Spring 2007 Biology 111 Take-Home 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 hours, except for typing. There are 5 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 10:30 am on Friday March 2. **EXAMS ARE DUE AT CLASS TIME ON FRIDAY MARCH 2.** 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. You can draw by hand or using the drawing tool in Word.

-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):

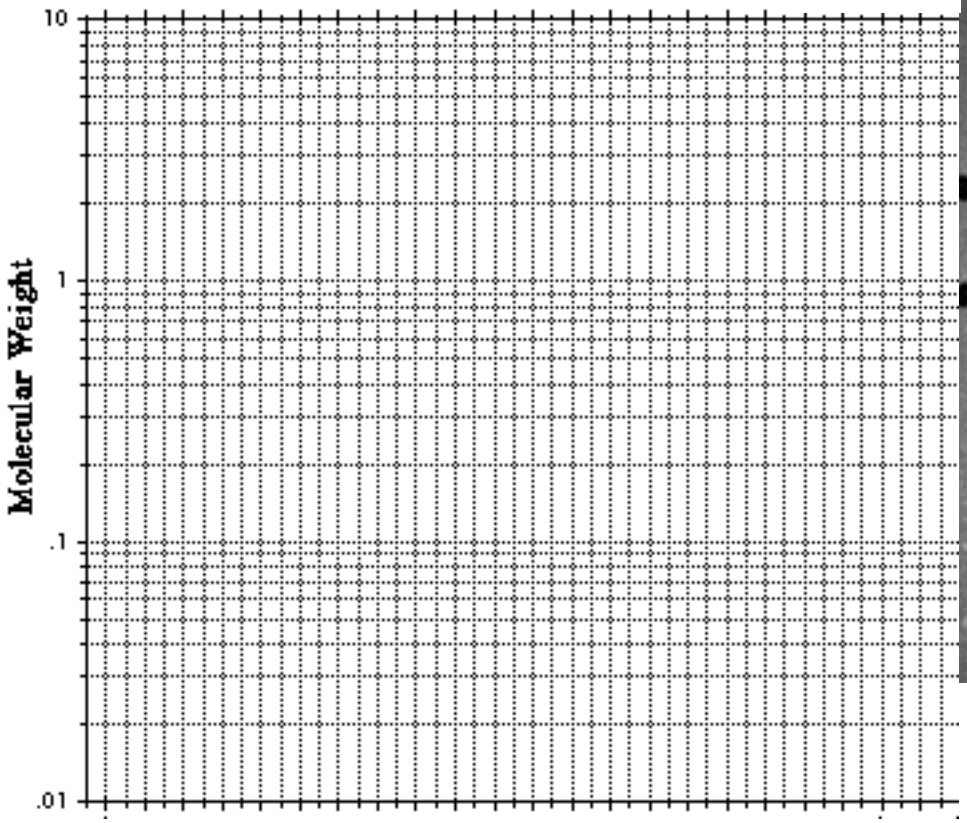
Write out the full pledge and sign:

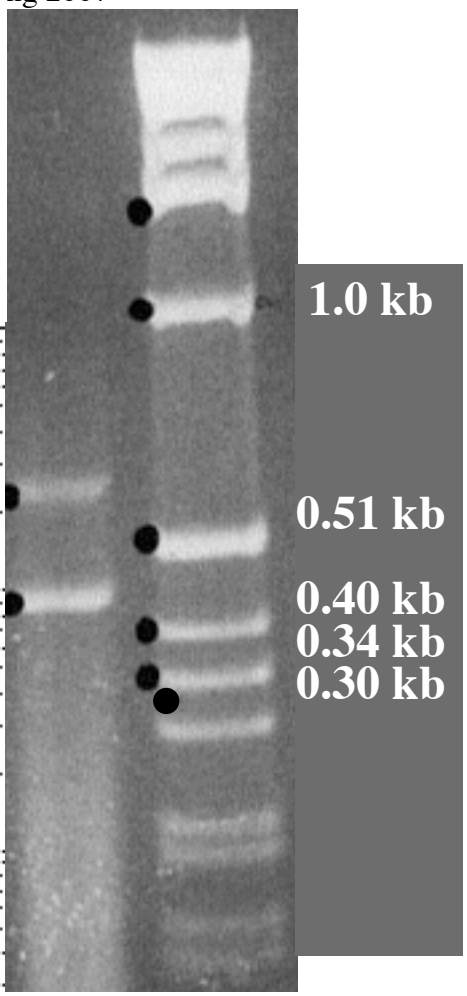
How long did this exam take you to complete (excluding typing)?

Lab Questions

6 pts.

1) Calculate the molecular weights of the two bands marked by dots in the gel on the right (left lane only).
Use this graph paper to find your answer & receive full credit.





Lecture Questions

8 pts.

2) A true breeding smooth pea plant is pollinated by a true breeding wrinkled pea plant. The F1 generation are all smooth. Draw the pedigree for this cross if there are 16 peas produced in the F2 generation. You must list the genotypes for every individual in your tree.

8 pts.

3) The ABO bloodtype is a codominant trait. The phenotype is produced by glycosylation of proteins on the extracellular surface of red blood cells. Draw a picture of a red blood cell surface and then explain why this is codominant.

8 pts.

4) A couple has two children. The parents are both heterozygous and phenotypically wild-type. They have two children, one has a mutant phenotype, the other does not. The F1 man with the

mutant phenotype marries a woman who is phenotypically wild-type. What is the probability that the F1 couple will:
a) have 1 girl followed by 2 boys followed by 1 girl (4 children from 4 different pregnancies)?
b) have a child (out of the 4 above) that has the disease phenotype?
c) have a girl (out of the 4 above) with the disease phenotype?
d) their youngest child of 4 will have the disease phenotype?

6 pts.
5) Explain how the woman with the SRY mutation acquired her mutation.

8 pts.
6) This image is taken from S phase, and the DNA is entering the protein complex from the bottom left corner towards the middle of the picture.
a. draw an arrow to the ligase.
b. draw a line (no arrow) to the Okazaki fragment.
c. draw a box around the leading strand.
d. draw a circle around the helicase.

8 pts.
7) This is transcription.
a. draw circle around RNA polymerase.
b. draw a box around the entire pre-mRNA.
c. draw an arrow that points to the enhancer (aim carefully)
d. what phase of transcription is shown here?

8 pts.

8) The 3' end of the mRNA is on the right side.

a. draw an arrow pointing to the incoming tRNA.

b. draw a circle around the A site.

c. draw a square around any one codon, but only one.

d. draw a line (with no arrow) that points to the carboxyl-most amino acid in the translating protein shown here.

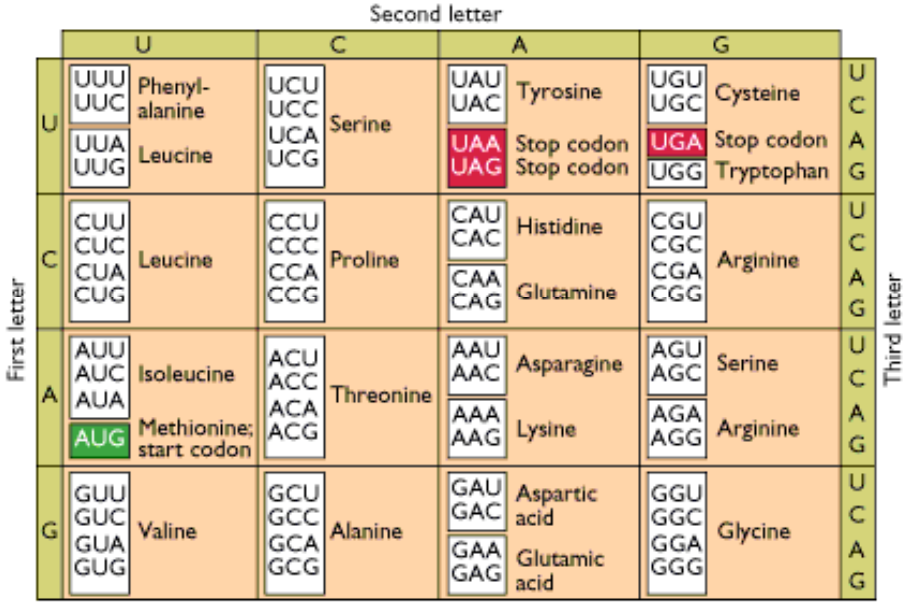
6 pts.

9) Find the correct reading frame and translate the encoded protein. For fun, use the one letter code for amino acids using the tables provided for you on the next page. You must write the protein from N terminus to C terminus (left to right).

GTGCAAGGATATGTACTGGATTTTAGACTGTGCGACTTCGTGGATAAACTGAGCGTTTG

Your answer:

YOU DO NOT NEED TO PRINT PAGE 5!!



amino acid	three letter code	single letter code
glycine	Gly	G
alanine	Ala	A
valine	Val	V
leucine	Leu	L
isoleucine	Ile	I
methionine	Met	M
phenylalanine	Phe	F
tryptophan	Trp	W
proline	Pro	P

serine	Ser	S
threonine	Thr	T
cysteine	Cys	C
tyrosine	Tyr	Y
asparagine	Asn	N
glutamine	Gln	Q

Electrically Charged (negative and hydrophilic)

aspartic acid	Asp	D
glutamic acid	Glu	E

Electrically Charged (positive and hydrophilic)

lysine	Lys	K
arginine	Arg	R
histidine	His	H