Section Summary

The endomembrane system of eukaryotic cells includes the nuclear envelope, the endoplasmic reticulum, the Golgi apparatus, lysosomes, vesicles, as well as the plasma membrane. These cellular components work together to modify, package, tag, and transport lipids and proteins.

Eukaryotic cells have a true nucleus meaning its DNA is surrounded by a membrane. The nucleolus within the nucleus is the site for ribosome assembly. Ribosomes are found in the cytoplasm or are attached to the plasma membrane of the rough endoplasmic reticulum. Ribosomes perform protein synthesis. Mitochondria perform cellular respiration and produce ATP. Peroxisomes break down fatty acids, amino acids, and some toxins. Vesicles and vacuoles are storage and transport compartments. In plant cells, vacuoles also help break down macromolecules.

Exercises

1. Which of the following organelles is most likely to aid in the digestion of food particles?
    a. nucleus
    b. rough endoplasmic reticulum
    c. lysosome
    d. ribosome

2. Which of the following is not a component of the endomembrane system?
    a. mitochondrion
    b. Golgi apparatus
    c. endoplasmic reticulum
    d. lysosome

3. Calcium ions are required for muscle contraction. Which organelle would you expect to find in abundance in a muscle cell that would aid in this function?
    a. mitochondrion
    b. Golgi apparatus
    c. lysosome
    d. smooth endoplasmic reticulum

4. Mitochondria contain both DNA and ribosomes.
    a. True
    b. False

5. Where in the nucleus are ribosomes formed?

6. Where are chromosomes found in a eukaryotic cell? Chromosomes are made of chromatin. What are the two materials that make up the chromatin?

7. Compare and contrast the rough endoplasmic reticulum to the smooth endoplasmic reticulum.

Answers

1. (c)
2. (a)
3. (d)
4. (a)
5. nucleolus
6. Chromosomes are found in the nucleus and are made of chromatin. Chromatin is made of DNA and protein.
7. Both types of endoplasmic reticulum are part of the endomembrane system. They are both a series of interconnected membranous tubules that collectively modify proteins and synthesize lipids. However, these two functions are performed in separate areas of the endoplasmic reticulum: the rough endoplasmic reticulum and the smooth endoplasmic reticulum, respectively.

Glossary

chromatin: substance consisting of DNA and associated proteins

chromosome: a condensed version of chromatin

endomembrane system: the group of organelles and membranes in eukaryotic cells that work together to modify, package, and transport lipids and proteins

endoplasmic reticulum (ER): a series of interconnected membranous structures within eukaryotic cells that collectively modify proteins and synthesize lipids

Golgi apparatus: a eukaryotic organelle made up of a series of stacked membranes that sorts, tags, and packages lipids and proteins for distribution

lysosome: an organelle in an animal cell that functions as the cell's digestive component; it breaks down proteins, polysaccharides, lipids, nucleic acids, and even worn-out organelles

mitochondria: (singular: mitochondrion) the cellular organelles responsible for carrying out cellular respiration, resulting in the production of ATP, the cell's primary energy-carrying molecule

nuclear envelope: the double-membrane structure that constitutes the outermost portion of the nucleus

nuclear pores: control the passage of ions, molecules, and RNA between the nucleus and the cytoplasm

nucleolus: the darkly staining body within the nucleus that is responsible for assembling ribosomal subunits

nucleus: the cell organelle that houses the cell's DNA and directs the synthesis of ribosomes and proteins

peroxisome: a small, round organelle that contains hydrogen peroxide, oxidizes fatty acids and amino acids and detoxifies many poisons

ribosome: a cellular structure that carries out protein synthesis

rough endoplasmic reticulum (RER): the region of the endoplasmic reticulum that is studded with ribosomes and engages in protein modification

smooth endoplasmic reticulum (SER): the region of the endoplasmic reticulum that has few or no ribosomes on its cytoplasmic surface and synthesizes carbohydrates, lipids, and steroid hormones; detoxifies chemicals like pesticides, preservatives, medications, and environmental pollutants, and stores calcium ions

vacuole: a membrane-bound sac, somewhat larger than a vesicle, that functions in cellular storage and transport

vesicle: a small, membrane-bound sac that functions in cellular storage and transport; its membrane is capable of fusing with the plasma membrane and the membranes of the endoplasmic reticulum and Golgi apparatus