

Chapter 3—Cells: The Basic Units of Life

MULTIPLE CHOICE

1. Human beings are

a.	machines.	c.	organisms.
b.	systems.	d.	protists.

ANS: C

2. One benefit of being a large organism is that you have

a.	larger cells.	c.	simpler functions.
b.	fewer predators.	d.	only one kind of cell.

ANS: B

3. The life span of a multicellular organism is

a.	only as long as the life of one cell.
b.	shorter than that of a single-celled organism.
c.	not limited to the life of a single cell.
d.	the same in every cell.

ANS: C

4. A group of cells with the same function makes up

a.	an organism.	c.	a tissue.
b.	an organ system.	d.	a structure.

ANS: C

5. In what kind of tissue does photosynthesis take place?

a.	nerve	c.	transport
b.	muscle	d.	ground

ANS: D

6. An organ consists of

a.	two or more tissues.	c.	two or more systems.
b.	a group of cells.	d.	nerves and muscles.

ANS: A

7. An organ system has

a.	one kind of tissue.	c.	two or more organs.
b.	only one function.	d.	one main kind of cell.

ANS: C

8. Even simple multicellular organisms can have

a.	organs.	c.	systems.
b.	specialized cells.	d.	colonies.

ANS: B

9. The highest level of organization is the

a.	cell.	c.	organ.
b.	tissue.	d.	system.

ANS: D

10. The functions of an organism's parts are related to those parts'

a.	structures.	c.	blood cells.
b.	systems.	d.	alveoli.

ANS: A

11. What is smallest unit that can perform all the processes necessary for life?

a.	cell	c.	organelle
b.	nucleus	d.	protist

ANS: A

12. Robert Hooke and Anton van Leeuwenhoek not only helped discover cells but also

a.	discovered that cells came from existing cells.
b.	helped develop the microscope.
c.	concluded that all living things had cells.
d.	discovered mushrooms and fungi.

ANS: B

13. Leeuwenhoek called the single-celled organisms that he found in pond scum "animalcules." Today we know them as

a.	animals.	c.	fungi.
b.	plant life.	d.	protists.

ANS: D

14. Scientist Matthias Schleiden contributed to the cell theory by concluding that

a.	the cells of plants and animals were the same.
b.	all plant parts were made of cells.
c.	the cells of plants were different from those of animals.

d.	all animal tissues were made of cells.
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ANS: B

15. Which of the following statements is not part of the cell theory?

a.	Animals and plants share the same kinds of cells.
b.	All organisms are made up of one or more cells.
c.	The cell is the basic unit of all living things.
d.	All cells come from existing cells.

ANS: A

16. Most cells are a very small size because

a.	they don't have hard shells like eggs.
b.	their volume does not increase.
c.	their volume is limited by how large their surface area is.
d.	their surface area-to-volume ratio is too small.

ANS: C

17. What cell part supports the cell and might be made of cellulose or chitin?

a.	cell membrane	c.	ribosome
b.	cell wall	d.	nucleus

ANS: B

18. What part of the cell forms a barrier between the cell and its environment?

a.	cell membrane	c.	ribosome
b.	nucleus	d.	cholesterol

ANS: A

19. What part of the cell keeps the cell membrane from collapsing?

a.	cell wall	c.	cytoskeleton
b.	cytoplasm	d.	nucleus

ANS: C

20. A cell's nucleus contains DNA, which carries genetic material with

a.	ribosomes.	c.	the endoplasmic reticulum.
b.	the cytoskeleton.	d.	instructions for how to make protein.

ANS: D

21. Ribosomes, the organelles that make proteins, are found on the membranes of the

a.	cell wall.	c.	mitochondria.
b.	endoplasmic reticulum.	d.	vacuoles.

ANS: B

22. What part of the cell acts as the cell's delivery system?

a.	nucleus	c.	mitochondrion
b.	nucleolus	d.	endoplasmic reticulum

ANS: D

23. Energy released by a cell's mitochondrion is stored in

a.	ATP.	c.	the ER.
b.	DNA.	d.	RNA.

ANS: A

24. What cell parts carry materials between organelles such as the ER and the Golgi complex?

a.	ribosomes	c.	vesicles
b.	lysosomes	d.	vacuoles

ANS: C

25. Larger size, longer life, and specialization are three advantages to being a

a.	eukaryote.	c.	unicellular organism.
b.	prokaryote.	d.	multicellular organism.

ANS: D

26. Which of the following is true of each of the four levels of organization of living things?

a.	Each contains larger cells than the level below it.
b.	Each is more complex than the level below it.
c.	Each performs the same functions as the level below it.
d.	Each is more specialized than the level below it.

ANS: B

27. The function of a part of an organism is related to

a.	its arrangement of cells.	c.	the structure of that part.
b.	the shape of its parts.	d.	its appearance under a microscope.

ANS: C

28. Which statement is NOT part of the cell theory?

a.	All organisms are made of one or more cells.
b.	Animal and plant cells contain the same organelles.

c.	The cell is the basic unit of living things.
d.	All cells originate from other cells.

ANS: B

29. A cell's volume grows faster than its surface area, so if a cell gets too large

a.	its surface area-to-volume ratio will decrease.
b.	the cell membrane and cell walls will break down.
c.	its outer surface will harden like an eggshell does.
d.	it will not be able to take in enough nutrients or get rid of wastes.

ANS: D

30. A large vesicle that aids in digestion within plant cells the way lysosomes do is called

a.	an enzyme.	c.	a mitochondrion.
b.	a vacuole.	d.	a nucleolus.

ANS: B

31. Most of a cell's ATP is made and stored in the inner membrane of the

a.	Golgi complex.	c.	endoplasmic reticulum.
b.	nucleus.	d.	mitochondrion.

ANS: D

32. Specialization in cells makes tissues, organs, and systems

a.	grow large in size.	c.	work more efficiently.
b.	produce larger cells.	d.	stay healthy.

ANS: C

33. Which phrase describes a cell?

a.	is always very small	c.	always looks like an egg
b.	does everything needed for life	d.	is found only in plants

ANS: B

34. What are all organisms made of?

a.	plants	c.	cells
b.	protists	d.	eggs

ANS: C

35. Where do all cells come from?

a.	animals	c.	cells
b.	ponds	d.	eggs

ANS: C

36. What keeps the size of most cells very small?

a.	their hard shells	c.	food and wastes
b.	the surface area-to-volume ratio	d.	their thin surfaces

ANS: B PTS: 1 DIF: 1 REF: 1
OBJ: 2

37. What protects the inside of a cell from the outside world?

a.	cytoplasm	c.	cell membrane
b.	nucleus	d.	DNA

ANS: C

38. How are archaea different from bacteria?

a.	Archaea have different ribosomes.	c.	Archaea have cell membranes.
b.	Archaea have only one cell.	d.	Archaea have RNA, not DNA.

ANS: A

39. Robert Hooke thought that animals did not have cells because he

a.	had not yet invented the microscope.
b.	could not see animal cells in his microscope.
c.	had not yet discovered protists.
d.	was looking at dead cork cells, not live ones.

ANS: B

40. The organisms that Leeuwenhoek called animalcules are today known as

a.	cells.	c.	prokaryotes.
b.	eukaryotes.	d.	protists.

ANS: D

41. The cell theory was developed

a.	by Robert Hooke.	c.	over a period of more than 200 years.
b.	by Rudolf Virchow.	d.	in the year 1858.

ANS: C

42. Which two things must be compared to explain why almost all cells are small?

a.	surface area and volume	c.	food production and waste elimination
b.	the shell and the yolk	d.	membranes and organelles

ANS: A

43. An organelle that is membrane-bound is			
a.	part of a prokaryote.	c.	unable to move around in the cell.
b.	surrounded by membranes.	d.	part of the nucleus.

ANS: B

45. The complex sugar cellulose is found in the cell walls of			
a.	all prokaryotes.	c.	animals.
b.	plants.	d.	fungi.

ANS: B

46. Because lipids are hydrophobic and face inward, their ends			
a.	keep water inside the cell.	c.	attract water.
b.	get rid of wastes.	d.	replace cell walls.

ANS: A

47. The hydrophilic ends of phospholipids face outward, where they serve to			
a.	protect the cell from water.	c.	attract water.
b.	get rid of wastes.	d.	replace cell walls.

ANS: C

48. What is cytoplasm?			
a.	the nucleus of a cell	c.	the genetic material in a cell
b.	the fluid inside a cell	d.	the proteins in a cell

ANS: B

49. Where does photosynthesis take place in a cell?			
a.	in the nucleus	c.	in the chloroplasts
b.	in the mitochondria	d.	in the ribosomes

ANS: C

50. What does the Golgi complex do in a cell?			
a.	It packages and distributes proteins.	c.	It makes sugar and oxygen.
b.	It is the power source of the cell.		
c.	It makes proteins.		

ANS: A

51. What is the job of the lysosomes?			
a.	They store water.	c.	They make new cells.
b.	They digest food particles.	d.	They package proteins.

ANS: B PTS: 1 DIF: 1 REF: 2
OBJ: 2

COMPLETION

Use the terms from the following list to complete the sentences below.

cell membrane	nucleus
lysosome	ribosome
organelle	Golgi complex
mitochondria	organs
prokaryotic	

1. Various tissues that work together to perform a specific job constitute _____.

ANS: organs

2. The role of the cell's _____ is to release energy that can be used to power various cellular processes.

ANS: mitochondria

3. DNA, the genetic material in cells, is located in a eukaryotic cell's _____.

ANS: nucleus

4. Cells that have no membrane-covered organelles are _____.

ANS: prokaryotic

5. A part of the Golgi complex can pinch off and form a(n) _____, which distributes materials to other parts of the cell.

ANS: lysosome

Use the terms from the following list to complete the sentences below.

cell	organ
structure	tissue
multicellular	system

6. The lowest level of organization is the _____.

ANS: cell

7. Cells that are like each other and do the same job form a(n) _____.

ANS: tissue

8. A structure made of two or more tissues working together is called a(n) _____.

ANS: organ

9. A group of organs that work together forms an organ _____.

ANS: system

10. Larger size, longer life, and more-specialized cells are characteristics of _____ organisms.

ANS: multicellular

11. How a part of an organism works is related to how it is built, or its _____.

ANS: structure

SHORT ANSWER

1. What four elements do all cells have in common?

ANS:
cell membranes, organelles, cytoplasm, DNA

2. What are three elements that plant cells have and animal cells do not?

ANS:
cell walls, chloroplasts, chlorophyll

3. List three roles played by proteins within a cell.

ANS:
Proteins control the chemical reactions in a cell, provide structural support for cells and tissues, and create passageways through the cell membrane.

4. Identify two functions of the Golgi complex and describe how it performs those functions.

ANS:
The Golgi complex packages and distributes proteins. It packages proteins in small bubbles made of a piece of membrane. The bubbles then break off and transport their contents to other parts of the cell.

5. List four levels of organization of living things.

ANS:
cell, tissue, organ, organ system

6. What is the role of the nucleolus?

ANS:
The nucleolus stores material that will be used to make ribosomes.

7. What is an amino acid?

ANS:

An amino acid is one of about 20 different organic molecules that are used to make proteins.

8. What are the two different kinds of endoplasmic reticulum?

ANS:

rough and smooth

9. What are two functions of smooth ER?

ANS:

Smooth ER makes lipids and breaks down toxic materials that enter the cell.

10. Besides the nucleus, what are two cell parts that make DNA?

ANS:

mitochondria, chloroplasts

11. Name three cell parts that help defend the cell against invading substances.

ANS:

cell membrane, smooth ER, lysosomes

12. Name two types of organelles that release energy.

ANS:

mitochondria, chloroplasts

13. What kinds of cells enable larger animals like humans to eat a wider variety of prey?

ANS:

specialized cells

14. What four basic types of tissues do animals have?

ANS:

nerve, muscle, connective, protective

15. How do your cells compare to the cells of smaller animals in size?

ANS:

The cells of larger and smaller animals are about the same size.

16. Why weren't cells discovered until 1665? What invention made their discovery possible?

ANS:

Cells weren't discovered until 1665 because almost all cells are too small to be seen with the naked eye. The microscope is the invention that made their discovery possible.

17. When Robert Hooke saw the "juice" in some cells, what was he looking at?

ANS:

cytoplasm

18. Why did Hooke think that cells existed only in plants and fungi and not in animals?

ANS:

Plants and fungi have cell walls. Hooke's microscope wasn't strong enough to view the more delicate cell membranes of animal cells.

19. List three differences between prokaryotic and eukaryotic cells.

ANS:

Prokaryotic cells have circular DNA, no nucleus, and no membrane-covered organelles, Eukaryotic cells have linear DNA, a nucleus, and membrane-covered organelles.

21. What is the cytoskeleton?

ANS:

a web of proteins in the cytoplasm that gives the cell shape and may help the cell move

22. Why can't you use your teeth to breathe? Why can't you use your muscles to digest food?

ANS:

because teeth and muscles are not specialized for those functions

23. What is the relationship between your digestive system, stomach, and intestines?

ANS:

The digestive system is an organ system. The stomach and intestines are organs that are parts of the digestive system.

24. What is the main difference between a unicellular organism and a multicellular organism in the way life processes are carried out?

ANS:

Sample answer: A unicellular organism must perform all life functions by itself. A multicellular organism may have specialized cells that work together to carry out each function.

25. What is the difference between the cytoskeleton and the cytoplasm?

ANS:

The cytoplasm is the fluid—and almost all of its contents—inside a cell, and the cytoskeleton is a web of proteins in the cytoplasm that gives the cell shape and many help the cell move.

MATCHING

Match each item with the correct statement below.

a.	archaea	f.	organelle
b.	cell membrane	g.	prokaryote
c.	bacteria	h.	ribosomes
d.	eukaryote	i.	surface area-to-volume ratio
e.	nucleus	j.	cytoplasm

1. tiny, round organelles made of protein and other material
2. the fluid inside a cell
3. the reason that most cells are limited to a very small size
4. a protective layer that covers the cell's surface and acts as a barrier
5. small bodies in a cell's cytoplasm that are specialized to perform specific functions
6. in a eukaryotic cell, an organelle that contains the cell's DNA and that has a role in growth, metabolism, and reproduction
7. an organism that consists of a single cell that does not have a nucleus or membrane-bound organelles
8. prokaryotes that are the smallest cells and that have ribosomes
9. prokaryotes that include extremophiles, organisms that live in extreme conditions
10. an organism made up of cells that have a nucleus enclosed by a membrane as well as membrane-bound organelles

1. ANS: H
2. ANS: J
3. ANS: I
4. ANS: B
5. ANS: F
6. ANS: E
7. ANS: G
8. ANS: C
9. ANS: A
10. ANS: D

Match each item with the correct statement below.

a.	cell membrane	f.	Golgi complex
b.	cell wall	g.	lysosomes
c.	chloroplasts	h.	mitochondrion
d.	cytoskeleton	i.	nucleus
e.	endoplasmic reticulum	j.	ribosomes

11. a rigid structure that gives support to a cell
12. a barrier that encloses and protects the cell
13. a web of proteins in the cytoplasm that keeps a cell's membrane from collapsing
14. a large organelle that produces and stores the cell's DNA
15. organelles that make proteins
16. a system of folded membranes that functions as the internal delivery system of a cell
17. an organelle that functions as the main power source of a cell, breaking down sugar to produce energy

18. organelles in which photosynthesis takes place
19. the organelle that packages and distributes proteins
20. organelles that contain digestive enzymes

11. ANS: B
12. ANS: A
13. ANS: D
14. ANS: I
15. ANS: J
16. ANS: E
17. ANS: H
18. ANS: C
19. ANS: F
20. ANS: G

Match each item with the correct statement below.

a.	archaea	e.	multicellular
b.	cell membrane	f.	nucleus
c.	bacteria	g.	organelles
d.	eukaryotes	h.	prokaryote

21. the part of the cell that keeps the cytoplasm inside and controls materials going in and out of the cell
22. structures that are usually surrounded by membranes and which perform specific functions within the cell
23. an organelle that contains the cell's DNA
24. a single-celled organism that has no nucleus or membrane-bound organelles
25. the smallest and most common form of prokaryotes, containing DNA, ribosomes, and a flagellum
26. prokaryotes that include such types as heat-loving, salt-loving, and methane-making
27. organisms made up of cells that have a nucleus and membrane-bound organelles
28. word that describes most organisms that you can see with your naked eye

21. ANS: B
22. ANS: G
23. ANS: F
24. ANS: H
25. ANS: C
26. ANS: A
27. ANS: D
28. ANS: E

Match each item with the correct statement below.

a.	DNA	c.	nucleus
b.	eukaryote	d.	prokaryote

29. a cell with a nucleus
30. a cell without a nucleus
31. genetic material in cells
32. where DNA is stored

29. ANS: B
30. ANS: D
31. ANS: A
32. ANS: C

Match each item with the correct statement below.

a.	cell walls
b.	endoplasmic reticulum
c.	ribosome

33. stiff surfaces that support cells
34. organelle that makes proteins
35. a cell's delivery system

33. ANS: A
34. ANS: C
35. ANS: B

Match each item with the correct statement below.

a.	found in plant cells
b.	found in animal cells
c.	found in both plant and animal cells

36. cellulose, a complex sugar used to build cell walls
37. nucleus
38. organelles that aid photosynthesis
39. vacuoles, large vesicles that store water and other materials

36. ANS: A
37. ANS: C
38. ANS: A
39. ANS: C

ESSAY

1. Compare the levels of organization among eukaryotes with the types of organization found among prokaryotes.

ANS:

Answers may vary. Sample answer: Prokaryotes are organized only on the cellular level, since they are single-celled organisms. However, some prokaryotic cells do live in colonies. Eukaryotes can be single-celled, but most are multicellular. In more complex eukaryotes, cells form tissues, tissues form organs, and organs work together to form systems.

2. Why does being single-celled give a species of extremophiles a greater chance of survival?

ANS:

Answers may vary. Sample answer: In a single-celled organism, only one type of cell has to be adapted to the environment. Once that cell has so adapted, it can keep surviving as long as it continues to replicate. In a multicellular organism, there are likely to be many different kinds of cells. To survive in an extreme environment, every kind of cell would have to adapt. This adaptation would also have to happen at the same time, or damage to one type of cell would affect the whole organism.