

Spring 2006 Immunology Exam #2 - Chapters 5 - 7

There is no time limit on this test, though I have tried to design one that you should be able to complete within 4 hours. You are not allowed to use your notes, any books, any electronic sources, nor are you allowed to discuss the test with anyone until all exams are turned in at 9:30 am on Friday February 24. **EXAMS ARE DUE AT CLASS TIME ON FRIDAY FEBRUARY 24.** Turning in an exam late will cost you a letter grade for each 24 hours. The **answers to the questions must be typed** unless the question specifically says to write/draw the answer in the space provided. If you do not type your answers on the appropriate pages, I may not find them unless you have indicated where the answers are. You will need black, blue, and red ink pens, as well as a regular pencil to answer at least one question on this exam.

There are 3 pages to this exam, including the cover sheet.

-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 here):

Write out the full pledge and sign:

How long did this exam take you to complete this exam?

20 pts.

I. Define these terms: 2 pts each. Define the terms and demonstrate your knowledge. These terms can be define succinctly so using a lot of words is not the best way to demonstrate your fluency with these terms. You may combine words with pictures if this helps, but don't hand write the words unless you print VERY neatly.

li

haplotype

AP1

JAKs

pro-B cell

nude mice

NK T cells

receptor editing

anergy

qualitative signaling hypothesis

Part II

Many of these questions require you to synthesize a lot of information and put what you know into a single answer. Volume of words is not the best response. If you say something wrong, it will cost you points. Be concise and answer the question I have asked.

15 pts.

1) Draw a cross-sectional picture of a non-leukocyte cell that has no functional tapasin. Your picture should show:

- a. MHC I in red
- b. peptides in blue
- c. ER in black
- d. Plasma membrane in pencil

You may show any other IMPORTANT molecules/structures you want.

15 pts.

2) **OUTLINE** the steps of vaccination beginning with what you put in the syringe to the production of secreted antibodies. Include the major steps of our immune systems response. To make it easier for me to grade, everyone should generate a vaccine against the bacterium that causes plague (black death).

15 pts.

3) Many anesthetics work because they block calcium channels. **OUTLINE** the signaling steps involved in T cell activation when the T cell is exposed to an anesthetic that blocks all calcium fluctuations, and where any of these pathways would be blocked.

5 pts.

4) Draw a picture of a T cell surface when it first becomes double positive. Use colors as you see fit. Label all the proteins you want me to grade.

15 pts.

5) Explain the final T cell outcome for these experimental conditions:

- Thymectomized mouse with MHC^{bxc} given donor thymus of genotype MHC^c.
- Male MHC^d mouse bone marrow injected into irradiated female MHC^c mouse.
- Transgenic mouse with mutated MHC I such that CD8 cannot bind to MHC I.
- MHC^a mouse has its HLA-DM mutated (mouse ortholog = H-2M).

Now, describe whether this organ transplants will work or not and explain your answer:

e. A mouse called Mickey is MHC^b has no bone marrow.

A mouse called Daffy is MHC^a and donates some bone marrow to Mickey.

A mouse called Tweety is MCH^{axb} and donates a kidney. Will the kidney transplant work?

15 pts.

6) Explain what you would have to do to produce a vaccine that could cure the common cold virus but does NOT use antibodies to work. Include in your answer how a normal immune system would respond in order to produce an adaptive immune response.

3 pts. Bonus

Sometimes a bone marrow transplant leads to a graft vs. host rejection where the new lymphocytes attack the new body. Explain how this can happen based on what we have learned so far.