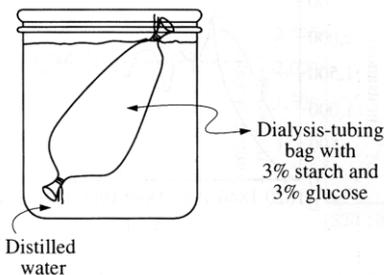


Cell Review: Key

B. Sample Multiple Choice Questions

1. Which is a characteristic of mitochondria and chloroplasts that supports the endosymbiotic theory?
 - A. Both have bacteria-like polysaccharide cell walls
 - B. Both can reproduce on their own outside the cell
 - C. Both contain DNA molecules**
 - D. Both contain endoplasmic reticulum and Golgi bodies
 - E. Both contain ribosome that are identical to ribosomes of the eukaryotic cytoplasm
2. The organelle that is the major producer of ATP and is found in both heterotrophs and autotrophs is the
 - A. chloroplast
 - B. nucleus
 - C. ribosome
 - D. Golgi apparatus
 - E. mitochondrion**
3. If plant cells are immersed in distilled water, the resulting movement of water into the cells is called
 - A. conduction
 - B. active transport
 - C. transpiration
 - D. osmosis**
 - E. facilitated diffusion
4. Which of the following is the primary role of the lysosome
 - A. ATP synthesis
 - B. intracellular digestion**
 - C. lipid transport
 - D. carbohydrate storage
 - E. protein synthesis

Questions 5-7: The following questions refer to an experiment in which a dialysis-tubing bag is filled with a mixture of 3% starch and 3% glucose and placed in a beaker of distilled water, as shown at right. After 3 hours, glucose can be detected in the water outside the dialysis-tubing bag, but starch cannot.



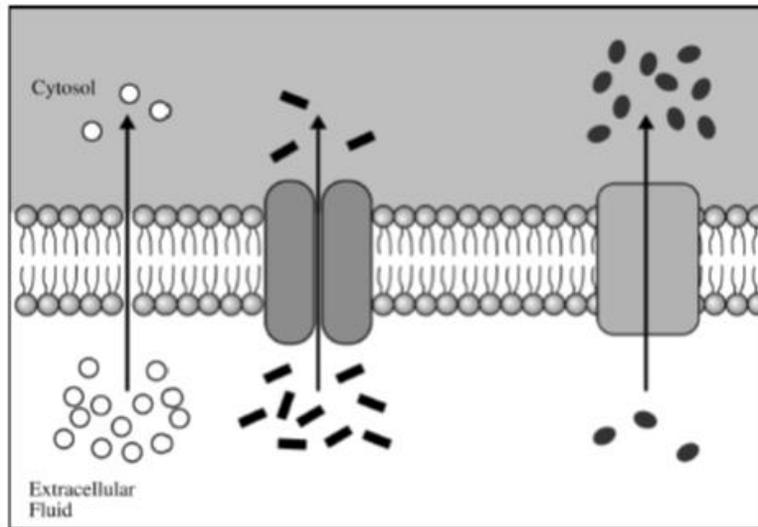
5. From the initial conditions and results described which of the following is a logical conclusion?
 - A. The initial concentration of glucose in the bag is higher than the initial concentration of starch in the bag.
 - B. The pores of the bag are larger than the glucose molecules but smaller than the starch molecules.**
 - C. The bag is not selectively permeable.
 - D. A net movement of water into the beaker has occurred.
 - E. The molarity of the solution in the bag and the molarity of the solution in the surrounding beaker are the same.
6. Which of the following best describes the conditions expected after 24 hours?
 - A. The bag will contain more water than it did in the original condition.
 - B. The contents of the bag will have the same osmotic concentration as the surrounding solution.
 - C. Water potential in the bag will be greater than water potential in the surrounding solution.**
 - D. Starch molecules will continue to pass through the bag.
 - E. A glucose test on the solution in the bag will be negative.

7. If, instead of the bag, a potato slice were placed in the beaker of distilled water, which of the following would be true of the potato slice?

- A. It would gain mass.
- B. It would neither gain nor lose mass.
- C. It would absorb solutes from the surrounding liquid.
- D. It would lose water until water potential inside the cells is equal to zero.
- E. The cells of the potato would increase their metabolic activity.

8. Mitochondria are found in most eukaryotic cells and contain their own DNA and ribosomes that are similar to those typical of many prokaryotic cells. Which of the following statements is justified by these observations?

- A. The mitochondrion is the only location in which eukaryotic cells can synthesize ATP.
- B. An ancestral cell most likely engulfed an aerobic prokaryote in a relationship that proved beneficial to both cells.
- C. Mitochondrial membranes provide abundant surface area for reactions because of the infoldings called cristae.
- D. The mitochondrion plays a role in respiration, but also stores the cell's extra mRNA.



9. Which of the following scientific questions is most relevant to the model represented in the figure above.

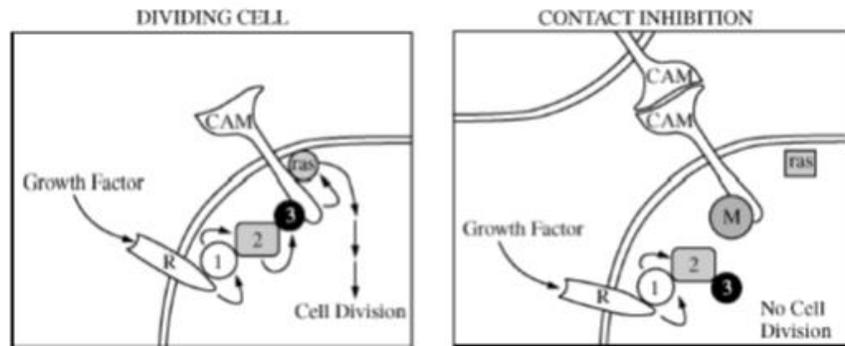
- A. Is ATP required for the transportation of sugars across the outer mitochondrial membrane?
- B. Do the types of phospholipids in a membrane affect the rate at which molecules enter the cell by passive diffusion?
- C. Which molecular substance is actively transported across the plasma membrane.
- D. How does temperature affect the movement of molecules into lysosomes.

10. A cell is treated with a drug that prevents the formation of new lysosomes. The cell continues to transcribe the genes that code for the hydrolytic enzymes normally found in the lysosomes and continues to translate mRNAs for those proteins on membrane bound ribosomes.

The hydrolytic enzymes are most likely to accumulate in which of the following cellular structures?

- A. Nucleus
- B. Mitochondria
- C. Smooth endoplasmic reticulum
- D. Golgi complex

11. Many human cells can be stimulated to divide by hormone like growth factors that bind to receptor proteins (R) on the plasma membrane and trigger an internal signal transduction cascade. In many cases, however, the process of contact inhibition prevents mitosis when cells are in direct contact with one another. Contact inhibition occurs when proteins called cell adhesion molecules (CAMs) interact, causing them to change shape so that the growth-factor signaling proteins that normally associate with CAMs are replaced by another protein, called M. Both pathways are depicted in the figures below.



Which of the following statements accurately uses the information presented to support the hypothesis that interruption of M function in a single body cell can result in cancer?

- A. Protein 3 will be prevented from interacting with CAMs, causing the cell cycle to stop permanently.
- B. The raw protein will remain bound to DNA, blocking expression of genes required for mitosis.
- C. Growth factor signaling can trigger mitosis in cells that are in direct contact with other cells.
- D. The receptor proteins of body cells will no longer bind to growth-factor proteins.

C. Sample Free Response Questions

1. Membranes are essential components of all cells.

a. Identify THREE macromolecules that are components of the plasma membrane in a eukaryotic cell and discuss the structure and function of each.

Phospholipids – saturated and unsaturated tails: describe the reasons for the phospholipid bilayer

Cholesterol – a type of lipid, embedded in the membrane of animals, maintain fluidity of membrane at extreme temperatures

Proteins – list the various functions of membrane proteins (enzymes, receptors, channel proteins, pumps) and explain how the proteins can stay in the phospholipid bilayer (relate to the characteristics of amino acids (polar / nonpolar))

b. Explain how membranes participate in THREE of the following biological processes.

- o muscle contraction **old curriculum**
- o fertilization of an egg **old curriculum**
- o chemiosmotic production of ATP
 - o in both c.respiration and photosynthesis H^+ ions are pumped to a location (inside membranes) in the chloroplast or mitochondria to create a concentration gradient. The ions cannot simple diffusion through the membrane because it is a charged particle. The ions can only diffuse through ATP synthase.
- o intercellular signaling
 - o hormones (water soluble) will bind to receptors in the cell membrane of the target cell. This will trigger a signal transduction pathway

2. A major distinction between prokaryotes and eukaryotes is the presence of membrane- bound organelles in eukaryotes.

a. Describe the structure and function of TWO eukaryotic membrane-bound organelles other than the nucleus.

b. Prokaryotic and eukaryotic cells have some non-membrane-bound components in common. Describe the function of TWO of the following and discuss how each differs in prokaryotes and eukaryotes.

- o DNA **eukaryotes – packs into chromatin and chromosomes**
- o cell wall **plant cell walls = cellulose bacteria cell walls = proteins and lipids**
- o ribosomes

c. Explain the endosymbiotic theory of the origin of eukaryotic cell and discuss an example of evidence supporting this theory

3. The following experiment was designed to test whether different concentration gradients affect the rate of diffusion. In this experiment, four solutions (0% NaCl, 1% NaCl, 5% NaCl, and 10% NaCl) were tested under identical conditions. Fifteen milliliters (mL) of 0% NaCl were put into a bag formed of dialysis tubing that is permeable to Na^+ , Cl^- , and water. The same was done for each NaCl solution. Each bag was submerged in a separate beaker containing 300 mL of distilled water. The concentration of NaCl in mg/L in the water outside the bag was measured at 40-second intervals. The results from the 5% bag are shown in the table below.

CONCENTRATION IN mg/L OF NaCl OUTSIDE THE 5% NaCl BAG	
Time (seconds)	NaCl (mg/L)
0	0
40	130
80	220
120	320
160	400

- On the axes provided, graph the data for the 5% NaCl solution
- Using the same set of axes, draw and label three additional lines representing the results that you would predict for the 0% NaCl, 1% NaCl, and 10% NaCl solutions. explain your predictions.
- Farmlands located near coastal regions are being threatened by encroaching seawater seeping into the soil. In terms of water movement into or out of plant cells, explain why seawater could decrease crop production. Include a discussion of water potential in your answer.
Salt water is a hypertonic solution. This solution will cause water to leave the cells of the plant's roots. Don't worry about describing water potential – that is part of the old curriculum.

