

Immunology Exam 2

October 9th, 2009

50 points

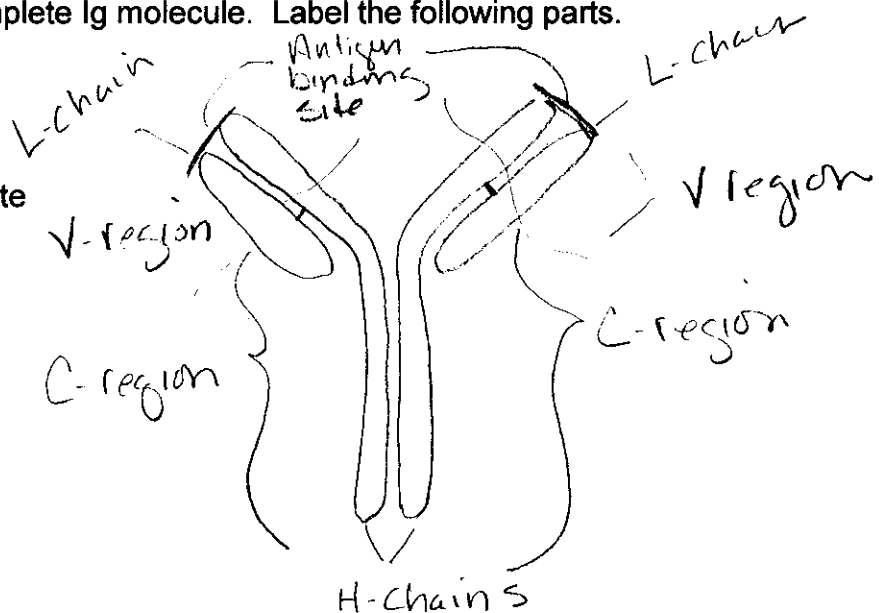
Name Key

Use complete sentences and/or sketches to answer the questions. Often, a specific example is often worth many words.

Part 1

Answer all 5 questions from the following group. Use only the space provided.

1. (5 points) Sketch a complete Ig molecule. Label the following parts.
- V-region
 - C-region
 - H-chain
 - L-chain
 - antigen binding site



2. (5 points) a. What is the general mechanism for complement activation?

Complement is activated in a series of protein cleavage events. C proteins are always present in an inactive form. Activation requires the large inactive protein be cleaved into 2 proteins (of different size). The larger protein is often a protease which will activate a second protein or which binds to the pathogen. The smaller proteins are often mediators of inflammation.

b. (2 points) Why is complement activation faster than activation of cells via a signal transduction mechanism? (like the events that occur after TLRs bind to antigen).

The complement proteins are ^{already} present, but not active. The process of signal transduction culminates with initiation of gene expression - The protein needs to be synthesized "from scratch".

DNA → RNA → Protein

3. (6 points) Give a written explanation of figure 3-6. Be as specific as possible explaining what is represented on the X and Y axis and the use of color in the figure.

Figure 3.6 represents the relative variability in amino acids within the first 110 residues of the V-regions of Ig L and Ig H chain genes. The x axis shows the linear position of each AA. The y axis shows how much variation occurs at each position. The higher the bar, the greater the number of different possible amino acids @ that position. The red bars/sections show the most variation, or the hypervariable regions. The H-chain V region is shown in blue. The L-chain V region is shown in yellow. The red regions end up at the ends of the folded V-regions.

4. (6 points) What insures that only B-cells and T-cells engage in somatic recombination and that the somatic recombination in B and T cells is limited to the Ig and TCR genes? (There are 2 parts to the answer.)

1. Somatic recombination requires the RAG1 and RAG2 enzymes. These are only expressed in B & T-cells.

2. Somatic recombination occurs when RAG1 or RAG2 enzymes bind to recombination signal sequences, which have specific sequence & spacing. Only Ig & TCR genes have these RSS, within them.

5. (6 points) Sketch a CTL binding to a host target cell. Show the important contacts (molecules that interact) holding the 2 cells together.

