1. Which one of the following statements is correct?

(A) Peptides of 15-20 amino acids in length are preferentially bound to the groove in the MHC Class I molecule
(B) Only senescent (“worn out”) proteins are degraded by proteasomes and bind to MHC Class I molecules
(C) Peptides derived from viral proteins are preferentially bound to MHC Class I molecules
(D) Interferon-γ alters proteasome function with the result that the peptides produced by protein degradation are more likely to bind to MHC Class I molecules
(E) Either the maternal or paternal MHC Class I gene product is expressed on the cell surface

2. Which one of the following statements is correct?

(A) Most of the double-positive (CD4+/D8+) T-cells in the thymus develop into CD4+ T cells
(B) High affinity interactions between the MHC-peptide complex on a thymic epithelial cell and a double-positive T cell results in activation of apoptosis
(C) Double-positive T cells interact only with MHC Class I molecules binding peptides
(D) Studies of the DNA in double-positive T cells will demonstrate the Vβ gene to have a germ line configuration
(E) Stem cells in the thymus give rise to double-positive T cells

3. A 78 year old man is admitted for treatment of a myocardial infarction. He develops a staphylococcal abscess in the dorsum of the left hand at the site of an intravenous catheter. Which statement is correct?

(A) Naïve CD4+ cells are activated at the periphery of the abscess
(B) Dendritic cells phagocytose staphylococcal organisms and migrate to the thymus to activate naïve CD4+ cells
(C) Peptides derived from staphylococcal proteins will bind to MHC Class II molecules
(D) Enlarged axillary lymph nodes indicate spread of bacteria into the lymph nodes with secondary abscess formation
(E) Proliferation of CD4+ T cells is stimulated by IL-2 synthesized by dendritic cells

4. Which one of the following statements about cytokine molecules is correct?

(A) Cytokines are large proteins stored in granules and released by exocytotic mechanisms
(B) Cytokines bind to cell surface receptors with high affinity
(C) Cytokines stimulate macrophages to migrate to an area of inflammation
(D) Each cytokine acts independently of other cytokines
(E) Cytokines act only in an autocrine, paracrine or endocrine fashion

5. Which of the following statements is correct?
(A) CD8+ cells become cytotoxic T cells after activation by interacting with MHC Class II molecules binding peptide
(B) CD8+ cells require co-stimulation by interaction between CD40 receptor on the antigen presenting cell and CD40 ligand
(C) The maximum number of cytotoxic T cells after activation of CD8+ cells by antigen presenting cells is reached within 24 hours
(D) Most CD8+ cells become memory cells after interacting with antigen presenting cells
(E) Cytotoxic T cells can cause cell death by interacting with the Fas ligand on the target cell surface membrane

6. Which statement is correct regarding IFN-γ?

(A) Stimulates B cells to produce IgE antibodies
(B) Activates macrophages
(C) Acts synergistically with IL-4
(D) Inhibits NK cell cytotoxicity for virally infected cells
(E) Is produced by Th2 cells

7. Which of the following statements about the complement system is correct?

(A) Activation of the complement system through the alternate mechanism does not increase opsonization of bacteria
(B) Immune complexes are cleared from the circulation by complement binding to CR1 receptors on erythrocytes and the red cells along with the immune complexes are lysed by the membrane attack complex
(C) Removal of apoptotic cell debris is facilitated by C1q interacting directly with the debris without antibody
(D) The membrane attack complex resulting from activation of complement by the classical pathway differs from that resulting from activation of the alternate pathway
(E) Human cell membranes react with activated C3 (C3b)

8. Which one of the following statements about C4a and C5a is correct?

(A) They increase binding between adjacent endothelial cells reducing permeability
(B) Massive release results in hypotension and acute left ventricular failure
(C) They increase expression of adhesion molecules on endothelial cell surfaces
(D) They stimulate release of mediators such as histamine from eosinophils
(E) They cause smooth muscle dilatation through enhanced production of nitric oxide
9. A 9 month-old infant is immunized against the toxin synthesized by diphtheria. The preparation is injected under the skin (subcutaneously) over the left triceps muscle. The vaccine is composed of an inactive protein (toxoid) derived from the toxin. Which statement is correct?

(A) The injection should have been intramuscular since phagocytic cells are not present in the subcutaneous tissue
(B) Toxoid derived peptides will be present on the surface of cells of the basal layer of the skin in combination with MHC class I molecules
(C) Within 4 days following immunization the infant will have high serum levels of IgG antibody with a high affinity for tetanus toxoid
(D) Dendritic cells expressing MHC class II molecules combined with toxoid derived peptides will interact with naïve CD4 cells in left axillary lymph nodes
(E) The pediatrician made a mistake in immunizing the child at this young age. Maternal antibodies transferred transplacentally will inactivate the toxoid and prevent a primary immune response

10. A 24 year old woman is seven months pregnant. She develops petechiae and her platelet count is 5,000/dl (lower limit of normal 150,000/dl). After further work up she is found to have antibody in her serum which reacts against her own as well as platelets from many donors. A diagnosis of autoimmune thrombocytopenic purpura is made. Which one of the following statement is correct?

(A) Maternal platelets will cross the placenta and stimulate the fetus to make anti-platelet antibodies
(B) Maternal IgE antibody will cross the placenta and result in thrombocytopenia in the fetus
(C) Maternal CD4+ T cells will cross the placenta and help fetal B cells synthesize antibodies against fetal platelets
(D) Maternal IgG antibody will cross the placenta and cause thrombocytopenia in the fetus
(E) The mother should decline therapy in order to protect her baby from obstetrical complications at delivery

11. Which one of the following statement is correct?

(A) Once an autoimmune disease is clinically manifest, the patient will have an inexorable course until the target organ is totally destroyed
(B) Genetic predisposition to autoimmune disease is inherited by mutations in HLA Class II genes
(C) The systemic manifestations of an autoimmune disease may result from antigen-antibody complexes in the circulation
(D) One monozygotic (identical) twin develops an autoimmune disease. The other twin has a 75% likelihood of developing the same disease within one year
(E) If a person is genetically predisposed to an autoimmune disease, clinical evidence of the disease will typically be apparent in childhood
12. A 34 year old woman who has had three pregnancies developed renal failure at age 30 and was treated with kidney dialysis until a cadaveric kidney became available for transplantation. The procedure was uncomplicated and she had normal renal function for one year. However, her renal function deteriorated and two years following the transplantation, she again required dialysis. Which statement is correct?

(A) The rejection of the kidney resulted from alloantibodies the woman developed during her pregnancies
(B) The transplanted kidney will show extensive parenchymal infiltration with neutrophils
(C) The patient had a “perfect” HLA match with the donor
(D) She had a different ABO blood type from the donor
(E) The transplanted kidney will show vascular changes including narrowing of the lumens of the major arteries (arteriosclerosis)

13. A 29 year old man is in a motor vehicle accident and requires surgery for a fractured femur. He is transfused due to blood loss and develops anaphylactic shock. After appropriate therapy he recovers. Further evaluation shows that he has a very low level of IgA in his serum (less than 50 ng/ml). He recovers from the acute illness and is discharged. Which of the following statements is correct?

(A) He has a rare immunodeficiency
(B) He should be started on a regimen of infusions of immunoglobulin to maintain a normal serum IgA level
(C) His expected life expectancy is less than 60 years
(D) He may have a history of more upper respiratory tract infections than other men his age
(E) He will have normal levels of mucosal IgA

14. Which of the following statements is correct?

(A) HIV infection does not stimulate an antibody response
(B) Integration of HIV DNA into a human chromosome always results in viral gene expression
(C) Infection of a monocyte by HIV results in down regulation of MHC Class II molecules on the cell surface
(D) Immature dendritic cells may endocytose HIV virions and transport them to naïve T cells
(E) Mutation of HIV is driven by CD8+ T cell killing of infected cells

15. A 24 year old woman who has lived her entire life in the northeast United States. She develops acute blindness in the right eye. MRI of the brain multiple lesions in the cerebral cortex consistent with previous episodes of multiple sclerosis. Which statement is correct?

(A) Antibodies to oligodendrocytes are the main mediators of the inflammatory process in the lesions visualized on the MRI
(B) Epidemiological studies have shown that the risk of developing multiple sclerosis is linked to particular HLA Class I molecules

(C) Like most people, this individual has T-cells that recognize self antigens in the CNS, but unlike most people, these T-cell clones have expanded

(D) The lesion seen on the MRI of the optic nerve is composed primarily of neutrophils infiltrating the perivascular space

(E) This illness represents a form of immune complex-mediated hypersensitivity