Benha University
Faculty of Education

INVERTEBRATES

PROTOZOA (3)

إعداد : د. دعاء صبرى إبراهيم
أستاذ مساعد بقسم علم الحيوان

CLASS PHYTOMASTIGOPHOREA

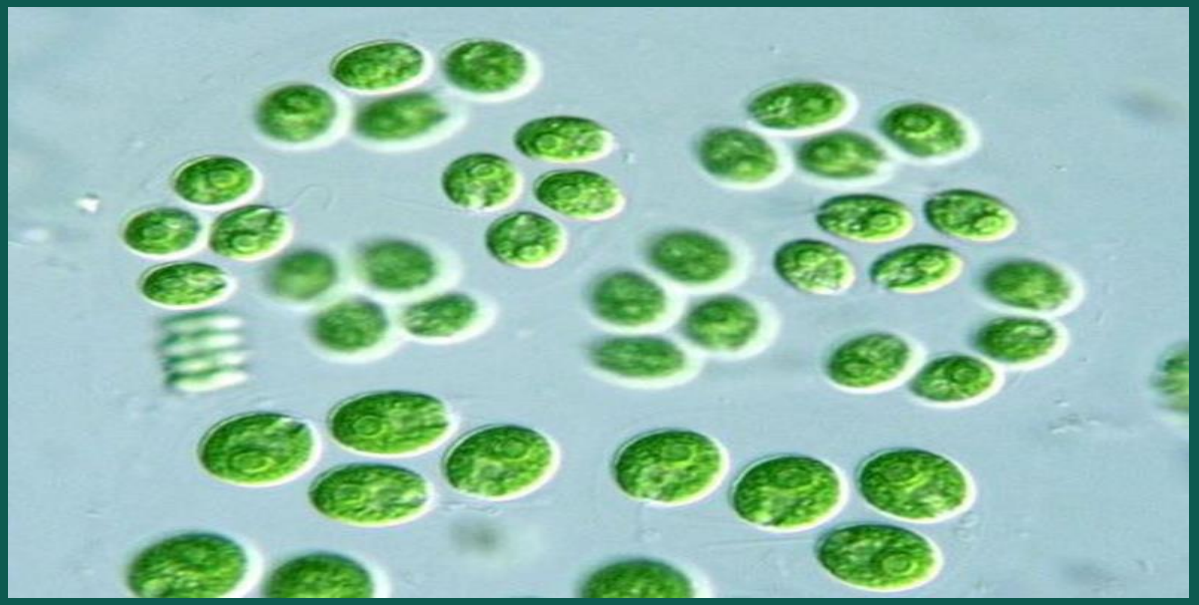
General Characters:

- Presence of chromatophores (chloroplasts).
- There is one or two flagella.
- Nutrition is mostly Holophytic (by photosynthesis).
- Reserve food is starch or paramylon (also known as paramylum).
- Reproduction takes place by longitudinal binary fission.

Chlamydomonas

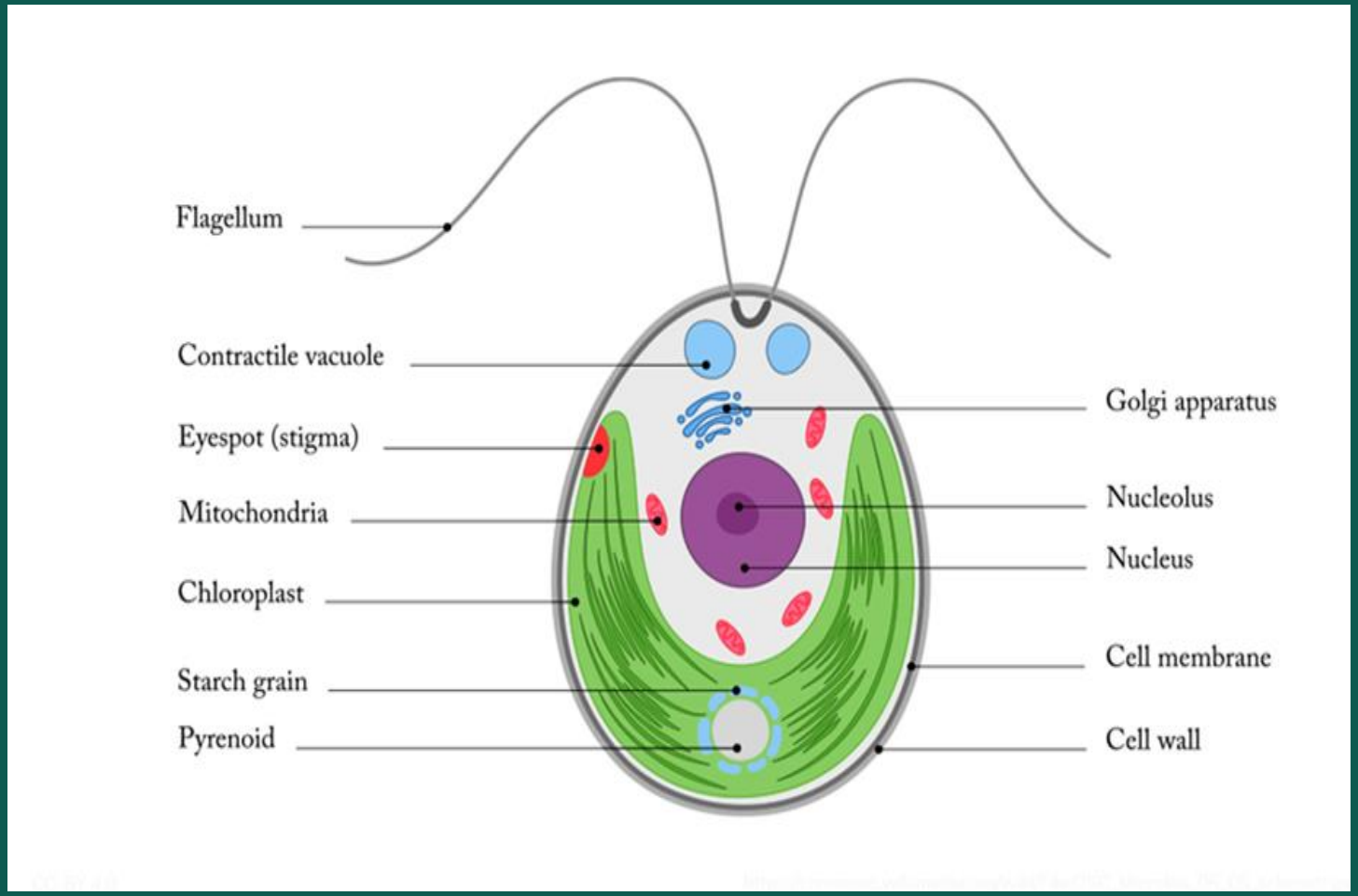
Habitat:

Chlamydomonas **is found worldwide, mainly in freshwater habitats such as ponds and damp soil, but some species also live in brackish or marine environments and even extreme environments like snow and ice.**



Chlamydomonas

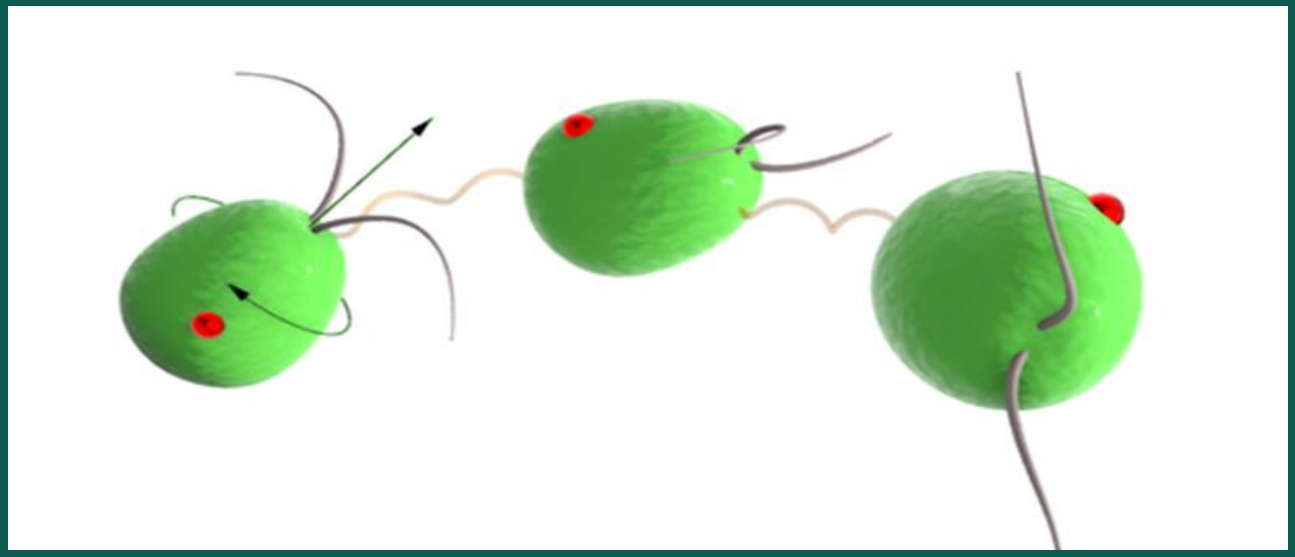
Morphology:



Chlamydomonas

Locomotion:

Chlamydomonas **moves in water using two anterior flagella that beat like a breaststroke to propel the cell forward. It shows phototaxis by moving toward light. It can also move along surfaces via gliding motility, powered by its flagella.**



Chlamydomonas

Nutrition:

1. **Holophytic (Autotrophic):** Performs photosynthesis using chlorophyll to produce carbohydrates, storing energy as starch and oil.
2. **Saprozoic (Heterotrophic):** In the absence of light, it absorbs organic substances for energy.
3. **Mixotrophic:** Combines photosynthesis with the use of organic compounds when both light and organic carbon are available.

Chlamydomonas

Water Balance (Osmoregulation):

Chlamydomonas **has two contractile vacuoles near the anterior end. These vacuoles collect excess water and periodically contract to expel it outside the cell through a temporary pore, using ATP energy.**

Chlamydomonas

Respiration and Excretion:

Chlamydomonas performs aerobic respiration. Oxygen diffuses into the cell and carbon dioxide diffuses out. Carbohydrates are oxidized in the mitochondria to produce ATP, which provides energy.

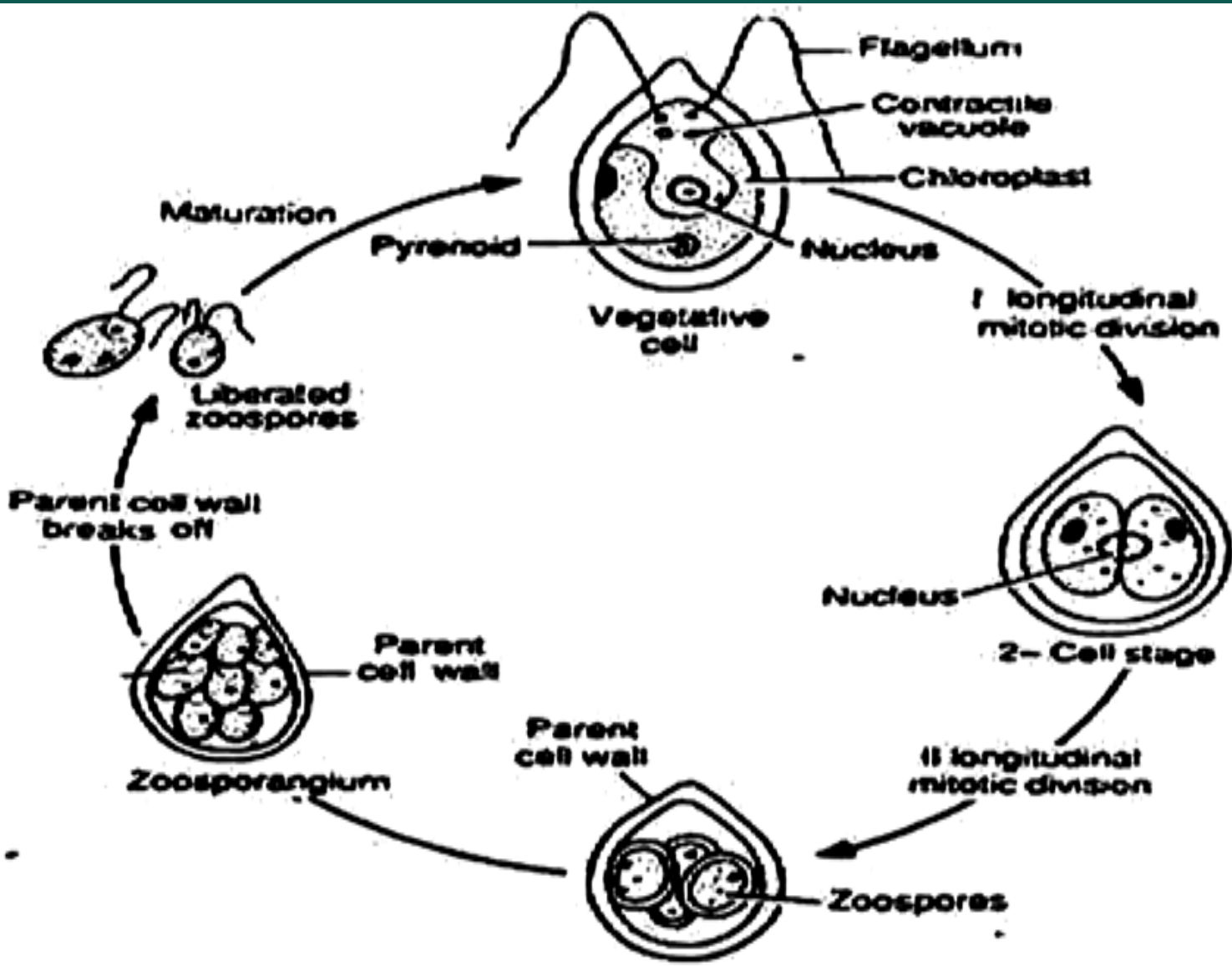
Excretion occurs mainly by diffusion. Waste products such as carbon dioxide, oxygen, and ammonia diffuse into the surrounding water.

Chlamydomonas

Reproduction:

A. Asexual Reproductive Stages in Chlamydomonas:

Zoospore: Formed during favorable conditions, the protoplast divides into 2-8 or more daughter cells, which develop flagella, cell walls, and contractile vacuoles before being released. They are motile and resemble miniature versions of the parent cell.



Asexual reproduction in *Chlamydomonas*

Chlamydomonas

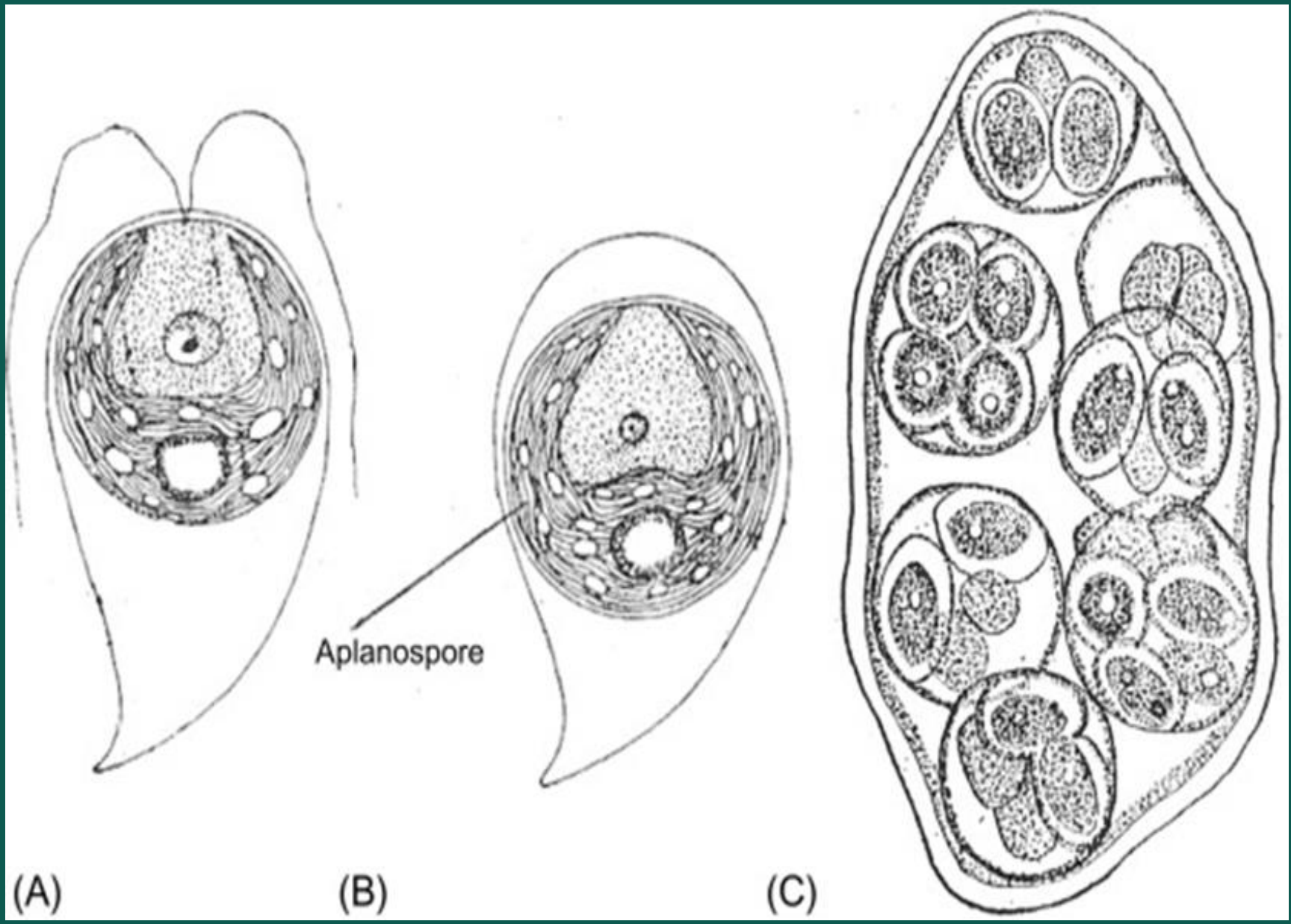
Reproduction:

A. Asexual Reproductive Stages in Chlamydomonas:

Aplanospore: Formed during slightly unfavorable conditions, the protoplast loses its flagella, rounds up, and secretes a thin wall.

Hypnospore: Formed under extreme unfavorable conditions, the protoplast forms a thick wall to survive.

Palmella Stage: Under adverse conditions, division occurs, but daughter cells fail to develop flagella. They remain embedded in a mucilaginous sheath. Each group of daughter cells also forms a gelatinous wall.


Aplanospore
(A)
(B)
(C)

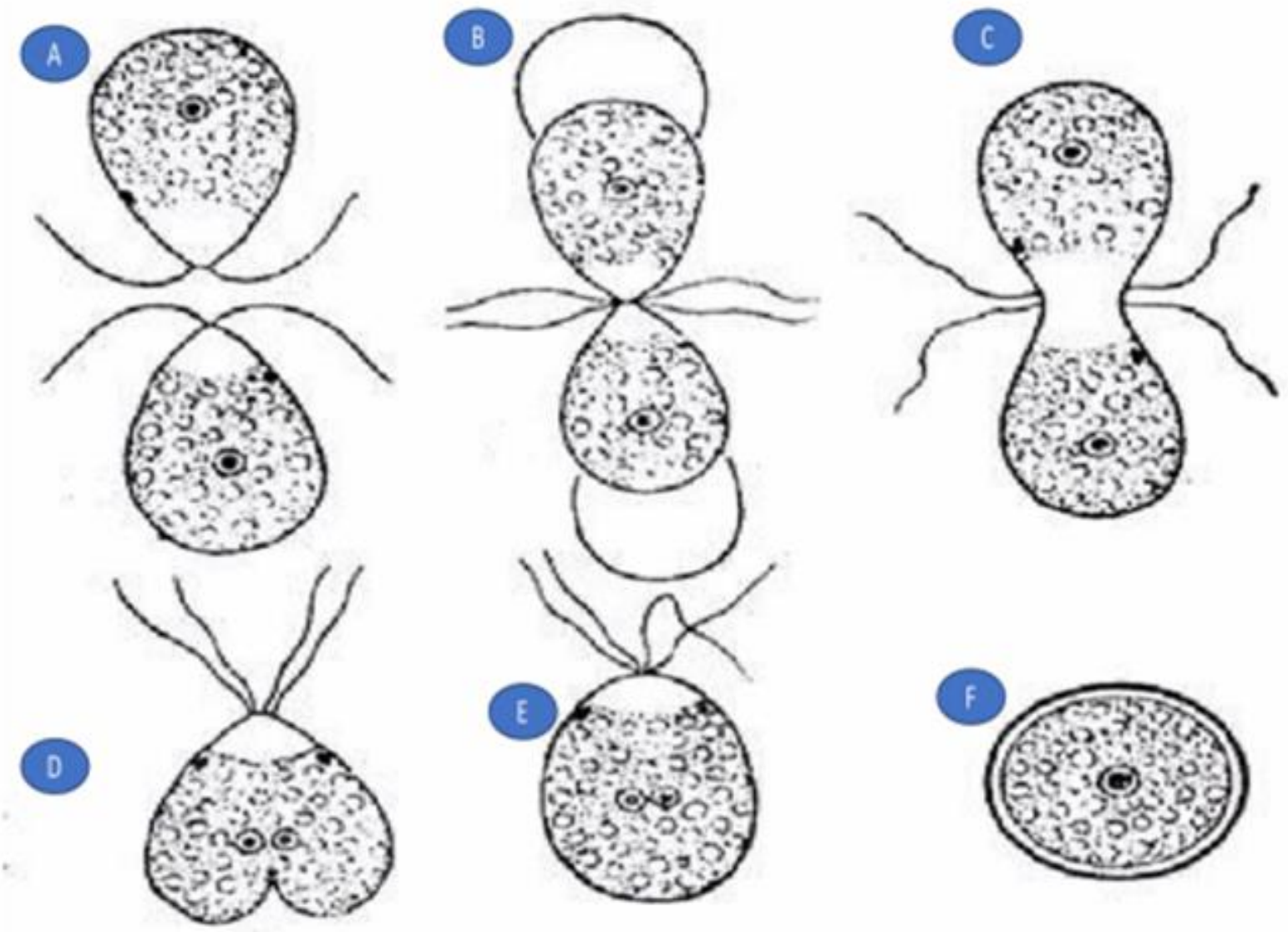
Chlamydomonas

Reproduction:

B. Sexual Reproduction:

1. Isogamy:

In isogamy, the fusing gametes are morphologically similar, equal in size, and usually motile. They are naked and indistinguishable as male or female.



Chlamydomonas:- Isogamous Sexual Reproduction

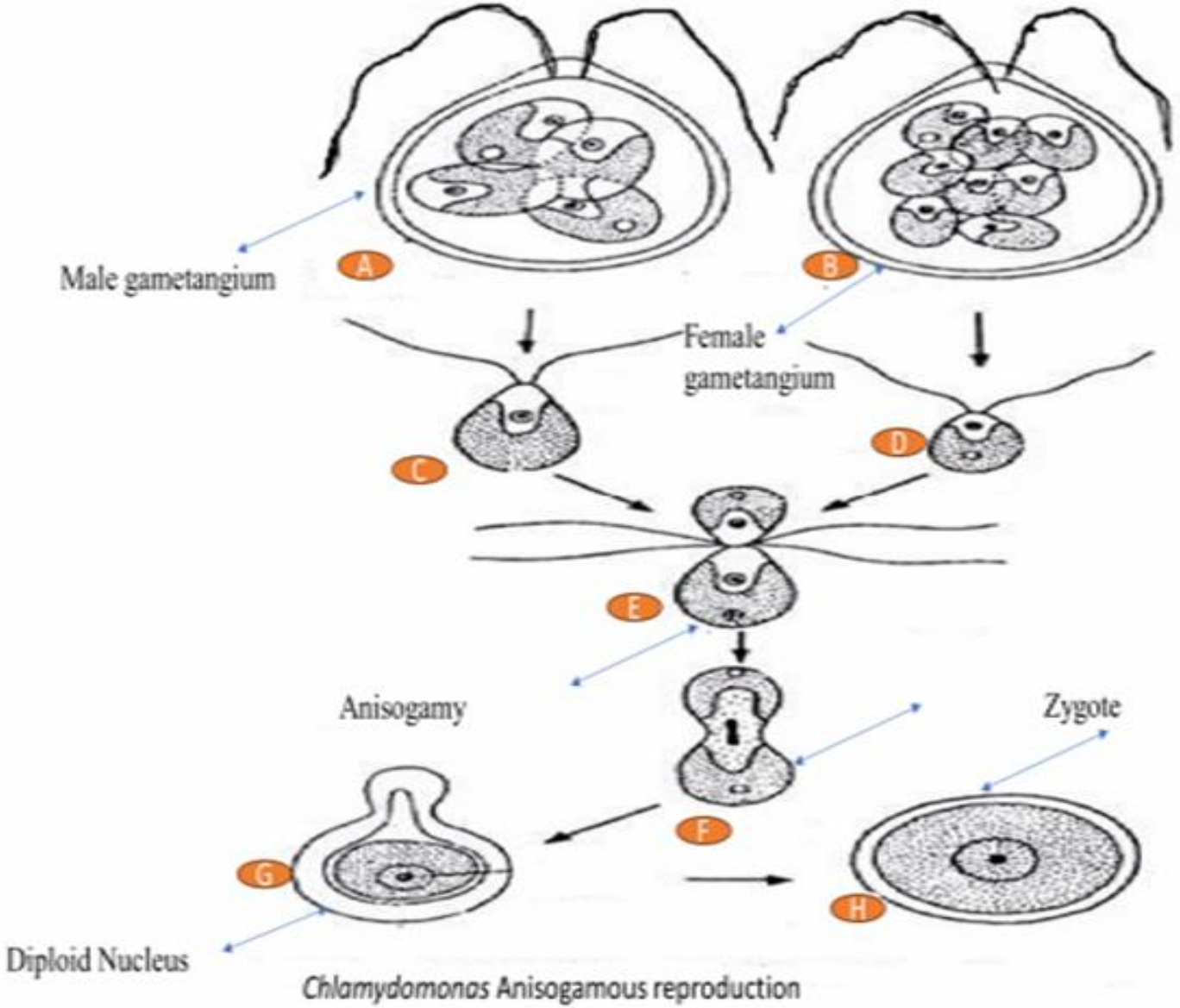
Chlamydomonas

Reproduction:

B. Sexual Reproduction:

2. Anisogamy:

In anisogamy, the gametes are morphologically similar but unequal in size. The female cell produces four large macrogametes, while the male cell produces eight small microgametes.



Chlamydomonas Anisogamous reproduction

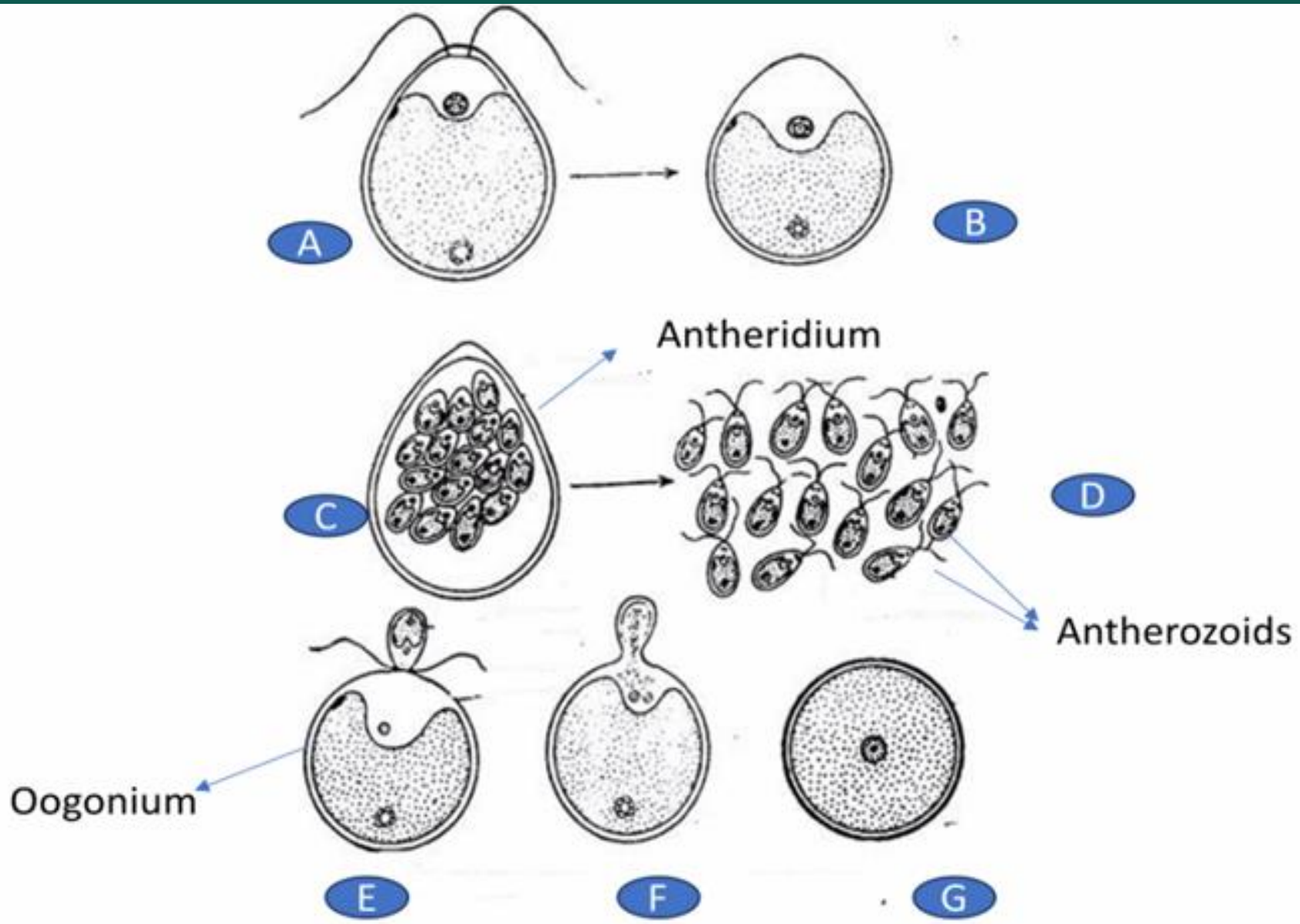
Chlamydomonas

Reproduction:

B. Sexual Reproduction:

3. Oogamy:

Oogamy is the most advanced type of sexual reproduction. The vegetative thallus functions as a female cell, loses its flagella, and forms a large non-motile egg (macrogamete) rich in pyrenoids. The male gamete is small and motile.



Chlamydomonas: Oogamous Reproduction

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