

SESSION 9: FUNGI AND PROTISTS

Key Concepts

In this session we will focus on summarising what you need to know about:

- Protists
 - Basic structure and general characteristics
 - Economic use
 - Diseases
- Fungi
 - Basic structure and general characteristics
 - Economic use
 - Diseases

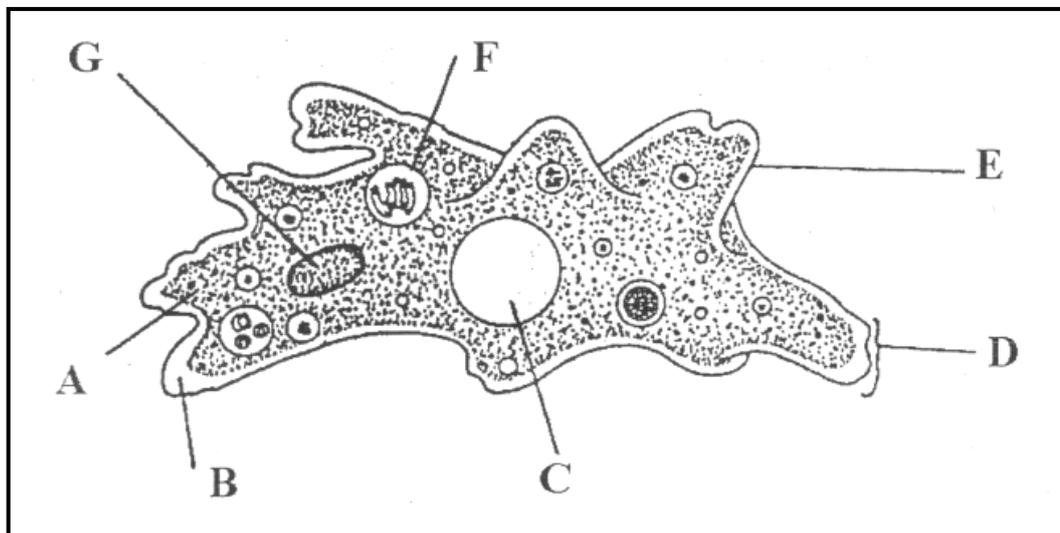
Protists

Terminology & definitions

- **Aquatic:** living in or around water
- **Eukaryote:** an organism with a true nucleus
- **Unicellular:** made up of only a single cell
- **Asymmetrical:** not symmetrical

Key Concepts and Diagram

Amoeba



- A – Endoplasm
- B – Ectoplasm
- C – Contractile vacuole
- D – Pseudopodium
- E – Cell membrane
- F – Food vacuole
- G – Nucleus

X-planation

Basic structure and general characteristics

a) General characteristics:

- Kingdom Protista: Slime moulds, protozoans, diatoms, red, brown and green algae. (All eukaryotes which did not fit into the plant, animal or fungi kingdoms).
- Most are unicellular.
- Most are aquatic.
- Some are autotrophic (like green algae) and some are heterotrophic. Some of the heterotrophic protists are parasitic, while others such as the slime moulds, engulf food by phagocytosis.
- Some protists reproduce asexually by a process called binary fission, where the organism simply splits into two. Some have complex life cycles with asexual and sexual reproduction.

b) Basic structure:

- E.g. *Amoeba*
- Unicellular.
- Asymmetrical. The shape is constantly changing because of the ongoing development of pseudopodia.
- It is surrounded by the cell membrane (differentially permeable membrane).
- Cytoplasm is made up of ectoplasm (gel state) and endoplasm (sol state).
- Oval nucleus in cytoplasm which controls all the activities of the cell.
- Contractile vacuole in cytoplasm which is responsible for the expulsion of water.
- Food vacuoles which digest and distribute food to all parts of the cell.

Economic use

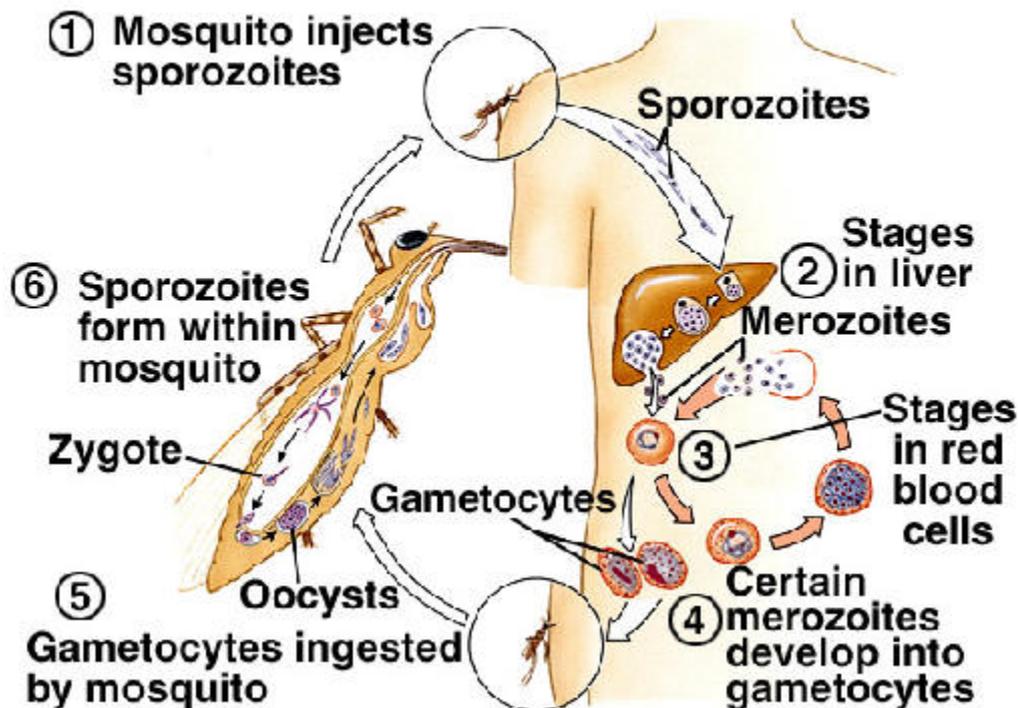
- All the microscopic organisms that are found in the upper layers of the water in the oceans, dams, ponds and lakes are called plankton. The autotrophic protists are producers in the aquatic food chains.
- Autotrophic protists use up CO₂ and release O₂ when they undergo photosynthesis. In this way they maintain the balance between oxygen and carbon dioxide in the water in which they live.
- Nutrient re-cycling: saprotrophic protists cause decay of the dead material on which they live, thus assisting in returning nutrients to the environment.
- Silica is deposited in the cell walls of diatoms. Silica occurs in quartz and as a main component of sandstone which has widespread industrial use.
- Red tide: Planktonic algae, especially dinoflagellates, secrete toxins which kill marine organisms like shellfish and fish. When eaten by humans, it affects the cell membranes of nerve and muscle cells, thus causing paralysis and even death.
- Seaweeds can be used for: soups, wraps for sushi and thickening powder in puddings, ice cream and salad dressing.

Diseases

E.g. malaria

Disease	Cause	Effects (symptoms)	Management	
			Prevention	Treatment
Malaria	Caused by a parasitic protozoan, <i>Plasmodium</i> . Spread by female Anopheles mosquitoes.	Headache, fever, sweating, chills, muscular pains (back and limbs), abdominal pain, diarrhoea, nausea and vomiting, loss of appetite, cough	1. Getting rid of mosquitoes. 2. Preventing mosquitoes from biting us. 3. Taking medicines before entering high risk areas.	Can be diagnosed by a chemical test known as a "Rapid Test" or by taking a blood sample and examining it for the parasites. Treatment with quinine, ACT or artemisinin. Country specific

Life Cycle of *Plasmodium*



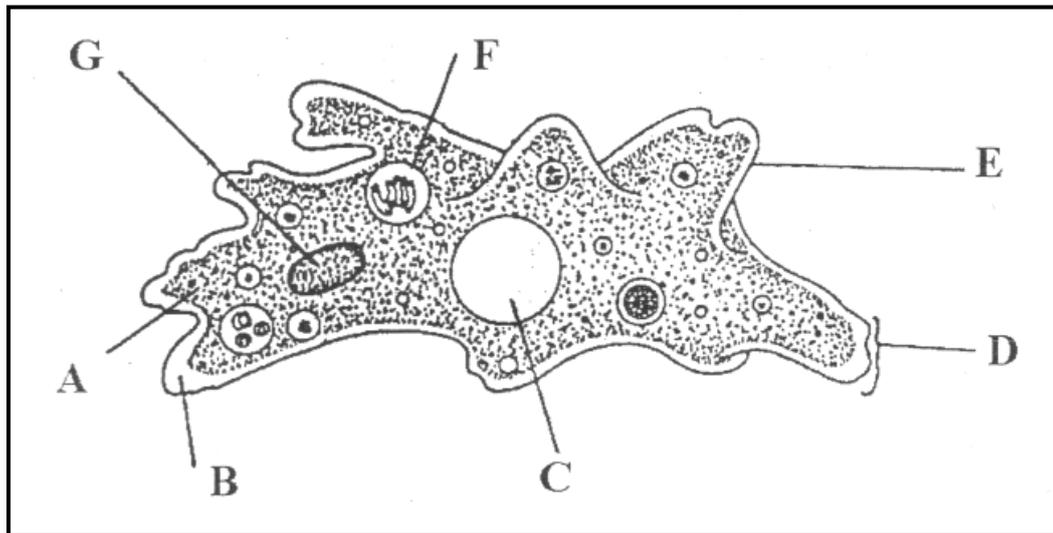
(http://faculty.southwest.tn.edu/rburkett/kingdom_protista.htm)

X-ample Questions

Question 1

(Adapted from GDE, NSC, June 2009, Grade 11, Question 3.3)

Study the diagram below of Amoeba and answer the questions.



1.1 Identify each of the following:

- i) Outermost layer E (1)
- ii) Gel layer labelled B (1)
- iii) Organelle of respiration labelled G (1)
- iv) Organelle of osmoregulation labelled C (1)

Question 2

(Adapted from NW, NSC, November 2010, Grade 11, Paper I, Question 4.1)

Read the following extract taken from a text book and answer the questions that follow.

Malaria is a sporozoan and a very important human parasite. The World Health Organisation reported that more than three million people died of malaria in 2003. Malaria parasites are transmitted from one person to another by the female mosquito (*Anopheles sp.*) which acts as the vector. People can stop the infection by sleeping under nets, use repellent lotions on the skin, use insecticides, smoking herbs in the room, spray oil on stagnant water in pots and old tyres, cover bodies with protective clothing in evening.

- 2.1 Which organism causes malaria? (1)
- 2.2 Explain TWO effects of malaria on the human body. (4)

- 2.3 Name TWO environmental conditions beneficial for the spreading of malaria. (2)
- 2.4 One of the symptoms of malaria is fever. Why is it that malaria patients break out into a fever every 2-4 days? (2)
- 2.5 Name THREE methods that form the basis for the treatment of malaria. (3)
- 2.6 Indicate TWO reasons why malaria is not easily diagnosed. (2)

X-ercise

1. The group of eukaryotic organisms that is able to photosynthesise.
- A Protists
 - B Fungi
 - C Bacteria
 - D Viruses
2. Protists are found in . . . surroundings.
- A dry
 - B moist
 - C windy
 - D still
3. Protists are
- A multicellular.
 - B unicellular.
 - C diploblastic.
 - D triploblastic.
4. A vector is
- A a parasite.
 - B a unicellular.
 - C an organism that carries a parasite.
 - D another name for the Protists.
5. Malaria is a disease
- 1. that is caused by the mosquito as a vector.
 - 2. by the plasmodium that enters the blood stream.
 - 3. by saprophytic Protists.
 - 4. by the bite of an infected female mosquito.
- Which of the following options is correct?
- A 1, 2 and 3
 - B 1, 2 and 4
 - C 1, 3 and 4
 - D 1 and 2 only

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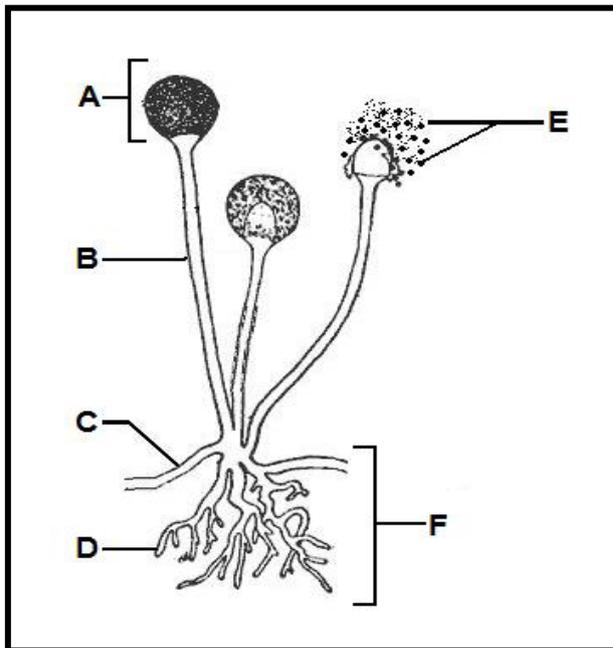
Fungi

Terminology & definitions

- **Heterotrophs:** organisms that are unable to manufacture their own food
- **Saprotrophic:** obtaining food from dead or decaying material
- **Thallus:** structure which is not differentiated into true roots, stems and leaves
- **Mycelium:** the mass of entangled filaments of fungi
- **Rhizoid:** root-like hyphae of fungi that penetrate the substrate
- **Stolon:** hyphae that creep over the substrate
- **Sporangiophore:** a long stalk which bears a sporangium at its tip
- **Sporangium:** a spore case or capsule, in which spores are produced
- **Antibiotic:** a drug formed from living organisms (usually bacteria and fungi) which stops or slows down the growth of disease-causing microbes

Key Concepts and Diagram

Structure of Fungi, e.g. *Rhizopus* (Bread Mould)



- A – Sporangium
- B – Sporangiphore
- C – Stolon
- D – Rhizoid
- E – Spore
- F – Mycelium

X-planation

Basic structure and general characteristics

a) General characteristics

- E.g. mushrooms, yeast and the moulds.
- They are like plants in that they have cell walls.
- They do not have chlorophyll.
- All are heterotrophic.
- Some are parasites, like the fungus that causes athlete's foot.
- Some are saprotrophic.
- Most fungi are multicellular, but some (e.g. yeast) are unicellular.
- Reproduction by spores.

b) Basic structure

- e.g. *Rhizopus*
- Thallus.
- It is made up of an entangled mass of fine filaments called hyphae.
- All the filaments together form a mycelium.
- They are coenocytic as the cytoplasm and nuclei are distributed throughout the hyphae.
- There are no cross walls to divide the hyphae into separate cells.
- Three types of hyphae:
 - Rhizoids that penetrate the bread
 - Stolons that creep over the surface of the bread
 - Sporangiohores which are upright hyphae bearing spore-producing sporangia.

Economic use

a) Role of fungi in the dairy industry for cheese making

- The moulds *Penicillium roqueforti* and *Penicillium cemberti* are important in the production of certain cheeses like Roquefort and Camembert cheese.

b) Role of fungi in medicine

- Fungi are used to produce antibiotics which kill bacteria. The most commonly used antibiotic is penicillin, which is derived from the blue mould, *Penicillium notatum*.

c) Role of fungi as a source of food

- Mushrooms, truffles and morels.

Diseases

E.g. rusts, thrush, ringworm

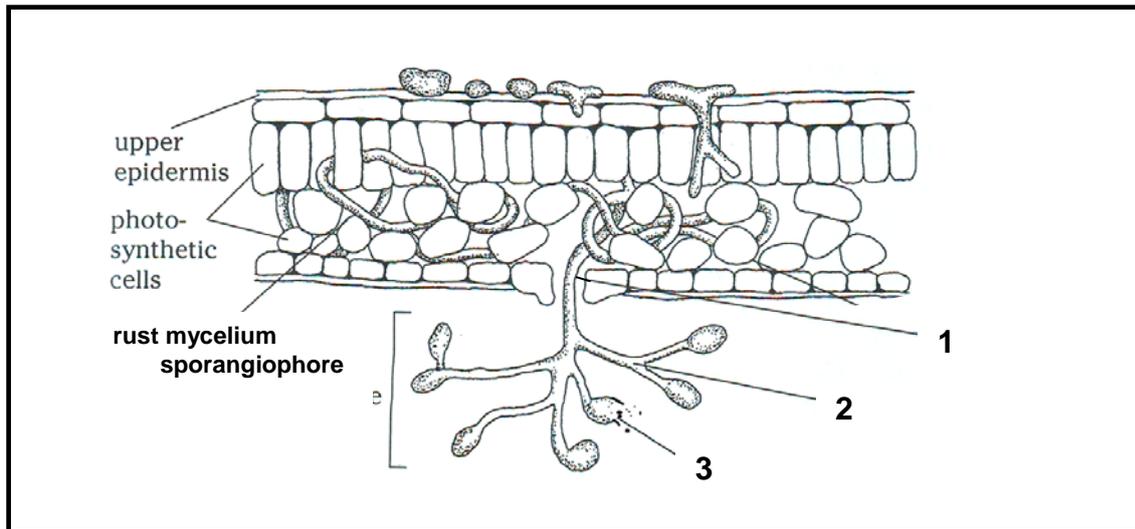
Disease	Cause	Effects (symptoms)	Management	
			Prevention	Treatment
Thrush (Candidiasis)	Yeast-like fungus, <i>Candida albicans</i> that causes thrush in the mouth and vagina. This condition can result from prolonged antibiotic treatment.	Vagina candidiasis: itchiness, a creamy discharge, general feeling of tiredness. A burning feeling during urination or sexual intercourse. Men (catch thrush from an infected partner): irritation, redness, burning or itching on the tip of the penis or under the foreskin. There is also a slight discharge from the urethra and discomfort when urinating. Babies: bottom Oral thrush: (often associated with HIV)	Eating yoghurt containing AB bacterial cultures	Anti-fungal drugs. Vaginal thrush – wear loose cotton clothes and underwear

X-ample Questions

Question 1

(Adapted from NW, NCS, November 2010, Grade 11, Paper I, Question 3.1)

The following diagram shows a transverse section through a potato leaf which is infected by with potato blight (*Phytophthora infestans*.) Study the diagram and answer the questions that follow.

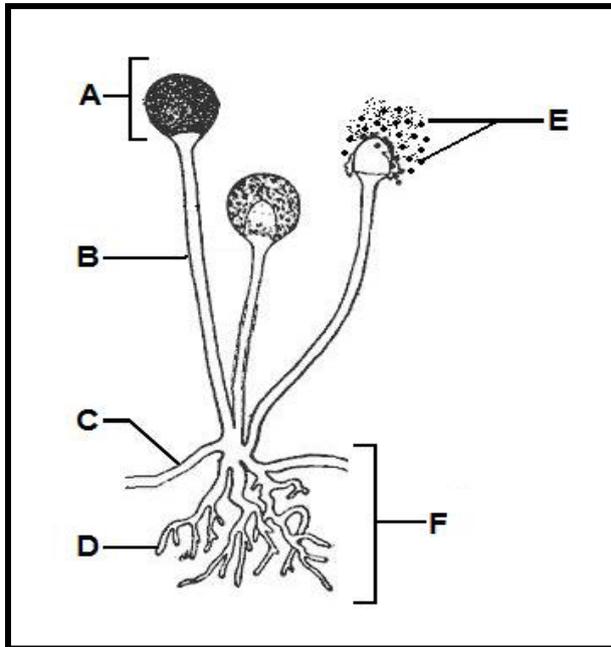


- 1.1 Supply labels for the parts numbered 1, 2 and 3. (3)
- 1.2 What is the normal function of the part numbered 1 (opening)? (1)
- 1.3 To which group of micro-organisms is potato blight classified? (1)
- 1.4 Explain why potato blight usually infects plants growing in shady areas? (3)
- 1.5 Name ONE way in which this disease can be safely controlled. (2)

Question 2

(Adapted from Free State, June 2011, Grade 11, Paper 1, Question 4.2)

Study the diagram below of a fungus and answer the questions that follow.



- 2.1. Identify parts A, C and F. (3)
- 2.2. Is this plant a parasite or saprophyte? (1)
- 2.3. Give a reason for your answer to Question .2.2. (2)
- 2.4. State ONE function of part D. (2)

Question 3: (Adapted from DBE, NSC, Exemplar2007 Question 2.2.5)

In the early part of the twentieth century, spiders' webs (in which many fungal spores were trapped) were placed on small cuts and wounds.

Suggest ONE reason for the following:

- (a) Why this might have been a useful procedure. (2)
- (b) Why it could have been dangerous. (2)

X-ercise

1. Fungi

- A are eukaryotic
- B are prokaryotic
- C have no cell wall
- D are autotrophic

2. Spores

- A are the roots of the fungi
- B are the male gametes of the fungi
- C are the female gametes of the fungi
- D produce new fungi

3. The thallus of the fungi

- A has true definite roots, stems and leaves
- B has true definite roots and stems
- C has true definite stems and leaves
- D has no true definite roots, stems and leaves

4. The structure that holds the sporangium is called the

- A spore
- B columella
- C sporangiophore
- D rhizoid

5. The hyphae is divided into

- A rhizoids and stolons
- B rhizoids and sporangiophores
- C sporangiophores and stolons
- D rhizoids, stolons and sporangiophores

(2 x 5)
[10]