BIO 158
IMMUNOLOGY EXAM
February 8, 2005

NAME: [Redacted]

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\frac{38}{40} = 95.0\%
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1. Which of the following B cell activities require T cell help?
   A. Expression of Membrane IgM
   B. Expression of κ Light Chain
   C. Rearrangement of Germline Gene Segments to Code for Variable Portions of Antibody Molecules
   D. Isotype Switching
   E. Expression of Surface MHC Class II Molecules

2. The Thoracic duct
   A. is the lymphocyte port of entry to the blood from the lymphatic system.
   B. was a major aqueduct in ancient Rome.
   C. is the dendritic cell port of entry for travel from the periphery to the lymph node.
   D. is part of the air venting system in the BMC.
   E. facilitates transfer of maternal antibody to the fetus.

3. You are a physician stationed at a base where a number of military personnel have recently returned from an extended mission in the Middle East. Several individuals are discovered to be ill with a virulent isolate of the intracellular bacteria, Listeria. The organism has been genetically engineered to be resistant to all known anti-bacterial drugs. Based upon what you have learned, which of the following would you attempt to use to treat these individuals?
   A. TGF-β
   B. IL-5
   C. IFN-γ
   D. IL-4
   E. Type 1 IFN

4. All of the following are true about NK cells EXCEPT that they
   A. make IL-2 to support T cell proliferation.
   B. use perforin to mediate lysis of virus-infected cells.
   C. mediate ADCC.
   D. are part of innate immunity.
   E. make IFN-γ in response to IL-12.
Each item or incomplete statement in this section is followed by answers or by completion of the statement. Circle the one lettered answer or completion that is best in each case.

5. Which of the following statements is true concerning the function of the thymus?
   A. It is a site of B cell development.
   B. It is a secondary lymphoid organ.
   C. It increases in size with increasing age.
   D. It is a site of T cell development and selection.
   E. It is a site for lymphocyte recirculation.

6. Which of the following can be found in lymph nodes?
   A. marginal zones
   B. red pulp
   C. Hassall's corpuscle
   D. germinal centers
   E. white pulp

7. Upon her return from South America, an otherwise normal 12 year old girl is found to be infected with a helminth parasite. She is doing relatively well because of an endogenous Th2 type cytokine response. Which of the following would you expect to see?
   A. IL-2 and CD4 T Cell IFN-γ Production
   B. TNF, IL-1 and IL-6 Production
   C. IFN-γ Production and IgE
   D. IL-5 Production and Eosinophils
   E. IL-15 and IL-12

8. All of the following components can be used by adaptive immune responses EXCEPT
   A. natural killer cells.
   B. B cells.
   C. MAC.
   D. alternate pathway of complement activation.
   E. macrophages.
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9. CD8 T cells can do all of the following EXCEPT
   A. be induced to make IFN-γ.
   B. be induced to become cytotoxic T lymphocytes.
   C. be a major helper cell for B cell antibody responses.
   D. mediate defense against viral infections.
   E. mediate lysis through a perforin-dependent pathway.

10. A dentist is bitten by a HIV-infected patient a day before this individual is found to have AIDS. How would you determine if the dentist was infected as a result of the incident?
    A. Call His/Her Mother
    B. Test for Virus Antibodies Immediately and at Two Weeks After the Exposure
    C. Test for Serum Cytokines
    D. Test for T Cell Proliferative Responses to the Virus at the Time of the Incident
    E. Test for Antibodies at Six to Eight Months After the Exposure

11. Mechanisms for inducing tolerance to self include which of the following?
    A. central tolerance resulting from deletion of self reactive cells in the thymus
    B. peripheral tolerance resulting from deletion of self-reactive cells
    C. peripheral tolerance resulting from anergy
    D. A and C
    E. A, B and C

12. Infection of individuals in a species that had evolved so as to have specific receptors for antigens but not to have complement, mononuclear phagocytes, granulocytes, or cytokines would result in which of the following?
    A. induction of a DTH response
    B. a protective immune response
    C. allergies
    D. succumbing to most infections
    E. anaphylactic shock
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13. Two unusual completely HLA identical individuals, each heterozygous across the MHC, have four children. Which of the following statements about the family members are probably true? (Assume that there are no recombinatorial events occurring.)

A. All of the children would accept skin grafts from the mother.
B. Organ transplants from either parent would be rejected in half of the children.
C. All of the children would accept skin grafts from each other.
D. All of the children would be heterozygous at the MHC.
E. Bone marrow transplants from the mother would be accepted in all of the children.

14. Which of the following are two hallmarks of the adaptive immune system?

A. Immediate and Broad
B. Immediate and Passive
C. Specificity and Memory
D. Non-Specific and Fast
E. Innate and Short

15. A major function of IgM is to

A. cross the placenta and mediate protection in newborns.
B. mediate protection at secretory sites.
C. play a unique role in defense against parasites.
D. mediate early defense by activating complement.
E. induce mast cell degranulation.

16. Presentation of internal antigen on class I MHC molecules is required for

A. activation of CD8+ T cells.
B. protection against infection with extracellular bacteria.
C. generation of an IgE antibody response.
D. generation of DTH responses to extracellular protein antigens.
E. affinity maturation of the antibody response.
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17. Suzy and her sister Alice were exposed to the infectious virus that causes a hepatitis in the fall of 1990. Suzy's physician gave her gamma globulin. Alice did not see her physician. Alice developed hepatitis but survived the illness. While vacationing in Costa Rica two years later, the sisters were re-exposed to the hepatitis virus. Alice did not develop disease but Suzy became very ill. What happened?

A. Alice developed passive immunity.
B. Alice developed active immunity.
C. Suzy had a poor immune system.
D. Suzy developed active immunity.
E. The physician made a mistake.

18. All of the following are important functions of the innate immune system EXCEPT that it 

A. promotes early defense against infectious agents.
B. has specific receptors for antigens.
C. recognizes microbes through receptors for "molecular patterns".
D. has immunoregulatory functions.
E. has nonclonal distribution of receptors.

19. If you had a tumor but did not know which of its proteins might be an antigen, what might be the best procedure to attempt to induce an immune response against it?

A. vaccinate with dendritic cells genetically modified to express tumor antigens
B. deplete endogenous T cells
C. vaccinate with tumor cells genetically modified to express cosstimulatory molecules
D. vaccinate with dendritic cells pulsed with tumor antigens
E. treat with IL-4

20. Which of the following statements about T cell receptors for antigen are true?

A. They contain variable α and β chains for antigen binding.
B. They see antigen peptide presented by either MHC class I or class II molecules.
C. They contain constant CD3 γ, ε, and ζ molecules for TCR expression and signal transduction.
D. A and B
E. A, B and C
Each item or incomplete statement in this section is followed by answers or by completion of the statement.
Circle the one lettered answer or completion that is best in each case.

21. Tolerance has all of the following characteristics EXCEPT that it

A. is a state of specific immunological unresponsiveness.
B. is induced when B and/or T cells are exposed to antigen in the absence of appropriate co-stimulatory signals.
C. is learned or acquired.
D. is independent of the route and dose of antigen administration.
E. can be a result of T cell clonal deletion in the thymus.

22. Mechanisms with the potential to contribute to allogeneic graft rejection by the recipient include all of the following EXCEPT

A. antibody-mediated hyperacute rejection.
B. passenger lymphocytes.
C. T cell-enhanced acute rejection.
D. chronic rejection with vessel occlusion.
E. CTL-mediated cell destruction.

23. Two unrelated individuals, AB and CD, are simultaneously exposed to an unusual new infectious agent expressing only one antigenic determinant on a single protein molecule. Both of these individuals led uneventful lives prior to encountering this new agent. Individual AB has a minor infection and recovers but CD has major problems fighting off the agent. After a period of one to two weeks, a DTH response to the antigen can be observed in individual AB but not individual CD. Both individuals demonstrate DTH responses to candidal antigens. High titers of IgG antibodies, binding to the infecting agent, are found in serum isolated from the AB individual at two weeks post-infection but only low titers of IgM are in serum from CD. What is the most likely explanation for the difference in susceptibility to the infection?

A. CD has deficient T cells.
B. CD's histocompatibility molecules fail to present the antigen.
C. AB has deficient T cells.
D. AB's histocompatibility molecules fail to present the antigen.
E. AB has protection conferred by maternal antibodies.

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\begin{array}{c|c}
\text{AB} & \text{CD} \\
\hline
\text{minor infection} & \text{major infection} \\
\text{DTH} & \text{no DTH} \\
\text{high IgG} & \text{low IgM} \\
\text{T-dependent Ag} & \text{not T cell help} \\
\text{like a T-independent Ag} & \\
\end{array}
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24. Acute rheumatic fever is an example of which of the following?
   A. an autoimmune disease
   B. molecular mimicry with induction of the disease dependent upon an immune response to a Streptococcal cell wall antigen cross-reacting with a myocardial antigen
   C. breaking of tolerance to self
   D. a disease dependent upon antibody
   E. all of the above

25. An individual is genetically deficient for the IFN-γ receptor. Which of the following would you expect to be blocked?
   A. NK Cell Development.
   B. Cell Surface Expression of A Functional T Cell Receptor for Antigen on Mature T Cells
   C. Antimicrobial Defense
   D. IgM Antibody Responses
   E. Immunoglobulin Gene Rearrangement

26. You would want the cells from a potential transplantation donor to have or do all of the following EXCEPT
   A. a match for class II MHC.
   B. be free of HIV.
   C. a match for class I MHC.
   D. stimulate proliferation of your peripheral white blood cells.
   E. be matched for blood group antigens.

27. A male child presents in your office at about 8 months of age with unusual susceptibility to a variety of infections. After ordering tests, you discover that there are decreases in all serum Ig isotypes and reduced B cell numbers but T cell numbers are normal. What do you expect the problem to be?
   A. DiGeorge syndrome
   B. SCID
   C. X-linked agammaglobulinemia
   D. X-linked hyper-IgM syndrome
   E. AIDS
NAME:

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Receptors for the Fc portion of IgG facilitate all of the following EXCEPT

A. opsonization of microbes for phagocytosis
B. antibody-dependent cell-mediated cytotoxicity by NK cells
C. downregulation of antibody production by B cells
D. activation of complement - classical pathway
E. transfer of maternal antibodies across the placenta
F. clearance of immune complexes in the kidney

29. You are in the emergency room and 22-year-old motorcycle accident victim is transported by ambulance. The individual has lost significant amounts of blood and needs a transfusion immediately. There is no indication of the victim's blood group. Which of the following blood types would you use?

A. A
B. B
C. AB
D. O - universal donor
E. Rh-

30. The activation of complement can promote all of the following biological responses EXCEPT

A. CTL activation.
B. inflammation.
C. opsonization.
D. cytosis.
E. antibody responses.

31. Although tumors are able to expand because they can avoid activating immune responses, certain types of tumor antigens have been identified. They include all of the following EXCEPT

A. mutated self proteins.
B. products of oncogenes or of mutated tumor suppressor genes.
C. self histocompatibility molecules.
D. oncogenic viral protein products.
E. overexpressed or aberrantly expressed self proteins.
A few weeks after liver transplantation, your patient begins to lose liver function. The most likely mechanism of rejection is which of the following?

- Alloreactive CD8 T Cells
- Circulating Alloreactive Antibodies
- IgE-Armed Mast Cells
- Alloantigen-Specific CD4 T Cells
- Activated Complement

37. Dendritic cells are very good at which of the following?

A. Accumulation in Liver
B. Lysis of Virus-Infected Cells
C. Production of Antibody
D. Killing of Bacteria
E. Antigen Presentation

38. Which of the following is NOT true of class I MHC antigens?

A. They are codominantly expressed
B. They are cell surface proteins on virtually all cells
C. They are processed from cytoplasmic proteins that have been degraded in proteasomes
D. They are the recognition elements for helper T cells

39. Which of the following is NOT true of the gene segments that combine to make up a heavy chain gene?

A. V, D, and J segments combine to encode the antigen-binding site
B. Antigens must first be encountered in order to generate the V, D, and J segments
C. Many V regions segments are available
D. Several J segments and several D segments are available

40. Which of the following is NOT true of class II MHC antigens?

A. They are highly polymorphic
B. They are mostly internalized from the extracellular environment
C. They are found on the surface of both B and T cells
D. They are involved in the presentation of antigen by macrophages