1) Key innate mechanisms to maintain health include the action of

* A. Neutrophils
  B. Cytotoxic T cells
  C. T-helper cells
  D. B-lymphocytes

2) The order in which phagocytosis occurs is

* A. chemotaxis, adherence, ingestion, digestion
  B. adherence, chemotaxis, ingestion, digestion
  C. adherence, ingestion, digestion, chemotaxis
  D. chemotaxis, ingestion, adherence, digestion

3) Natural killer cells are related to

  A. Neutrophils
  B. Monocytes
  C. B-lymphocytes
* D. T-lymphocytes

4) With respect to antigens and immunogenicity, which of the following statements is <u>false</u>?

  A. The immune response to microbes and eukaryotic cells is often the summation of several simultaneous responses against each of many molecules presented by the organism.
  B. The immune response is not directed against the molecule as a whole, but involves reaction with specific exposed areas on the molecule called epitopes
  C. An epitope may be part of a single molecule, or can result from adjacent parts of different molecules that are close to each other
  D. Immunogens are antigens that are able to induce an immune response
* E. Epitopes recognized by B cells and T cells are often the same

5) Immunogenicity is the ability of an antigen to stimulate an immune response. Which one of the following factors reduces immunogenicity?

  A. Larger size
  B. Stability
  C. Structural rigidity
* D. Low structural diversity
  E. High 'foreignness'

6) Which of the following is the most immunogenic?

  A. Nucleic acids, because they are easily degraded
  B. Polysaccharides, because of their repeating subunits
* C. Protein, because of their size, complexity and structural rigidity
  D. Lipids, because of their size and complexity

7) Which of the following statements best describes a hapten?

  A. It marks foreign organisms so that the immune response can be triggered
  B. It is an inert foreign substance that stimulates macrophages to release cytokines
  C. It is capable of initiating an immune response by itself but becomes more potent when coupled to a carrier.
* D. It is incapable of initiating an immune response by itself but becomes immunogenic when coupled to a carrier.

8) Different antigens may have similar epitopes. Consequently, antibodies created in reaction to one antigen may be directed against the other. This is called

  A. Piggy-backing
  B. Antigen crossover
  C. Antibody heterogenecity
* D. Cross-reactivity

9) Antigen presentation is NOT carried out by which cells

  A. Macrophages
  B. B-lymphocytes
  C. Reticuloendothelial cells
  D. Dendritic cells
* E. T-lymphocytes

10) Which of the following statement is NOT true?

  A. MHC I is found on all nucleated cells
  B. MHC I presentation by most cells requires endogenous processing
  C. Antigens presented by MHC II are recognized by CD4+ T cells
  D. Antigens presented by MHC I are recognized by CD8+ T cells
* E. MHC II is found on all nucleated cells

11) With respect to MHC I molecules, which statement is <u>false</u>?

  A. Antigens presented by MHC I are recognized by CD8+ T cells
* B. It typically processes antigens exogenously
  C. It is comprised of an alpha chain which is anchored in the cell membrane and a smaller closely associated molecule, b2 microglobulin, that serves to stabilize the structure.
  D. MHC I is found on all nucleated cells
  E. Only antigens of live organisms produced in infected host cells are presented by MHC I

12) With respect to MHC II molecules, which of the following statements is <u>FALSE</u>?

  A. Expression of MHC II molecules can be upregulated, and is greatest on dedicated APCs (Antigen presenting cells)
* B. Antigens presented by MHC II are recognized by CD8+ T cells
  C. MHC II is comprised of two non-covalently linked chains, alpha and beta, both anchored in the cell membrane.
  D. MHC II molecules are expressed by all leukocytes (and in rare circumstances endothelial cells)

13) Antigen-specific or Acquired Immunity is mounted by

  A. Neutrophils, dendritic cells and macrophages
  B. Only T lymphocytes
* C. Both B and T lymphocytes
  D. Only B lymphocytes

14) The Bursa of Fabricius is a site where

  A. T-cell maturation occurs in ruminants
  B. B-cell maturation occurs in ruminants
  C. T-cell maturation occurs in birds
* D. B-cell maturation occurs in birds

15) Thymic education is related to

  A. the process of expression of antigen receptors in the bloodstream
  B. the process of expression of antigen receptors in the thymus
  C. the process of regulation of other T and B lymphocytes
* D. the turning off or dying of T cells that express "self antigens" (antigens in the thymus).

16) A helper or effector T cell is uniquely identified by which marker?

  A. CD4
  B. CD2
  C. CD3
  D. CD8
* E. None of the above

17) A T-cell that has the CD8 marker can be a

* A. Suppressor or Cytotoxic T cell
  B. T stem cell
  C. Helper T cell
  D. Natural Killer cell

18) The most probable site for initiation of an immune response is

  A. The respiratory system
  B. Primary lymphatic organs
  C. Tertiary lymphatic organs
  D. The circulatory system
* E. Secondary lymphatic organs

19) Lymphoid follicles

  A. that are quiescent have many germinal centers, but they are not active
  B. are found in all primary lymphoid organs
* C. are composed of B cells arranged in nodules in secondary lymphoid organs
  D. are composed of T cells arranged in nodules in secondary lymphoid organs

20) Antigens introduced into tissues are most likely to stimulate an immune response in

  A. circulating blood
  B. the spleen
  C. bone marrow
* D. a lymph node

21) Lymph node swelling during infection occurs because of

  A. Lymphocyte proliferation in response to the antigen
  B. Lymphocyte trapping that is monokine mediated
* C. Both lymphocyte trapping and lymphocyte proliferation in response to the antigen
  D. Inflammation

22) The primary and secondary response to an antigen in a lymph node in initiated in the

  A. cortex and medulla respectively
  B. cortex
  C. medulla
* D. medulla and cortex respectively

23) The largest mass of lymphocytes is located in the

  A. Spleen
  B. Tonsils
  C. Bone marrow
* D. Mucosal lymphoid tissues of the intestine
  E. Blood

24) An INTRAVENOUS particulate antigen is most likely to be

  A. trapped in tissue, triggering inflammation
* B. trapped in sinusoids of the spleen or bone marrow and also in micro-circulation of the lung
  C. catabolized by macrophages
  D. trapped in lymph nodes

25) An intramuscular insoluble antigen is most likely to be

  A. trapped in lymph nodes
  B. catabolized by macrophages
  C. trapped in sinusoids of the spleen or bone marrow and also in micro-circulation of the lung
* D. trapped in tissue, triggering inflammation

26) Lipid soluble antigens may penetrate intact skin. They are usually

  A. trapped in sinusoids of the spleen or bone marrow and also in micro-circulation of the lung
  B. catabolized by macrophages
  C. retained in tissue to be attacked by neutrophils
* D. carried by lymphatics to lymph nodes and could trigger local responses

27) Inhaled antigens are acted upon as follows :

  A. trapped in sinusoids of the spleen or bone marrow and also in micro-circulation of the lung
* B. Action is variable, depending on their size
  C. carried by lymphatics to lymph nodes and could trigger local responses
  D. catabolized by macrophages

28) Immunity is

  A. the ability of the body to prevent intrusion by microorganisms
* B. an immune response that is sufficiently rapid to abort infection before any clinical signs
  C. the ability to ward off infection
  D. the ability to mount an immune response

29) On the initial or primary exposure, there is a lag period before mediators (antibodies and specific lymphocytes) are detected in circulation. This lag period is usually about

* A. 10-14 days
  B. 1-2 hours
  C. 1-2 days
  D. 10-14 hours

30) With respect to lymphocyte antigen receptors, which of the following statements is <u>false</u>

* A. A single lymphocyte can express several thousand different antigen receptors
  B. A single lymphocyte can only recognize a single antigenic epitope
  C. The pool of lymphocytes can express several million different antigen receptors
  D. A single lymphocyte can express several thousand antigen receptors

31) Which of the followings statements with regards to the Clonal Selection Theory of immunity is INCORRECT?

  A. The specificity for antigen of the antibodies or T lymphocytes produced is identical to the specificity of the antigen receptor on the initial responding lymphocyte
* B. An antigen triggers the production of a number of lymphocytes, each with differing receptors
  C. Antigen binding to a lymphocyte's receptor triggers proliferation and differentiation of the lymphocyte into effector and memory cells
  D. The body is equipped with billions of lymphocytes each committed to respond to one specific epitope

32) With respect to B-lymphocytes, which of the following statements is <u>false</u>?

  A. The most peripheral domains of the receptors constitute the specific binding sites for antigen, and vary in structure among individual B cells
  B. Antigen receptors resemble an immunoglobulin (antibody) molecule fixed to the cell membrane with antigen binding regions pointing outward from the cell
* C. The antigen binding variable region resemble IgM and IgD when naive; as the response progress, they start resembling IgG, IgA and IgE
  D. There are 10 thousand to 100 thousand receptors per cell
  E. Antigen receptors consist of two identical heavy and two identical light protein chains linked by disulphide bonds

33) With respect to plasma cells, which of the following statements is <u>false</u>?

A. They are ovoid cells with eccentric nucleus with cartwheel chromatin, basophilic cytoplasm and a large Golgi apparatus (designed for protein synthesis)
B. They have a life span of 3 to 6 days
* C. They are the, so-called, "memory cells" that allow a quicker response to subsequent challenges by the particular antigen
D. They are found mainly in secondary lymphoid organs
E. They manufacture antibodies of a single antigen specificity identical to that of their B cell parent

34) With respect to T-lymphocytes, which of the following statements is <u>false</u>?

A. The amino acid sequence of the constant region is conserved and is similar for all T cells
* B. Unlike B-cells, T-cells can recognize multiple antigens because their alpha-beta receptors are highly polymorphic
C. The T cell antigen receptor (TCR) has a pair of protein chains, alpha and beta or gamma and delta, linked by disulphide bonds and fixed to the cell membrane with antigen binding sites pointing outward
D. T cell recognition is restricted to antigens presented on the surface of other cells (MHC restriction)
E. The T-cell antigen receptor (TCR) is closely linked on the lymphocyte surface to CD4 or CD8, depending on T cell type

35) Interleukins (IL - #) are

A. cytokines that control the behavior of dendritic cells and macrophages
* B. cytokines produced by leukocytes that also bind to leukocytes
C. monokines that are produced by leukocytes
D. cytokines produced by APC (antigen presenting cells) like macrophages

36) With respect to CD4+ T cells, which of the following statements is <u>false</u>?

* A. A major effector response is mediated through recruitment and activation of neutrophils
B. They respond to antigens presented with MHC II by proliferation, to produce clones of identical daughter cells that enter the circulation and migrate into tissues
C. Lymphokines released also result in chemotaxis of monocytes from circulation, maturation into macrophages and subsequent activation
D. Recruited TH1 cells also release lymphokines that are chemotactic for other lymphocytes, and can induce proliferation, providing expansion of antigen reactive lymphocytes locally.
E. When clones make contact with the specific antigen bearing target cells, they release several lymphokines that recruit (and activate) other leukocytes to the site
F. Lymphokines released are antigen-specific, but their action is not antigen-specific

37) When a macrophage is activated, all of the following will happen, EXCEPT

A. ruffling of cell membrane, increased surface area, multiple dendrites
B. increased bactericidal activity, increased capacity to kill target cells
C. production of more potent mediators
D. increased production of hydrolytic enzymes in lysosomes "foam cells"
E. increased expression of MHC II
* F. increased expression of MHC I

38) If a Delayed Type Hypersensitivity skin reaction test is applied to an individual infected by the mycobacteria that cause tuberculosis, the reaction will peak how long after injection?

  A. 2-4 hours
* B. 24-48 hours
  C. 3-6 hours
  D. within 10 minutes

39) HIV affects which cells?

  A. All leukocytes
* B. CD4+
  C. Red blood cells
  D. CD8+

40) CD8+ T Killer lymphocytes

* A. respond to antigens presented by MHC I. They produce clones that bind to and destroy the target cell
  B. respond to antigens presented by MHC II. They produce clones that bind to and destroy the target cell
  C. respond to antigens presented by MHC I. They produce clones that migrate into tissue, locate target cells, then produce lymphokines to attract other "killer" cells.
  D. respond to antigens presented by MHC II. They produce clones that migrate into tissue, locate target cells, then produce lymphokines to attract other "killer" cells.

41) Which of the following are involved with eliminating damaged or infected host cells?

* A. Natural Killer cells
* B. CD8+ T cells
* C. Macrophages
  D. Neutrophils
  E. Monocytes
  F. CD4+ T cells
* G. ADCC

42) With regards to tissue matching for transplantation, which statement is <u>false</u>?

  A. The rejection process is complex and potentially involves the entire spectrum of specific and non-specific immune responses
  B. The chance of a sibling match is about 1:8
* C. Matching of MHC I is most critical
  D. Matching of MHC II is most critical

43) B cells bind and respond to

  A. particulate matter
  B. virus-infected host cell
  C. bacteria
  D. host cells 'marked' by macrophages
* E. soluble antigens

44) Antibodies are immunoglobulins of a single specificity for antigens. They are produced by

* A. Plasma cells
  B. Neutrophils
  C. B-cells
  D. Macrophages
  E. T-cells

45) With regards to immunoglobulins, which of the following statements is <u>false</u>?

  A. There are 4 major isotypes or classes: IgM, IgG, IgA, IgE
  B. The immunoglobulin molecule has 3 regions : variable, hinge and constant
* C. Immunoglobulins is the precise term for a specific antibody in the context of reaction with a particular antigen
  D. Immunoglobulin is a general term, referring to the entire group of antibody proteins without regard to the specific antigen reactivity of the molecules
  E. The typical immunoglobulin structure consists of 2 identical light chains and 2 identical heavy chains held together by disulphide bonds

46) With respect to B-cells in an anamnestic (memory) immune response, the "variable region stays constant, but the constant region varies". What does this mean?

* A. In the primary response a large amount of Ig-M is produced, all of which have the same variable region as the initiating B-cell. The anamnestic response switches Ig-M to Ig-G, Ig-A or Ig-E (i.e. changes the constant region) while keeping the same variable region.
  B. In the primary response a large amount of Ig-A is produced, all of which have the same variable region as the initiating B-cell. The anamnestic response changes the constant region while keeping the same variable region.
  C. In the primary response a large amount of Ig-G, Ig-A and Ig-M is produced, all of which have the same constant region as the initiating B-cell but differing variable regions.
  D. Naive B cells express a monomer of Ig-G on their surface as the antigen receptor. As isotype switching occurs during progression of the immune response, B cells express a monomeric form of the new isotype, Ig-M thus keeping the same variable region while changing the constant region.

47) In a naive animal, an antigen will typically stimulate a

* A. Polyclonal response
  B. Anamnestic response
  C. Monoclonal response
  D. Biclonal response

48) With respect to antigen-antibody binding, which of the following statements is <u>false</u>?

  A. Avidity is defined as the strength of the collective interaction of a polyclonal response.
  B. The key binding force is hydrophobic force
  C. Affinity is defined as the strength of binding between a single epitope and idiotype.
* D. During an immune response, antibodies complement each other in the attack on the antigen.
  E. During an immune response, antibodies (and B cells) compete with each other for the antigen.

49) Antibodies disrupt antigens in a variety of ways. Which of the following is NOT one of them?

  A. Toxin neutralization
  B. Triggering aggregation through precipitation or agglutination
* C. Phagocytosis
  D. Opsonization
  E. Virus neutralization
  F. Immobilization
  G. Preventing attachment to host cells

50) Which statement relating to the Complement system is <u>FALSE</u>?

  A. There are several pathways for activation, all result in cleavage of C3, the pivotal factor for further activation of components with biological action.
* B. The Classical and Lectin pathways are antigen specific, needing antibodies for activation
  C. It is a biochemical cascade of the immune system that affects both innate immunity and acquired immunity.
  D. The Alternative pathway is an innate mechanism

51) The biological consequences of Complement activation are many. Which of the following is NOT one of them?

  A. Immune regulation
  B. Chemotaxis (neutrophils, eosinophils, macrophages)
  C. Opsonization of antigen
* D. Tubercle formation
  E. Clotting
  F. Lysis (host cells and antigen)

52) Disseminated intravascular coagulation, a result of a mismatched blood transfusion for example, is a result of activation of

  A. Delayed Type Hypersensitivity (DTH)
* B. Complement system
  C. B-cells
  D. T-cells
  E. Neutrophils

53) With respect to the measurement of antibodies (titre), which of the following statements is <u>false</u>?

* A. It is measured in kDa/litre
  B. The highest dilution of serum that yields a defined positive reaction is referred to as the titre.
  C. Recent infection will result in an elevated titre
  D. Using a fixed amount of antigen and serial dilutions of serum the amount of antibody present can be estimated (titrated)

54) With respect to Passive immunity, which of the following statements is <u>FALSE</u>?

  A. Ruminants have no placental transfer while carnivore mothers transfer some (about 10%) IgG trans-placentally to their fetus
  B. Passive immunization occurs naturally as the transfer of antibodies from dams to their offspring
* C. Passive immunity results from immunoglobulins, T-cells and B-cells received from the donor
  D. The majority of passive immunization occurs through colostrum (with the exception of primates)
  E. No immunological memory results from passive immunization

55) There are a number of "compartments" within the body that are partially or wholly separated from mediators in the blood vascular system. All these are such compartments, EXCEPT

  A. Anterior chamber of the eye
  B. Joints
* C. Mucosal immune system
  D. Central nervous system
* E. Liver

56) The vast majority of infectious organisms enter by mucosal routes (inhalation, ingestion, coitus). Important non-specific innate mechanisms protecting mucosae include all of the following, EXCEPT

* A. Peyer's patches
  B. Urine flow
  C. Epithelial cell barrier
  D. Mucociliary movement in the lungs
  E. Mucous coating
  F. Peristalisis (gut)

57) In most species mucosal B lymphocytes synthesize mainly IgA (Ruminant mucosal B cells also produce a large amount of IgG). IgA, in the mucosal humoral response, protects mainly by

* A. Immune exclusion
  B. an Anaphylactic reaction
  C. Opsonization
  D. Complement activation

58) Mucosal tissue are rich in mast cells. Which class of immunoglobulin causes degranulation of mast cells?

  A. IgA
  B. IgG
  C. IgT
  D. IgM
* E. IgE

59) With respect to the mucosal immune system, which of the following statements is <u>false</u>

  A. Important non-specific innate mechanisms protecting mucosae include the epithelial cell barrier, the mucous coating, ciliary movement (lung), peristalsis (gut), urine flow, and normal flora.
  B. The humoral response involves IgA (mainly), IgE, IgG and IgM
* C. The cell-mediated response is negligible in mucosal tissue
  D. The vast majority of infectious organisms enter by mucosal routes

60) With respect to "Common Mucosal Immunity" and the concept of "homing", which of the following statements is <u>FALSE</u>?

  A. Movement of IgA positive B cells from the intestine and lung to the mammary gland (MALT) is especially important for production of antibodies in milk that give passive protection for the suckling neonate's gut and respiratory tract
* B. Generalized systemic immune response can never originate from mucosal sites
  C. Tonsilar immune response provides memory cells that home to intestinal and respiratory tracts, to prime these sites for possible later invasion
  D. As well as acting as foci for mediator production, GALT and BALT export antigen reactive memory cells

61) Immunoglobulins in covered mucosal surfaces exposed to the external environment are predominantly

* A. IgA
  B. IgE
  C. IgG
  D. IgM

62) In most species, immune competence may be expected at the end of

  A. Second trimester of gestation
* B. First trimester of gestation
  C. Third trimester of gestation
  D. Weaning

63) The newborn is susceptible to infectious disease because

* A. of the unprimed state of its immune system
  B. immune competence may only be expected a few months after birth
  C. of inability to mount an immune response
* D. the neonate may be transiently immune suppressed at the time of birth due to hormonal influences

64) Passive transfer of immunity from the bitch (dog) to her offspring occurs

  A. by colostrum only
  B. by the placenta only
* C. by the placenta and/or colostrum and from milk
  D. by colostrum and milk only

65) As lactation progresses mammary secretion changes to milk. This provides nutrition and also immunoglobulin in a concentration about 1/10 that of colostrum. What is the fate of such immunoglobulin?

A. Antibodies in milk are absorbed
B. Antibodies in milk have nutritional value (protein)
C. Antibodies in milk serve no purpose
* D. Antibodies in milk mediate local gastrointestinal resistance