

**Fall 1999 Biology 111 Final Exam
Cancer, HIV, Genetic Engineering and Pseudo-Cumulative.**

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. You are not allowed to use your notes, old tests, or any books, nor are you allowed to discuss the test with anyone until all exams are turned in at noon on December 15. **EXAMS ARE DUE AT NOON ON DECEMBER 15.** I will be out of town Dec. 11 – 13 and back in my office on Dec. 14. 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.

-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:

8 pts.

1) a) Determine the molecular weights of the two alleles with dots to the left (next lane) of the molecular weight markers. The molecular weight markers with dots are (from top to bottom)

1.6, 1.0, 0.51, 0.4, 0.34, and 0.3 kb. Use the graph paper provided.

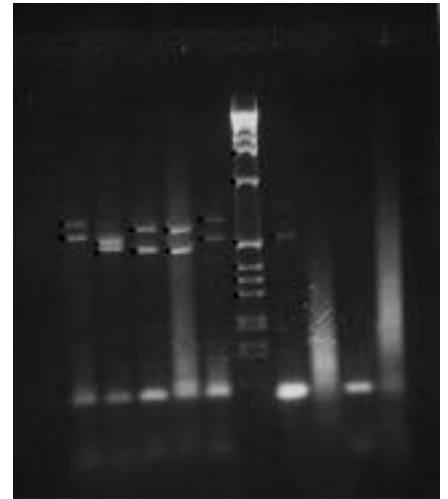
b) If the VNTR at this locus is made of 12 base pairs and the band consists of 99 base pairs if there were zero VNTRs, how many copies of the repeat unit are in each allele from above?

(show your work for partial credit)

Put your answers here:

Top band = _____ base pairs and _____ repeats

Bottom band = _____ base pairs and _____ repeats



2 pts.

2) List one weakness and one strength to PCR-based DNA profiling, compared to RFLP DNA profiling.

Lecture Questions:

6 pts.

3) Briefly describe the naturally occurring mechanism to produce two genetically identical cells.

b) Although these two cells are genetically identical, they may vary in other ways. Explain how this can be. You must give at least two different ways this can happen.

2 pts.

4) Drs. Michael Bishop and Harold Varmus (both graduates of small liberal arts colleges) won a Nobel Prize in medicine for their breakthrough work that discovered oncogenes and protooncogenes. This work set the stage for our understanding of the human genetics behind cancer. What was the name of the pet chicken in their lab at the time that mutant strain of RSV was first isolated?

10pts.

5) In the space provided here, draw a picture of MPF. Be sure to include all relevant binding sites and label them in this figure. As with all figures, you should write a figure legend. In this legend, I want you to tell me the function of each structure that you labeled in your diagram. The figure legend should be typed and added to your list of answers.

6 pts.

6) Interpret these results:

Synchronous cultures of cells in mitosis and G_1 were used to generate heterokaryons. When observed under the microscope, the chromosomes in G_1 were condensing.

6 pts.

7) How can a retrovirus carry a human gene that acts as an oncogene?

5 pts.

8) What is a retrovirus and how does it differ from other viruses?

9 pts.

9) a) Why don't antibiotics work to kill HIV?

b) Why isn't HIV destroyed (in 7 – 10 days) the way the cold virus is?

c) Why are we protected by a tetanus vaccine, but there is no effective HIV vaccine?

8 pts.

10) Briefly explain the mechanism that AZT uses to produce its anti-HIV effects.

b) Briefly explain the mechanism that protease inhibitors use to produce their anti-HIV effects.

4 pts.

11) Give one benefit and one disadvantage inherent in creating a transgenic organism.

8 pts.

12) Nicotine (from cigarettes) binds to, and opens, sodium ion channels on presynaptic nerve termini. Explain how this binding leads to an increase in the release of neurotransmitter from these neurons, which explains why nicotine is a stimulant.

5 pts.

13) How is it possible for a latent HIV provirus to become mutated even though it is not being transcribed or reverse-transcribed?

9 pts.

14) a) If there are 28 alleles in existence for D1S80, what are the odds that two unrelated people would have identical alleles?

b) What are the odds of two siblings having the same alleles if there are four alleles present in the parents?

b) What are the odds of two unrelated people having one band in common (assume both are heterozygous)?

12 pts.

15) a) Explain what is produced and consumed by plant during photosynthesis. Just focus on the beginning and the end, but not intermediates.

b) Explain what is produced and consumed by plants during cellular respiration.

c) In plants, which is more productive, photosynthesis or cellular respiration? Explain how you know this.

+2 Bonus Points

Design the appropriate control(s) for the experiment in question # 6.