

## CHAPTER 2 - THE CELL: AN OVERVIEW

1. Which plant tissue did the first observed cells come from?

- a. cork
- b. pollen
- c. a maple leaf
- d. human skin

ANSWER: a

2. Which scientist was first credited for observing the cell nucleus?

- a. Theodor Schwann
- b. Anton van Leeuwenhoek
- c. Matthias Schleiden
- d. Robert Brown

ANSWER: d

3. Which of the following is synonymous with cellulae?

- a. "small rooms"
- b. "small compartments"
- c. "small spaces"
- d. "small particles"

ANSWER: a

4. Who played the most influential role in the discovery of the cell?

- a. Matthias Schleiden
- b. Theodor Schwann
- c. Rudolf Virchow
- d. Robert Hooke

ANSWER: d

5. Who played the most influential role in discovering protists?

- a. Rudolf Virchow
- b. Anton van Leeuwenhoek
- c. Theodor Schwann
- d. Matthias Schleiden

ANSWER: b

6. Who played the most influential role in discovering the importance of the nucleus?

- a. Matthias Schleiden
- b. Theodor Schwann
- c. Robert Hooke
- d. Rudolf Virchow

ANSWER: a

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7. Which early scientist proposed that cells arise only from pre-existing cells?

- a. Theodor Schwann
- b. Robert Brown
- c. Matthias Schleiden
- d. Rudolf Virchow

ANSWER: d

8. Who proposed that all animals and plants consist of cells that contain a nucleus?

- a. Matthias Schleiden
- b. Rudolf Virchow
- c. Theodor Schwann
- d. Anton van Leeuwenhoek

ANSWER: c

9. Who discovered and described diverse protists?

- a. Anton van Leeuwenhoek
- b. Matthias Schleiden
- c. Theodor Schwann
- d. Rudolf Virchow

ANSWER: a

10. Which statement most correctly describes living cells?

- a. Living cells grow, reproduce, and respond to outside stimuli in an uncoordinated fashion.
- b. Living cells grow and respond to outside stimuli in a coordinated fashion.
- c. Living cells grow, reproduce, and respond to outside stimuli in a coordinated fashion.
- d. Living cells reproduce and respond to outside stimuli in a coordinated fashion.

ANSWER: c

11. Which unit of measurement is most commonly used for expressing cell size?

- a. centimetre (cm)
- b. decimetre (dm)
- c. micrometre ( $\mu\text{m}$ )
- d. millimetre (mm)

ANSWER: c

12. A human egg is approximately 100  $\mu\text{m}$  in size. What is this equal to?

- a. 10.0 mm
- b. 0.10 mm
- c. 0.010 mm
- d. 0.0010 mm

ANSWER: b

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13. Why can the human eye NOT see cells?

- a. because cells are only about 1.0 mm in diameter
- b. because cells are only about 0.1 mm in diameter
- c. because cells are only about 5.0  $\mu\text{m}$  in diameter
- d. because cells are only about 0.5  $\mu\text{m}$  in diameter

ANSWER: c

14. Which cell organelle regulates the movement of molecules in and out of the cell?

- a. the nucleus
- b. the ribosome
- c. the plasma membrane
- d. the cytoplasm

ANSWER: c

15. Staining with dye is a technique typically used to enhance contrast and visualization of cellular structures. Which microscope magnifies passing light directly through a specimen?

- a. a fluorescence microscope
- b. a bright field microscope
- c. a confocal laser scanning microscope
- d. a phase-contrast microscope

ANSWER: b

16. Which of the following is synonymous with organelles?

- a. "little cells"
- b. "little organisms"
- c. "little organs"
- d. "little particles"

ANSWER: c

17. If organs are analogous to the body, which of the following are organelles analogous to?

- a. an eukaryote
- b. a prokaryote
- c. a cell
- d. an animal

ANSWER: c

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18. Where is the cell's hereditary information stored?

- a. in RNA
- b. in genes
- c. in glucose
- d. in protein

ANSWER: b

19. Which of the following is an organelle that distinguishes between prokaryotic and eukaryotic cells?

- a. the ribosomes
- b. the nucleus
- c. the cell wall
- d. the plasma membrane

ANSWER: b

20. In what way are prokaryotic and eukaryotic cells different?

- a. A prokaryotic cell does not have cytoplasm, but a eukaryotic cell does.
- b. A prokaryotic cell does not have a nucleus, but a eukaryotic cell does.
- c. A prokaryotic cell does not have genetic material, but a eukaryotic cell does.
- d. A prokaryotic cell does not have a flagellum, but a eukaryotic cell does.

ANSWER: b

21. What would a comparison of prokaryotic and eukaryotic cells reveal?

- a. That they both have a cell wall.
- b. That they both have a nucleus.
- c. That they both have an endomembrane system.
- d. That they both have DNA.

ANSWER: d

22. In what way are prokaryotic and eukaryotic cells different?

- a. A prokaryotic cell has a cell wall, but a eukaryotic cell does not.
- b. A prokaryotic cell does not have a cell wall, but a eukaryotic cell does.
- c. A prokaryotic cell has a capsule, but a eukaryotic cell does not.
- d. A prokaryotic cell does not have a capsule, but a eukaryotic cell does.

ANSWER: c

23. Which of the following shapes are most common among prokaryotes?

- a. rodlike, cylindrical, and spherical
- b. rodlike, spiral, and spherical
- c. rodlike, circular, and spherical
- d. rodlike, spiral, and cylindrical

ANSWER: b

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24. Which of the following groups belong to the domain of the prokaryotes?

- a. bacteria
- b. protists
- c. fungi
- d. animals

ANSWER: a

25. If a plasma membrane is analogous to the cell, which of the following is analogous to the animal body?

- a. a reproductive system
- b. a muscle system
- c. the skin
- d. a digestive system

ANSWER: c

26. Which network of protein filaments reinforce the inner surface of the nuclear envelope in animal cells?

- a. actins
- b. tubulins
- c. lamins
- d. chromatins

ANSWER: c

27. What do mitochondria and chloroplasts have in common?

- a. Both are found in the majority of animal cells.
- b. Both are engaged in cellular respiration.
- c. Both are transforming energy.
- d. Both are engaged in photosynthesis.

ANSWER: c

28. If a cell contains centrioles, which type of cell must it be?

- a. an animal cell
- b. a prokaryotic cell
- c. a plant cell
- d. a fungal cell

ANSWER: a

29. If a cell contains lysosomes, what type of cell must it be?

- a. a fungal cell
- b. a prokaryotic cell
- c. an animal cell
- d. a plant cell

ANSWER: c

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30. If a cell contains chloroplasts, what type of cell must it be?
- a. a prokaryotic cell
  - b. a fungal cell
  - c. a plant cell
  - d. an animal cell

ANSWER: c

31. If a cell contains tonoplast, what type of cell must it be?
- a. an animal cell
  - b. a fungal cell
  - c. a prokaryotic cell
  - d. a plant cell

ANSWER: d

32. What does chromatin consist of?
- a. only RNA
  - b. only DNA
  - c. both DNA and RNA
  - d. DNA and associated proteins

ANSWER: d

33. What is the eukaryotic chromosome composed of?
- a. DNA and carbohydrate
  - b. DNA only
  - c. DNA and protein
  - d. RNA only

ANSWER: c

34. What is the semi-liquid substance within the nucleus called?
- a. chromatin
  - b. nuclear gel
  - c. cytoplasm
  - d. nucleoplasm

ANSWER: d

35. Which are synthesized in the nucleoli found within the nucleus?
- a. mRNAs
  - b. ribosomal subunits
  - c. chromatin
  - d. proteins

ANSWER: b

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36. What can we find in cells that are making large quantities of proteins?

- a. numerous cilia
- b. numerous ribosomes
- c. numerous centrioles
- d. numerous chromosomes

ANSWER: b

37. Which organelle is NOT a part of the endomembrane system?

- a. the endoplasmic reticulum
- b. the lysosome
- c. the nucleolus
- d. the Golgi complex

ANSWER: c

38. What do mitochondria and chloroplasts have in common?

- a. Both contain chlorophyll.
- b. DNA is present in both.
- c. Both are found in animal cells.
- d. A nucleus is present in both.

ANSWER: b

39. Which organelles contain DNA?

- a. lysosomes and ribosomes
- b. lysosomes and mitochondria
- c. chloroplasts and mitochondria
- d. chloroplasts and ribosomes

ANSWER: c

40. Which organelle is involved in the synthesis of lipids?

- a. the ribosome
- b. the smooth endoplasmic reticulum
- c. the Golgi complex
- d. the rough endoplasmic reticulum

ANSWER: b

41. What is the function of the Golgi complex?

- a. It synthesizes lipids.
- b. It synthesizes proteins for export from the cell.
- c. It receives proteins made in the rough ER and chemically modifies them.
- d. It receives proteins made in the smooth ER and chemically modifies them.

ANSWER: c

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42. Which of the following is the correct path in the endomembrane system for a protein synthesized on a ribosome attached to the rough ER?

- a. rough ER ? smooth ER ? Golgi complex ? plasma membrane
- b. rough ER ? vesicle ? smooth ER ? plasma membrane
- c. rough ER ? vesicle ? lysosome ? plasma membrane
- d. rough ER ? Golgi complex ? vesicle ? plasma membrane

ANSWER: d

43. Which cellular component is capable of digestion?

- a. the rough endoplasmic reticulum
- b. the Golgi complex
- c. the ribosome
- d. the lysosome

ANSWER: d

44. Cells that are more active in secreting enzymes would most likely exhibit which one of the following?

- a. exocytosis
- b. endocytosis
- c. diffusion
- d. osmosis

ANSWER: a

45. When molecules are brought into the cell from the exterior, they need to be placed onto one of the following organelles for further routing to other locations. Which of the following organelles serve(s) the purpose of further routing?

- a. the nucleus
- b. lysosomes
- c. mitochondria
- d. ribosomes

ANSWER: b

46. At one point in human development, tissue that connected the fingers and the hand appeared to be “webbed.” Enzymes eventually destroy the cells of the webbing and the fingers separate. Where are these enzymes probably liberated from?

- a. from the nucleus
- b. from the smooth endoplasmic reticulum
- c. from the chromosomes
- d. from the lysosomes

ANSWER: d



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47. At which pH do lysosomes function best?

- a. 3.2
- b. 5.0
- c. 6.5
- d. 7.4

ANSWER: b

48. Which organelle contains hydrolytic enzymes for the digestion of proteins, lipids, nucleic acids, and polysaccharides?

- a. the Golgi complex
- b. the rough endoplasmic reticulum
- c. the nucleus
- d. the lysosome

ANSWER: d

49. If a lysosome is analogous to the animal cell, which of the following is analogous to the plant cell?

- a. a chloroplast
- b. a cell wall
- c. a tonoplast
- d. a vacuole

ANSWER: d

50. If a lysosome is analogous to the cell, which of the following is analogous to the animal body?

- a. a digestive system
- b. a muscle system
- c. a nervous system
- d. a reproductive system

ANSWER: a

51. Where does cellular respiration occur?

- a. in lysosomes
- b. in mitochondria
- c. in chloroplasts
- d. in peroxisomes

ANSWER: b

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52. In the process of cellular respiration, what is converted to water and carbon dioxide during the formation of energy?

- a. O<sub>2</sub> and CO<sub>2</sub>
- b. CO<sub>2</sub> and glucose
- c. CO<sub>2</sub> and fats
- d. O<sub>2</sub> and glucose

ANSWER: d

53. What greatly increases the interior surface area of mitochondria?

- a. centrioles
- b. microfilaments
- c. cristae
- d. the matrix

ANSWER: c

54. What are cytoskeletal elements assembled from?

- a. proteins
- b. triglycerides
- c. phospholipids
- d. glycogen

ANSWER: a

55. What are microfilaments assembled from?

- a. keratins
- b. tubulins
- c. actins
- d. myosins

ANSWER: c

56. Which protein are microtubules assembled from?

- a. tubulins
- b. actins
- c. myosins
- d. keratins

ANSWER: a

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57. If a cell contains intermediate filaments, to which organism must the cell then belong?
- to a unicellular organism
  - to a multicellular organism
  - to a protist
  - to a bacterium

ANSWER: b

58. Which pair is NOT matched correctly?
- plant cell wall : cellulose
  - intermediate filaments : tubulin
  - microfilaments : actin
  - cell membrane : phospholipid bilayer

ANSWER: b

59. Which of the following radiate from the centre of the cell and anchor the ER, Golgi complex, lysosomes, and secretory vesicles in place?
- microfilaments
  - microtubules
  - actins
  - laminins

ANSWER: b

60. In what way are cilia and flagella similar?
- They both propel a cell in the same way.
  - They both occur in great numbers.
  - They are identical in structure.
  - They are both of the same length.

ANSWER: c

61. If a cell is propelled through a medium in a whip-like motion, what does it most likely possess?
- a capsule
  - cilia
  - a cell wall
  - a flagellum

ANSWER: d

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62. If a cell moves through water by moving the fluid over its surface, what does the cell mostly likely possess?
- a. a capsule
  - b. a cell wall
  - c. cilia
  - d. a flagellum

ANSWER: c

63. From which cellular component do cilia and flagella arise?
- a. the chromosome
  - b. the centriole
  - c. the nucleus
  - d. the Golgi complex

ANSWER: b

64. What does the 9 + 2 complex refer to?
- a. both the Golgi complex and the endoplasmic reticulum
  - b. both the cilia and the nucleus
  - c. both the flagella and the plasma membrane
  - d. both the flagella and the cilia

ANSWER: d

65. What are the principal structural components of cilia and flagella?
- a. intermediate filaments
  - b. myosin microfilaments
  - c. actin microfilaments
  - d. microtubules

ANSWER: d

66. If a flagellum is analogous to the cell, which of the following is analogous to the animal body?
- a. a muscle system
  - b. a nervous system
  - c. a reproductive system
  - d. a digestive system

ANSWER: a

67. Which of the following extend as a bundle from the base to the tip of a flagellum or cilium?
- a. microfilaments
  - b. intermediate filaments
  - c. actins
  - d. microtubules

ANSWER: d

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68. Where are cell walls found?

- a. in plant and fungal cells
- b. in plant cells only
- c. in fungal cells only
- d. in animal cells only

ANSWER: a

69. Which organelles store starch in plants?

- a. amyloplasts
- b. chromoplasts
- c. vacuoles
- d. chloroplasts

ANSWER: a

70. Which of the following processes occurs in chloroplasts?

- a. DNA synthesis
- b. photosynthesis
- c. protein synthesis
- d. cellular digestion

ANSWER: b

71. Why do scientists believe that mitochondria may have evolved from ancient bacteria?

- a. because both have their own DNA and ribosomes
- b. because both have five chromosomes
- c. because both are surrounded by a cell wall
- d. because the shapes and size of both are exactly the same

ANSWER: a

72. With which organelle(s) do chloroplasts share many similarities?

- a. the lysosomes
- b. the rough endoplasmic reticulum
- c. the mitochondria
- d. the nucleus

ANSWER: c

73. What do chloroplasts utilize light energy for?

- a. to make carbohydrates
- b. to make proteins
- c. to make nucleic acids
- d. to make fats

ANSWER: a

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74. In which organelles can grana and thylakoids be found as structural components?

- a. ribosomes
- b. mitochondria
- c. chloroplasts
- d. chromoplasts

ANSWER: c

75. Which of the following may occupy more than 90% of a mature plant cell's volume?

- a. chromoplasts
- b. the rough endoplasmic reticulum
- c. the central vacuole
- d. the nucleus

ANSWER: c

76. What is another name for the membrane that surrounds the central vacuole?

- a. tonoplast
- b. ionoplast
- c. chloroplast
- d. chromoplast

ANSWER: a

77. In plant cells, what provides cellular support and protects cells from pathogens?

- a. the cell wall
- b. the cell membrane
- c. the cytoplasm
- d. the plasmodesmata

ANSWER: a

78. In what way are lysosomes and plant vacuoles similar to each other?

- a. They are both involved in cell movement.
- b. They are both involved in cell digestion.
- c. They are both involved in cell sensitivity.
- d. They are both involved in cell reproduction.

ANSWER: b

79. If a cell wall is analogous to the plant cell, which of the following is analogous to the animal cell?

- a. the cytoskeleton
- b. the capsule
- c. the plasma membrane
- d. the extracellular matrix

ANSWER: d

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80. The cell wall is composed primarily of cellulose. What is the cellulose composed of?

- a. carbohydrates
- b. proteins
- c. phospholipids
- d. steroids

ANSWER: a

81. What connects the cytoplasm of adjacent cells in plants?

- a. the plasma membrane
- b. plasmodesmata
- c. the primary cell wall
- d. the secondary cell wall

ANSWER: b

82. Which of the following is the component of plant cell wall?

- a. protein
- b. chitin
- c. cellulose
- d. nucleic acid

ANSWER: c

83. Plant cells permit ions and small molecules to move between adjacent cells by means of cytoplasmic channels in their cell walls. What are these channels called?

- a. plasmodesmata
- b. cell junctions
- c. desmosomes
- d. gap junctions

ANSWER: a

84. Over time, cancerous cells typically lose the cell adhesion molecules embedded in their plasma membrane. Loss of these molecules is best associated with which of the following traits of cancer cells?

- a. production of new proteins
- b. angiogenesis
- c. increased rate of cell division
- d. migration to new locations in the body

ANSWER: d

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85. What are cell adhesion molecules in normal cells partially responsible for?

- a. the ability of cells to migrate to new locations in the body
- b. the ability of cells to do endocytosis
- c. the ability of cells to recognize other cells as “self”
- d. the ability of cells to do exocytosis

ANSWER: c

86. What are desmosomes?

- a. a type of anchoring junction
- b. a type of gap junction
- c. a type of tight junction
- d. a type of cell adhesion molecule

ANSWER: a

87. What is the function of tight junctions?

- a. to seal the spaces between cells
- b. to give the cell its shape
- c. to allow ions and small molecules to pass between cells
- d. to allow cells to communicate with each other

ANSWER: a

88. What is the function of gap junctions?

- a. to allow plant cells to communicate with each other
- b. to allow ions and small molecules to pass between cells
- c. to give the cell its shape
- d. to seal the spaces between cells

ANSWER: b

89. Which of the following allow communication between the cells of the heart muscle tissue, resulting in the coordinated beating of the heart?

- a. tight junctions
- b. anchoring junctions
- c. desmosomes
- d. gap junctions

ANSWER: d



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90. What are the main components of the extracellular matrix?

- a. glycoproteins
- b. phospholipids
- c. cellulose
- d. glycolipids

ANSWER: a

91. In general, how are prokaryotic and eukaryotic cells different and how are they similar?

*AN* Both mitochondria and chloroplasts contain DNA, RNA, and ribosomes that resemble those found in *SW* bacteria. In prokaryotic cells, the genetic material is found in a central region called the nucleoid, while in *ER* eukaryotic cells, it is contained in the membrane-bound nucleus. Also, eukaryotic cells contain membrane systems that form organelles, while prokaryotic cells do not. A plasma membrane surrounds both prokaryotic and eukaryotic cells.

92. If prokaryotic cells do not have mitochondria, where do they produce their cellular energy?

ANSWER: The plasma membrane contains most of the molecular systems needed to metabolize food molecules to ATP.

93. Compare animal and plant cells. How are they different? How are they the same?

ANS Both animal cells and plant cells have a plasma membrane, nucleus, mitochondria, endoplasmic reticulum, *WER* ribosomes, and Golgi complex. Animal cells, however, do not have a cell wall, central vacuole, or chloroplasts.

94. Explain how a cell isolated from the pancreas would be the same as a muscle cell. How would the two cell types be different?

*AN* Both cell types would contain the same organelles; however, due to the very different functions of the two *SW* cells, the proportion of certain organelles would be different. For example, the pancreatic cell, which is *ER* involved in the production of digestive enzymes, would have an extensive rough ER network, while a muscle cell would have a large proportion of mitochondria to make the large amount of energy necessary for muscle contraction.

95. Why are chloroplasts and mitochondria believed to have originated from ancient prokaryotes?

ANSWER: Both mitochondria and chloroplasts contain DNA, RNA, and ribosomes that resemble those found in bacteria.

96. Why is cartilage relatively soft while tendons are tough and elastic?

ANSW Cartilage contains a high proportion of interlinked glycoproteins, which make it soft. Tendons are made *ER*: of almost pure collagen, which is tough and elastic.

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Match each type of microscopy with the best description.

- a. utilizes a thin beam of electrons to examine structures within a cell
- b. utilizes lasers to scan a fluorescently stained specimen; a computer focuses the light to show a single plane through a cell
- c. utilizes differences in the way light is bent (refraction) in areas of various cellular density to visualize living cells
- d. requires light passing through the specimen; typically involves staining with dye to enhance contrast; usually “fixes” and kills the cell
- e. a beam of electrons scanned over a whole cell allows visualization of surface structures; gives a 3D-appearing image

97. phase-contrast microscopy

ANSWER: c

98. confocal laser scanning microscopy

ANSWER: b

99. bright field microscopy

ANSWER: d

100. transmission electron microscopy (TEM)

ANSWER: a

101. scanning electron microscopy (SEM)

ANSWER: e

Match each description with the cellular structure that corresponds best.

- a. contain enzymes for intracellular digestion
- b. location of genetic material
- c. synthesize subunits that will be used to assemble ribosomes
- d. site of protein synthesis
- e. composed of cellulose; provides support and protection
- f. synthesis of lipids
- g. conversion of fuel molecules into energy
- h. conversion of light energy into chemical energy
- i. storage site in plant cells
- j. synthesis of proteins for secretion
- k. chemically modifies proteins
- l. membrane-bound transport structure

102. smooth ER

ANSWER: f

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103. mitochondria

ANSWER: g

104. ribosomes

ANSWER: d

105. chloroplast

ANSWER: h

106. nucleus

ANSWER: b

107. lysosomes

ANSWER: a

108. nucleoli

ANSWER: c

109. central vacuole

ANSWER: i

110. Golgi complex

ANSWER: k

111. cell wall

ANSWER: e

112. rough ER

ANSWER: j

113. vesicle

ANSWER: l

Match each description of a cellular structure to the cell type it would be found in. A cell type may be used once, more than once, or not at all.

- a. found in all living cells
- b. found in prokaryotic cells only
- c. found in eukaryotic cells only
- d. found in plant cells only
- e. found in animal cells only

114. nucleus

ANSWER: c

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115. chloroplast

ANSWER: d

116. ribosome

ANSWER: a

117. mitochondria

ANSWER: c

118. nucleoid

ANSWER: b

119. plasma membrane

ANSWER: a

For each descriptive phrase, choose the most appropriate structure of the cytoskeleton from the list of terms. A term may be used once, more than once, or not at all.

- a. microfilaments
- b. microtubules
- c. intermediate filaments

120. composed of the hollow cylinders of tubulin dimers

ANSWER: b

121. involved in the process of cytoplasmic streaming

ANSWER: a

122. involved in moving chromosomes during cell division

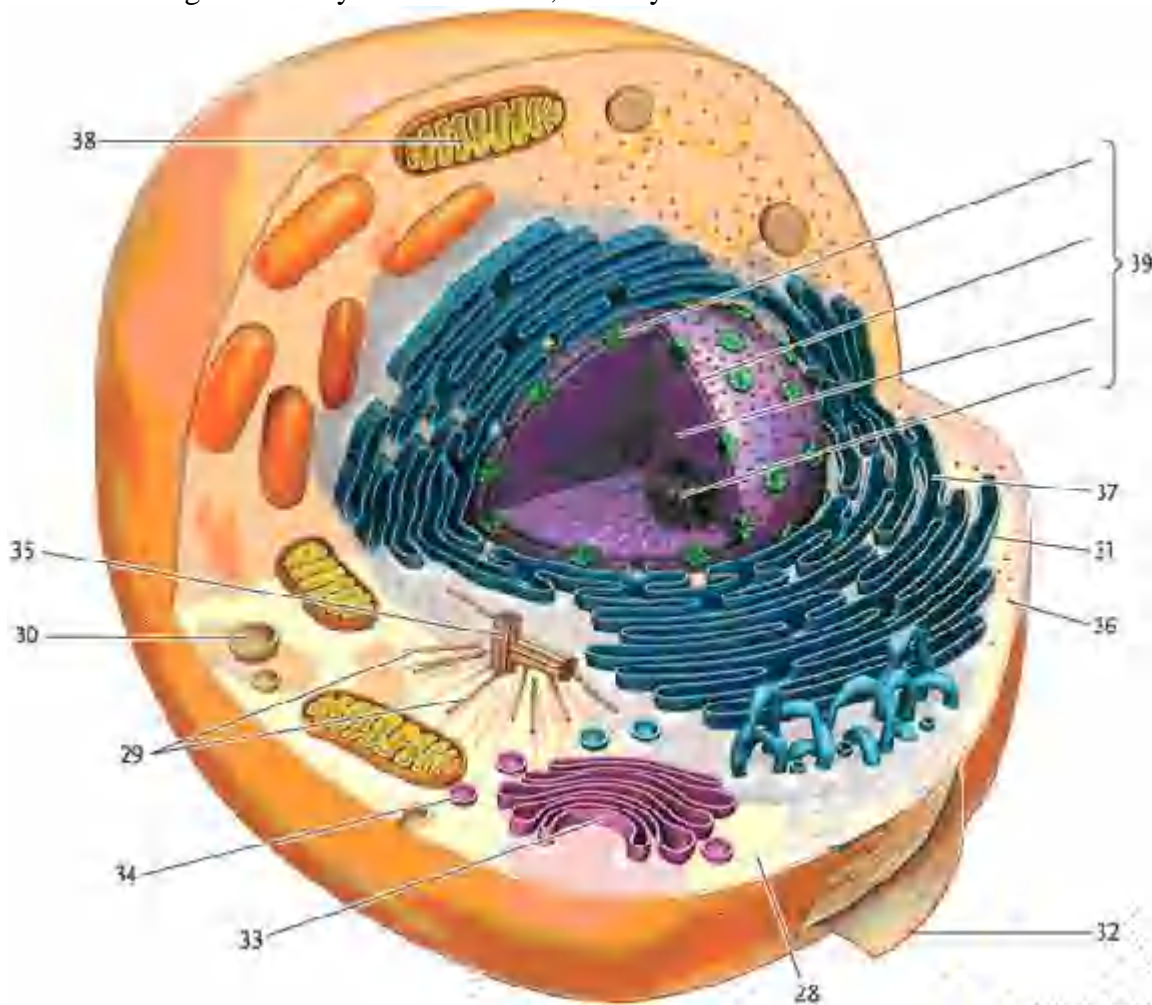
ANSWER: b

123. composed of two helically coiled actin polymers

ANSWER: a

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In this drawing of a eukaryotic animal cell, identify the cellular structures indicated.



124. cytosol

ANSWER: g

125. microtubules

ANSWER: d

126. lysosome

ANSWER: c

127. attached ribosomes

ANSWER: k

128. plasma membrane

ANSWER: h

129. Golgi complex

ANSWER: f

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130. vesicle

ANSWER: e

131. pair of centrioles

ANSWER: b

132. free ribosome

ANSWER: j

133. rough ER

ANSWER: l

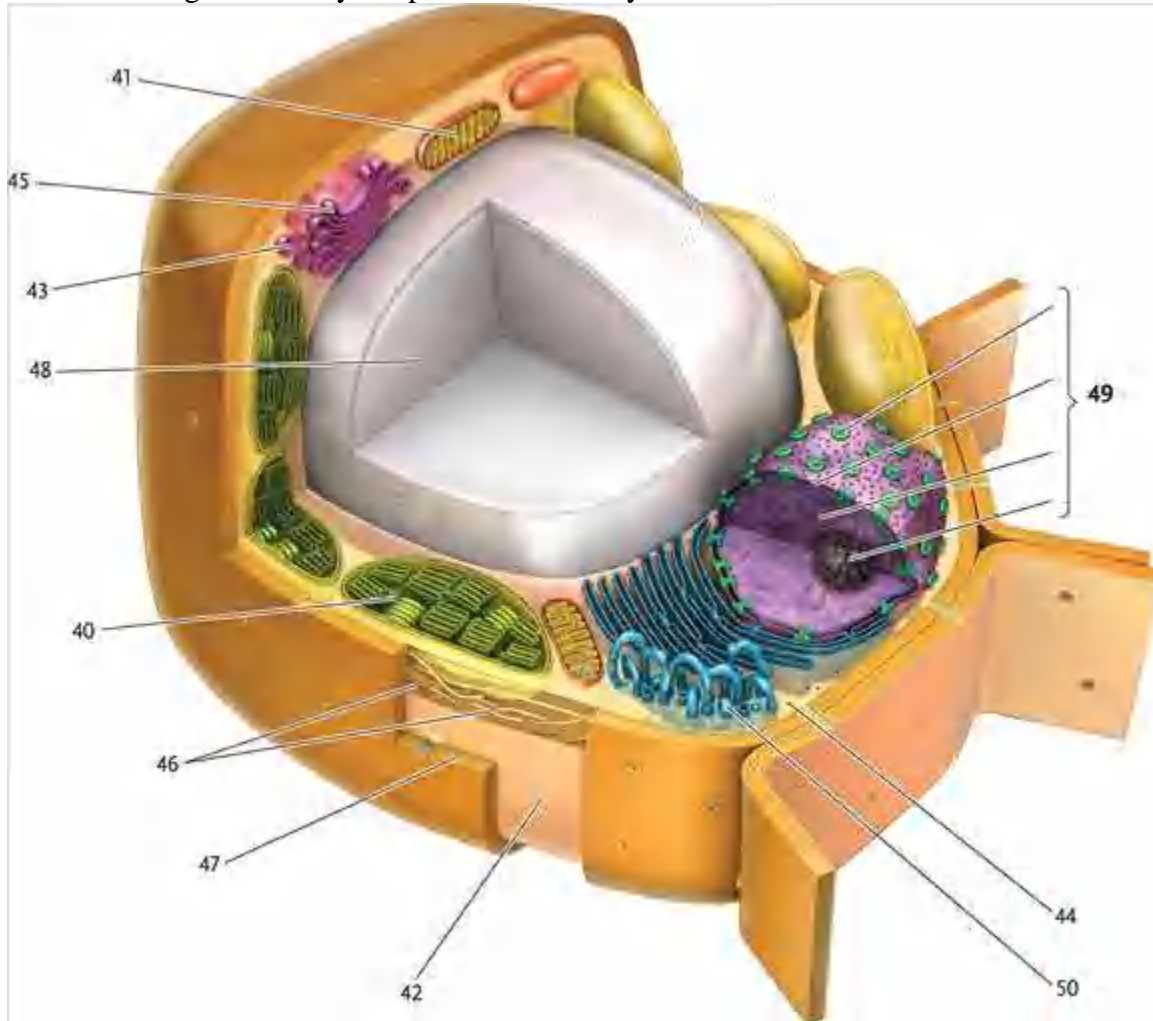
134. mitochondrion

ANSWER: a

135. nucleus

ANSWER: m

In this drawing of a eukaryotic plant cell, identify the cellular structures indicated.



Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

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136. chloroplast

ANSWER: e

137. mitochondrion

ANSWER: a

138. plasma membrane

ANSWER: h

139. vesicle

ANSWER: c

140. free ribosomes

ANSWER: j

141. Golgi complex

ANSWER: b

142. microtubules

ANSWER: f

143. cell wall

ANSWER: g

144. central vacuole

ANSWER: d

145. nucleus

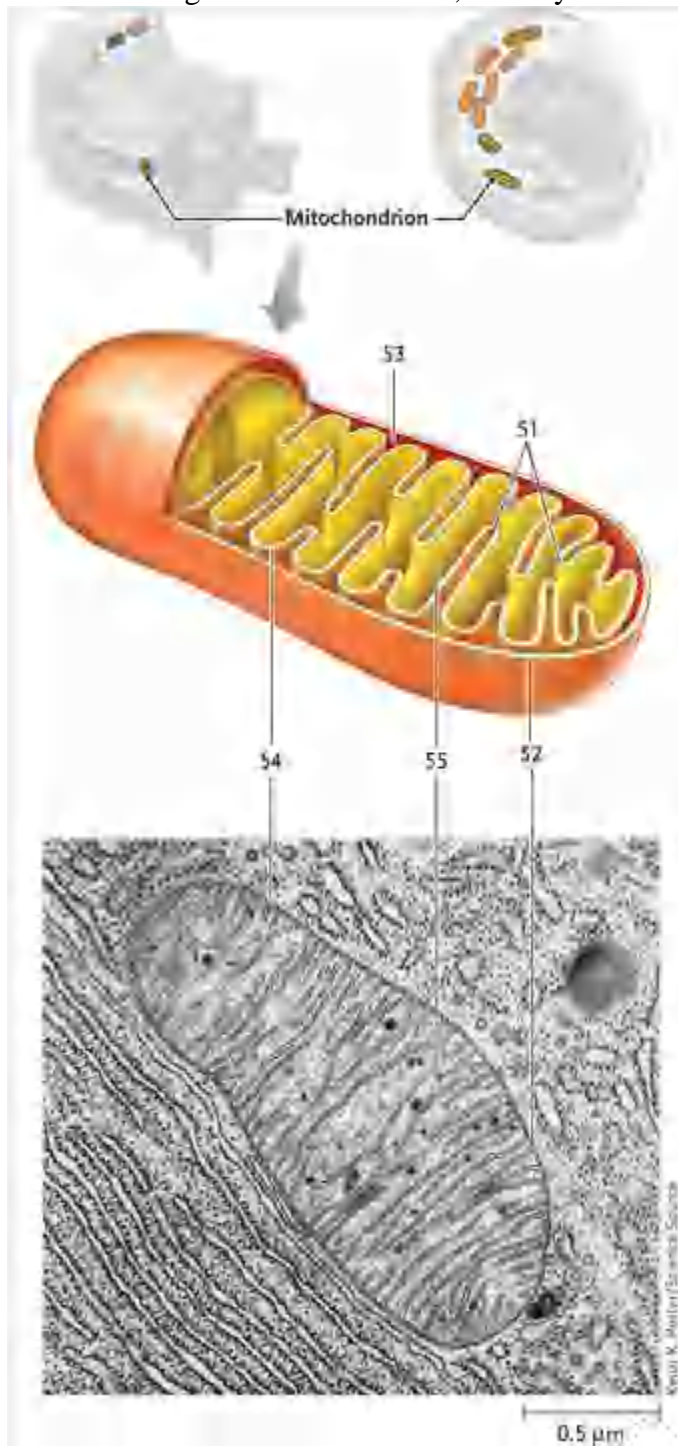
ANSWER: m

146. smooth ER

ANSWER: i

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In this drawing of a mitochondrion, identify the structures indicated.



147. cristae  
ANSWER: b

148. outer mitochondrial membrane  
ANSWER: c



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149. intermembrane compartment

ANSWER: a

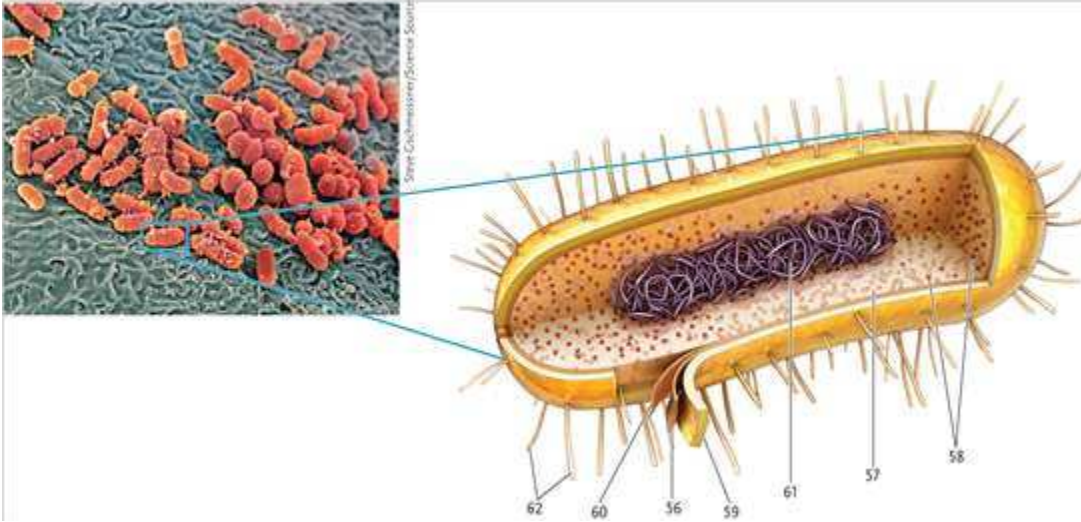
150. inner mitochondrial membrane

ANSWER: e

151. matrix

ANSWER: d

In this drawing of a prokaryotic cell, identify the cellular structures indicated.



152. cell wall

ANSWER: d

153. cytoplasm

ANSWER: g

154. ribosomes

ANSWER: h

155. capsule

ANSWER: e

156. plasma membrane

ANSWER: c

157. nucleoid

ANSWER: f

158. pili

ANSWER: b