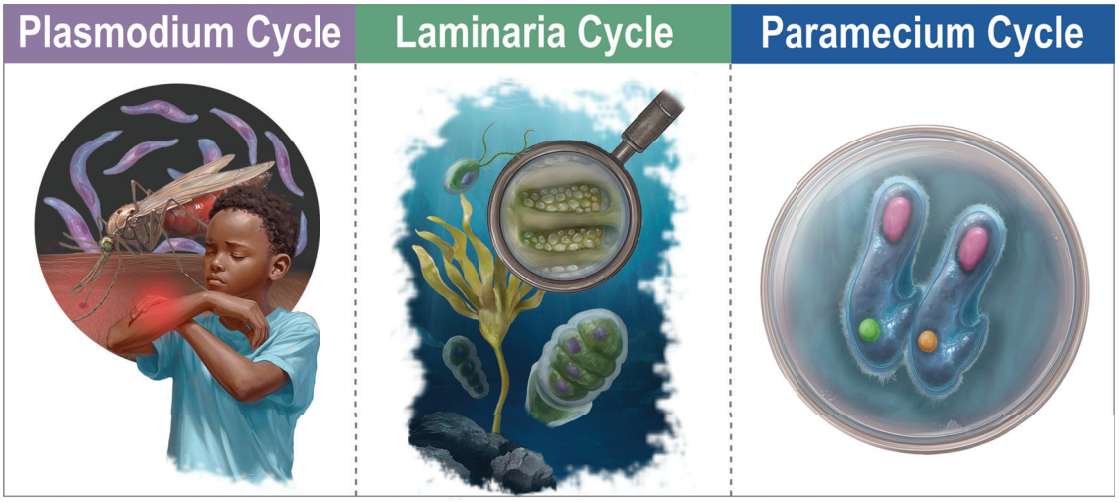
TOPIC: PROTIST LIFE CYCLES

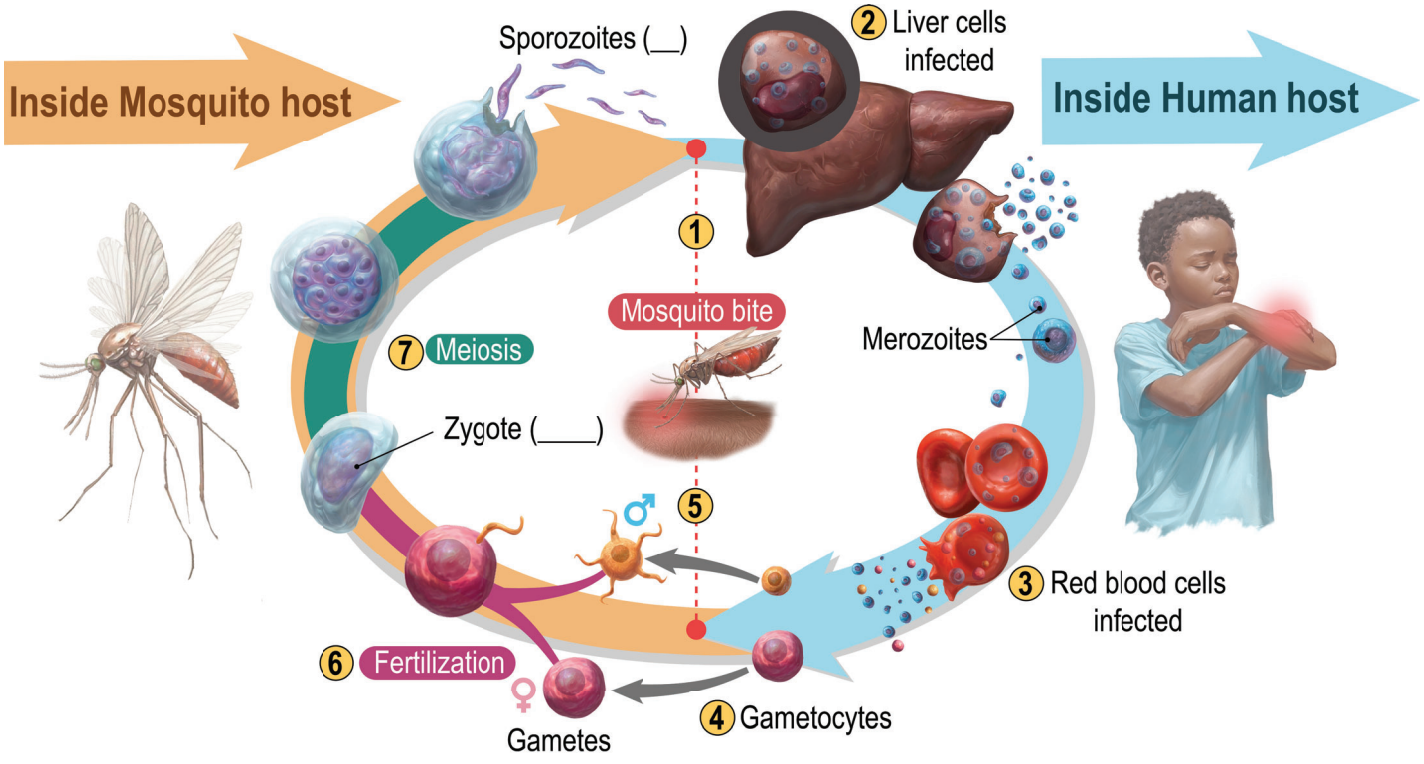
Protist Life Cycles

- Protists exhibit huge diversity in their _____ cycles.
  - Life cycles can be sexual, asexual, or both and include multiple hosts or shift between haploid & diploid forms.
  - In this lesson we're going to cover some life cycles that your professor may want you to know.



Plasmodium Life Cycle (Malaria)

- Malaria is one of the deadliest diseases in the world, killing ~600,000 people every year.
  - It's caused by a protist called *plasmodium*, which enters/exits humans via _____ bite.
  - Plasmodium's life cycle requires multiple _____ & contains both sexual & _____ stages.



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EXAMPLE

Number the following steps of the plasmodium life cycle so that they are in the correct order, starting from when a mosquito bites & infects a human:

- ◆ An infected mosquito bites a human, infecting it with the sporozoite form of the plasmodium parasite. _1_
- ◆ Some merozoites differentiate into plasmodium gametocytes. ____
- ◆ Gametocytes form gametes that fertilize in the mosquito's digestive tract, forming a diploid zygote. _____
- ◆ Sporozoites infect human liver cells, then become merozoites & reproduce asexually until released. _____
- ◆ The zygote undergoes meiosis then mitosis, releasing haploid sporozoites in mosquito's salivary gland. _____
- ◆ Merozoites continuously infect & destroy red blood cells as they reproduce asexually (causes fever). _____
- ◆ An uninfected mosquito bites an infected human, picking up plasmodium gametocytes. _____

PRACTICE

When an infected mosquito bites a human, it injects _____ (the infective stage of plasmodium) into the blood. Once they have invaded liver cells they become _____, which infect red blood cells.

a) Sporozoites; merozoites.

b) Sporozoites; gametocytes.

c) Merozoites; sporozoites.

d) Merozoites; gametocytes.

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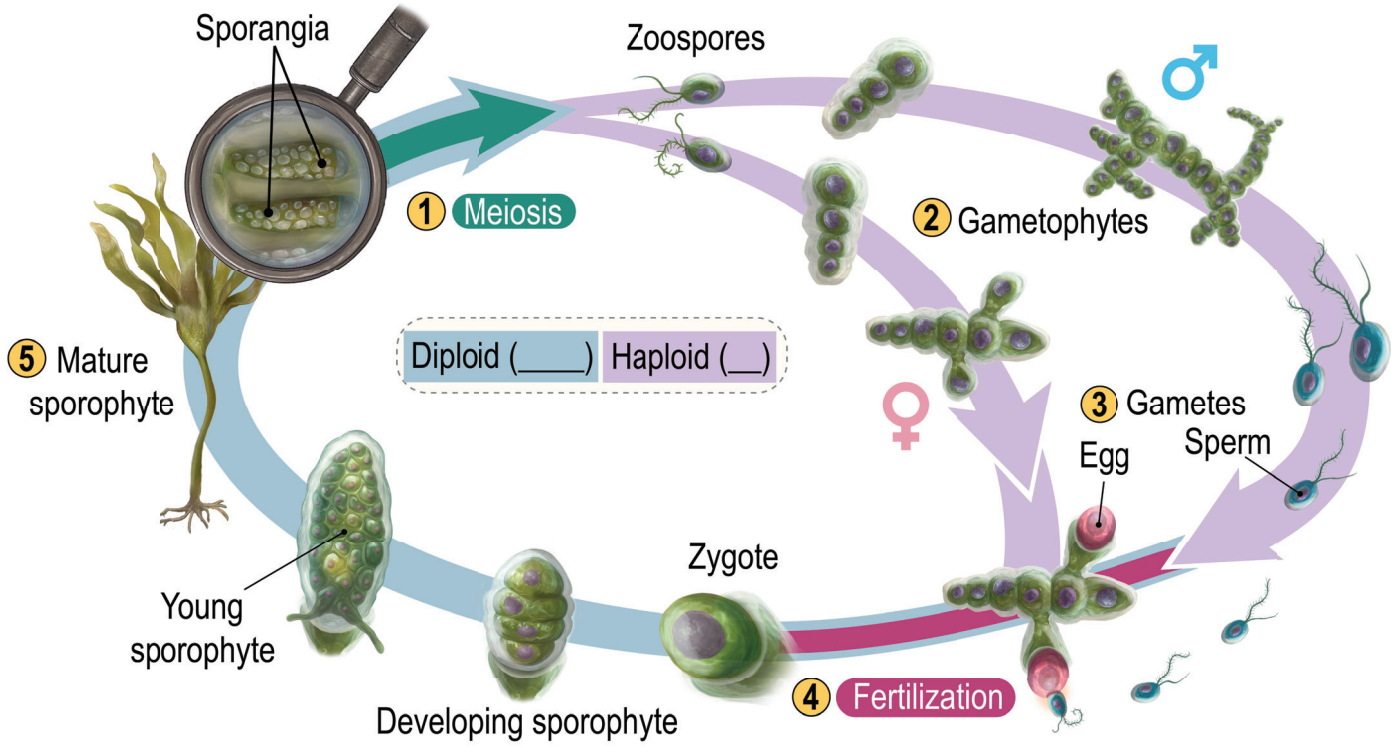
Laminaria Life Cycle: Alternation of Generations

◆ **Alternation of Generations:** life cycle _____ between multicellular *diploid* & multicellular *haploid* forms.

- ___**porophyte:** multicellular *diploid* form; produces ___pores via meiosis.
- ___**ametophyte:** multicellular *haploid* form; produces ___ametes via mitosis.



1 **Sporophyte (2n)**	Large, multicellular diploid sporophyte produces haploid zoospores via meiosis.
2 **Spore Germination**	Haploid spores grow into multicellular gametophytes (n) – half male & half female.
3 **Gamete Production**	Gametophytes produce haploid gametes (sperm/eggs) via mitosis.
4 **Fertilization**	Sperm fertilizes the egg, forming a diploid zygote (2n).
5 **Zygote Development**	The zygote grows into a new diploid sporophyte.

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EXAMPLE

In an alternation of generations life cycle, which of the following is true?

a) The organism alternates between multicellular diploid & multicellular haploid forms.

b) Male gametophytes produce sperm while female gametophytes produce eggs.

c) Organisms may look different during the 2 parts of their life cycle.

d) All of the above.

PRACTICE

Which of the following represents the correct sequence of alternation of generations in laminaria?

a) Sporophyte > spore fusion > gametophyte > gamete > sporophyte.

b) Sporophyte > zygote > zoospore > gamete > gametophyte > sporophyte.

c) Gametophyte > gamete > zygote > zoospore > sporophyte > gametophyte.

d) Sporophyte > zoospore > gametophyte > gamete > zygote > sporophyte.

PRACTICE

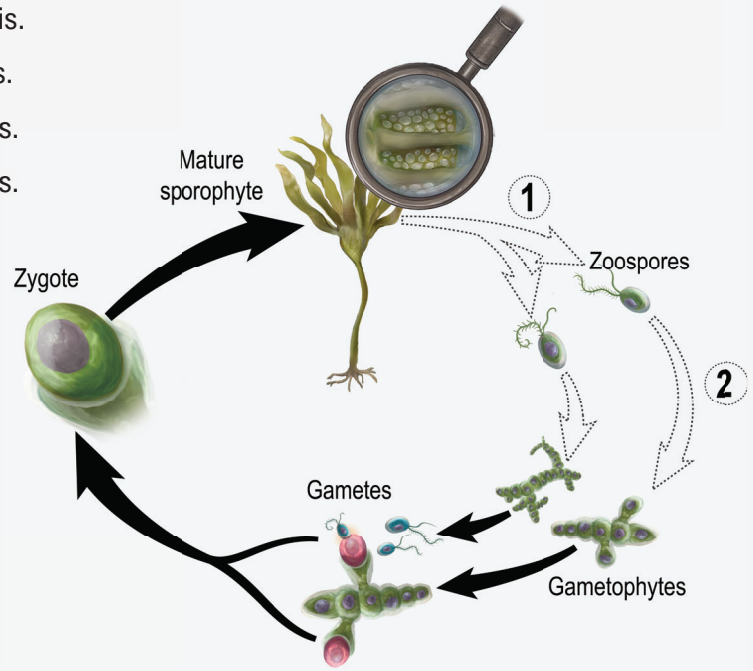
Select the answer option that correctly completes the diagram below:

a) 1. meiosis, 2. meiosis.

b) 1. mitosis, 2. mitosis.

c) 1. mitosis, 2. meiosis.

d) 1. meiosis, 2. mitosis.



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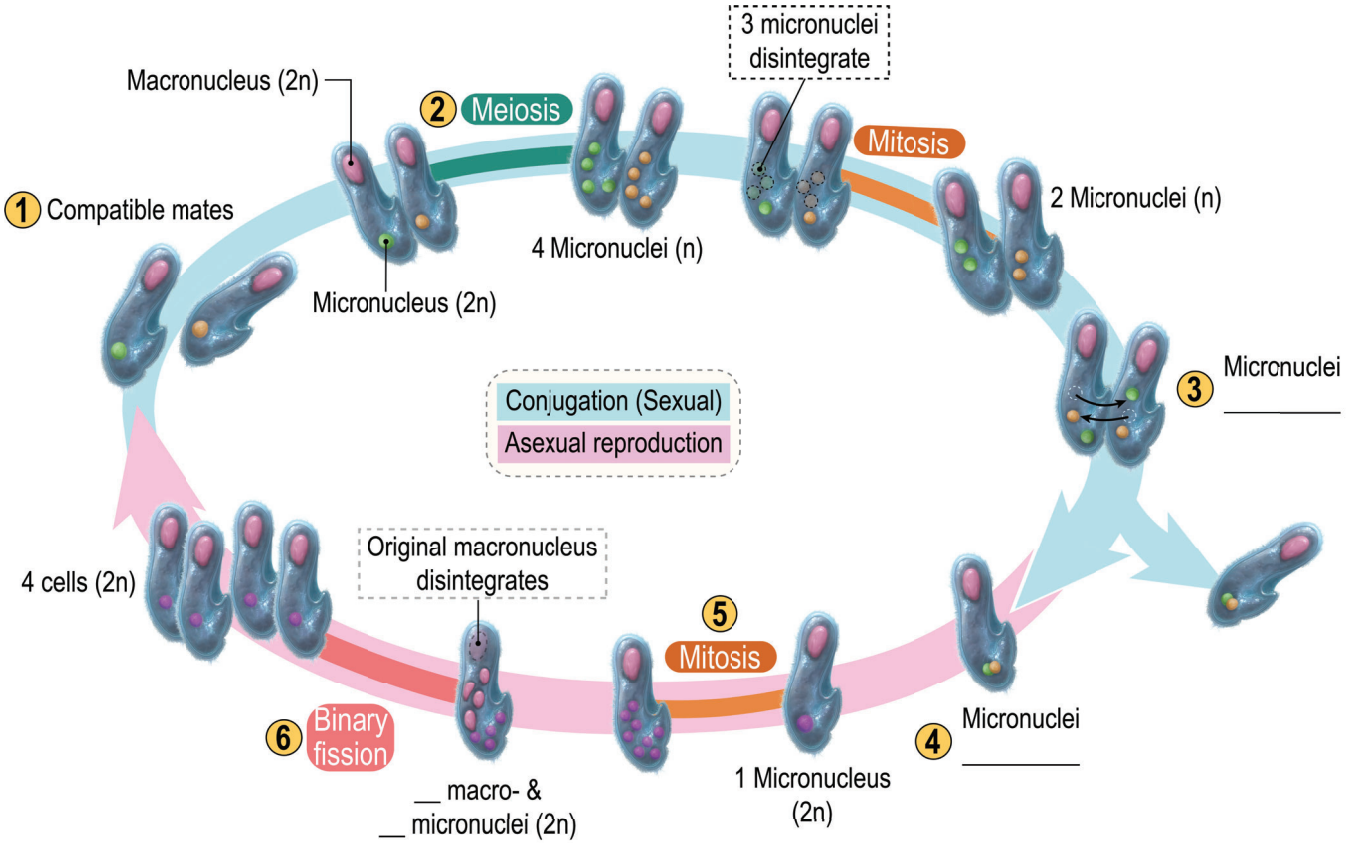
Paramecium Life Cycle: Conjugation & Asexual Reproduction

- The protist Paramecium exchanges DNA sexually via conjugation and reproduces via binary fission (asexual).
  - *Recall:* **Conjugation:** exchange of genetic information between 2 cells in _____ contact.
- Paramecia have 2 types of nuclei: a _____nucleus & a _____nucleus.
  - The macronucleus is responsible for "day-to-day" operations; the micronucleus is active during reproduction.



1 **Compatible mates pair**	Two compatible diploid (2n) paramecia adhere in preparation for conjugation.
2 **Micronuclear meiosis**	In each cell, micronucleus undergoes meiosis, producing 4 haploid micronuclei (n).
3 **Conjugation**	In each cell, 3 of the 4 micronuclei disintegrate; the leftover micronucleus undergoes mitosis, producing 2 haploid micronuclei. The cells then exchange one micronucleus.
4 **Micronuclei fusion**	The 2 micronuclei fuse together to form a genetically new diploid micronucleus (2n).
5 **Nuclear reorganization**	The new micronucleus undergoes 3 rounds of mitosis, producing 8 micronuclei, 4 of which develop into macronuclei. The original macronucleus disintegrates.
6 **Binary fission**	Binary fission produces 4 cells, each with 1 micro- & 1 macronucleus.

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PRACTICE

Which of the following statements is true about *conjugation* in the Paramecium life cycle?

a) It results in an increase in population size only.

b) It results in genetic recombination only.

c) It results in both an increase in population size & genetic recombination.

d) It does not result in an increase in population size or genetic recombination.

PRACTICE

Which protist life cycle has a distinct use of both mitosis & meiosis across haploid & diploid stages?

a) Plasmodium; sporozoites (n) & merozoites (n) undergo mitosis, the zygote (2n) undergoes meiosis.

b) Laminaria; the mature sporophyte (2n) undergoes meiosis, the gametophytes (n) undergo mitosis.

c) Paramecium; meiosis occurs during conjugation, mitosis occurs during conjugation & before binary fission.

d) All of the above.

PRACTICE

Which of these statements about the plasmodium, laminaria, and paramecium life cycles is correct?

a) Plasmodium requires 2 hosts, Laminaria requires 1 host, Paramecium does not require a host.

b) Plasmodium only replicates asexually, Laminaria only has unicellular gametophytes, Paramecium undergoes conjugation.

c) Plasmodium requires a vector (a mosquito), Laminaria may look different depending on which stage of its life cycle it's in, Paramecium creates genetic variation during its asexual reproduction phase.

d) Plasmodium requires 2 hosts, Laminaria may look different at different stages of its life cycle, Paramecium produces new cells during its asexual phase.