SI Biology - Full Discipline Demo

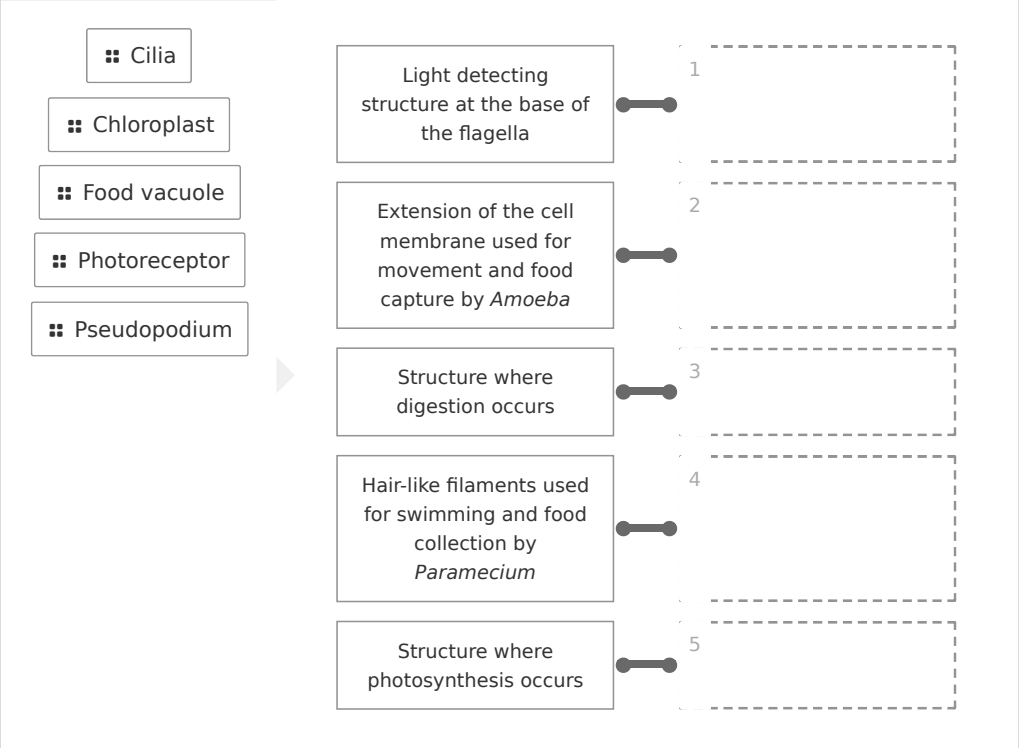
Protista

Final Report - Answer Guide

Institution	Science Interactive University
Session	SI Biology - Full Discipline Demo
Course	SI Biology - Full Discipline Demo
Instructor	Sales SI Demo

Test Your Knowledge

Match each term with the best description.

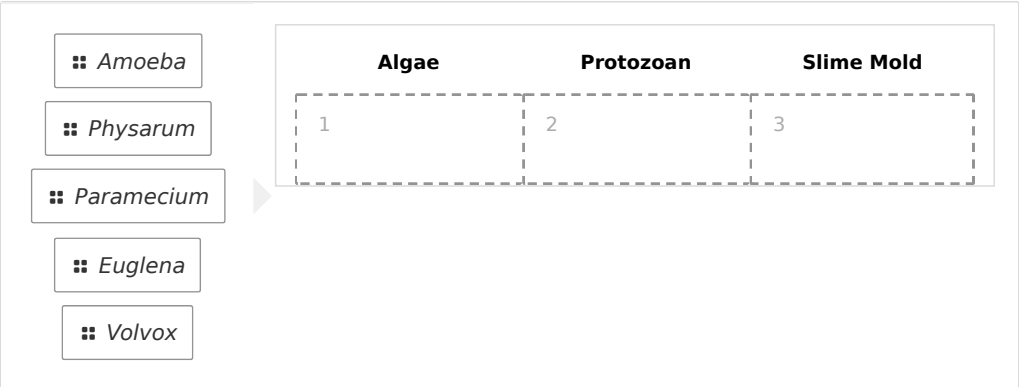


Correct answers:

1 Photoreceptor 2 Pseudopodium 3 Food vacuole 4 Cilia

5 Chloroplast

Identify each genus as an algae, protozoan, or slime mold.



Correct answers:

1 *Euglena* *Volvox* 2 *Paramecium* *Amoeba*

3 *Physarum*

Exploration

Kingdom Protista includes single-celled and colonial organisms that resemble plants, animals, or fungi.

- True ✔
- False

The _____ is a whip-like structure used for movement in *Euglena*.

- chloroplast
- flagellum ✔
- pellicle
- photoreceptor

____ cells of *Volvox* orientate and swim towards light.

- Germ
- Gonidia
- Somatic ✔
- Amoeboid

Food enters *Amoeba* cells by ____.

- oral grooves
- gonidia
- contractile vacuoles
- phagocytosis ✔

Exercise 1

What structures were shared among all the cells examined in this exercise? Include the definition of protist in your explanation.

All cells contained a cell membrane, a nucleus, and other membrane-bound organelles as all protists are unicellular or colony-forming eukaryotic organisms. Due to the diversity the kingdom Protista, the only common organelle observed in each organism was the nucleus.

How do the cell shapes of *Euglena* and *Paramecium* compare to the other protists viewed in this exercise? Explain your answer by describing how these organisms move in their environments.

Both *Euglena* and *Paramecium* are streamlined spindle or slipper shapes compared the oval shapes individual *Volvox* cells and amorphic shapes of Amoeba and *Physarum* cells. *Euglena* and *Paramecium* swim by flagellar and cilia movements and associated pellicle contractions, whereas *Volvox* colonies orient and drift for movement and individual *Amoeba* and *Physarum* crawl.

Data Table 1: Protist Structures and Functions

(SAMPLE ANSWER BELOW)

Structure	Description
Chloroplast	Structure where photosynthesis occurs
Flagellum	Whip-like structure used for movement
Nucleus	Membrane-bound organelle containing genetic material
Photoreceptor	Structure at base of flagellum used to detect and orient towards light
Gonidia	Group of germ cells in center of Volvox that produces new colonies
Oral groove	Mouth-like structure where food is collected
Food vacuole	Site of digestion and formed when food enters the cell
Cilia	Hair-like structures used for movements
Pellicle	Flexible cell membrane that causes cell to move when contracted
Pseudopodia	Extensions of cell membrane used for movement and food collection
Contractile vacuole	Structure used for osmoregulation by collecting and pumping excess water from cell

Photo 1: Euglena Labeled

(SAMPLE ANSWER BELOW)

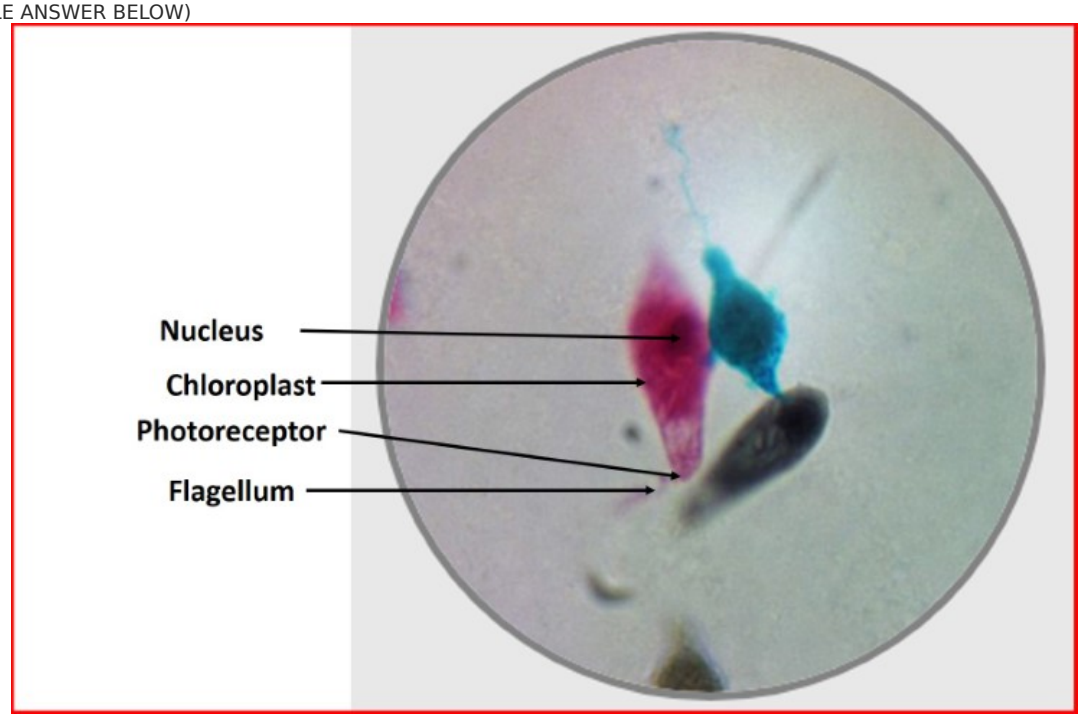
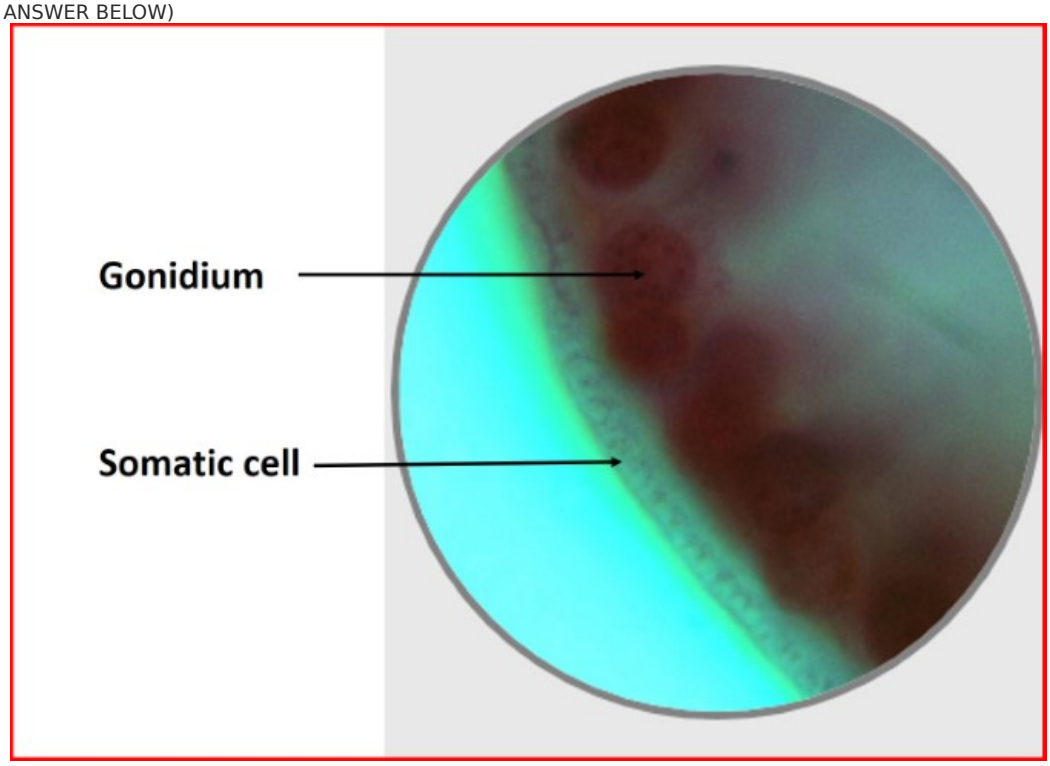


Photo 2: Volvox Labeled

(SAMPLE ANSWER BELOW)



Data Table 2: Total Magnification of Slides

(SAMPLE ANSWER BELOW)

Slide	Magnification	Comments
Euglena	600x	Students should only provide answers in this section if they were unable to identify structures.
Volvox	600x	
Amoeba, Whole Mount	600x	
Paramecium	600x	
Physarum	600x	

Photo 3: Amoeba Labeled

(SAMPLE ANSWER BELOW)

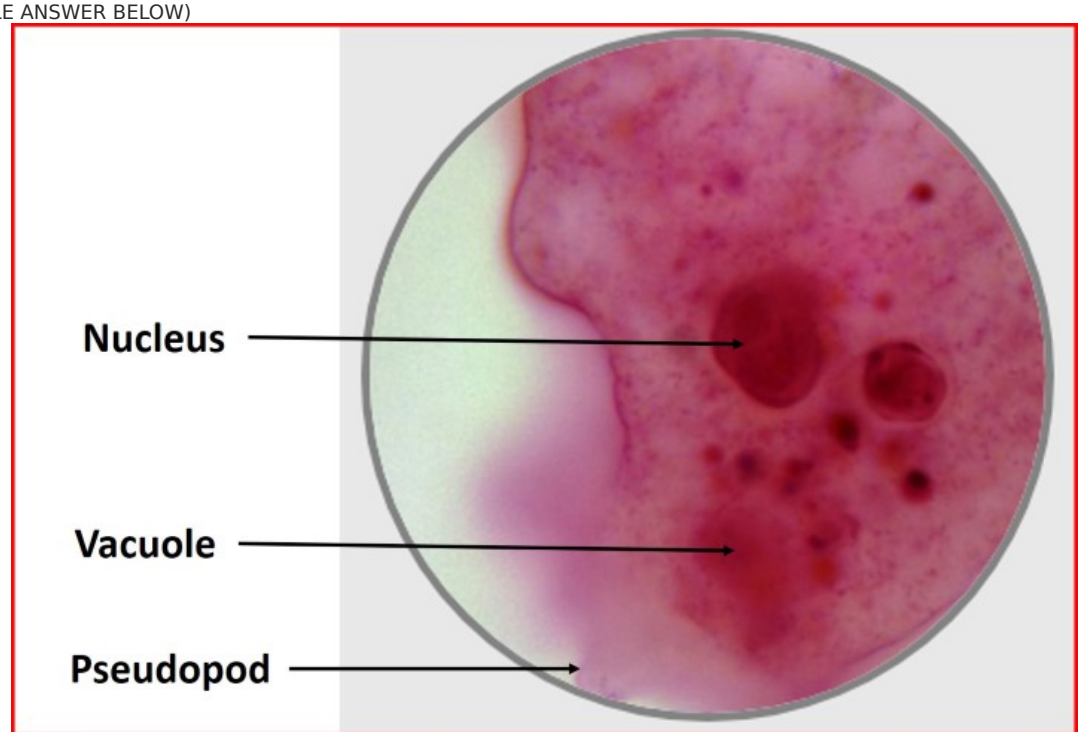


Photo 4: Paramecium Labeled
(SAMPLE ANSWER BELOW)

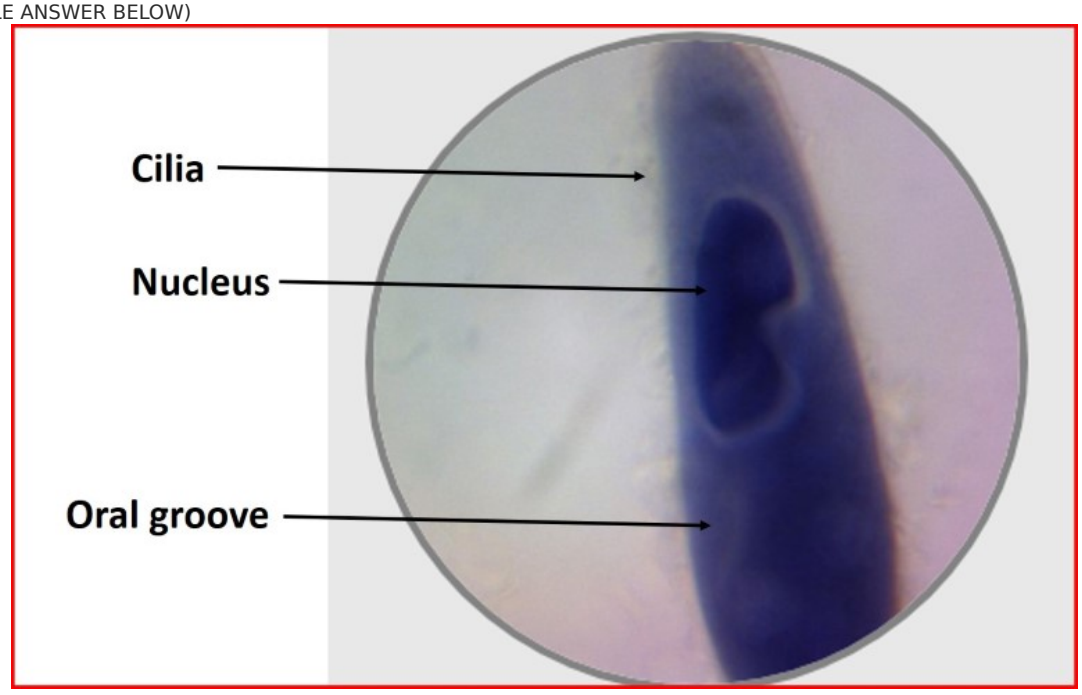
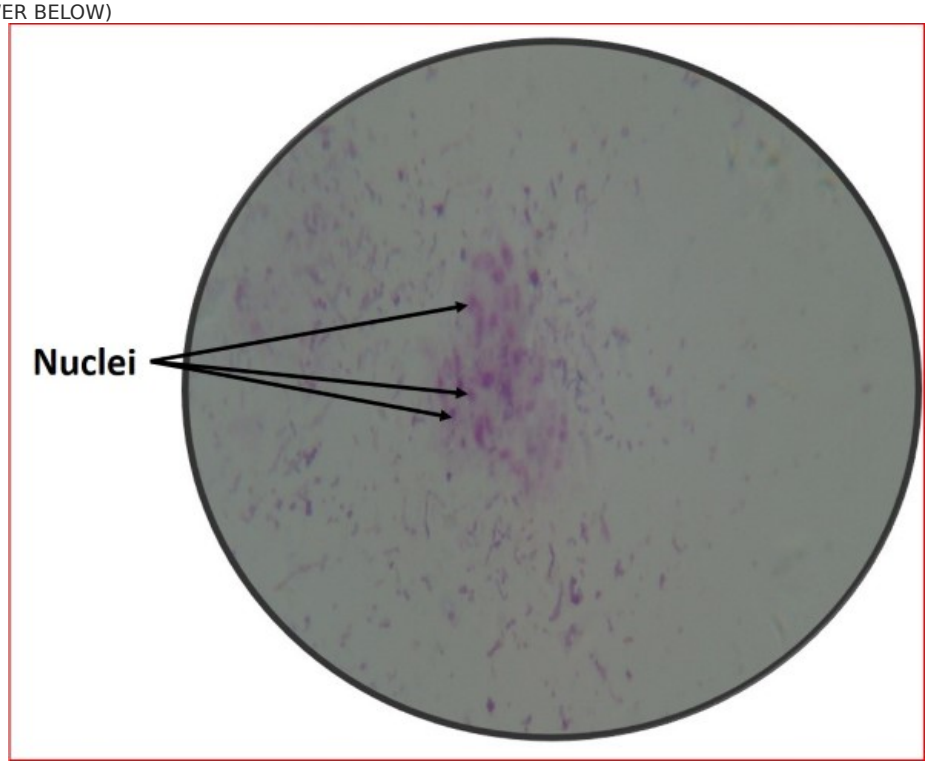


Photo 5: Physarum Labeled
(SAMPLE ANSWER BELOW)



Exercise 2

What is the common habitat requirement for all organisms listed in Data Table 3? Include the defining characteristics for kingdom Protista in your answer.

All organisms in Data Table 3 require moist or aquatic environments, as all members of kingdom Protista live in aquatic or damp environments or inside the bodies of other eukaryotic organisms.

How do the feeding strategies of the plant-like protists differ from those of the protozoans and slime mold included in Data Table 3? Include organelles associated with feeding or energy production in your answer.

The plant-like protists *Euglena* and *Volvox* each contain chloroplasts that are used to produce energy from sunlight. These photoautotrophs generate their cellular energy without consuming other organisms. The protozoans *Paramecium* and *Amoeba* and the slime mold *Physarum* are heterotrophs that consume other organisms for food. The cells of these three protists contain food vacuoles where digestion occurs.

What common reproductive mechanisms do all organisms in Data Table 3 share? Which organism exhibits the greatest array of reproductive methods? Reference haploid and diploid cells in your explanation of the later organism.

All protists in Data Table 3 reproduce asexually by mitosis with cytokinesis, termed binary fission. *Physarum* exhibits the greatest array of reproductive methods as it also reproduces sexually when haploid ameboid cells fuse to form a diploid zygote, which develops into a diploid plasmodium. A plasmodium can then undergo meiosis to produce haploid spores that generate haploid ameboid cells upon dispersal to favorable conditions.

Data Table 3: Life History Descriptions
(SAMPLE ANSWER BELOW)

	Euglena	*Volvox*	*Amoeba*	*Paramecium*	*Physarum*
Habitat	Fresh and salt water	Freshwater lakes, ponds, and puddles.	Freshwater lakes, ponds, and puddles	Fresh and salt water	Moist soil
Feeding	Photoautotrophs using sunlight and chloroplasts	Photoautotrophs using sunlight and chloroplasts	Heterotrophs that feed on bacteria, yeasts, and other protists by phagocytosis	Heterotrophs that feed on algae, bacteria, and yeasts.	Heterotrophs that feed on bacteria.
Mobility	Swimming by flagella and pellicle contraction	Swimming by flagella	Crawling by pseudopodia	Swimming by wavelike pellicle contractions and cilia	Amoeboid movement by pseudopodia, flagellate cell movement by swimming with flagella, plasmodium movement by growth and streaming.
Reproduction	Asexual by binary fission.	Asexual by formation of gonidia and sexual by release of gametes	Asexual by mitosis with cytokinesis	Asexual by binary fission and sexual by conjugation and exchange of micronuclei	Asexual by mitosis and cytokinesis of haploid amoeboid cells. Sexual by fusion of amoeboid cells to form diploid zygote that develops into a plasmodium. Asexual meiotic formation of spores by plasmodia.

Competency Review

_____ are animal-like, heterotrophic protists such as *Amoeba* and *Paramecium*.

- Algae
- Protozoans ✔
- Slime molds
- Fungi

The _____ is a flexible cell membrane that provides movement for numerous protists.

- pellicle ✔
- gonidia
- cilium
- micronucleus

_____ are used by *Amoeba* for movement and feeding.

- contractile vacuoles
- flagella
- pseudopodia ✔
- cilia

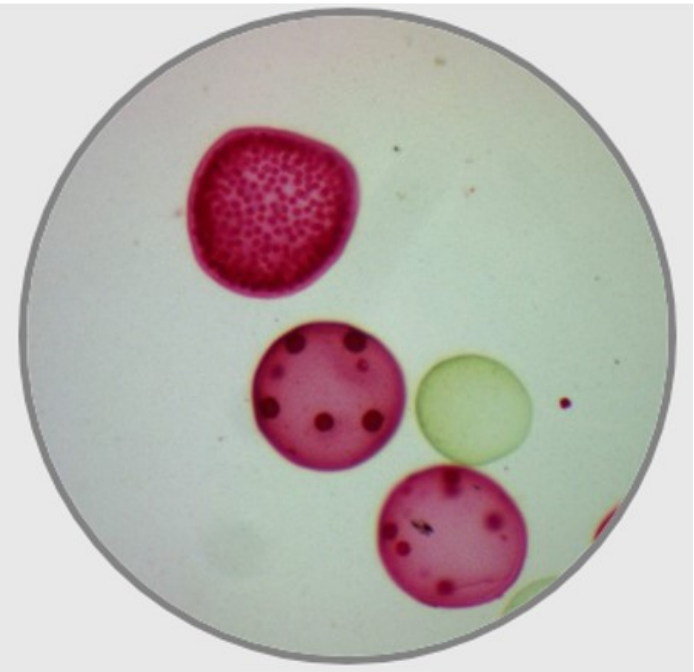
***Euglena* and *Volvox* are photoautotrophic organisms that produce sugars from sunlight.**

- True ✔
- False

***Paramecium* collect food in a(n) ____.**

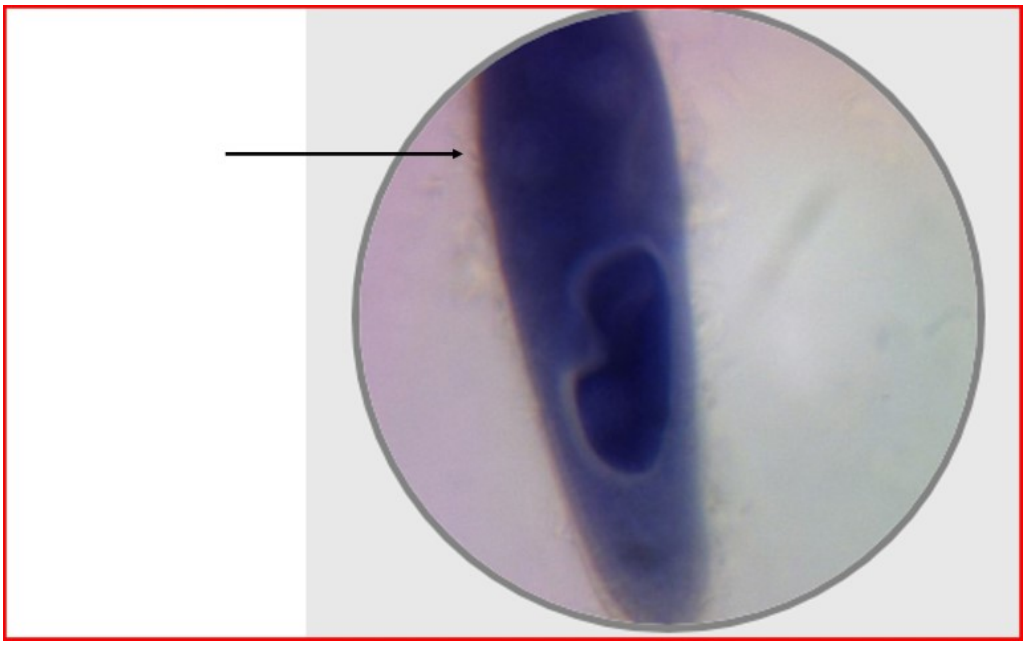
- contractile vacuole
- pellicle
- gonidium
- oral groove ✔

The slide image below displays protists from the genus ____.



- *Euglena*
- *Amoeba*
- *Physarum*
- *Volvox* ✔

A(n) ____ is indicated by an arrow in the slide image of *Paramecium* below.



- [x] cilium
- [ ] oral grove
- [ ] micronucleus
- [ ] flagellum

Members of the genus ____ reproduce asexually by haploid cells undergoing mitosis with cytokinesis, sexually by nuclear fusion of haploid cells to form a diploid zygote, and also by spore formation through meiosis.

- [ ] *Euglena*
- [ ] *Paramecium*
- [x] *Physarum*
- [ ] *Volvox*

Extension Questions

Phylum Rotifera is composed of microscopic, multicellular, heterotrophic members of the animal kingdom that live in aquatic and damp environments. Rotifer bodies are composed of a ciliated head, digestive system, nervous system, and retractable foot. Rotifers reproduce sexually by mating and females produce eggs. Apply your knowledge of Kingdom Protista to describe both the similarities and differences between rotifers and protists. (SAMPLE ANSWER BELOW)

Kingdom Protista is composed of unicellular or colony forming organisms. Rotifers are multicellular organisms that have organs and organ systems. Protists reproduce asexually by mitosis or sexually by fusion of nuclei of different cell strains. Rotifers reproduce sexually by mating and producing eggs. Similarities between rotifers and protists include the environments where they are found (aquatic or damp environments), microscopic size, heterotrophy, and the presence of cilia.