Immunobiology
Exam # 1, Fall 199

Name_____

I. Multiple Choice (3 points each)

_____1. Which of the following statements is **TRUE** concerning innate immunity?

a. It is highly specific in its action against antigen.
b. Antigen (bacterial) killing may be caused by a respiratory burst within macrophages.
c. Before killing or removal, antigen must be bound to the antigen receptor on the APC cell surface.
d. If the antigen is exogenous it is presented by attachment to MHC class I proteins.
e. All of these statements are FALSE.

_____2. Which of the following statements is **FALSE** concerning the immune system?

a. Antigen presenting cells are found only in the primary immune organs.
b. B lymphocytes are capable of processing and presenting antigens to T lymphocytes.
c. T lymphocytes are capable of helping to activate B lymphocytes.
d. All nucleated cells have MHC class I antigens on their cell surface.
e. All of these statements are TRUE.

_____3. Which of the following statements is **FALSE**?

a. Macrophages produce interleukin I.
b. Macrophages are able to express foreign antigen in association with both class I and class II MHC antigens.
c. Macrophages can express more than one type of antigenic fragment in association with MHC class II proteins at the same time.
d. Macrophages are not specific in their ability to process and present antigen to T lymphocytes.
e. All of these statements are TRUE.

_____4. Which of the following statements is **FALSE** concerning antigens?

a. In order to stimulate an immune response antigens may be as small as 6-8 amino acids long.
b. T cells usually "see" native antigen while B cells see

"processed" antigen.
c. Antigens are usually composed of more than one antigenic region.
d. Most antigens do not have repeating antigenic sites throughout their structure.
e. All of these statements are TRUE.

_____5. Which of the following statements is **FALSE**?
a. CD4 proteins represent the antigen binding site on a T cell.
b. CD3 proteins are necessary for signal transduction responses.
c. The T cell receptor (TcR) recognizes both self-MCH and foreign antigen together.
d. The B cell antigen receptor is represented by the surface bound immunoglobulin.
e. All of these statements are TRUE.

_____6. Which of the following statements is **FALSE** concerning the Thymus.
a. "Pre-T cells" migrate from the bone marrow through the blood to the thymus where they enter directly into the medullary region.
b. When a "pre-T cell" enters the thymus it lacks both CD4 and CD8 proteins on the cell surface.
c. As the T lymphocyte matures it will first get both CD4 and CD8 proteins and then lose one or the other before it gets out of the thymic environment.
d. If the thymus is removed in a new born animal the animal will lack the ability to fight effectively against viral diseases.
e. All of these statements are TRUE.

_____7. Which of the following statements are **FALSE**?
a. The thymus positively selects for T cells that have self-MHC receptors and receptors for foreign antigens.
b. The thymus negatively selects for cells that have self-MHC receptors and receptors for foreign antigens.
c. T cells maturing in the thymus that have non-self MHC receptors and receptors for self-antigens will undergo programmed cell death.
d. Any T cell with high affinity receptors for self-MHC alone will be killed during the maturation process in the thymus.

_____8. Which of the following in **NOT** a second messenger molecule?
a. calcium b. cyclic AMP
c. diacylglycerol d. adenylate cyclase

_____9. Which statement is **FALSE** concerning antigens?
a. Most antigens induce a polyclonal response.
b. MHC genes play a major role in determining the degree of immune responsiveness to an antigen.
c. A large protein can combine with many different antibody molecules.
d. Each MHC molecule binds a unique peptide.
e. All of these statements are TRUE.

____10. Antigenic stimulation does **NOT** cause which of the following to occur in T lymphocytes?

a. Activation of transcriptional and translational events.
b. Cellular proliferation and secretion of cytokines.
c. Production of MHC receptors and antigen receptors.
d. Production of interleukin-2 and interleukin-2 receptors.
e. All of these occur.

II. Fill-In (2 points each)

11. The process whereby thymocytes are pre-programmed to die is called _____.

12. The process of _____ is one in which phagocytic cells are able to better engulf antigens due to antibody binding.

13. One type of granulocytic cell is a _____.

14. The CD protein that is able to recognize and bind to self- MHC class II proteins is CD _____.

15. The CD protein that is able to recognize and bind to self-MHC class I proteins is CD _____.

16. The CD 45 molecule is important in _____ _____.

17. A molecule that is not immunogenic by itself but is capable of binding to antibodies is called a _____.

18. A _____ _____ is an antibody-producing B lymphocyte.

19. The receptor that allows immunoglobulin E (Ig E) to bind to mast cells is called the _____ receptor.

20. The type of cell that does not need activation for killing of foreign cells or tumor cells is called _____ _____.

21. Name 3 ways that antibodies work to rid the system of foreign antigens: (21) _____, (22) _____, (23) _____.

24. The two primary lymphoid organs are the _____ and the _____.

25. The structure in birds that is the site of B cell maturation is

the _____.

26. Two types of APC's are : _____, and _____.

27. Proliferating B cells can be found in the _____ _____ of the splenic follicles.

28. The five classes of immunoglobulins are: _____.

29. The K and D regions of the mouse MHC represent class ____ molecules.

30. _____ is a non-responsive state of the immune system to specific antigens.

III. Short Essay (5 points each)

Pick <u>4</u> of the following and answer them:

31. Describe the interaction of an APC with an antigen (i.e., what three processes occur and what is the importance in T cell stimulation).

32. Discuss the interaction of an MHC molecule with an antigen (i.e. what are the differences between exogenous and endogenous Antigens, and what is the specificity of binding).

33. Discuss the purpose of second messengers (give examples) and

briefly describe some of their actions.

34. Describe the differences between T cell dependent and T cell independent B cell activation.

35. Discuss, briefly, the role of the thymus. What is the "educational program" that it offers?

IV. Essay (10 points)

36. Discuss **either** of the following 2 situations: if you have time and want to do a bonus question then answer both parts (the second, bonus answer will count for 5 extra points).

A. You are infected with a hepatitis virus. Describe how your immune system would respond to this invasion by going through how the immune

system senses the foreign invasion, responds to the antigen, and gets rid of the antigen.

B. You are infected with the bacteria *Streptococcus pyogenes* (Strep. throat). Describe how your immune system would respond to this invasion by going through how the immune system senses the foreign invasion, responds to the antigen, and gets rid of the antigen.