BIOLOGY – UNIT 3 ENERGY STUDY GUIDE

CELLULAR RESPIRATION AND PHOTOSYNTHESIS

Bio.4.2.1 *Analyze photosynthesis and cellular respiration in terms of how energy is stored, released, and transferred within and between these systems.*

1. What are the reactants for cellular respiration?
2. What are the products of cellular respiration?
3. Write the equation, using both words and symbols, summarizing cellular respiration.
4. What gas do organisms require for cellular respiration?
5. What gas do organisms produce when they do cellular respiration?
6. In what organelle does cellular respiration occur?
7. What is the energy produced by cellular respiration and what type of macromolecule is it?
8. Compare and contrast cellular respiration and fermentation (anaerobic respiration):

	Cellular Respiration	**Lactic Acid Fermentation**	**Alcohol Fermentation**
What are the reactants?			
What are the products?			
How much ATP is produced?			
What is the 1st step, what is produced and where does it occur?			
What is the 2nd step, what is produced and where does it occur?			
What is the 3rd step, what is produced and where does it occur?			
In what organisms do the reactions occur?			

9. All of the reactions that occur during cellular respiration are catalyzed by enzymes. Using what you know about enzymes, predict how each of the following could affect the rate of cellular respiration?
   a. pH
   b. Temperature

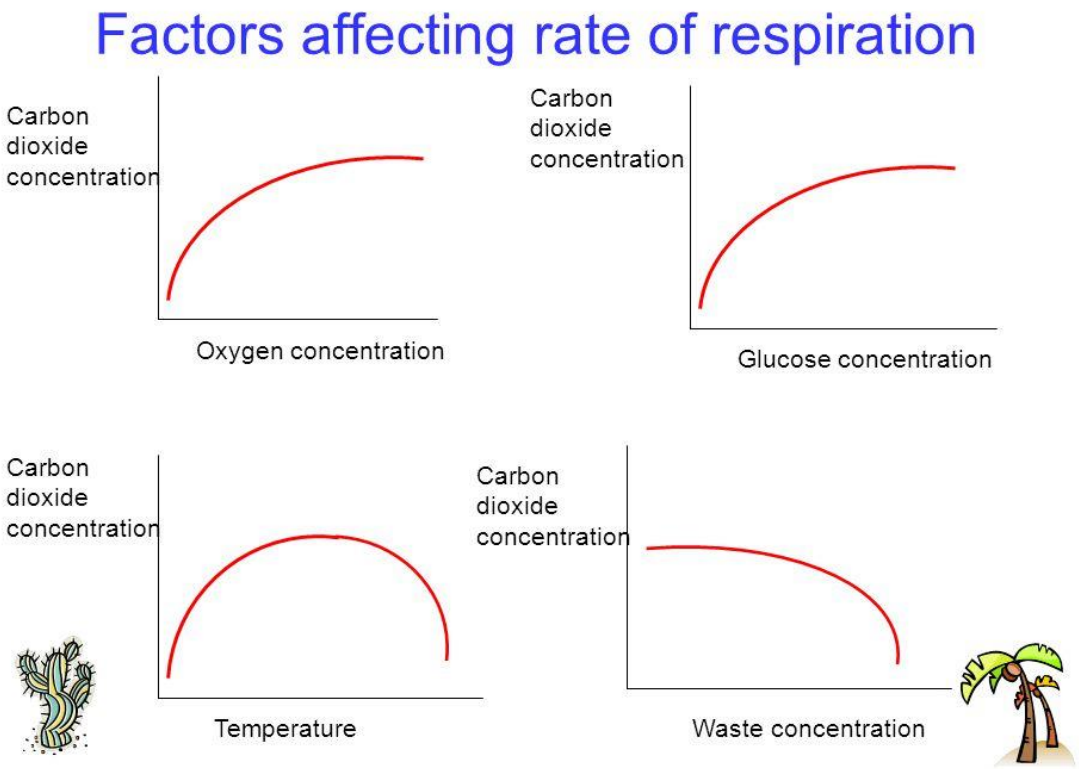
10. The graphs below summarize an experiment done to measure the effects of oxygen concentration, glucose concentration, temperature and waste concentration (CO_2) on respiration. Carbon dioxide concentration was used to measure the rate of respiration – the higher the CO_2 concentration, the higher the rate of respiration.
    Use the graphs to answer the following questions:
    a. What is the dependent variable in the experiment?

    b. Explain the effects of oxygen concentration on the rate of respiration.

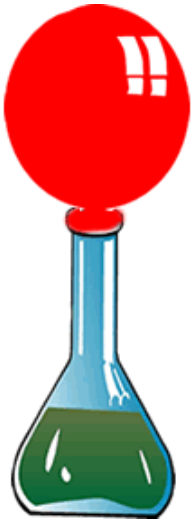
    c. Explain the effects of glucose concentration on the rate of respiration.

    d. Explain the effects of temperature on the rate of respiration.

    e. Why do you think the rate of respiration decreased as the concentration of waste products increased?



11. At the right is a picture of an experiment in a flask containing a yeast solution that is securely covered by a balloon. The yeast solution in the flask contains yeast and sugar dissolved in warm water. What process is happening that is causing the balloon to expand? What gas is inside the balloon?



12. What are the reactants for photosynthesis?

13. What are the products of photosynthesis?

14. Write the equation, using both words and symbols, summarizing photosynthesis.

15. What gas do organisms require for photosynthesis?

16. What gas do organisms produce when they do photosynthesis?

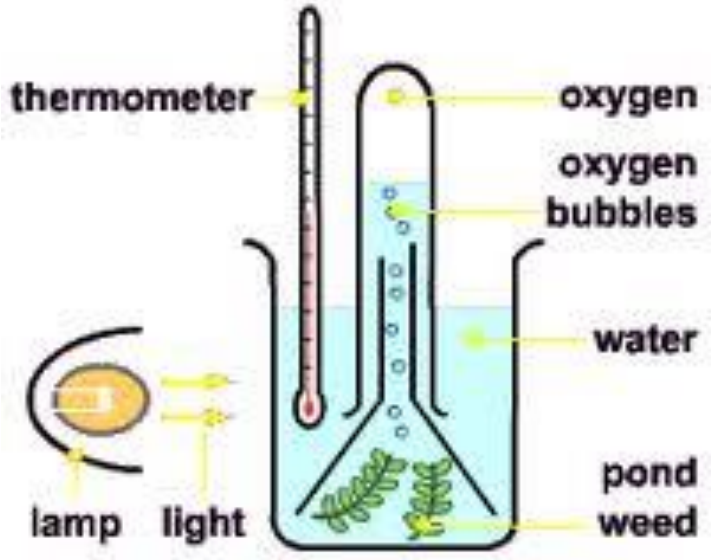
17. In what organelle does photosynthesis occur?

18. Summarize the steps in photosynthesis:

	Light-dependent Reaction	**Calvin Cycle**
What are the reactants?		
What are the products?		
How much ATP is produced?		
Where does it occur?		

19. How do the light absorbing pigments, Chlorophyll a and Chlorophyll b, contribute to the green color of plants?

20. What is happening in the image at the right? List 3 things you see that indicate what is happening.



ENERGY AND HOMEOSTASIS

Bio.4.2.2 *Explain ways that organisms use released energy to maintain homeostasis.*

21. What is homeostasis?

22. Complete the table below describing how each process helps maintain homeostasis in the organism and whether or not it requires energy.

	How it helps to maintain homeostasis	**ATP required?**
Passive Transport		
Osmosis		
Active Transport		
Diffusion		
Exocytosis		
Endocytosis		
Synthesis of lipids & proteins		
Movement		

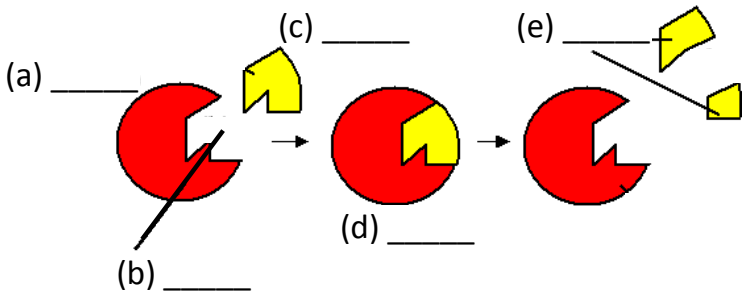
ENZYMES

Bio.4.1.3 *Explain how enzymes act as catalysts for biological reactions.*

23. In an enzyme-catalyzed reaction with substrate and an enzyme, explain which is used up and which is reusable.

24. Label the image using these terms:

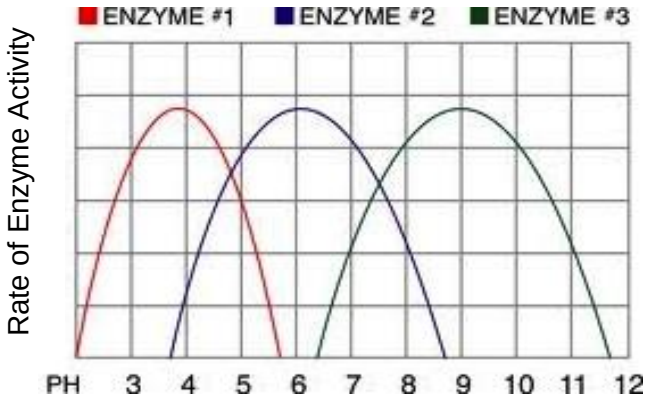
    Enzyme
    Substrate
    Active Site
    Products
    Enzyme-Substrate Complex



Lock & Key Hypothesis

25. What are the 6 properties of enzymes?

26. Based on the graph, what is the optimum pH for enzyme 3 (on the right)? _____.
    Is this an acid or a base? _____



27. What determines the shape of an enzyme? Why is the shape of an enzyme important?

28. How do pH and temperature alter the activity of an enzyme? What is the term used to describe an enzyme that has been destroyed?

CARBOHYDRATES

Bio.4.1.1 *Compare the structures and functions of carbohydrates as related to the survival of living organsisms.*

29. Carbohydrates are assembled from smaller organic compounds. Complete the table below.

Organic Molecule	Monomers	Function	Polymers	Test for presence of molecule
Carbohydrates				

30. Match the molecule with its subunits and/or function.

____	Cellulose	A	An enzyme protein that digests lactose
____	Steroid	B	Long-term energy; bent lipid monomer
____	Glycogen	C	Structural support for plants; made of glucose
____	Enzymes	D	Short-term energy; product of photosynthesis
____	Triglyceride	E	Speed up chemical reactions; a protein
____	Glucose	F	Plant storage of energy; made of glucose
____	Lactase	G	Animal storage of energy; made of monosaccharides
____	Saturated Fatty Acid	H	Long-term energy; made of 3 fatty acids and glycerol
____	Starch	I	Backbone of triglycerides and phospholipids
____	Phospholipid	J	Long-term energy; straight lipid monomer
____	Unsaturated Fatty Acid	K	A lipid; includes Cholesterol and Vitamin D
____	Fructose	L	Contains a phosphate group; made of fatty acids
____	Glycerol	M	Short-term energy; a monosaccharide