

Fall 2003 Biology 111 Exam #2 – Classical Genetics

There is no time limit on this test, though I have tried to design one that you should be able to complete within 3 hours, except for typing. There are four pages for this test, including this cover sheet. You are not allowed to use your notes, old tests, the internet, or any books, nor are you allowed to discuss the test with anyone until all exams are turned in at 8:30 am on Friday October 10. **EXAMS ARE DUE AT CLASS TIME ON FRIDAY OCTOBER 10.** 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 in the appropriate location, I may not find them.

-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:

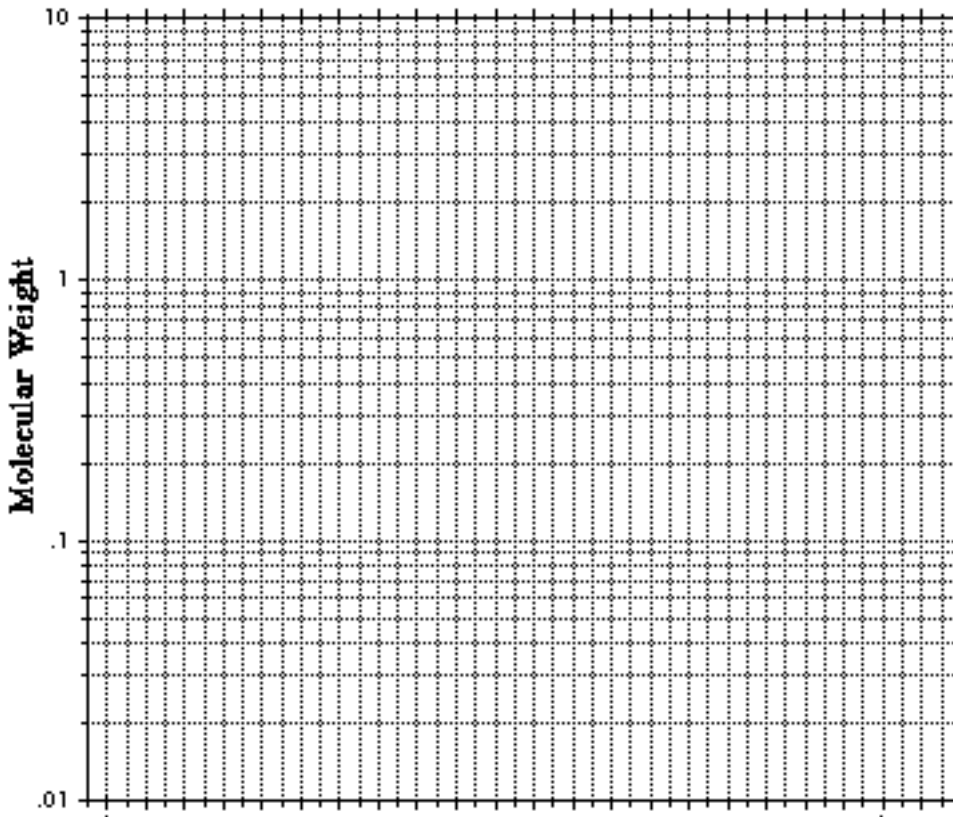
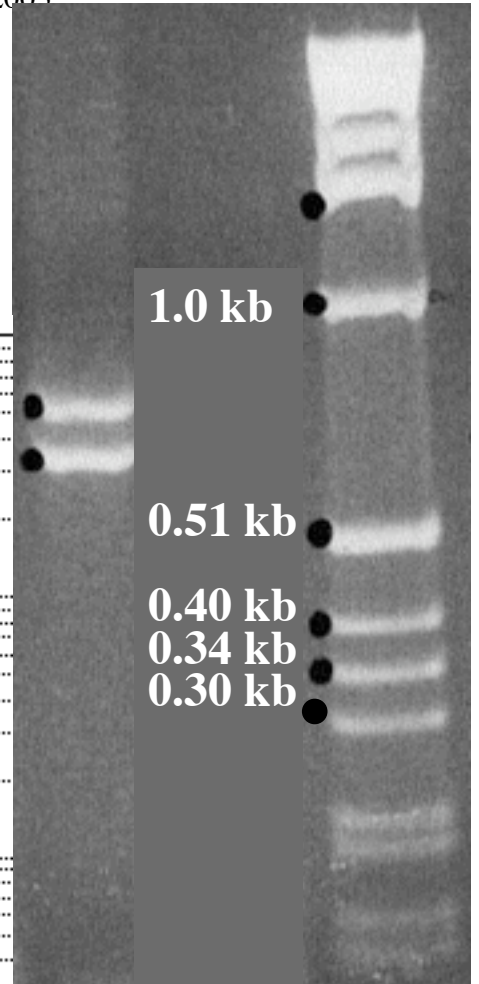
How long did this exam take you to complete (excluding typing)?

Lab Questions

6 pts.

1) Calculate the molecular weights of the two bands marked by dots in the gel on the right.

Use this graph paper to receive full credit.



4 pts.

2) If the basic PCR product is 350 bp and the VNTR consists of the repeated sequence GCAT, how many copies of this repeated sequence are in the two bands you measured?

Lecture Questions

12 pts.

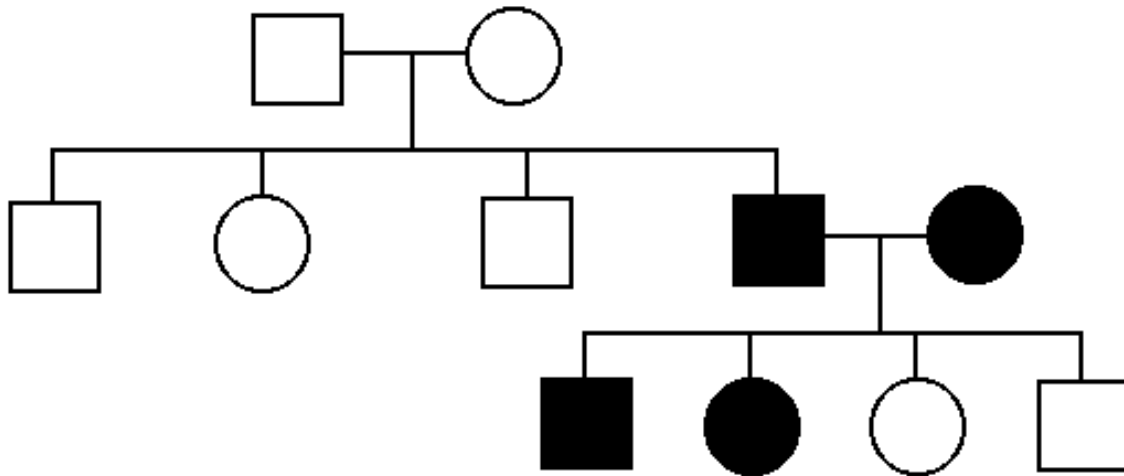
3) Describe three examples of post-translational modification experienced by proteins.

6 pts.

4) Describe a situation where a population has 60% penetrance for a bizarre phenotype (have fun with the phenotype you choose).

8 pts.

5) Looking at the pedigree below, determine if this phenotype is dominant, recessive or incomplete dominant. To receive full credit, you must support your answer with data.



12 pts.

6) A pair of chameleons mated and produced 12 offspring with 3 horns and 4 with two horns.

- If they had one more baby, what are the odds that their next offspring will be a male with 2 horns?
- In the next breeding season, what are the odds of them having two male babies with two horns and one female baby with three horns?
- What are the odds of this couple producing three females with two horns each?

8 pts.

7) Explain why a black moth and a white moth could have gray offspring. To receive full credit, you must explain your answer using molecular terminology as well as Mendelian terminology.

10 pts.

8) On your own paper, draw a dinucleotide of RNA. For the bases, simply use one letter abbreviation that indicates it has to be RNA and not DNA. Your diagram must include the structures of all parts except the bases which can be represented by single letters.

6 pts.

9) Describe a change in DNA that may lead to a dominant allele but the DNA sequence of the gene is not altered.

6 pts.

10) Why do red blood cells take on the sickle shape in people who suffer from sickle cell disease.

8 pts.

11) Pick one protein used during transcription that could lead to a recessive disease if a person inherited two recessive alleles at this locus. Explain how this protein would result in a specific genetic disease.

6 pts.

12) How are RFLPs related to the process of DNA fingerprinting?

8 pts.

13) Using this protein sequence, deduce an mRNA sequence (you only need to supply one of the many possible sequences). When you type your answer, be sure to group your letters in the appropriate reading frame with spaces between the codons.

Methionine, Proline, Lysine, Glutamic Acid, Cysteine, Tryptophan, Histidine.

		Second letter					
		U	C	A	G		
First letter	U	UUU Phenyl-alanine UUC UUA Leucine UUG	UCU Serine UCC UCA UCG	UAU Tyrosine UAC UAA Stop codon UAG Stop codon	UGU Cysteine UGC UGA Stop codon UGG Tryptophan	U C A G	
	C	CUU Leucine CUC CUA CUG	CCU Proline CCC CCA CCG	CAU Histidine CAC CAA Glutamine CAG	CGU Arginine CGC CGA CGG	U C A G	
	A	AUU Isoleucine AUC AUA AUG Methionine; start codon	ACU Threonine ACC ACA ACG	AAU Asparagine AAC AAA Lysine AAG	AGU Serine AGC AGA Arginine AGG	U C A G	
	G	GUU Valine GUC GUA GUG	GCU Alanine GCC GCA GCG	GAU Aspartic acid GAC GAA Glutamic acid GAG	GGU Glycine GGC GGA GGG	U C A G	
						Third letter	