**Review questions for Immune system lecture**

**Multiple choice review questions:**

1) Cells that do phagocytosis include all of the following except

 A) neutrophils

 B) lymphocytes.

 C) macrophages

 D) eosinophils

2) The thermoregulatory control center or "thermostat" that regulates the body's response to changes in temperature such as during a fever, is located in the

 A) hypothalamus.

 B) pituitary.

 C) cerebral cortex.

 D) adrenal gland.

3) Basophils secrete \_\_\_\_\_\_\_ to dilate blood vessels for the purpose of increasing blood flow and increasing capillary permeability.

 A) complement proteins

 B) histamine

 C) antibodies

 D) thromboxane

4) The chemical secreted during an immediate hypersensitivity response, such as hay fever, that is most responsible for the itching, sneezing, tearing, and runny nose, is

 A) histamine.

 B) antibodies.

 C) adrenaline.

 D) antigens.

5) Local inflammation is characterized by all of the following except

 A) redness.

 B) shortness of breath.

 C) swelling (edema).

 D) pain

6) Which defense mechanism is considered part of the specific immune system?

 A) epithelial membranes (such as the skin) that protect body surfaces

 B) strong acidity of gastric juice (pH = 1-2)

 C) activity of macrophage cells digesting bacteria and viruses

 D) activity of lymphocyte cells

7) Which function is a characteristic of B lymphocytes?

 A) releasing histamine

 B) formation of antibodies

 C) generating digestive enzymes for pathogen lysis

 D) phagocytosis

8) Which is not **true** of antibodies

 A) They are found in the blood

 B) They are part of cell-mediated immune system

 C) They are proteins

 D) They are Y-shaped

9) Which statement about complement proteins is false?

 A) Complement proteins are present in body fluids even during times of no infection

 B) They are activated by T cells

 C) They attack cells covered by antibodies

 D) They lyse (break open) pathogen cells

10) The cells that do “clonal expansion” are

 A) B and T lymphocytes

 B) Bacteria that enter the body before the immune system controls their growth

 C) All immune cells

 D) Cancer cells

11) Which event does **not** represent an action of the nonspecific immune system?

 A) the activation of B lymphocytes to produce antibodies

 B) histamine causing vasodilation and increased capillary permeability

 C) phagocytosis by neutrophils and macrophages

 D) WBCs attracted to site of injury

12) The cell types that are most responsible for presenting foreign antigens to T lymphocytes are

 A) B lymphocytes.

 B) cancerous cells

 C) platelets.

 D) macrophages

13) The subpopulation of T lymphocytes that is attacked by the human immunodeficiency virus (HIV) in AIDS victims, is the

 A) helper T cells.

 B) memory T cells.

 C) accountant T cells.

 D) killer T cells.

**Answers to multiple choice review questions:**

1 = B

2 = A

3 = B

4 = A

5 = B

6 = D

7 = B

8 = B

9 = C

10 = A

11 = A

12 = D

13 = A

**Fill-in-the-blank review questions:**

1) Living things that cause disease (such as bacteria and viruses) are called \_\_\_\_\_\_.

2) Bacteria/viruses (circle one) are small cells that reproduce by dividing themselves into two new cells.

3) \_\_\_\_\_\_ reproduce by entering the inside of the body’s cells, and then forcing the cell to make copies of themselves.

4) A(n) \_\_\_\_\_ is any molecule that the immune system interacts with; usually these molecules are proteins, carbohydrates, and lipids on the surface of cells.

5) \_\_\_\_\_ are the blood cells that are part of the immune system. These cells are also called \_\_\_\_\_\_.

6) There are \_\_\_\_\_ (a number) major types of white blood cells.

7) The five major types of white blood cells are: \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.

13) Pathogens that enter the body can engulfed (“eaten”) by white blood cells, a process known as \_\_\_\_\_\_\_. Any WBC that does this is called a(n) \_\_\_\_\_\_.

14) The three phagocytes of the immune system are \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.

15) The main function of neutrophils is to \_\_\_\_\_.

17) \_\_\_\_\_cells, which develop from monocytes, are the most voracious of the phagocytes.

20) Basophils secrete \_\_\_\_\_, which dilates blood vessels (and attracts other leukocytes) so

that the immune system can reach and attack an invading organism.

23) Fluid that exits the bloodstream and enters the tissue is called the \_\_\_\_\_\_.

24) Excess amounts of tissue fluid are called \_\_\_\_\_.

25) Excess tissue fluid is eventually returned to the bloodstream after it flows through the vessels, ducts, and nodes of the \_\_\_\_\_ system.

26) The hollow structures of the lymphatic system where lymph vessels merge are called \_\_\_\_\_. It is there that the lymph is \_\_\_\_\_. Because pathogen cells tend to get trapped there, many WBCs are stationed inside these structures.

27) In addition to trapping pathogen cells (which come from outside the body), the lymph nodes can often trap dangerous cells that come from within the body. These rapidly multiplying cells are \_\_\_\_\_\_\_ cells.

28) All the lymphatic vessels in the body merge into two major lymph vessels: The \_\_\_\_\_\_ duct and the \_\_\_\_\_\_ duct. From these two ducts, the lymph drains back into the blood vessels.

29) Water molecules are part of many fluids in the body, including lymph, tissue fluid, and blood. In the blank spaces below, use the numbers 1 – 6 to indicate the order a molecule of water would encounter the following fluids and body parts, as it moves from the blood to the end of the lymphatic system.

 The thoracic duct \_\_\_\_\_

 A lymph node \_\_\_\_\_

 A lymph vessel \_\_\_\_\_

 The plasma \_\_\_\_\_

 Tissue fluid \_\_\_\_\_

Capillary wall \_\_\_\_\_

Circle the answer above where the water would re-enter the blood.

Draw a box around the answer above where the water would find large numbers of stationary immune cells

Draw a star over the answer above that swells when we are fighting an infection.

30) The lymphoid organs that help cleanse the upper respiratory tract of pathogens are the \_\_\_\_\_\_.

31) The \_\_\_\_\_\_ is the lymphoid organ that helps rid the blood of pathogens and filters out \_\_\_\_\_\_.

33) During infection, certain immune cells secrete molecules that travel to the body’s "thermostat" in the \_\_\_\_\_\_\_ (a region of the body) and reset the body temperature upward, resulting in a. \_\_\_\_\_\_\_

34) As the amount of histamine in the blood increases, blood vessels \_\_\_\_\_\_\_.

35) The body has two lines of defense against attack by foreign invaders: the \_\_\_\_\_\_ immune system and the \_\_\_\_\_\_ immune system.

36) The \_\_\_\_\_\_ is the most important organ of the non-specific immune system, because it simply blocks most pathogens from ever entering the body.

37) The \_\_\_\_\_\_ is a set of proteins present in the blood that, when activated, destroy pathogen cell membranes.

38) Many cells, after being infected by a virus, manage to secrete \_\_\_\_\_ proteins, which inhibit viruses from entering neighboring cells.

39) \_\_\_\_\_ is an immune response in which body temperature increases. The elevated temperature assists the immune system in two ways: \_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_.

40) The four signs of inflammation are \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.

41) The inflammatory response is part of the specific/non-specific (circle one) immune system.

42) The inflammatory response is initiated when \_\_\_\_\_ (a type of WBC) releases \_\_\_\_\_\_, which makes capillaries \_\_\_\_\_\_\_. This causes the redness and swelling of the inflammation, and allows \_\_\_\_\_\_ to pass from the blood into the injured tissue.

43) During inflammation, molecules released by damaged tissue do two things: \_\_\_\_\_\_ and \_\_\_\_\_\_.

44) The branch of the immune system that is able to recognize specific pathogens and launch powerful attacks against them is the \_\_\_\_\_\_\_\_ immune system.

45) The cells of specific immune system are the white blood cells that defend the body against specific pathogens. Of the five major types of white blood cells, only one type, the \_\_\_\_\_\_, are part of the specific immune system.

46) The two major types of lymphocytes are \_\_\_\_\_ cells and \_\_\_\_\_\_ cells.

47) Each lymphocyte can recognize one/many (circle one) type(s) of foreign antigen. Since there are thousands of different pathogens that could potentially infect the body, there must be one /many (circle one) different lymphocytes.

48) Thanks to the memory B cells and T cells, we have a much stronger and faster immune response against a pathogen we have encountered before. This phenomena is called the \_\_\_\_\_\_ of the immune system.

49) For the body to mount a specific defense against a newly encountered pathogen takes \_\_\_\_\_ (how long?). This response is slow because at the beginning of the infection there may be only a single lymphocyte in the body that happens to bind to that particular pathogen.

50) Re-exposure, even years later, to an antigen that has been responded to before results in a specific defense that takes \_\_\_\_\_ (how long?) to mount. This is due to the presence of \_\_\_\_\_ B and T cells made during the first encounter with the pathogen.

51) \_\_\_\_\_\_ are Y-shaped molecules in the blood that bind antigens.

52) Antibodies are \_\_\_\_\_ (a type of macromolecule molecule).

53) \_\_\_\_\_ are the lymphocytes that produce antibodies.

54) When a B lymphocyte has encountered its foreign antigen (the specific foreign antigen that the B cell is programmed to respond to) the B cell begins to reproduce itself, a process that is called \_\_\_\_\_\_\_ of the lymphocyte.

55) When a B-cell encounters an antigen, it proliferates into two types of cells: One type releases antibodies to the antigen, and the other type are \_\_\_\_\_ cells that will become active if the pathogen is encountered again in the future.

56) When a lymphocyte (such as a B cell) does clonal expansion, the all the new cells it produces

do/do not (circle one) have the same specificity for the same antigen as the original cell that clonally expanded.

57) The antibodies attached to a pathogen slow the spread of the infection in many ways: The antibodies attached to the pathogen simply "get in the way," so to speak, interfering with the functioning of the pathogen cell. Another way that the antibodies fight the pathogen is by linking several pathogens together. The term \_\_\_\_\_ means when cells are clumped together by antibodies

58) Each antibody can simultaneously bind to \_\_\_\_\_ (how many?) identical antigens. This is what allows antibodies to agglutinate pathogens containing foreign antigens.

59) Antibodies bound to a pathogen trigger attacks on that pathogen by \_\_\_\_\_ proteins, which are proteins in the blood that can lyse (tear open) cells.

60) The complement proteins only destroy cells that have antibodies attached to their antigens. This prevents the complement proteins from attacking \_\_\_\_\_.

66) B lymphocytes provide antibody-mediated immunity. Antibodies are a branch of the specific immune system called the \_\_\_\_\_\_ immune system because antibodies are found in the blood and lymph, which are body fluids.

67) \_\_\_\_\_ are the lymphocytes that attack pathogen cells by direct cell-to-cell contact (unlike B cells, which fight pathogens indirectly by releasing antibody proteins).

68) Unlike B cells, T cells are **not** activated simply by encountering the foreign antigen they are specific for. For a T cell to become activated, it first must encounter a \_\_\_\_\_\_ which has digested and displayed the specific foreign antigen that the T cell is programmed to respond to.

69) When a T lymphocyte has encountered its foreign antigen (the specific foreign antigen that the T cell is programmed to respond to) displayed by a macrophage cell, the T cell begins to reproduce itself, a process that is called \_\_\_\_\_\_\_ of the lymphocyte.

70) When an activated T lymphocyte proliferates, are three subpopulations of T lymphocytes that are formed: \_\_\_\_\_\_\_, \_\_\_\_\_\_\_, and \_\_\_\_\_\_\_.

71) Killer T-cells attack pathogen cells by direct cell-to-cell contact. The killer T cell contacts the pathogen cell then injects the pathogen cell with \_\_\_\_\_\_\_.

72) Some T cells are \_\_\_\_\_ T cells, which remain inactive until the pathogen is encountered again.

73) Some T cells are \_\_\_\_\_ T cells, which are necessary for B and T lymphocytes to undergo clonal expansion.

74) The branch of the specific immune system that is carried out by T lymphocytes is called the \_\_\_\_\_ mediated immune system because living cells (T cells, macrophages, and pathogen cells) are all required for its functioning.

75) After each description, write B if it describes a B cell, write T if it describes a T cell, and write M if it describes a Macrophage cell. Some blanks may require more than one answer.

 a) Lymphocytes: \_\_\_\_\_

 b) Makes antibodies: \_\_\_\_\_

 c) Part of the humoral immune system: \_\_\_\_\_

 d) Part of the cell-mediated immune system: \_\_\_\_\_

 e) It works with the complement proteins to destroy pathogen cells: \_\_\_\_\_

 f) Has memory cells: \_\_\_\_\_

 g) It requires the help of a macrophage cell to become activated to fight pathogens: \_\_\_\_\_

76) One way that we medically enhance the immune response against a specific pathogen is to inject a person with non-living antigens from the pathogen (or in some cases, a weakened but living form of the pathogen). This procedure is called a \_\_\_\_\_\_. The person will not become sick if they encounter the true pathogen because their immune system has already produced \_\_\_\_\_ B and T cells against the pathogen.

77) Multiple sclerosis (MS) is a disease where the immune system attacks the body’s own tissues. Diseases of this type are called \_\_\_\_\_\_\_\_\_\_\_\_\_\_ diseases. In MS, the immune system attacks, the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, which causes the speed of nerve signals to decrease.

78) Transplanting an organ from one person to another is complicated by the fact that the recipient’s immune system may “reject the organ” (mount an immune response against it). For this reason, \_\_\_\_\_\_\_\_\_ are often given to the organ recipient.

79) A(n) \_\_\_\_\_ is a excessive (tissue damaging) response by the immune system to a harmless antigen. Examples of such harmless antigens are pollen, cat hair, and dust.

80) \_\_\_\_\_\_\_\_ is a genetic disease that produces a deficit of the immune system.

81) Acquired immune deficiency syndrome (AIDS) is a disease caused by the \_\_\_\_\_\_ virus.

82) AIDS disease is caused by the HIV virus killing \_\_\_\_\_ (a specific type of lymphocyte).

83) Without helper T cells, the specific immune system cannot function because B cells and killer T cells cannot \_\_\_\_\_\_\_\_ without the assistance of helper T cells.

**Answers to fill-in-the-blank review questions:**

1) Pathogens

2) Bacteria

3) Viruses

4) Antigen

5) White blood cells20) Histamine

23) Tissue fluid

24) Lymph

25) Lymphatic

26) Lymph nodes

 Filtered

27) Cancer

28) Right lymphatic duct

 Thoracic duct

29) 6 (circled)

 5 (boxed) (star)

 4

 1

 3

 2

30) Tonsils

31) Spleen

 Old red blood cells

33) Hypothalamus

 Fever

34) Dilate/Become leaky

35) Non-specific

 Specific

36) Skin

37) Complement

38) Interferons

39) Fever

 Inhibits bacterial growth

 Speeds immune system reactions

40) Redness

 Swelling

 Heat

 Pain

41) Non-specific

42) Basophil

 Histamine

 Dilate/become leaky

 White blood cells

43) Activate pain receptors

 Attract WBCs

44) Specific

45) Lymphocytes

46) B cells

 T cells

47) One

 Many

48) Memory

49) About 2 weeks

50) Days

 Memory

51) Antibodies

52) Proteins

53) B cells

54) Clonal expansion

55) Memory

56) Do

57) Agglutination

58) Two

59) Complement

60) Self cells (cells of the body)

66) Humoral

67) T cells

68) Macrophage

69) Clonal expansion

70) Killer T cells

 Memory T cells

 Helper T cells

71) Digestive enzymes

72) Memory

73) Helper

74) Cell-mediated

75) a) B, T

 b) B

 c) B

 d) T

 e) B

 f) B, T

 g) T

76) Vaccination/Immunization

 Memory

77) Autoimmune

 Myelin sheath on neurons

78) Immunosuppressant drugs

79) Allergy

80) SCID (severe combined immunodeficiency)

81) HIV

82) Helper T cells

83) Clonally expand

**Short answer review questions:**

1) Fill in the following table about the lymphoid organs.

 Lymphoid organ: Location in body: Fluid it cleanses and filters:

 The spleen

 The tonsils

2) One of the non-specific body defenses is called the inflammatory response. The inflammatory response, which occurs in an injured tissue, includes (a) making the capillaries leaky, and (b) activating pain receptors. Explain briefly how each of these two functions protects the body.

3) What is the defining difference between the specific and the non-specific immune systems?

4) You receive a flu shot (a vaccination against that year’s flu virus). A few months later, you are exposed to a person with the flu. Thanks to the flu shot, your body is able to fight off the virus so quickly that you never feel ill. Explain (a) What was in the flu shot? (b) What did the flu shot change in your body that allowed you to fight off the flu virus? (c) Why do you have to get the flu shot again next year? Be as specific as possible in your answers.

5) If you are exposed to a pathogen that your body has never encountered before, the immune system makes new B and T cells. Most of the new B and T cells fight the pathogen, but some B and T cells (called memory B cells and memory T cells) do not. Explain why your body makes memory B cells and memory T cells.

6) Multiple sclerosis (MS) is an example of an autoimmune disease. In MS, the immune system attacks the myelin sheath that surrounds neurons, decreasing the efficiency of the nervous system. In lecture, we discussed other examples of autoimmune diseases. Name an autoimmune disease (other than MS) and describe what part of the body is being attacked by the immune system.

7) Patients with autoimmune diseases often treated by giving them hormones that decrease the activity of the immune system. Name the hormones that decrease the immune system’s activity: \_\_\_\_\_\_\_\_\_\_ (You may need to review your notes on the endocrine system to answer this question). What is an unintended and dangerous side effect of lowering a patient’s immune system activity to treat an autoimmune disease?

8) What is the difference between HIV and AIDS?

9) The HIV virus only destroys helper T cells, which are only a small part of all your immune cells. Explain how HIV can totally destroy the activity of the immune system by infecting only helper T cells.

**Answers to short answer review questions:**

1) Lymphoid organ: Location in body: Fluid it cleanses and filters:

 The spleen Upper abdominal cavity Blood

 The tonsils Upper esophagus Saliva

2) Making the capillaries leaky allows WBCs in the blood to exit the capillary and move into the injured tissue. Activating pain receptors discourages us from using the injured organ until it has repaired itself.

3) The specific immune system mounts attacks against specific pathogen types. The non-specific immune system makes the body less accessible and less hospitable to pathogens in general, but it does not mount attacks against specific pathogen types.

4) (a) The flu shot contained antigens from the flu virus (or perhaps a weakened form of the virus).

(b) The flu shot caused clonal expansion of the B and T cells that are against that particular flu virus.

(c) The flu virus mutates rapidly, so the flu virus of one year is not the same as the flu virus of another year. Flu vaccinations contain only antigens from the flu virus type of the current year. Each year, a new flu vaccination (containing antigens from the latest flu virus) must be obtained.

5) Memory B and memory T cells are made so that the immune system’s response time will be much quicker if the same pathogen is ever encountered again. The immune system does not have to begin clonal expansion against the pathogen from just a few B and T cells. Large numbers of memory B and T cells against the pathogen are already present if the same pathogen invades again.

6) Rheumatoid arthritis is an autoimmune disease where the immune system attacks the articular cartilage of the joints. This eventually leads to reduced mobility of the joint and pain.

Another example of an autoimmune disease is lupus. The immune system attacks a wide range of connective tissue types in the body which results in a variety of symptoms, although muscle and joint pain are common among lupus victims.

7) Glucocorticoids (such as cortisone, cortisol, and prednisone) are immunosuppressant steroids. Although these drugs treat the autoimmune disease by suppressing the immune system, an unintended side effect is increased susceptibility to infection because of lowered immune system activity.

8) AIDS is a disease and HIV is the virus that causes AIDS.

9) Helper T cells are necessary for all B cells and T cells to clonally expand when activated by their foreign antigens. The destruction of helper T cells by the HIV virus therefore leaves the immune system unable to produce the large numbers of B and T cells needed to repel pathogens. This results in the death of the patient from pathogens that would normally be easily for the immune system to overcome.