

AP Biology Summer Assignment

Welcome to AP Biology!

I am very excited for the opportunity to advance your knowledge and understanding living organisms and how they interact. But before we can start learning the “good stuff”, you need to remember the chemistry that you previously learned. So the summer assignment is geared to refresh your memory and add a Biology “twist”. Summer work is very important and must be completed before school starts. This work is due the 2nd day of class and will be tested for on the 3rd day of class. Please do NOT procrastinate; you will NOT be able to complete this assignment in a couple of days.

1. Read Unit One: The Chemistry of Life (Chapters 2-5) in your textbook.
2. Complete the Multiple Choice HW Packet using your textbook.
2. Complete the diffusion lab attached.

Have a great summer!

Melody P Noah, MD

AP Biology
Unit 1 Homework Set (CH. 2 – 5)

Name: _____

Instructions: Read each question carefully before answering. Work at a steady pace, and you should have ample time to finish.

- ___ 1. The atomic number of neon is 10. Therefore, it
1. Has 8 electrons in the outer electrons shell.
 2. Is inert.
 3. Has an atomic mass of 10.
- a. 1
b. 2
c. Only 1 and 2 are correct
d. 1, 2, and 3 are correct

- ___ 2. An atomic form of an element containing different numbers of neutrons is
- a. An isotope.
 - b. An ion.
 - c. A polar atom
 - d. An isomer

Use the choices below to answer the questions #3 and #4.

1. Nonpolar covalent molecule
2. Polar covalent bond
3. Ionic bond
4. Hydrogen bond

- ___ 3. Results from a transfer of election(s) between atoms.
- a. 1
 - b. 2
 - c. 3
 - d. 4

- ___ 4. Results from an unequal sharing of elections between atoms.
- a. 1
 - b. 2
 - c. 3
 - d. 4

- ___ 5. How many electrons does carbon have in its outermost (valence) energy level?
- a. 4
 - b. 8
 - c. 7
 - d. 5

- ___ 6. A covalent bond is likely to be polar when
- a. One of the atoms sharing electrons is much more electronegative than the other.
 - b. The two atoms sharing electrons are equally electronegative.
 - c. The two atoms sharing electrons are of the same element.
 - d. It is between two atoms that are both very strong electron acceptors.

- ___ 7. What bonds are easily disrupted in aqueous solutions?
- a. Covalent
 - b. Polar covalent
 - c. Ionic
 - d. Hydrogen

Refer to Figure 2.2 to answer the following question(s).

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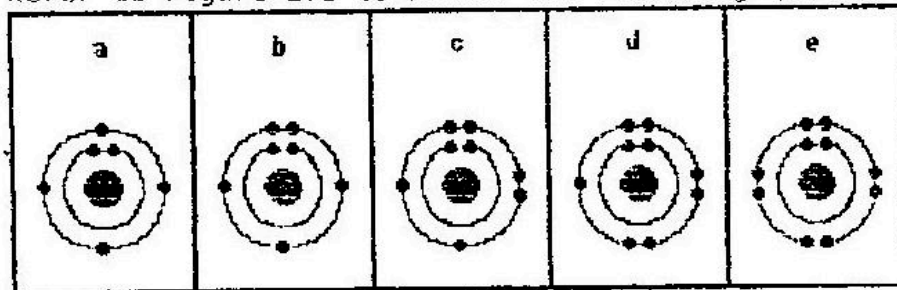
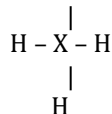


Figure 2.2

- ___ 8. Which of the drawings depicts the electron configuration of neon?
- ___ 9. Which of the drawings depicts the electron configuration of the carbon?
- ___ 10. Which four elements make up approximately 96% of living matter?
 a. Carbon, hydrogen, nitrogen, and oxygen
 b. Carbon, sulfur, phosphorus, and hydrogen
 c. Oxygen, hydrogen, calcium, sodium
 d. Carbon, sodium, chlorine, magnesium
- ___ 11. The combining properties of an atom depend on the number of
 a. Valence shells in the atom.
 b. Orbital found in the atom.
 c. Electrons in each orbital in the atom
 d. Electrons in the outer valence in the atom
- ___ 12. Atoms whose outer electron shells contain eight electrons tend to
 a. Form ionic bonds in aqueous solutions.
 b. Form covalent bonds in aqueous solutions.
 c. Be particularly stable and nonreactive
 d. Be particularly unstable and very reactive
- ___ 13. A covalent chemical bond is one in which
 a. Electrons are removed from one atom and transferred to another atom so that the two atoms become oppositely charged.
 b. Protons or neutrons are shared by two atoms so as to satisfy the requirements of both.
 c. outer shell electrons are shared by two atoms so as to satisfactorily fill the outer electron shells of both.
 d. Outer shell electrons on one atom are transferred to the inner electron shells of another atom.
- ___ 14. The partial negative charge at one end of a water molecule is attracted to the partial positive charge of another water molecule. What is this attraction called?
 a. A covalent bond
 b. A hydrogen bond
 c. An ionic bond
 d. A hydration shell
- ___ 15. If atom ${}_6X$ (atomic number 6) were allowed to react with hydrogen, the molecule formed would be
 a. $X - H$
 b. $H - X - H$
 c. $H - X - H$
 |
 H
 d. H



___ 16. Life on earth is dependent on all the properties of water as well as the abundance of water. Which property of water is probably most important for the functioning of organisms at the molecular level?

a. Cohesion and high surface tension c. Expansion upon freezing
b. High specific heat d. Versatility as a solvent

___ 17. What do the following have in common with reference to water: cohesion, surface tension, specific heat?

a. All are products of the structure of the hydrogen atom. c. All are properties related to hydrogen bonding
b. All are produced by covalent bonds. d. All have to do with polarity of water molecules

___ 18. Which of the following ionizes completely in solution and is therefore a strong acid?

a. NaOH c. HCl
b. H₂CO₃ d. NH₂

___ 19. It is correct to say that the action of buffers

a. Is of relatively little significance in living systems.
b. Tends to prevent great fluctuations in pH.
c. Depends on the formation of a great number of hydrogen ions.
d. Depends on the presence of many electron donors.

___ 20. A compound contains hydroxyl groups as its predominate functional group. Which of the following statements is true concerning this compound?

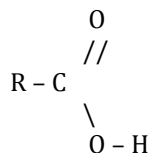
a. It is probably a lipid. c. It should dissolve in a non-polar solvent
b. It should dissolve in water. d. It is hydrophobic

___ 21. Glucose and fructose differ in

1. The number of carbon, hydrogen, and oxygen atoms
2. The types of carbon, hydrogen, and oxygen atoms.
3. The arrangement of carbon, hydrogen, and oxygen atoms.

a. 1 c. 3
b. 2 d. 1 and 2

___ 26. What is the name of the function groups below?



a. Carbonyl c. Carboxyl
b. Methyl d. Acetyl

___ 23. Which of the following contains nitrogen in addition to carbon, oxygen, and hydrogen?

a. Alcohol such as ethanol c. a compound such as glycerol
b. Amino acid such as glycine d. a steroid such as testosterone

Refer to the molecule shown in Figure 4.4 to answer next 3 questions.

OH H H H H H H H H H H H H H H H

- a. A saturated fatty acid
- b. An unsaturated fatty acid
- c. A polyunsaturated triglyceride
- d. Likely to be a common component of plant oils

___ 34. What is the structure shown in Figure 5.2?

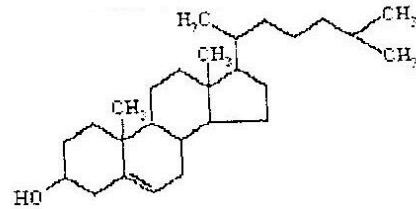
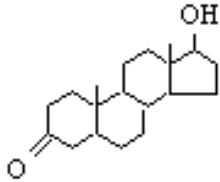


Figure 5.2

- a. A starch molecule
- b. A steroid
- c. A cellulose molecule
- d. A nucleic acid polymer

___ 35. Which of the following is true both of starch and of cellulose?

- a. They are both polymers of glucose.
- b. They are geometric isomers of each other.
- c. They can both be digested by humans.
- d. They are both used for energy storage in plants.
- e. They are both structural components of the plant cell wall.

___ 36. Hydrolysis is involved in which of the following?

- a. Formation of starch
- b. The digestion of maltose to glucose
- c. hydrogen bond formation between nucleic acids
- d. peptide bond formation of proteins

___ 37. What maintains the secondary structure of a protein?

- a. Peptide bonds
- b. Hydrogen bonds
- c. ionic bonds
- d. disulfide bridges

___ 38. Which of the following is true concerning saturated fatty acids?

- a. They have double bonds between the carbon atoms of the fatty acids.
- b. They have a higher ratio of hydrogen to carbon than unsaturated fatty acids.
- c. They are usually liquid at room temperature.
- d. They are usually produced by plants.

___ 39. Which of the following would yield the most energy per gram when oxidized?

- a. Starch
- b. Fat
- c. glycogen
- d. protein

___ 40. All of the following molecules are proteins EXCEPT

- a. Hemoglobin
- b. Antibodies
- c. DNA
- d. Enzymes

___ 41. Which of the following descriptions best fits the class of molecules known as nucleotides?

- a. A nitrogen base and a phosphate group
- b. A nitrogen bas and a five-carbon group

- c. A nitrogen base, a phosphate group, and a five-carbon sugar
 d. A five-carbon sugar and adenine or uracil
- ___ 42. The tertiary structure of a protein is the
 a. Bonding together of several polypeptide chains by weak bonds
 b. Order in which amino acids are joined in a peptide chain
 c. Bonding of two amino acids together to form a dipeptide
 d. Folding of a peptide chain into an alpha helix
- ___ 43. How does an enzyme catalyze a reaction?
 a. By supplying the energy to speed up a reaction
 b. By lowering the energy of activation of a reaction
 c. By lowering the ΔG of a reaction
 d. By changing the equilibrium of a spontaneous reaction
- ___ 44. Why is ATP an important molecule in metabolism?
 a. It has high-energy phosphate bonds.
 b. Its hydrolysis is endergonic.
 c. Its phosphate bonds are easily made and broken.
 d. It is readily obtained from an organism's environment.
- ___ 45. Increasing the substrate concentration in an enzymatic reaction could overcome which of the following?
 a. Denaturing of the enzyme
 b. Competitive inhibition
 c. allosteric inhibition
 d. noncompetitive inhibition
- ___ 46. A solution of starch at room temperature does not spontaneously decompose rapidly to a sugar solution because
 a. The start solution has less free energy than the sugar solution.
 b. The hydrolysis of starch to sugar is endergonic.
 c. The activation energy barrier cannot be surmounted by most of the starch molecules.
 d. Starch cannot be hydrolyzed in the presence of so much water.
 e. Starch hydrolysis is non spontaneous.
- ___ 47. Which of the statements regarding enzymes is false?
 a. Enzymes are proteins that function as catalysts.
 b. Enzymes display specificity for certain molecules to which they attach.
 c. Enzymes provide activation energy for the reactions they catalyze.
 d. The activity of enzymes can be regulated by factors in their immediate environment.
- ___ 48. Which of the following statements is true concerning catabolic pathways?
 a. They combine molecules into more complex and energy rich molecules.
 b. They are usually coupled with anabolic pathways to which they supply energy in the form of ATP.
 c. They involve endergonic reactions that break complex molecules into simpler ones.
 d. They build up complex molecules such as protein from simpler compounds.
- ___ 49. According to the induced fit hypothesis of enzyme function, which of the following is correct?
 a. The binding of the substrate depends on the shape of the active site.
 b. Some enzymes become denatured which activators bind to the substrate.
 c. A competitive inhibitor can out-compete the substrate for the active site.
 d. The binding of the substrate changes the shape of the enzyme slightly and may stress of bend substrate bonds.
- ___ 50. Correct statements regarding ATP include:
 I. ATP (adenosine triphosphate) serves as the main energy shuttle in cells.

II. ATP drives endergonic reaction in the cell by the enzymatic transfer of the phosphate group to specific reactants.

III. The regeneration of ATP from ADP and phosphate is an endergonic reaction

a. I only

c. II only

d. III only

d. I and III only

Name _____

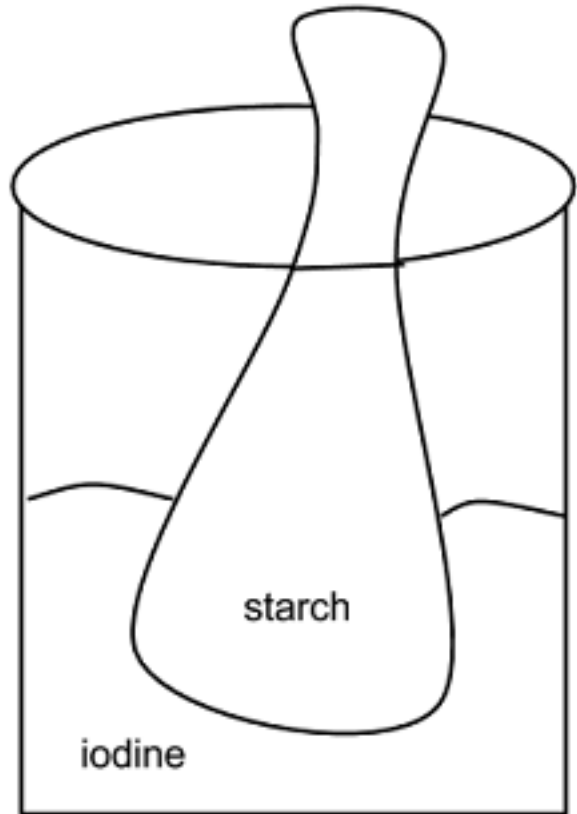
Diffusion Lab

Introduction: In this lab you will observe the diffusion of a substance across a semi permeable membrane. Iodine is a known indicator for starch. An indicator is a substance that changes color in the presence of the substance it indicates.

Prelab Observations: Add a small amount of iodine to $\frac{1}{4}$ tsp cornstarch dissolved in $\frac{1}{4}$ cup water. Describe what happens.

Procedure:

1. Fill a plastic baggie with a teaspoon of cornstarch and a half a cup of water tie bag.
2. Fill a beaker halfway with water and add ten drops of iodine.
3. Place the baggie in the cup so that the cornstarch mixture is submerged in the iodine water mixture.
4. Wait fifteen minutes and record your observations in the data table, repeat every 5 minutes until a change occurs.
5. While you are waiting, answer the questions.



Questions:

1. Define diffusion.
2. Define osmosis
3. What is the main difference between osmosis and diffusion?
4. Why is iodine called an indicator?
5. Molecules tend to move from areas of _____ concentration to areas of _____ concentration.

What's in the Bag?

We're going to think about concentrations now, which substances are more or less concentrated depends on which one has the most stuff in it.

1. Is the baggie or beaker more concentrated in starch?
2. Is the baggie or beaker more concentrated in iodine?

3. Iodine solution: is the baggie or the beaker hypertonic?

4. Starch solution: is the baggie or the beaker hypertonic?

5. Which one is hypotonic in relation to starch, baggie or beaker?

Make Some Predictions

1. If the baggie was permeable to starch, which way would the starch move, into the bag or out of the bag? _____

2. If the baggie was permeable to iodine, which way would the iodine move, into or out of the bag?

3. If the baggie was permeable to iodine, what color would you expect the solution in the baggie to turn?
_____ What about the solution in the beaker? _____

4. If the baggie was permeable to starch, what color would you expect the solution in the baggie to turn?
_____ What about the solution in the beaker? _____

5. Make a prediction about what you think will happen:

Data Table – Create data table in the space below.

Post Lab Analysis

1. Based on your observations, which substance moved, the iodine or the starch?

2. How did you determine this?

3. The plastic baggie was permeable to which substance?

4. Is the plastic baggie selectively permeable?

5. Sketch the cup and baggie in the space below. Use arrows to illustrate how diffusion occurred in this lab.

6. What would happen if you did an experiment in which the iodine solution was placed in the baggie, and the starch solution was in the beaker?
Be detailed in your description.

7. Why is it not a good idea to store iodine in a plastic bag?