

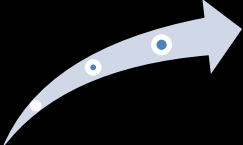
**CRITERIA FOR ALGAL
CLASSIFICATION**

&

**CHARACTERISTIC FEATURES
OF ALGAL CLASSES**

PRINCIPAL PHOTOSYNTHETIC PIGMENTS

UNIVERSAL PIGMENT



CHLOROPHYLL A
CHLOROPHYLL B
CHLOROPHYLL C
CHLOROPHYLL D

CHLOROPHYLL A AND B – CHLOROPHYCOTA AND EUGLENOPHYCOTA;
CHLOROPHYLL A AND C – CHROMOPHYCOTA
CHLOROPHYLL A AND D – RHODOPHYCOTA

ACCESSORY PHOTOSYNTHETIC PIGMENTS

CAROTENOIDS: α -CAROTENE
 β -CAROTENE
 γ -CAROTENE

XANTHOPHYLLS: MYXOXANTHIN, ZEAXANTHIN,
 CRYPTOXANTHIN, FUCOXANTHIN,
 DIATOXANTHIN, DIADINOXANTHIN, HETERO-
 XANTHIN, VAUCHERIA XANTHIN, VIOLAXANTHIN,
 ASTAXANTHIN, ANTERAXANTHIN, NEOXANTHIN,
 SIPHONOXANTHIN, SIPHONIN, PERIDININ AND
 NEOPERIDININ

PHYCOBILIPROTEINS: PHYCOCYANIN, ALLOPHYCOCYANIN AND
 PHYCOERYTHRIN

PHOTOSYNTHETIC APPARATUS

THYLAKOID / PLASTID

FREE / STACKED

NO. OF THYLAKOIDS IN STACKS

CHLOROPLAST ENDOPLASMIC RETICULUM

CONTINUITY OF CER WITH NM

FOOD RESERVES

PHYCOCYANIN GRANULES

FLORIDEAN STARCH

CHRYSOLAMINARIN

β -1,3-LINKED GLUCOSE

FATS AND OILS

LIPIDS

STARCH

LAMINARIN

MANNITOL

PARAMYLON

CELL WALL CONSTITUENTS

PEPTIDOGLYCAN

CELLULOSE

XYLAN (BANGIOPHYCIDAE)

POLYSACCHARIDES

CALCIUM CARBONATE

SCALES

SILICA

ALGINIC ACID

PERIPLAST

PELLICLE

MANNAN

FLAGELLAR CHARACTERISTICS

AKONT

ISOKONT

HETEROKONT

STEPHANOKONT

PSEUDOFLAGELLA

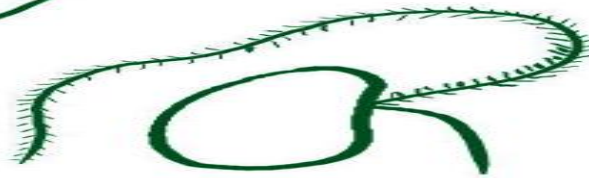
HAPTONEMA

HOMODYNAMIC

HETERODYNAMIC



1



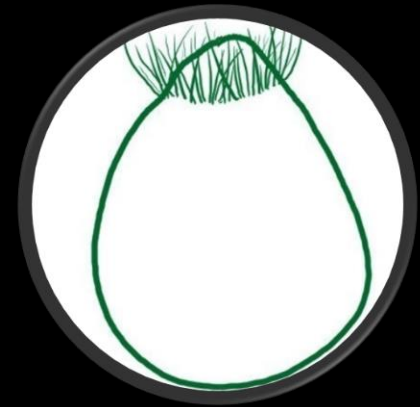
2



3

FLAGELLAR POSITION

APICAL
SUBAPICAL
LATERAL
TRANSVERSE
POSTERIOR



STRUCTURE AND NO. OF FLAGELLA

WHIPLASH
TINSEL
HAIR POINT
PERIPHERAL MICROTUBULES
CENTRAL MICROTUBULES
BASAL BODY
SCALES

ONE
TWO
THREE
FOUR
NUMEROUS



Oedogonium

SEXUAL REPRODUCTION AND LIFE-CYCLE

SEXUAL REPRODUCTION : PRESENT/ABSENT

LIFE-CYCLE: MONOPHASIC

BIPHASIC

TRIPHASIC

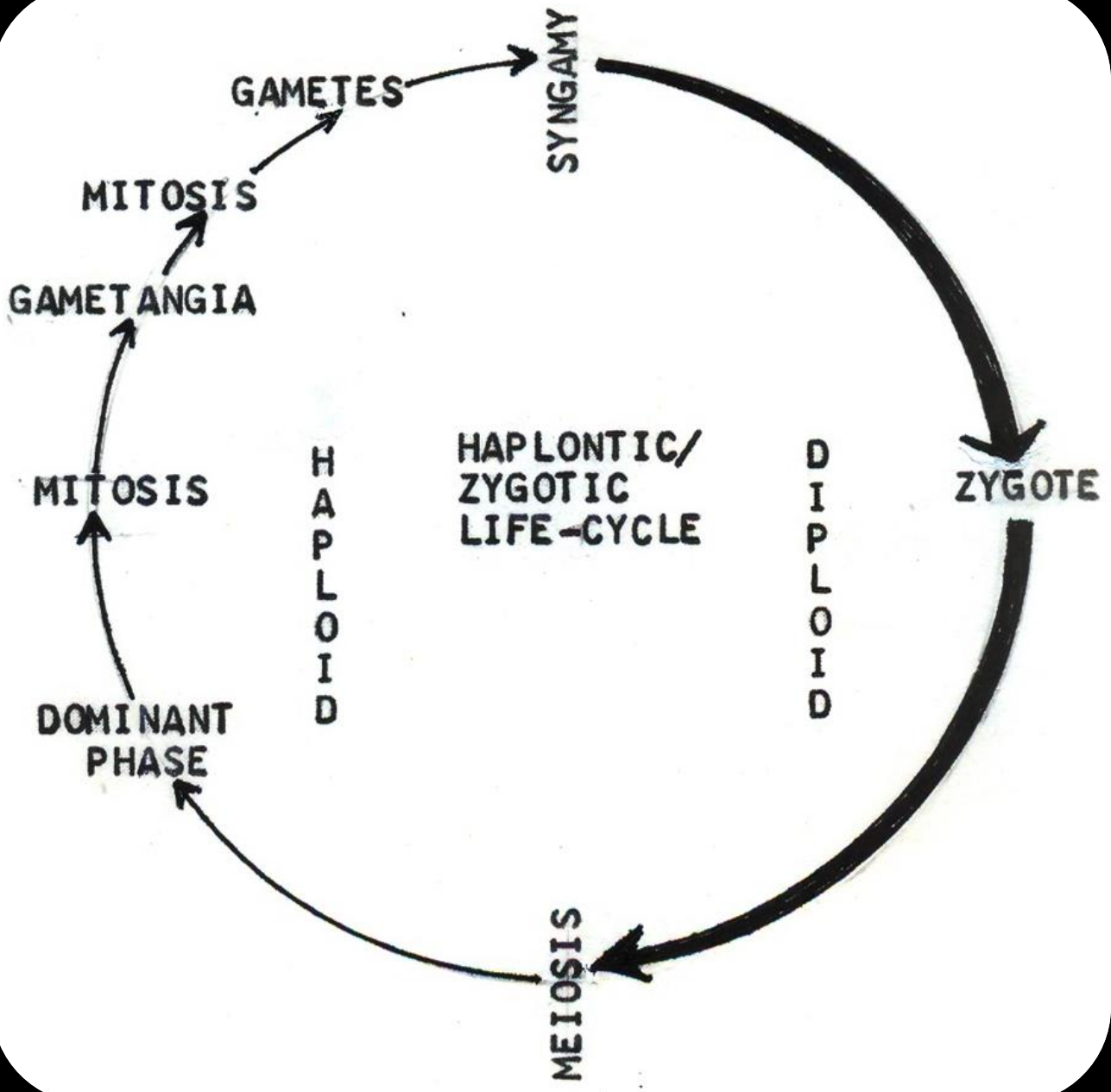
ZYGOTIC OR HAPLONTIC

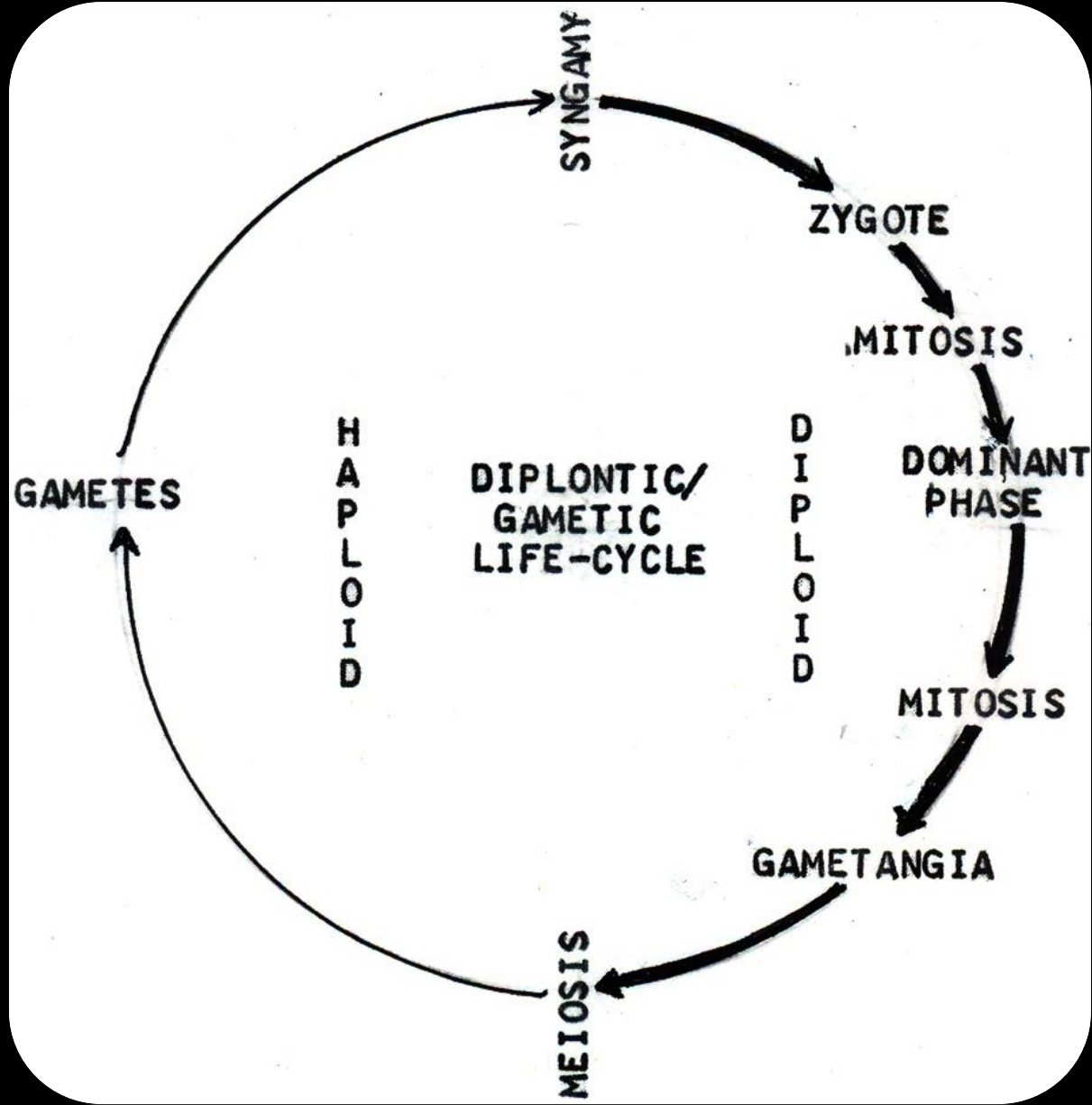
GAMETIC OR DIPLONTIC

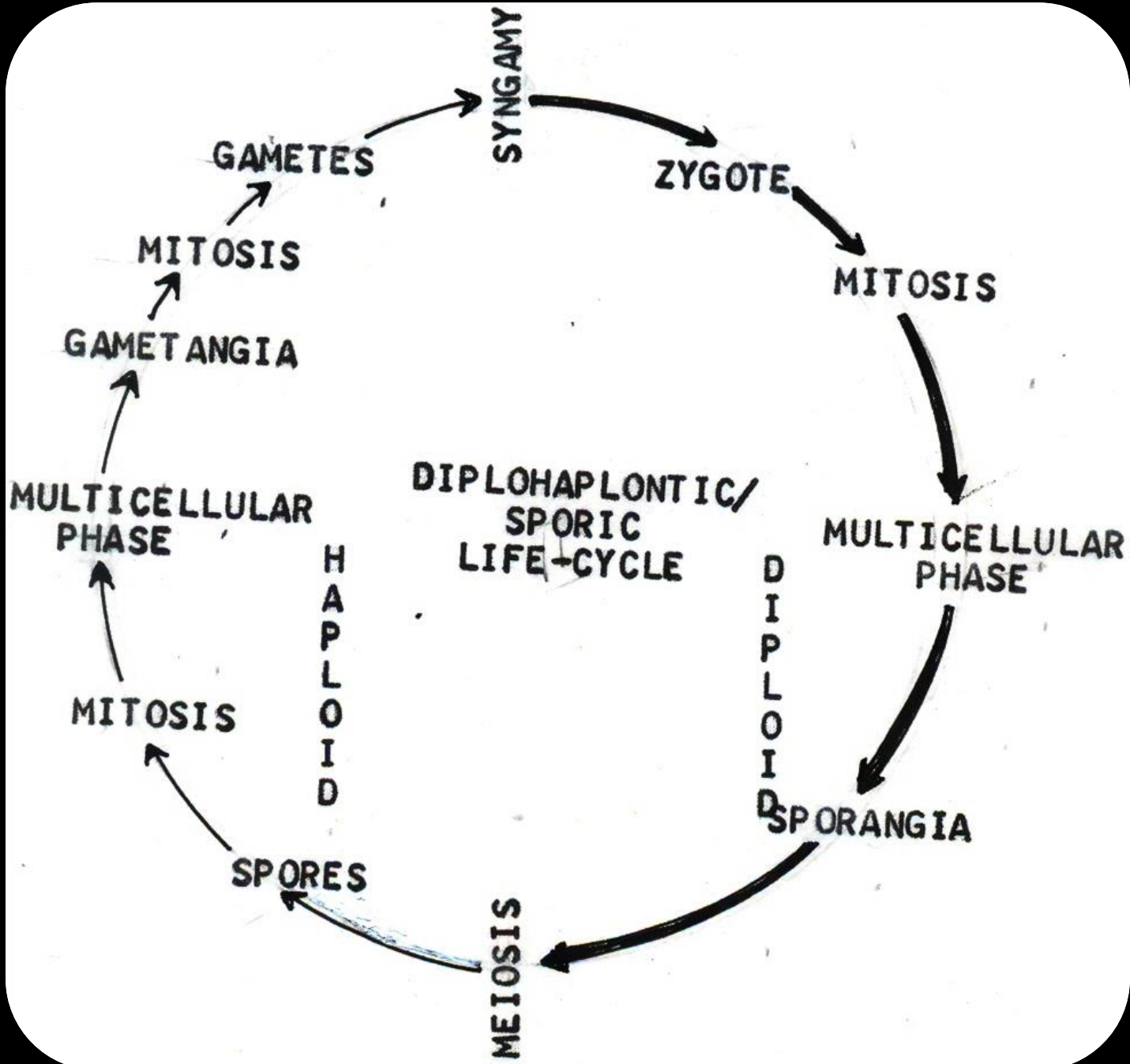
SPORIC OR DIPLOHAPLONTIC

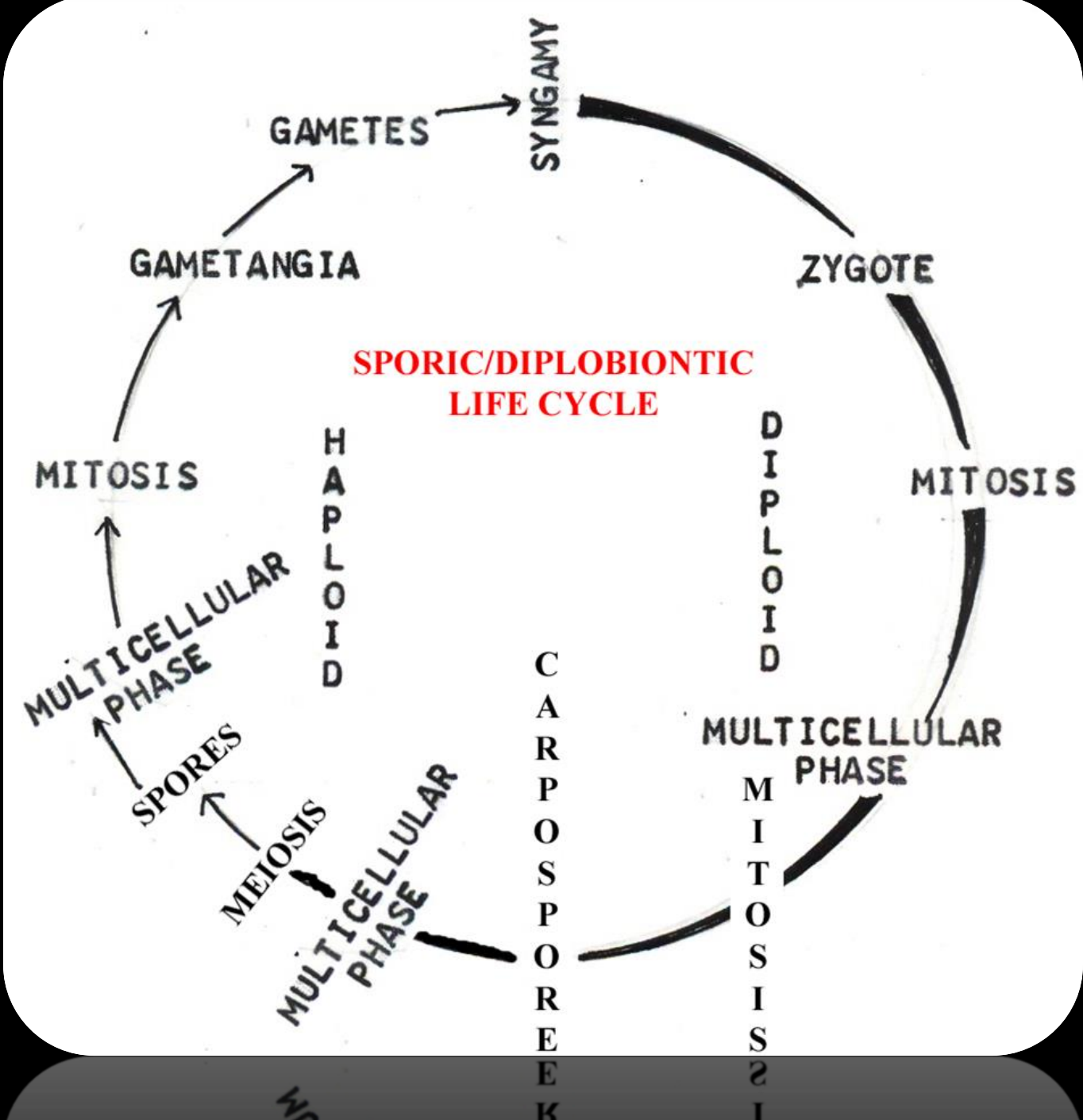
DIPLOBIONTIC

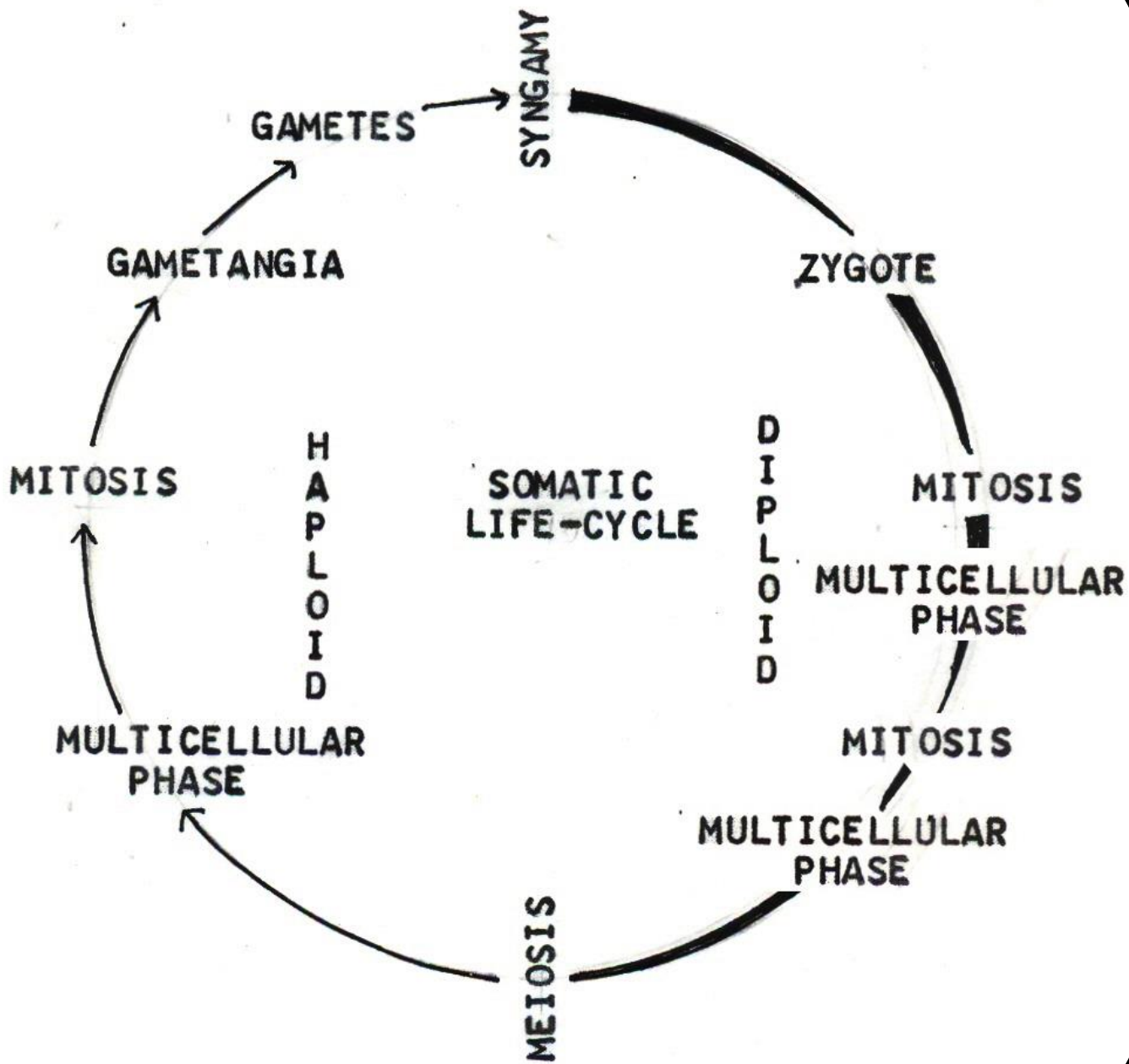
SOMATIC

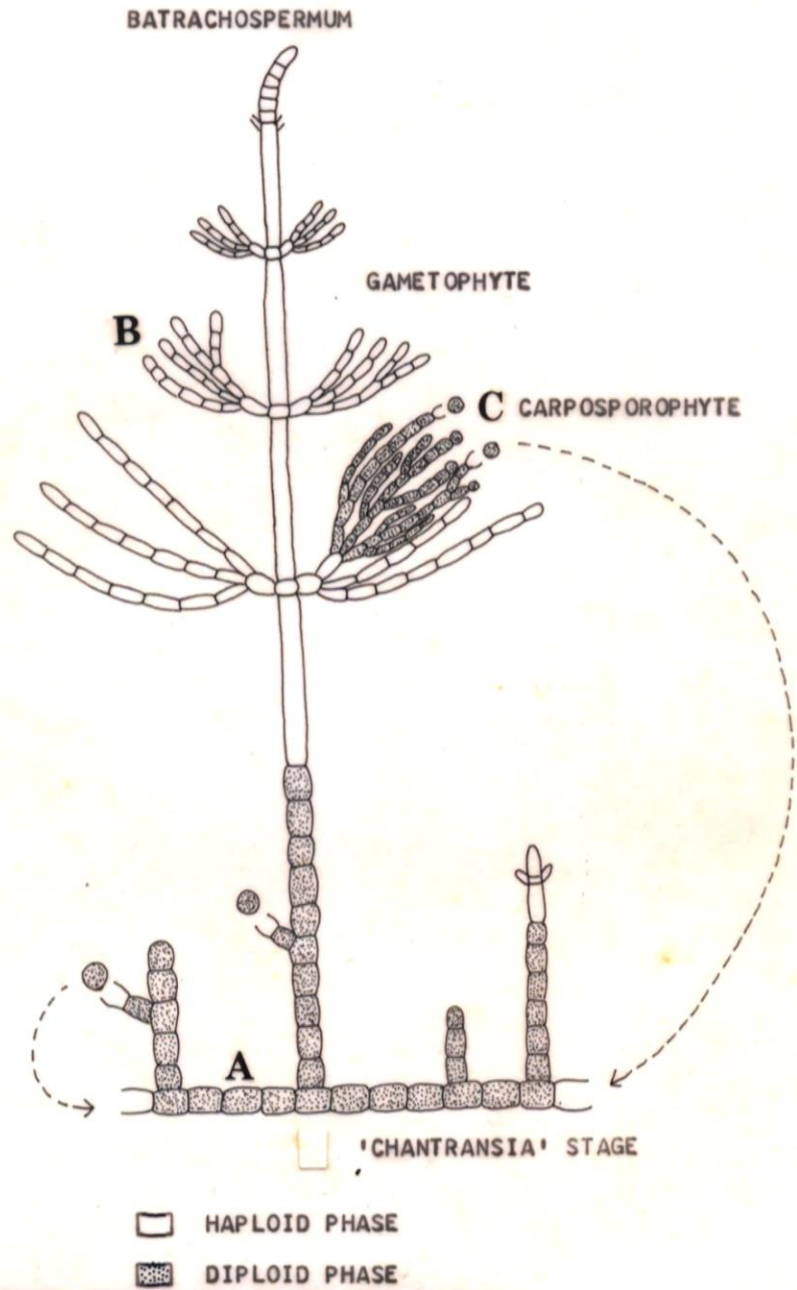
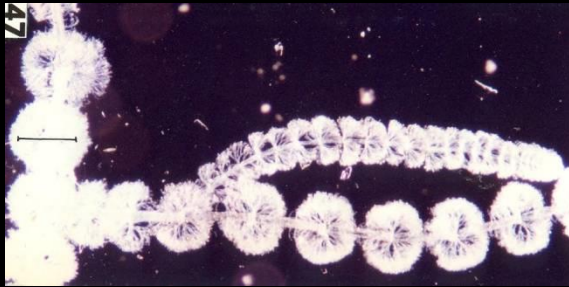












CHARACTERISTICS OF ALGAL CLASSES

SUBKINGDOM

DIVISION

CLASS

PIGMENTS

CELL WALL

FOOD RESERVE

FLAGELLA

PHOTOSYNTHETIC APPARATUS

SEXUAL REPRODUCTION AND LIFE-CYCLE

CHARACTERISTICS OF ALGAL CLASSES

PROKARYOTA

CYANOPHYCOTA

CYANOPHYCEAE

PIGMENTS

CHLOROPHYLL A
β-CAROTENE
PHYCOCYANIN
ALLOPHYCOCYANIN
PHYCOERYTHRIN

CELL WALL

FOUR LAYERED
PEPTIDOGLYCAN IS PRINCIPAL
COMPONENT

FOOD RESERVES

PHYCOCYANIN GRANULES
(ARGININE AND ASPARTIC
ACID)

FLAGELLA

ABSENT

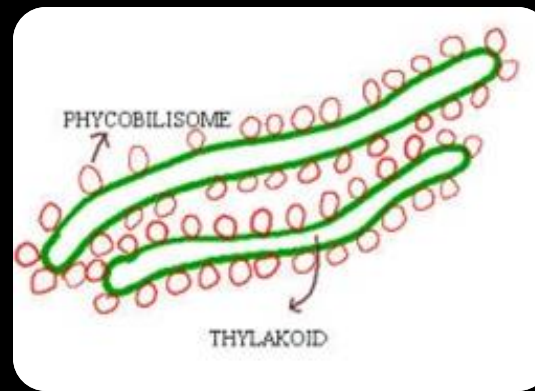
SEXUAL REPRODUCTION AND

LIFE-CYCLE

NO SEXUAL REPRODUCTION

PHOTOSYNTHETIC APPARATUS

NO CHLOROPLAST. THYLAKOIDS FREE
IN CYTOPLASM. UNSTACKED .
WITH PHYCOBILISOMES



CHARACTERISTICS OF ALGAL CLASSES

PROKARYOTA

PROCHLOROPHYCOTA

PROCHLOROPHYCEAE

PIGMENTS

CHLOROPHYLL A

CHLOROPHYLL B

β -CAROTENE

ZEAXANTHIN

CRYPTOXANTHIN

FOOD RESERVES

NOT KNOWN

PHOTOSYNTHETIC APPARATUS

ONLY THYLAKOIDS, FREE, SOME
STACKING IN PAIRS OR MORE

CELL WALL

FOUR LAYERED,
PEPTIDOGLYCAN IS
PRINCIPAL COMPONENT

FLAGELLA

ABSENT

SEXUAL REPRODUCTION AND LIFE-CYCLE

NO SEXUAL REPRODUCTION



CHARACTERISTICS OF ALGAL CLASSES

EUKARYOTA

RHODOPHYCOTA

RHODOPHYCEAE

PIGMENTS

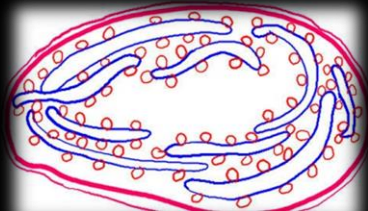
CHLOROPHYLL A
CHLOROPHYLL D
PHYCOCYANIN
ALLOPHYCOCYANIN
PHYCOERYTHRIN
ALPHA AND BETA CAROTENE

FOOD RESERVES

FLORIDEAN STARCH

CHLOROPLAST FEATURES

CHLOROPLAST ENVELOPE 2 LAYERED
CHL ER ABSENT, THYLAKOIDS
UNSTACKED



CELL WALL

CELLULOSE
(XYLAN IN SOME BANGIOPHYCIDAE)
POLYSACCHARIDES. SOME CALCIFIED
WITH CaCO_3

FLAGELLA

ABSENT

SEXUAL REPRODUCTION AND LIFE-CYCLE

SEXUAL-REPRODUCTION COMPLECATED
POST-FERTILIZATION DEVT.
LIFE-CYCLE: SOMATIC; SPORIC (ISOMOR-
PHIC), HETEROMORPHIC - PALMARIALES

CHARACTERISTICS OF ALGAL CLASSES

EUKARYOTA CHROMOPHYCOTA BACILLARIOPHYCEAE

PIGMENTS

CHLOROPHYLL A

CHLOROPHYLL C

β- CAROTENE

FUCOXANTHIN

DIATOXANTHIN

DIADINOXANTHIN

FOOD RESERVES

CHRYSOLAMINARIN

LIPIDS

PHOTOSYNTHETIC APPARATUS

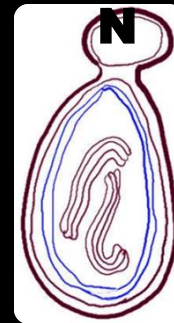
**TWO ADDITIONAL MEMBRANES OF CHL ER.
THE OUTER CONTINUOUS WITH OUTER MEMBRANE
OF NUCLEAR ENVELOPE. THYLAKOIDS IN STACKS
OF THREE**

CELL WALL

SILICA FRUSTULE

FLAGELLA

**MALE GAMETES WITH SINGLE HAIRY
FLAGELLUM WHICH LACKS CENTRAL
MICROTUBELES**



SEXUAL REPRODUCTION AND LIFE-CYCLE

DIPLONTIC OR GAMETIC

CHARACTERISTICS OF ALGAL CLASSES

EUKARYOTA CHROMOPHYCOTA

CHRYSOPHYCEAE

PIGMENTS

CHLOROPHYLL A
CHLOROPHYLL C
FUCOXANTHIN

CELL WALL

**NAKED, SCALES OR
LORICA IN SOME**

FLAGELLA

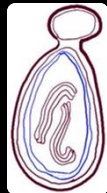
**NORMALLY TWO UNEQUAL;
SMOOTH POSTERIOR
SHORTER; HAIRY
ANTERIOR LONGER**

FOOD RESERVES

CHRYSOLAMINARIN

PHOTOSYNTHETIC APPARATUS

**TWO ADDITIONAL MEMBRANES OF CHL ER.
THE OUTER CONTINUOUS WITH OUTER MEMBRANE
OF NUCLEAR ENVELOPE. THYLAKOIDS IN STACKS
OF THREE**



SEXUAL REPRODUCTION AND LIFE-CYCLE

HAPLONTIC OR ZYGOTIC

CHARACTERISTICS OF ALGAL CLASSES

EUKARYOTA CHROMOPHYCOTA

CRYPTOPHYCEAE

PIGMENTS

CHLOROPHYLL A

CHLOROPHYLL C

α-CAROTENE

DIATOXANTHIN

PHYCOERYTHRIN

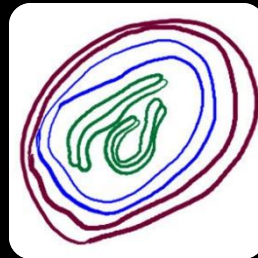
PHYCOCYANIN

FOOD RESERVES

STARCH LIKE

PHOTOSYNTHETIC APPARATUS

**TWO ADDITIONAL MEMBRANES OF CHL ER.
THYLAKOIDS IN PAIRS**



CELL WALL

PERIPLAST

FLAGELLA

**TWO, APICAL OR LATERAL,
EQUAL HAIRY**

SEXUAL REPRODUCTION AND LIFE-CYCLE

**SEXUAL REPRODUCTION
NOT KNOWN**

CHARACTERISTICS OF ALGAL CLASSES

EUKARYOTA CHROMOPHYCOTA

RAPHIDOPHYCEAE

PIGMENTS

CHLOROPHYLL A

CHLOROPHYLL C

?FUCOXANTHIN

DIATOXANTHIN

DIADINOXANTHIN

HETEROXANTHIN

FOOD RESERVES

NOT KNOWN

PHOTOSYNTHETIC APPARATUS

**TWO ADDITIONAL MEMBRANES OF CHL ER.
THYLAKOIDS IN STACKS OF THREE**

CELL WALL

NAKED

FLAGELLA

**TWO, UNEQUAL; THE ANTERIOR
LONGER, HAIRY; THE POSTERIOR
SHORTER, SMOOTH.**

SEXUAL REPRODUCTION AND LIFE-CYCLE

**SEXUAL REPRODUCTION
NOT KNOWN**

CHARACTERISTICS OF ALGAL CLASSES

EUKARYOTA CHROMOPHYCOTA

DINOPHYCEAE

PIGMENTS

CHLOROPHYLL A

CHLOROPHYLL C

β-CAROTENE

PERIDININ

NEOPERIDININ

CELL WALL

CELLULOSIC THECA.

BODY SCALES RARE

FLAGELLA

USUALLY TWO. TRANSVERSE AND LONGITUDINAL, HEEROKONTIC, TRANSVERSE LONGER, HELICAL RUNS IN A GROOVE OR GIRDLE, SHORTER LONGITUDINAL DIRECTED POSTERIORLY

FOOD RESERVES

STARCH

PHOTOSYNTHETIC APPARATUS

**TWO ADDITIONAL MEMBRANES OF CHL ER.
THYLAKOIDS IN STACKS OF THREE**

SEXUAL REPRODUCTION AND LIFE-CYCLE

HAPLONTIC (DIPLONTIC IN *Noctiluca miliaris*)

CHARACTERISTICS OF ALGAL CLASSES

EUKARYOTA CHROMOPHYCOTA

XANTHOPHYCEAE

PIGMENTS

CHLOROPHYLL A
CHLOROPHYLL C
β-CAROTENE
DIATOXANTHIN
DIADINOXANTHIN
HETEROXANTHIN
VAUCHERIA XANTHIN

FOOD RESERVES

BETA 1,3-LINKED GLUCAN,
FATS AND OILS

PHOTOSYNTHETIC APPARATUS

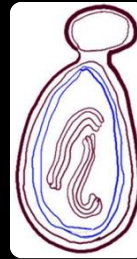
TWO ADDITIONAL MEMBRANES OF CHL ER.
THE OUTER CONTINUOUS WITH OUTER MEMBRANE
OF NUCLEAR ENVELOPE. THYLAKOIDS IN STACKS
OF THREE

CELL WALL

CELLULOSE, GLUCOSE AND
URONIC ACIDS. MANY WALLS
ARE BIPARTITE

FLAGELLA

USUALLY TWO, UNEQUAL; THE
ANTERIOR LONGER, HAIRY;
THE POSTERIOR SHORTER, SMOOTH



SEXUAL REPRODUCTION AND LIFE-CYCLE

DIPLOHAPLONTIC OR
SPORIC. ISOMOPHIC,
BIPHASIC

CHARACTERISTICS OF ALGAL CLASSES

EUKARYOTA CHROMOPHYCOTA PRYMNESIOPHYCEAE

PIGMENTS

CHLOROPHYLL A
CHLOROPHYLL C
β CAROTENE

**THIS CLASS IS ALSO
CALLED AS
HAPTOPHYCEAE**

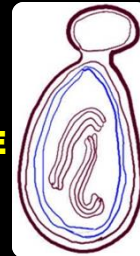
**CELL WALL
ORGANIC SCALES IN
ONE TO SEVERAL
LAYERS**

**FOOD RESERVES
CHRYSLAMINARIN**

**FLAGELLA
TWO, UNEQUAL, SMOOTH WITH
HAPTONEMA**

PHOTOSYNTHETIC APPARATUS

**TWO ADDITIONAL MEMBRANES OF CHL ER.
THE OUTER CONTINUOUS WITH OUTER MEMBRANE
OF NUCLEAR ENVELOPE. THYLAKOIDS IN STACKS
OF THREE**



**SEXUAL REPRODUCTION
AND LIFE-CYCLE
DIPLOHAPLONTIC OR
SPORIC (HETEROMORPHIC)**

CHARACTERISTICS OF ALGAL CLASSES

EUKARYOTA CHROMOPHYCOTA EUSTIGMATOPHYCEAE

PIGMENTS

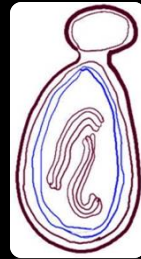
CHLOROPHYLL A
CHLOROPHYLL C
 β CAROTENE
VIOLAXANTHIN
VAUCHERIAANTHIN

CELL WALL
NAKED

FLAGELLA

SINGLE ANTERIOR HAIRY FLAGELLUM;
AND A BASAL BODY

FOOD RESERVES
OIL



PHOTOSYNTHETIC APPARATUS

TWO ADDITIONAL MEMBRANES OF CHL ER.
THE OUTER CONTINUOUS WITH OUTER MEMBRANE
OF NUCLEAR ENVELOPE. THYLAKOIDS IN STACKS
OF THREE

SEXUAL REPRODUCTION
AND LIFE-CYCLE
SEXUAL REPRODUCTION
ABSENT

CHARACTERISTICS OF ALGAL CLASSES

EUKARYOTA CHROMOPHYCOTA PHAEOPHYCEAE

PIGMENTS

CHLOROPHYLL A
CHLOROPHYLL C
β CAROTENE
FUCOXANTHIN

CELL WALL

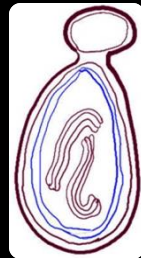
TWO LAYERED, THE INNER CELLULOSE, THE OUTER OF ALGINIC ACID AND FUCOIDAN

FLAGELLA

TWO, LATERAL, THE ANTERIOR LONGER, HAIRY. THE POSTERIOR SHORTER, SMOOTH

FOOD RESERVES

LAMINARIN
MANNITOL



PHOTOSYNTHETIC APPARATUS

TWO ADDITIONAL MEMBRANES OF CHL ER. THE OUTER CONTINUOUS WITH OUTER MEMBRANE OF NUCLEAR ENVELOPE. THYLAKOIDS IN STACKS OF TWO TO SIX

SEXUAL REPRODUCTION AND LIFE-CYCLE

DIPLOHAPLONTIC OR SPORIC AND DIPLONTIC OR GAMETIC. ISOMORPHIC OR HETEROMORPHIC

CHARACTERISTICS OF ALGAL CLASSES

EUKARYOTA **EUGLENOPHYCOTA** **EUGLENOPHYCEAE**

PIGMENTS

CHLOROPHYLL A
CHLOROPHYLL B
β CAROTENE
ASTAXANTHIN
ANTHERAXANTHIN
DIADINOXANTHIN
NEOXANTHIN

FOOD RESERVES

PARAMYLON (BETA-1.3-GLUCAN)

PHOTOSYNTHETIC APPARATUS

ONE ADDITIONAL MEMBRANE OF CHL ER NOT CONTINUOUS WITH OUTER MEMBRANE OF NUCLEAR ENVELOPE. THYLAKOIDS IN STACKS OF THREE OR MORE.

CELL WALL

PROTEINACEOUS PELLICLE

FLAGELLA

USUALLY TWO, UNEQUAL, HAIRY, ONE OFTEN NOT EMERGENT

SEXUAL REPRODUCTION AND LIFE-CYCLE NOT KNOWN

CHARACTERISTICS OF ALGAL CLASSES

EUKARYOTA **CHLOROPHYCOTA** **CHLOROPHYCEAE**

PIGMENTS

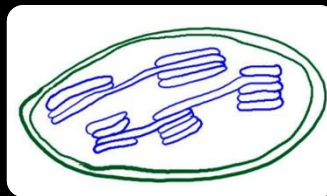
CHLOROPHYLL A
CHLOROPHYLL B
 α , β , γ - CAROTENES
LUTEIN
VIOLAXANTHIN
ZEAXANTHIN
ANTHERAXANTHIN
NEOXANTHIN
SIPHONOXANTHIN
SIPHONEIN
FOOD RESERVES
STARCH (AMYLASE AND AMYLOPECTIN)

CELL WALL

SOME NAKED;
CELLULOSE,
HYDROXY PROLINE,
GLYCOSIDES,
XYLANS, MANNANS,
SOME CALCIFIED

FLAGELLA

TWO, THREE, FOUR OR
NUMEROUS, EQUAL, SMOOTH
SPIRALLY INSERTED.



SEXUAL REPRODUCTION
AND LIFE-CYCLE
ALL TYPES OF LIFE CYCLES
PRESENT

PHOTOSYNTHETIC APPARATUS

NO ADDITIONAL MEMBRANE OF CHL ER. THYLAKOIDS IN STACKS
OF 2-6 OR MORE. GRANA MAY BE PRESENT

CHARACTERISTICS OF ALGAL CLASSES

EUKARYOTA CHLOROPHYCOTA

CHAROPHYCEAE

PIGMENTS

CHLOROPHYLL A
CHLOROPHYLL B
 α , β , γ - **CAROTENES**
VIOLAXANTHIN
ZEAXANTHIN
ANTHERAXANTHIN
NEOXANTHIN

FOOD RESERVES

STARCH AND MANNITOL

PHOTOSYNTHETIC APPARATUS

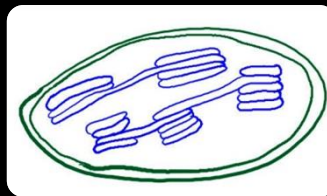
NO ADDITIONAL MEMBRANE OF CHL ER. THYLAKOIDS IN STACKS OF 2-6 OR MORE; GRANA MAY BE PRESENT.

CELL WALL

**CELLULOSE,
MANY CALCIFIED**

FLAGELLA

**MALE GAMETES ONLY, TWO.
UNEQUAL, SUB-TERMINALLY
INSERTED, SCALY.**



SEXUAL REPRODUCTION AND LIFE-CYCLE

HAPLONTIC OR ZYGOTIC

CHARACTERISTICS OF ALGAL CLASSES

EUKARYOTA CHLOROPHYCOTA

PRASINOPHYCEAE

PIGMENTS

CHLOROPHYLL A
CHLOROPHYLL B
β CAROTENE
SIPHONIN
SIPHONOXANTHIN

CELL WALL
NAKED,
USUALLY
SCALY

FLAGELLA
ONE TO TWO UNEQUAL,
OR FOUR; MORE OR LESS
EQUAL; SCALY

FOOD RESERVES
STARCH AND
MANNITOL

SEXUAL REPRODUCTION
AND LIFE-CYCLE
NOT KNOWN

PHOTOSYNTHETIC APPARATUS
NO ADDITIONAL MEMBRANE OF CHL ER .
THYLAKOIDS IN STACKS
OF TWO TO SIX.

ALGAL DIVISIONS

CYANOPHYCOTA

PROCHLOROPHYCOTA

RHODOPHYCOTA

CHROMOPHYCOTA

EUGLENOPHYCOTA

CHLOROPHYCOTA

ALGAL DIVISIONS

PROKARYOTES

CYANOPHYCOTA

PROCHLOROPHYCOTA

EUKARYOTES

RHODOPHYCOTA

CHROMOPHYCOTA

EUGLENOPHYCOTA

CHLOROPHYCOTA

ALGAL CLASSES

CYANOPHYCOTA

CYANOPHYCEAE

PROCHLOROPHYCOTA

PROCHLOROPHYCEAE

RHODOPHYCOTA

RHODOPHYCEAE-

SUB-CLASS:

BANGIOPHYCIDAE

FLORIDEOPHYCIDAE

CHROMOPHYCOTA

BACILLARIOPHYCEAE

CHRYSOPHYCEAE

CRYPTOPHYCEAE

RAHIDOPHYCEAE

DINOPHYCEAE

XANTHOPHYCEAE

PHAEOPHYCEAE

EUSTIGMATOPHYCEAE

PRASINOPHYCEAE

CHROMOPHYCOTA

BACILLARIOPHYCEAE

CHRYSOPHYCEAE

CRYPTOPHYCEAE

RAHIDOPHYCEAE

DINOPHYCEAE

XANTHOPHYCEAE

PHAEOPHYCEAE

EUSTIGMATOPHYCEAE

PRASINOPHYCEAE

EUGLENOPHYCOTA

EUGLENOPHYCEAE

CHLOROPHYCOTA

CHLOROPHYCEAE

CHAROPHYCEAE

PRASINOPHYCEAE

END OF CRITERIA
FOR ALGAL
CLASSIFICATION
AND
CHARACTERISTIC
FEATURES OF
ALGAL CLASSES