

To remain as unbiased as possible when grading exams, I ask that you place your name and a neutral identifier on the half sheet of paper. Write the same identifier, **BUT NOT YOUR NAME**, on the line below. When you turn in the exam, you will place the name/identifier in an envelope which I will use only after grading to record your score.

IDENTIFIER Key

## SECTION 1

Questions 1-4 are short answer type questions (6 points each). Answer all 4 of these questions using complete sentences, using the space provided (do not use extra paper). Answers to these questions should show you have a *big-picture* understanding of the specific immunology concept. However, answers in this section should be sufficiently complete and specific to receive full credit.

1. A. What is the general purpose of the immune system?

The purpose of the immune system is to protect the organisms from disease or death caused by pathogens. (bacteria, fungi, viruses, <sup>parasitic</sup> worms)

B. How do the 2 main systems, innate and adaptive immunity, serve this general purpose in different ways?

Events related to innate immunity are rapid & intense to try to limit the spread & damage done by the pathogen. Innate system cells are only semi-specific in that they recognize features common to many pathogens, not a specific antigen. Adaptive immune responses are slower to develop and entirely antigen specific - but are eventually very powerful. They also protect the host long-term when memory lymphocytes persist.

2. A. Briefly summarize the routes by which pathogens gain entry into humans and the barriers set up to prevent such entry.

Pathogens can enter via the mouth, eyes, ears, or openings to the digestive or urogenital tract, or breaches in the skin - e.g. wounds. The skin & mucous linings have mechanical barriers such as tight junctions between cells, & cilia. Chemical barriers such as low pH or destructive enzymes, and microbial barriers - the normal population of bacteria that compete with pathogens.

B. How do the host cells that harbor intracellular pathogens get distinguished (by T-cells) from those that don't?

T-cells bind to antigen that is displayed on the host cell surface. (Pieces of protein from the pathogen presented by MHC.)

3. Inflammation occurs in the vast majority of bacterial infections, and results in some level of discomfort for the host.

A. How does inflammation aid in fighting bacterial infections? Inflammation results in an influx of phagocytes from the circulation, clotting (and fluid containing antigen) & walling off of the area of infection and repair of damaged tissues surrounding the area of infection.

B. What is happening, specifically, when inflammation occurs in a tissue—say a finger you cut while slicing veggies? (What accounts for the sensations you experience in that finger?)

The feeling of pain, heat, redness & swelling are the result of changes in local blood vessels. Blood vessels dilate, bringing in more blood & slowing its flow (redness & heat). The swelling & accompanying pain from stretched skin is the result of leakiness in the endothelial cells allowing fluids with cytokines, antibodies etc to leave the circulation & enter the affected tissue.

C. Why must inflammation be both rapid, and tightly controlled?

If inflammation becomes systemic, blood vessels throughout the body will dilate. This causes rapid blood pressure drop and can be fatal. This condition is called shock.

4. HIV infects and disables both T-cells and macrophages. In your opinion, is the loss of one cell type more serious than the other? Support your answer.

Thus far we have discussed the importance of macrophages as the primary mediators of the innate response and with a role as APC in the adaptive response, so from that respect a loss of macrophages would negate both an innate & an adaptive response.

\* Other answers possible - We will learn later that T-cells are indispensable for most viral pathogens