

Spring 2007 Biology 111 Exam #2.5 - Molecular Genetics Take-Home Exam

There is no time limit on this test, though I have tried to design one that you should be able to complete within 1 hour, except for typing. You are not allowed to use your notes, old tests, any electronic sources (except as directed by this exam), any books, nor are you allowed to discuss the test with anyone until all exams are turned in by 10:30 am on Monday March 26. **EXAMS ARE DUE AT THE START OF CLASS ON MONDAY MARCH 26.** You may use a calculator and/or ruler. The **answers to the questions must be typed on a separate sheet of paper** unless the question specifically says to write the answer in the space provided. If you do not write your answers on the appropriate pages, I may not find them unless you have indicated where the answers are. There are 3 pages to this exam, including this cover sheet.

- 3 pts if you do not follow this direction.

Please do not write or type your name on any page other than this cover page. Staple all your pages (INCLUDING THE TEST PAGES) together when finished with the exam.

Name (please print):

Write out the full pledge and sign:

How long did this exam take you to complete (excluding typing)?

4 pts.

- 1) a. Look at the pedigree on the last page. Is this trait sex-linked?
b. Explain your answer.

You cannot tell for sure. If it is, then the mother in F1 must be a carrier. If not, then it is just a somatic chromosome, recessive disease.

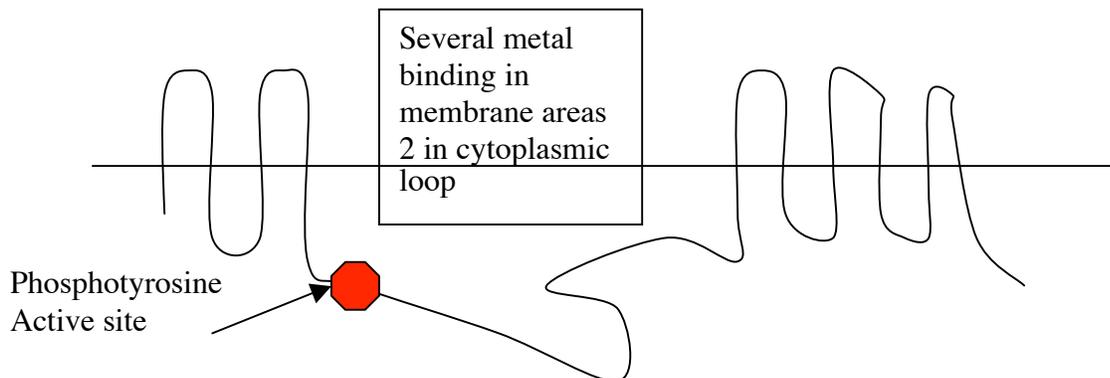
6 pts.

- 2) Using the map on the next page showing loci K, Q, and R, use a table to show the frequency of all possible genotypes if the next generation produces 200 offspring and the diploid organism has two types of chromosomes (a big pair and a small pair).

I had wanted to ask about the gametes, but instead asked about progeny. So, if you did more than 4 genotypes that showed linkage, you got -0 points. If you did not, then you got -1 point. The correct answer had 27 combinations, more than I wanted for this test.

9 pts.

- 3) Go to this web site <<http://www.expasy.org/cgi-bin/sprot-search-de?>> and draw the topology of the protein AT2A2_CHICK. Be sure to include all the additional features depicted on the appropriate page.

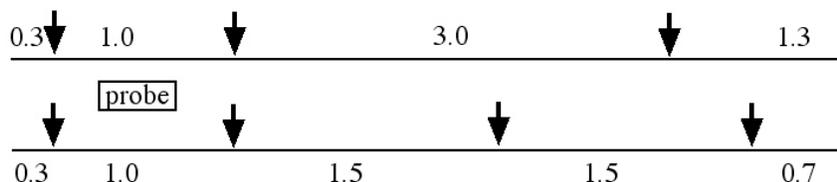


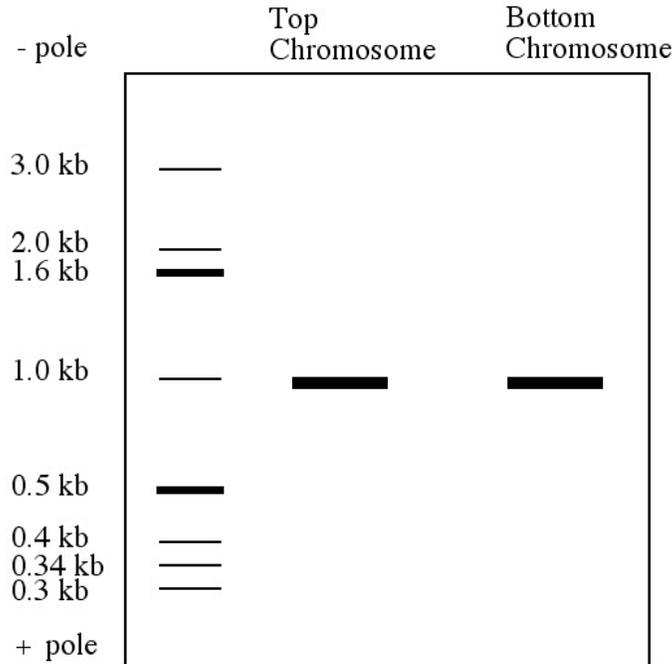
- b. How many amino acids are in this protein? Which organs express this protein? Who was the lead author?

1041, brain and heart, A.M. Campbell (my PhD thesis research)

6 pts.

- 4) Below are two chromosome pieces (top and bottom). The arrows mark the site of restriction enzyme digestion. The location of the probe binding site is shown along with the distances in kilobases. On the figure below, draw a picture of the Southern blot for these two chromosomes:





6 pts.

5) If you wanted to cure CF by applying a chloride salt mist inhaler to the lungs of patients, would you apply a slightly hypotonic solution, a slightly hypertonic solution, or a slightly isotonic solution (relative to the CF lung cells)? Explain your answer.

Slightly hypertonic so water would be drawn out of the cells and dilute the mucus. Hypotonic might make mucus more viscous and might blow up the cells – a lethal outcome. There is no such thing as slightly isotonic.

4 pts.

6) Think about the nucleotides used in DNA sequencing. What structural aspects of these nucleotides are key for their use in non-radioactive DNA sequencing? Use a drawing of their structure in your answer to get full credit.

I wanted you to describe the ddNTP 3' H in place of the OH. Also that these bases carry a dye with them.

