

Exam 2 Practice Problems

Cell Structure and Function Practice Questions

- One of the relationships that exists between ribosomes and lysosomes is that
 - ribosomes produce enzymes that could be stored in lysosomes.
 - ribosomes produce lipids that could be stored in lysosomes.
 - lysosomes are located near ribosomes on the surface of the endoplasmic reticulum.
 - lysosomes are produced by ribosomes and therefore contain proteins that were synthesized at the ribosomes.
- Alcohol consumption adversely affects the digestion of proteins within liver cells, which can eventually lead to liver damage. Given this information, which organelle in liver cells is most directly affected?
 - nucleus
 - Golgi apparatus
 - rough ER
 - lysosome
- Small cells function more effectively, because as cells become larger their surface area to volume ratio
 - increases.
 - decreases.
 - stays the same.
 - is squared.
 - is cubed.
- The eukaryotic organelle that is modifies proteins that have been synthesized in the rough ER is called
 - mitochondria.
 - vacuole.
 - cytoskeleton.
 - Golgi apparatus
 - nucleus.
- In eukaryotes, mitochondria are the organelles primarily involved in
 - the production of ATP
 - phospholipid assembly.
 - export of enzymes.
 - lipid synthesis.
 - protein synthesis.
- Chromosomes can be condensed into compact structures, visible with the light microscope, but usually only
 - after the cell is dead.
 - during cell division.
 - while the DNA is being copied into RNA.
 - while the proteins are being assembled.
 - while the nuclear pores are open.
- A cell biologist treats a cell so that oxygen cannot diffuse across the membrane. Which organelle will be directly affected?
 - mitochondria
 - lysosome
 - nucleus
 - ribosome
 - Golgi apparatus

8.) Plant cells

- A) lack mitochondria and chloroplasts.
- B) have mitochondria and chloroplasts.
- C) have mitochondria but do not have chloroplasts.
- D) lack mitochondria but have chloroplasts.

Tay-Sachs disease

The following 8 Practice questions give you the opportunity to apply what you have learned about the 4 classes of biomolecules (carbohydrates, lipids, proteins, and nucleic acids), cell organelles, and Gaucher's disease to another genetic disease that we have not studied, Tay-Sachs disease. But since all genetic diseases involve many of the same principles, cell organelles, and biomolecules that you have studied so far, you should be able to apply that knowledge to this and many other genetic diseases. The true test of comprehension and understanding is the application of those concepts to new and unfamiliar situations.

Tay-Sachs disease is an inherited disorder in humans that affects one in 3600 births in Askenazic Jews, about 100 times greater than the incidence in non-Jews. As in Gaucher's disease, affected individuals have a single faulty enzyme. The defective enzyme, gangliosidase, is found in the brain cells of Tay-Sachs patients. As a consequence, the brain cells of an affected baby are unable to breakdown gangliosides, a type of lipid. This causes gangliosides to build up causing a gradual decrease in brain cell function that ultimately results in death within a few years. Symptoms are seen within a few months of birth and include seizures, blindness, and degeneration of motor and mental performance. There is no known cure.

1. Why do Tay-Sachs patients have the defective enzyme, gangliosidase? Be as specific as you can in answering this question.
 2. Name the cell organelle in which you would expect gangliosides to be broken down in normal brain cells. Explain your reasoning.
 3. Name the cell organelle that you would expect to make gangliosides. Explain your reasoning.
 4. Explain why gangliosidase is unable to break down gangliosides.
 5. Would you expect all brain cells that are capable of making gangliosidase to have the faulty enzyme? Explain your reasoning.
 6. Where would you expect the gangliosides to accumulate within the brain cells of babies affected by Tay-Sachs? Explain your reasoning.
 7. Explain why enzyme therapy is not successful in treating Tay-Sachs disease. Hint: Think about where you need to get the enzyme.
 8. Explain why gene therapy is not successful in treating Tay-Sachs disease. Hint: Think about where you need to get the enzyme.
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9. Suppose that you are a biologist out for a stroll at Dash Point State Park on the Puget Sound and notice many fish have washed up dead on the beach. Upon examination you find small red lesions in their skin. You examine the lesions under a microscope and find a single celled organism that has a cell wall, green organelles and a nucleus, but no mitochondria.
 - a. Is this organism eukaryotic or prokaryotic? Explain your reasoning.
 - b. Which domains does this organism not belong to? Explain your reasoning.
 - c. To which biological domain does this organism belong? If the organism belongs to domain Eukarya, which kingdom does it belong to? Explain your reasoning.

10. a. Like the cutting of hair, when you trim your nails, you are removing dead cells that have accumulated to a huge amount one of the four classes of large biological molecules. Which one is it? Explain your reasoning.
- b. When you trim your nails, you are removing dead cells that have accumulated to a huge amount one of the cell organelles involved in giving shape and support to the cell. Which one is it? Explain your reasoning.
- c. Which cell organelle is responsible for building this class of large biological molecules referred to in part a, above?
- d. Which class of large biological molecules determines if a cell will be capable of making this class of large biological molecules referred to in part a, above?
- e. Almost all cells in the human body contain the exact same quantity and kind of molecules referred to in part d, above. Why then don't all cells in the body produce nails?
11. Beginning with the atom, list the hierarchy of organization of life of a Multicellular organism. Show your understanding of each level with a brief explanation.

Biological Molecules Practice Questions

1. A general principle of large biological molecules is that monomers join to make polymers. On separate paper, make a table similar to that below, and list the four large groups of biological molecules, tell what the monomers are called, and list the major functions. Note: Lipids is one of polymers, but isn't really made of monomers. But you can still list the major molecules that make up lipids.

Polymer Name	Monomer(s) Name(s)	Specific Examples and their Functions
Lipids		

2. Migratory birds expend vast amounts of energy during migration. Which type of biological molecule would be most suitable for energy storage? Explain.

Estimating the size of an object viewed under the microscope.

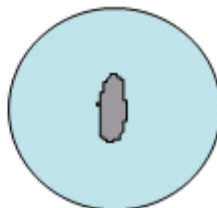
Problem 1

- Calculate the length and width of the following microscopic object in both millimeters and micrometers. **1 mm = 1000 μ m**
- Base your calculations on the following field sizes:

Low power (40x): 4.5 mm

Medium power (100x): 1.8 mm

High power (400x): 0.45 mm



Object viewed at medium power (100x)

Remember: Field size decreases by the same factor as the magnification increases!

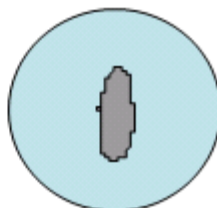
Problem 2

- Calculate the length and width of the following microscopic object in both millimeters and micrometers. **1 mm = 1000 μ m**
- Base your calculations on the following *hypothetical* field sizes:

Low power (30x): 4.0 mm = ___ μ m

Medium power (180x): ___ mm = ___ μ m

High power (300x): ___ mm = ___ μ m



Object viewed at high power (300x)

Diffusion, Osmosis and Active Transport Practice Questions

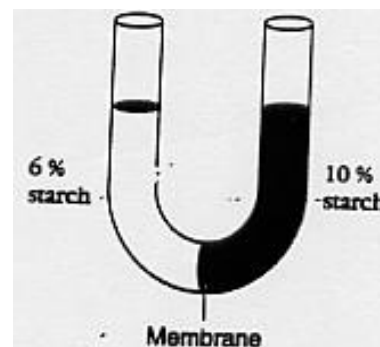
Multiple Choice Questions

1. Water-loving molecules such as glucose are:
A. hydrophobic
B. hydrophilic
C. insoluble in water
2. The model of a cell membrane containing a bilayer of phospholipid molecules with interspersed protein molecules is the:
A. fluid mosaic model
B. induced fit model
C. lock and key model

3. The cell membrane is differentially permeable. This means that:
 - A. all molecules pass through the membrane at the same rate
 - B. some molecules may pass through but not others
 - C. only glucose passes through easily
4. The transport of mineral ions from soil to plant root requires energy-rich ATP. This is an example of:
 - A. passive transport
 - B. osmosis
 - C. active transport
5. Diffusion is the movement of substances from:
 - A. high to low concentrations
 - B. low to high concentrations
 - C. equal areas
6. The diffusion of water is called:
 - A. hydrophobic
 - B. osmosis
 - C. concentration gradient
7. When a microscopic protozoan takes in a particle of food into itself, the process used is:
 - A. endocytosis
 - B. exocytosis
 - C. osmosis
8. When milk is secreted by mammary glands, the process used is:
 - A. endocytosis
 - B. osmosis
 - C. exocytosis
9. White blood cells engulfing foreign bacteria is an example of:
 - A. phagocytosis
 - B. exocytosis
 - C. diffusion
10. Which of the following correctly describes the process of osmosis?
 - A. The passive movement of water molecules from areas of low solute concentration to high solute concentration, through a selectively permeable membrane.
 - B. The passive movement of water molecules from areas of high solute concentration to low solute concentration, through a selectively permeable membrane.
 - C. The active movement of water molecules from areas of high solute concentration to low solute concentration, using a membrane pump protein.
 - D. The passive movement of water molecules from areas of low solute concentration to high solute concentration, through a channel protein.
11. Inside one osmosis bag, A, is a 50% glucose solution and side bag B is a 20% glucose solution. Both bags are put into beakers containing 100% water.
 - A) Bag A will gain weight.
 - B) Bag B will gain weight.
 - C) Both bags will gain weight.
 - D) Both bags will lose weight.
 - E) Both bags will remain the same.

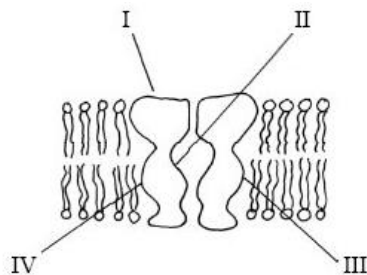
12. A 0.9% NaCl solution is isotonic to red blood cells. Which of these describes the results if red blood cells are placed into a 9% solution of NaCl?
- A) They will burst.
 - B) They will shrink.
 - C) There will be no net change.
 - D) They will expand but not burst.
 - E) None of the above.

13. The U-shaped tube in the figure below is divided by a membrane that is impermeable to starch but permeable to water. Which of the following will occur?
- A) Water will move from the right to the left.
 - B) Water will move from the left to the right.
 - C) Starch will move from the right to the left.
 - D) Starch will move from the left to the right.
 - E) Nothing will happen. The membrane blocks the passage of all the molecules.



14. Red blood cells has a salt concentration of 0.9%. What will happen if it is placed into a 0.5% salt solution? The red blood cell will
- A) shrink if its membrane is permeable to both the salt and the water.
 - B) shrink if its membrane is impermeable to the salt and permeable to the water.
 - C) maintain its shape, ie nothing will happen.
 - D) swell and probably burst because its membrane is impermeable to salt and permeable to water.
 - E) swell and probably burst because its membrane is impermeable to water and permeable to salt.
15. The movement of materials through a transport protein without the use of energy is termed:
- A. active transport
 - B. diffusion
 - C. osmosis
 - D. endocytosis
 - E. facilitated diffusion
16. If the concentration of solutes outside a cell is equal to the concentration of solutes inside the cell, then the cell is _____ when compared to its surroundings?
- a.) hypertonic b.) isotonic c.) hypotonic d.) endocytic
17. The diffusion of water across a semipermeable membrane is:
- a. active transport of water b. osmosis c. exocytosis d. Endocytosis
18. The energy responsible for active transport is associated with which of the following?
- a. ATP b. ADP c. AMP d. kinetic energy of the diffusing particles
19. Which of the following is not true of an plasmolyzed plant cell when placed into distilled water?
- a. the cell is hypertonic to the water
 - b. the water is hypotonic to the cell
 - c. the cell will gain water
 - d. the cell will lose water

20. Red blood cells will lyse (burst) if they are in ____ solution.
a. isotonic b. hypertonic c. hypotonic
21. Active transport moves materials from ____ to ____ concentration and requires an input of ____:
a. low to high, water b. low to high, energy c. high to low, water d. high to low, energy
22. If a cell has a 10% solute concentration. What occurs to the cell in a 0% solute fluid?
a. the cell neither gains nor loses water
b. the cell will lose water
c. the cell will gain water.
d. none are correct
23. A substance moving through the membrane by facilitated diffusion moves through what part of the membrane?
a. phospholipid bilayer b. cytoskeleton c. transport protein d. Na/K pump portion
24. The diagram below shows a channel protein in a plasma membrane. Channel proteins allow polar molecules to pass through by facilitated diffusion. Which labeled parts of the channel proteins are likely to be polar?



- A. I and II only
B. III and IV only
C. I and III only
D. All parts