Spring 2008 Biology 111 In-Class Exam #2 – Classical Genetics

The in-class portion of this exam is designed so that you can complete it in 20 minutes, but you may use the full 50 minutes. There are 3 pages for this exam, including this cover sheet. You are <u>not allowed to use your notes, old tests, the internet, or any books, nor are you allowed to discuss the test with anyone</u> until the in-class exam is completed at 1:30 pm on Friday February 29. You <u>may</u> use a calculator and/or ruler for both portions of the exam. The **answers to the in-class exam must be hand written very neatly. If I cannot read your writing, then you will lose points because I cannot determine whether you have the right answer or not**.

<u>For the in-class test, bring a **black ink pen**, **a red ink pen**, and a regular pencil.</u>

-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 pledge and sign:

On my honor I have neither given nor received unauthorized information regarding this work, I have followed and will continue to observe all regulations regarding it, and I am unaware of any violation of the Honor Code by others.

Lab Question:
3 pts.
1) List the steps a PCR machine cycles through in order to amplify DNA.

95° C – denature DNA
65° C – anneal primers
72° C – elongate DNA
repeat

Lecture Questions:
6 pts.
2) Starting with this sequence below, produce new sequences that match these terms (underline the mutations you create):
CTAUGGCAUGCUACCAUUGAUUU

Frame shift:
Lots of possible answers – insert 1 or 2 bases easiest to do

Missense mutation:
Lots of possible answers – need stop codon

Translate the original mRNA provided above (use the single letter code for each amino acid):
MACYH

	T	C	A	G
T	TTT Phe (F) TTC Phe (F) TTA Leu (L) TTG Leu (L)	TCT Ser (S) TCC Ser (S) TCA Ser (S) TCG Ser (S)	TAT Tyr (Y) TAC Tyr (Y) TAA **Stop** TAG **Stop**	TGT Cys (C) TGC Cys (C) TGA **Stop** TGG Trp (W)
C	CTT Leu (L) CTC Leu (L) CTA Leu (L) CTG Leu (L)	CCT Pro (P) CCC Pro (P) CCA Pro (P) CCG Pro (P)	CAT His (H) CAC His (H) CAA Gln (Q) CAG Gln (Q)	CGT Arg (R) CGC Arg (R) CGA Arg (R) CGG Arg (R)
A	ATT Ile (I) ATC Ile (I) ATA Ile (I) **ATG** Met (M)	ACT Thr (T) ACC Thr (T) ACA Thr (T) ACG Thr (T)	AAT Asn (N) AAC Asn (N) AAA Lys (K) AAG Lys (K	AGT Ser (S) AGC Ser (S) AGA Arg (R) AGG Arg (R)
G	GTT Val (V) GTC Val (V) GTA Val (V) GTG Val (V)	GCT Ala (A) GCC Ala (A) GCA Ala (A) GCG Ala (A)	GAT Asp (D) GAC Asp (D) GAA Glu (E) GAG Glu (E)	GGT Gly (G) GGC Gly (G) GGA Gly (G) GGG Gly (G)

10 pts.
3) Draw a picture of metaphase I. Your diagram must be for a diploid cell with chromosomes numbered 1, 2 and 3, each of a different length. Be sure to include the *spindle in normal pencil color*. Color code the paternal DNA BLACK and the maternal DNA RED. Be sure your chromosomes show evidence of having gone through prophase I.
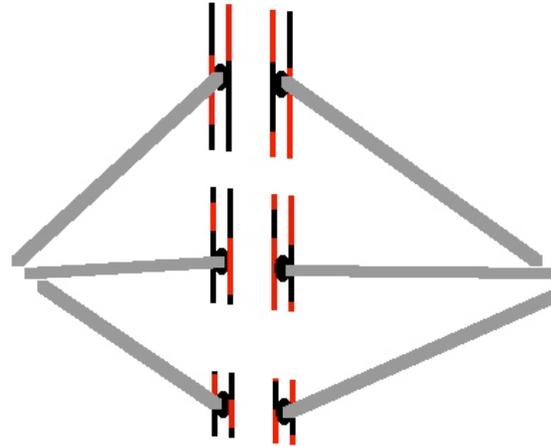
Now draw those same chromosomes at anaphase I.
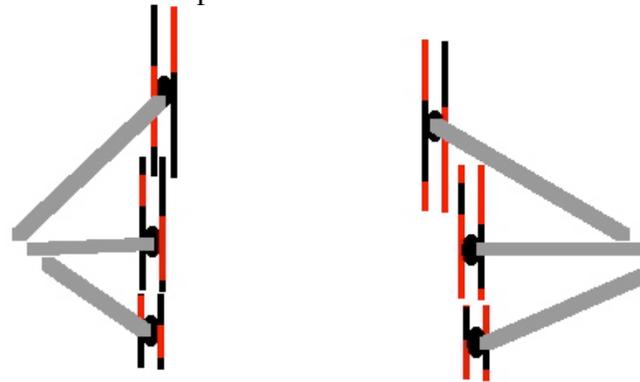
10 pts.

4) Using the line below as dsDNA, augment the drawing by adding: 2 enhancers, one promoter, start codon, stop transcription site, stop codon, and all the transcription factors needed to activate this gene. Draw a box around all the DNA that is downstream.

Enhancer 1 and 2   Promoter   ATG start codon   Stop codon stop transcription

Downstream box
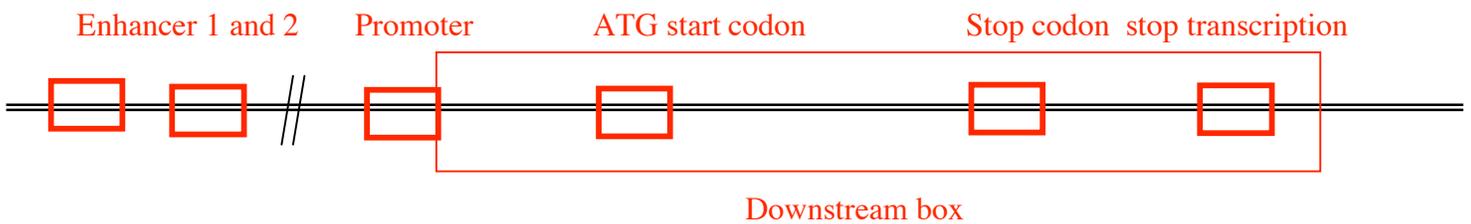
8 pts.

5) Draw a picture of a ribosome and label its key parts.

N

Large subunit

P   A

5'   3'

Small subunit

3
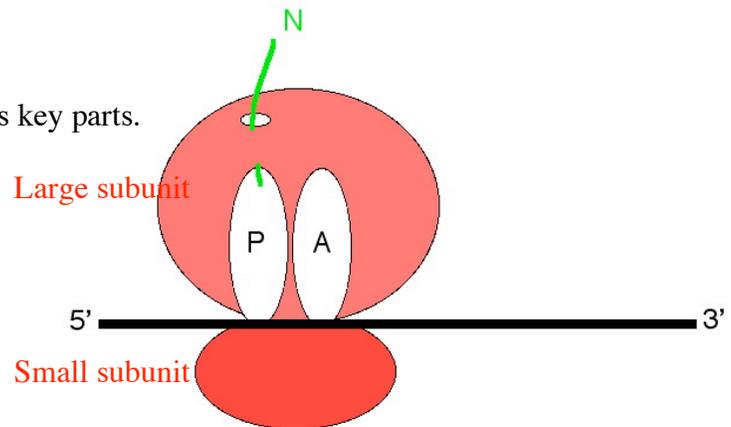
3 pts.

9) What is the probability of producing a purple boned, national anthem humming F1 from this mating, assuming the loci are on separate chromsomes:

b = bones colored purple

a = ankles hum national anthem when walking

Bbaa   x   bbaA

Final answer here

1/4