Biology GT—Unit One Review Guide

**Note: This will not be collected or graded. It is for your reference. Do as much or as little as you would like.**

**Vocab Practice**

Given the definition, write the word:

1. The amount of energy required to increase the temperature of a substance by one degree: **specific heat**
2. Special kind of lipid that makes up the cell membrane: **phospholipid**
3. A solid that is dissolved in a liquid: **solute**
4. Molecules with atoms from two or more different elements: **compound**
5. A sub-atomic particle with a charge of 0; it is found in the nucleus: **neutron**

Matching:

1. Molecule = **E** a. Bond that joins together two amino acids
2. Peptide bond = **A** b. A biological macromolecule made from

monosaccharides and used for energy

1. Carbohydrate = **B** c. In science, an explanation about the natural

world that accounts for all available evidence

and accurately predicts new observations

1. Non-polar = **D** d. Describes covalent bonds in which electrons

are shared equally

Describes molecules in which there is an equal

distribution of charge

1. Theory = **C** e. Atoms that have combined chemically

Choose the correct answer.

1. Composed of a sugar, a phosphate, and a nitrogen base; building block of nucleic acids  
   A) Electron  
   B) Neutron  
   C) Nucleic Acids  
   **D) Nucleotides**
2. Bond formed when two atoms share a pair of electrons  
   A) Electron  
   B) Ionic Bond  
   **C) Covalent Bond**  
   D) Hydrogen Bond
3. Monomer of a triglyceride  
   A) Nucleic Acid  
   B) Ionic bond  
   **C) Fatty acid**  
   D) Amino acid
4. Water molecules "sticking" to other water molecules  
   A) Theory  
   **B) Cohesion**  
   C) Protein  
   D) Adhesion
5. A process in which the formation of a new bond between two molecules results in the loss of a water molecule  
   A) Hydrogen bond  
   B) Hydrophobic  
   **C) Dehydration synthesis**D) Hypothesis

True or False

\_\_\_**T**\_\_\_\_\_ Capillary action is the tendency of water to “climb” tubes and it can be explained by cohesion and adhesion

\_\_\_\_**F**\_\_\_ Monosaccharides are the building blocks of protein

\_\_\_\_**T**\_\_\_ Lipids are biological macromolecules made up of fatty acids and triglycerides; they are used for long-term energy storage and make up cell membranes

\_\_\_\_**T**\_\_ Amino acids are the building blocks of proteins

\_\_\_\_**F**\_\_ Hydrogen bonds form between two atoms of opposite charge

**Scientific Method**

1. What does “theory” mean in the scientific community, and how is this different than how “theory” is used by the general public?  
   **In the scientific community, a theory has been supported by substantial evidence gathered through experimentation and observation. It is an explanation of all of the available evidence for a particular phenomenon, or occurrence, in the natural world. In the general public, “theory” is used as a synonym for “guess.”**

David is interested in finding out whether different growing mediums have an effect on bacteria. He mixes up some growth medium with sugar and some growth medium with protein, and he puts each medium into a separate Petri dish. To get bacteria, he swabs the door handle of the classroom. After swabbing the door handle, he touches the swab to each plate to transfer bacteria. The plates are kept in the same incubator at 37 degrees Celsius for 48 hours. He examines the plates and collects the following data:

|  |  |
| --- | --- |
| **Medium** | **Growth** |
| Sugar | Lots of bacteria  Colonies are different shapes and sizes |
| Protein | Fewer bacteria than sugar Some colonies are “fuzzy” |

Answer the following questions based on this experiment:

1. Point out one good feature of David’s experiment and explain why it was a good thing for him to do.  
   **--Same incubator for same length of time: this controls for temperature and growing time**  
   **Other answers possible**
2. Point out at least two flaws in David’s experiment, explain why they were flaws, and explain how you would have avoided making those mistakes.  
   **--He only sets up one plate (one trial) for each of the growing media; multiple plates of each would be better**  
   **--He should have also included a control medium. This would be a growth medium whose effects on bacterial growth were already known and described.**  
   **--It’s clear in his results that his sampling led to lots of different kinds of bacteria (and probably some mold) growing on the plate. It’s tough to make claims about growth from these results, given that different species of bacteria and mold have different growing requirements. He should have isolated a colony from each plate.  
   Other answers possible; these are just examples.**
3. What claims, if any, can David make based on this experiment?  
   **Growth media with sugar supports more bacterial growth than growth media with protein.**

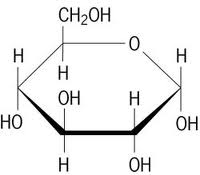
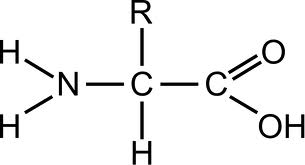
Christina did an experiment in which she isolated mold from bread and grew the mold on several different Petri dishes. She wanted to know how different temperatures affected the growth of the mold, so each plate was incubated at a different temperature for 48 hours. One plate was left out at room temperature (25 degrees C) for 48 hours. Here is her data:

|  |  |
| --- | --- |
| **Temperature** | **Growth** |
| 20 degrees C | No |
| 30 degrees C | Yes |
| 40 degrees C | No |
| Room temperature (25 degrees C) | Yes |

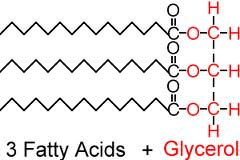
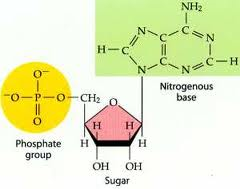
1. Make a claim based on this data. Support your claim with evidence and provide reasoning.

**Bread mold grows best between 25 and 30 degrees Celsius. Growth was visible at bo0th 25 degrees C and 30 degrees C. Since growth was not visible at 20 degrees C or 40 degrees C, it can be concluded that the optimal temperature range for mold growth is between 25 and 30 degrees C.**

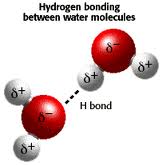
Identify each of the following structures:

**Glucose Amino Acid**

**Lipid (triglyceride) Nucleotide**

1. Both carbohydrates and lipids have “energy” and “structure” as general functions. Explain the difference between how carbohydrates are used for energy and how lipids are used for energy. In addition, give a specific example of carbohydrates providing structure and lipids providing structure.  
     
   **Carbohydrates are used for short-term energy and lipids are used for long-term energy storage. Cellulose, a carbohydrate, provides structure in cell walls, while phospholipids make up cell membranes.**
2. Every protein has a unique 3D shape. Why does this matter?  
   **The shape of a protein determines its function. Because each protein has a unique function, it has a unique shape. If the shape is disrupted, the function will also be disrupted.**
3. Give two differences between saturated and unsaturated fatty acids.  
   **Saturated fatty acids are solid at room temperature while unsaturated fatty acids are liquid at room temperature. Saturated fatty acids have only single bonds between the carbon atoms in the chain, but unsaturated fatty acids have both single and double bonds between the carbon atoms in the chain.**
4. Glycogen, starch, and cellulose are all carbohydrates. What else do they have in common?  
   **All three are built from long chains of glucose molecules.**
5. Why are nucleic acids important?  
   **Nucleic acids store and transmit genetic information, an essential biological function. Nucleic acids are responsible for passing traits onto offspring.**
6. Give an example of a food that contains…  
   Carbohydrates: **bread, pasta, potatoes, etc.**  
   Protein: **meat, legumes, beans, nuts, etc.**  
   Lipids: **butter, oils**
7. Why is a chain of amino acids called a “polypeptide?”  
   **The bond between two amino acids is called a peptide bond. The prefix “poly” means “many.” In a chain of amino acids there are many peptide bonds, hence the term “polypeptide.”**
8. When a bond is formed between two glucose molecules, the process is called “dehydration synthesis.” Why?  
   **The formation of a bond between two molecules of glucose results in the loss of a water molecule—one glucose “gives up” a hydrogen while the other glucose “gives up” an –OH group. “Dehydration” refers to the loss of water while “synthesis” refers to the formation of the bond.**
9. Give an example of a polymer and an example of a monomer.  
   **Polymer: protein  
   Monomer: amino acid**  
   **Other answers possible**
10. Define the four levels of protein structure:  
    Primary: **sequence of amino acids**  
      
    Secondary: **chains of amino acids (polypeptides!) fold and twist into organized shapes**  
    Tertiary: **the secondary structures begin to fold on top of one another, creating a more complex, globular 3D shape**  
      
    Quaternary: **interaction between two or more tertiary forms**
11. Explain how surface tension works.  
    **Surface tension in water is the result of hydrogen bonding between water molecules. Since water molecules hydrogen bond with one another, they “stick” to one another. This is called cohesion, and it results in the phenomenon we observe as surface tension.**
12. Detergents—soap molecules—are often used to clean up oil that has spilled into bodies of water. Explain why this is a useful strategy.  
    **Soap is an amphipathic molecule, which means that it has a polar region and a nonpolar region. If there is oil in water and you add soap to it, the nonpolar part of the soap will break up the oil into small particles, and these oil particles will be surrounded by soap molecules. As the soap molecules surround the oil, the polar heads of the soap molecules will interact with the water. This will essentially “dissolve” the oil, making the spill less harmful and easier to manage.**
13. Why does water form a very round drop on wax paper but not on microscope slides?  
    **On a microscope slide, water molecules can hydrogen bond with the glass. This reduces the cohesion between water molecules, causing the water to spread out. However, wax paper is nonpolar, so water cannot hydrogen bond with the surface. As a result, the cohesion between water molecules remains very strong, resulting in a nearly spherical drop of water.**
14. Someone gives you a flask containing a liquid. The flask is labeled cyclohexane. You pour some of this cyclohexane into a beaker of water, and the cyclohexane forms a layer on top of the water. What can you conclude about cyclohexane?  
    A) It’s a fancy name for oil  
    B) It’s hydrophilic  
    C) It’s polar  
    **D) It’s nonpolar**
15. If you have a solution of water and alcohol and you heat it up, the alcohol will evaporate much more quickly than water. Why?  
      
    **Water has a much higher specific heat than alcohol, which means that it takes longer for water to heat up. Alcohol has a lower specific heat and will therefore boil off before water reaches its boiling point.**
16. Differentiate between a hydrogen bond and an ionic bond.  
    **A hydrogen bond occurs between two polar molecules. Polar molecules have a region that is partially negatively charged and a region that is partially positively charged. When two of the molecules are near one another, there is an attraction between the negatively charged region of one molecule and the positively charged region of the other. This attraction is the hydrogen bond.  
      
    An ionic bond, on the other hand, occurs between two oppositely charged atoms—two ions. One atom “gives” an electron to the other, creating two atoms with opposite charges. These two oppositely charged atoms are attracted to each other. The attraction between them is the ionic bond.**
17. Look at the molecule below. Remember that each line between atoms represents a covalent bond. Are these covalent bonds polar or non-polar? Support your answer.  
      
    **This is a nonpolar molecule because it is a chain of the same atom (carbon). The carbon atoms (being identical) will share electrons equally, creating an even distribution of charge throughout the molecule.**
18. Draw two water molecules and indicate the hydrogen bonding between them.  
    **something like this:**
19. How does an atom become an ion?  
    **gains or loses an electron**
20. Flourine has 9 protons and usually has 9 electrons. If you find a fluorine ion with a charge of -1, then how many electrons does this fluorine ion have?  
    **10**
21. Calcium has 20 protons. When calcium is ionized, it has a charge of +2. A calcium ion has:  
    A) 20 protons  
    B) 20 neutrons  
    C) 18 electrons  
    **D) All of the above**
22. How many carbon atoms are there in 12CO2?   
    **12**
23. How many oxygen atoms in 12CO2?  
    **24**
24. How many carbon dioxide molecules in 12CO2?  
    **12**
25. Diana can run 400 m in 55 s. How many kilometers can she run in 3 min?  
    **400 m = 0.4 km**  
    **She can run 1.31 km in 3 min.**
26. Which is bigger, a microgram or a nanogram?  
    **microgram**
27. Why is the metric system more useful for scientists than the US system?

**--The base ten system makes converting between units simple and convenient**

**--Each unit is based on a physical standard, making it much more precise than the US system**