

**Fall 2003 Biology 111 Exam #2.5 - Molecular Genetics Half Exam**

There is no time limit on this test, though I have tried to design one that you should be able to complete within 1.5 hours, 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 class on Monday November 3. **EXAMS ARE DUE AT CLASS TIME ON MONDAY NOVEMBER 3.** 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:

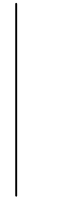
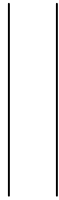
How long did this exam take you to complete (excluding typing)?

**10 pts.**

1) Three recessive traits exist in a species that has orange, round heads. The recessive traits are triangle eyes, pyramid nose, and one tooth. Determine which alleles were on each parent's chromosomes, the order of the loci, and the distance between each locus. Use the space provided here for your answers:

Draw the alleles carried on each parents' chromosomes (vertical lines).

round eyes, single tooth, wedge nose *crossed with* triangle nose, many teeth, pyramid nose  
 Draw Mother's Alleles below Draw Father's Alleles below

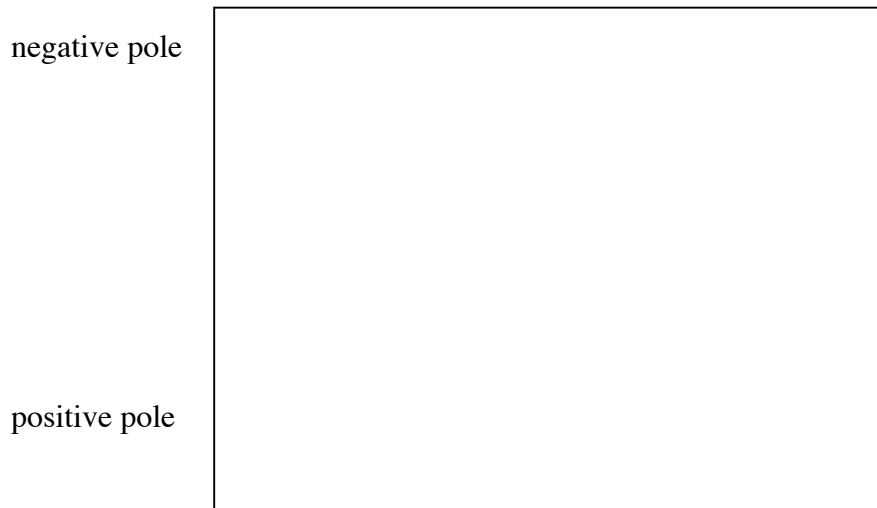


Map: \_\_\_\_\_

<b>Phenotypes</b>	<b>Number of Individuals</b>
round eyes, single tooth, wedge nose	370
round eyes, many teeth, pyramid nose	9
round eyes, many teeth, wedge nose	47
round eyes, single tooth, pyramid nose	1
triangle eyes, many teeth, pyramid nose	369
triangle eyes, single tooth, wedge nose	8
triangle eyes, single tooth, pyramid nose	45
triangle eyes, many teeth, wedge nose	1

**6 pts.**

2) In the space provided, draw a picture of a sequencing gel if each dideoxynucleotide reaction was loaded onto a different lane of a gel and the sequence was 5' GCATCGTAGCAT 3'.



**6 pts.**

3) Go to this <<http://www.ncbi.nlm.nih.gov:80/BLAST/>> and determine the gene, accession number, and species from which this sequence was extracted.

MVHLTPEEKSAVTALWGKVNVDVEVGGEALGRLLVVYPWTQRFFE

**6 pts.**

4) Draw a picture of CFTR in two ways. One way should show the major features of the protein as determined from the sequence analysis online, including the most common mutation. The second way should show what CFTR looks like in its wild-type 3D shape while performing its normal function.

**4 pts.**

5) Why is the mucus thick in people with two  $\Delta$ F508 alleles?

**6 pts.**

6) a. Describe the type of mutation that causes Huntington's disease.

b. What happens over time to a family's mutant allele that causes the allele to disappear from the human gene pool?

**12 pts.**

7) a. Draw a pedigree that describes a family with Duchene's muscular dystrophy and meets the conditions below. Be sure to include as many grandparents as you can.

1) The patient is a boy. His parents have no symptoms. He has a twin sister who does not have any symptoms.

2) Both of the boy's maternal uncles have muscular dystrophy.

3) The boy's paternal aunt has muscular dystrophy.

b. Write in the genotypes of all individuals in the pedigree. If you are uncertain about a particular person, put in a "?" for any uncertain alleles.

c. Is it possible that this disease is sex-linked or not? Explain your answer.