

Chapter 4 – Cell Structure and Function

I. So What Is “A Cell”?

A. The Basics of Cell Structure

1. All cells have _____ features in common:
 - a. A _____ separates each cell from the environment, permits the flow of molecules across the membrane, and contains receptors that can affect the cell’s activities.
 - b. A _____ or _____ region localizes the hereditary material, which can be copied and read.
 - c. The _____ contains membrane systems, particles (including ribosomes), filaments (the cytoskeleton), and a semifluid substance.

II. Introducing Prokaryotic Cells

- A. _____ are the smallest known cells and are the most metabolically diverse forms of life on Earth.
- B. Two domains of prokaryotes exist: Bacteria and Archaea.
 1. The term prokaryotic (“before the nucleus”) indicates the existence of bacteria before evolution of cells with a nucleus.
 - a. A somewhat rigid _____ supports the cell and surrounds the plasma membrane, regulating transport into and out of the cell.
 - b. Sticky _____ help cells attach to surfaces, such as teeth.
 - c. Bacterial _____ project from the membrane and permit rapid movement; pili filaments aid in attachment to surfaces.
 - d. Many bacterial species have plasma membrane _____ embedded with photosynthetic machinery as do the cyanobacteria.
 - e. _____, protein assembly sites, are dispersed throughout the cytoplasm.
 - f. DNA is concentrated in an irregularly shaped region of cytoplasm

called the _____. The bacterial chromosome is a single, circular DNA molecule; other smaller circles of DNA called plasmids are present in some bacteria.

III. Introducing Eukaryotic Cells

A. Eukaryotic cells (_____ nucleus) are larger and generally more complex with a nucleus and other membrane-bound organelles.

IV. The Nucleus – isolates _____, which codes for proteins

A. Nuclear Envelope

1. A nuclear envelope (double-membrane) encloses the _____ interior of the nucleus, called nucleoplasm.

2. Outer surface is studded with _____, loaded with pores and continuous with the endoplasmic reticulum membrane.

B. Nucleolus

1. Located within the nucleus, the _____ appears as a darker globular mass where subunits of ribosomes are prefabricated before shipment out of the nucleus.

C. Grainy, Threadlike, Rodlike—Nuclear DNA's Changing Appearance

1. _____ refers to the cell's total collection of DNA and associated proteins.

2. A _____ is a double-stranded DNA molecule and its associated proteins (histones).

V. The Endomembrane System

A. Endoplasmic Reticulum (ER)

1. The _____ is a collection of interconnected tubes and flattened sacs that begin at the nucleus and ramble throughout the cytoplasm.

2. There are _____ types distinguished by the presence or absence of ribosomes.

a. _____ consists of stacked, flattened sacs with many ribosomes attached; oligosaccharide groups are

attached to polypeptides as they pass through on their way to other organelles or to secretory vesicles.

- b. _____ has no ribosomes; it is the area from which vesicles carrying proteins and lipids are budded; and it also inactivates harmful chemicals.

B. Golgi Bodies

1. The membranes of the _____ are arranged in stacks of flattened sacs whose edges break away as vesicles.
2. In the Golgi bodies, proteins and lipids undergo final _____, sorting, and packaging.

C. Diverse Membranous Sacs

1. _____ are vesicles that bud from Golgi bodies; they carry powerful enzymes that can digest the contents of other vesicles, worn-out cell parts, or bacteria and foreign particles.

VI. Mitochondria

A. Mitochondria are the primary organelles for transferring the energy in _____ to ATP under oxygen-plentiful conditions.

1. Each mitochondrion has two membranes, an inner folded membrane surrounded by a smooth outer membrane.
2. Like bacteria, they have their own _____ and divide on their own apart from the cell.

They have _____.

VII. Specialized Plant Organelles

A. Chloroplasts and other plastids

1. Chloroplasts are _____ or disk-shaped organelles, bounded by a double membrane, and specialized for photosynthesis.
 - a. _____ such as chlorophyll (green) confer distinctive colors to the chloroplasts.

B. Central Vacuoles

1. In a mature plant, the central vacuole may occupy _____ percent of the cell interior.
 - a. Central vacuoles store amino acids, sugars, ions, and wastes.
 - b. The enlarged cell, with more surface area, has an enhanced ability to absorb nutrients.

VIII. Cell Surface Specializations

A. Eukaryotic Cell Walls

1. Cell walls are carbohydrate frameworks for mechanical support in protists, fungi, and plants; cell walls are not found in _____.

B. Prokaryotic Cell Walls Bacteria

C. Cell Junctions

1. In plants, tiny channels called _____ cross the adjacent primary walls and connect the cytoplasm.
2. In animals, _____ are small, open channels that directly link the cytoplasm of adjacent cells.

4.10 Even Cells Have a Skeleton

A. Components of the Cytoskeleton

1. The cytoskeleton of eukaryotic cells forms an interconnected system of bundled fibers, slender threads, and lattices that extends from the nucleus to the plasma membrane.
2. The main components are microtubules, microfilaments, and intermediate filaments—all assembled from protein subunits that give cells their internal organization, shape, and capacity to move.