

**Biology 150: 1<sup>st</sup> in-class examination**  
**Sept 14, 2012**

Name \_\_\_\_\_

Indicate the lab you are registered in:

Tuesday, 8-9:50 \_\_\_\_\_

Tuesday, 10-11:50 \_\_\_\_\_

Tuesday, 12-1:50 \_\_\_\_\_

Tuesday, 3-4:50 \_\_\_\_\_

Tuesday, 5-6:50 \_\_\_\_\_

Thursday, 3-4:50 \_\_\_\_\_

Answer the questions in the space provided and you may also use the back of the page to complete your response. There are 30 questions worth a total of 50 points (plus three one point bonus questions). The point value of individual questions appears in parentheses.

1. All living things grow, reproduce, have complex organized structure composed of carbon containing molecules, and acquire matter and energy which they convert to other forms. Name two additional characteristics of all living things. (2)
  
2. All science assumes common perception, uniformity of natural laws and \_\_\_\_\_ . (1)
  
3. Two scientists used the scientific method to discover that *Helicobacter pylori* is causal in stomach ulcers. Name the four steps of the scientific method and describe how each step applied to this discovery. (2)
  
4. Charles Darwin's major contribution to Biology was his realization that survival in nature was subject to natural selection. He also realized that two other processes combined with natural selection to drive evolution. Name those two processes. (2)
  
5. Give an example of artificial selection. (1)
  
6. Name the three most abundant elements in the human body. (1)

7. Consider the atom  $^{14}\text{C}$ . (5)
- what is its atomic number?
  - what is its atomic mass?
  - it contains \_\_\_\_\_ protons, \_\_\_\_\_ neutrons, and \_\_\_\_\_ electrons.
  - how many of its electrons normally reside in its outer electron shell?
  - name one other Carbon isotope.
8. If the half-life of  $^{14}\text{C}$  is about 5,730 years, (2)
- why is the amount in the atmosphere more or less constant over time?
  - suppose, today, you had 10g of pure  $^{14}\text{C}$ . About how much would you have left after another 11,460 years.
9. Each electron shell around an atomic nucleus has a limited capacity. Give electron capacity of the first 4 electron shells. (1)
10. Define the term ion. (1)
11. What is the valence of O? (1)
12. Circle all the polar covalent bonds: (1)
- O-H                  C-C                  N-H                  H-C                  H-H
13. Molecules that contain polar covalent bonds or are ionic and are therefore quite water soluble are said to be \_\_\_\_\_, while those composed of non-polar covalent bonds and less water soluble are said to be \_\_\_\_\_. Those molecules that contain both entirely non-polar regions as well as polar/ionic regions are said to be \_\_\_\_\_. (3)
14. The term \_\_\_\_\_ describes the tendency of water to climb \_\_\_\_\_

surfaces which are ones covered by molecules rich in polar bonds. (2)

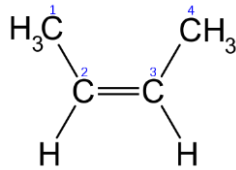
15. If the pH of a solution is 5: (Hint: remember your units) (3)  
 a) what is the pOH?      b) what is the  $[H^+]$ ?      c) what is the  $[OH^-]$ ?

16. What is a buffer? (1)

17. Which has the greatest specific heat, water, alcohol, or Styrofoam? (1)

18. In chemistry, what does the term organic mean? (1)

19. For the following molecule draw its geometric isomer and label it cis or trans: (2)



20. How do aldoses differ from ketoses? (1)

21. Name one hexose aldose. (1)

22. Name one polysaccharide: (2)

a) composed entirely of  $\beta$  glucose

b) composed entirely of N-acetylglucosamine

23. Fat or oil molecules are formed when a dehydration reactions links a glycerol molecule to three \_\_\_\_\_ molecules. (1)

24. How do waxes differ from fats and oils? (1)

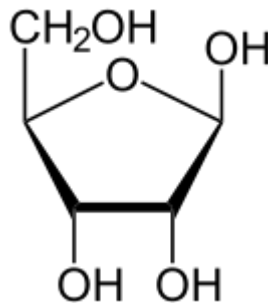
25. Name one steroid molecule. (1)

26. Draw the structure of an amino acid. (1)

27. Proteins are composed of how many different kinds of amino acids? (1)

28. The  $\alpha$  helix is an example of what level of protein structure? (1)

29. The molecule below occurs in nucleotides: (6)



- what is the name of this molecule?
- number its carbons (assuming this molecule is part of a nucleotide)
- indicate to which carbon the nucleotide base is attached

- d) indicate to which carbon the phosphate(s) is attached
- e) indicate the O that would be missing if this nucleotide was incorporated into DNA
- f) indicate the carbon that connect this molecule to the next nucleotide in DNA or RNA

30. What does it mean to say DNA is antiparallel? (1)

Bonus questions:

- (1) As the temperature drops during a fall frost the cells of an apple hanging on a tree convert much of their store of amylopectin to sucrose (which has antifreeze properties). This is an example of which characteristic of all living things? (1)
  
- (2) For what is Charles Lyell justly famous? (1)
  
- (3) Robin Warren and Barry Marshal are both citizens of what country? (1)