Name _____ **Period** _____

AP Biology **Date** _____

REVIEW 2: CELLS & CELL DIVISION UNIT

A. Top "10" — If you learned anything from this unit, you should have learned:

1. Prokaryotes vs. eukaryotes
    - No internal membranes vs. membrane-bound organelles
2. Cell structures & the functions they perform
    a. Controlling internal environment
        - cell membrane, membrane proteins & cell receptors
        - movement across membrane: diffusion, facilitated diffusion, osmosis, active transport
        - hypertonic, hypotonic, isotonic solutions
    b. Protein production
        - nucleus & DNA
        - ribosomes
        - ER & vesicles
        - Golgi apparatus & vesicles
    c. Energy production
        - mitochondria, chloroplasts
    d. Cell reproduction
        - nucleus & DNA
        - centrioles & spindle fibers
    e. Digestion
        - lysosomes & vesicle, vacuoles
    f. Cell connections
        - connecting junctions: plasmodesmata & gap junctions
        - barrier junctions: tight junctions, desmosomes
3. Cell division
    a. Cell cycle
        - interphase; mitosis: prophase, metaphase, anaphase, telophase; cytokinesis
        - G0, G1, S, G2
    b. Produces genetically identical clones
    c. Replication
        - DNA polymerase (I & III), leading strand, lagging strand, helicase, single-stranded binding proteins, ligase, primase, RNA primer, Okazaki fragments, telomeres

d. Regulation
   - G1/S & G2/M checkpoints, cdKs, cyclins, growth factors
   - cancers are caused by loss of cell cycle control
   - p53, proto-oncogenes, tumor suppressor genes

B. Labs

1. Diffusion & Osmosis

   Be sure to review the procedures and the conclusions, and understand:

   a. Factors that affect movement of water across a membrane

   b. How water & solutes will move across a membrane under different osmotic conditions

   c. How to measure osmotic concentration of an unknown tissue or solution using solutions of known concentrations

2. Cell Division

   Be sure to review the procedures and the conclusions, and understand:

   a. Replication

   b. How chromosomes are distributed during mitosis

   c. The products of mitosis

C. Sample Multiple Choice Questions

1. The nucleolus functions in the production of (1994:12)

   A. Golgi apparatus

   B. microtubules

   C. mitochondria

   D. ribosomes

   E. endoplasmic reticulum

2. Which is a characteristic of mitochondria and chloroplasts that supports the endosymbiotic theory (1994:10)

   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

3. All of the following cell components are found in prokaryotic cells EXCEPT (1990:17)
   A. DNA
   B. ribosomes
   C. cell membrane
   D. nuclear envelope
   E. enzymes

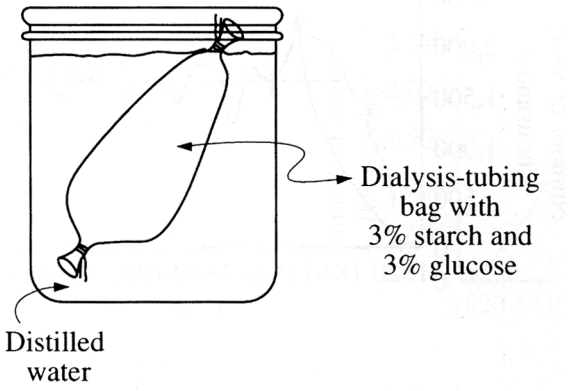
4. The organelle that is the major producer of ATP and is found in both heterotrophs and autotrophs is the (1990:7)
   A. chloroplast
   B. nucleus
   C. ribosome
   D. Golgi apparatus
   E. mitochondrion

5. If plant cells are immersed in distilled water, the resulting movement of water into the cells is called (1990:34)
   A. conduction
   B. active transport
   C. transpiration
   D. osmosis
   E. facilitated diffusion

6. Which of the following is the primary role of the lysosome (1990:46)
   A. ATP synthesis
   B. intracellular digestion
   C. lipid transport
   D. carbohydrate storage
   E. protein synthesis

7. Cytoplasmic channels between plant cells which are most similar to gap junctions between animal cells are called (1990:64)
   A. middle lamellas
   B. tonoplasts
   C. plasmodesmata
   D. tight junctions
   E. desmosomes

Questions 114–116. 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. *(99:114.116)*



8. From the initial conditions and results described which of the following is a logical conclusion? *(99:114)*
   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.

9. Which of the following best describes the conditions expected after 24 hours? *(99:115)*
   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.

10. 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? *(99:116)*
    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.

D. Sample Free Response Questions

1. 2002:4

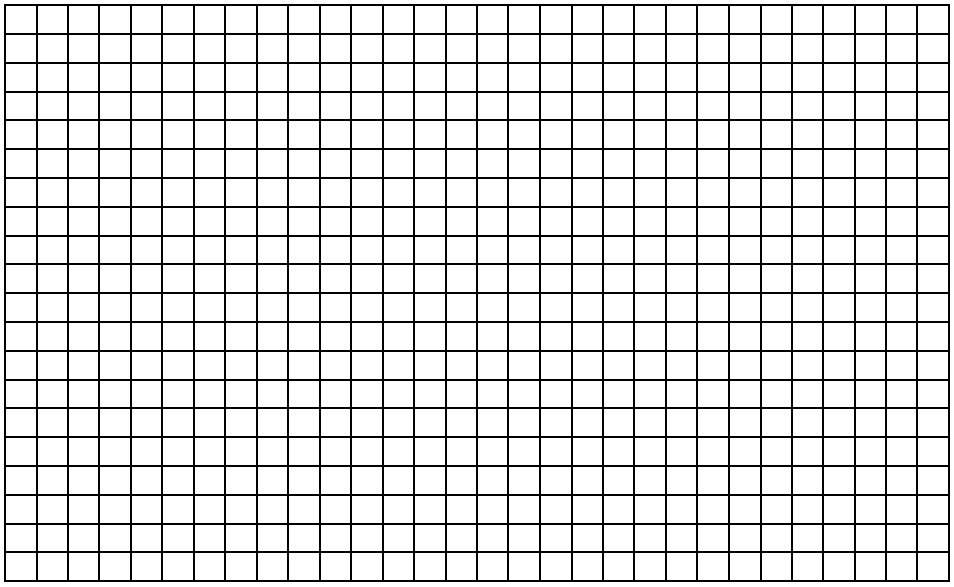
The following experiment was designed to test whether different concentration gradients affect the rate of diffusion. In this experiment, four solutions (0% NaCl, 1% NaCl, 5% NaCl, and 10% NaCl) were tested under identical conditions. Fifteen milliliters (mL) of 0% NaCl were put into a bag formed of 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

a. On the axes provided, graph the data for the 5% NaCl solution

b. 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.

c. 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.



2. 2004B:1

   Prokaryotes are found throughout the biosphere. Answer <u>two</u> of the following.

   a. Provide three examples of adaptations found in various prokaryotes. Explain how these three adaptations have ensured the success of prokaryotes.

   b. Discuss how prokaryotes early in Earth's history altered environments on Earth.

   c. Discuss three ways in which prokaryotes continue to have an ecological impact today.

3. 2007:1

   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.

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

      - muscle contraction
      - fertilization of an egg
      - chemiosmotic production of ATP
      - intercellular signaling

4. 2006:1

   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.

      - DNA
      - cell wall
      - ribosomes

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