

Biology 150: 1st in-class examination
Sept 17, 2010

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, 12-1:50 _____

Answer the questions in the space provided and you may also use the back of the page to complete your response. There are 36 questions worth a total of 50 points (plus a three one point bonus questions). The point value of individual questions appears in parentheses.

1. All living things grow, reproduce, acquire matter and energy from their environment, and have complex organized structure based on carbon containing molecules. Name two additional characteristics of all life. (1)
2. All science is conducted making certain assumptions about the nature of reality. One of these is the *assumption of natural causality* meaning that no events in nature have a supernatural explanation or cause. Another science assumption is the assumption of uniformity of natural laws. What does this assumption actually mean? (1)
3. Explain how discovery science and hypothetical (i.e. explanatory) science differ? (1)
4. There are four steps to the scientific method. Name each of them in order and briefly describe how each step applies to the discovery of *Helicobacter pylori* as the causative agent of human stomach ulcers. (2)

5. What is the difference between an hypothesis and a theory? (1)
6. Charles Darwin saw in nature three processes that explained the evolutionary change. He recognized (a) that nature produced too many individuals and (b) that natural selection non-randomly allows only some to survive and reproduce. What was his other important insight? (1)
7. What is the name (either common or scientific) for a New England insect shown to be evolving into two distinct species. (1)
8. Name each of the four most common elements in the human body and, for each indicate the valence of its atoms? (2)
9. ^{12}C , ^{13}C , and ^{14}C are three different _____ of Carbon. Which is radioactive? How many neutrons does it contain and what does it radioactively decay into? (2)
10. For each of the following bonds indicate if they are (1) non-polar covalent, (2) ionic, or (3) polar covalent. (1)
O-H _____, Na-Cl _____, N-H _____, C-H _____, C-C _____
11. Molecules that are rich in non-polar covalent bonds and therefore tend not to dissolve easily in water and are there said to be _____. (1)
12. Detergent molecules are referred to as being _____ as they contain both regions entirely composed of non-polar bonds as well as regions contain polar or ionic bonds. (1)

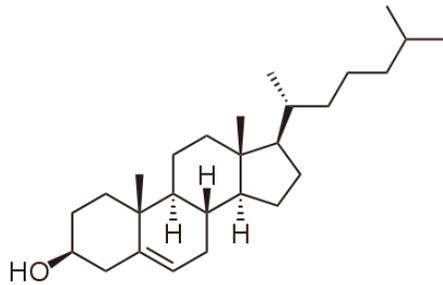
13. You are asked to make a 0.5 L solution at 500 mM . The compound has a molecular weight of 400 g/mole. How much of the compound would you need? (Note: don't forget the units) (1)
14. The pH is 4, what then is the concentration of H^+ ? (Note: don't forget the units.) (1)
15. You are designing a building and are choosing the isolation material to be used in the walls. Substance A has a specific heat of 1 calorie/g. Substance B has a specific heat of 0.2 calories/g. Which material would make the better insulator? (1)
16. A compound that tends to maintain the pH of a solution is referred to as a _____. (1)
17. A certain compound has a central carbon bonded to an amino group, a carboxyl group, a phosphate, and an hydroxyl group. Draw its complete structure showing all atoms and bonds. (5)
18. Would the compound just drawn have a stereoisomer? (1)
19. Name one hexose ketose. (1)
20. What are the constituent monosaccharides of sucrose and of lactose? (2)
21. Name one polymer consisting glucose subunits connected by β (alpha) 1-4 linkages. (1)
22. Where is chitin found? (1)
23. Reactions that join monomers of biological molecules together usually release H_2O and are called _____ reactions. (1)

24. Name a reducing sugar. (1)

25. Triglycerides are commonly referred to as... (1)

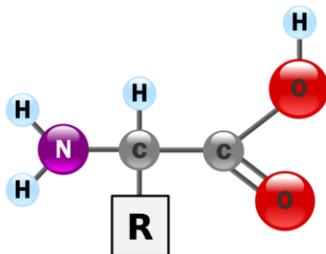
26. How do waxes differ from triglycerides? (2)

27. What class of lipid is this molecule? (1)



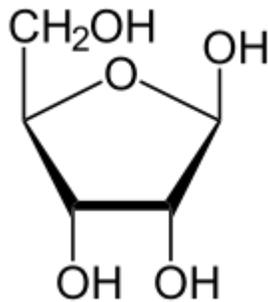
28. How do phospholipids differ from triglycerides? (2)

29. What kind of molecule is this? (1)



30. What is meant by the primary structure of a protein? (1)

31. What does the abbreviation DNA stand for. (1)
32. Adenine and Guanine are both what type of N-containing base? What is the other type occurring in DNA and RNA? (2)
33. Shown below is the ribose sugar that occurs in nucleotides. First, indicate the numbering of each of the carbons if the sugar was indeed incorporated into a nucleotide. Indicate which of these carbons would be attached to the base and which would be attached to phosphate(s). If this was instead deoxyribose which oxygen would be missing? (3)



34. DNA is double stranded and RNA is single stranded? What are two other differences between the two molecules? (1)

35. Explain how the two strands of DNA fit together (i.e. what base-pairs with what and what does antiparallel refer to)? (2)

36. Which has a higher surface to volume ratio, a golf ball or a baseball, or are they the same? (1)

Bonus questions:

(1) Who wrote "An essay on population" in 1799? (1)

(2) Who authored the book "Principles of Geology" in 1837? (1)

(3) Each glucose contains how many of each C, H, and O atoms? (2)