Biology 12

LAB 10 Cell Structures and organelles

Answers:

1. The function of the cell membrane is (a) to act as the outer membrane of the cell, and (b) to regulate the entrance and exit of molecules into and out of the cell.

2. There appears to be a space between the two cells in figure 1. This space is filled with extracellular fluid [contains water, dissolved oxygen, dissolved carbon dioxide, other small molecules].

3. The fluid mosaic model of cell membrane structure indicates that the membrane consists of a double layer of phospholipids in which proteins are either partially or wholly embedded. The darker outer layer of the membrane consists of the denser heads of the phospholipid molecules, while the inner, less dense layer consists of phospholipid tails.

4. The cytoskeleton of a cell plays a role in (a) assisting in cellular movement, (b) maintaining a cell's shape, and (c) anchoring organelles or allowing them to move, as appropriate.

5. Microtubules are made up of 13 rows of globular proteins arranged to form a hollow tube, while microfilaments are made up of double filaments arranged in a helical pattern, with each filament being made up of numerous globular proteins joined together.

6. The nuclear envelope appears to be made up of two membranes.

7. Pores serve to let large molecules such as proteins move in or out of the nucleus. The diaphragm, when in place, would prevent the movement of such molecules through the pore.

8. Heterochromatin appears to be a dense granular substance found concentrated along the nuclear envelope. Euchromatin appears granular, but is not as concentrated as heterochromatin. It also does not appear to be associated with the cell membrane.

9. The nucleolus appears to be a spherical mass composed of large concentrations of molecules.

10. The polysomes produce proteins that will likely be used *inside* the cell. Polysomes represent several ribosomes bunched together, each of which is producing the same type of protein.

11. Polysomes are composed of a cluster of ribosomes, therefore a polysome is larger than a single ribosome*.

12. The ribosomes attached to the ER produce proteins which will be exported to the outside of the cells.

13. Glycogen can be readily decomposed into monosaccharide sugars. These simple sugars can then be used by mitochondria during aerobic cellular respiration an energy-producing fuel (ATP), which can be used to facilitate muscle cell contractions.

14. Protein-rich vesicles are received from the ER at the inner surface of the Golgi apparatus (see figures 5a, 5b). The proteins are sorted out and packaged into vesicles at the outer surface. The vesicles can move the proteins to different locations within the cell in this manner or to the cell membrane for export to the outside of the cell by exocytosis.

15. Lysosomes contain powerful hydrolytic enzymes concerned with intracellular digestion.

16. Two other roles that lysosomes may play are (a) autodigestion or disposal of damaged cell components like mitochondria, and (b) the breakdown of a whole cell (by releasing their contents into the cell cytoplasm).

17. The lysosomes in figure 6b, which appear to be filled with undigested materials, are probably residual bodies.

18. A vesicle is a small vacuole.

19. Vacuoles (vesicles) are formed by (a) glebbing off from the Golgi apparatus, (b) infolding (endocytosis) of the cell membrane, and (c) extension of the ER membrane, such as the large central vacuole of a plant cell.

20. The respiratory enzymes that aid in production of energy are located in an assembly line fashion on the cristae. Furthermore, each crista membrane is divided into many functional units containing one complete set of enzymes used for carrying on cellular respiration.

21. Cilia and flagella con propel a cell or organism through a liquid medium. Cilia may also propel substances past cells which anchor the cilia. An example of this would be the cilia lining the trachea; these propel particulate matter away from the lungs.

22. Each flagellum and cilia has a basal body lying in the cytoplasm at its base. Basal bodies have a cylindrical arrangement of nine microtubule triplets in a 9 + 0 pattern. Basal bodies organize to give rise to the structure of each flagellum and cilium.

23. A flagellum is a membrane-bounded cylinder enclosing a matrix area. In the matrix are nine microtubule doublets arranged in a circle around two central microtubules (a 9 + 2 pattern). Each doublet has a pair of arms (dynein arms) projecting toward a neighbouring doublet.

24. In a tight junction, the cell membranes of the two adjacent cells are joined together at regular intervals (interlocked in a zipper fashion), but within a desmosome, cell membranes do not meet.

25.' The role of a tight junction and a dcsmosome is to bind tissue cells together. Cells joined together by tight junctions prevent leakage of molecules into or out of this type of tissue. For example, cells lining the intestine are held together by tight junctions; this prevents intestinal contents from leaking into the intestinal tissue. In desmosomes, a fibrous plaque in each cell which joins to a dense mat of thin filaments extending within each cell and across the intercellular space. This gives each cell greater stability.

26. The cell membranes of each cell within a gap junction are joined together in a stitch-like fashion. At the point of each junction, a number of channel-filled protein bodies provide a means for movement of substances from cell to cell. The cell membranes of each cell in an intermediate junction remain apart.

27. The type of junction that allows for movement of molecules from cell to cell is the gap junction, since proteins with channels through them are found at the junction points of the two adjacent cells.

28. As a cell matures, the cytoplasm increases in mass at a faster rate than the nucleus.

29. Free ribosomes produce proteins that will probably be used inside the cell, while ribosomes attached to the ER produce proteins that will likely be used outside the cell.

30. The nucleolus is the organelle that fills most of the nucleus.

31. The chlorophyll molecules are found inside the thylakoid **sacs** that make up each granum.

32. An outer and inner membrane surround the contents of a chloroplast.

33. The outer membranes are not continuous with the thylakoid membranes.

34. The thylakoid sacks of the grana are interconnected by membranous tubes which are extensions of the thylakoid sacks.

35. The main function of the cell wall is to provide support for the cell.

36. The cell wall is made up of a large number of cellulose fibres cemented together, like cellulose fibres in paper.

37. Small molecules would probably have no difficulty penetrating the cell wall, while larger molecules may not be able to pass through.

38. The large central vacuole in plants may function in (a) water storage, (b) food storage, (c) waste storage, and (d) cell support.

39. The large central vacuole occupies most of the cell, thus pushing the contents of the cell toward the cell wall.

40. The central vacuole is thought to be an extension of the ER membrane.

F.igure 16b

1. Vacuole
2. Lysosome
3. Cell wall
4. Chloroplast.
5. Mitochondria
6. Nucleus
7. Starch granule

1. nuclear membrane
2. nucleus
3. lysosome
4. microbody
5. rough endoplasmic reticulum
6. glyrogcn granule
7. mitochondria
8. smooth endoplasmic reticulum