

Biology 150: 1<sup>st</sup> in-class examination  
February 1, 2019

Name Answer Key

Indicate the lab you are registered in:

Tuesday, 9:00-11:50 \_\_\_\_\_; Tuesday, 11:00-12:50 \_\_\_\_\_; Tuesday, 1:00-1:50 \_\_\_\_\_

Answer the questions in the space provided and you may also use the back of the page to complete your response. There are 34 questions worth a total of 50 points (plus three one-point bonus questions). The point value of individual questions appears in parentheses.

- Living things differ from non-living things in that they grow, exhibit homeostasis, respond to stimuli, and reproduce using DNA. Give two other characteristics of living things. (2)
  - have complex and organization based on C containing molecules
  - take up matter + energy from their environments and convert these to other forms
- Not everything can be studied by science. Give an example of something “beyond the limits of science”. (1)
  - what is art?
  - the nature of God.
  - the meaning of life.
- A child goes missing in the woods. When the child is discovered unharmed days later some argue that the child’s survival is the result of prayer by many concerned people. Such an explanation, true or untrue, is non-scientific because it violates what scientific assumption? (1)
 

The assumption of natural causality  
(that everything in nature is the product of natural laws)
- For what accepted hypothesis did Barry Marshal and Robin Warren receive the Nobel Prize? (1)
 

that Helico bacter pylori is the cause (or required for) peptic ulcers
- Charles Darwin understood the world to be very old because of the work of what other scientist? (1)
 

Charles Lyell
- What observation prompted that scientist to conclude the world was old? (1)
  - the succession of lava flows on Mt. Etna
  - or — the way sediment accumulation in lakes resembles the appearance of sedimentary rocks.

7. Charles Darwin accounted for evolution by suggesting it resulted from three processes. Name and/or describe them. (3)

— struggle for survival (too many are born)  
 — survival is non-random / natural selection / adaptive traits increase likelihood of survival  
 — adaptive traits are heritable / offspring of survivors have their adaptive traits

8. What name is given to the process by which humans have generated domesticated animals and plants by picking and choosing which individuals to interbreed over many generations? (1)

artificial selection

9. What is the fourth most abundant element in the human body? (1)

N

10. What is the atomic number of O? (1)

8

11.  $^{12}\text{C}$ ,  $^{13}\text{C}$ , or  $^{14}\text{C}$ , which is most abundant in nature? (1)

$^{12}\text{C}$

12. Explain:

(a) why <sup>is</sup> "carbon dating" is only useful for determining things dead up to 30,000 years (1)

there is very little in living things and after  $\approx 6$  half-lives the amount left is  $\approx$  undetectable.

(b) why isotopic ratio of C in the air and living things is constant (2)

in the upper atmosphere:  $^{14}\text{N} \xrightarrow{\text{cosmic rays}} ^{14}\text{C}$

13. For each of the following indicate if the bond is ionic, polar covalent, non-polar covalent.

a) O-H polar b) NaCl IONIC c) C-C non-polar d) C-H non-polar e) N-H polar (1)

14. Give one example of a cation. (1)

$\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Ca}^{++}$  etc

15. Molecules that dissolve easily in water are described as being hydrophilic (1)

16. Describe and/or diagram what happens to detergent molecules in water. What is the name of the structures formed? (2)

— the molecules will cluster together w/ their hydrophobic tails pushed into the middle of molecular balls called micelles



17. Water climbing up a paper towel is an example of what? (1)

capillarity

18. If the pH is 7, what is the  $[H^+]$ ? (1)

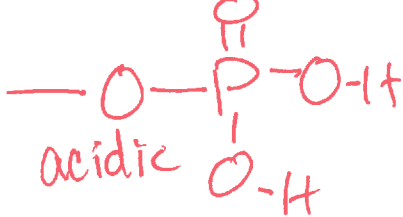
$$[H^+] = 1 \times 10^{-7} M \text{ or } = 0.0000001 M$$

19. What, in science, does "organic" mean? (1)

contains C + H

20. Draw the structure of the following functional groups and indicate if they are acidic, basic or polar: (4)

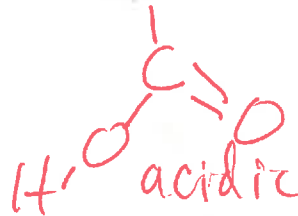
a) phosphate



b) hydroxyl



c) carboxyl



d) amino



21. Give the empirical formula (or the elemental content ratio) of all carbohydrates. (1)



22. Name two hexose aldose monosaccharides. (2)

glucose + galactose

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

=O is on the penultimate C, not the terminal C

24. Polymeric biological organic molecules are generally disassembled by water consuming reactions called hydrolysis. (1)

25. Name the monomeric composition of each of the following: (3)

a) chitin

N-acetylglucosamine

b) cellulose

$\beta$  glucose

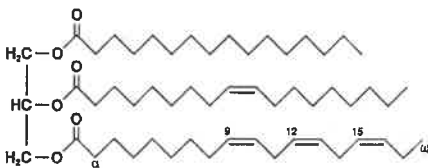
c) amylose

$\alpha$  glucose

26. Name the disaccharide found in milk. What is its monomeric composition? (2)

lactose  $\rightarrow$  glucose + galactose

27. What type of lipid is this? Are the double bonds cis or trans? (2)



triglyceride (triglycerol)

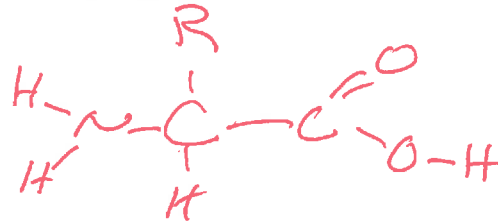
28. How do waxes differ from triglycerides? (1)

*contain longer chain alcohol w > 3 fatty acids*

29. Name one non-hormonal steroid. What function does it serve in living cells? (2)

*Cholesterol. Serves to increase fluidity in membranes*

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



31. How many different protein amino acids exist? (1)

*20*

32. The primary structure of a protein starts at which end of the molecule? (1)

*amino*

33. Give an example of secondary protein structure. (1)

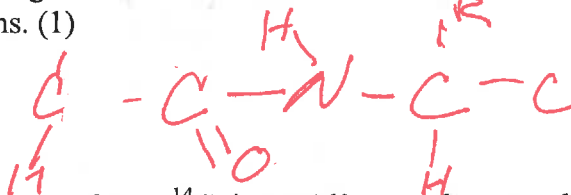
*Helix or  $\beta$  pleated sheet*

34. Describe the quaternary structure of  $O_2$  carrying of red blood cells, hemoglobin. (1)

*4 polypeptides - 2  $\alpha$  subunits + 2  $\beta$  subunits*

Bonus questions (same as last year):

1) Draw a peptide bond. Begin with the central carbon of one amino acid and end with the central carbon of the next showing the atoms and bonds between them as well as all atoms bonded to those intervening atoms. (1)



2) If you have 10 grams of pure  $^{14}C$ , in 11,460 years, how much would remain as  $^{14}C$ ? (1)

*2.5g*

3) Two objects are sitting together in the sunshine. The first has a specific heat of 0.3 calories/g, the second has a specific heat of 1.0 calories/g. If you pick them up, which will feel warmer or would they feel the same? Why? (1)

*would feel warmer.*