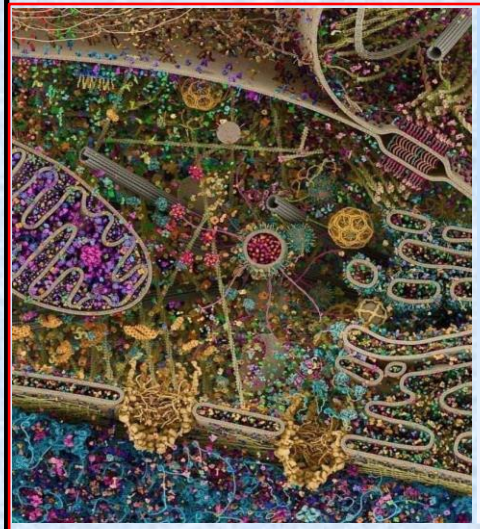
General Animal Biology

Zoo-109 | علم الأحياء | **109- حـيـن**



For Pre-Medical Students **Common First Year**

السنة الأولى المشتركة - المسار الصحي

1444-H - 2023

Reference: *Campbell, N. A. and Reece, J. B. (2014). Biology (10th edition). Pearson Education. Inc. USA.*

عمادة التعليم الإلكتروني والتعلم عن بعد
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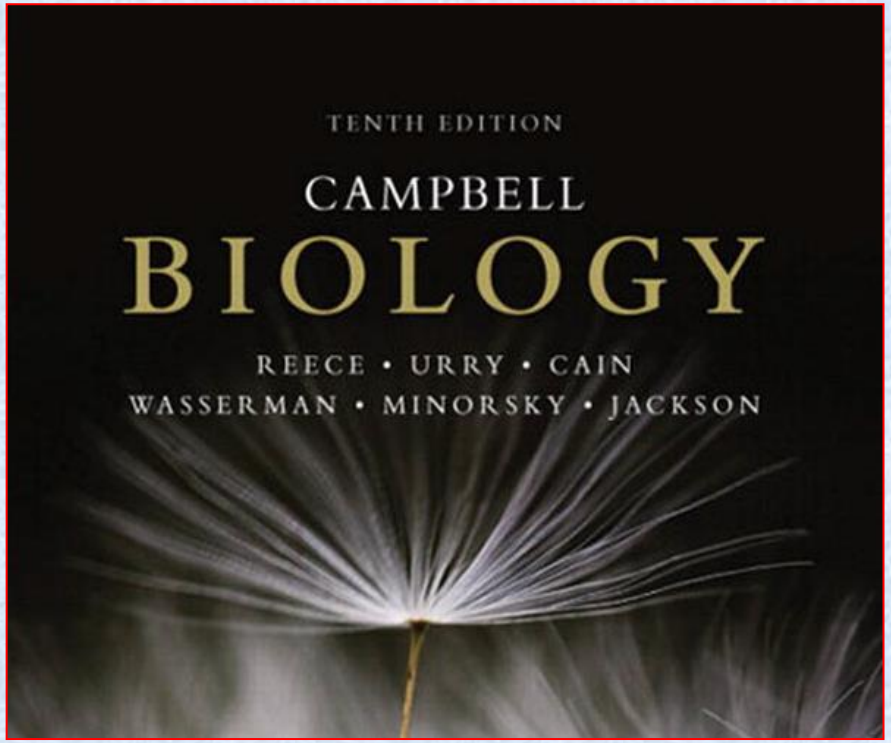
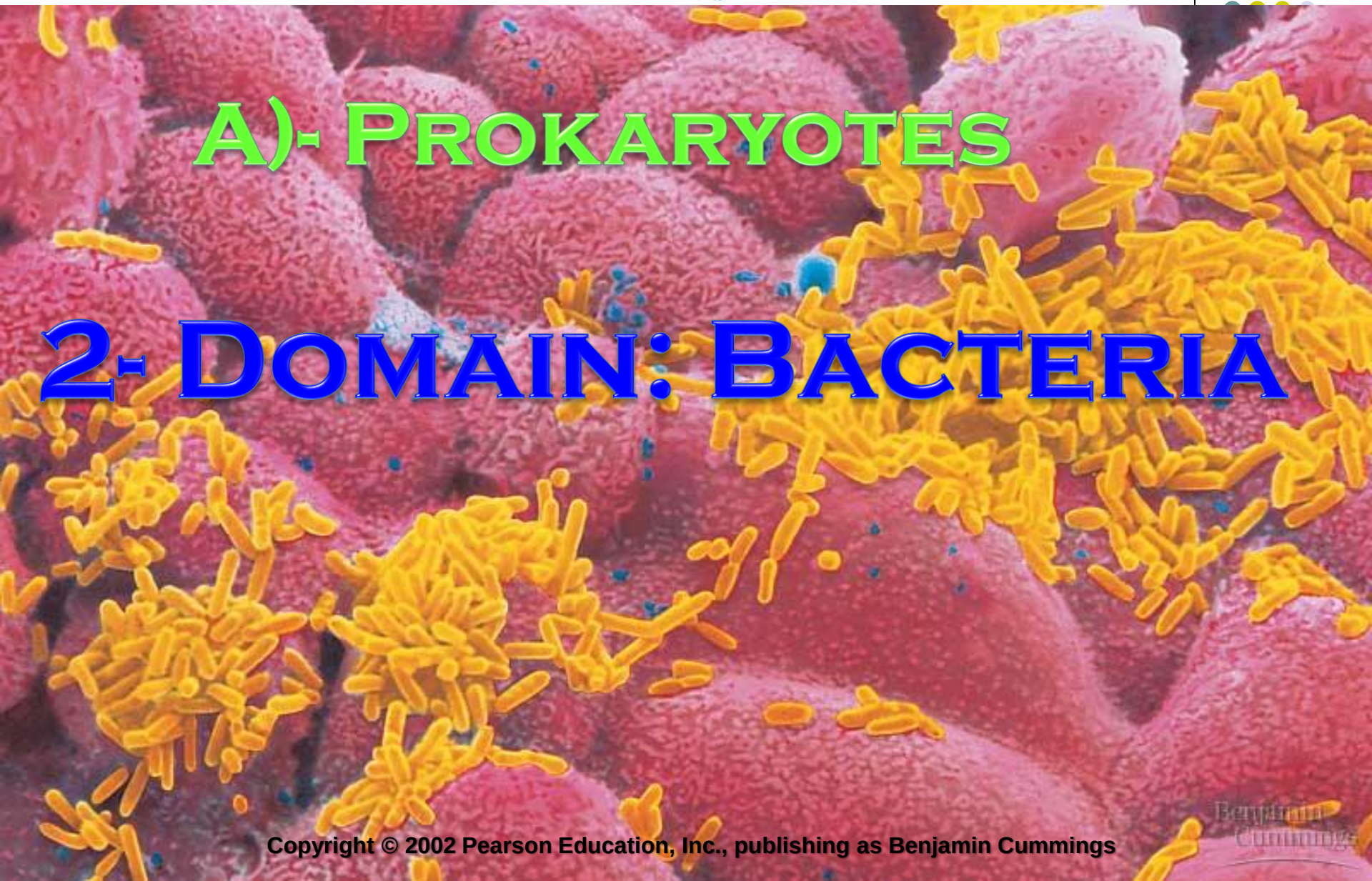
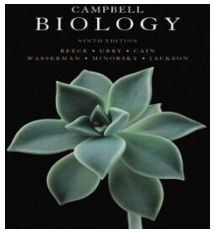




A)- Prokaryotes

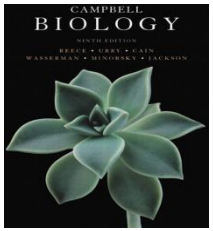
2- Domain: Bacteria



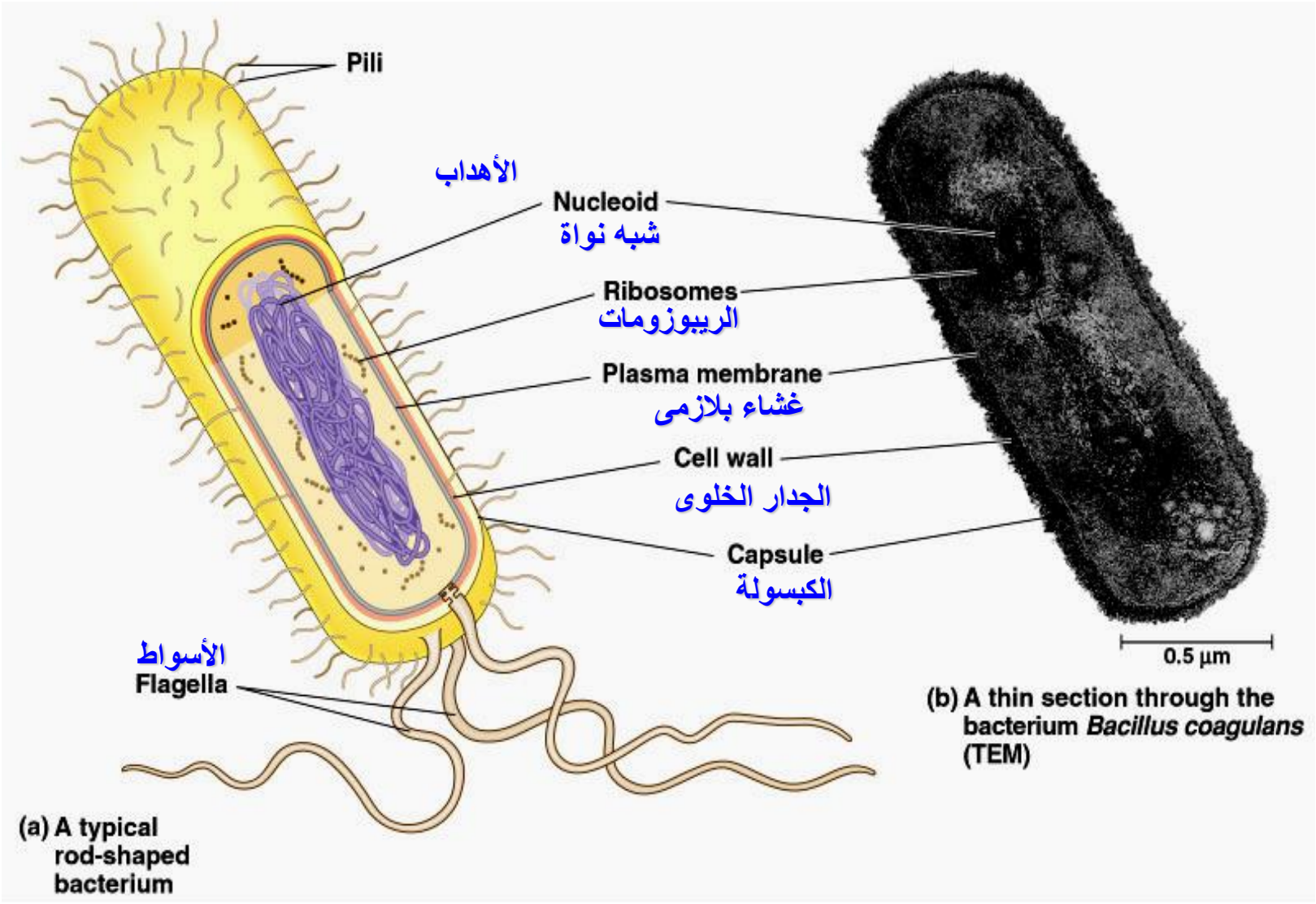
Objectives

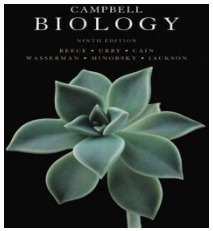
2)- Bacteria

- Structure of the bacterial cell.
- Shapes of bacteria.
- The Gram's stain.
- Reproduction of bacteria.
- Major Nutritional Modes.

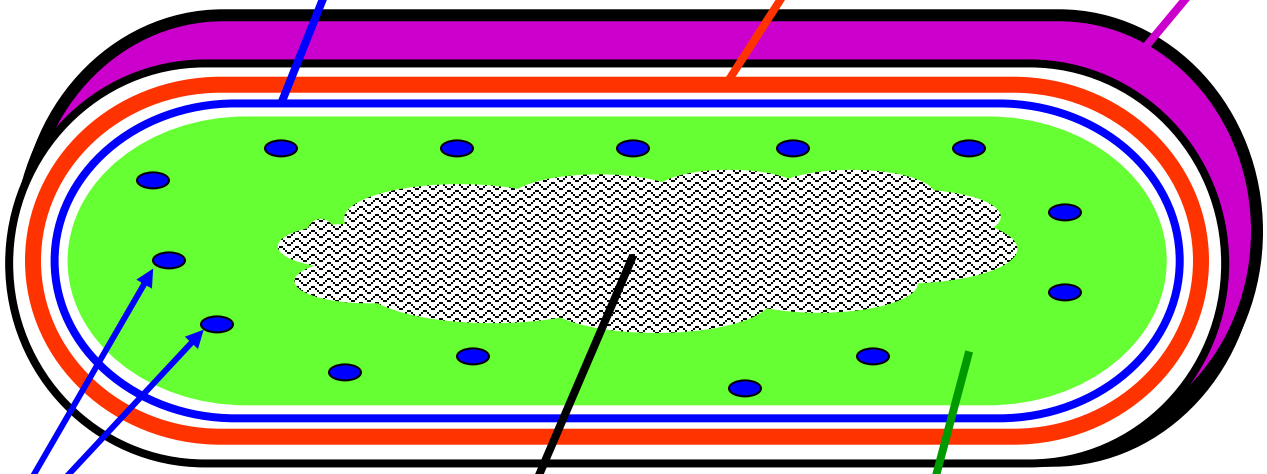


Structure of Bacteria Cell





Structure of Bacteria Cell



Plasma membrane

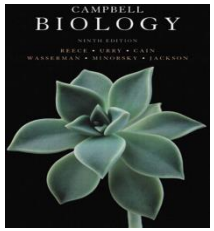
Cell Wall

Capsule

Ribosomes

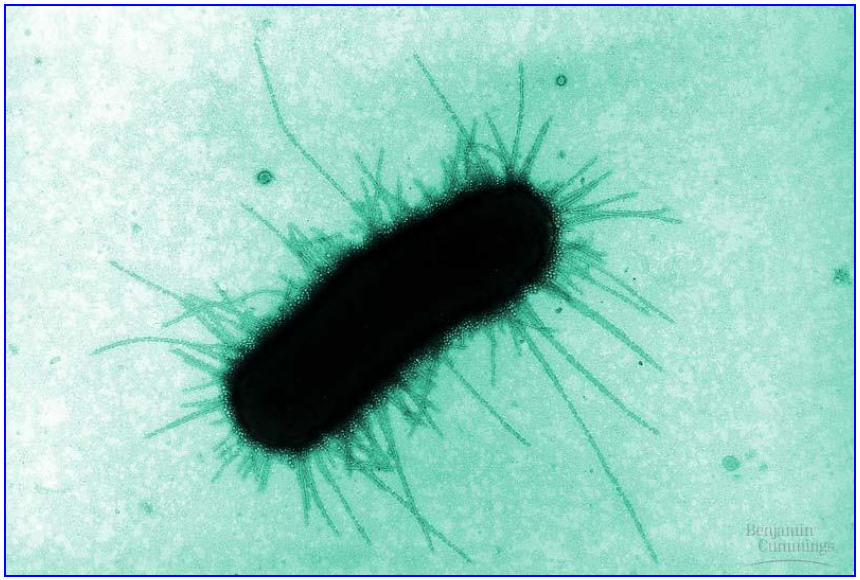
Nucleoid

Cytoplasm (Cytosol)

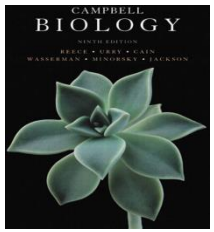


I - Bacterial capsule

- **Many bacteria secrete a sticky protective layer called capsule outside the cell wall.**
- **Capsule has the following functions وظائف:**



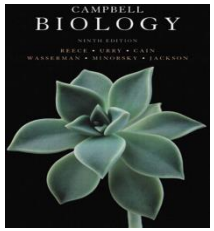
1. **Adhere** تثبيت **bacterial cells to their substratum** السطح.
2. **Increase bacterial resistance** المقاومة **to host defenses** مناعة العائل.
3. **Stick** (تلصق) **bacterial cells together when live in colonies.**
4. **Protect** تحمى **bacterial cell.**



II - The bacterial cell wall

- **In all prokaryotes, the functions of the cell wall are as follow:**
  1. **Maintains** تحافظ **the shape of the cell,**
  2. **Affords physical protection** توفر الحماية الطبيعية
  3. **Prevents the cell from bursting (**إنفجار**) in a hypotonic environment** البيئة ذات التركيز الأسموزى المنخفض.

- **Most bacterial cell walls contain PEPTIDOGLYCAN (a polymer of modified sugars cross-linked by short polypeptides).**
- **The walls of Archaea lack (**تفتقد**) peptidoglycan.**



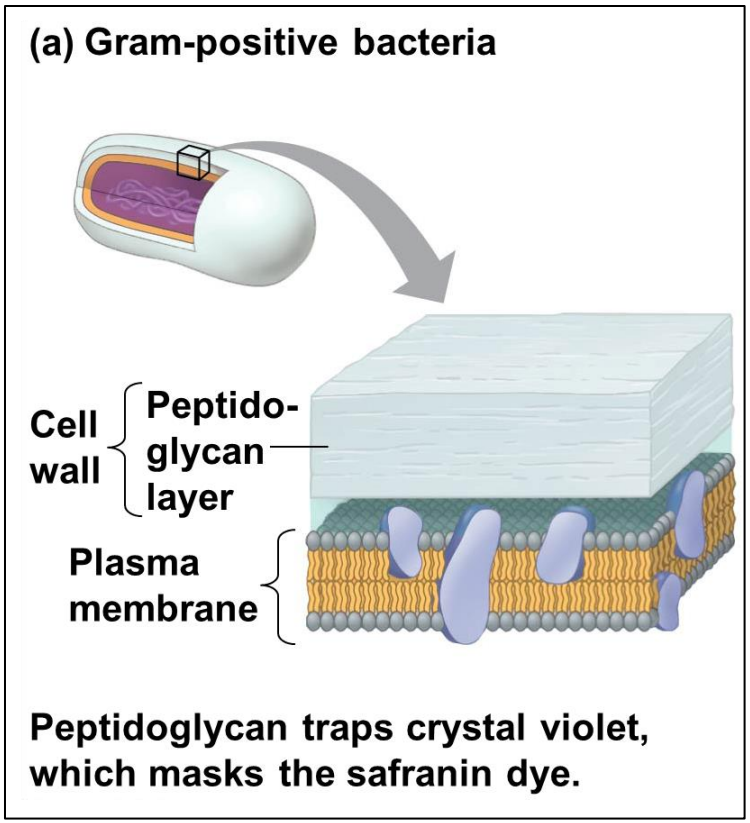
The Gram's stain: صبغة جرام

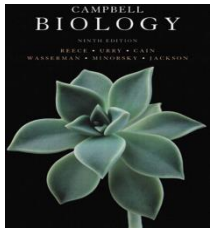
Developed by the Danish physician "Hans Christian Gram" in 19th century

- It is a tool for identifying تعريف bacteria, based on differences in their cell walls.

A)- Gram-positive (Gram +ve) bacteria:

- Their cell walls have large amounts كمية كبيرة of peptidoglycans that react with Gram's stain (appear violet-stained تُصبغ بنفسجيا).

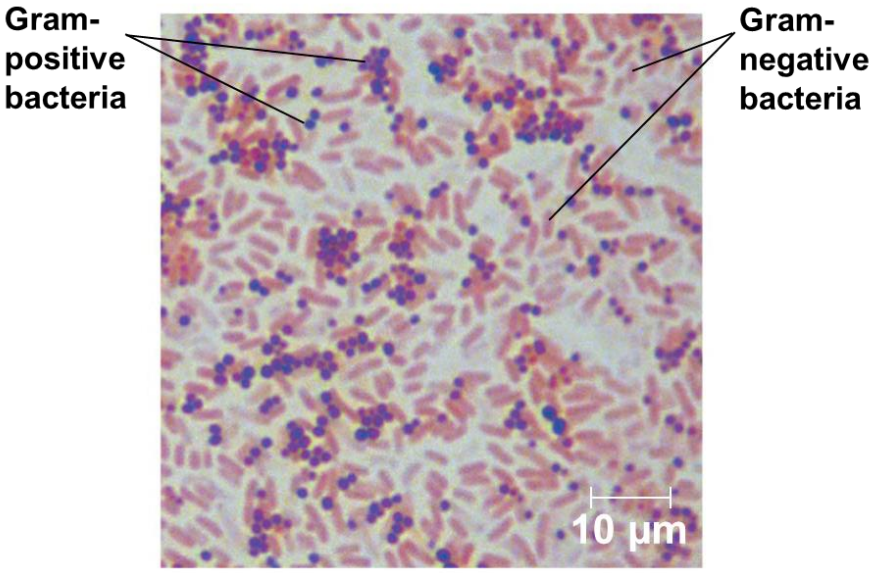


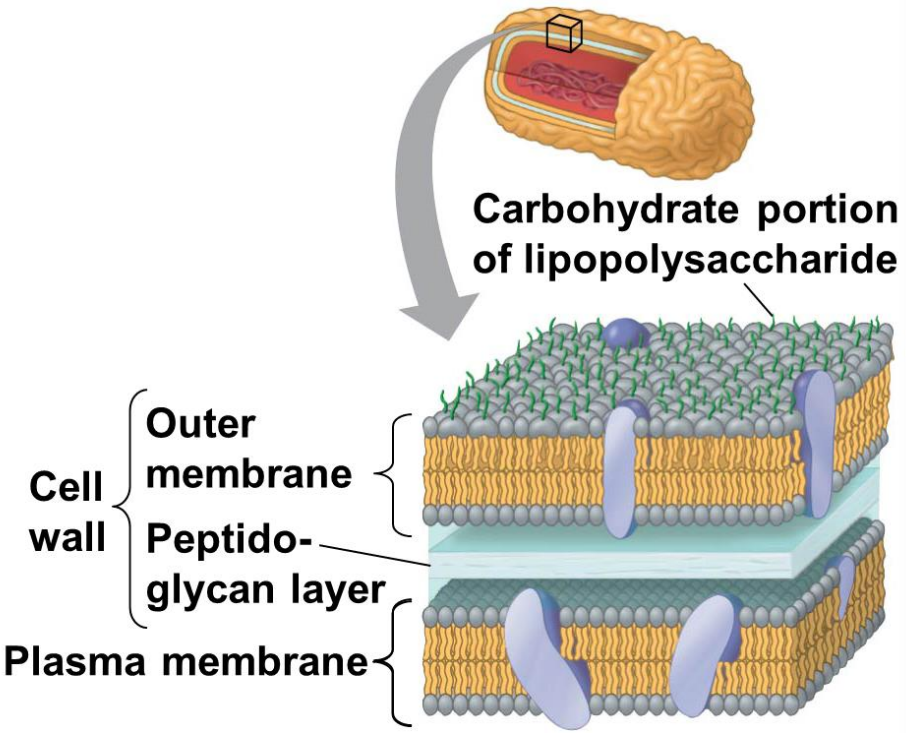


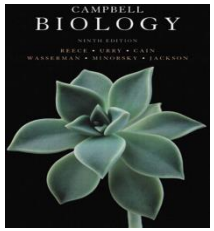
The Gram's stain: صبغة جرام

- **B)- Gram-negative (Gram -ve) bacteria:**

- **their cell walls have small amount of peptidoglycan. So, they do not react (**or very weakly react**) with Gram's stain (appear red-stained** تصبغ باللون الأحمر**)**



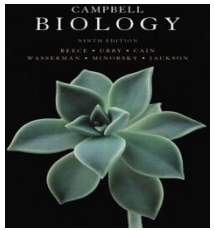




Summary of Gram's stain: صبغة جرام

- **Gram Staining: Most species of bacteria are classified into two categories based on the structure of their cell walls as determined by a technique called the Gram stain.**
  - **Gram-positive bacteria have a thick layer of peptidoglycan in their cell wall, and they appear violet under a microscope after the Gram-staining procedure.**
  - **Gram-negative bacteria have a thin layer of peptidoglycan in their cell wall, and they appear reddish-pink under a microscope after the Gram-staining procedure.**

- **Most Gram-negative species are *pathogenic* (ممرضة) *more threatening* (أكثر خطورة) than gram-positive species.**
- **Gram-negative bacteria are commonly *more resistant* أكثر ممانعة to antibiotics للمضادات الحياتية than gram-positive ones.**



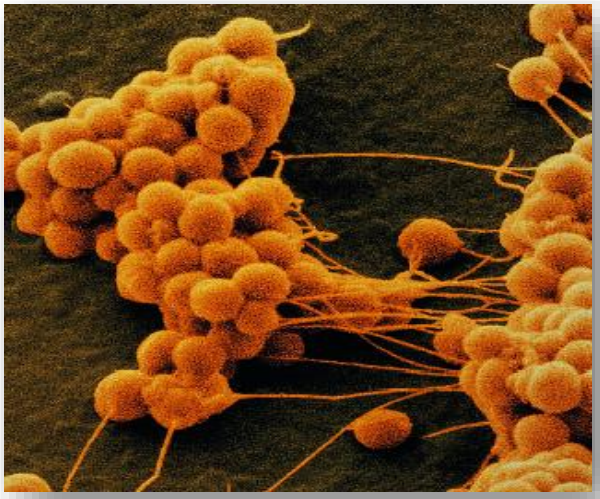
Shapes of Bacteria

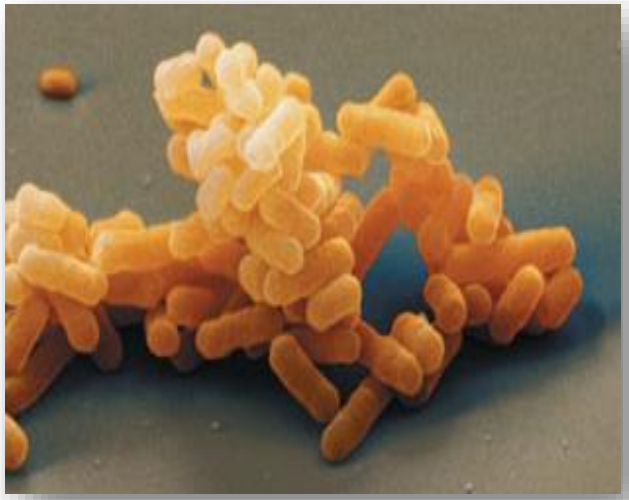
Bacteria are of four shapes: *spiral-shaped, sphere-shaped, rod-shaped, and more other shapes*.

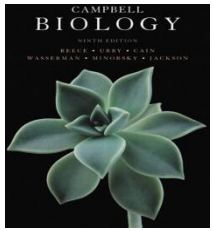
A. **Spiral shaped** (حلزونية الشكل) **bacteria in the form of spirilla (singular, *spirillum*) or vibrio (comma like). An example of spirella is *Spirillum volutans***

B. **Sphere-shaped** (كروية الشكل) **bacteria are called cocci (singular, *coccus*). An example of cocci is *Micrococcus luteus*.**

C. **Rod-shaped** (عصوية الشكل) **bacteria are called bacilli (singular, *bacillus*). An example of bacilli is *Bacillus sabtilis*.**



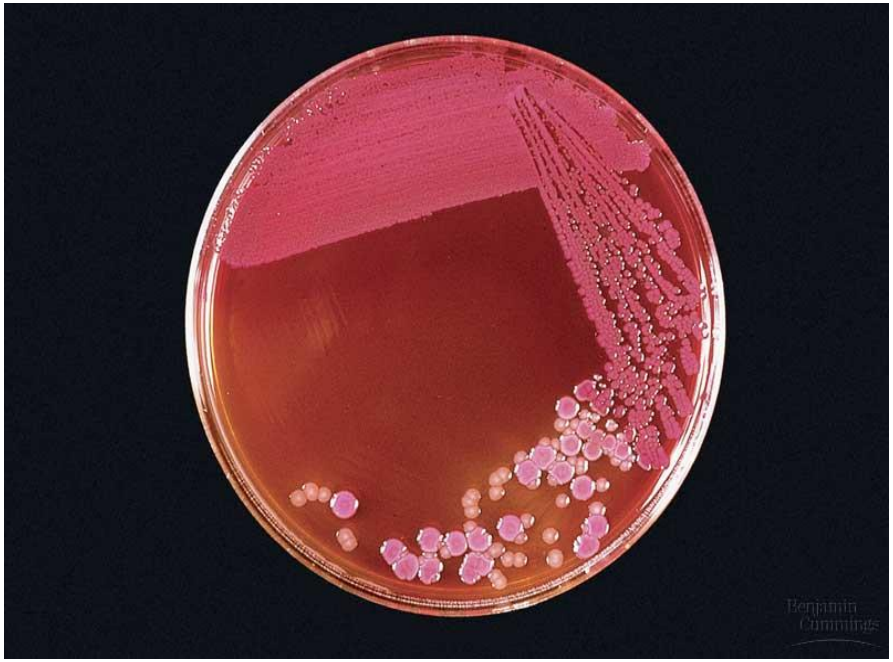


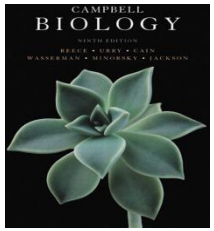


Reproduction of Bacteria

التكاثر في البكتريا

- **Prokaryotes reproduce (تتكاثر) only asexually (لا جنسيا) by binary fission (الإنقسام الثنائي البسيط).**
- **A single cell produces a colony of offspring.**

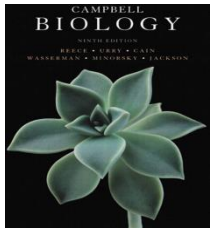




Nutrition of Prokaryotes
التغذية في بدائيات النواة

- **Nutrition refers to how an organism obtains energy and a carbon from the environment to build the organic molecules of its cells.**

- **Prokaryotes are grouped (صُنِفَت) into four categories (أنواع) according to how they obtain energy and carbon.**



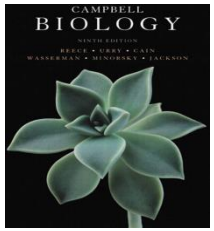
Nutrition of Prokaryotes
التغذية في بدائيات النواة

A)- Source of Energy

- ***Phototrophs*** **(ضوئية التغذية): Organisms that obtain energy from light.**
- ***Chemotrophs*** **(كيميائية التغذية): Organisms that obtain energy from chemicals in their environment.**

B)- Source of Carbon

- ***Autotrophs*** **(ذاتية التغذية): Organisms that obtain carbon from CO_2.**
- ***Heterotrophs*** **(متعدد التغذية): Organisms that obtain carbon from organic nutrients.**



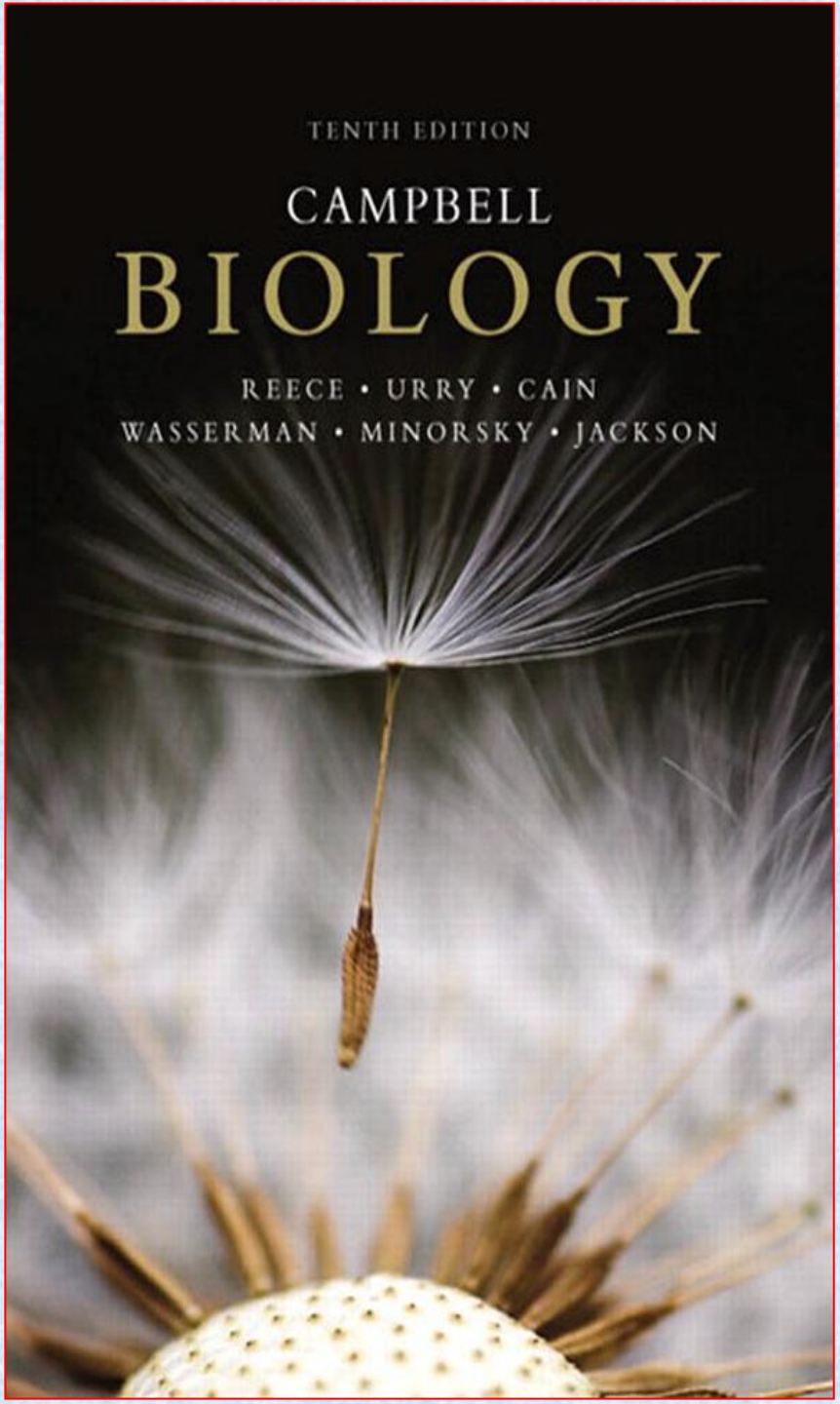
Major modes of nutrition

- **Photoautotrophs (ذاتية التغذية الضوئية):**
  use light energy as an energy source, and CO_2 as a carbon source to synthesize (تخلق) organic compounds.

- **Chemoautotrophs (ذاتية التغذية الكيميائية):**
  use chemical inorganic substances as an energy source, and CO_2 as a carbon source.

- **Photoheterotrophs (متعدد التغذية الضوئية):**
  use light as an energy source, and organic substances as carbon sources.

- **Chemoheterotrophs (متعدد التغذية الكيميائية):**
  use organic substances as a source for both energy and carbon.



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Zoology Department

General Animal Biology

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Thank you very much

شكرا جزيلا

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