

Fall 2001 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 2.5 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 11:30 am on Monday October 8. **EXAMS ARE DUE AT CLASS TIME ON MONDAY OCTOBER 8.** 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)?

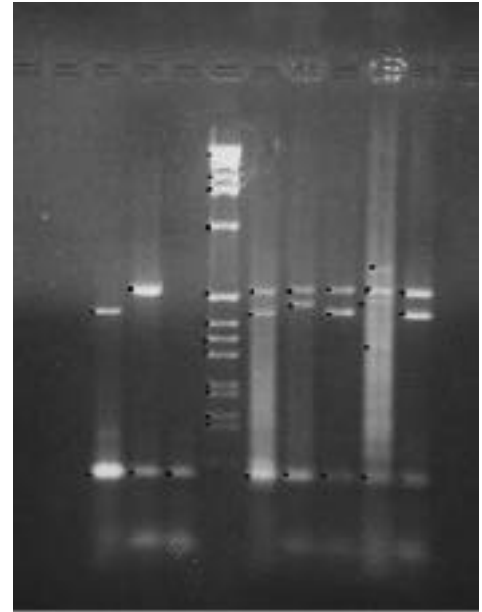
Lab Questions:

3 pts.

1) List the ingredients needed in order for a PCR mixture to work properly.

7 pts.

2) Calculate the molecular weight of the band in the far left lane. To receive full credit, you must calculate your answer by using a graph that you must draw on the last page of this exam. A key to the molecular weight markers is on the last page.



Lecture Questions:

10 pts.

3) Draw a pedigree for the following family. Only draw in the people described and any spouses necessary to produce progeny.

Brumhilda married Bubba and they have four children – three girls and newborn boy. The boy and the middle girl have retinitis pigmentosa. Neither Brumhilda nor Bubba had the disease but Bubba's brother does. Bubba's father is a first cousin to one of Brumhilda's parents. Bubba's paternal grandmother had only one sibling who was Brumhilda's maternal grandfather. Bubba's paternal grandmother had retinitis pigmentosa as did Brumhilda's father. Finally, the mother in the P generation also had retinitis pigmentosa.

8 pts.

4) Deduce the genotypes for the following individuals:

Brumhilda's husband

Brumhilda's father

Bubba's paternal great grandmother.

Bubba's mother.

4 pts.

5) During mitosis, sister chromatids separate. During what meiosis phase do sister chromatids separate?

8 pts.

6) What were the odds that Brumhilda and Bubba could have three girls and a boy when one girl and the boy had retinitis pigmentosa?

6 pts.

7) What specific genetic defect causes sickle cell disease?

18 pts.

8) Below is the coding strand of a segment of DNA. Tell me the mRNA and also the amino acid sequences if the first DNA nucleotide is the start transcription site. Begin to translate when you see a start codon for methionine (Met). The genetic code is provided for you at the end of the test. For your protein sequence, you only need to supply the three letter code for the amino acids as are shown in the genetic code table.

3' GGCAATACCCGGTCGAACTCTTTTTTACCATTGGATCCGGT 5'

8 pts.

9) Nonsense and missense mutations usually destroy a gene's ability to produce a functional protein. Explain why this is so.

7 pts.

10) The Japanese woman who had a mutant SRY gene was sterile. Do you think she inherited this mutation or do you think it was a new mutation in her. Explain your answer.

12 pts.

11) Are these traits linked or are they unlinked? Support your answer by calculating the recombination frequency between the two loci regardless of your conclusion about linkage or no linkage.

Bulging nostrils is a dominant trait over aerodynamic nostrils.

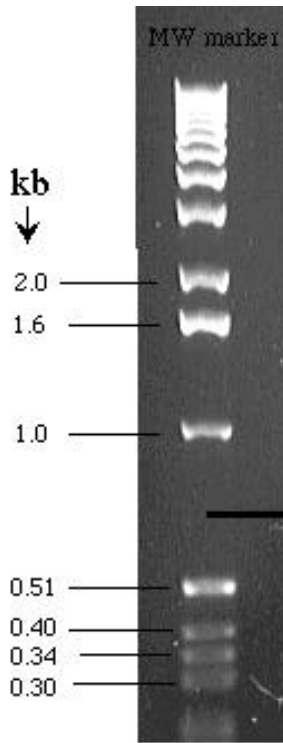
Knee dimples is dominant over rounded knees.

A bunny with bulging nostrils and dimpled knees mated with another bunny that had aerodynamic nostrils and rounded knees. They produced 60 progeny with aerodynamic nostrils and rounded knees; 62 progeny with bulging nostrils and dimpled knees; 40 progeny with bulging nostrils and rounded knees; and 38 progeny with aerodynamic nostrils and dimpled knees.

9 pts.

12) Define allele, gene and locus. Give a specific example for each term using a protein or trait we have studied this semester.

Courtesy Access Excellence Web Site:



2nd base in codon

	U	C	A	G		
1st base in codon	U	Phe Phe Leu Leu	Ser Ser Ser Ser	Tyr Tyr STOP STOP	Cys Cys STOP Trp	U C A G
	C	Leu Leu Leu Leu	Pro Pro Pro Pro	His His Gln Gln	Arg Arg Arg Arg	U C A G
	A	Ile Ile Ile Met	Thr Thr Thr Thr	Asn Asn Lys Lys	Ser Ser Arg Arg	U C A G
	G	Val Val Val Val	Ala Ala Ala Ala	Asp Asp Glu Glu	Gly Gly Gly Gly	U C A G
					3rd base in codon	

