Cells

MULTIPLE-CHOICE QUESTIONS

Matching Column*

1. Produces ATP
2. Produces proteins
3. Packages and secretes substances
4. Contains hydrolytic enzymes
5. Directly assists with cell division

(A) Golgi apparatus
(B) Microtubules
(C) Rough endoplasmic reticulum
(D) Mitochondria
(E) Lysosomes

6. Which of the following is *not* normally found in a plant cell?
   (A) mitochondria
   (B) endoplasmic reticulum
   (C) plastids
   (D) centrioles

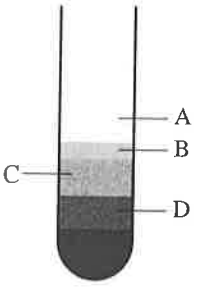
7. Which of the following is *present* in a prokaryote cell?
   (A) mitochondria
   (B) ribosomes
   (C) endoplasmic reticulum
   (D) chloroplasts

8. Membranes are components of all of the following EXCEPT a
   (A) microtubule
   (B) nucleus
   (C) Golgi apparatus
   (D) mitochondrion

9. Which are the following is NOT related to cell-to-cell communication?
   (A) Contact inhibition
   (B) Countercurrent exchange
   (C) Quorum sensing
   (D) Cyclic-AMP

*For study purposes, matching columns contain 5 choices.

10. A scientist has made a homogenate of human liver cells in a blender and then spun that mixture in an ultracentrifuge, as shown below. Which layer would include the most mitochondria?



(A) A
(B) B
(C) C
(D) D

11. What is the approximate size of a human red blood cell?

(A) 0.01 micrometer
(B) 8 micrometers
(C) 80 micrometers
(D) 8 nanometers

12. Smooth E.R. carries out all of the following activities EXCEPT

(A) lipid production
(B) detoxification
(C) connects rough E.R. to the Golgi
(D) produces RNA

13. An animal cell in a hypertonic solution would

(A) swell
(B) swell and exhibit turgor
(C) exhibit plasmolysis
(D) shrink and then swell

14. Which one of the following would *not* normally diffuse through the lipid bilayer of a plasma membrane?

(A) CO_2
(B) amino acid
(C) starch
(D) water

15. Which of the following requires ATP?

(A) the uptake of cholesterol by a cell
(B) the facilitated diffusion of glucose into a cell
(C) countercurrent exchange
(D) the diffusion of oxygen into a fish's gills.

16. All of the following cellular activities require ATP EXCEPT

(A) sodium-potassium pump
(B) cells absorbing oxygen
(C) receptor-mediated endocytosis
(D) amoeboid movement

17. Which of the following best characterizes the structure of the plasma membrane?

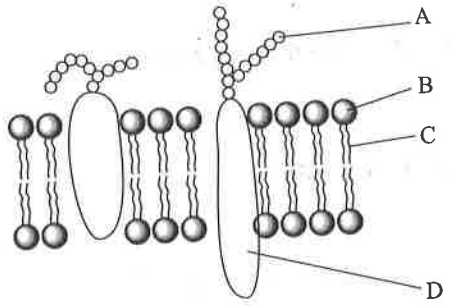
(A) rigid and unchanging
(B) rigid but varying from cell to cell
(C) fluid but unorganized
(D) very active

18. The cytoplasmic channels between plant cells are called

(A) desmosomes
(B) middle lamellae
(C) plasmodesmata
(D) tight junctions

Questions 19–21

The following questions refer to the figure below, which shows the plasma membrane.



19. Identify the hydrophilic portion of a lipid molecule.

20. Identify the proteins involved in transport.

21. Identify the structure involved in cell-to-cell communication.

22. Which organelle contains DNA?

(A) ribosomes
(B) mitochondria
(C) Golgi body
(D) lysosomes

23. Which of the following is NOT a receptor on the surface of a cell?

(A) Ion-channel receptor
(B) G-protein-coupled receptor
(C) Cyclic-AMP
(D) Protein kinase receptor

24. Which of the following is correct about protein kinase receptors?

(A) They activate G-protein in the cytoplasm of the cell.
(B) They bind to steroid messengers on the surface of a cell.
(C) They belong to a class of plasma membrane receptors that exhibit enzyme activity.
(D) They allow for the passage of ions such as Na^+ ions through the plasma membrane of a cell.

25. Which of the following is correct about signal transduction pathways?

(A) Signal transduction pathways are found only in the cells of the most complex animals.
(B) Signal transduction pathways have evolved recently along with the development of enlarged brain size in mammals.
(C) In the signal transduction pathway, a single molecule can stimulate the release of thousands of molecules of product within a cell.
(D) Signal transduction pathways are unique in that receptors that stimulate the pathway are located only on the surface of a plasma membrane.

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Answers to Multiple-Choice Questions

1. **(D)** Mitochondria release energy from organic molecules and store it in ATP molecules.

2. **(C)** Ribosomes attached to rough endoplasmic reticulum produce proteins.

3. **(A)** The Golgi apparatus receives newly synthesized proteins and lipids from the E.R. and distributes them to the plasma membrane, lysosomes, and secretory vesicles.

4. **(E)** Lysosomes are the principal sites of intracellular digestion.

5. **(B)** Microtubules make up the spindle fibers, which connect to the centromeres of chromosomes and assist in mitosis.

6. **(D)** Plant cells lack centrioles. Instead they have microtubule organizing regions. They also have mitochondria, ribosomes, plastids, and endoplasmic reticulum.

7. **(B)** Prokaryotes have NO internal membranes. Therefore, they lack mitochondria, E.R., chloroplasts, and nuclear membrane. They do have small ribosomes.

8. **(A)** Microtubules are part of the cytoskeletal structure and are made of the protein tubulin. The others all consist of selectively permeable plasma membranes.

9. **(B)** Countercurrent exchange refers to a mechanism that enhances diffusion, such as increased absorption of oxygen across fish gills. It is not an example of how cells communicate. Contact inhibition is the phenomenon whereby cells can sense that they are in a crowded environment at which point they stop dividing. Quorum sensing relates to the fact that cells, such as bacteria, can sense the size of their own population. Cyclic-AMP is a common secondary messenger in the cytoplasm of a cell receiving a signal from outside the cell.

10. **(D)** Centrifugation causes the densest structures to sink to the bottom and the lightest to remain on top. Nuclei are the densest, and mitochondria are the next most dense. The least dense layer would consist of ribosomes.

11. **(B)** Human red blood cells are small, 8 micrometers (μm) or 8000 nanometers (nm). An average cell is about 80 micrometers.

12. **(D)** Smooth E.R. connects the rough E.R. to the Golgi, carries out detoxification, and produces lipids like steroids. The nucleolus produces RNA.

13. **(C)** An animal cell in a hypertonic solution would shrink because the concentration of water is greater inside the cell than outside the cell. Since water flows down a gradient, it would flow out of the cell. Plasmolysis means cell shrinking.

14. **(C)** Starch, a polysaccharide, is too large to diffuse through the plasma membrane.

15. **(A)** The uptake of cholesterol occurs by receptor-mediated endocytosis, which requires energy. B is an example of facilitated diffusion, and C and D are examples of countercurrent exchange. B, C, and D are all examples of passive transport and do not require energy.

16. **(B)** Oxygen is absorbed by diffusion. All the other choices are examples of active transport.

17. **(D)** The plasma membrane is organized and made of many small particles that move about readily. Hence the name, fluid mosaic. A membrane is a very active structure. A cell's activity is limited by how fast plasma membranes can take in and get rid of materials.

18. **(C)** Plasmodesmata are functionally like gap junctions in animal cells and are a means of cytoplasmic communication among plant cells. A system of plasmodesmata is called a symplast.

19. **(B)** The phospholipid head is polar and hydrophilic.

20. **(D)** This is a protein channel.

21. **(A)** The glycocalyx is involved in cell-to-cell communication.

22. **(B)** The nucleus, chloroplasts, and mitochondria all contain DNA.

23. **(C)** Cyclic-AMP is a common secondary messenger in the cytoplasm of a cell, not on the plasma membrane of a cell. It is activated when a lipid-soluble molecule (the first messenger) passes through the plasma membrane and enters the cell. All the others are examples of receptors on the cell surface.

24. **(C)** Protein kinase receptors belong to a class of plasma membrane receptors that function as enzymes. One example is RTK, receptor tyrosine kinase. Steroid messengers diffuse directly through the cell membrane and once inside the cell, bind to a second messenger, like c-AMP. G-protein-coupled receptors are another example of a receptor on the surface of the cell membrane. Ion-channel receptors are another example of a receptor on the surface of a cell.

25. **(C)** Signal transduction pathways are highly specific and regulated. Their similarity across different kingdoms speaks to a common ancestry. Receptors that stimulate signal transduction pathways are located both on the surface of the membrane as well as within the cytoplasm.