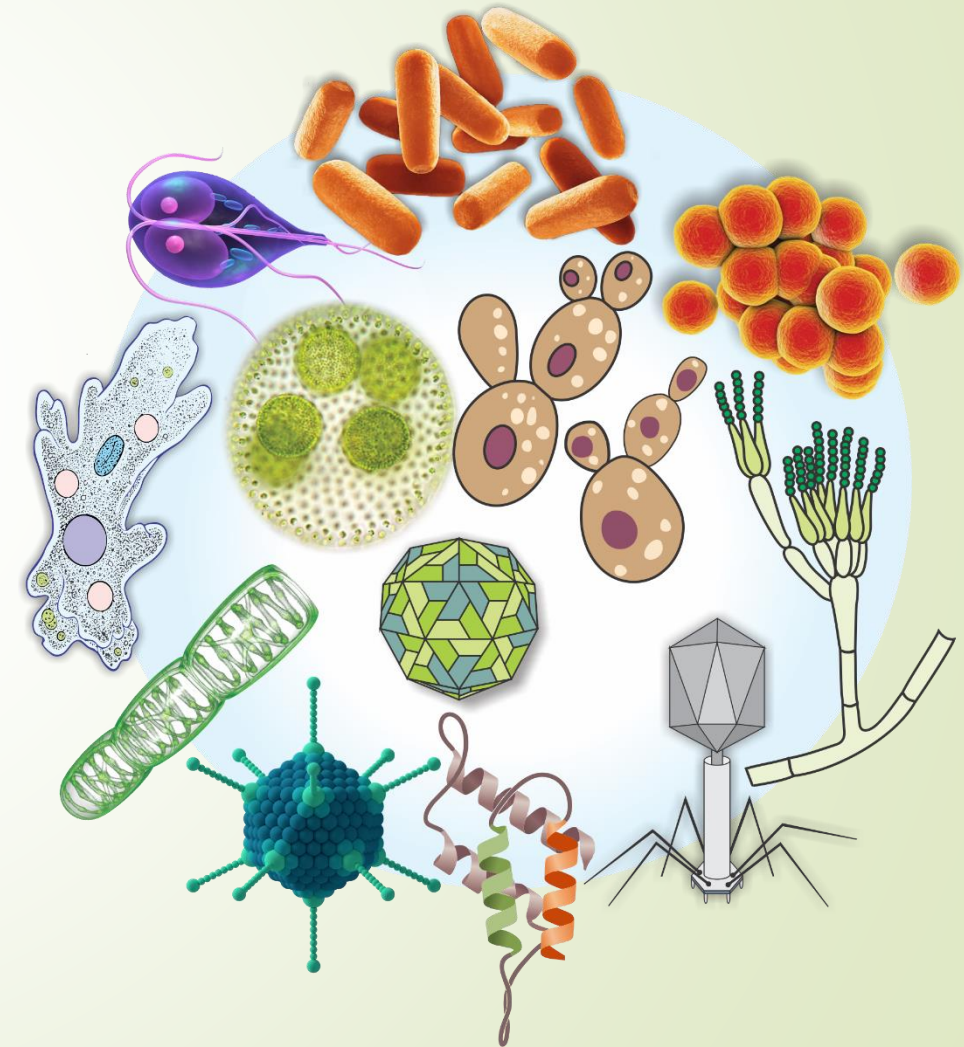




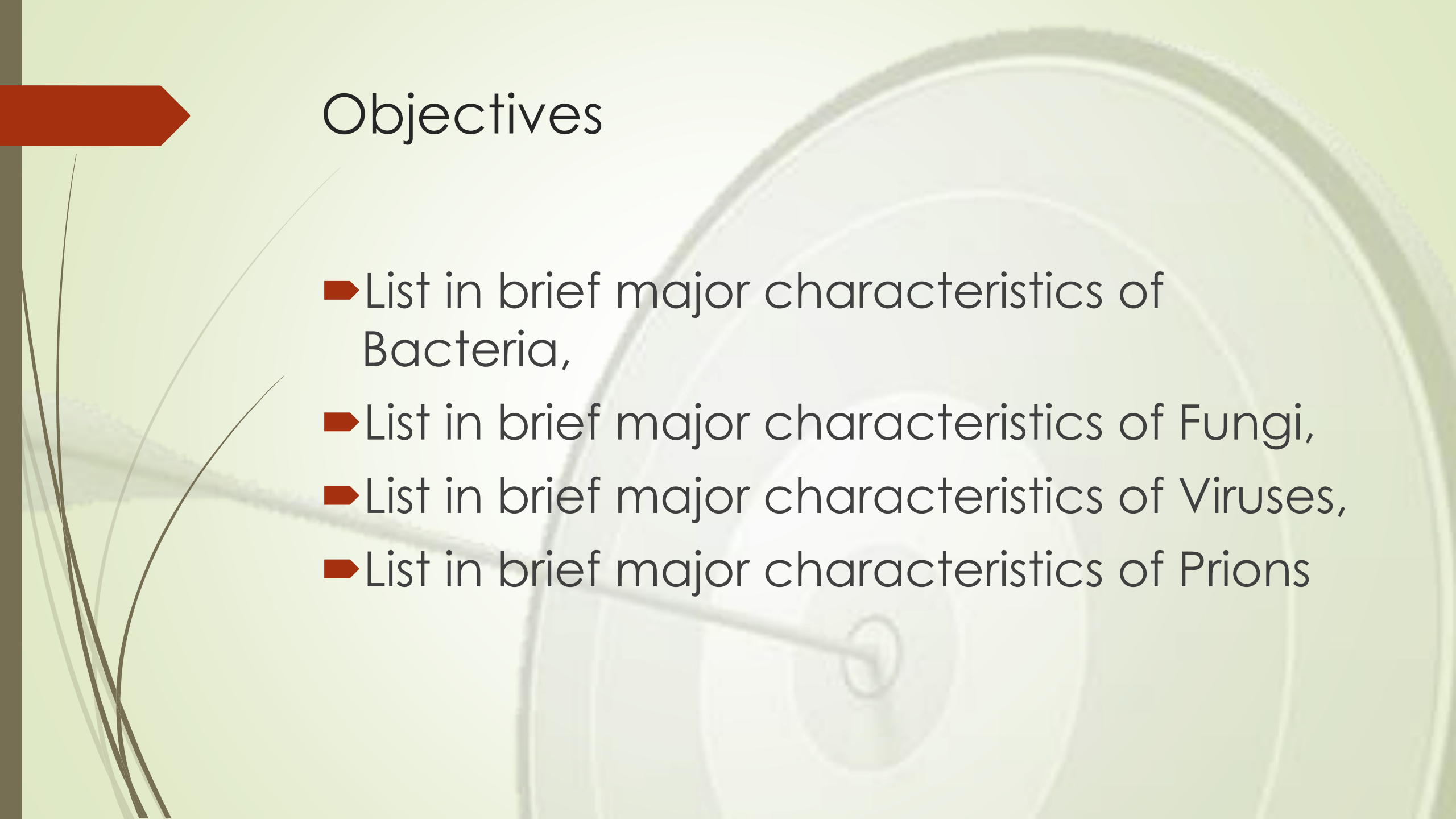
## Lecture (2)

# CHARACTERISTICS OF MICROORGANISMS





# Objectives

- List in brief major characteristics of Bacteria,
  - List in brief major characteristics of Fungi,
  - List in brief major characteristics of Viruses,
  - List in brief major characteristics of Prions
- 

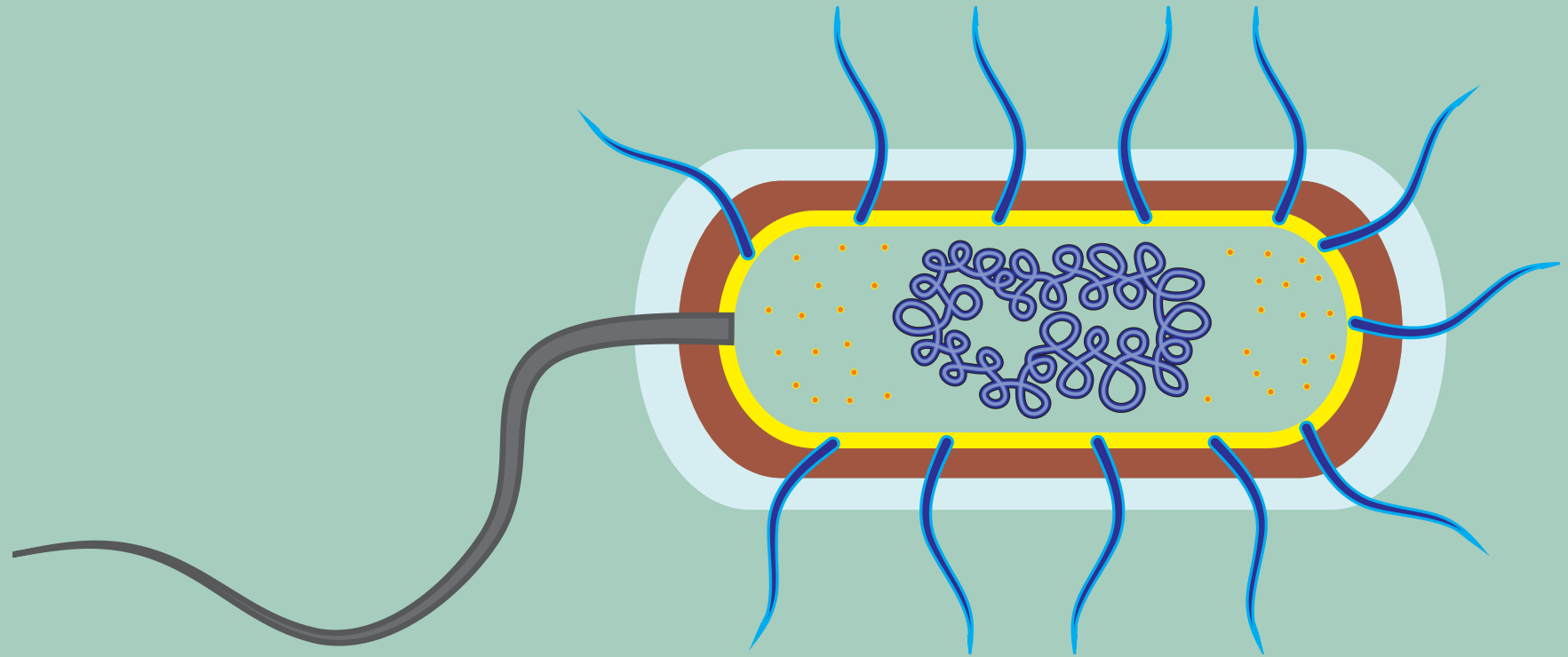
# Bacteria

Bacteria are unicellular prokaryotic organisms



# I. Bacteria are Prokaryotic Cells

Their cells lack nuclear membrane and organelles, which distinguish them from eukaryotes.

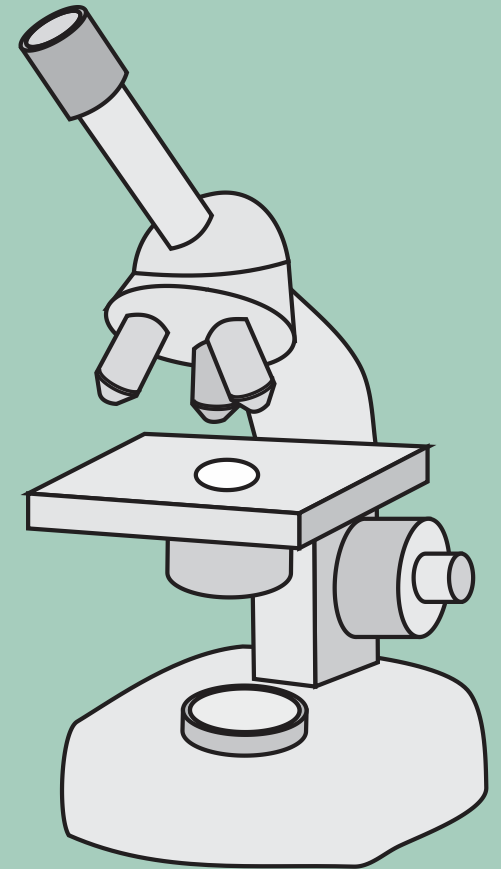


## Size of Bacteria:

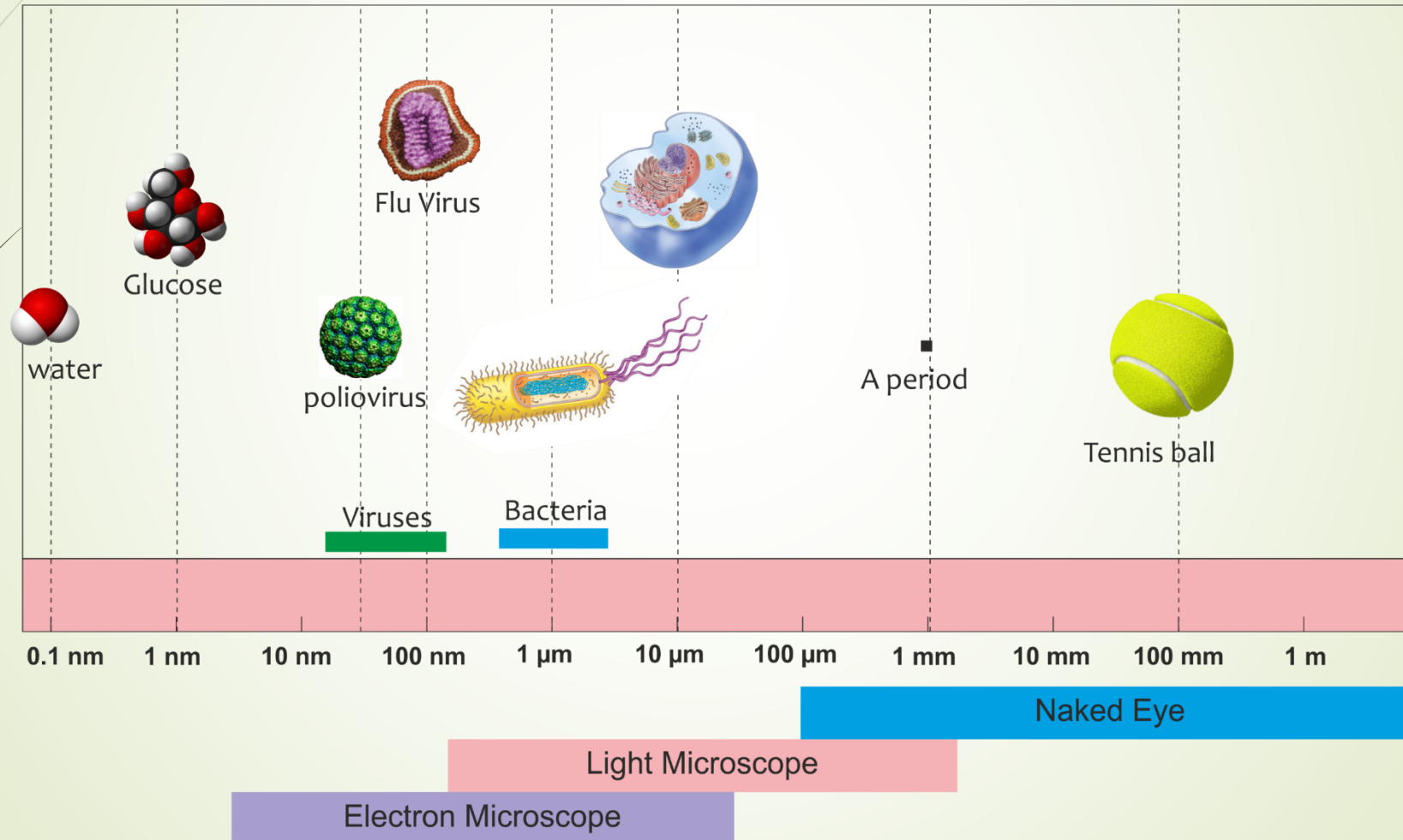
Bacteria are smaller than eukaryotic cells.

Bacterial cells are extremely small so they are:

- Measured in micrometers ( $\mu\text{m}$ ). One micrometer equals 1/1000 millimeter.
- Bacteria can be seen by light microscope.

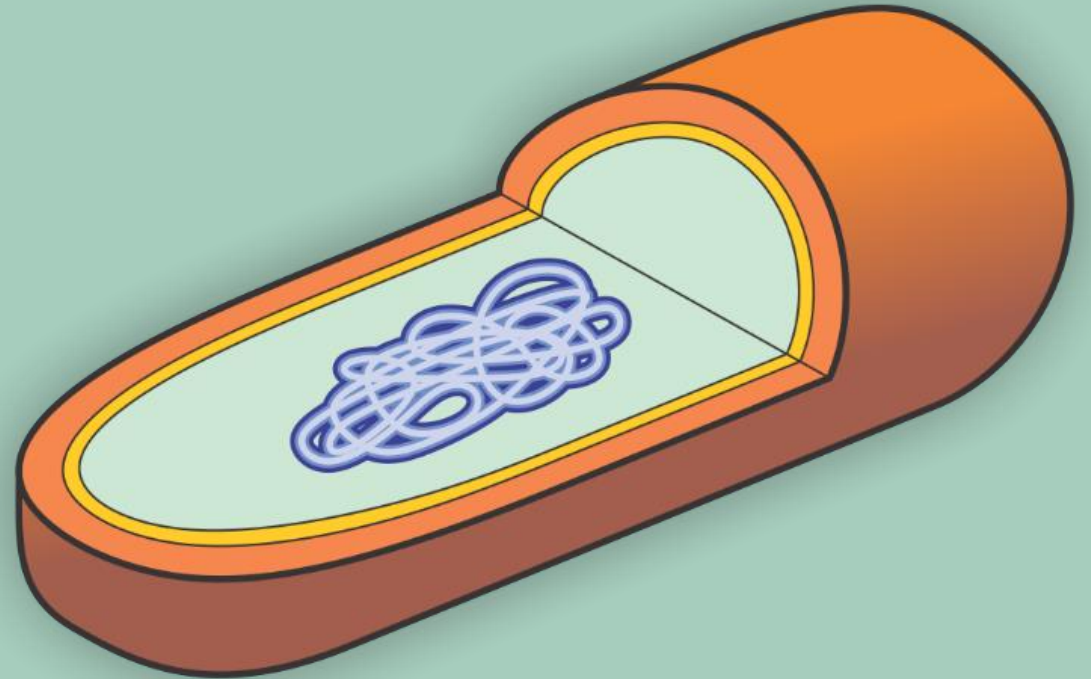


# Size of Bacteria



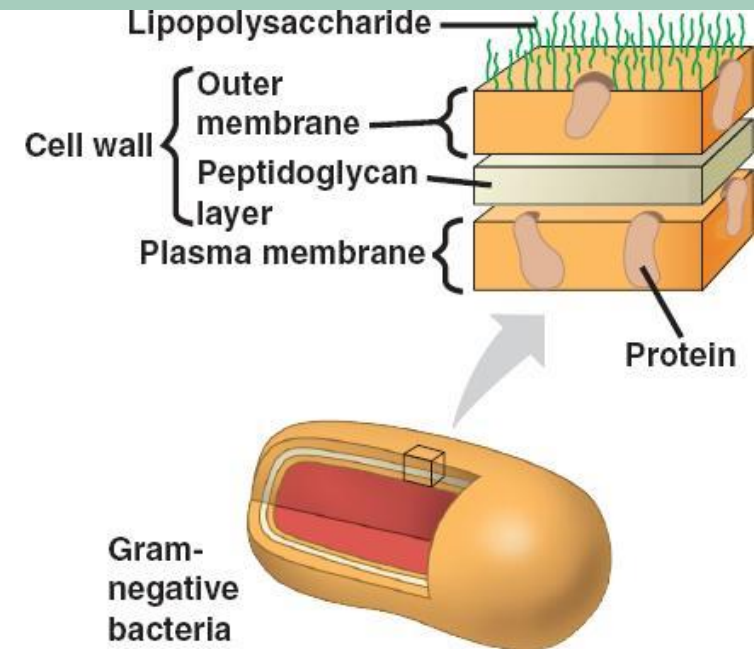
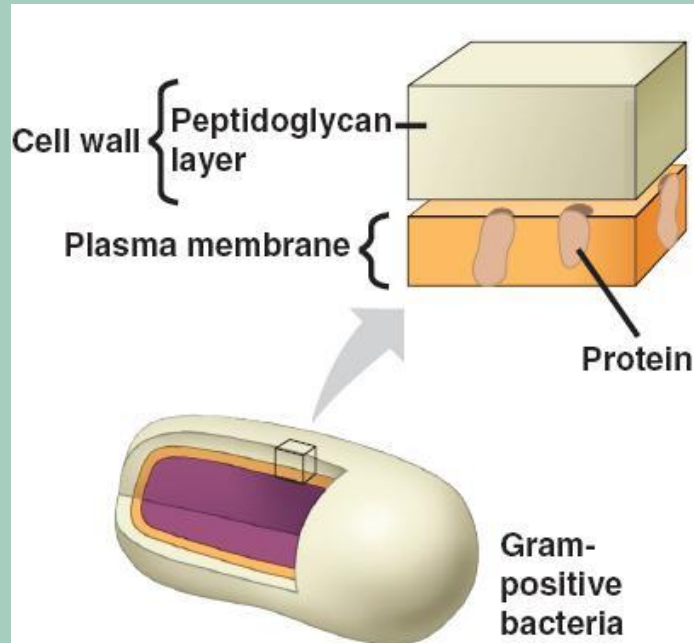
# Bacteria have a rigid cell wall

- Bacterial cell wall contain peptidoglycan.
- The cell wall surround the cell membrane and determines the **shape** of the organism.



# Bacteria have a rigid cell wall

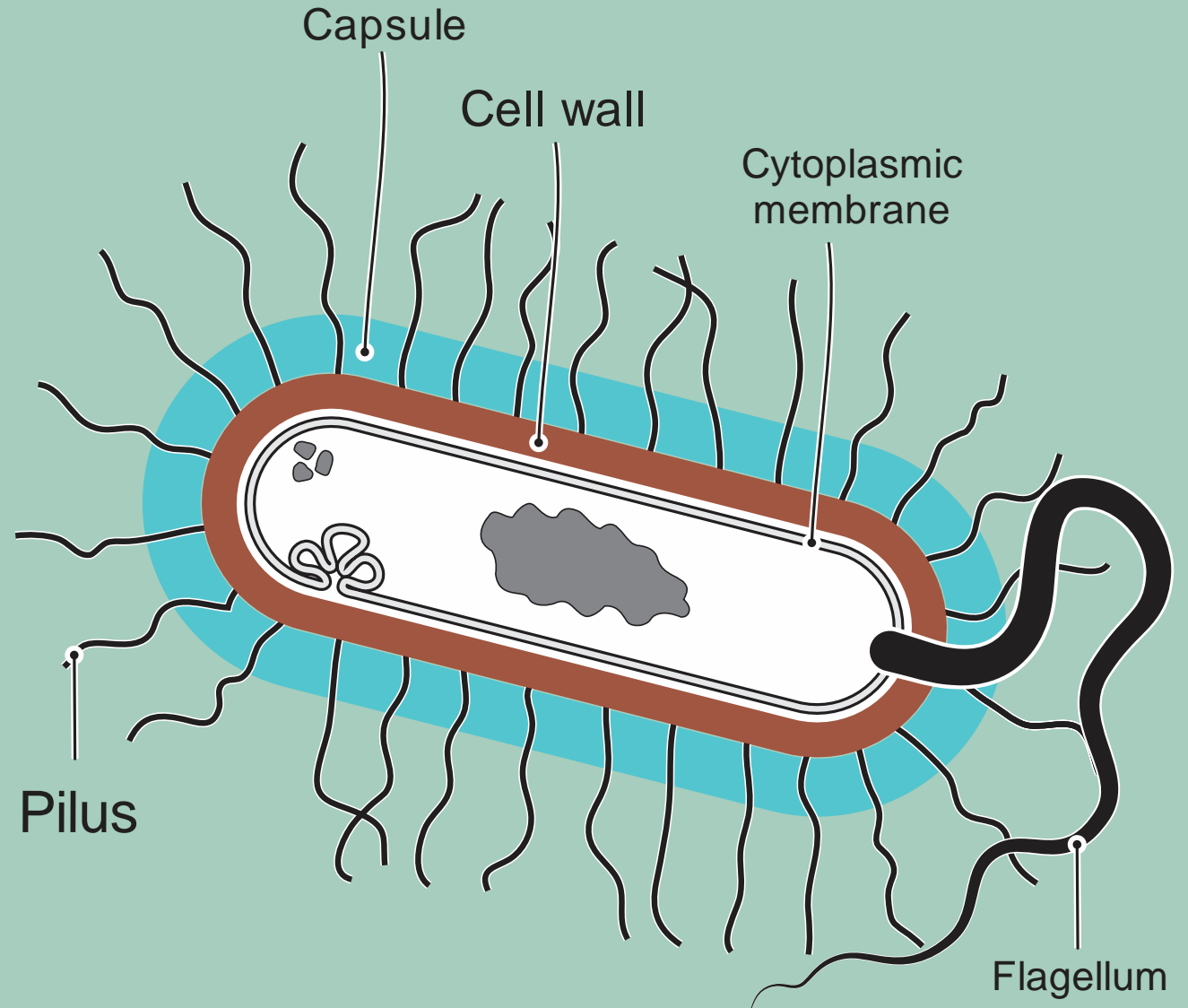
- Bacteria are classified according to the structure of their cell wall into two groups, either Gram-positive or Gram-negative.



# Additional structures

➤ External to the cell wall may be:

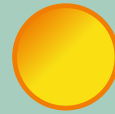
- Flagella,
- Pili, and/or a
- Capsule.



# Shape of Bacteria

Most bacteria have one of four basic shapes that can be described as either:

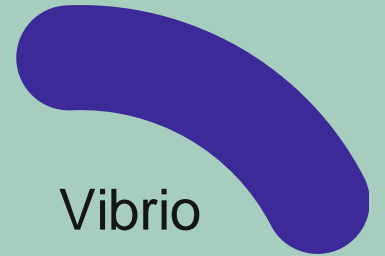
- Rod shaped (Bacillus),
- Spherical (Coccus),
- Curved (vibrio) or
- Spiral (spirochete).



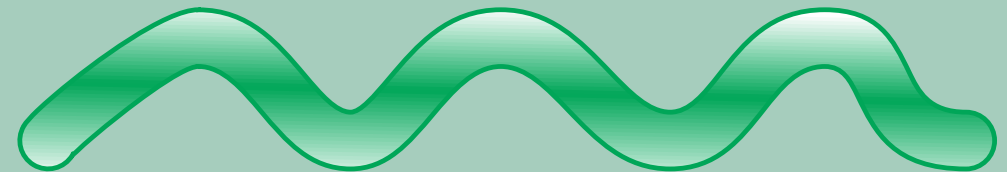
Coccus



Bacillus

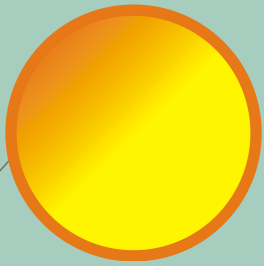


Vibrio



Spirochete

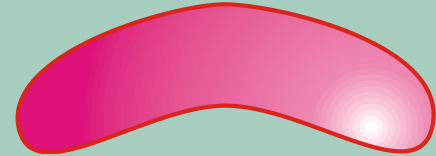
# Bacterial shapes



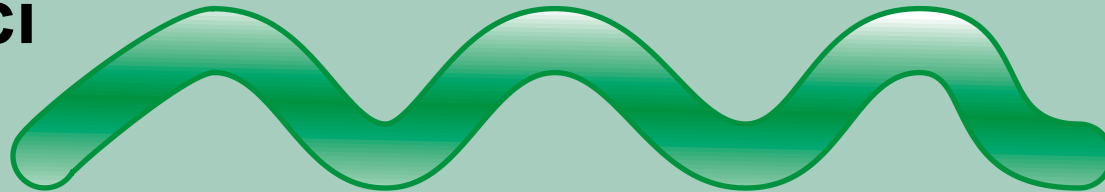
**Sphere shaped**  
**(Coccus)**  
pl. cocci



**Rod shaped**  
**(Bacillus)**  
pl. bacilli

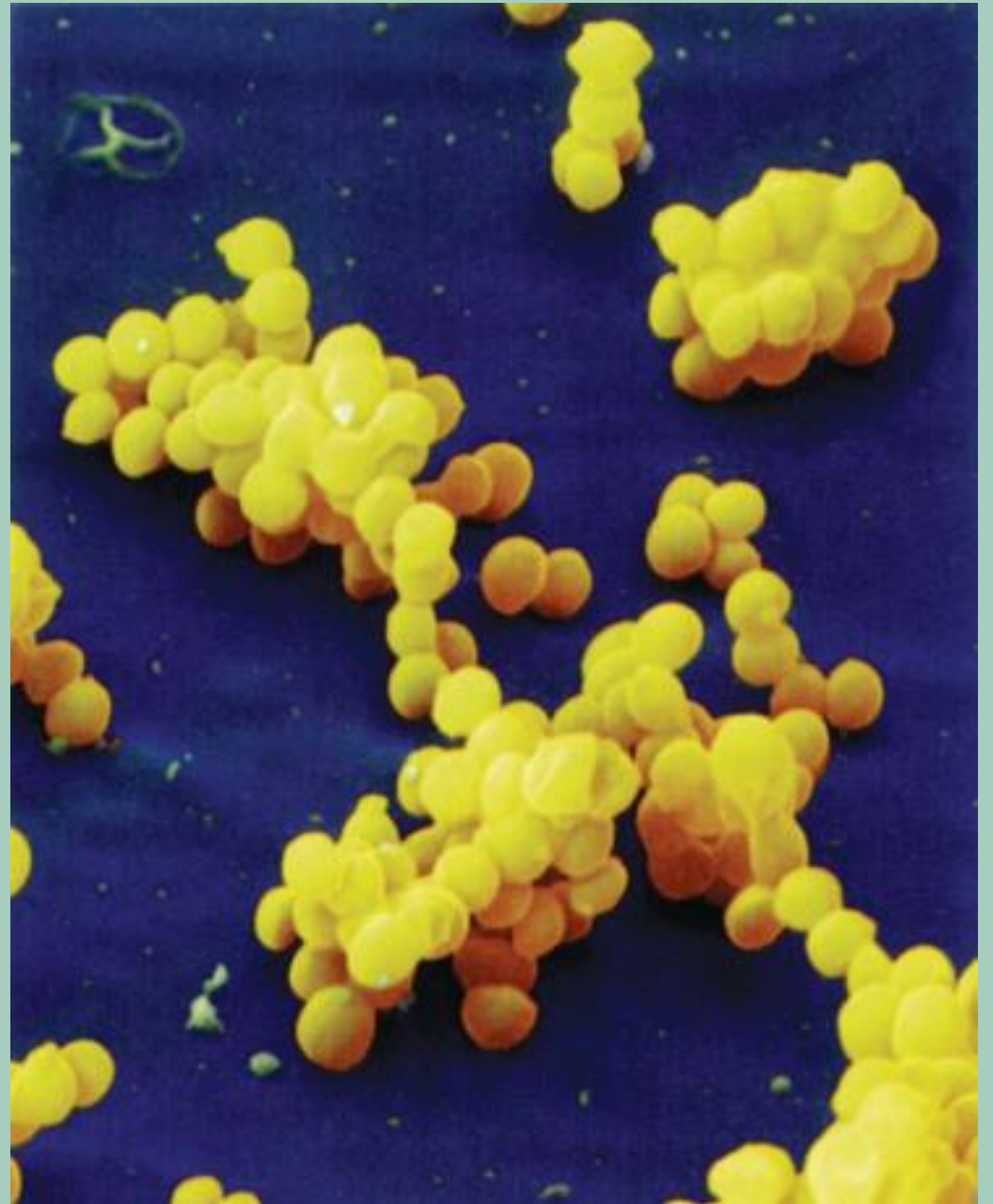


**Curved**  
**(Vibrio)**



**Spiral**  
**(spirochetes)**

This picture is of *Staphylococcus aureus* which has the shape of cocci arranged in clusters





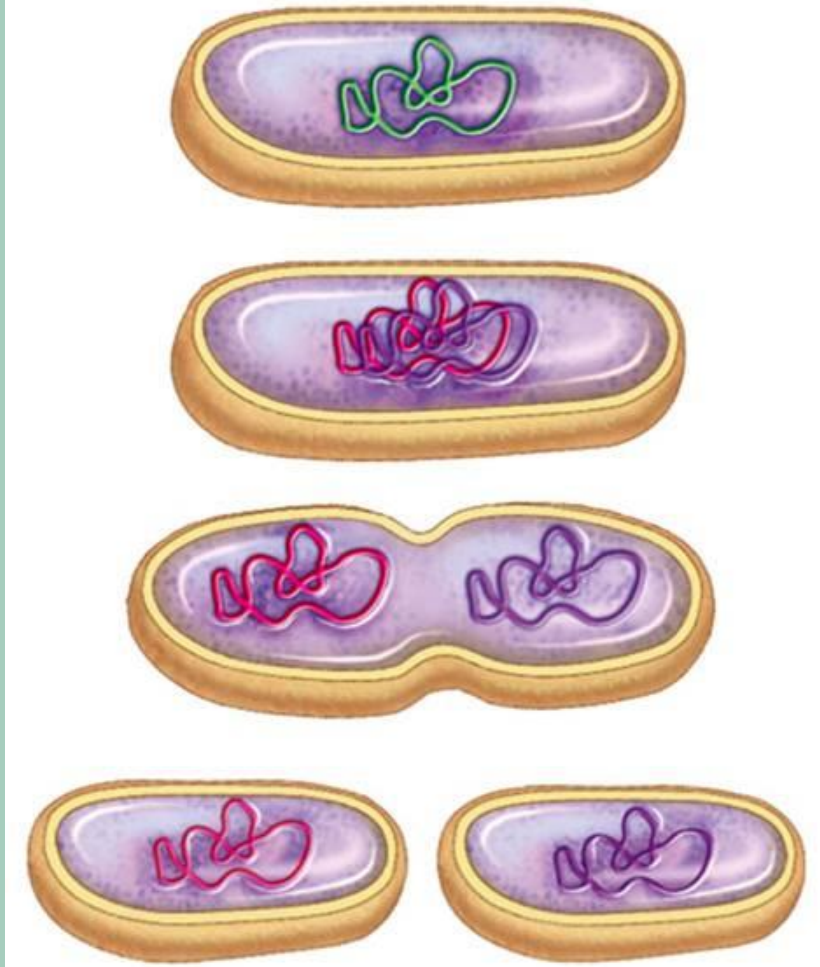
# Independent existence

- Most bacteria are capable of independent existence and growth, but species of Chlamydia and Rickettsia are obligately intracellular organisms.

# Bacterial Reproduction

- Bacterial cells **reproduce** asexually by **binary fission**.
- This type of asexual reproduction produces **identical cells**.
- However, many bacteria can **exchange** some genetic information carried on **plasmids** “small extrachromosomal genetic elements”.

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.

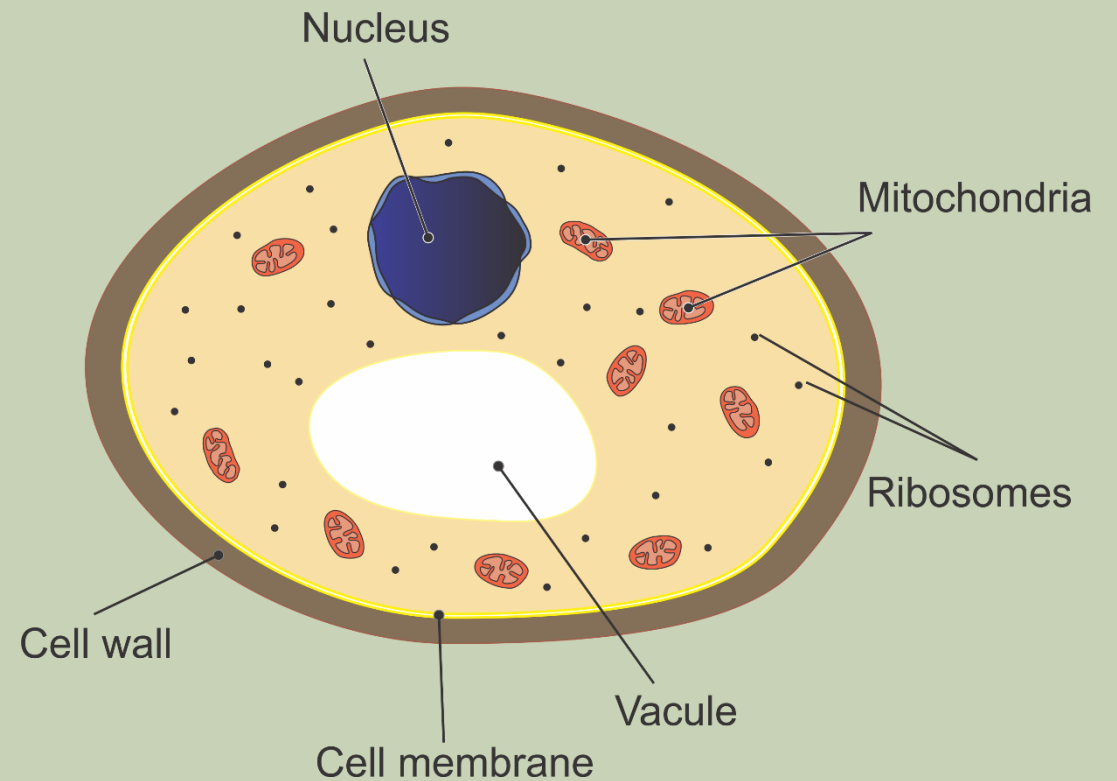


# Fungi



# Fungi are eukaryotic

- Fungi are eukaryotes.
- Fungi have a complex carbohydrate cell wall (like plants) that contain chitin (plant's cell wall contain cellulose).



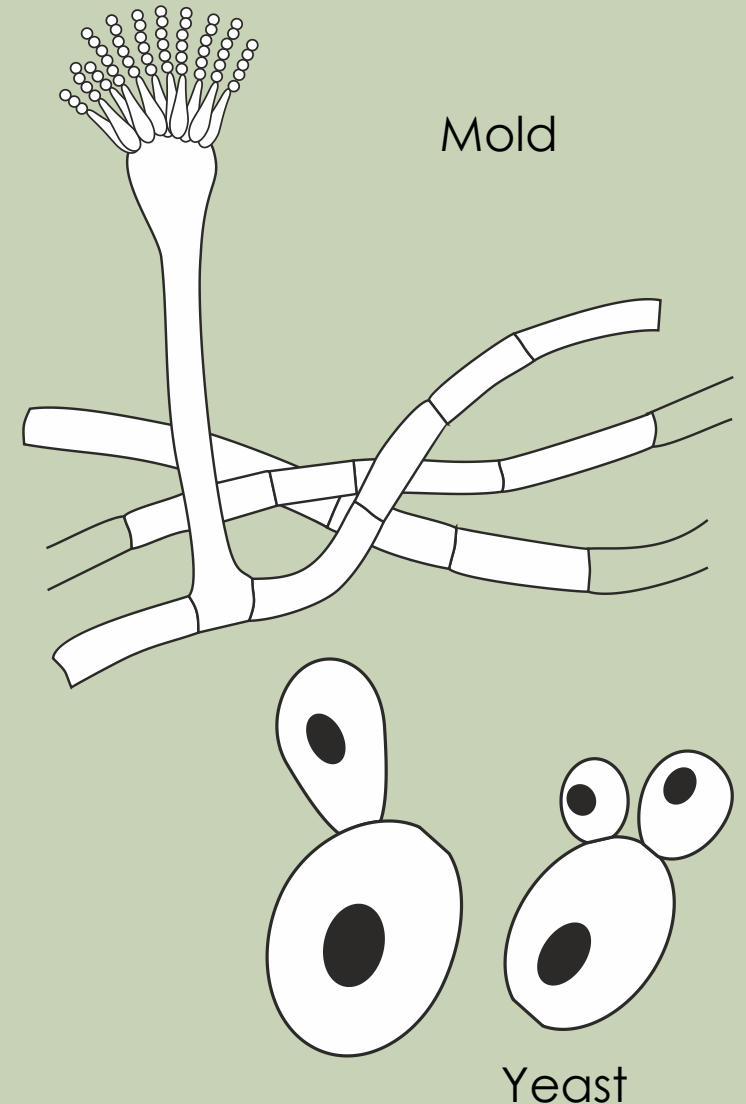
# Fungi are saprophytic

- Fungi are **non-photosynthetic**, generally **saprophytic** organisms (unlike plants).



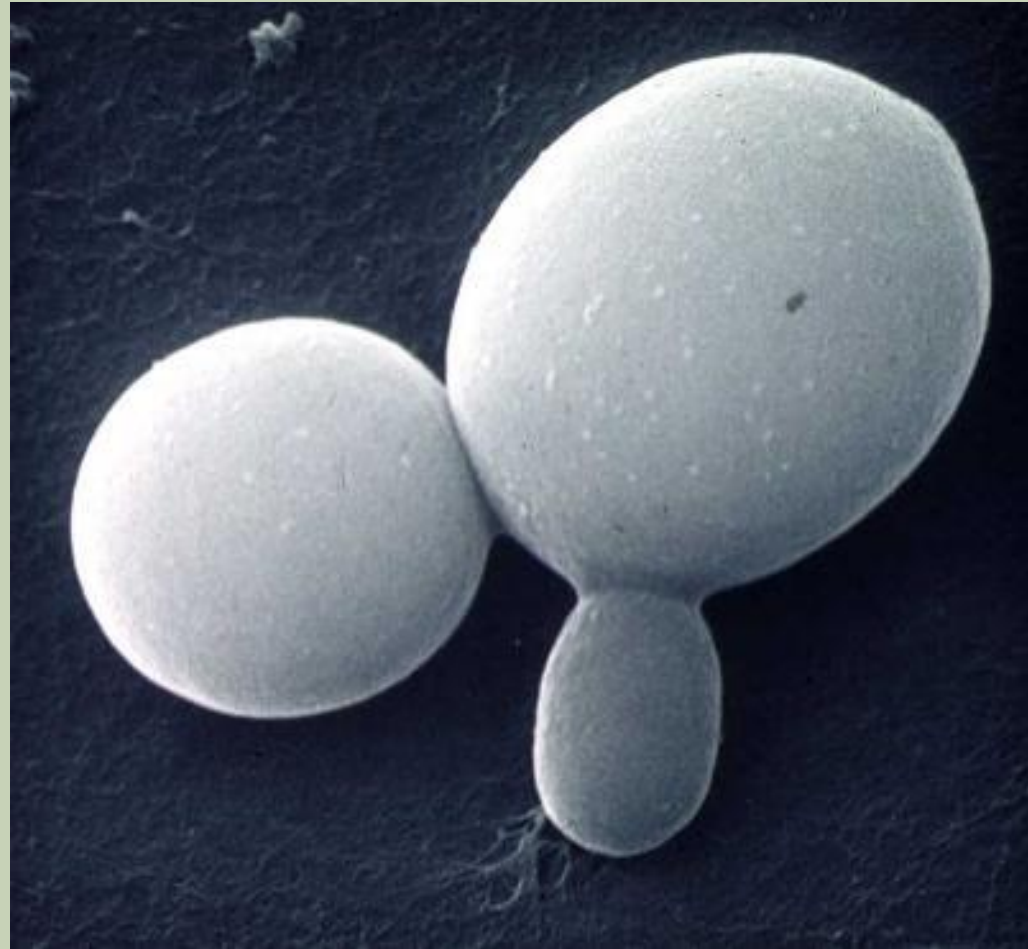
Two major groups are **yeast** and **mold**.

- Some fungi are multicellular filamentous, and are commonly called **molds**,
- Others “the **yeasts**” are unicellular.



## Yeasts:

This figure shows budding oval yeast cells



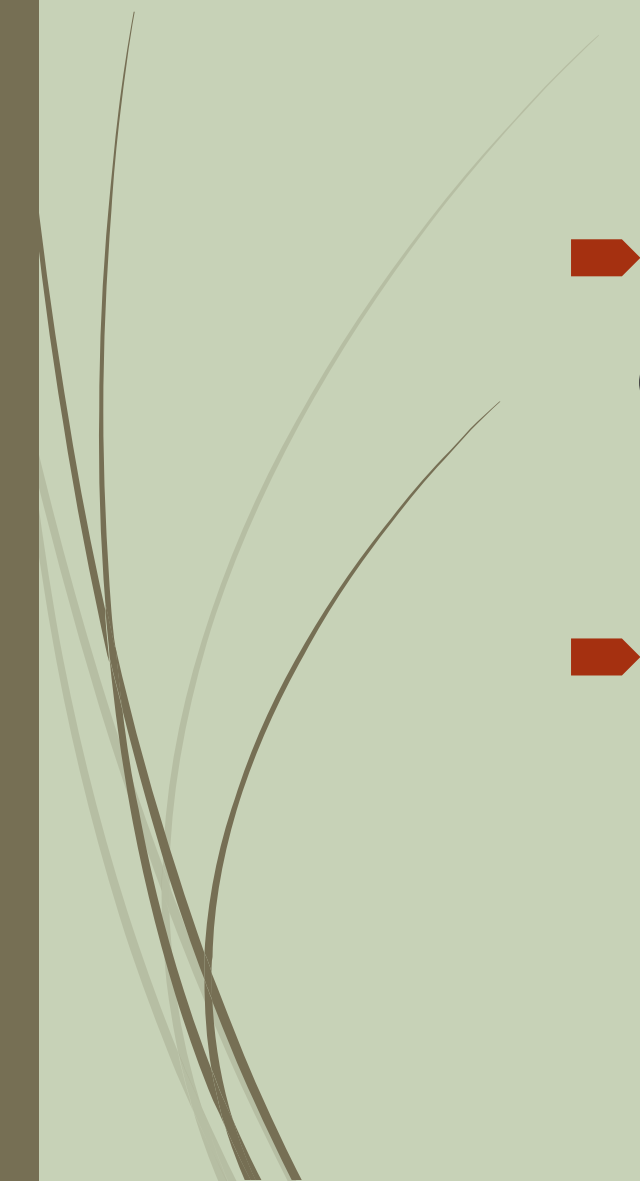
## Molds:



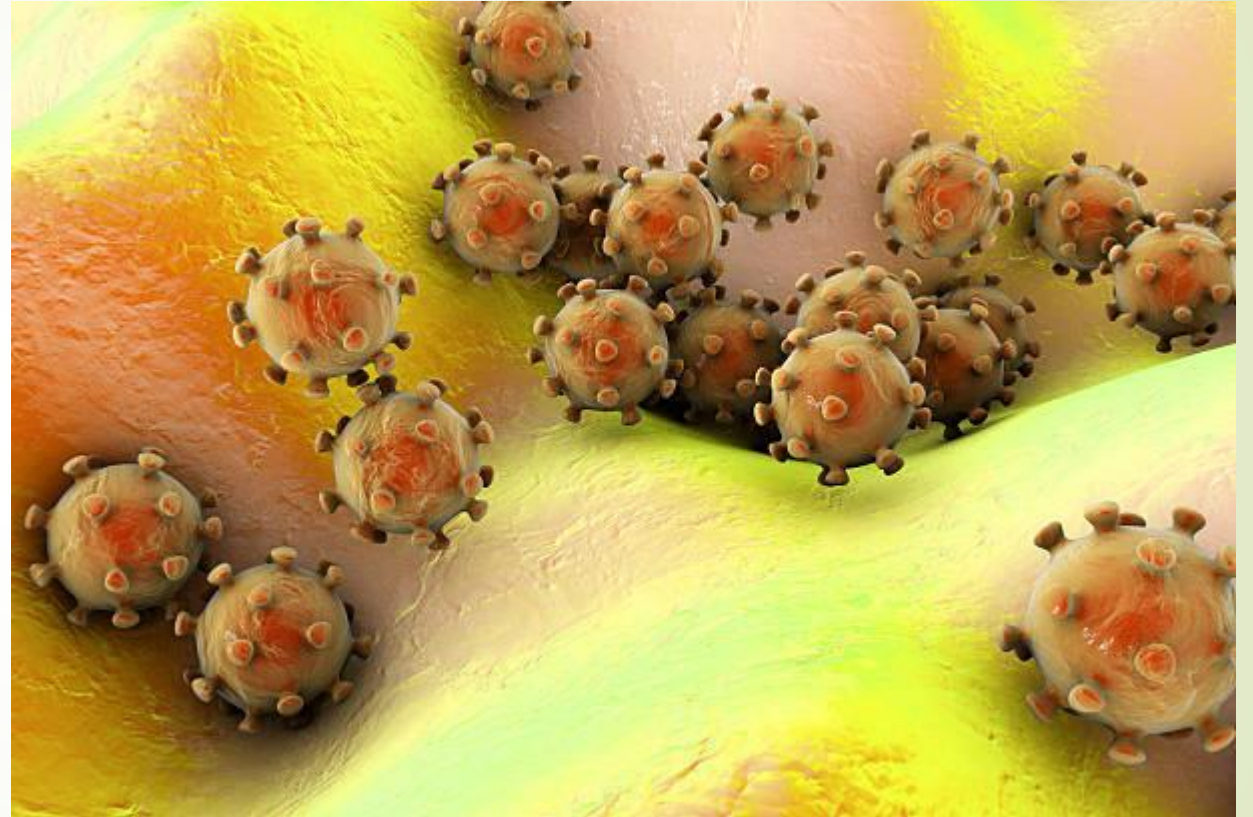
This figure shows branching mold hyphae



# Fungal reproduction

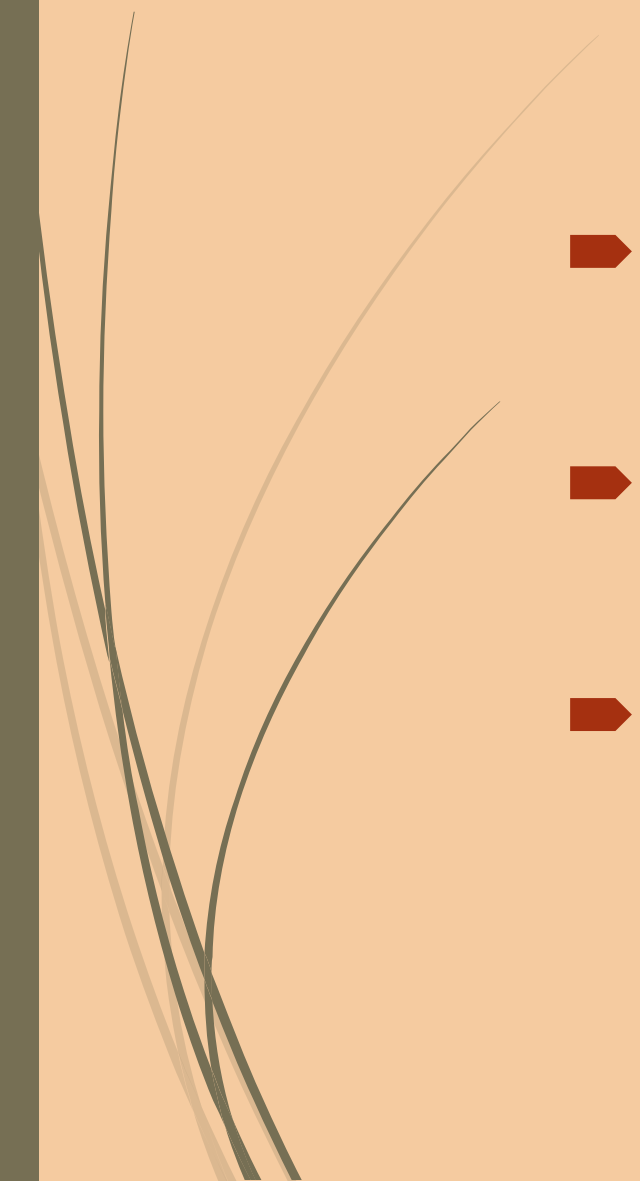
- Fungal reproduction may be **asexual, sexual**, or both.
  - All fungi produce **spores**.
- 

# Viruses



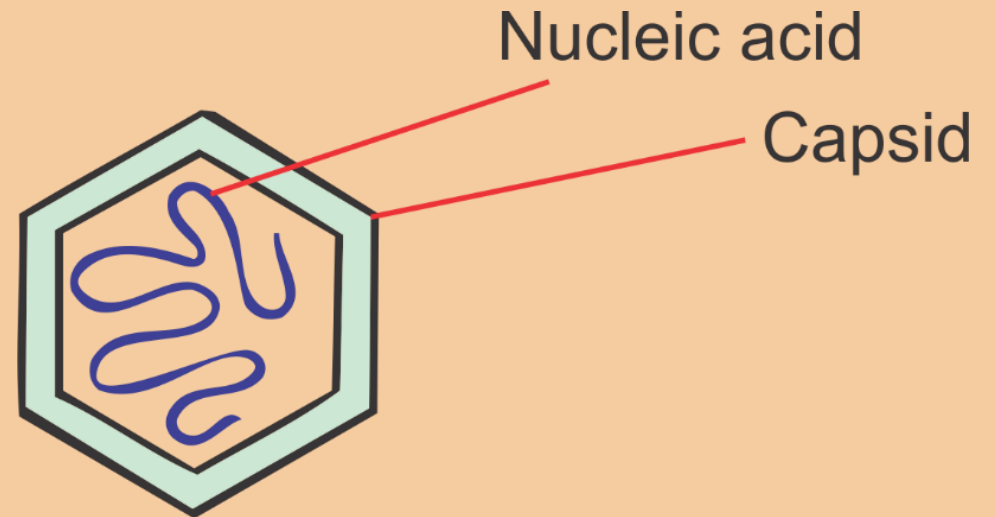


# Viruses are very small

- Viruses are **too small** to be seen in the light microscope
  - Measured in **nanometer**  
(one nanometer = 1/1000 micrometer)
  - Can be seen only by **electron microscope**.
- 

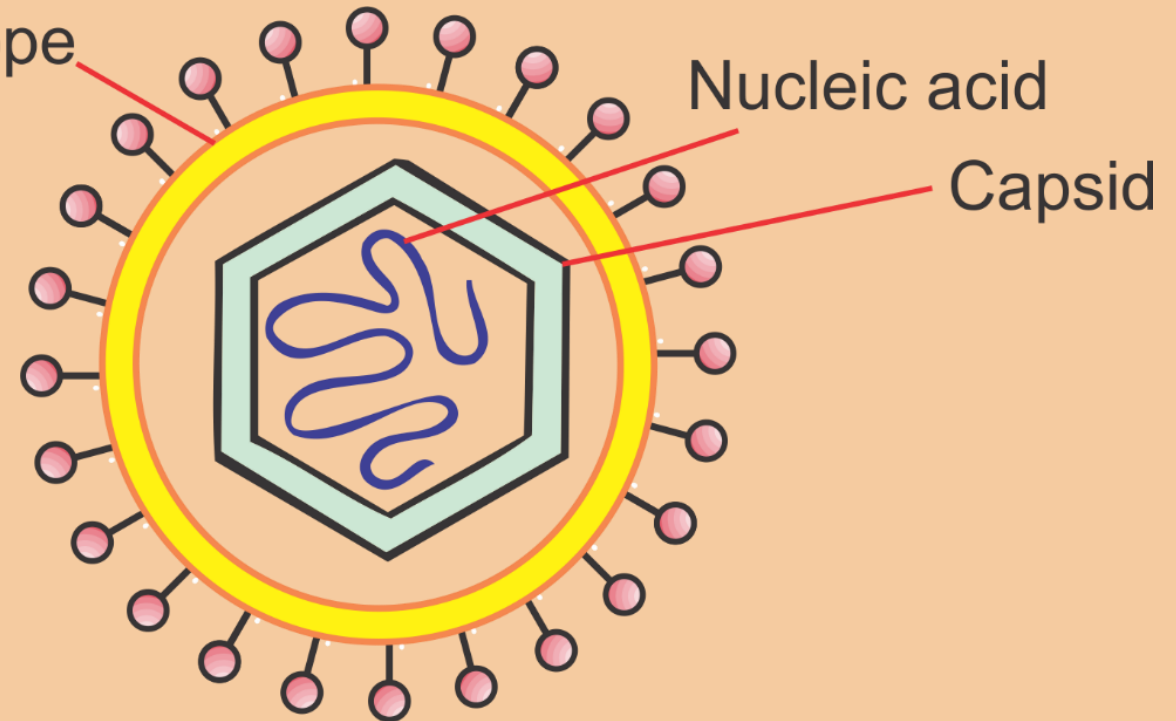
# Virus Structure

- Viruses are not cells (acellular). They have a simple structure.
- A virus consists of **Nucleic acid** molecule(s) (DNA or RNA but not both), surrounded by a **protein coat** (Capsid).



# Virus Structure

- Some viruses may also have a lipid "**envelope**".



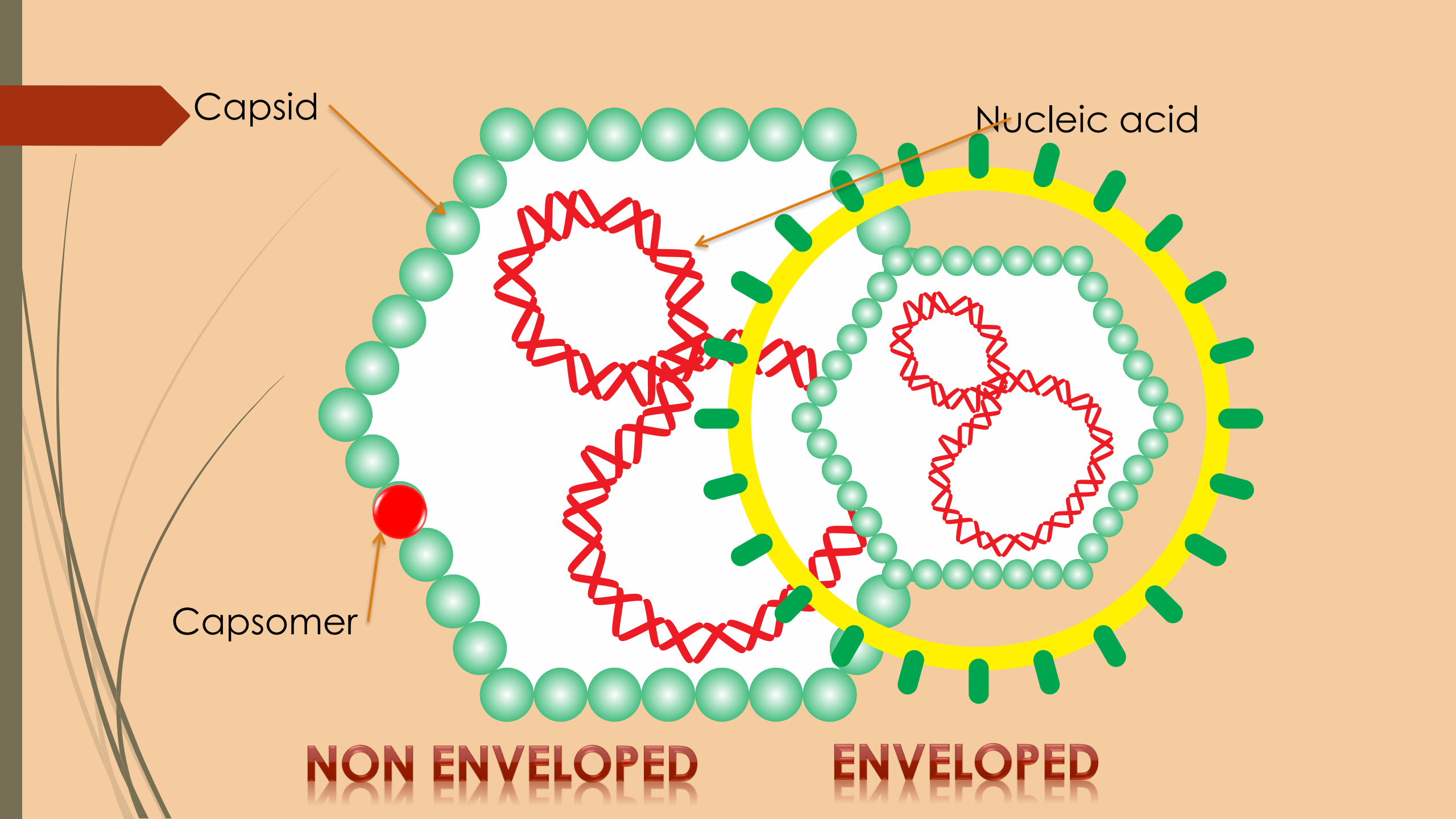
Capsid

Nucleic acid

Capsomer

**NON ENVELOPED**

**ENVELOPED**





# Obligate intracellular parasites

- Viruses Are **obligate intracellular parasites** of other living cells.
- Viruses contain the genetic **information** necessary to direct their own replication, however, they require the host cell's structures and enzymatic machinery.



# Prions

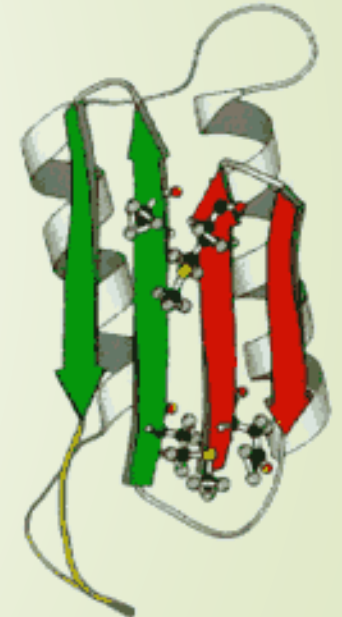


# Prions

- **Prions** are infectious protein particles that lack nucleic acid.
- A prion is a misfolded form of a normal brain protein.



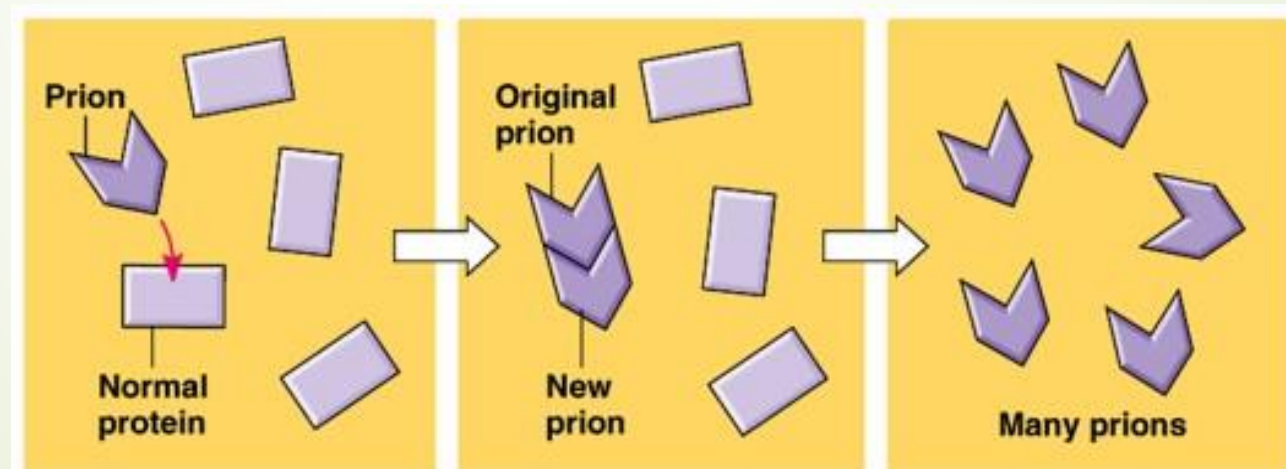
normal



Disease-  
causing

# Prions

- Prion can convert a normally folded protein into the prion form, creating a chain reaction that increases prion numbers.



# Prions

Prions can cause several **degenerative brain diseases** including scrapie in sheep, “mad cow disease”, and Creutzfeldt-Jacob disease in humans





Quizzes



**1. Mention three basic bacterial shapes:**

1) .....

2) .....

3) .....



## 2. Virus size is measured in \_\_\_\_\_?

- A. Millimeter
- B. Micrometer
- C. Nanometer
- D. Picometer



**3. Virus can be seen by \_\_\_\_\_?**

- A. Light microscope
- B. Naked Eye
- C. Electron Microscope





**4. Which of the following is measured in nanometer:**

- A. Fungi
- B. Viruses
- C. Bacteria

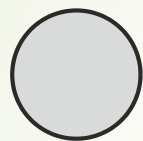


5. The eukaryotic infectious agent that has a complex carbohydrate cell wall:

- A. Viruses
- B. Fungi
- C. Prions
- D. Bacteria



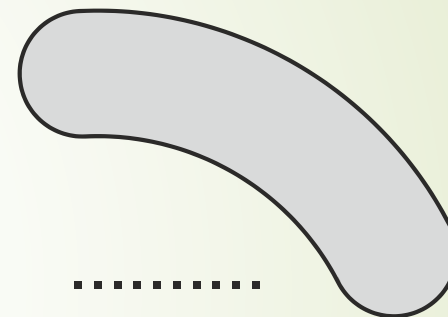
## 6. Fill in the spaces:



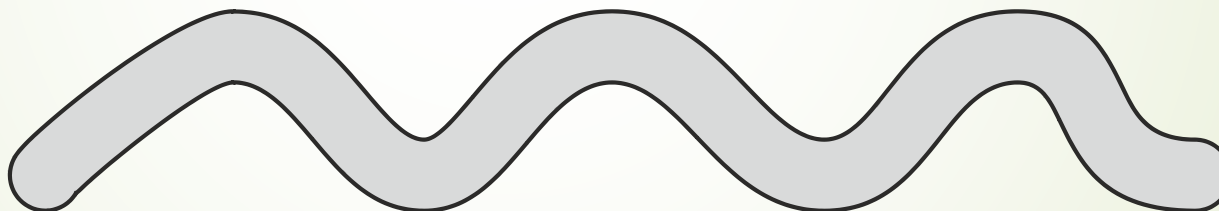
.....



.....



.....



.....



## 7. Unicellular fungi are called

- A. Yeast
- B. Mold



## 8. True or False

1. Viruses can be seen by light microscope ( )
2. Viruses can be seen by Electron microscope ( )
3. Eukaryotic cells are smaller than bacterial cells ( )
4. bacterial cells are smaller than Eukaryotic cells ( )



## 9. True or False

1. Fungi are photosynthetic ( )
2. Fungi are saprophytic ( )
3. Fungi has cell wall that contain peptidoglycan ( )
4. Fungi has cell wall that contain chitin ( )



## 10. Bacterial cell wall contain \_\_\_\_\_?

- A. Peptidoglycan
- B. Cellulose
- C. Chitin



## 11. Fungal cell wall contain \_\_\_\_\_?

- A. Peptidoglycan
- B. Cellulose
- C. Chitin



**12. Bacterial cell are measured by**  
\_\_\_\_\_?

- A. Nanometer
- B. Micrometer
- C. Millimeter



**13. Infectious protein particles that lack nucleic acid are called**

- A. Virus
- B. Bacteria
- C. Prion
- D. Yeast



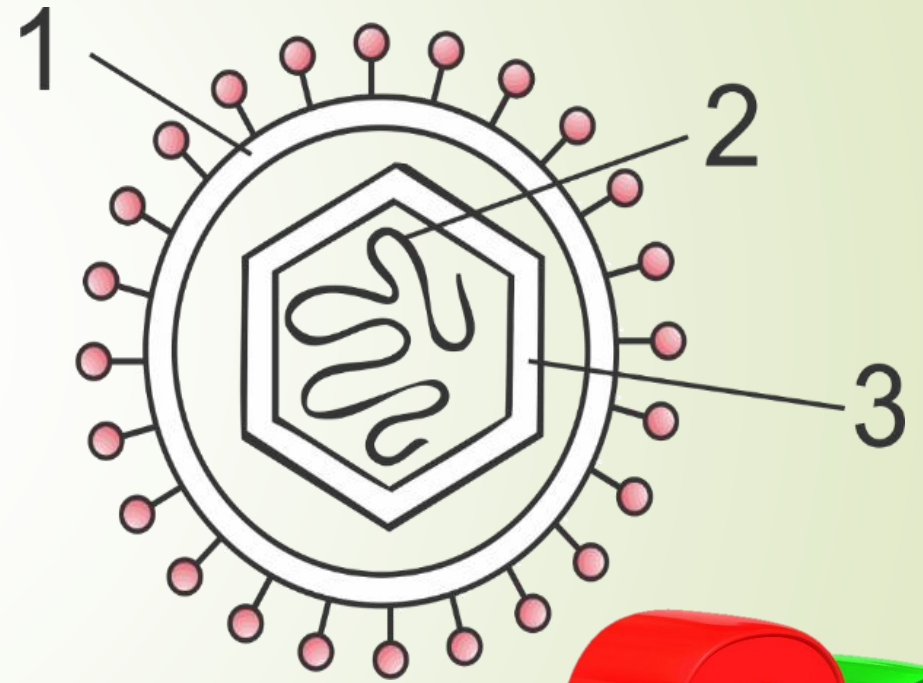
**14. Multicellular fungi are called**  
\_\_\_\_\_?

- A. Yeast
- B. Mold



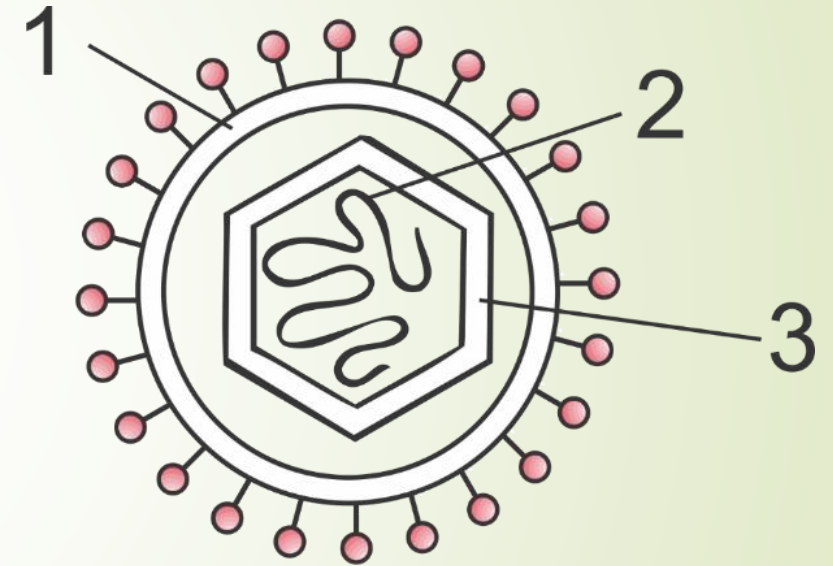
**15. This picture is of:**

- A. Virus
- B. Bacteria
- C. Fungus
- D. Prion



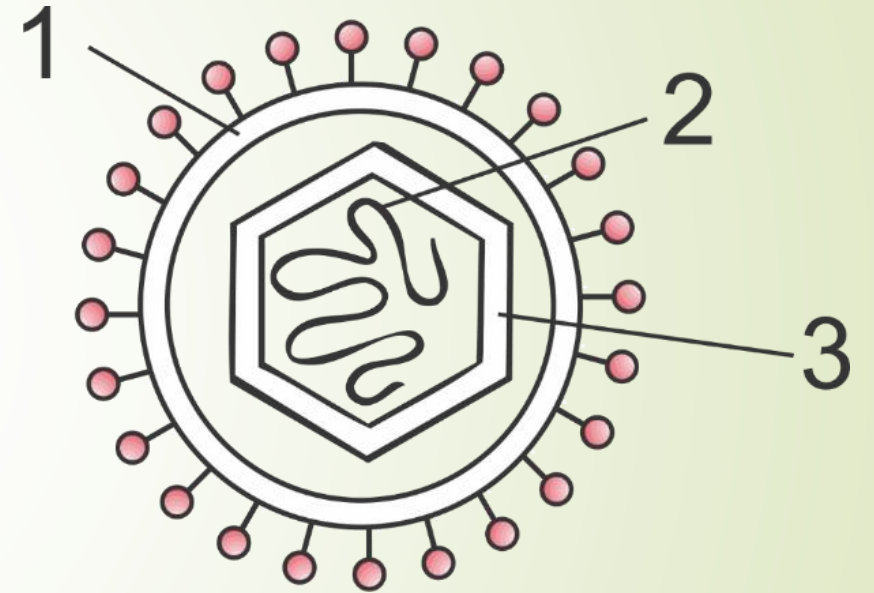
**16. This infectious agent is:**

- A. Prokaryotic
- B. Eukaryotic
- C. Subcellular



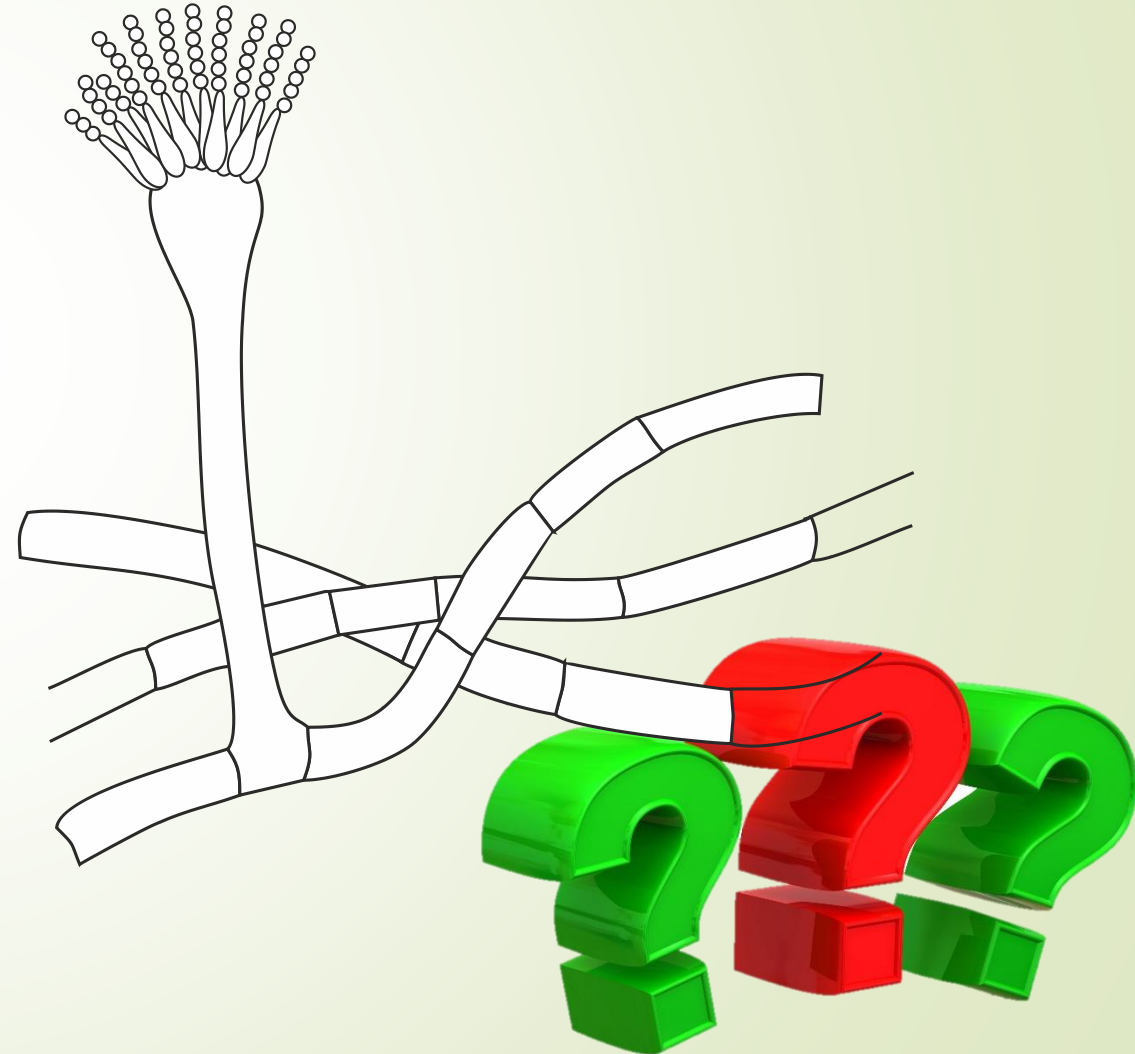
## 17. Fill in the spaces:

- ➡ Number 1 is : .....
- ➡ Number 2 is : .....
- ➡ Number 3 is: .....



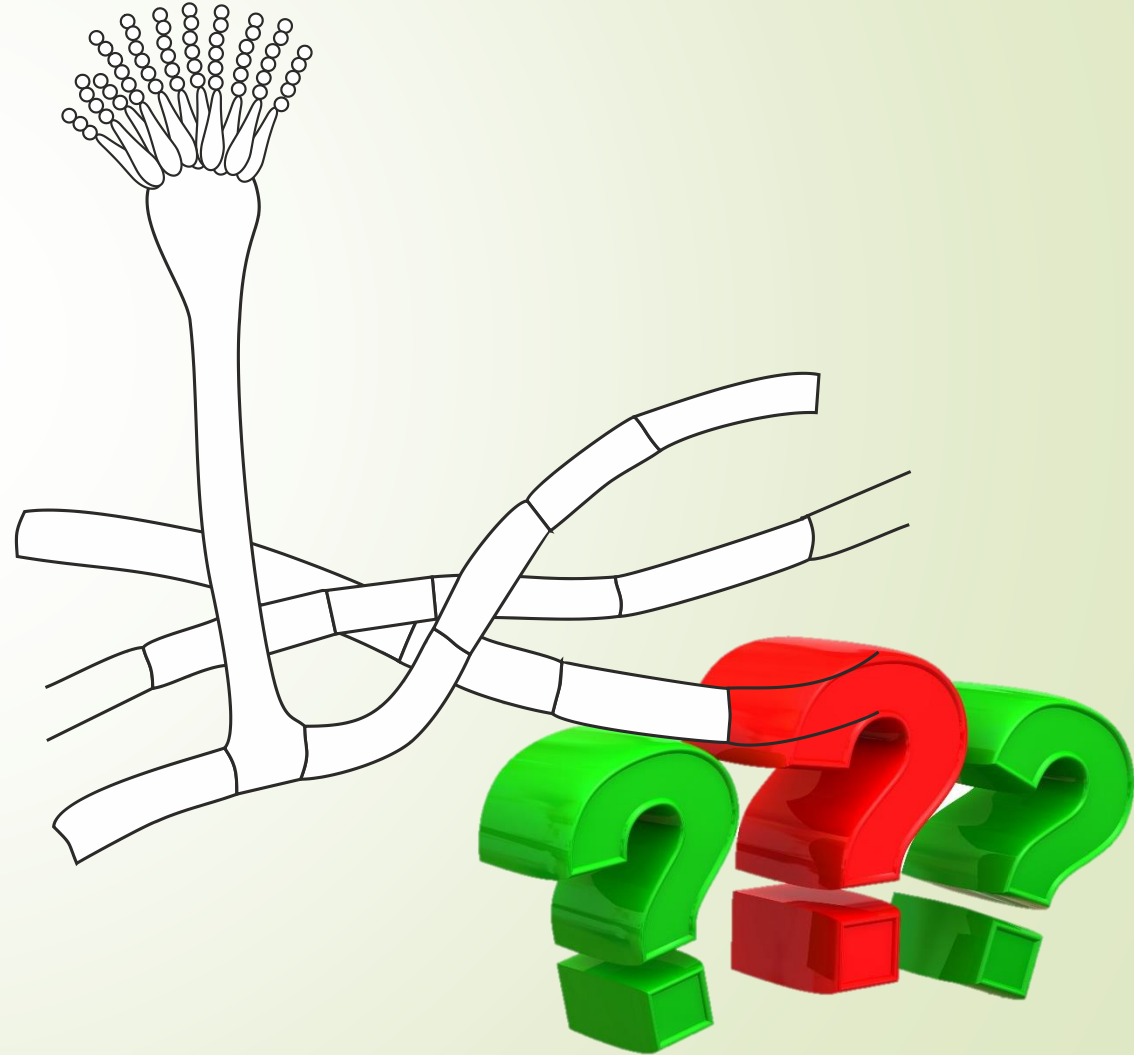
**18. This infectious agent is:**

- A. Bacteria
- B. Virus
- C. Fungus



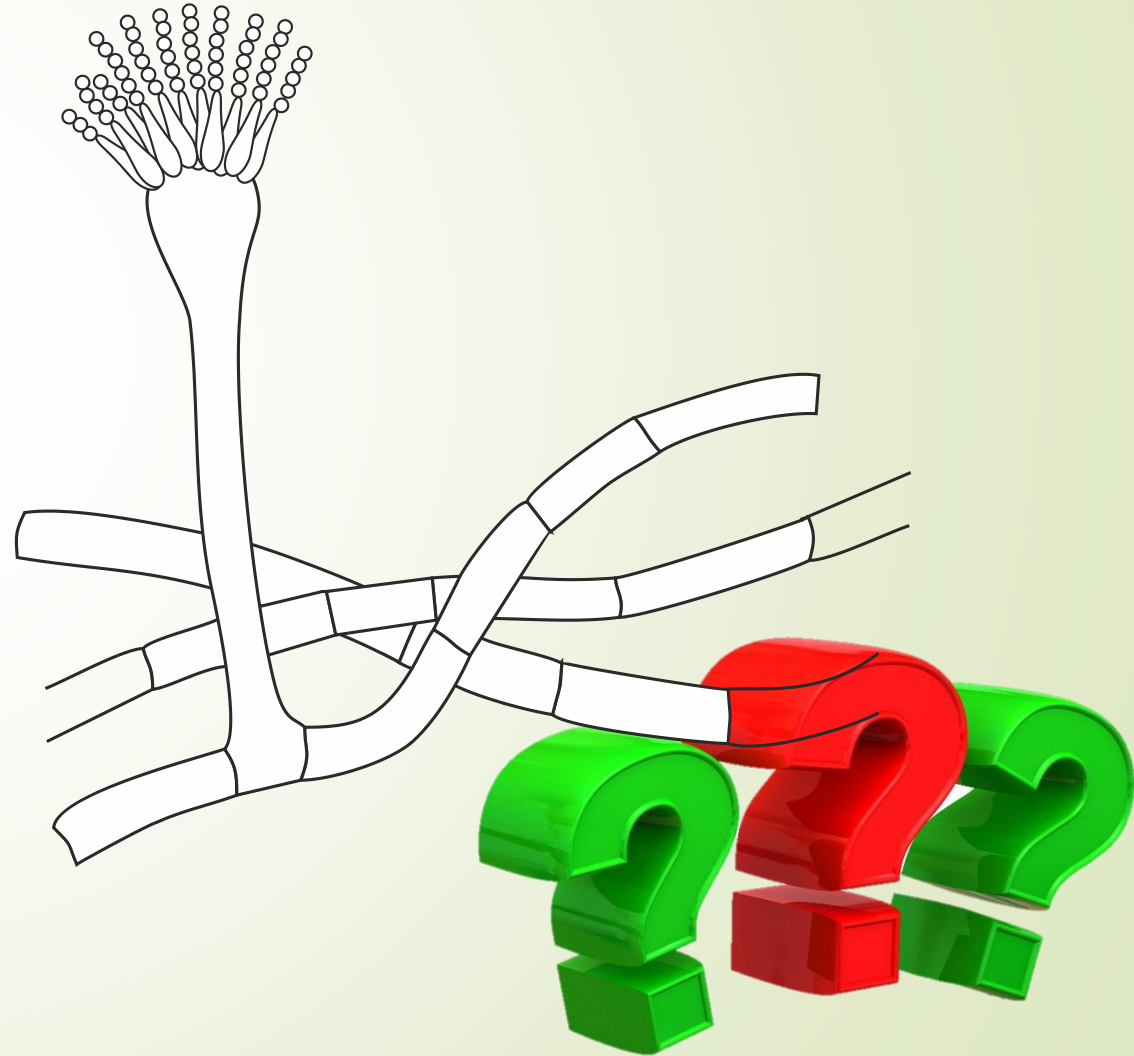
**19. This infectious agent is:**

- A. Eukaryote
- B. Prokaryote



**20. This infectious agent is:**

- A. Yeast
- B. Mold



**21. Prions can cause a disease that affect \_\_\_\_\_?**

- A. Brain
- B. Lung
- C. Intestine
- D. Bones



**22. Bacteria reproduce by**  
**\_\_\_\_\_?**

- A. Mitosis
- B. Meiosis
- C. Binary fission



## 23. Fill in the spaces:

- Number 1 is :  
.....
- Number 2 is :  
.....
- Number 4 is:  
.....
- Number 5 is:  
.....

