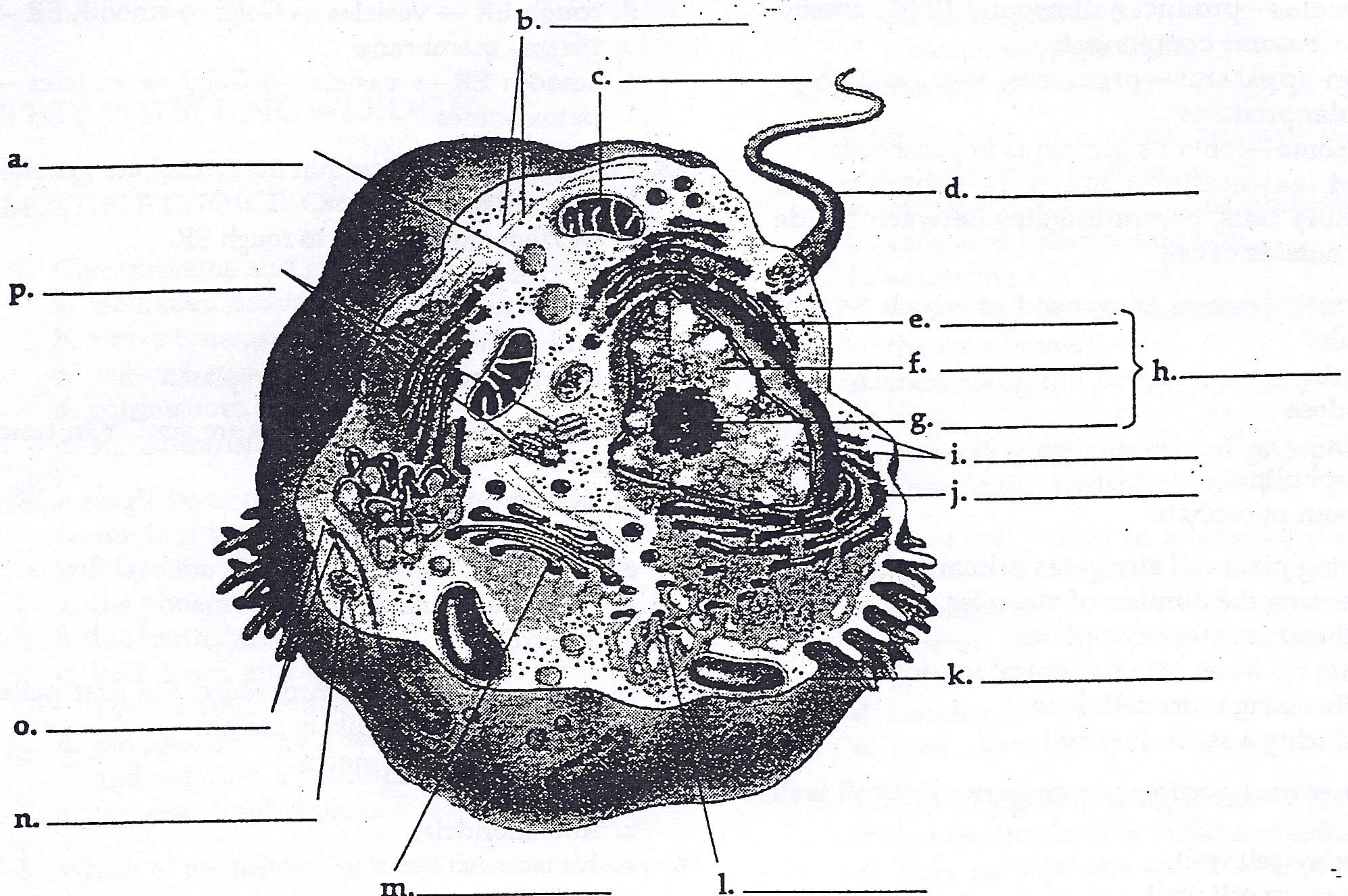


Label the indicated structures in this diagram of an animal cell.



- Which of the following is *not* a similarity among the nucleus, chloroplasts, and mitochondria?
 - They contain DNA.
 - They are bounded by a double phospholipid bilayer membrane.
 - They can divide to reproduce themselves.
 - They are derived from the endoplasmic reticulum system.
 - Their membranes are associated with specific proteins.
- The pores in the nuclear envelope provide for the movement of
 - proteins into the nucleus.
 - ribosomal components out of the nucleus.
 - mRNA out of the nucleus.
 - enzymes into the nucleus.
 - all of the above.
- The ultrastructure of a chloroplast could be seen best using
 - transmission electron microscopy.
 - scanning electron microscopy.
 - phase-contrast light microscopy.
 - cell fractionation.
 - fluorescence microscopy.

TEST YOUR KNOWLEDGE

MULTIPLE CHOICE: Choose the one best answer.

- Which of the following is/are *not* found in a prokaryotic cell?
 - ribosomes
 - plasma membrane
 - mitochondria
 - a and c
 - a, b, and c
- Resolving power of a microscope is
 - the distance between two separate points.
 - the sharpness or clarity of an image.
 - the degree of magnification of an image.
 - the depth of focus on a specimen's surface.
 - the wavelength of light.

6. Which of the following is *incorrectly* paired with its function?
 - a. peroxisome—contains enzymes that break down H_2O_2
 - b. nucleolus—produces ribosomal RNA, assembles ribosome components
 - c. Golgi apparatus—processes, tags, and ships cellular products
 - d. lysosome—contains pigments in plant cells
 - e. ECM (extracellular matrix)—supports and anchors cells, communicates between inside and outside of cell
 7. The cytoskeleton is composed of which type of molecule?
 - a. protein
 - b. cellulose
 - c. chitin
 - d. phospholipid
 - e. calcium phosphate
 8. A growing plant cell elongates primarily by
 - a. increasing the number of vacuoles.
 - b. synthesizing more cytoplasm.
 - c. taking up water into its central vacuole.
 - d. synthesizing more cellulose.
 - e. producing a secondary cell wall.
 9. The innermost portion of a mature plant cell wall is the
 - a. primary cell wall.
 - b. secondary cell wall.
 - c. middle lamella.
 - d. plasma membrane.
 - e. plasmodesmata.
 10. Contractile elements of muscle cells are
 - a. intermediate filaments.
 - b. centrioles.
 - c. microtubules.
 - d. actin filaments.
 - e. fibronectins.
 11. Microtubules are components of all of the following *except*
 - a. centrioles.
 - b. the spindle apparatus for separating chromosomes in cell division.
 - c. tracks along which organelles can move using motor molecules.
 - d. flagella and cilia.
 - e. the pinching apart of the cytoplasm in animal cell division.
 12. Of the following, which is probably the most common route for membrane flow in the endomembrane system?
 - a. rough ER → Golgi → lysosomes → nuclear membrane → plasma membrane
 - b. rough ER → transport vesicles → Golgi → vesicles → plasma membrane
 - c. nuclear envelope → rough ER → Golgi → smooth ER → lysosomes
 - d. rough ER → vesicles → Golgi → smooth ER → plasma membrane
 - e. smooth ER → vesicles → Golgi → vesicles → peroxisomes
 13. Proteins to be used within the cytosol are generally synthesized
 - a. by ribosomes bound to rough ER.
 - b. by free ribosomes.
 - c. by the nucleolus.
 - d. within the Golgi apparatus.
 - e. by mitochondria and chloroplasts.
 14. Plasmodesmata in plant cells are similar in function to
 - a. desmosomes.
 - b. tight junctions.
 - c. gap junctions.
 - d. the extracellular matrix.
 - e. integrins.
 15. In a cell fractionation procedure, the first pellet formed would most likely contain
 - a. the extracellular matrix.
 - b. ribosomes.
 - c. mitochondria.
 - d. lysosomes.
 - e. nuclei.
- Use the cells described as follows to answer questions 16–20.
- a. muscle cell in the thigh muscle of a long-distance runner
 - b. pancreatic cell that manufactures digestive enzymes
 - c. macrophage (white blood cell) that engulfs bacteria
 - d. epithelial cell lining digestive tract
 - e. ovarian cell that produces estrogen (a steroid hormone)
16. In which cell would you expect to find the most tight junctions?
 17. In which cell would you expect to find the most lysosomes?
 18. In which cell would you expect to find the most smooth endoplasmic reticulum?
 19. In which cell would you expect to find the most bound ribosomes?
 20. In which cell would you expect to find the most mitochondria?

TEST YOUR KNOWLEDGE

MULTIPLE CHOICE: Choose the one best answer.

- Glycoproteins and glycolipids are important for
 - facilitated diffusion.
 - active transport.
 - cell-cell recognition.
 - cotransport.
 - signal-transduction pathways.
- A single layer of phospholipid molecules coats the water in a beaker. Which part of the molecules will face the air?
 - the phosphate groups
 - the hydrocarbon tails
 - both head and tail because the molecules are amphipathic and will lie sideways
 - the phospholipids would dissolve in the water and not form a membrane coat
 - the glycolipid regions
- Which of the following is *not* true about osmosis?
 - It increases free energy in a system.
 - Water moves from a hypotonic to a hypertonic solution.
 - Solute molecules bind to water and decrease the water available to move.
 - It increases the entropy in a system.
 - There is no net osmosis between isotonic solutions.
- Support for the fluid mosaic model of membrane structure comes from
 - the freeze-fracture technique of electron microscopy.
 - the movement of proteins in hybrid cells.
 - the amphipathic nature of membrane proteins.
 - both a and c.
 - all of the above.
- A freshwater *Paramecium* is placed into salt water. Which of the following events would occur?
 - an increase in the action of its contractile vacuole
 - swelling of the cell until it becomes turgid
 - swelling of the cell until it lyses
 - shriveling of the cell
 - diffusion of salt ions out of the cell
- Ions diffuse across membranes down their
 - electrochemical gradient.
 - electrogenic gradient.
 - electrical gradient.
 - concentration gradient.
 - osmotic gradient.
- The fluidity of membranes in a plant in cold weather may be maintained by
 - increasing the number of phospholipids with saturated hydrocarbon tails.
 - activating a H^+ pump.
 - increasing the concentration of cholesterol in the membrane.
 - increasing the proportion of peripheral proteins.
 - increasing the number of phospholipids with unsaturated hydrocarbon tails.
- A plant cell placed in a hypotonic environment will
 - plasmolyze.
 - shrivel.
 - become turgid.
 - become flaccid.
 - lyse.
- Which of the following is *not* true of the carrier molecules involved in facilitated diffusion?
 - They increase the speed of transport across a membrane.
 - They can concentrate solute molecules on one side of the membrane.
 - They may have specific binding sites for the molecules they transport.
 - They may undergo a conformational change upon binding of solute.
 - They may be inhibited by molecules that resemble the solute to which they normally bind.
- The membrane potential of a cell favors the
 - movement of cations into the cell.
 - movement of anions into the cell.
 - action of an electrogenic pump.
 - movement of sodium out of the cell.
 - action of a proton pump.
- Cotransport may involve
 - active transport of two solutes through a transport protein.
 - passive transport of two solutes through a transport protein.
 - ion diffusion against the electrochemical gradient created by an electrogenic pump.
 - a pump such as the Na^+-K^+ pump that moves ions in two different directions.

- e. transport of one solute against its concentration gradient in tandem with another that is diffusing down its concentration gradient.

12. Exocytosis involves all of the following *except*

- a. ligands and coated pits.
- b. the fusion of a vesicle with the plasma membrane.
- c. a mechanism to transport carbohydrates to the outside of plant cells during the formation of cell walls.
- d. a mechanism to rejuvenate the plasma membrane.
- e. a means of exporting large molecules.

13. The proton pump in plant cells is the functional equivalent of an animal cell's

- a. cotransport mechanism.
- b. sodium-potassium pump.
- c. contractile vacuole for osmoregulation.
- d. receptor-mediated endocytosis of cholesterol.
- e. ATP pump.

14. Pinocytosis involves

- a. the fusion of a newly formed food vacuole with a lysosome.
- b. receptor-mediated endocytosis and the formation of vesicles.
- c. the pinching in of the plasma membrane around small droplets of external fluid.
- d. pseudopod extension as vesicles move along the cytoskeleton and fuse with the plasma membrane.
- e. the accumulation of specific large molecules in a cell.

15. Watering a houseplant with too concentrated a solution of fertilizer can result in wilting because

- a. the uptake of ions into plant cells makes the cells hypertonic.
- b. the soil solution becomes hypertonic, causing the cells to lose water.
- c. the plant will grow faster than it can transport water and maintain proper water balance.
- d. diffusion down the electrochemical gradient will cause a disruption of membrane potential and accompanying loss of water.
- e. the plant will suffer fertilizer burn due to a caustic soil solution.

16. A cell is manufacturing receptor proteins for cholesterol. How would those proteins be oriented in the following membranes before they reach the plasma membrane?

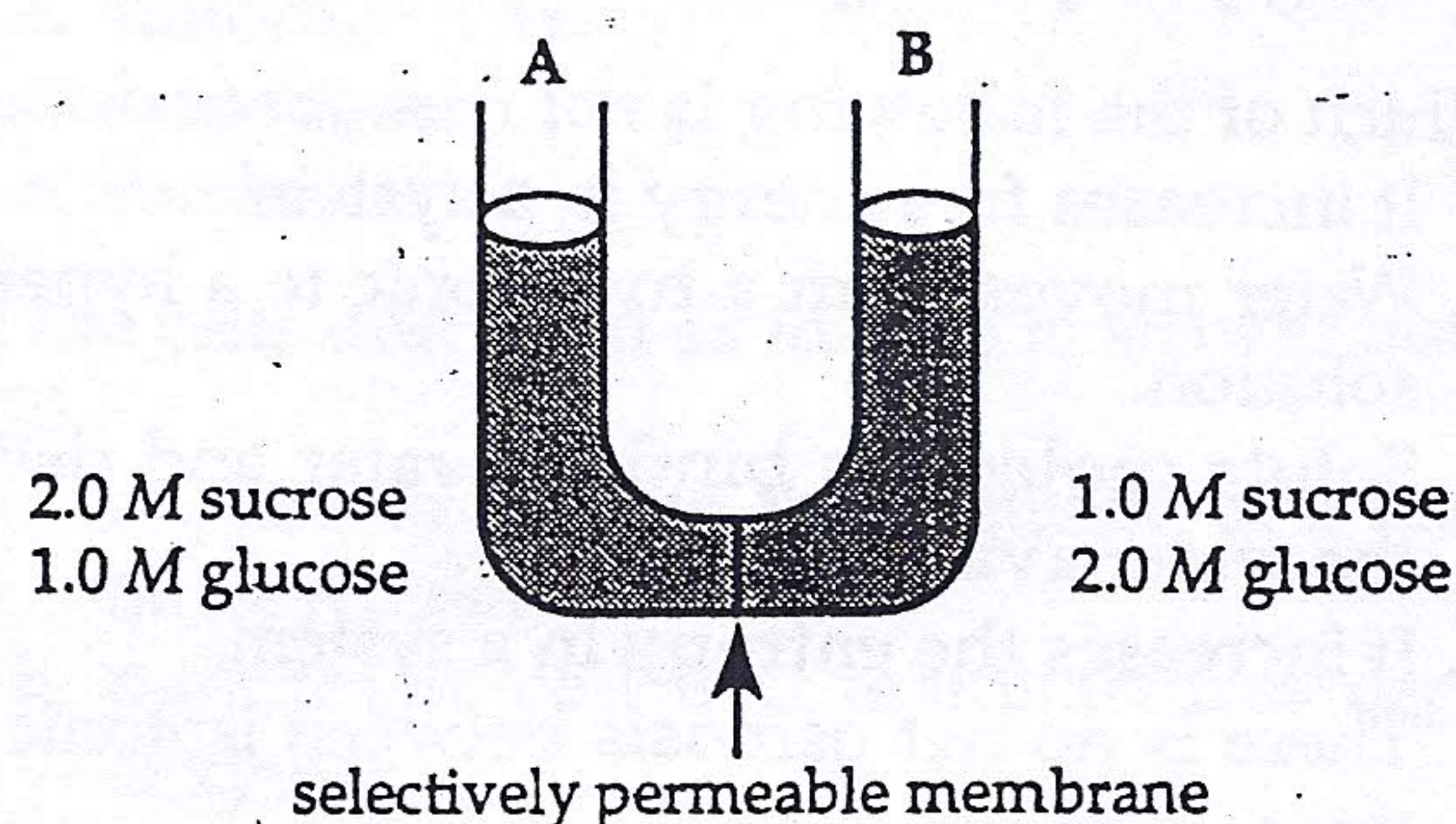
- a. facing inside the ER lumen but outside the transport vesicle membrane

- b. facing inside the ER lumen and inside the transport vesicle
- c. attached outside the ER and outside the transport vesicle
- d. attached outside the ER but facing inside the transport vesicle
- e. completely embedded in the hydrophobic center of both the ER and transport vesicle membranes

17. Which of the following is the most probable description of an integral, transmembrane protein?

- a. amphipathic with a hydrophilic head and a hydrophobic tail region
- b. a globular protein with hydrophobic amino acids in the interior and hydrophilic amino acids arranged around the outside
- c. a fibrous protein coated with hydrophobic sugar residues
- d. a glycoprotein with oligosaccharides attached to the portion of the protein facing the exterior of the cell and cytoskeletal elements facing inside the cell
- e. a middle region composed of α -helical stretches of hydrophobic amino acids, with hydrophilic regions at both ends of the protein

Use the U-tube setup to answer questions 18 through 20.



The solutions in the two arms of this U-tube are separated by a membrane that is permeable to water and glucose but not to sucrose. Side A is filled with a solution of 2.0 M sucrose and 1.0 M glucose. Side B is filled with 1.0 M sucrose and 2.0 M glucose.

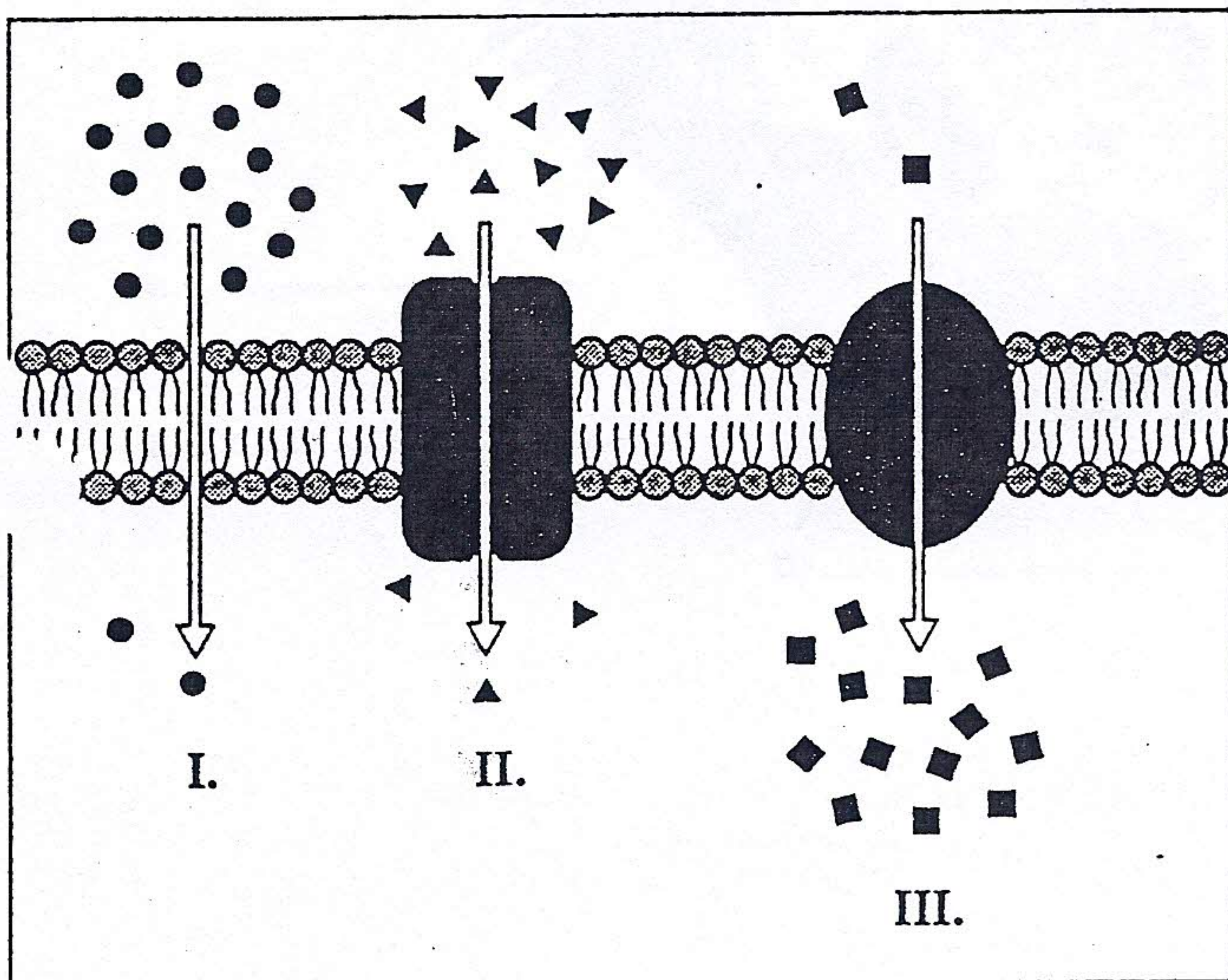
18. *Initially*, the solution in side A, with respect to that in side B, is

- a. hypotonic.
- b. hypertonic.
- c. isotonic.
- d. lower.
- e. higher.

19. After the system reaches equilibrium, what changes are observed?
- The water level is higher in side A than in side B.
 - The water level is higher in side B than in side A.
 - The molarity of glucose is higher in side A than in side B.
 - The molarity of sucrose has increased in side A.
 - Both a and c have occurred.

20. During the period *before* equilibrium is reached, which molecule(s) will show net movement through the membrane?
- water
 - glucose
 - sucrose
 - water and sucrose
 - water and glucose

The following diagram illustrates passive and active transport across a plasma membrane. Use it to answer questions a–d.



- a. Which section represents facilitated diffusion?

How can you tell?

Does the cell expend energy in this transport?

Why or why not?

What types of solute molecules may be moved by this type of transport?

- b. Which section shows active transport?

How can you tell?

Does the cell expend energy in this transport?

Why or why not?

- c. Which section shows diffusion?

What types of solute molecules may be moved by this type of transport?

- d. Which of these sections are considered passive transport?