

**Biology 150: Final Exam**  
**Dec 13, 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 \_\_\_\_\_

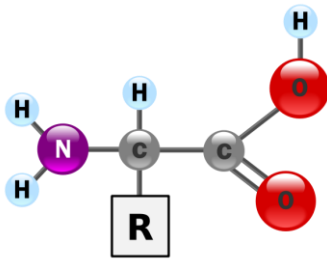
Tuesday, 5-6:50 \_\_\_\_\_

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 48 questions worth a total of 100 points (plus a couple of bonus questions). The point value of individual questions appears in parentheses.

1. 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)
2. What is the difference between an hypothesis and a theory? (1)
3. Name each of the four most common elements in the human body and, for each indicate the valence of its atoms? (2)
4.  $^{12}\text{C}$ ,  $^{13}\text{C}$ , and  $^{14}\text{C}$  are three different \_\_\_\_\_ of Carbon. Which is radioactive? How many neutrons does it contain and what does it radioactively decay into? (2)
5. 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)
6. The pH is 4, what then is the concentration of  $\text{H}^+$ ? (Note: don't forget the units.) (1)

7. What are the constituent monosaccharides of sucrose and of lactose? (2)
8. Name one polymer consisting glucose subunits connected by  $\beta$  (alpha) 1-4 linkages. (1)
9. Where is chitin found? (1)
10. How do phospholipids differ from triglycerides? (2)
11. What kind of molecule is this? (1)



12. What is meant by the primary structure of a protein? (1)
13. Define the following: (3)
- a) protoplasm
  - b) cytosol
  - c) cytoplasm
14. In a eukaryote cell where do you find the nucleolus? What is its function? (2)
15. What are proplastids? (1)

16. What does the Endosymbiosis Theory propose? Describe the evidence that supports this idea. (4)
17. Name the three types of cytoskeletal fibers and indicate the type of protein that makes up each. (3)
18. The fluid mosaic model as first described in 1972 contained three elements. What were they?  
Though the model is still widely accepted today, it has been modified in one respect. How so? (4)
19.  $E_A$ ,  $\Delta G$ ,  $K_{eq}$ , and/or  $\Delta S$ , which of these is (or are) altered by enzyme catalysis? (1)
20. Mitochondrial respiration produces ATP by both substrate level phosphorylation and by oxidative phosphorylation. What is the difference? Where does each occur? (3)
21. In fat metabolism, where do the fatty acid carbons enter the respiratory pathway? (1)

22. Cyclic photophosphorylation occurs in the \_\_\_\_\_ membrane where light energy is first absorbed by chlorophyll molecules attached to individual proteins which are clustered together in groups of three called \_\_\_\_\_. The light energy is passed pigment to pigment until it reaches a special chlorophyll called \_\_\_\_\_ which is attached to a reaction center protein. From here, an energized electron is passed to an electron transport chain leading back to \_\_\_\_\_. Some energy lost in this process is coupled to the transport of \_\_\_\_\_. (5)
23. Who discovered DNA in what year from what source? (3)
24. Bacterial cells, unlike other kinds of cells, are capable of transformation. What exactly is bacterial transformation? (1)
25. Bacterial transformation was discovered in the year \_\_\_\_\_ by an English microbiologist named \_\_\_\_\_ who found combining heat killed virulent Streptococcus with living avirulent Streptococcus produced a lethal cocktail capable of causing pneumonia in \_\_\_\_\_. (3)
26. DNA replication in eukaryotes begins when regulatory proteins bind at several points along each chromosome called \_\_\_\_\_. Binding of these regulatory proteins allows an enzyme that separates the strands called \_\_\_\_\_ to bind. Tension produced by separating the strands is relieved by the enzyme \_\_\_\_\_. Separated strands are stabilized by \_\_\_\_\_. The new daughter strands produced by replication are designated by different names. The strand formed following the separating strands is called the \_\_\_\_\_ strand. The strand formed in a "backstitch" pattern, bit by bit, away from the separating strands is called the \_\_\_\_\_ strand and is formed in 1000-2000 base stretches called \_\_\_\_\_. These sections are initially separated by short 10 base RNA segments called \_\_\_\_\_. The enzyme complex that replaces the RNA segments with DNA is called \_\_\_\_\_ and the short sections are jointed together by the enzyme \_\_\_\_\_. (10)

27. Describe the method used to solve the genetic code. Which was the first codon solved? Define codon. (3)
28. Briefly describe what a human karyotype looks like. How many of what items does it contain? How are these items labeled? (3)
29. What are autosomes? (1)
30. Draw the diploid lifecycle. Indicate where cells are haploid or diploid and where mitosis occurs. Of what organisms is this lifecycle typical? (4)
31. What distinguishes the haploid lifecycle from a diploid lifecycle? What group(s) of organisms have haploid lifecycles? (2)
32. Sometime next summer, while out for a walk you spot a patch of ferns, you search the ground beneath these fern fronds until you find a few green thumbnail shaped plants growing on the ground. What have you found? (1)
33. What is the name given to the lifecycle of plants? (1)
34. Describe three ways prophase I differs from prophase. (3)

35. At what phase of meiosis do chromatids separate? (1)
36. At what phase of meiosis do homologs separate? (1)
37. So-called recombinant chromosomes are the product of what process? (1)
38. Name the ways that meiosis mixes parental genetic material in the resulting gametes. (2)
39. Define the term (gene) locus (plural: loci). (1)
40. What does it mean to say gene loci are linked or unlinked? (1)
41. When Gregor Mendel crossed true breeding white flowered peas with true-breeding purple flowered peas, what was(were) the phenotype(s) of the F1 progeny in what proportions? (2)
42. State Mendel's first law. (2)
43. Assuming unlinked loci, give the genotypes of progeny and their expected proportions for the following crosses: (3)
- a)  $Aa \times Aa$
  - b)  $Aa \times aa$
  - c)  $AaBb \times aabb$
44. In an experiment involving unlinked genes, you cross  $AaBbCcDd$  with  $AaBbCcDd$ . What proportion of the progeny would be expected to be: (2)
- a) heterozygous for all traits?
  - b) show the dominant phenotype of all traits?
45. You work in a lab which studies fruit fly inheritance. You cross a fly without bristles and stubby

wings with a fly that has normal bristles and wings. All the progeny have normal bristles and wings. Crossing these progeny, however, results in flies of which most are an approximately 3:1 mix of entirely normal flies to flies with both no bristles and stubby wings except there are also a small number of flies with either normal wings and no bristles or flies with stubby wings and normal bristles.

- a) What do these results suggest to you about dominance and loci location? (2)
  
- b) You look again at your F2 progeny and observe that all the flies with both stubby wings and without bristles are male. What does this tell you? (2)
  
- c) What sex were “the small number of flies with either normal wings and no bristles or flies with stubby wings and normal bristles”? (1)
  
- d) Of the original parent flies, male or female, which was the mutant? (1)
  
- e) You do one more experiment. You cross an F2 male with both stubby wings and without bristles and an F2 female. In the resulting progeny 8 have either both normal wings and bristles, 8 have both stubby wings and no bristles, 2 have normal wings and no bristles and 2 have stubby wings and normal bristles. What does this tell you? (3)

**Bonus questions:**

- 1) During meiosis of a cell with 6 homologous pairs how many different possible gametes are possible due to independent assortment alone? (1)
- 2) The monastery of Saint Thomas, where Gregor Mendel spent most of his adult life, is now in what country? (1)