasma membrane.
HT . . . Lomasomes
J . . . Nucleoides
JP . . . . *Chromatinic bodies*
OR . . . *Chromoplasts, chromatophores*
OV . . . . Thylakoids
PX . . . Flagella
PY . . . Flimbriae
QL . . . Spherules
QM . . . *Chrystals*
QN . . . . Raphidosomes
QW . . . Eye spot

EKF B . *Development & growth of organism*
DQ . . *Stages*
* For endospores, * see EKL DR.
. . . *Rest*
DR . . . . Insolution
DS . . . Unbalanced growth
DT . . . Differentiation in space
DU . . . Lag phase

MICROORGANISMS

Biological sciences E
Biological structures EDA
MICROORGANISMS EK
Development & growth of organism EKF B
. . Lag phase EKF DU

EKF DV . . Stationary phase
DW . . Logarithmic phase
LJ . . Lysis
LW . . Death
N *Genetics*
O . *Chromosomes*
. . *Special processes*
P . . . Genetic exchange
* * See also Sexual reproduction EKI Y.
PQ . . . Conjugation
PS . . . Transformation
PT . . . Transduction
PTR . . . . Abortive transduction
PTS . . . . Unrestricted transduction
PTT . . . . Restrictive transduction
PU . . . Lysogeny
V . *Mutation*
VO . . Suppressor mutations
VQ . . *Extra chromosomal inheritance*
XQM . . . Episomes
XQN . . . . Fertility factors
XQP . . . Plasmids
XQR . . . . Resistance factors
EKG O *Ecology*
EKH IM . *Colonies*
T *Behaviour*
W . *Movement*
X . . Propulsion
Y . . Migration
* Of internal inclusions.
EKI B *Parts, organs, systems*
P . Nutrition
X . *Reproduction*
* See also Genetics EKF N
XS . . *Asexual*
XV . . *Sporulative, Spores*
* For non-reproductive spores, * see Endospores EKL DR.
. . . *Special forms of spores*
XWT . . . . Oidiospores
XWV . . . . Conidia
Y . . *Sexual*

Biological sciences E
Biological structures EDA
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Parts, organs, systems EKI B
. . Sexual EKI Y

EKJ B *Types of microorganisms*
* Any given type may be qualified by all preceding facets. * See Special Auxiliary Schedule G2 (p.) for guidance on notation.
* The classes below (non-taxonomic types) constitute a selection from EJB/EJR with some modifications & shorter notation from EKK B onwards.
BC . *Non-taxonomic categories*
* Specific types should go with their taxon in EK/EU and not in a non-taxonomic class.
X . . *By sex*
. . *By application*
* * As EJI.
EKK . . *By other non-taxonomic characteristics*
* Add to EK letters K/X following EJ.
B . . *By physiological characteristics*
G . . *By developmental characteristics*
. . . *By stage of development*
. . . . *Resting*
EKL DR . . . . . Endospores
* Encapsulated, non-reproductive. For true (reproductive) spores * see EKI XV.
DS . . . . . Capsule
DST . . . . . Encystment
DSV . . . . . Slime layer
M . . *By variation & genetic factors*
V . . . Mutants
. . *By ecological & behavioural factors*
EKM TFK . . . Psychrophilic
TFL . . . Mesophilic
TFM . . . Thermoduric
EKN CR . . . Mutualistic
D . . . Parasitic
DV . . . . Plant parasitic
DW . . . . Animal parasitic
. . . . (Human parasitic) * see HRL
JR . . . Aerial microorganisms
K . . . Aquatic microorganisms
QF . . . Soil microorganisms
EKP VY . . . Immotile microorganisms
W . . . Amoeboid microorganisms
. . *By structural characteristics*
EKQ RT . . . Acellular organisms (general)
RU . . . Unicellular organisms (general)
. . *By nutritional system*
EKR QD . . . Phototrophic
QF . . . Chemotrophic
QG . . . Autotrophic
QL . . . Heterotrophic
. . . *By reproductive system*
S . . . Spores

VIRUSES

Biological sciences E
Biological structures EDA
MICROORGANISMS EK
Non-taxonomic categories EKJ BC
. . Spores EKR S

EKS R *By taxonomic categories*
* For discussion of the taxonomic status of the following classes, * see Introduction, Section 12.
. (Pre-monera) * See Procaryotae EMW

EL . VIRUSES, VIROLOGY
* The taxonomic status of these is still unsettled. They are located here on the score that non-cellular life should precede cellular forms.
* For medical virology, * see HRO.

ELB P . . *Biochemistry*
ELC CSM . . . *Nucleic acids*
CSN . . . . *DNA*
CSO F . . . . . Singlestrandedness
CSO J . . . . . Doublestrandedness
CSP . . . . *RNA*
CSP YF . . . . . Singlestrandedness
CSP YJ . . . . . Doublestrandedness
CSQ . . . . . Messenger RNA, mRNA
CT . . . *Proteins*
CU . . . *Enzymes*
CUW . . . . Polymerases
ELF N . . *Genetics*
P . . . *Genetic code*
PN . . . *Special genetic processes*
PQ . . . . Conjugation
PS . . . . Transformation
PT . . . . Transduction
. . . . . (Lysogeny) * see ELI P
UR . . . *Genome*
ELG O . . *Ecology*
ELH D . . . *Parasitism*
DJ . . . . *Mode of transmission*
DJP . . . . . Ingestion
DJR . . . . . Inhalation
DJS . . . . . Contact
DL . . . *Vectors, carriers*
DM . . . . Microorganisms
* Add to DM letters K/U following E
DN . . . . Plants
* Add to ELH DN letters J/V following F
DO . . . . Animals
* Add to ELH DO letters J/R following G
. . *Special processes*
* Normal retroactive synthesis from EI/EK is interrupted here and resumed at ELK.

Biological sciences E
Biological structures EDA
MICROORGANISMS EK
VIRUSES EL
Special processes

ELI B . Virus-host interaction
C . . Entry into host, infective process
D . . Adsorption, attachment
F . . Penetration (of host cell)
H . . Localization, site of growth
. . *Intracell reproductive processes*
* Add to ELI J letters H/T following EFP -e.g. transcription ELI JM.
L . . Growth (viral particle numbers)
* In number of viral particles.
M . . Maturation
* For virion, * see ELM J.
N . . Release of viruses
* From host, with lysis of host cell.
. . *Interaction of host with temperate viruses*
P . . . Lysogeny
PP . . . . Prophage
* See also Episomes EKF XQM
PQ . . . . Abortive lysogeny
PR . . . . Pseudo-lysogeny
PS . . . . Polylysogeny
R . . Multiple-viral infection, mix
S . . . Interference
* Inhibition of viral activity by presence of another viral invader.

ELJ G *Morphology*
* The distinction, recognized in general biology (at EDP) and for many organisms, between micro- and macro-structures in which the latter generate new processes, does not apply to viruses and the morphology is therefore moved to this location.
* Add to ELJ letters H/J following EB. A brief selection is given here, with modifications:
HT . *Dimensions, size*
IH . *Shape*
. . (Symmetry) * Use ELJ K
K . Symmetry
L . . Cubic structure
M . Helical structure
N . Complex structure
NV . Viroplasm
. (Accessory structures) * see Types of viruses ELM C
Q . Envelope
QR . . Surface projections
R . Capsid, coat
RS . . Nucleocapsid
RT . . Capsomers
RV . . Peplos, outer envelope
S . Oxial canal
T . Filaments
U . Head
V . Tail

Biological sciences E
Biological structures EDA
MICROORGANISMS EK
VIRUSES EL
Morphology ELJ G
. Tail ELJ V

ELK *Parts, organs, systems*
* Retroactive synthesis by EI/EJ (so far as applicable) is resumed here after the interruption at ELI.
* Add to ELK letters B/T following EI.

Types of viruses
. *Non-taxonomic categories*
* Add to ELL letters I/R following EJ.
. . *By shape*
ELL S . . . Spherical
T . . . Helical
V . . . Rodlike
X . . . Filament-like
. . *By structure*
ELM C . . . With accessory structure
E . . . Without accessory structure
G . . Regular
* Usually assumed.
H . . Mutants
J . . Virions
* Mature infective particle.
K . . . Complex virions
M . . Pseudotypes

SQ . *Taxonomic categories*
ST . . Taxonomy
. . *By host*
* For viruses defined by host and by nucleic acid, etc., * see latter - e.g., Pox viruses of vertebrates ELT.
ELN K . . . *Viruses of microorganisms*
* Add to ELN letters K/U following E
N . . . . Bacterial viruses, bacteriophages, phages
ELO . . . Plant viruses
* Add to ELO letters J/V following F.
ELP . . . Animal viruses
* Add to ELP letters J/R following G.
KA . . . . Viruses of invertibrates
N . . . . Viruses of vertibrates

Biological sciences E
Biological structures EDA
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VIRUSES EL
By host
. . Viruses of vertibrates ELP N

By nucleic acid and envelope
* The following schedule has been extracted from Classification and nomenclature of viruses: 3rd report of the International Committee on Taxonomy of Viruses (by R.E.F. Matthews), 1979. A few general classes have been added which do not appear explicitly in the report.
* Species and members of a given genus may be accommodated in the letters P/X following the classmark of the genus or subfamily - e.g., Squirrel fibroma ELU LQ
ELQ N . Enveloped viruses (general)
P . Non-enveloped viruses (general)
ELR . DNA viruses (general)
X . . Double stranded-DNA (enveloped)
ELS . . . Poxviridae (family), pox virus group
ELT . . . . Chordopoxvirinae (subfamily), poxviruses of vertebrates
V . . . . . Orthopoxvirus (genus), vaccinia subgroup
ELU B . . . . . Parapoxvirus (genus), Orf subgroup
E . . . . . Avipoxvirus (genus), fowlpox subgroup
H . . . . . Capripoxvirus (genus), sheep pox subgroup
L . . . . . Leporipoxvirus (genus), myxoma virus
P . . . . . Suipoxvirus (genus), swinepox
S . . . . Entomopox virus (subfamily)
V . . . . *Other members of Poxviridae, not yet assigned*
ELV . . . Herpesviridae (family), herpes virus group
T . . . . Alphaherpesvirinae (subfamily), Herpes simplex virus group
V . . . . Betaherpesvirinae (subfamily), Cytomegalovirus group
X . . . . . Human cytomegalovirus group
ELW B . . . . . Murine herpesvirus group
D . . . . Gammaherpes virinae (subfamily), Lymphoproliferative virus group
H . . . Baculoviridae (family), baculovirus group
J . . . . Baculovirus (genus)
L . . . . . Nuclear polyhedrosis virus (subgroup)
N . . . . . Granulosis virus (subgroup)
R . . . Plasmidviridae (family), mycoplasma virus type 2 phages
X . . Double-stranded-DNA (nonenveloped)
ELX B . . . Iridoviridae (family), icosahedral cytoplasmic deoxyriboviruses
C . . . Iridovirinae (proposed subfamily)
E . . . . Iridovirus (genus)
G . . . . Ranavirus (proposed genus)
J . . . Adenoviridae (family), adenovirus family
L . . . . Mastadenovirus (genus)
N . . . . Aviadenovirus (genus)
P . . . Papovaviridae (family), papovavirus group
R . . . . Papillomavirus (genus)
S . . . . Polyomavirus (genus)

RNA viruses

MICROORGANISMS EK
VIRUSES EL
DNA viruses ELR
. Double-stranded-DNA ELW X
. . Papovaviridae ELX P
. . . Polyomavirus ELX S

ELX V . . Caulimovirus (group), cauliflower mosaic virus group
ELY B . . Tectiviridae (family), PRD1 phage group
D . . Corticoviridae (family), PM2 phage group
F . . Tailed phages
* No assigned status.
H . . . Myoviridae (family)
J . . . . T-even phage group (genus)
L . . . Styloviridae (family)
N . . . . 2 Phage group (genus)
P . . . Pedoviridae (family)
R . . . . T7 phage group (genus)
EMA B . Single-stranded-DNA (nonenveloped)
D . . Parvoviridae (family)
F . . . Parvovirus group (genus)
G . . . Adeno-associated virus, AAV (genus)
H . . . Densovirus (genus), insect parvovirus group
K . . Geminivirus (group)
M . . Microviridae (family), qX phage group
P . . Inoviridae (family), rod-shaped phages
Q . . . Filamentous phages (proposed genus)
R . . . Mycoplasma virus type 1 phages (proposed genus)

EMB RNA viruses (general)
T . Double-stranded-RNA (enveloped)
V . . Cystoviridae (family), q6 phage group
Y . . Double-stranded-RNA (nonenveloped)
EMC D . . . Reoviridae (family)
F . . . . Reovirus (genus)
G . . . . Orbivirus (genus)
H . . . . Rotavirus (genus)
J . . . . Phytoreovirus (genus), plant reovirus subgroup 1
K . . . . Fijivirus (genus), plant reovirus subgroup 2
M . . . . Cytoplasmic polyhedrosis virus group (genus)
P . . . Pencillium chrysogenum virus group (proposed group)
Q . . . Penicillium stoloniferum PSV-S group (proposed group)
V . Single-stranded RNA (enveloped)
W . . *Without DNA step in replication cycle*
X . . . *With positive sense genome*
EMD B . . . . Togaviridae (family)
D . . . . . Alphavirus (genus), arbovirus group A
F . . . . . Flavivirus (genus), arbovirus group B
G . . . . . Mosquito-borne virus
H . . . . . *Specific members, A/Z*
J . . . . . Tick-borne
K . . . . . *Specific members, A/Z*
L . . . . . *Vector unknown*
M . . . . . *Specific members, A/Z*

Single-stranded RNA EMC V
. Without DNA step in replication cycle EMC W
. . With positive sense genome EMC X
. . . Togaviridae EMD B
. . . . Flavivirus EMD F
. . . . . Specific members, A/Z EMD M

EMD P . . . . Rubivirus (genus), rubella virus
R . . . . Pestivirus (genus), mucosal disease virus group
T . . . Coronaviridae (family), corona virus group
V . . . . Coronavirus (genus)
X . . *With negative sense genome*
EME . . . Paramyxoviridae (family)
S . . . . Paramyxovirus (genus)
T . . . . Morbillivirus (genus), measles-rinderpest-distemper group
V . . . . Pneumovirus (genus), respiratory syncytial virus group
EMF . . . Orthomyxoviridae (family), influenza virus group
S . . . . Influenzavirus
EMG B . . . Rhabdoviridae (family), bullet-shaped virus group
D . . . . Vesiculovirus (genus)
F . . . . Lyssavirus (genus), rabies virus group
H . . . . Plant rhabdoviruses (ungrouped)
K . . . Bunyaviridae (family), Bunyamwera supergroup
N . . . Arenaviridae (family), arenavirus group
P . . . . Arenavirus (genus), LCM virus group
. . *Genome not established*
T . . . Tomato spotted wilt virus group
Y . *With DNA step in replication cycle*
EMH . . Retroviridae (family), RNA tumor viruses
R . . . Oncovirinae (subfamily), RNA tumor virus group
T . . . . Type C oncovirus group (genus)
U . . . . . Mammalian type C oncoviruses (subgenus)
V . . . . . Avian type C oncoviruses (subgenus)
W . . . . . Reptilian type C oncoviruses (subgenus)
EMI B . . . . Type B oncovirus group (Genus)
D . . . . Type D oncovirus group (proposed genus)
H . . . Spumavirinae (subfamily), foamy virus group
L . . . Lentivirinae (subfamily), Maedi/visna group
V Single-stranded RNA (nonenveloped)
X . *Monoparti te genomes*
EMJ . . Picornoviridae (family), picornovirus
R . . . Enterovirus (genus)
S . . . Cardiovirus (genus)
U . . . Rhinovirus (genus), common cold virus
W . . . Aphthovirus (genus), foot-and-mouth disease virus
EMK B . . Caliciviridae (proposed family), calicivirus group
C . . . Calicivirus (proposed genus)
F . . Leviviridae (family), ss-RNA phages
J . . Tymovirus (group), turnip yellow mosaic virus group
L . . Luteovirus (group), barley yellow dwarf virus group
N . . Tombusvirus (group), tomato bushy stunt virus group
Q . . Southern bean mosaic virus group (group)
T . . Tobacco necrosis virus group (group)
W . . Maize chlorotic dwarf virus group (group)
EML C . . Clostervirus (group), beet yellow virus group

BACTERIA

Biological sciences E
Biological structures EDA
MICROORGANISMS EK
VIRUSES EL
. . . . . Monoparti te genomes EMI X
. . . . . Clostervirus EML C

EML E . . . . . Calavirus (group), carnation latent virus group
H . . . . . Potyvirus (group), potato virus Y group
J . . . . . Potexvirus (group), potato virus X group
EMM . . . . . Tobamovirus (group), tobacco mosaic virus group
X . . . . . *Bipartite genomes*
EMN C . . . . . Nepovirus (group), tobacco ringspot virus group
E . . . . . Pea enation mosaic virus group (group)
G . . . . . Comovirus (group), cowpea mosaic virus group
J . . . . . Tobravirus (group), tobacco rattle virus group
N . . . . . *Tripartite genomes*
Q . . . . . Cucumovirus (group), cucumber mosaic virus group
S . . . . . Bromovirus (group), brome mosaic virus group
U . . . . . Ilarvirus (group), tobacco streak virus group
W . . . . . Alfalfa mosaic virus group (group)
X . . . . . Hordeivirus (group), barley stripe mosaic virus group
EMW *Procaryotae, Monera (Kingdom)*
* See definition & note at EJY P
* * Alternative (not recommended) to locating at EJY P.
EMY *Thallophyta*
* Obsolete term. * See Plantae FKC

EN BACTERIA, SCHIZOMYCOPHYTA, SCHIZOMYCETES
* Use this general position when document includes photobacteria and algal microbiology as well as Scotobacteria (bacteria proper).
* The arrangement (except for classes ENS/ENV) is taken from Bergey: Manual of determinative bacteriology, 8th ed. Baltimore, Williams & Wilkins, 1974 (adjusted to proposals for 9th ed.).
ENR . Phototrophic procaryotae phototrophic bacteria, photobacteria, algal microbiology
ENS . . Cyanophyta, blue-green photobacteria, blue-green algae
* Alternative (not recommended) is to collocate with Algae in Plantae (at FKE).
* From Engler (see ref. at FJV B) Abt. II.
ENT . . . Cyanophycea (class), Myxophyceae, Schizophyceae
R . . . . Chroococcales (order)
S . . . . . Chroococcaceae (family)
V . . . . Pleurocapsales

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BACTERIA EN
Phototrophic procaryotae phototrophic bacteria ENR
. Cyanophyta ENS
. . . Pleurocapsales ENT V

ENU . . . Chamaesiphonales (Dermocarpales)
W . . . . Chamaesiphonaceae
ENV . . . Hormogonales
R . . . . Nostocinales (suborder)
S . . . . . Oscillatoriaceae (family)
V . . . . . Nostocaceae
X . . . . . Rivulaniaceae
Y . . . . . Scytonemataceae
EOB . Rhodospirillales (order)
X . . Rhodospirillaceae (family), red photobacteria
EOC . . . Rhodospirillum (genus)
T . . . Rhodopseudomonas
V . . . Rhodomicrobium
EOD B . . Chromatiaceae
C . . . Chromatium
E . . . Thiocystis
G . . . Thiosarcina
H . . . Thiospirillum
J . . . Thiocapsa
L . . . Lamprocystis
M . . . Thiodictyon
N . . . Thiopedia
P . . . Amoebobacter
Q . . . Ectothiorhodospira
EOE . . Chlorobiaceae, green photobacteria
R . . . Chlorobium
S . . . Prosthecochloris
T . . . Chloropseudomonas
V . . . Pelodictyon
W . . . Clathrochloris

EOG Scotobacteria, dark bacteria, schizophyta
* Procaryotes indifferent to light.
EOH . Gliding bacteria
R . . Myxobacterales (order)
S . . . Myxococcaceae (family)
T . . . . Myxococcus (genus)
V . . . Archangiaceae
W . . . . Archangium
EOJ B . . . Cystobacteraceae
D . . . . Cystobacter
F . . . . Melittangium
G . . . . Stigmatella
K . . . Polyangiaceae
M . . . . Polyangium
N . . . . Nannocystis
P . . . . Chondromyces

Scotobacteria

MICROORGANISMS EK
BACTERIA EN
Scotobacteria EOG
Gliding bacteria EOH
. Myxobacterales EOH R
. . . Chondromyces EOJ P

EOK . Cytophagales
R . . Cytophagaceae
S . . . Cytophaga
T . . . Flexibacter
V . . . Herpetosiphon
X . . . Flexithrix
EOL B . . . Saprospira
D . . . Sporocytophaga
EOM . . Beggiatoaceae
R . . . Beggiatoa
T . . . Vitrioscilla
V . . . Thioploca
EON B . . Simonsiellaceae
D . . . Simonsiella
F . . . Alysiella
H . . Leucotrichaceae
K . . . Leucothrix
M . . . Thiothrix
O . *Families and genera of uncertain affiliation*
P . . Toxothrix (genus)
R . . Achromatiaceae (family)
S . . . Achromatrium (genus)
T . . Pelonemataceae (family)
V . . . Pelonema
W . . . Achroonema
X . . . Peloploca
Y . . . Desmanthos
EOP B Sheathed bacteria
D . Spaerotilus (genus)
F . Leptothrix
H . Streptothrix
L . Lieskaela
N . Phragmidiothrix
P . Crenothrix
R . Clonothrix
EOQ B Budding and/or appendaged bacteria
D . Hyphomicrobium (genus)
F . Hyphomonas
H . Pedomicrobium
J . Caulobacter
L . Asticcacaulis
N . Ancalomicrobium
P . Prosthecomicrobium
R . Thiodendron
T . Pasteuria
V . Blastobacter
X . Seliberia
EOR BB . Gallionella
D . Nevskia
F . Planctonyces
H . Metallogenium

Biological structures EDA
MICROORGANISMS EK
BACTERIA EN
Scotobacteria EOG
Budding and/or appendaged bacteria EOQ B
. Metallogenium EOR H

EOR J . Caulococcus
K . Kusnezovia
EOS Spirochetes
R . Spirochaetales (order)
S . . Spirochaetaceae (family)
T . . . Spirochaeta
V . . . Cristispira
EOT . . . Treponema
S . . . Borrelia
V . . . Leptospira
EOU Spiral and curved bacteria
S . Spirillaceae (family)
EOV . . Spirillum (genus)
S . . Campylobacter
T . *Genera of uncertain affiliation*
TN . . Bdellovibrio (genus)
V . . Microcyclus
W . . Pelosigma
X . . Brachyarcus

EOW Gram-negative bacteria
EOX . Gram-negative aerobic rods and cocci
EPA . . Pseudomonadaceae (family)
EPB . . . Pseudomonas (genus)
T . . . Xanthomonas
V . . . Zoogloea
W . . . Gluconobacter (genus)
EPC B . . Azotobacteraceae (family)
D . . . Azotobacter (genus)
F . . . Azomonas
H . . . Beijerinckia
J . . . Derxia
M . . Rhizobiaceae
P . . . Rhizobium
R . . . Agrobacterium
T . . Methylomonadaceae
V . . . Methylomonas
W . . . Methylococcus
EPD B . . Halobacteriaceae
D . . . Halobacterium
F . . . Halococcus
H . . *Genera of uncertain affiliation*
J . . . Alcaligenes (genus)
L . . . Acetobacter
N . . . Brucella
P . . . Bordetella
R . . . Francisella
T . . . Thermus

Gram-negative bacteria

MICROORGANISMS EK
BACTERIA EN
Scotobacteria EOG
Gram-negative bacteria EOW
Gram-negative aerobic rods and cocci EOX
. . Thermus EPD T

EPE Gram-negative facultatively anaerobic rods
EPF . Enterobacteriaceae (family)
EPG . . Escherichia (genus)
T . . Edwardsiella
V . . Citrobacter
EPH . . Salmonella
EPI . . Shigella
EPK . . Klebsiella
EPL . . Enterobacter
T . . Hafnia
V . . Serratia
EPM . . Proteus
T . . Yersinia
V . . Erwinia
EPN . Vibrionaceae
R . . Vibrio
T . . Aeromonas
V . . Plesiomonas
X . . Photobacterium
EPO B . . Lucibacterium
D . *Genera of uncertain affiliation*
E . . Zymomonas (genus)
F . . Chromobacterium
G . . Flavobacterium
H . . Haemophilus
J . . . H. vaginalis
K . . Pasteurella
L . . Actinobacillus
M . . Cardiobacterium
N . . Streptobacillus
P . . Calymmatobacterium
R . Parasites of Paramecium
EPP Gram-negative anaerobic bacteria
EPQ . Bacteroidaceae (family)
S . . Bacteroides (genus)
V . . Fusobacterium
X . . Leptotrichia
EPR . *Genera of uncertain affiliation*
B . . Desulfovibrio
D . . Butyrivibrio
E . . Succinivibrio
F . . Lachnospira
G . . Selenomonas
EPS Gram-negative cocci and coccobacilli
EPT . Neisseriaceae (family)
S . . Neisseria (genus)
T . . Branhamella
V . . Moraxella
X . . Acinetobacter
EPU . *Genera of uncertain affiliation*
C . . Paracoccus

MICROORGANISMS EK
BACTERIA EN
Scotobacteria EOG
Gram-negative bacteria EOW
. Gram-negative cocci and coccobacilli EPS
. . . Paracoccus EPU C

EPU D . . . Lampropedia
EPV . Gram-negative anaerobic cocci
EPW . . Veillonellaceae (family)
T . . . Veillonella (genus)
V . . . Acidaminococcus
X . . . Megasphaera
EPX . Gram-negative chemo-lithotrophic bacteria
N . . *Oxidizing ammonia or nitrite*
T . . . Nitrobacteraceae (family)
V . . . . Nitrobacter (genus)
X . . . . Nitrospira
EPY B . . . . Nitrococcus
D . . . . Nitrosomonas
F . . . . Nitrosospira
H . . . . Nitrosococcus
J . . . . Nitrosolobus
L . . *Metabolizing sulfur*
N . . . Thiobacillus (genus)
P . . . Sulfolobus
Q . . . Thiobacterium
R . . . Macromonas
S . . . Thiovulum
T . . . Thiospira
EQ . . *Depositing iron or manganese oxides*
EQA . . . Siderocapsaceae (family)
S . . . . Siderocapsa (genus)
T . . . . Naumanniella
V . . . . Ochrobium
W . . . . Sidérococcus
EQB Methane-producing bacteria
S . Methanobacteriaceae (family)
T . . Methanobacterium
V . . Methanosarcina
X . . Methanococcus
EQC Gram-positive cocci
EQD . *Aerobic and/or facultatively anaerobic*
EQE . . Micrococcaceae (family)
S . . . Micrococcus (genus)
EQF . . . Staphylococcus
V . . . Planococcus
X . . Streptococcaceae
EQG . . . Streptococcus
S . . . Leuconostoc
T . . . Pediococcus
V . . . Aerococcus
X . . . Gemella
EQH . *Anaerobic*
S . . Peptococcaceae
T . . . Peptococcus (genus)
V . . . Peptostreptococcus
W . . . Ruminococcus

Scotobacteria

Biological structures EDA
MICROORGANISMS EK
BACTERIA EN
Scotobacteria EOG
Gram-positive cocci EQC
. . . Ruminococcus EQH W

EQH X . . . Sarcina
EQI Endospore-forming rods and cones
X . Bacillaceae (family)
EQJ . . Bacillus (genus)
T . . Sporolactobacillus
EQK . . Clostridium
T . . Desulfotomaculum
V . . Sporosarcina
W . *Genera of uncertain affiliation*
X . . Oscillospira
EQL Gram-positive, asporogenous rod-shaped bacteria
T . Lactobacillaceae (family)
V . . Lactobacillus (genus)
W . *Genera of uncertain affiliation*
EQM B . . Listeria
E . . Erysipelothrix
H . . Caryophanon
EQN Actinomycetes and related organisms
S . Coryneform group
T . . Corynebacterium (genus)
V . . . *Human and animal parasites and pathogens*
EQO B . . . *Plant pathogenic Corynebacteria*
E . . . *Non-pathogenic Corynebacteria*
H . . Arthrobacter
K . . *Genera of uncertain affiliation*
L . . . Brevibacterium
M . . . Microbacterium
P . . Cellulomonas
Q . . Kurthia
S . Propionibacteriaceae (family)
T . . Propionibacterium (genus)
V . . Eubacterium
EQP B . Actinomycetales (order)
D . . Actinomycetaceae (family)
F . . . Actinomyces (genus)
H . . . Arachnia
J . . . Bifidobacterium (genus)
L . . . Bacterionema
N . . . Rothia
R . . Mycobacteriaceae (family)
S . . . Mycobacterium (genus)
V . . Frankiaceae
W . . . Frankia
EQQ B . . Actinoplanaceae
D . . . Actinoplanes
F . . . Spirillospora
H . . . Streptosporangium
J . . . Amorphosporangium
L . . . Ampullariella
N . . . Pilimelia
P . . . Planomonospora

MICROORGANISMS EK
BACTERIA EN
Scotobacteria EOG
Actinomycetes and related organisms EQN
. . Actinoplanaceae EQQ B
. . . Planomonospora EQQ P

EQQ R . . . Planobispora
T . . . Dactylosporangium
V . . . Kitasatoa
EQR B . . Dermatophilaceae
D . . . Dermatophilus
F . . . Geodermatophilus
H . . Nocardiaceae
J . . . Nocardia
L . . . Pseudonocardia
N . . Streptomycetaceae
P . . . Streptomyces
R . . . Streptoverticillium
T . . . Sporichthya
V . . . Microellobosporia
EQS B . . Micromonosporaceae
D . . . Micromonospora
F . . . Thermoactinomyces
H . . . Actinobifida
J . . . Thermomonospora
L . . . Microbispora
N . . . Micropolyspora
ER Rickettsias
* Obligate intracellular Scotobacteria in eucaryotic cells
ERR B . Rickettsiales (order)
D . . Rickettsiaceae (family)
F . . Rickettsieae (tribe)
G . . . Rickettsia (genus)
H . . . Rochalimaea
J . . . Coxiella
L . . Ehrlichieae (tribe)
M . . . Erlichia (genus)
N . . . Cowdria
P . . . Neorickettsia
R . . Wolbachieae (tribe)
S . . . Wolbachia (genus)
T . . . Symbiotes
V . . . Blattabacterium
W . . . Rickettsiella
ERS B . . Bartonellaceae (family)
D . . . Bartonella (genus)
F . . . Grahamella
H . . Anaplasmataceae (family)
J . . . Anaplasma (genus)
L . . . Paranaplasma
N . . . Aegyptianella
P . . . Haemobartonella
R . . . Eperythrozoon
ERT C . Chlamydiales (order)
E . . Chlamydiaceae (family)
G . . . Chlamydia (genus)

Eucaryotic microorganisms

Biological sciences E
Biological structures EDA
MICROORGANISMS EK
BACTERIA EN
. . Rickettsias ER
. . . . . Chlamydia ERT G

ERT X . . Mycoplasmas
ERU . . . Mollicutes (class)
R . . . . Mycoplasmatales (order)
S . . . . . Mycoplasmataceae (family)
T . . . . . Mycoplasma (genus)
V . . . . . Acholeplasmataceae
W . . . . . Acholeplasma
X . . . *Genera of uncertain affiliation*
ERV D . . . . Thermoplasma
F . . . . Spiroplasma
L . . . Mycoplasma-like bodies in plants

ESC Eucaryotic microorganisms, protista
JRP . *Autotrophic*
JRQ L . *Heterotrophic*
. (Algae) * see FKE.
. (Fungi) * see FMJ.
ESE . Euglenophyta, euglenoids
* Alternative (not recommended) is to collocate with Plantae, at FLE
* From Engler (see ref. at FJV B) Abt. V
ESF . . Euglenales (order)
R . . . Eugleninales (suborder)
S . . . . Euglenaceae (family)
T . . . . Astasiaceae
V . . . . Peranemaceae
W . . . Colaciinales
X . . . . Colaciaceae
ESG . Protistan algae
* * Alternative (not recommended) is to collocate with Algae in Plantae at FKE.
* For algal microbiology in general, and blue-green algae, etc., * see ENR
ESH . . Pyrrophyta, fire algae
ESI . . . Crytophyceae (class), cryptoflagellates
S . . . . Monomastigales (order)
T . . . . Cryptomonadales
V . . . . . Cryptomonadaceae (family)
ESJ . . . Chloromonadophyceae
S . . . . Chloromonadales
T . . . . . Chloromonadaceae
ESK . . . Dinophyceae
S . . . . Dinoflagellatae (subclass)
T . . . . . Peridiniales (order)
V . . . . Phytodiniformes (subclass)

Biological structures EDA
MICROORGANISMS EK
Eucaryotic microorganisms ESC
Protistan algae ESG
. Pyrrophyta ESH
. . . Phytodiniformes ESK V

ESL . Chrysophyta, golden-brown algae
ESM . . Heterokortae, Xanthophyceae, yellow-green algae
S . . . Heterosiphonales (order)
V . . . . Vaucheriaceae (family)
ESN . . Chrysophyceae, yellow-brown algae
S . . . Chrysomonadales
T . . . . Chromulininales (suborder)
V . . . . . Mallomonadaceae (family)
W . . . . Ochromonadinales
ESO . . . Chrysocapsales (order)
S . . . . Hydruraceae (family)
ESP . . Bacillariophyceae (class), diatoms
ESQ . . . Centricae (subclass), Centrales
S . . . . Discales (order)
T . . . . Soleniales
V . . . . Biddulphiales
X . . . . . Rutilariaceae
ESR . . . Pennatae (Pennales)
S . . . . Araphidales
T . . . . . Fragilanaceae
V . . . . Raphidioidales, Raphidioideae
W . . . . . Eunotiaceae
ESS C . . . . Monoraphidales, Monoraphideae
E . . . . . Achnanthaceae
G . . . . Biraphidales, Biraphideae
J . . . . . Naviculaceae
L . . . . . Epithemiaceae
N . . . . . Nitzschiaceae

EST Protozoa (phylum)
* Unicellular, animal-like protista.
* * Alternative (not recommended) is to class in Zoology, at GKA U.
* Based on Rothschild (see note at GJS R)
N . *Fossil forms*
ESU . Mastigophora (class), Flagellata
S . . Phytomastigina (subclass), Phytoflagellata
T . . . Phytomonadina (order), Volvocina
V . . . . Chlamydomonas
W . . . . Volvox
X . . . Xanthomonadina
Y . . . Chloromonadina
ESW . . . *Euglenoidina*
* * Alternative (not recommended) to locating at ESF
ESY . . . *Cryptomonadina*
* * Alternative (not recommended) to locating with Pyrrophyta at ESH
ETB . . . *Dinoflagellata, Peridineae*
* * Alternative (not recommended) to locating with Pyrrophyta at ESK
ETC . . . Ebrideae, Ebriaceae (order)

Protozoa

MICROORGANISMS EK
Eucaryotic microorganisms ESC
Protozoa EST
Mastigophora ESU
. Phytomastigina ESU S
. . Ebrideae ETC

ETC S . . Silicoflagellata
V . . Coccolithophorida
ETD . . *Chrysomonadina*
* * Alternative (not recommended) to locating with Protistan algae at ESN
ETF . Zoomastigina (subclass), Zooflagellata
ETG . . Protomonadina (order)
S . . . Leishmania
T . . . Trypanosoma
V . . . Bodo
W . . . Schizotrypanum
ETH . . Metamonadina, Polymastigina and Hypermastigina
S . . . Trichomonas
T . . . Trichanympha
V . . Distomatina, Diplomonadida
X . . Opalinina
ETJ Rhizopoda (class), Sarcodina
S . Rhizomatigina (order), Pantostomatida
T . . Mastigamoeba
V . . Histomonas
Y . Amoebina
ETK . . Amoeba
T . . Entamoeba
ETL . Testacea
S . . Arcella
T . . Difflugia
V . . Chlamydophrys
ETM . Foraminifera
N . . *Fossil forms*
S . . Globigerina
T . . Peneroplis
V . . Textularia
X . . Nummulites
ETN B . . Rotalia
D . . Miliola
M . Mycetozoa
ETO Actinopoda (class)
ETP . Radiolaria (order)
N . . *Fossil forms*
S . . Acanthometra
T . . Sphaerocapsa
V . . Acanthosphaera
X . Heliozoa (order)
ETQ Sporozoa (class), Telosporidia
S . Gregarinomorpha (subclass)
T . . Archigregarina (order)
V . . Eugregarina
W . . . Gregarina
X . . Schizogregarina

MICROORGANISMS EK
Eucaryotic microorganisms ESC
Protozoa EST
Sporozoa ETQ
. Gregarinomorpha ETQ S
. . Schizogregarina ETQ X

ETR . Coccidiomorpha (subclass)
S . . Prococcidia (order)
T . . Eucoccidia
V . . . Adeleidea (suborder)
W . . . Eimeridea
X . . . . Eimeria, Coccidium
ETS . . . Haemosporidia
S . . . . Plasmodium
ETU . *Sporozoa of uncertain affiliation*
C . . Toxoplasma
E . . Sarcocystis
G . . Babesia
J . . Theileria
ETV Cnidosporidia (class), Nematocystida, Neosporidia, Amoebosporidia
S . Myxosporidia
T . Microsporidia
V . Actinomyxidia
X . Haplosporidia
ETW Ciliata (class), Ciliophora, Infusoria
N . *Fossil forms*
T . Holotricha (subclass)
V . . Gymnostomatida (order)
ETX B . . . Rhabdophorina (suborder)
D . . . . Prorodon
F . . . . Didinium
H . . . Cyrtophorina
K . . Suctorida, Acineta, Tentaculifera
N . . Chonotrichida, Peritricha
P . . Trichostomatida
R . . . Balantidium
T . . Hymenostomatida (order)
V . . . Tetrahymenina (suborder)
X . . . Peniculina
ETY B . . . . Paramecium, slipper animalcule
D . . . Pleuronematina
F . . Astomatida, Anoplophryinea
H . . Apostomatida
J . . Thigmotrichida
L . . Petrichida, Stomatoda
N . . . Vorticella
P . . . Epistylis
EUA . Spirotricha (subclass)
S . . Heterotrichida (order)
T . . . Heterotrichina (suborder)
V . . . . Stentor
X . . . Licnophorina
EUB B . . Oligotrichida
D . . . Halteria
F . . Tintinnida

PLANTS

MICROORGANISMS EK
Eucaryotic microorganisms ESC
Protozoa EST
Ciliata ETW
Spirotricha EUA
Tintinnida EUB F

EUB H Entodiniomorphida
J . Cycloposthium
N Odontostomatida, Ctenestomatida
P Hypotrichida
R . Euplotes

Biological sciences E
Biological structures EDA
MICROORGANISMS EK
. . . . . Euplotes EUB R

F PLANTS, BOTANY
F2 . *Common subdivisions*
* As E2/E9
F7 . . Herbaria
F8 . . Botanical gardens
FAA . *Principles, schools of thought, viewpoints*
FAC . *Research*
FAG C . . *Sampling*
C9G . . . Grid sampling
C9L . . . Permanent sample plots
C9Q . . . Quadrants
FAK . *Experimental & practical botany*
FBB . *Physiology in general*
J . . *By organism*
* * Alternative/& (not recommended) for libraries wishing to cite organism * after/& processes & structures. If this option is taken, proceed as follows:
* Add/& to FBB letters J/V following F in FJ/FV. e.g. germination in Primulaceae FFL G BB UHR.
FBC . . *By part, organ or system*
* * Alternative/& (not recommended) for libraries wishing to cite physiology before parts, organs & systems. If this option is taken, proceed as follows:
* Add/& to FBC letters C/Y following FI in FIC/FIY.
* Add/& to FBD letters A/H following FJ in FJA/FJH, e.g. effect of light on mineral asbsorption by by plant roots FIP T CHP BOH BDC.
FBP . . *Biochemistry*
FBW . . . *Metabolism & nutrition*
* For organs & processes serving intake of nutrients, * see/& Digestive system, FIP.
C . . . . *Pathways*
E . . . . . *Intermediary metabolism*
FBX N . . . . *Energy metabolism*
* For metabolism of particular substances,
* see/& substances (in FCF/FCY) - e.g. lipid respiration.
S . . . . . *Catabolism*
T . . . . . *Respiration*
* For external respiration, * see/& Respiratory system FIL
U . . . . . *Aerobic respiration*
V . . . . . *Anaerobic respiration*
W . . . . . *Fermentation*
X . . . . . *Cellular respiration*
FBY B . . . . . *Anabolism, biosynthesis*
* Covers chemistry of autotrophic nutrition. For heterotrophic nutrition,
* see/& Digestive system FIP.
D . . . . . *Photosynthesis*
E . . . . . *Light reactions*
F . . . . . Phosphorylation
FD . . . . . Cyclicphosphorylation
FG . . . . . Non-cyclic phosphorylation
G . . . . . *Dark reactions*

PLANTS

Physiology in general FBB
. Biochemistry FBP
. . Metabolism & nutrition FBW
. . . Energy metabolism FBX N
. . . . . Photosynthesis FBY D
. . . . . Dark reactions FBY G

FBY K . . . . . Chemosynthesis, chemoautrophic nutrition
M . . . . . *Assimilation*
. . . *Special nutritional processes*
S . . . . Storage, reserve formation
FCF . . *Biochemistry of particular substances*
FCI . . . *Inorganic elements & compounds*
E . . . . Essential elements (general)
F . . . . *Hydrogen*
G . . . . *Water*
J . . . . *Carbon*
Q . . . . *Nitrogen*
U . . . . *Phosphorus*
FCJ A . . . . *Oxygen*
FCN T . . . . Trace elements (general), micronutrients
FCO . . . *Organic compounds*
* For photosynthesis, * see/& FBY D.
FCR O . . . . *Sugars*
FCS B . . . . *Lipids*
JB . . . . *Nucleosides & nucleotides*
T . . . . *Amino acids*
FCT . . . . *Proteins*
FCU . . . . . *Enzymes*
FCW . . . . . *Hormones*
L . . . . *Plant growth substances*
FCY . . . . *Pigments*
FDD . *Special physiological processes*
C . . *Transport processes*
L . . *Biomechanics*
P . . *Motility, movement*
PR . . . Circulation
FDF B . . *Thermal phenomenol*
FDH . . *Optical phenomenol*
FDL . . *Pathology*
QE . . . Galls
* See also/& Regeneration FFD M.
FDN *Constituent materials*
FDO . *Fluids*
N . . Water relations
* See also/& Circulation & transport FIG.
FDP *Anatomy, morphology in general*
FE *Cytology*
FEH H . *Cell walls*
KG . *Surface membranes*
KP . . *Pellicle*
KS . . . Cuticle
L . *Lamellae*
M . Plasmodesmata
P . *Protoplasm, Protoplast*
FEO P . *Plastids*
QT . . Aleuroplast, aleurone-plast

Biological sciences E
Biological structures EDA
PLANTS F
Cytology FE
. Plastids FEO P
. . Aleuroplast FEO QT

. *Quasi-cellular structures*
FER V . . Coenocytes
* Analogous to synotum in animals.
X . . Plasmodium
FES *Histology, tissues*
* For growth tissue (meristems, etc.) * see Growth & development in general, FFF.
. *Development & growth*
DJ . . Formation of tissue
. *Types of tissues, by cell characters*
S . . Parenchyma, ground tissues
ST . . . Pits (tissues)
. . . *Mesophyll*
* see leaves FJG EST
TV . . Collenchyma
. *Types of tissues, by function*
. . *Mechanical support*
FET C . . . Sclerenchyma
TD . . . . Sclereids, stone-cells
TF . . . . Fibres
TG . . . . . Bast fibres
. . *Protection*
TJ . . . Epidermis, tegumentary tissue
TK . . . . Cuticle
TL . . . . . Cutin
TM . . . . Hairs, papillae
TP . . . . Guard cells (of leaf & stem)
TQ . . . . Stoma, stomata (of leaf & stem)
TR . . . . Piliferous layers (of root)
TV . . . Cortex
TW . . . Endodermis
TX . . . . Passage cells (of root)
FEU C . . *Conducting tissues*
. . . *Elements*
E . . . . Tracheal elements
F . . . . . Tracheids
G . . . . . Pits (conducting tissue)
J . . . . . Vessel elements
. . . *Types*
FEV . . . . Vascular tissue
* For secondary vascular tissue,
* see FIG T.
S . . . . . Vascular bundle
T . . . . . Phloem
V . . . . . Sieve cells
W . . . . . Sieve tube elements
X . . . . . Primary phloem
FEW B . . . . . Xylem, woody tissue
D . . . . . Primary xylem
F . . . . . Stele
G . . . . . Pericycle

Life cycles

PLANTS F
Histology, tissues FES
. Types of tissues, by function
. . Conducting tissues FEU C
. . . . Vascular tissue FEV
. . . . . Pericycle FEW G

. . . . . (Pith) 6&see FJE R
FEW J . . . . Aerative tissue
K . . . . . Aerenchyma
L . . . . . Lenticels
O . . . . Laticiferous tissues
P . . *Storage*
R . . . Reserve cell tissue
S . . . . Aleurone layer
T . *Other tissues*

FFB *Development & growth, ontogeny*
* The concept of an "individual" plant is more ambiguous than in the case of the animal kingdom, owing to such phenomena as vegetative reproduction, alternation of generations and the ability of somatic cells to initiate reproduction under certain conditions. So it is more difficult to maintain a clear demarcation line between plant reproduction & plant development.
* The preferred arrangement is to locate here material on complete development/reproduction cycles & to locate under Reproductive system (FIU) material on the structure, functions & immediate products of the organs of sporulative & gametic reproduction. Note that gametophyte forms in alternation of generations (e.g. thalli, protonemae) are regarded as reproductive organs & go in FIV R.
* An * alternative (not recommended) is to locate all material on development & reproduction under Reproductive system.

K . Differentiation (general)
* See also Differentiation & morphogenesis under Embryology FFE F.

. *Life span*
* See FFL L

P . Life cycles
Q . . Diplohaplontic life cycle, alternation of generations, metagenesis, multiphase development
R . . . Gametophyte phase, haplophase
* For reproductive organs & reproduction phases up to formation of zygotes, * see Reproductive system FIV R.

S . . . Sporophytic phase, diplophase, sporophyte generation
* For spore-production organs (sporophylls, sporangia, etc.) see Reproductive system FIU V.

Biological sciences E
Biological structures EDA
PLANTS F
Life cycles FFB P
Diplohaplontic life cycle FFB Q
. Sporophytic phase FFB S

FFB T *Single-phase development*
V . Diplontic life cycle
* For reproductive system, * see FIU.

W . Haplontic life cycle
* For reproductive system, * see FIU.

FFD . Growth
. . *Growth substances*
E . . *Differential growth*
H . . *Localization of growth*
HI . . . Intercalary growth
J . . Restitution
* For galls, * see Pathology FDL QE.

K . . . Reparation
* Renewed meristem activity by damaged cells themselves.

M . . . Regeneration
* For vegetative reproduction, * see FIU T.

Q . . Stages of growth
* Subsequent to formation of Zygote (see FIV LZ).
* For cell division, * see FIV FDJ.

S . . . Spores
* For production of spores, * see Reproductive system FIU V.

T . . . . Sporogonia
* Special to Bryophyta & homosporous Pteridophyta.

V . . . . *Zygospores*
* Special to Algae & Fungi

W . . . Seeds
* Special to Spermatophytes.

X . . . . Formation of seeds, production of seeds
* For specific elements of seed (e.g. hilum) * see embryo. For seed dormancy * see FFL E.

FFE . . . Embryos
E . . . . *Cytology*
EN . . . . *Histology*
* For special growth tissues see Meristem FFF.

F . . . . Differentiation & morphogenesis
G . . . . . Diffrentiation
H . . . . . Induction, embryonic induction
HT . . . . . Metamorphosis
J . . . . . Morphogenesis
JN . . . . . Photomorphogenesis
K . . . . *Self-sustaining functions*
* This allows qualification of particular stages and structures by general processes where necessary - e.g. nutrient supply to growth tissue.

Stages of growth

PLANTS F
Life cycles FFB P
Growth FFD
Stages of growth FFD Q
Embryos FFE
Self-sustaining functions FFE K

FFF Meristem, growth tissue
* Remains permanently embryonic throughout life of plant.
N . Apical meristem, growing points
P . Primary meristem
R . . Protoderm
S . . Ground meristem
T . . Procambrium
* Special to vascular plants.
W . Residual meristem
. (Secondary meristem) * see FFL S
FFG Permanent tissue
* See also Post-embryo development FFL B.
N . Intercellular spaces
. (Ground tissue) * see Parenchyma FES SC
Parts of embryo
. *Special to Spermatophyta*
FFH C . . Proembryo
D . . Embryo sac
E . . Endosperm
G . . Suspensor
H . Shoot apex
J . Root apex
L . Foot apex, basal apex
N . Nucellus
* For nucellus of ovule before formation of zygote, * see Reproductive system FIX W.
P . Plumule
Q . . Epicotyl
R . . Coleoptile
S . Radicle
T . . Coleorhiza
V . Hypocotyl
. *Special to Spermatophyta*
X . . Cotyledon
FFI . . Seed coat, testa
M . . . Micropyle
P . . . Hilum
R . . . *Particular forms*
Types of embryos
T . Adventitious embryo
V . Multiple embryo, polyembryony
Types of seeds
W Winged

PLANTS F
Life cycles FFB P
Growth FFD
Stages of growth FFD Q
Embryos FFE
. Winged FFI W

FFJ Fruit
* Ripened ovary, usually enclosing seed.
* Special to Angiosperma.
. *Formation*
EFC . . Parthenocarpy
* See also Seedless fruit FFJ V
. *Parts*
N . . Exocarp
P . . Mesocarp
R . . Endocarp
. *Types*
V . . Seedless fruit
W . . Dehiscent fruit
X . . . Capsule
FFK B . . Indehiscent fruit
D . . . Nut
* Usually an achene.
F . . . Fleshy fruit, succulent fruit
G . . . . Berry
H . . . . . Hesperidum
J . . . . Drupe
K . . . . . Aggregate
L . . . . . Pepo
N . . . . Dry fruit
P . . . . . Achene
Q . . . . . Caryopsis
S . False fruit, pseudocarp
* derived from parts of flower other than ovary.
T . . Anthocarp, multiple fruit
V . . Pome
FFL B *Post-embryo development*
C . Dispersal of seed, dissemination of seed
D . Seed dormancy
DN . . Innate dormancy
DP . . Induced dormancy
DR . . Enforced dormancy
G . Germination
GN . . Date of germination
GP . . Decay of seedcoat
GR . . Successful germination
GS . . Unsuccessful germination
J . *Degeneration*
JP . . Cicatrization
JQ . . . Liquefaction
K . Ageing, senescence
L . . Longevity, life span
N . Seedlings, young plants
NP . . Emergency from soil
NQ . . . Rate of emergency
NR . . Self-thinning

PLANTS

Biological sciences E
Biological structures EDA
PLANTS F
Development & growth, ontogeny FFB
. . . . . Seedlings FFL N
. . . . . Self-thinning FFL NR

FFL Q . . . . . Mature plants, maturation
* Special to Spermatophyta
S . . . . . Secondary meristem
T . . . . . Cambium
TN . . . . . Fasciscular cambium
TP . . . . . Interfasciscular cambrium
U . . . . . Periderm
UN . . . . . Cork cambium, phellogen
UP . . . . . Phelloderm, secondary cortex
W . . . . . *Death*
FFM T *Variation, genetics, evolution*
FGO *Ecology*
* * See/& notes at EHT. The following selection from GHT/GHY includes some adjustments.
FHW . *Movements*
LC . . Curvature
LG . . Growth movements (general)
LJ . . Independent of growth
LP . . Paratonic movements
* Responses to external stimuli
LR . . . Mechanical movements
LT . . . . Hygroscopic movements, hydration movements
M . . . . Turgor
MR . . . Irritability movements
N . . . . Tropisms, tropic movements
* Directed movements of part of a plant.
NP . . . . . Positive tropisms
NQ . . . . . Aggregation
NR . . . . . Negative tropisms
NS . . . . . Contact inhibition
NT . . . . . Autotrophism
NV . . . . . Orthotropism, parallelotropism
OE . . . . . Geotropism
OF . . . . . Plagiotropism
OH . . . . . Diogeotropism
OK . . . . . Thigmatropism, haptotropism
OM . . . . . Thermotropism
OR . . . . . Radiothermotropism
OT . . . . . Electrotropism, galvanotropism
P . . . . . Phototropism
PQ . . . . . Heliotropism
PR . . . . . Nyctitropism
Q . . . . . Chemotropism
QR . . . . . Aerotropism
QS . . . . . Hydrotropism
QT . . . . . Rheotropism
QV . . . . . Osmotropism
QW . . . . . Traumotropism
R . . . . Tactic movements, taxes
* Directed movements of whole organism.

Biological structures EDA
PLANTS F
Ecology FGO
. Movements FHW
. . Paratonic movements FHW LP
. . . . Tactic movements FHW R

FHW S . . . . Nastic movements, nasty
* Independent of direction of stimulus.
SR . . . . . Hyponasty
SS . . . . . Epinasty
ST . . . . . Seismonasty
SV . . . . . Haptonsty
SW . . . . . Thermonasty
T . . . . . Photonasty
U . . . . . Nyctinasty
* See also Sleep, rest GHXIP.
V . . . . . Chemonasty
W . . . . . Hydronasty
FHX E . . Autonomic movements
F . . . Nutation, circumnutation
G . . . Unfolding, closing
H . . Projection
FHY F . *Protection*
FQ . . *Against mechanical forces*
FR . . . Solidity of organs
FS . . . Attachment of organs
L . . *Against other organisms, self preservation*
LT . . . Secretion, raphides
M . . . Mimicry, deception
MX . . . Electric charge

FI Parts, organs, systems, Organology
* The preferred arrangement is to subordinate to a given part, organ or system all those aspects which have already appeared in the schedule on physiology & anatomy, cytology & histology, etc.
* * Alternatives to this arrangement have been indicated under preceding classes (e.g. at physiology FBC) whereby parts, organs & systems may be subordinated to the special aspect.
* Any given part, organ or system may be qualified by all preceding facets by following the instructions below. These modify simple, retroactive synthesis in one detail only. Classes FDN/FDY (Constituents, and General structures) are moved down to file immediately before specific structural subclasses.
* Add to the classmark of the part, organ or system (represented below by hyphen) as follows: - A (Physiology, microsystems, development, etc.)
* Add to - lketters A/H following F in FA/FH
* except for letters DN/DW - I (Constituents)
* Add to - I letters N/O following FD in FDN/FDO (General structures)
* Add to - I letters P/W following FD in FDP/FDW - J (Elements from other parts, organs, systems)
* * See notes under next heading (Regional systems)
* Add to - J letters C/Y following FI in FIC/FIY - e.g. Leaves - circulatory system FJGJG
* Add to - K letters A/H following FJ in FJA/FJH

Parts

Biological sciences E
Biological structures EDA
PLANTS F
Parts FI

* The regional parts of plants (root, stem, etc.) are best regarded as multi-functional organs and are located at the end of this facet. By the normal retroactive principle this means that a given regional organ will be cited before a "mono-functional" organ/ system, to give, for example, Leaves - Circulatory system FJG JG.
* But if a document deals with the role or contribution of a regional part to the operations of the whole organ or system (e.g. Respiration - * role of - Leaves) then cite the regional part * after the mono- functional organ/system - e.g. Respiration - Leaves FIL KG.

FIC Y . *Protective, supportive, locomotive systems*
FID . . *Support system*
* See also Roots FJC ; Stem FJE.
FIE . . *Integumentary system*
FIF . . *Locomotive system*
* See Movement (behaviour) FHW.
FIG . *Circulatory system, translocation system*
AK . . *Experimental & practical botany*
AKN . . . Ringing
DC . . *Special physiological processes*
* For Transport processes, * use FIG E. Normal retroactive qualification is resumed at FIG G.
E . . *Transport processes*
* Add to FIG E letters C/I following EDD, with the additions shown below
EE . . . Absorption
EF . . . Diffusion
EP . . . Circulation, conduction, rising of sap
EPR . . . . Vertical conduction
F . . . Suction
FG . . . . Root pressure
FJ . . . . Stem suction
FL . . . . Leaf suction, negative tension
FN . . . . Guttation
FP . . . Exudation
FR . . . Transpiration, emmission
FS . . . . Transpiration stream
G . . *Other processes, structures, etc.*
* Normal retroactive synthesis is resumed here after interruption for FIG E.
* Add to FIG G letters DL/N following FD in FDDL/FDN
GDL . . . *Biomechanics*
GH . . . *Optical phenomena*
. . . (Constituents & general structures) * See FIG I
H . . . *Cytology, Development, Ecology, etc*
* Add to FIG H letters E/H following F in FE/FH e.g. growth of circulatory system FIG HFD.
. . . . (Conducting tissues) * see FIG P
I . . . *Constituents*
J . . . *Elements from other parts*

Biological structures EDA
PLANTS F
Parts FI
Circulatory system, translocation system FIG
. Other processes, structures, etc. FIG G
. . Elements from other parts FIG J

FIG L . *Substances transported*
* Add to FIG L letters G/Y following EC in ECG/ECY.
* Add to FIG M letters N/O following ED in EDN/EDO.
. *Structures*
T . . Vascular system
* Special to vascular plants.
U . *By tissue origin*
* Add to FIG letters U/W following FE - e.g. Vascular bundle FIG VS.
FIH *Regulatory system, coordination system*
FIK . *Chemical control*
S . . *Hormone systems*
* Add to FIK S letters P/Y following FCW L - e.g. auxins FIK SP.
FIL *Respiratory system*
* External system ('breathing') only. For catabolism & cellular respiration, * see FBX T. For transpiration, * see FIG FR.
. *Ecology*
GWI . . Daytime respiration
GWJ . . Night-time respiration
FIM . *Special processes*
FIN . *Structures*
D . . *Breathing surfaces*
F . . . Pores
H . . . Stomata
J . . . Guard cells
L . . . Lenticels
N . . . Intercellular spaces
FIP *Digestive system*
* Procurement & digestion of nutrients.
* For metabolism & nutrition, * see FBW.
R . *Intake*
S . *Digestion*
T . . *Absorption*
. . (Assimilation) * see Metabolism FBY M.
W . . Intracellular digestion
. . (Translocation of nutrients) * see Circulation FIG
FIQ L . Heterotrophic nutrition in plants
* For autotrophic nutrition, see Biosynthesis FBY B.
FIS *Secretory, storage & excretory systems*

Parts

Biological sciences E
Biological structures EDA
PLANTS F
Parts FI
Secretory, storage & excretory systems FIS

FIU *Reproductive system*
* For relations between reproduction process & development * see notes at FF B.
* This class is confined to the structures and mechanisms designed to produce a zygote or spore from which a new organism develops.
* Add to FIU letters A/Y following EIX with the amendments & additions indicated below.

S . *Asexual reproduction, agamic reproduction*
T . . *Vegetative reproduction*
TS . . . *Fission*
UF . . . *Fragmentation*
UJ . . . Budding, propagules
UN . . . . Bulbils
UQ . . . . Meristogenetic reproduction
UR . . . . . Gemmae
US . . . . . Suckers
UT . . . . . Tubers

UW . *Reproductive cell systems*
V . . *Sporulative reproduction*
VDJ . . . *Sporulation*
VE . . . *Cytology*
VER . . . . *Spore mother cells*
. . . *Organs*
VR . . . . Sporophylls
VS . . . . Sporangia, capsules
WC . . . *Types of spores*
. . . *Products of spores*
XD . . . . Protonema
* Special to Bryophyta
XH . . . . Prothalli
* Special to Pteridophyta

Y . . *Gametic reproduction*

FIV . . . *Sexual reproduction, amphimixis*
* Add/& to FIV letters A/N following EIY
* Add/& to FIV O letters C/Y following FI
* Add/& to FIV P letters A/H following FJ
* Note that this instruction overrides those at FI and incorporates their provisions - e.g. (Constituents) is FIV N not FIV I

F . . . . *Gametes*
FDJ . . . . . *Gametogenesis*
FFG . . . . . Mitosis
FG . . . . . Meiosis
. . . . . *Types of gametes*
G . . . . . *Receptor*
GR . . . . . Ovum
H . . . . . *Donor*
HR . . . . . Sperm

Biological structures EDA
PLANTS F
Parts FI
Gametes FIV F
. Types of gametes
. . . Sperm FIV HR

FIV J . *Release of gametes & union*
K . . Pollination
* Special to flowering plants
KR . . . Self-pollination
KS . . . Cross-pollination
KT . . . Anemophily
KU . . . Hydrophily
KV . . . Zoophily
KW . . . Entomophily
L . Fertilization, syngamy
. . *Products*
LV . . . Pronuclei
LZ . . . Zygotes
* Fertilized egg For germination & subsequent development * see FFL B

Facilitating structures & processes

R . Reproductive organs
* Many of the terms below & of the concepts they stand for are drawn from sexual reproduction in Spermatophyta. Where a term is peculiar to a type other than Spermatophyta this is noted.
* Generally speaking, the main use of this class will be to qualify spermatophyt But insofar as other types of plants, or plants in general, have closely analogous parts or processes, these parts & processes may be used for reproduction in plants in general (& located here) or to qualify types of plants other than Spermatophyta (e.g. Bryophyta - Archegonium FOI XR).

. . *Macrostructures*
TR . . . Protonemae
* Special to Bryophyta
TS . . . Prothalli
* Special to Pteridophyta
TT . . . . Microprothallis
TU . . . . Megaprothallis
TV . . . Cones, strobili
* Special to Gymnosperma
TW . . . . Sporophylls

Flowers

Biological structures EDA
PLANTS F
Parts FI
Reproductive organs FIV R
Cones FIV TV
. Sporophylls FIV TW

FIV U Flowers
. *Presentation*
U2H V . . Floral diagrams
U2H W . . . Floral formulae
. *Subsystems*
. . *Accessory flower parts*
V . . . Receptacle, thalamus, torus
W . . . Perianth
WR . . . . Calyx
WS . . . . . Sepal
WT . . . . Corolla
WU . . . . . Petal
WV . . . . Tepal
. . *Essential flower parts*
X . . . Theca, sporangium
XS . . . . Sporogonium, capsule
* Special to liverworts, etc
FIW . . . *Male organs*
* Add/& to FIW letters A/P following FIV
. . . . *Cytology*
. . . . . *Gametes*
F . . . . . Sperm, spermatozoid, antherozoid
R . . . . Androecium, antheridium
S . . . . . Stamen, microsporophyll
ST . . . . . Filament
T . . . . . Anther
. . . . . (Microsporangium) * see/& FIW W
TS . . . . . Microsporocyte, pollen mother cell
TT . . . . . Microspore
U . . . . . Pollen grain
* Young male gametophyte
UT . . . . . Tube cell
UW . . . . . Generative cell
. . . . . (Sperm) * See/& Gametes FIW KF
V . . . . . Mature anther
W . . . . . Pollen sac, microsporangium
FIX . . . *Female organs*
* Add to FIX letters A/P following FIV
EZ . . . . *Gametes*
F . . . . . Ovum, egg-cell
R . . . . Gynoecium, oogonia, archegonium
S . . . . . Carpel, pistil, megasporophyll, macrosporophyll
T . . . . . Style
TS . . . . . Stigma
U . . . . . Ovary
US . . . . . Placenta

PLANTS F
Parts FI
Reproductive organs FIV R
Flowers FIV U
Subsystems
. . . . . Placenta FIX US

FIX V . . . . . Ovule, megasporangium
W . . . . . Nucellus
WS . . . . . Megasporocyte, embryo-sac mother cell
WT . . . . . Megaspore
WY . . . . . *Mature ovule*
X . . . . . Embryo sac
XR . . . . . Haploid nucleus
. . . . . *Egg-cell*
* See Gametes FIX KF
XT . . . . . Antipodal cell
XV . . . . . Polar nucleus, primary endosperm nucleus
XW . . . . . Synergida
YB . . . . . Micropyle
YE . . . . . Venter
Types of flowers
. *By completeness of structure*
FIY CD . . Complete
CF . . Incomplete
CH . . . Apetalous
. *By symmetry*
CM . . Zygomorphic, bilaterally symmetrical
CP . . Actinomorphic
. *By union/separation of appendages*
DC . . Distinct
DE . . Coalescent
DG . . Synsepalous
DJ . . Sympetalous
DL . . Synadelphous
DN . . Syncarpous
DP . . Adnate
DS . . Heterostyled
. *By sexual parts*
E . . Perfect, monoclinous, bisexual
F . . Imperfect, diclinous, unisexual
FS . . . Staminate
FT . . . Pistillate
G . . . Monoecious, hermaphrodite
GR . . . . Protandrous
GT . . . . Protogynous
H . . . Dioecious
J . . Polygamous
* With perfect & imperfect flowers on one plant.
. *By position of ovary/receptacle*
KH . . Hypogynous
KP . . Perigynous
KS . . Epigynous

Parts

PLANTS F
Parts FI
Sexual reproduction, amphimixis FIV
. Facilitating structures & processes
. . . . . By position of ovary/receptacle
. . . . . Epigynous FIY KS

FIY L . . . . . Inflorescence
* Flowering shoot.
M . . . . . Head, composite flower
N . . . . . Florets
NR . . . . . Marginal, ray florets
. . . . . *By branching method*
P . . . . . Indefinite branching, racemose branching
Q . . . . . Raceme
QS . . . . . Corymb
QV . . . . . Panicle
R . . . . . Spike
RS . . . . . Catkin
RV . . . . . Spadix
RX . . . . . Umbel
S . . . . . Capitulum
T . . . . . Definite branching, cymose branching
TS . . . . . Monochasium
TV . . . . . Diachasium
V . . . . . Mixed
. *Forms of sexual reproduction*
. . *By size and state of gametes*
FJA C . . . Merogamy
D . . . Hologamy
E . . . Isogamy
F . . . Anisogamy
G . . . . Oogamy
. . *By organ or mode of production of gametes*
J . . . Allogamy, cross-fertilization
K . . . Automixis, self-fertilization
L . . . . Parthenogamy
M . . . . Autogamy
N . . . Hermaphroditic reproduction, bisexual reproduction
O . . . . *Allogamy*
P . . . . *Autogamy*
Q Apomixis
R . Apospory
S . Apogamy
* Special to Pteridophyta.
T . Agamospermy
U . . Pseudogamy
V . . Parthenogenesis

Biological sciences E
Biological structures EDA
PLANTS F
Parts FI
Reproductive system FIU
. . . . . Parthenogenesis FJA V

FJB *Regional parts, organs, systems*
. *Anatomy*
DP . . Regional anatomy, topographical anatomy
T . Thallus
* Simple, vegetative plant body, without differentiation into root, stem & leaf.
FJC . Roots
ES . . *Tissues*
ET . . . Hairs, trichome
* See also Integument FIE
JE . . *Integument*
. . . *Degeneration*
JED LQC . . . . Desquamation
. . *Parts of roots*
R . . . Growing points
T . . . Tip
V . . . . Meristematic region, promeristem
W . . . . Enlargement region
X . . . . Maturation region
Y . . . . Cap
FJD E . . . Primary root, radicle
* See also Embryo radicle FFH S
G . . . Secondary root, branch root, lateral root
. . *Types of roots*
. . . *By origin*
J . . . . Seminal root
K . . . . Adventitious root
L . . . . Prop root
N . . . Taproot
P . . . Fibrous root
Q . . . Tuberous root
R . . . Fascicled root
. . . *By modifications*
T . . . . Aerial root
V . . . . Climbing root
FJE . Stems, axes
JE . . *Integument*
JEP . . . Prickles, thorns
JER . . . Spines
JES . . . Scales
. . *Parts*
R . . . Medulla, pith
S . . . Buds
SS . . . . Bud scales
ST . . . . Axillary buds, lateral buds
T . . . Neck, hypocotl
U . . . Nodes
UT . . . Internodes
UW . . . Leaf gaps
UX . . . Leaf scars
V . . . Lenticels

Parts

Biological structures EDA
PLANTS F
Parts FI
Stems FJE
. Parts
. . Lenticels FJE V

FJE W . . Shoots
X . . Branches, ramification
. . . *Degeneration*
Y . . . . Deramification, loss of branches
. *Types of stems*
. . *By woody tissue content*
FJF B . . . Woody stems
D . . . Herbaceous stems
. . *By modification*
G . . . Rhizomes
H . . . Suckers
J . . . Stolons, runners
L . . . Tubers
N . . . Bulbs
P . . . Corms
R . . . Tendrils
T . . . Cladodes, phylloclades
V . . . Peduncles
FJG Leaves
ES . *Tissues*
EST . . Mesophyll
EST R . . . Palisade mesophyll
EST S . . . Spongy mesophyll
. . *Vascular bundle*
EVS . . . Veins, venation, ramification
. *Development*
FB . . Foliation
. *Degeneration*
FLJ . . Defoliation, loss of leaf
. *Properties*
N . . Arrangement, phyllotaxy
. *Parts*
R . . Abscission layer
S . . Stipules
T . . Stipels
V . . Petioles, stalks
W . . Phyllodes
X . . Laminae, blades
. *Types*
. . *By origin*
FJH C . . . Megaphylls
D . . . Microphylls
. . *By shape*
F . . . Simple leaves
G . . . Compound leaves
H . . . Obovate leaves
J . . . Linear leaves
K . . . Sagittate leaves
L . . . Palmate leaves
M . . . Pinnate leaves

Biological structures EDA
PLANTS F
Parts FI
. . Leaves FJG
. . . Types
. . . . . Pinnate leaves FJH M

. . . *Modified forms*
FJH P . . . . Bracts
. . . . (Stipules) * see FJGS
Q . . . . Scales
R . . . . Cataphylls, bud scales
. . . . (Tendrils) * see Stem FJE
S . . . . Foliar spines
T . . . . Needles
. . . . *By function*
V . . . . . Absorbing leaves
W . . . . . Storage leaves
X . . . . . Trapping and digesting organs
. . *Flowers*
* Directle or indirectly, these serve only one function - that of reprodeuction. They are therfore subordinated to the Reproductive system at FIVU
* For seed & fruit * see Development FFDW and FFJ.

Types of plants
* Any type of plant, however defined (taxonomically or not) may be qualified retroactively by adding to its classmark letters A/J following F - e.g. physiology of aquatic plants FJN KBB.

FJI B . *Non-taxonomic categories*
* Specific classes, orders, familes, genera or species of plants should go with their taxon in EK/EW and not in a non-taxonomic class; e.g. Utricularia are not classed with symbiotic plants but with the taxon of Bladderworts.
* For argricultural & horticultural crops, * see G
* The nature & order of the classes is exactly the same as in EJB/EJS, but the notation is modified at the very begining (FJI). FJJ/FJS are the same as EJJ/EJS.
* Add to FJI letters C/G following EJB - e.g. rare plants FJIE.
K . . *By sex*
L . . . *Sexual dimorphism*
M . . . *Males*
N . . . *Females*
. . *By application*
* Add to FJI letters Q/X following EJI - e.g. useful plants FJIQ.
. . *By topographical distribution*
FJJ . . . Floras (by country)
FJK B . . *By physiological charactistics*
G . . *By development characteristics*
. . . *By cyclical factors*
FJL CC . . . . Ephemeral plants
CE . . . . Annual plants, therophytes
CF . . . . Biennial plants
CG . . . . Perennial plants

PLANTS

Biological sciences E
Biological structures EDA
PLANTS F
By development characteristics FJK G
. . Perennial plants FJL CG

FJM O *By ecological & behavioural factors*
FJN AQL . Halophytes
AQP . Calcicoles
AQQ . Califuges
C . Symbiotic plants
K . Aquatic plants, hydrophytes
NKT . . Floating leaf communities
NKW . . Subaqueous
PR . Helophytes
SC . Urban plants
SQ . Hedgerow plants
FJP W . Motile plants
By part, organ, system characteristics
* Add to FJR letters C/Y following FI.
. *By nutritional system*
FJR P . . Autotrophs
* Usually assumed.
QL . . Heterotrophs
. *By reproductive system*
YG . . Hermaphroditic plants, monoecious plants
YX . *By forms of sexual reproduction*
* Add to FJS letters A/H follow FJ.
. . *By character of perennatory buds*
FJS GRU . . . Phanerophytes
GRV . . . Chamaephytes
GRW . . . Geophytes, cryophytes
GRX . . . Heicryophytes
M *Other special groupings*
* For herbaceous, woody plants, etc. * see seed plants FQL.

Biological sciences E
Biological structures EDA
PLANTS F
Non-taxonomic categories FJI B
. Other special groupings FJS M

FJS R *Taxonomic categories, Plantae*
FJT . *Botanical taxonomy*
X . *Botanical nomenclature*
FJU . *Fossil forms*
* * See/& notes on treatment of Palaeobotany EGF MY
* Fossil forms of particular classes, orders, families, etc. go with the class, etc,
. . *By stratigraphic eras*

FJV B . *Taxa*
* The detailed taxa below are taken from A. Engler's Syllabus der Pflanzenfamilien. 12th ed. Berlin, 1954. But a number of major categories have been moved so as to obtain an order closer to modern views on structural and phylogenetic relationships.
* Alternatives/& are provided below for libraries wishing to follow Engler's order without alteration.
* In addition to the detailed taxa extracted from Engler, a limited number of large groupings from earlier botanical classification are included in their approximately correct position in order to accommodate the general works using such groupings. That they do not feature in Engler's 12th edition is noted in each case.
* In order to keep the enumeration of taxa within reasonable bounds, division ceases at the level of families and subfamilies, although not all families and subfamilies are included. Genera and species are not included, but space in notation is provided for their addition alphabetically (see/& Introduction, sections 12.74/12.78).
FKB . . Cryptogamia
* From earlier classifications. Not in Engler.
* Reproductive organs not prominent as in Phanerogamia (FQ). Includes Thallophyta, Bryophyta and Pteridophyta.

FKC . . Thallophyta
* From earlier classifications. Not in Engler.
* No differentiation of root, stem, leaf. Includes Bacteria, Algae, Fungi, Lichens.
* * Alternative/& (not recommended) at EMY.
. . . *Bacteria*
* This class (Abteilung I in Engler) is not used, being replaced by Bergey's classification. * See/& under Monera EN.

ALGAE

Biological sciences E
Biological structures EDA
PLANTS F
Thallophyta FKC
Bacteria

FKE ALGAE (general), phycology
* Now abandoned as a formal taxon. Abteilung II/XI in Engler. This class takes general works on Algae.
* Alternatives/& are provided below which allow a library to keep all Algae together here, although the preferred arrangement is to distribute a number of major categories, as indicated below.

FKF . *Cyanophyta, blue-green algae*
* Engler's Abteilung II. The preferred arrangement is to place with Monera ENR.
* * Alternative/& (not recommended) is to place here. If this option is taken proceed as follows:
* Add/& to FKF/FKI letters following ENS/ENV respectively (i.e. F = S; G = T; H = U; I = V).

FKJ . Glaucophyta
* Engler's Abteilung III.

R . . Glaucophyceae (class)

FKK . *Myxophyta*
* Engler's Abt. IV. * Alternative/& (not recommended) to locating after Fungi, at FNA. If this option is taken, proceed as follows
* Add/& to FKK/FKM letters following FNA/FNC respectively (i.e. K = A; L = B; M = C).

FLE . *Euglenophyta, Pyrrophyta, Chrysophyta*
* Engler's Abt. V/VII. * Alternative/& (not recommended) to subordinating to Protista at ESE. If this option is taken, proceed as follows
* Add/& to FL letters E/S following ES in ESE/ESS.

FLT . Chlorophyta, green algae
* Engler's Abt. VIII.

L . . Volvocales (order)
N . . . Chlamydomonadinales (suborder)
P . . . . Chlamydomonadaceae (family)
Q . . . . Volvocaceae
S . . . Testrasporinales
V . . . . Tetrasporaceae
W . . . . Chaetopeltidaceae

FLU C . . Chlorococcales, Euprotococcales (order)
E . . . Protosiphonaceae
F . . . Chlorellaceae
G . . . Oocystaceae
H . . . Hydrodictyaceae
J . . . Coelastraceae
K . . . Chlorosphaeraceae
M . . Ulotrichales
O . . . Ulotrichinales (sub-order)
P . . . . Ulotrichaceae (family)
Q . . . . Cylindrocapsaceae
R . . . Ulvinales
S . . . . Ulvaceae (family)
V . . . Sphaeropleinales (suborder)
W . . . . Sphaeropleaceae

PLANTS F
Thallophyta FKC
ALGAE FKE
Chlorophyta FLT
. Ulotrichales FLU M
. . . Sphaeropleaceae FLU W

FLV C . Chaetophorales (order)
E . . Chaetophoraceae (family)
F . . . Chaetophoreae
G . . . . Aphanochaetaceae
J . . Trentepohliaceae
K . . Coleochaetaceae
L . . Cladophoraceae
M . . Witrochiellaceae
O . Oedogoniales
Q . . Oedogoniaceae

FLW A . Conjugatae Conjugales
C . . Mesotaeniaceae (family)
D . . . Zygnemataceae
F . . Desmidiinales
H . . . Desmidiaceae
K . Siphonales, Siphonocladales (order)
M . . Caulerpaceae (family)
N . . . Bryopsis
P . . Derbesiaceae
Q . . Dasycladaceae
T . . Codiaceae
V . . Valoniaceae
W . . . Siphonocladeae

FLX Charophyta, stoneworts
* Engler's Abt. IX.

M . Charales (order)
P . . Characeae (family)
R . . . Nitelleae

FMA Phaeophyta, brown algae
* Engler's Abt. X

JSN . Kelps
L . Isogeneratae (class)
N . . Ectocarpales (order)
P . . . Ectocarpaceae (family)
Q . . . . Giffordia
S . . Sphacelariales
V . . . Sphacelariaceae
W . . . Choristocarpaceae

FMB A . . Cutleriales
C . . . Cutleriaceae
E . . Tilopteridales
F . . . Tilopteridaceae
H . . Dictyotales
J . . . Dictyoptaceae

Thallophyta

PLANTS F
Thallophyta FKC
ALGAE FKE
Phaeophyta FMA
. Isogeneratae FMA L
. . . Dictyoptaceae FMB J

FMB L . Heterogeneratae
N . . Haplostichidae (sub-class)
P . . . Chordariales (order)
Q . . . . Myrionemataceae
R . . . Elachistaceae
S . . . Corynophlocaceae
T . . . Chordariaceae Mesogloiaceae
V . . . Spermatochnaceae
FMC A . . . Sporochnales (order)
B . . . . Sporochnaecae (family)
D . . . Desmarestrales
E . . . . Desmarestiaceae
H . . Polystichidae (sub-class)
J . . . Dictyosiphonales (order)
K . . . . Punctariaceae, Asperococcaceae (family)
L . . . . . Hydroclathrus
N . . . . Dictyosiphonaceae
P . . . Laminariales
R . . . . Chordaceae
T . . . . Laminariaceae
V . . . . . Macrocysteae
FMD . Cyclosporeae (class)
L . . Fucales (order), rock wees, seaweeds
N . . . Durvilleaceae (family)
P . . . Notheiaceae
R . . . Fucaceae
FME Rhodophyta, red algae
* Engler's Abt. XI.
FMF . Bangiophyceae, Protoflorideae, Bangioidea (class)
L . . Porphyrideales (order)
N . . Bangiales
P . . . Bangiaceae
R . . Compsopogonales
S . . . Compsopogonaceae
V . . Rhodochactales
W . . . Rhodochactaceae
FMG . Florideae (class), red seaweeds, sea mosses
L . . Nemalionales (order)
N . . . Lemaneaceae (family)
O . . . Thoreaceae
P . . . Helminthocladiaceae
Q . . . Chaetangiaceae
S . . Gelidiales
V . . . Gelidiaceae
FMH A . . Cryptonemiales
C . . . Dumontiaceae
D . . . Rhizophyllidaceae
E . . . Squamariaceae
F . . . Corallinacea
G . . . Grateloupiaceae
H . . . Gloiosiphoniaceae

Biological structures EDA
PLANTS F
Thallophyta FKC
ALGAE FKE
. . . Cryptonemiales FMH A
. . . . Gloiosiphoniaceae FMH H

FMH K . . . Gigartinales
M . . . . Nemastimaceae
N . . . . Plocamiaceae
O . . . . Sphaerococcaceae
P . . . . Rhodophyllidaceae
Q . . . . Phyllophoraceae
R . . . . Gigartinaceae
FMI . . . Rhodyminiales (order)
M . . . . Rhodymeniaceae (family)
P . . . Ceramiales
R . . . . Ceramiaceae
S . . . . Delesseriaceae
T . . . . Dasyaceae

FMJ FUNGI, MYCOTA, MYCOPHYTA, MYCOLOGY
* Engler Abt. XII.
M . Archimycetes, Myxochytridiales (class)
O . . Olpidiaceae (family)
P . . Synchytriaceae
Q . . Plasmodiophoraceae
T . Eumycetes
* From earlier classification. Not used in Engler.
FMK . Physomycetes, Algal fungis, moulds, mildews
JNK . . *Aquatic forms*
M . . Chytridiales (order)
O . . . Rhizophydiaceae (family)
P . . . Rhizidiaceae
Q . . . Cladochytriaceae
S . . Hyphochytriales, Anisochytriales
T . . . Hyphochytriaceae
FML A . . Blastocladiales
B . . . Blastocladiaceae
D . . Monoblepharidales
E . . . Monoblepharidaceae
G . . Saprolegniales, water moulds
J . . . Saprolegniaceae
K . . . Leptomitaceae
P . . Peronosporales
Q . . . Pythiaceae
R . . . Peronosporaceae
FMM . . Zygomycetes (sub-class)
* Not in Engler.
L . . . Mucorales (order)
M . . . . Mucoraceae
N . . . . Mortierellaceae
O . . . . Choanephoraceae
P . . . . Piptocephalidaceae
R . . . Entomophthorales
S . . . . Entomophthoraceae
V . . . Endogonales
W . . . . Endogonaceae

Euascomycetidae

Biological structures EDA
PLANTS F
Thallophyta FKC
FUNGI FMJ
Physomycetes FMK
. . . Endogonaceae FMM W

FMN Ascomycetes (class), sac fungi
. *Special groups*
* Not in Engler.
JSP . . Pyrenomycetes
JSQ . . Discomycetes
L . Protasiomycetidae (sub-class)
N . . Protascales, Endomycetales (order)
P . . . Eremascaceae
Q . . . Dipodascaceae
R . . . Endomycetaceae
S . . . Saccharomycetaceae, yeasts
T . . . Spermaphthoraceae
FMO A . . Taphrinales
C . . . Ascocorticiaceae
D . . . Taphrinaceae
E . . . Protomycetaceae
F . . . Pencystaceae
H . Euascomycetidae (subclass)
J . . Plectascales, Aspergillales, Eurotiales (order)
L . . . Gymnoascaceae (family)
M . . . Aspergillaceae
N . . . . Aspergillus
P . . . . Penicillium
Q . . . Onygenaceae
R . . . Trichocomaceae
S . . . Elaphomycetaceae
FMP A . . Erysiphales, Perisporiales
C . . . Meliolaceae, Perisporiaceae
D . . . Protocadiciaceae
F . . Myhangiales
H . . . Myriangiaceae
J . . Pseudosphaeriales
M . . . Pseudosphaeriaceae
N . . . . Pleosporiacceae
P . . . . Massariaceae
Q . . . Mycosphaerellaceae
R . . . Botryosphaeriaceae
S . . . . Melogramma
T . . . Cucurbitariaceae
V . . . Coryneliaceae
W . . . Dothideaceae
FMQ A . . Hemisphaeriales
C . . . Microthyriaceae
E . . Sphaeriales
G . . . Sordariaceae
H . . . Hypocreaceae
J . . . Chaetomiaceae
K . . . Sphaeriaceae
L . . . Ceratostomataceae
M . . . Lophiostomataceae
N . . . Amphisphaeriaceae

PLANTS F
Thallophyta FKC
FUNGI FMJ
Ascomycetes FMN
. . Sphaeriales FMQ E
. . . Amphisphaeriaceae FMQ N

FMQ P . . . Gnomoniaceae
Q . . . Diatrypaceae
R . . . Valsaceae
S . . . Xylariaceae
V . . Clavicipitales
FMR A . . Pezizales
C . . . Pyronemaceae
E . . . Rhizinaceae
F . . . Pezizaceae
G . . . Ascobolaceae
H . . . Helvellaceae
J . . Helotiales, Phacidales
L . . . Ostropaceae
M . . . Dermeaceae
N . . . . Mollisiaceae
P . . . Phacidraceae
Q . . . . Hypodermataceae
R . . . Helotiaceae
S . . . Geoglossaceae
T . . . Cyttariaceae
V . . . Tryblidiaceae
FMS A . . Hysteriales
C . . . Hysteriaceae
D . . . Celidiaceae
F . . Tuberales
H . . . Tuberineae, truffles
* Not in Engler.
J . . . Eutuberaceae
K . . . . Balsamia
L . . . Terfeziaceae
N . . Laboulbeniales
P . . . Ceratomycetaceae
Q . . . Laboulbeniaceae
R . . . Peyritschiellaceae
FMT Basidiomycetes (class)
M . Holobasidiomycetidae (sub-class)
O . . Hymenomycetales (order)
Q . . . Exobasidiinales (sub-order)
R . . . . Exobasidiaceae (family)
S . . . Thelephorinales
T . . . . Thelephoraceae
FMU A . . . Clavariinales
C . . . . Clavariaceae
E . . . Hydninales
F . . . . Hydnaceae
H . . . Polyporinales
J . . . . Polyporaceae
L . . . Agaricinales
N . . . . Amanitaceae
P . . . . Agaricaceae, mushrooms

Thallophyta

Thallophyta FKC
FUNGI FMJ
Basidiomycetes FMT
. Holobasidiomycetidae FMT M
. . Hymenomycetales FMT O
. . . . Agaricaceae FMU P

FMV A . . Gastromycetales
C . . . Hymenogastrinales
D . . . . Hymenogastraceae
F . . . Sclerodermatinales
G . . . . Sclerodermataceae
H . . . . Calostomataceae
J . . . . Tylostomataceae
K . . . . Sphaerobolaceae
M . . . Nidulariinales, bird's-nest fungi
N . . . . Nidulariaceae
P . . . Lycoperdinales
Q . . . . Lycoperdineae, puff-balls
R . . . . Hycoperdaceae
T . . . Phallinales
V . . . . Clathraceae
W . . . . Phallaceae, stink-horn
FMW A . Phragmobasidiomycetidae (sub-class)
C . . Tremellales (order)
E . . . Tremellaceae (family)
F . . . . Tulasnella
G . . . Hyaloriaceae
I . . Auriculariales
J . . . Auriculariaceae
K . . . Phlegmaceae, Pilacraceae
M . . Uredinales, rust fungi
N . . . Melampsoraceae
O . . . . Cronartieae
P . . . Pucciriaceae
R . . Ustilaginales, smut fungi
S . . . Ustilaginaceae
T . . . Tilletiaceae
FMX Fungi imperfecti, Deuteromycetes
M . Sphaeropsidales (order)
P . . Sphaeropsidaceae (family)
Q . . Zythiaceae, Nectrioideaceae
R . . Leptostromataceae
S . . Excipulaceae
FMY A . Melanconiales
C . . Melanconiaceae
E . Moniliales, Hyphomycetes
G . . Moniliaceae, Mucedinaceae
H . . Dematiaceae
J . . Stilbaceae
K . . Tuberculariaceae
S Mycelia sterilia

Biological sciences E
Biological structures EDA
PLANTS F
Thallophyta FKC
FUNGI FMJ
. Mycelia sterilia FMY S

FNA MYXOPHYTA, Schleimpilze, slime-moulds
* Engler's Abt. IV (under Algae). * Alternative (not recommended) is to subordinate to Algae at FKK.
M . Acrasieae (class)
P . . Acrasiales (order)
Q . . . Dictyosteliaceae (family)
S . . Labyrinthalales
FNB . Myxomycetes, Mycetozoa, Myxogastcres, Phytosarcodina, slime fungi
M . . Exosporeae
N . . . Ceratiomyxaceae
P . . Endosporeae
R . . . Physarales
S . . . . Physaraceae
T . . . . Didymiaceae
FNC A . . . Stemonitales, Amaurochaetineae
C . . . . Collodermaceae
D . . . . Stemomtaceae
F . . . Liceales
H . . . . Cribrariaceae
J . . . . Liceaceae
K . . . . Tubiferaceae
L . . . . Reticulariaceae
N . . . Trichiales, Calonemineae
P . . . . Dianemaceae, Margaritaceae
Q . . . . Arcyriaceae
R . . . . Trichiaceae
T . . . Hydromyxales
V . . . Plakopaceae
W . . . Vampyrellaceae
FND LICHENES, lichens
* Engler's Abt XIII.
P . Phycolichenes (class)
R . . Geosiphonales (order)
FNE . Ascolichenes
M . . Pyrcuocarpeae
P . . . Verrucariales (family)
R . . . . Moniolaceae
S . . . . Epigloeaceae
T . . . . Verricariaceae
V . . . . Dermatocarpaceae
W . . . . Pyrenothamniaceae
FNF A . . . Pyrenulales
C . . . . Pyrenulaceae
D . . . . Phyllopyreniaceae
E . . . . Trypretheliaceae
F . . . . Paratheliaceae
G . . . . Astrotheliaceae
J . . . Pyrenidiales
L . . . . Strigulaceae
M . . . . Pyrenidaceae

Embryophyta

PLANTS F
Thallophyta FKC
LICHENES FND
. Ascolichenes FNE
. . Pyrcuocarpeae FNE M
. . . . Pyrenidaceae FNF M

FNG . . Gymnocarpeae, Discolichens
M . . . Coniocarpiidae (order-group)
O . . . . Caliciales(order)
P . . . . . Caliciaceae
Q . . . . . Cypheliaceae
S . . . . . Sphaerophoraceae
FNH A . . . Graphidiidae
C . . . . Graphidales
E . . . . . Arthoniaceae
F . . . . . Graphidaceae
G . . . . . Chiodectoriaceae
H . . . . . Dirinaceae
K . . . . Roccellales
M . . . . . Roccellaceae
FNI . . . Cyclocarpiidae
M . . . . Thelotrematales
P . . . . . Lecanactinaceae
Q . . . . . Chrysotrichaceae
R . . . . . Thelotremataceae
S . . . . . Diploshistaceae
T . . . . . Asterothyriaceae, Ectolechiaceae
V . . . . . Gyalectaceae
W . . . . . Coenogoniaceae
FNJ A . . . . Cyanophilales
C . . . . . Ephebaceae
D . . . . . Pyrenopsidaceae
E . . . . . Lichinaceae
F . . . . . Collemataceae
G . . . . . Heppiaceae
H . . . . . Pannariaceae
J . . . . . Stictaceae
K . . . . . Peltigeraceae
M . . . . Lecideales
P . . . . . Lecideaceae
Q . . . . . Phyllosporaceae
R . . . . . Cladoniaceae
FNK A . . . . Lecanorales
C . . . . . Acarosporaceae
D . . . . . Pertusariaceae
E . . . . . Lecanoraceae
F . . . . . Parmeliaceae
G . . . . . Usneaceae
K . . . . Caloplacales
M . . . . . Caloplacaceae
N . . . . . Reloschistaceae
P . . . . . Buelliaceae
Q . . . . . Physciaceae
FNL . Basidolichenes (class)
FNM Lichenes imperfecti, Deuterolichenes

Biological sciences E
Biological structures EDA
PLANTS F
Thallophyta FKC
. Lichenes imperfecti FNM

FNO Embryophyta, metaphyta
* From earlier classification. Not in Engler.
* All plants with multicellular sex organs and embryo.

FNP . Archegoniatae, asiphonogamic embryophyta
* From earlier classification. Not in Engler.
* Cryptogams in which female sex organ is archegonium and fertilization is not via pollen tube, (c f. Spermatophyta FQ). Includes Bryophyta and Pteridophyta.

FO . . Bryophyta (phylum division), mosses & liverworts
* Engler Abteilung XIV.
FOJ U . . . *Fossil forms*
FOL . . . Hepaticae (class), liverworts
M . . . . Anthocerotoles (order), hornworts
P . . . . . Anthocerotaceae (family)
Q . . . . . Notothylaceae
S . . . . Jungermaniales (order)
V . . . . . Anacrogynae (suborder)
W . . . . . Metgeriaceae (family)
FOM A . . . . . Calobryinales
C . . . . . Acrogynae
E . . . . . Jungermaniineales (family groups)
F . . . . . Ptilidiaceae (family)
G . . . . . Junger maniaceae, scale mosses
H . . . . . Scapaniaceae
J . . . . . Pleuroziaceae
L . . . . . Jubulineales
N . . . . Sphaerocarpales (order)
P . . . . Marchantiales
Q . . . . . Marchantiales (family group)
R . . . . . Targioniaceae (family)
S . . . . . Marchantiaceae
V . . . . . Ricciieales
W . . . . . Ricciaceae (family)

Bryidae

PLANTS F
Embryophyta FNO
Archegoniatae FNP
Bryophyta FO
Hepaticae FOL
. . . Ricciaceae FOM W

FON Musci (class), mosses
L . Sphagnidae (sub-class)
N . . Sphagnales (order)
P . . . Sphagnaceas (family), bog mosse, peat mosses
R . Andreacidae (sub-class)
S . . Andreaeales (order), black mosses
T . . Andreaceae (family)

FOO . Bryidae (sub-class)
L . . Archidiales (order)
M . . . Archidiaceae (family)
P . . Dicranales
Q . . . Ditrichaceae (family)
R . . . Archifissidentaceae
S . . . Bryoxiphiaceae
T . . . Dicranaceae
V . . . . Seligerioideae
W . . . Dicnemonoceae
X . . . Pleurophascaceae
Y . . . Leniobryaceae
FOP C . . Fissidentales
E . . . Fissidentaceae
G . . Pottiales(order)
J . . . Synhopodontinales (sub-order)
K . . . . Cahyamperaceae (family)
L . . . Encalyptinales
N . . . Pottiinales
P . . . . Pottiaceae (family)
R . . Grimmiales (order)
T . . . Grimmiaceae (family)
FOQ A . . Funariales
C . . . Gigaspermaceae (family)
D . . . Disceliaceae
E . . . Ephemeraceae
F . . . Funariaceae
G . . . Oedipodiaceae
H . . . Splachnaceae
K . . Schistostegales (order)
L . . . Schistostegaceae (family)
N . . Tetraphidales
P . . . Georgiaceae (family)
FOR A . . Eubryales
B . . . Bryinales (suborder)
C . . . . Bryaceae (family)
D . . . . . Orthodontioideae (subfamily)
E . . . . . Mielichoferioideae
F . . . . Lettostomaceae
G . . . . Mniaceae

Bryophyta FO
Musci FON
Bryidae FOO
Eubryales FOR A
. Bryinales FOR B
. . Mniaceae FOR G

FOR J . Rhizogoniiales
L . . Drepanophyllaceae (family)
M . . Eustichiaceae
N . . Sorapillaceae
P . . Mitteniaceae
Q . . Calomninoceae
R . . Rhizogoinaceae
S . Hypnodendrinales
T . . Hypnodendraceae (family)
FOS . Bartramiinales
L . . Anlacomniaceae (family)
M . . Meeseaceae
N . . Bartramiaceae
P . Spindentinales
R . . Spiridentaceae (family)
T . Timmiinales (suborder)
V . . Timmiaceae (family)
FOT A Isobryales (order)
C . Orthotrichinales (suborder)
D . . Erpodiaceae (family)
E . . Ptychomitriaceae
F . . Orthotrichaceae
G . Rhacopilianles
H . . Heliophyliaceae (family)
I . . Rhacopilaceae
K . Leuodontinales
L . . Hedwigiaceae (family)
M . . Cryphaceaceae
N . . Leucodontaceae
P . . Cyrtopodaceae
Q . . Ptychomniaceae
R . . Rutenbergiaceae (family)
S . . Trachpypodaceae
T . . Myuriaceae
V . . Pterobryaceae
W . . Meteoriaceae
FOU B . Necherinales (suborder)
D . . Phynogoinaceae (family)
E . . Neckeraceae
F . . Lembophyllaceae
G . . Echinodiaceae
I . Fontinalinales
K . . Fontinalaceae (family)
L . . Climaciaceae
N Hookeriales (order)
P . Nemataceae (family)
Q . Pilotrichaceae
R . Hookeriaceae
S . Hypopterygiaceae

PTERIDOPHYTA

PLANTS F
Embryophyta FNO
Archegoniatae FNP
. . . Bryidae FOO
. . . . Hookeriales FOU N
. . . . . Hypopterygiaceae FOU S

FOV A . . . . Hypnobryales (order)
C . . . . . Theliaceae (family)
D . . . . . Fabroniaceae
E . . . . . Leskeaceae
F . . . . . Thuidiaceae
G . . . . . Amblystegiaceae
H . . . . . Brachytheciaceae
J . . . . . Entodontaceae
K . . . . . Plagiotheciaceae
L . . . . . Sematophyllaceae
M . . . . . Hypnaceae
N . . . . . Rhytidiaceae
P . . . . . Hylocomiaceae
FOW A . . . Buxaumiidae (subclass)
C . . . . Buxbaumiales (order)
D . . . . . Diphysciaceae (family)
E . . . . . Buxbaumiaceae
H . . . Polytrichidae (subclass)
J . . . . Polytrichales (order)
K . . . . . Polytrichaceae (family)
M . . . . Dawsoniales
P . . . . . Dawsoniaceae (family)

FOY Tracheophyta, vascular plants
* Modern division based on physiological and phylogenetic significance of the vascular system. Not in Engler.
* Includes Pteridophyta & Spermatophyta (seed plants).
FP . PTERIDOPHYTA (phylum, division), vascular cryptogams
FPJ U . . *Fossil forms*
FPM . . Psilophytopsida (class), Psilophyta, Psilophytinae
JU . . . *Fossil forms*
L . . . Psilophytales (order)
N . . . . Rhyniaceae (family)
P . . . . Asteroxylaceae
Q . . . . Pseudosporochnaceae
FPN . . Lycopsida (class), Lycopodiinae, club mosses
JU . . . *Fossil forms*
M . . . Protolepidodendrales (order)
N . . . Lycopodiales
P . . . . Lycopodiaceae (family)
R . . . Selaginellales
S . . . . Selaginellaceae
FPO A . . . Lepidodendrales, Lepidophytales
C . . . . Lepidodendraceae (family)
D . . . . Bothrodendraceae
E . . . . Sigillariaceae
F . . . . Pleuromeiaceae
H . . . Isoctales
I . . . . Isoetaceae (family), quillworts
L . . . Lepidospermiales

PLANTS F
Embryophyta FNO
Tracheophyta FOY
PTERIDOPHYTA FP
Lycopsida FPN
. Lepidospermiales FPO L

FPO P Psilotopsida (class), Psilotinae, Tinesopsida
Q . Psilotales (order)
R . . Psilotaceae (family)
FPP Articulatea (class), Sphenopsida
JU . *Fossil forms*
M . Hyeniales (order)
N . . Hyeniaceae (family)
P . Pseudoborniales (order)
Q . . Pseudoborniaceae (family)
S . Sphenophyllales
T . . Sphenophyllaceae
V . . Cheirostirbaceae
FPQ A . Calamitales
C . . Calamitaceae
E . Equisetales, horsetails
G . . Equisetaceae
FPR Filices (class), Pteropsida, ferns and seedplants
JU . *Fossil forms*
M . Primofilices (subclass)
O . Eusporangiatae
P . . Ophioglossales (order), adder's tongue ferns, grape ferns
Q . . . Ophioglossaceae (family)
S . . Marattiales
T . . . Marattiaceae
FPS A . Osmundidae (subclass)
M . . Osmundales (order)
O . . . Osmundaceae, flowering ferns
FPT . Leptosporangiatae
M . . Filicales (order)
P . . . Schizacaceae (family), curly grasses
Q . . . Gleicheniaceae
R . . . Matoniaceae
S . . . Dipteridaceae
T . . . Hymenophyllaceae, filmy ferns
V . . . Hymenophyllopsidaceae
FPU A . . . Loxsomaceae
C . . . Dicksoniaceae
E . . . Cyatheaceae, tree ferns
G . . . Polypodiaceae
H . . . . Aspleniurideae
K . . . Parkeriaceae
M . . Marsileales (order)
N . . . Marsileaceae (family), water clovers
S . . Salviniales
T . . . Salviniaceae

Spermatophyta

Biological structures EDA
PLANTS F
Embryophyta FNO
Tracheophyta FOY
PTERIDOPHYTA FP
. . . . Salviniaceae FPU T

FQ Spermatophyta, phanerogamia, seed plants, spiphonogamatic embryophyta
* From earlier classifications. Not in Engler.
* Reproductive organs clearly evident (cf. Cryptogamia FKB).
. *Non-taxonomic categories*
FQL . . Herbaceous plants (general)
* Without woody stems.
. . . (Flowering plants) * see FS
FQN . . . *Quasi-shrubs & vines*
* Including carpet & mat plants, succulents, bush plants, climbers.
FQP . . Woody plants
FQQ . . . Evergreen plants
FQR . . . Deciduous plants
FQT . . . Trees
* For forestry * see GV
FQU . . . Shrubs (general), frutices
FQV . . . Vines (general)
FR . GYMNOSPERMAE (phylum,division), Archiospermae
FRL . . Cycadopsida (class), Cycadophyta
M . . . Pteridospermae (order), Cycadofilices, Samenfarne
MJU . . . . *Fossil forms*
ML . . . . Lyginopteridaceae (family)
MN . . . . Medullosaceae
N . . . Caytoniales
P . . . Cycadales, Palmfarne
Q . . . . Cycadaceae (family)
R . . . . . Zamirideae, sage palms
S . . . Nilssoniales
T . . . Bennettitales, Cycadeoideales
V . . . . Bennettitaceae (family)
W . . . Pentoxylales
FRM . . . Ginkgoales
JU . . . . *Fossil forms*
M . . . . Ginkgoaceae (family), maidenhair trees
FRN . . Coniferopsida (class), Coniferophyta
JU . . . *Fossil forms*
M . . . Cordaitales (order)
P . . . . Pityaceae (family)
R . . . . Cordaitaceae
FRO . . . Coniferae (order)
M . . . . Protopinaceae
N . . . . Pinaceae, pines
P . . . . . Abietoideae (subfamily), firs
Q . . . . . Laricoideae, larches
R . . . . . Pinoideae
T . . . . Taxodiaceae, swamp cypresses
V . . . . . Sequoieae, redwoods

Tracheophyta FOY
Spermatophyta FQ
GYMNOSPERMAE FR
. Coniferopsida FRN
. . . Taxodiaceae FRO T
. . . . Sequoieae FRO V

FRO W . . . . Toxodieae, bald cypresses
FRP C . . . Cupressaceae, cypresses
E . . . . Cupressoideae (sub-family)
G . . . . Thujoideae
J . . . . Juniperoideae, junipers, red cedars
M . . . Podocarpaceae
O . . . . Pherosphaeroideae (sub-family)
P . . . . Phyllocladoideae
Q . . . . Podocarpoideae
S . . . Cephalotaxaceae
U . . . Araucariaceae
FRQ . Taxopsida (class), Taximae
M . . Taxales (order)
P . . . Taxaceae (family), yews
FRR . Chlamydospermae (class), Chlamydospermophyta, Gnetophyta
JU . . *Fossil forms*
N . . Gnetales (order)
P . . . Welwitschiaceae (family)
Q . . . Ephedraceae
R . . . Gnetaceae

FS ANGIOSPERMAE (phylum, division), Archiospermae, flowering plants

FSG . *Non-taxonomic categories*
N . . Herbaceous flowering plants, wild flowers

FSL . . DICOTYLEDONEAE (class)

M . . . ARCHICHLAMYDEAE (subclass), Apetalae and Chloripetalae
O . . . . Casuarinales (order), Verticillatea
P . . . . . Casuarinaceae (family), beefwood
Q . . . . Juglandales and Myricales
R . . . . . Juglandaceae, walnuts
S . . . . Balanopales, Balanopsidales
T . . . . Leitneriales
V . . . . . Leitneriaceae, cork wood
FSM A . . . . Salicales
C . . . . . Salicaceae, willows
F . . . . Fagales and Betulales
H . . . . . Betulaceae, birches
J . . . . . Fagaceae, beeches
L . . . . Quercoideae (sub-family)

ARCHICHLAMYDEAE

Tracheophyta FOY
Spermatophyta FQ
ANGIOSPERMAE FS
DICOTYLEDONEAE FSL
ARCHICHLAMYDEAE FSL M
Quercoideae FSM L

FSN Urticales, Urticiflorae
L . Rhoipteleaceae
M . Ulmaceae, elms
N . Eucommiaceae
P . Moraceae, mulberries
Q . . Moroideae (sub-family)
R . . . Artocarpeae
S . . Conocephaloideae
T . . Cannaboideae
V . Urticaceae, nettles
FSO A Proteales
C . Proteaceae
D . . Proteoideae (sub-family)
E . . Grevilleoideae
G Santalales
I . Santalineae (sub-order)
K . . Olacaceae (family)
L . . . Schoepfioideae (sub-family)
M . . . . Octoknemeae
N . . . . Schoepfieae
O . . . Olacoideae
Q . . Opiliaceae
R . . Grubbiaceae
S . . Santalaceae, sandalwood
T . . Misodendraceae
FSP A . Loranthineae (sub-order)
C . . Loranthaceae (family), mistletoe
D . . . Loranthoideae
E . . . Viscoideae
G Balanophorales (order)
H . Balanophoraceae (family)
J Medusandrales
L Polygonales
N . Polygonaceae
P . . Eriogonoideae (sub-family)
Q . . Polygonoideae
R . . Cocoloboideae
FSQ A Centrospermae, chenopoidiales, caryophyllales
C . Phytolaccineae (sub-order)
E . . Phytolaccaceae (family)
F . . . Phytolaccoideae (sub-family)
G . . Gyrostermonaceae
H . . Achatocarpaceae
J . . Nyctaginaceae
K . . Molluginaceae (family)
L . . Aizoaceae, Ficoidaceae
M . . . Ruschioideae (sub-family)
N . . . Tetragonioideae
P . Portulacineae (sub-order)
Q . . Portulaiaceae (family)
R . . . Montioideae

DICOTYLEDONEAE FSL
ARCHICHLAMYDEAE FSL M
Centrospermae FSQ A
. Portulacineae FSQ P
. . Portulaiaceae FSQ Q
. . . Montioideae FSQ R

FSQ T . . Basellaceae
FSR A . Caryophyllineae
C . . Cartophyllaceae, carnations
E . . . Paronychioideae (sub-family)
F . . . Alsinoideae
G . . . . Sclerautheae
H . . . Silenoideae
J . Chenopodiineae (sub-order)
L . . Chenopoidioceae (family)
M . . Amaranthaceae
P Cactales (order), Opuntiales
Q . Cactaceae (family), Opuntiaceae, cacti
R . . Opuntioideae
S . . Cactoideae (sub-family), Cereoideae
FSS Magnoliales (order)
M . Magnoliaceae (family)
N . Himantandraceae
P . Annonaceae
Q . Eupomatiaceae
R . Myristicaceae, nutmeg
S . Monimiaceae (family)
T . . Monimioideae (sub-family)
V . Calycanthaceae
FST A . Lauraceae, laurel
C . . Lauroideae (sub-family)
E . Hernandiaceae
F . Trochodendraceae
G . Euptelaceae
H . Cercidiphyllaceae
FSU Ranunculales (order), Ranales
M . Ranunculineae (sub-order)
P . . Ranunculaceae (family), crowfoot, buttercup
Q . . Berberidaceae, barberry
R . . . Podophylloideae (sub-family)
S . . Lardizabalaceae
T . . Menispermaceae (family), moonseed
FSV . Nymphaeineae (sub-order), Nymphaeales
M . . Nymphaeaceae (family), water-lillies
P . . . Cabomboidea
Q . . . Nymphaeoidea
R . . . Nelumbonoideae
T . . Ceratophyllaceae, hornworts
FSW Piperales (order), Sauruales
M . Piperaceae (family), peppers
P Aristolochiales
Q . Aristolochiaceae
R . Rafflesiaceae, Cytinaceae

ARCHICHLAMYDEAE

Spermatophyta FQ
ANGIOSPERMAE FS
DICOTYLEDONEAE FSL
ARCHICHLAMYDEAE FSL M
Aristolochiales FSW P
. Rafflesiaceae FSW R

FSX Guttiferales, Theales, Guttales, Clusiales, Parietales
M . Dillencineae (sub-order), Dilleniales
N . . Dilleniaceae (family)
P . . Orossosomataceae
Q . . Eucryphiaceae
R . . Modusagynaceae
S . . Actinidiaceae
FSY A . Ochnineae (sub-order), Ochnales
C . . Ochnaceae (family)
D . . Dipterocarpaceae
G . Theineae (sub-order), Theales
H . . Theaceae (family), tea
J . . . Ternstroemioideae (sub-family)
L . . Marcgraviaceae
M . . Guttiferae, Clusiaceae, Balsam fig
N . . . Kielmeyeroideae (sub-family)
P . . . Calophylloideae
Q . . . Clusioideae
R . . . Moronoboideae
S . . . Hypericoideae
T . Ancistrocladineae (sub-order)
FTA Sarraceniales (order), Nepenthales, Droserales
M . Sarraceniaceae (family)
P . Nepenthaceae
R . Droseraceae
FTB Papaverales, Rhoeadales, Cruciferales, Brassicales
M . Papaverineae (sub-order), Rhoeadineae
N . . Papaveraceae (family), poppies
P . . . Hypecooideae (sub-family)
Q . . . Papaveroideae
R . . . Fumarioideae
FTC A . Capparineae, Capparidales
C . . Capparaceae (family), Capparidaceae
D . . . Capparoideae (sub-family)
E . . . . Koeberlinieae
F . . . Emblingioideae
G . . . Cleomoideae
H . . . Dipterygioideae
J . . Cruciferae (family), Brassicaceae
K . . . Stanleyeae
L . . . Sisymbricae
M . . . Hesperideae
N . . . Arabideae
P . . . Alysseae
Q . . . Lepideae
R . . . Brassiceae
T . . Tovariaceae
FTD A . Resedineae (sub-order)
C . . Resedaceae (family)
E . Moringineae
G . . Moringaceae, Ben nut

Spermatophyta FQ
ANGIOSPERMAE FS
DICOTYLEDONEAE FSL
ARCHICHLAMYDEAE FSL M
Papaverales FTB
. . Moringaceae FTD G

FTD J Batales, Batidales
L . Bataceae, Batidaceae
FTE Rosales
M . Hamamelidineae (sub-order)
O . . Platanaceae (family), plane trees
P . . Hamamelidaceae, witch hazel
Q . . . Hamamelidoideae (sub-family)
R . . . Rhodoleioideae
S . . . Symingtonioideae, Bucklandioideae
T . . . Liquidambaroideae, Altingiaceae
V . . Myrothamnaceae
FTF A . Saxifragineae (sub-order)
C . . Crassulaceae (family), stone-crops
D . . Cephalotaceae
F . . Saxifragaceae
G . . . Penthoroideae (sub-family)
H . . . Saxifragoideae
J . . . . Astilbeae
K . . . Ribesioideae
L . . . Parnassioideae
M . . . Baueroideae
N . . . Pterostemonoideae
P . . . Hydrangloideae
Q . . . Iteoideae
R . . . Iteoideae
S . . . Escallonioideae
FTG A . . Brunelliaceae (family)
C . . Cunoniaceae
D . . . Cunonieae
F . . Pittosporaceae
G . . Byblidaceae
H . . Roridulaceae
J . . Bruniaceae
L . Rosineae (sub-order)
M . . Rosaceae (family), roses
N . . . Spiraeoideae (sub-family)
P . . . Rosoideae (sub-family)
Q . . . Maloideae, Pomaceae, Malaceae
R . . . Prunoideae, Amygdalaceae, Drupaceae
T . . Neuradaceae
V . . Chrysobalanaceae (family)
FTH A . Leguminosineae (sub-order)
C . . Connaraceae (family)
D . . . COnnaroideae (sub-family)

ARCHICHLAMYDEAE

ANGIOSPERMAE FS
DICOTYLEDONEAE FSL
ARCHICHLAMYDEAE FSL M
Rosales FTE
. . Connaraceae FTH C
. . . COnnaroideae FTH D

FTH F . . Leguminosae, Fabaceae
G . . . Mimosoideae (sub-family)
H . . . . Acacieae
J . . . . Mimoseae, mimosa
L . . . Caesalpinioideae
M . . . . Caesalpinieae, senna
N . . . . Bauhineae
P . . . . Cassieae
FTI A . . . Faboideae
C . . . . Sophoreae
D . . . . Podalyrieae
E . . . . Dalbergieae
G . . . . Genisteae
H . . . . Astragaleae, Galegeae
J . . . . Loteae
L . . . . Coronilleae, Hedysareae
M . . . . Ononideae
N . . . . Trifoliae
P . . . . Fabeae, Vicieae
Q . . . . Phaseoleae
R . . Krameriaceae (family)
FTJ A Hydrostachyales (order)
C . Hydrostachyaceae (family)
E Podostemales, Podostemonales
G . Podostemaceae, Podostemonaceae
H . . Tristichoideae (sub-family)
J Geraniales, Gruinales
L . Limnanthineae (sub-order)
M . . Limanthaceae
O . Geraniineae
Q . . Oxalidaceae (family), wood sorrel
R . . Geraniaceae, stork's bill
T . . Tropaeolaceae, nasturtiums
FTK A . . Zygophyllaceae
C . . . Peganoideae (sub-family)
D . . . Chitonioideae
E . . . Tetradiclidoideae
F . . . Augeoideae
G . . . Zygophylloideae
H . . . Nitrarioideae
J . . . Balanitoideae
L . . Linaceae, flax
M . . . Linoideae (sub-family)
N . . . Ctenolophonoideae
P . . . Ixonanthoideae
Q . . . Humirioideae
S . . Erythroxylaceae, coca
FTL . Euphorbiineae, Euphorbiales, Tricoccae
M . . Euphorbiaceae (family)
P . . . Phyllanthoideae (sub-family)

ANGIOSPERMAE FS
DICOTYLEDONEAE FSL
ARCHICHLAMYDEAE FSL M
Geraniales FTJ J
. . Euphorbiaceae FTL M
. . . Phyllanthoideae FTL P

FTL Q . . . Euphorbioideae
R . . . . Crotoneae
T . . Daphniphyllaceae (family)
FTM Rutales (order), Terebinthales
L . Rutineae (sub-order)
N . . Rutaceae (family), rue
P . . . Rutoideae (sub-family)
Q . . . . Zanthoxyleae
R . . . . Ruteae
S . . . Dictyolomatoideae
T . . . Flindersioideae
V . . . Spathelioideae
W . . . Toddalioideae
X . . . Citroideae
Y . . . Rhabdodendroideae
FTN C . . Cneoraceae
E . . Simaroubaceae
F . . . Surianoideae (sub-family)
G . . . Simarouboideae
H . . . Picramnioideae
J . . . Alvaradoideae
L . . Burseraceae (family), balsam-trees
N . . Meliaceae
P . . . Cedreloideae (sub-family)
Q . . . Swietenioideae
R . . . Melioideae
T . . Akaniaceae
FTO . Malpighiineae (sub-order), Malpighiales
M . . Malpighiaceae (family)
N . . Trigoniaceae
P . . Vochysiaceae
R . Polygalineae (sub-order), Polygalales
T . . Tremandraceae (family)
V . . Polygalaceae, milk wort
X . . . Xanthophylleae
FTP Sapindales (order), Acerales, Terebinthales
M . Coriariineae (sub-order), Coriariales
P . Anacardiineae
Q . . Anacardiaceae, sumac
S . Sapindineae
T . . Aceraceae, maple
V . . Bretschneideraceae
FTQ A . . Sapindaceae, soap-berry trees
C . . . Dodonaeoideae (sub-family)
D . . . Sapindoideae, Eusapindaceae
F . . Hippocastanaceae, Aesculaceae, Horse chestnut
H . . Sabiaceae
J . . Melianthaceae
K . . Aextoxicaceae
M . Balsaminineae, Balsaminales
O . . Balsaminaceae

ARCHICHLAMYDEAE

Spermatophyta FQ
ANGIOSPERMAE FS
DICOTYLEDONEAE FSL
ARCHICHLAMYDEAE FSL M
Sapindales FTP
. . Balsaminaceae FTQ O

FTQ R Julianiales (order)
FTR Celastrales
M . Celastrineae (sub-order)
O . . Cyrillaceae (family)
P . . Pentaphylacaceae
Q . . Aquifoliaceae, holly
R . . Corynocarpaceae
S . . Celastraceae, spindle-tree
T . . Staphyleaceae
V . . Hippocrateaceae
FTS A . . Stackhousiaceae
C . . . Stackhousioideae (sub-family)
E . . Salvadoraceae
G . Buxineae (sub-order)
H . . Buxaceae (family), box
K . Icacinineae
L . . Icacinaceae
P Rhamnales (order)
R . Rhamnaceae (family), buckthorn
S . Vitaceae, vines
T . Leeaceae
FTT A Malvales (order)
C . Elaeocarpineae
E . . Elaeocarpaceae
G . Chlaenineae
I . Malvineae
J . . Tiliaceae (family), lime
K . . . Brownlowioideae
L . . . Tilioideae
M . . Malvaceae, mallow
N . . . Malveae
O . . . Hibisceae
Q . . Bombacaceae, cotton-trees
S . . Sterculiaceae
T . . . Byttnerieae
V . Scytopetalineae (sub-order)
W . . Scytopetalaceae (family)
FTU A Thymelaeales (order)
C . Geissolomataceae (family)
E . Penaeaceae
G . Dichapetalaceae, Chailletiaceae
J . Thymelaeaceae
L . . Gonystyloideae (sub-family)
M . . Aquilarioideae
N . . Gilgiodaphnoideae
P . . Thymelaeoideae
R . Elaegnaceae (family), oleaster

Spermatophyta FQ
ANGIOSPERMAE FS
DICOTYLEDONEAE FSL
ARCHICHLAMYDEAE FSL M
Thymelaeales FTU A
. Elaegnaceae FTU R

FTV Violales (order), Parietales, Bixales
L . Flacourtiineae (sub-order), Flacourtiales
N . . Flacourtiaceae (family), Samydaceae
P . . . Lacistemeae
R . . Violaceae, violets
S . . Stachyuraceae
T . . Turneraceae
W . . Malesherbiaceae
X . . Passifloraceae, passion-flower
FTW C . . Achariaceae
E . Cistineae
G . Tamaricineae (sub-order), Tamaricales
I . . Tamaricaceae (family), tamarisk
J . Caricineae, Papayineae
K . Loasineae, Loasales
L . . Loasaceae
N . Begoniineae, Begoniales, Datiscales
O . . Datiscaceae
P . . Begoniaceae
R Cucurbitales (order), Peponiferae
T . Cucurbitaceae
V . . Melothriceae
W . . Cucurbiteae
X . . Sicyoideae
FTX Myrtiflorae (order), Myrtales
M . Myrtineae (sub-order)
N . . Lythraceae (family)
P . . Crypteroniaceae
Q . . Myrtaceae, myrtle
R . . . Leptospermoideae (sub-family)
S . . . Myrtoideae
T . . Sonneratiaceae
FTY A . . Punicaceae, pomegranate
C . . Lecythidaceae, monkey-pot
D . . . Planchonioideae
E . . . Lecythidoideae
F . . . Napoleonoideae
H . . Melastomataceae
J . . . Melastomatoideae (sub-family)
K . . . Astronioideae
L . . . Memecyloideae
N . . Rhizophoraceae, mangroves
P . . Combretaceae, Terminaliaceae
Q . . Onagraceae, Oenotheraceae
R . . Oliniaceae
S . . Haloragaceae
T . . . Haloragoideae
V . . . Gunneroideae
W . . Theliogonaceae, Cynocrambaceae
FUB . Hippuridineae (sub-order), Hippuridales
L . . Hippuridaceae, Mare's tail

SYMPETALAE

ANGIOSPERMAE FS
DICOTYLEDONEAE FSL
ARCHICHLAMYDEAE FSL M
. Myrtiflorae FTX
. . Hippuridineae FUB
. . . Hippuridaceae FUB L

FUB N . . Cynomoriineae, Cynomoriales
P . . . Cynomoriaceae
FUD . Umbelliflorae (order), Umbelliferales, Umbellales, Apiales, Ammiales
L . . Alangiaceae (family)
N . . Nyssaceae, tupelo
P . . Cornaceae, dogwood
Q . . . Curtisioideae (sub-family)
R . . . Mastixioideae
S . . . Cornoideae
T . . Garryaceae
V . . Araliaceae, ginseng
W . . . Aralieae, ivy
FUE A . . Umbelliferae, Apiaceae, Ammiaceae
C . . . Hydrocotyloideae
D . . . . Hydrocotyleae
E . . . . Mulineae
G . . . Saniculoideae
H . . . . Saniculeae
J . . . . Lagoecieae
L . . . Apioideae
N . . . . Echinophoreae
P . . . . Scandiceae
Q . . . . Coriandreae
R . . . . Smirnieae
S . . . . Peucedameae
T . . . . Laserpitieae
V . . . . Dauceae

FUF SYMPETALAE (sub-class), Metachlamydeae
M . Diapensiales (order)
N . . Diapensiaceae (family)
P . Ericales, heaths
Q . . Clethraceae
R . . Pyrolaceae, wintergreen
S . . . Pyroloideae (sub-family)
T . . . Monotropoideae
FUG A . . Ericaceae, heather
C . . . Rhododendroideae
D . . . Arbutoideae
E . . . . Andromedeae
F . . . Vaccinioideae
G . . . . Gaylussacieae
H . . . Ericoideae
K . . Empetraceae
L . . Epacridaceae

Spermatophyta FQ
ANGIOSPERMAE FS
DICOTYLEDONEAE FSL
SYMPETALAE FUF
Ericales FUF P
. Epacridaceae FUG L

FUH Primulales (order)
M . Theophrastaceae (family)
N . Myrsinaceae
P . . Myrsinoideae (sub-family)
Q . . Maesoideae
R . Primulaceae, primroses
S . . Lysimachieae
T . . Cyclamineae
V . . Primuleae, Androsaceae
W . . Samoleae
FUI A Plumbaginales (order)
C . Plumbaginaceae, lead-wort
D . . Plumbagineae
E . . Staticeae
G Ebenales (order), Diospyrales
H . Sapotineae (sub-order)
J . . Sapotaceae (family)
K . . . Sideroxyloideae (sub-family)
L . . . . Bumelieae
M . . . Achradoideae
N . . . . Mimusopeae
P . Ebenineae, Diospryineae
Q . . Ebenaceae, ebony
R . . Styracaceae
S . . Lissocarpaceae
T . . Symplocaceae
V . . Hoplestigmataceae
FUJ Oleales (order), Ligustrales
M . Oleaceae (family), olives
N . . Jasminoideae (sub-family)
P . . . Jasmineae
Q . . . Forsythieae
S . . Oleoideae
T . . . Fraxineae
V . . . Oleae
FUL Gentianales (order), Contortae, Loganiales, Apocynales
L . Loganiaceae (family)
M . . Gelsemieae
N . . Loganieae
P . . Spigelieae
Q . . Strychneae
S . Desfontainiaceae
T . Gentianaceae, gentian
V . Menyanthaceae
FUM A . Apocynaceae
C . . Plumerioideae (sub-family)
D . . Cerberoideae
E . . Apocynoideae, Echitoideae
G . Asclepiadaceae (family), silk-weed
H . . Periplocoideae (sub-family)

SYMPETALAE

ANGIOSPERMAE FS
DICOTYLEDONEAE FSL
SYMPETALAE FUF
Gentianales FUL
. Asclepiadaceae FUM G
. . Periplocoideae FUM H

FUM J . Rubiaceae
L . . Cinchonoideae (sub-family)
M . . Rubioideae, Coffeoideae
FUN Tubiflorae (order), Solanales
L . Convolvulineae (sub-order), Convovulales, Polemoniales
M . . Polemoniaceae (family), Jacob's ladder
N . . . Cobaeeae
P . . Fouquieriaceae
Q . . Convolvulaceae, bindweed
R . . . Convolvuloideae (sub-family)
S . . . . Convolvuleae
T . . . Cuscutoideae
FUO A . Boraginineae Boraginales, Lamiales, Lennoineae
C . . Hydrophyllaceae (family)
D . . Boraginaceae
E . . . Cordioideae (sub-family)
F . . . Ehretioideae
G . . . Heliotropoideae
H . . . Boraginoideae
J . . . Wellstedioideae
L . . Lennoaceae
N . Verbenineae (sub-order), Verbenales, Lamiales
P . . Verbenaceae (family)
Q . . . Viticoideae (sub-family)
R . . . . Viticeae
S . . . Verbenoideae (sub-family)
T . . . . Verbeneae
V . . . Avicennioideae
X . . Callitrichaceae
FUP A . . Labiatae
B . . . Prostantheroideae (sub-family)
C . . . Ajugoideae
D . . . Ocimoideae
E . . . Catopherioideae
F . . . Lavanduloideae
G . . . Prasioideae
H . . . Stachyoideae
J . . . . Saturejeae
K . . . . Monardeae
L . . . Scutellarioideae
N . Solanineae (sub-order), Personatae, Scrophulariales, Gesneriales
P . . Nolanaceae (family)
Q . . Solanaceae, deadly nightshade
R . . . Solaneae
S . . . Datureae
T . . . Cestreae
V . . . Salpiglossideae

DICOTYLEDONEAE FSL
SYMPETALAE FUF
Tubiflorae FUN
. Solanineae FUP N
. . Solanaceae FUP Q
. . . Salpiglossideae FUP V

FUQ A . . Scrophulariaceae
C . . . Scrophularioideae (sub-family), Antirrhinoideae, Pseudosolanoideae
D . . . . Gratioleae
E . . . . Verbasceae
F . . . . Collinsieae
G . . . . Antirrhineae
J . . . Rhinanthoideae
K . . . . Digitaleae
L . . . . Buchereae, Gerardieae
M . . . . Veroniceae
P . . Globulariaceae (family), globe daisy
Q . . Bignoniaceae, calabast
R . . Acanthaceae
S . . . Nelsonioideae (sub-family)
T . . . Thunbergioideae
V . . . Mendoncioideae
W . . . Acanthoideae
FUR A . . Pedaliaceae (family), sesame
C . . Martyniaceae
D . . Gesneriaceae
E . . . Cyrtandroideae
F . . . Gesnerioideae
G . . Columelliaceae
H . . Orobanchaceae, broom-rape
J . . Lentibulariaceae, butter wort
L . Myoporineae (sub-order), Myoporales
M . . Myoporaceae (family)
O . Phyrmineae
P . . Phrymaceae
R Plantaginales (order)
S . Plantaginaceae (family), plantains
FUS Dipsacales, Rubiales
M . Caprifoliaceae, honeysuckle
P . Adoxaceae, moschatel
R . Valerianaceae
T . Dipsaeaceae, teasels
FUT Campanulales (order), Campanulatae, Asterales, Synandrae
L . Campanulaceae (family)
M . . Campanuloideae (sub-family)
N . . Cyphioideae
O . . Lobelioideae
P . Goodeniaceae
Q . Brunoniaceae
R . Stylidiaceae, Candolleaceae
S . . Donatioideae (sub-family)
T . . Stylidiodeae
V . Calyceraceae

MONOCOTYLEDONEAE

Embryophyta FNO
Tracheophyta FOY
Spermatophyta FQ
ANGIOSPERMAE FS
DICOTYLEDONEAE FSL
. . . Calyceraceae FUT V

FUV . . . Compositae, Asteraceae
M . . . . Asteroideae, Carduoideae, Tubuliflorae
N . . . . . Veronieae
P . . . . . Eupatorieae
Q . . . . . Astereae
R . . . . . Inuleae
S . . . . . Heliantheae
T . . . . . Helenieae
V . . . . . Anthemideae
FUW A . . . . . Senecionieae
C . . . . . Calenduleae
D . . . . . Arctoteae
E . . . . . Cardueae, Cynareae
F . . . . . Mutisieae
J . . . . Cichorioideae, Liguliflorae

FV MONOCOTYLEDONEAE (class)
FVL . Helobiae (order), Alismatales
M . . Alismatineae (sub-order)
N . . . Alismataceae (family)
O . . . Butomaceae
Q . . Hydrocharitineae
R . . . Hydrocharitaceae
S . . . . Hydrocharitoideae
T . . . . . Stratioteae
V . . . . . Hydrochariteae, frog-bit
W . . . . Vallisnerioideae
X . . . . Thalassioideae
Y . . . . Halophiloideae
FVM C . . Scheuchzeriineae (sub-order)
D . . . Scheuchzeriaceae
F . . Potamogetonineae
H . . . Aponogetonaceae
J . . . Juncaginaceae
K . . . Potamogetonaceae
L . . . . Zostereae
M . . . Zannichelliaceae
N . . . . Cymodoceaceae
P . . . Najadaceae
R . Triuridales (order)
T . . Triuridaceae

Tracheophyta FOY
Spermatophyta FQ
ANGIOSPERMAE FS
MONOCOTYLEDONEAE FV
Triuridales FVM R
. Triuridaceae FVM T

FVN Liliiflorae, Liliales
L . Liliineae (sub-order)
M . . Liliaceae (family)
N . . . Melanthioideae
P . . . Herrerioideae
Q . . . Asphodeloideae
R . . . Wurmbaeoideae
S . . . Lilioideae
T . . . Scilloideae
V . . . Allioideae
FVO A . . . Asparagoideae
B . . . . Asparageae
C . . . Ophiopogonoideae (sub-family)
E . . . Aletroideae
F . . . Luzuriagoideae
H . . Xanthorrhoeaceae (family)
J . . Stemonaceae
K . . Agavaceae
L . . Haemodoraceae
M . . Cyanastraceae
N . . Amaryllideae, narcissi
O . . . Amaryllidoideae (sub-family)
Q . . Hypoxidaceae
R . . Velloziaceae
T . . Taccaceae
V . . Dioscoreaceae (Tamaceae)
FVP A . Pontederiineae (sub-order), Pontederiales
B . . Pontederiaceae
D . Iridineae, Iridales
E . . Iridaceae (family), irises
G . Burmanniineae, Burmanniales
H . . Burmanniaceae
J . Philydrineae, Philydrales
N Juncales (order)
O . Juncaceae (family), rushes
Q Bromeliales (order)
R . Bromeliaceae (family), pineapple
FVQ A Commelinales, Farinosae, Enantoblastae
C . Commelinineae (sub-order)
D . . Commelinaceae
E . . Mayacaceae
F . . Xyridaceae
G . . Rapateaceae (family)
J . Eriocaulineae
K . . Eriocaulaceae (family)
L . . . Paepalanthoideae (sub-family)
N . Restionineae, Restionales
O . . Restionaceae
P . . Centrolepidaceae
R . Flagellariineae
S . . Flagellariaceae

MONOCOTYLEDONEAE

Tracheophyta FOY
Spermatophyta FQ
ANGIOSPERMAE FS
MONOCOTYLEDONEAE FV
Commelinales FVQ A
. . Flagellariaceae FVQ S

FVR A Graminales (order), Poales, Glumiflorae
C . Gramineae (family), Poaceae, grasses
D . . Pooideae, sub-family, Festucoideae
E . . . Poeae, Festuceae
F . . . Triticeae, Hordeeae
G . . . Aveneae
H . . . Phalarideae
J . . Eragrostoideae
K . . . Chlorideae
L . . . Lappagineae, Zoysieae
N . . Oryzoideae
O . . . Oryzeae
P . . Panicoideae
Q . . . Melinideae, Tristegineae
R . . Andropogonoideae
S . . . Andropogoneae
T . . . Maydeae
V . . Bambusoideae
W . . . Bambuseae
FVS Principes, Palmales, Arecales
L . Palmae (family), Arecaceae
N . . Nypoideae
O . . Borassoideae
P . . Lepidocanjoideae
Q . . Coryphoideae
R . . Phoenicoideae
S . . Arecoideae
T . . Phytelephantoideae
V Synanthae (order), Cyclanthales
W . Cyclanthaceae (family)
FVT A Spathiflorae (order), Arales
C . Araceae (family)
D . . Pothoideae (sub-family)
E . . Monsteroideae
F . . Calloideae
G . . Lasioideae
H . . Philodendroideae
J . . Colocasioideae
K . . Aroideae
L . . Pistioideae
N . Lemnaceae (family)
P . . Lemnoideae (sub-family)
Q . . Wolffioideae
S Pandanales (order)
T . Pandanaceae (family)
V . Sparganiaceae
W . Typhaceae
FVU A Cyperales (order)
C . Cyperaceae (family)

Tracheophyta FOY
Spermatophyta FQ
ANGIOSPERMAE FS
MONOCOTYLEDONEAE FV
Cyperales FVU A
. Cyperaceae FVU C

FVU E Scitamineae (order), Zingiberales, Musales
G . Musaceae (family), bananas
GN . . Strelitzioideae (sub-family)
H . . Musoideae
K . Zingiberaceae, Curcumaceae, Alpiniaceae, ginger
L . . Zingiberoideae
M . . Costoideae
P . Cannaceae
Q . Marantaceae, arrowroot
S . Lowiaceae
FVV Microspermae (order), Orchidales, Gynandrae
L . Orchidaceae (family), orchids
N . . Cypripedioideae
P . . Apostasieae
Q . . Cypripedieae
R . . Orchidoideae (sub-family), Monandrae