Name: \_**Ms. Franckowiak’s Answer Key**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Pd:\_\_\_\_\_\_\_\_

GT Biology: Unit One Test—90 Points

Experimental Design, Scientific Process, Measurement, Chemistry, Macromolecules

1. Gibberellic acid (GA) is a hormone that affects the growth of plants. A student predicted that spraying a gibberellic acid solution on corn plants would increase their rate of growth. To test this theory, he planted one corn plant and sprayed the same amount of gibberellic acid solution on it every day for one week. At the end of the week, he found that the corn plant had grown seven centimeters. Based on this observation, he claimed that gibberellic acid had caused the plant to grow faster.
2. What is wrong with the student’s claim? Be specific (4 pts).
**--Student had no control, and therefore could not be sure that the GA actually affected plant growth**
**--The student makes a claim about growth rate (“faster”), but he only measures the plant at the end of the week, so we do not actually know how quickly the plant grew.**
3. How should the student have designed his investigation in order to get useful results? (5 pts)
**Student should have had multiple trials and a control group with no GA. He also should have measured growth daily and extended the length of his experiment.**
4. Sam claims that water is a molecule. Tom claims that it is a compound. Who is right and why? (2 pts)
**Water is a molecule and a compound. It is a molecule because it is composed of multiple atoms bonded together. Since not all of those atoms are of the same element, it is also a compound.**
5. Light travels 3.0 x 108 meters per second. How many kilometers does light travel in a year? (3 pts)
**Seconds in a year:60 x 60 x 24 x 365 = 31,536,000**
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6. One molecule of hemoglobin has a mass of approximately 1.09 x 10-10 nanograms. How many hemoglobin molecules are there in one milligram? (3 pts)
**Find the mass of one molecule of hemoglobin in milligrams:
1.09 x 10-10 x 1,000,000 = 1.09 x 10-16 mg per molecule of hemoglobin
**
7. Jenna is preparing growth medium for bacteria and needs to convert microliters to milliliters. The recipe calls for 750 µL of a liquid yeast extract. After converting, Jenna figures that she needs 750,000 mL. You’re a much better lab technician and can tell that she is wrong without doing any calculations. How do you know she’s wrong? (1 pt)

**Since microliters (µL) are smaller than mL, after converting Jenna should have fewer mL than µL.**
8. What do protons and neutrons have in common? (1 pt)

**Both are subatomic particles found in the nucleus of an atom.**
9. Potassium has 19 protons. When potassium has a charge of +1, it has (2 pts):
A) 20 protons
B) 19 electrons
C) 18 protons
**D) 18 electrons**
E) Not enough information to tell
10. Which of the following has the most carbon atoms (2 pts)?
A) 25CO
**B) 6C6H12O6**C)30CO2D) 4C7H16
11. What are two differences between hydrogen bonding and ionic bonds (2 pts)?

**A. Hydrogen bonding occurs between molecules while ionic bonds form between atoms**
**B. Electrons are transferred in ionic bonds but not in hydrogen bonds**
12. Draw two water molecules and clearly indicate the hydrogen bonding between them (4 pts).
**In the diagram below, red represents oxygen and white represents hydrogen.**


13. Why is water polar? (2 pts)
**Water is polar because the electrons are more attracted to the oxygen atom than to the hydrogen atoms. This unequal distribution of electrons creates a concentration of negative charge around the oxygen.**
14. If you have grease on your hands, why does washing them with soap work better than just washing them with water? (3 pts)
**Soap is amphipathic, meaning that it has both a hydrophilic and a hydrophobic region. The hydrophobic region can bond to the grease while the hydrophilic region hydrogen bonds with the water. This has the overall effect of pulling the grease from your hands. Water alone cannot bond with grease.**
15. True or **false**: Water has higher surface tension on glass than on wax paper. (1 pt)

Why? (2 pts)
**Surface tension is higher on wax paper because the wax paper is hydrophobic. Water cannot interact with it, so the hydrogen bonds between water molecules are uninterrupted. Hydrogen bonding can occur between the molecules of glass and water, so the surface tension on glass is reduced.**
16. Water does not adhere to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ surfaces (2 pts):
A) Polar
**B) Hydrophobic**
C) Hydrophilic
D) Glass
17. You dump some salt into a glass of water. Answer the following questions:
A) What is the solvent? (1 pt)
**Water**
B) What is the solute? (1 pt)
**Salt**
C) Explain how the salt dissolves. If a diagram would help you explain, feel free to include one. (3 pts)
**Salt is an ionic compound—it contains a positively charged sodium ion and a negatively charged chloride ion. These ions will be attracted to the two “poles” of water: sodium will be attracted to the more negative oxygen and chloride will be attracted to the more positive hydrogens. This will disrupt the hydrogen bonding between water molecules and the ionic bonding between Na and Cl. The two ions will separate and be surrounded by water molecules.**
18. Water has a high specific heat. What does that mean? (2 pts)
**Water heats up much more slowly than most liquids.**
19. Identify each of the following (2 pts each):
 
**Amino Acid**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_**Nucleotide**\_\_\_\_\_\_\_\_\_\_\_\_\_\_
 
\_**Lipid (triglyceride)**\_ **Monosaccharide (glucose) or carbohydrate**
20. Fill in the following chart (2 pts each):

|  |  |
| --- | --- |
| **Macromolecule** | **Monomer** |
| Protein | **Amino acid** |
| **Carbohydrate** | Monosaccharide |
| Nucleic Acid | **Nucleotide** |
| **Lipid** | Fatty acids/glycerol |

Fill in the blanks; be as specific as you can (2 pt each blank).

1. \_**Cellulose**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ provides structure in the cell walls of plant cells, while cell membranes are made of \_\_**phospholipids**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
2. \_**Enzymes**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are \_\_**proteins**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ that speed up chemical reactions in the cell.
3. A protein’s \_**primary**\_\_\_\_\_\_\_\_\_\_\_\_\_\_ structure is the sequence of \_\_\_**amino acids**\_.
4. Every protein has a unique \_**structure**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ that corresponds with its specific \_**function**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
5. \_**Saturated**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ fatty acids are solid at room temperature while \_**unsaturated**\_\_\_\_\_\_\_\_\_\_\_\_\_ fatty acids are liquid at room temperature.
6. \_**Carbohydrates**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ provide short-term energy for cells while \_**lipids**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ store energy for the long term.
7. Two amino acids are bonding together. Answer the following questions:
A) What is the name of the bond that they form? (1 pt)
**Peptide bond**

B) Describe what happens as this bond is formed. (3 pts)
**The bond is formed by dehydration synthesis. During dehydration synthesis, a molecule of water is formed as two monomers (in this case, amino acids) bond together.**