

Biology 111 Take-Home Exam #4 – Cancer, HIV, & Genetic Engineering

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 3 pages in this test, including this cover sheet. You are not allowed to look at someone else's test, nor use your notes, old tests, the internet, any books, nor are you allowed to discuss the test with anyone until all exams are turned in no later than noon on Monday May 14. **EXAMS ARE DUE BY NOON ON MONDAY MAY 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 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):

Read the pledge and sign if you can do so with honor:

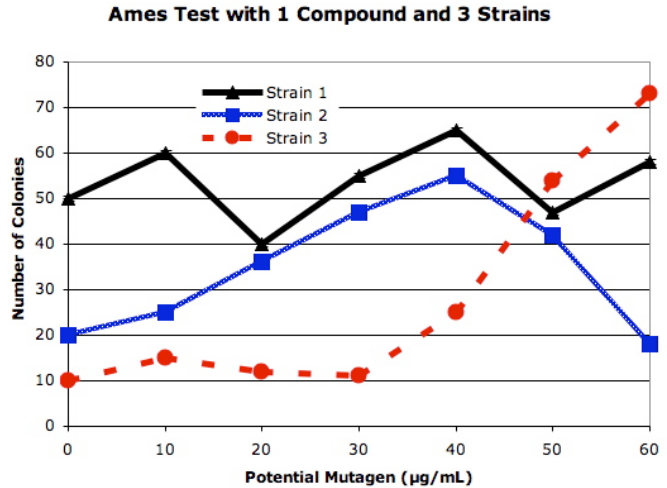
On my honor I have neither given nor received unauthorized information regarding this work, I have followed and will continue to observe all regulations regarding it, and I am unaware of any violation of the Honor Code by others.

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

Lab Questions:

7 pts.

1) Interpret these data from an Ames test conducted in the secret Davidson College Food Testing Lab. The procedure used in this experiment was identical to what you did in lab.



Lecture Questions:

6 pts.

2) How do carcinogenic mutations differ from non-carcinogenic mutations? To receive full credit, you must use specific examples in your answer.

8 pts.

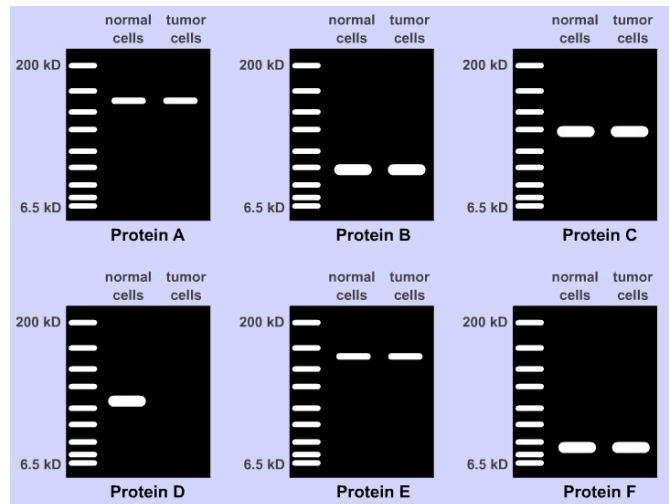
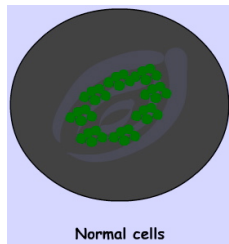
3) List four major types of proto-oncogenes and give a specific human example for each type.

6 pts.

4) Here are some western blot data for a cancer patient. →

- What is wrong with this patient?
- Theoretically, could gene therapy be beneficial in this case? (ignore issues of technical challenges)

c. What category of molecule is affected in this patient? Green represents immunofluorescent staining of wild-type molecules affected in the patient; only one cell is pictured here. →



6 pts.

5) Once you finish your finals, you travel home and a grandmother asks you two questions which you must answer now:

- What is the difference between being HIV+ and having AIDS?
- Is it possible to have AIDS but test HIV- using an ELISA? (this grandmother is pretty savvy with molecular medicine!)

6 pts.

- 6) a. What is the difference between a nucleoside and a nucleotide?
- b. Name one drug that is based on one of your DNA bases.

10 pts.

- 7) a. What are the two branches of your immune system and which types of illnesses does each specialize in killing?
- b. What is immunological memory?

8 pts.

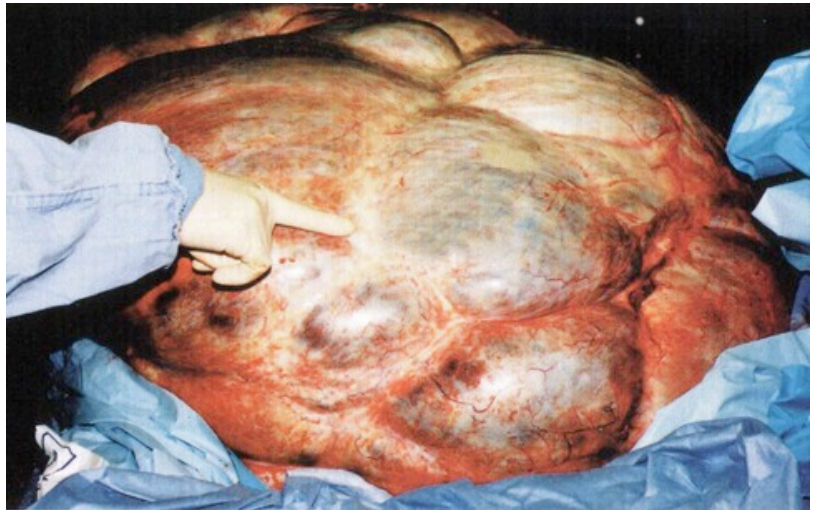
- 8) Compare and contrast the production of a transgenic organism with the application of gene therapy for a disease such as CF.

8 pts.

- 9) The photo shown here is real. It is a photograph taken of the world's largest tumor that was removed at Johns Hopkins University from a woman who weighed about 600 pounds. The tumor was 330 pounds and about 3 feet in diameter (it was ovarian in origin). Her only complaint was shortness of breath and this led to an MRI that revealed the tumor.

- a. In 3 sentences or less, what genes must have been activated, and what genes must not have been activated, to make the mass of cells a tumor but not a cancer?

- b. In two sentences or less, tell me what type of cellular respiration these tumor cells must have used while inside her body.



3 pts.

Bonus Question:

- In two sentences or less, explain why it is impossible to get identical personalities in a clone vs. the original person.