1. Base your answer to the following question on the reading passage below and on your knowledge of biology.

Polio Vaccines

Polio is a disease that results in the destruction of nerve cells. The first vaccine against polio was developed by Jonas Salk and was made from polio viruses that were killed using the chemical formalin. In 1953, Salk tested the vaccine on himself, his wife, and his three sons. The vaccine was found to be safe and seemed to work. In 1954, more than 1.8 million schoolchildren were part of a trial to test the vaccine, and in April 1955, the vaccine was declared to be safe and effective.

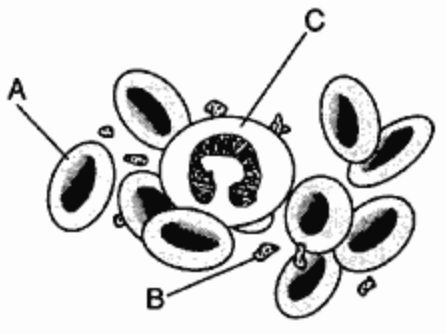
Albert Sabin also developed a vaccine against polio. The vaccine developed by Sabin was made from weakened polio viruses. While the Salk vaccine had to be injected, the Sabin vaccine was administered orally on a cube of sugar.

Both vaccines were found to be effective in protecting people against polio because these vaccines stimulate immune responses involving antibody production. However, the Sabin vaccine is effective over a longer period of time and is easier to administer. Together, these vaccines have nearly eliminated polio in many parts of the world.

Which statement about the Salk vaccine is correct?

A) Dead viruses are injected.
B) Antibodies are injected.
C) Antibodies are administered orally.
D) Sugar cubes are administered orally.

2. Which statement correctly describes the activities of the components of human blood shown in the diagram below?



A) Both *A* and *B* function in immune responses, and *C* transports oxygen.
B) *A*, *B*, and *C* are able to synthesize hemoglobin.
C) Both *B* and *C* provide immunity, and *A* transports nutrients.
D) *A* transports oxygen, *B* initiates clots, and *C* functions in immune responses.

3. A person with allergies may develop a rash and swollen eyes when exposed to certain substances. These symptoms are a reaction to

A) histamines produced as a result of an immune reaction
B) antigens produced as a result of passive immunity
C) phagocytosis, resulting in the destruction of body cells
D) an increase in the number of platelets

4. A person with AIDS is likely to develop infectious diseases because the virus that causes AIDS

A) destroys cancerous cells
B) damages the immune system
C) increases the rate of antibody production
D) increases the rate of microbe destruction

5. Which statement best describes an immune response?

A) It always produces antibiotics.
B) It usually involves the recognition and destruction of pathogens.
C) It stimulates asexual reproduction and resistance in pathogens.
D) It releases red blood cells that destroy parasites.

Base your answers to questions **6** through **9** on the information below.

Organ Transplants of the Future

While most people take good health for granted, thousands of others desperately need to replace a failing organ with one that is healthy. Most healthy organs come from people who agreed to donate them upon their death, although it is possible to remove some tissue and organs (such as kidneys and bone marrow) from living donors. Unfortunately, organs for transplant are in short supply. As of 1992, over 22,000 Americans were waiting for a transplant.

Although increasingly common, transplants are risky procedures. During the operation, veins and arteries must be blocked to prevent blood loss. This deprives parts of the body of oxygen and nutrients and may result in permanent damage. In addition, the body may recognize the transplanted organ as foreign and mount an immune response in which specialized white blood cells (T cells) attack the transplanted organ.

Drugs called immunosuppressants are given to transplant patients to prevent their immune system from rejecting the transplanted organ. However, these drugs weaken the ability of the body to fight disease and leave the patient less able to fight infection.

Scientists are exploring new technology for producing transplant tissues and organs. Unspecialized cells called stem cells are removed from the patient and then grown in a laboratory. Treating stem cells with the appropriate chemicals causes them to differentiate into various specialized tissues. In the future, scientists hope to develop chemical treatments that will cause stem cells to grow into complete organs needed for transplants. Transplants produced by this process would not be foreign material and, therefore, would not be rejected by the immune system of the patient.

6. Explain why a transplant might be dangerous to the health of a patient.

7. State *one* reason that transplant patients might take an immunosuppressant drug.

8. State *one* specific *disadvantage* of taking an immunosuppressant drug.

9. Explain why doctors would consider using tissues or organs that have been grown from stem cells.

10. Newborn infants nursing from their mother receive milk containing antibodies against diseases to which the mother is immune. The infants, however, remain immune to those diseases for only a short time. This situation is an example of

A) active immunity
B) passive immunity
C) an oral vaccine
D) a phagocytic activity

11. Base your answer to the following question on the information below and on your knowledge of biology.

Children must be vaccinated against certain diseases before they can enter school. Some parents feel that vaccinations are dangerous.

Explain to these parents what a vaccine is and what it does in the body.

12. Which disease damages the human immune system, leaving the body open to certain infectious agents?

A) flu **B) AIDS**
C) chicken pox D) pneumonia

13. In some individuals, the immune system attacks substances such as grass pollen that are usually harmless, resulting in

A) an allergic reaction
B) a form of cancer
C) an insulin imbalance
D) a mutation

14. People with AIDS are unable to fight multiple infections because the virus that causes AIDS

A) weakens their immune systems
B) produces antibodies in their blood
C) attacks muscle tissue
D) kills pathogens

15. Allergic reactions are most closely associated with

A) the action of circulating hormones
B) a low blood sugar level
C) immune responses to usually harmless substances
D) the shape of red blood cells

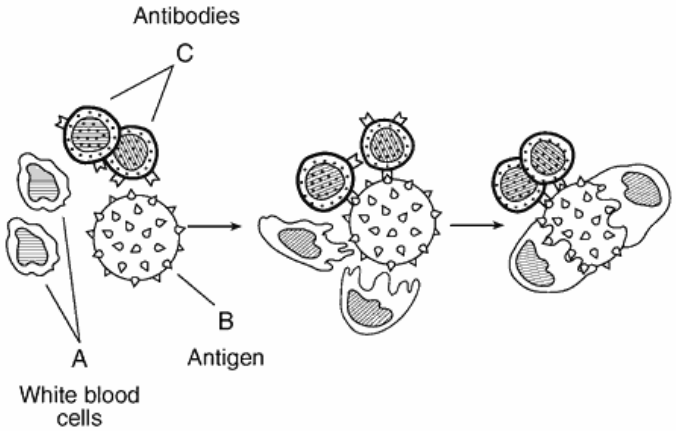
16. Many vaccinations stimulate the immune system by exposing it to

A) antibodies
B) enzymes
C) mutated genes
D) weakened microbes

17. Certain microbes, foreign tissues, and some cancerous cells can cause immune responses in the human body because all three contain

A) antigens B) enzymes
C) fats D) cytoplasm

18. The diagram below represents one possible immune response that can occur in the human body.



The structures that are part of the immune system are represented by

A) *A,* only **B) *A* and *C,* only**
C) *B* and *C,* only D) *A, B,* and *C*

19. Base your answer to the following question on the information below and on your knowledge of biology.

Cells of the immune system and the endocrine system of the human body contribute to the maintenance of homeostasis. The methods and materials these two systems use as they carry out this critical function are different.

State *two* ways cells of the immune system fight disease.

20. To replace burned skin, doctors can successfully transplant replacement skin taken from another part of the body of the burn victim. Which statement best explains why the transplanted skin is *not* rejected?

A) The transplanted skin is damaged, making the immune system nonfunctional.

B) The antigens of the replacement skin are the same as those of the damaged skin.

C) Burn victims lose so much blood that white blood cells cannot cause an immune response.

D) There is no blood supply to the skin, so mixing of antigens does not occur.

21. Base your answer to the following question on the question below and on your knowledge of biology.

Describe how a flu vaccine protects the human body.

State how the human immune system reacts to the vaccine.

Base your answers to questions **22** through **24** on the information below and on your knowledge of biology.

Beware of Dust Mites

Quietly lurking within our mattresses, under our beds, and inside sofas and carpets are creatures too small to be seen without a microscope. Dust mites are arthropods closely related to spiders, scorpions, and ticks. They feed on the dead skin cells regularly shed by humans and their animal pets. The average human sheds about 10 grams of dead skin a week. Cats and dogs create even more dander for dust mites to eat. The mites also eat pollen, fungi, and bacteria. They do not drink water but absorb it from the air.

Dust mites do not carry diseases and are harmless to most people. It's their bathroom habits that make some of us itch and sneeze. Many people develop severe allergies to dust mite feces (wastes). If you lie on a rug where dust mites live, you might develop itchy red bumps on your skin. Breathe in dust containing their feces and you might have more serious symptoms, such as difficulty breathing or a severe asthma attack.

Dust mites thrive in warm, humid environments - eating and nesting in dust-collecting bedding, fabric, and carpet. Think about this! A typical mattress can contain anywhere from 100,000 to 10 million dust mites. Nearly 100,000 dust mites can live in one square yard of carpet.

During a process called sensitization, a person's immune system mistakenly identifies the inhaled dust mite waste as an invader. The next time the person is exposed to the dust mite waste, the immune system launches an allergic reaction.

22. The immune system of an individual who is allergic to dust mite waste produces

A) specialized chemicals that mark dust mite waste for destruction
B) viruses that combat dust mites
C) white blood cells that attack human skin cells
D) white blood cells that attack the skin cells of cats and dogs

23. An allergic reaction occurs when the immune system

A) does not respond to pathogens
B) maintains homeostasis
C) responds to usually harmless environmental substances
D) undergoes rapid, uncontrolled cell division

24. State *one* way, other than using a pesticide, that an individual could *decrease* the number of dust mites present in his home.

25. Base your answer to the following question on the information below and on your knowledge of biology.

In order to enroll in most schools, students must be vaccinated against certain viral diseases, such as mumps. Even with these vaccinations, many students still suffer from other diseases. Discuss how a vaccination works and why some students still become infected with other diseases. In your answer, be sure to:

Identify what is present in a vaccine that stimulates an immune response

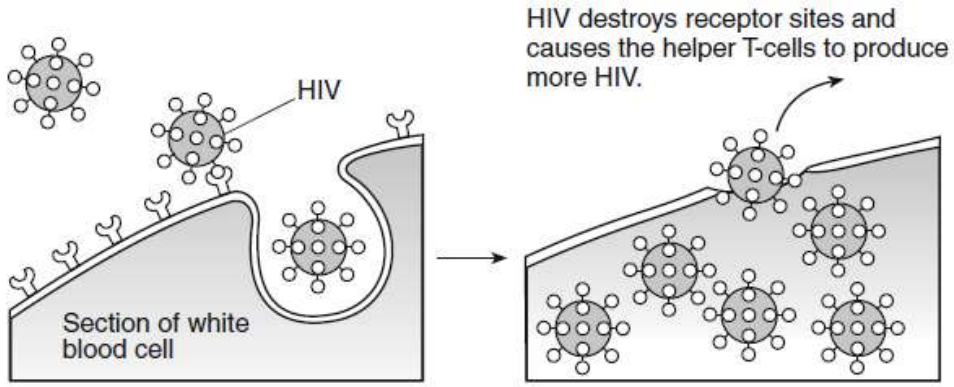
26. People who have AIDS are more likely than others to become ill with multiple infections because the pathogen that causes AIDS

A) targets many body systems
B) mutates, releasing toxins directly into the bloodstream
C) increases the rate of enzyme activity in different types of body cells
D) damages the immune system

27. Responses of the immune system to usually harmless environmental substances are known as

A) antigen production
B) chromosomal mutations
C) pathogens
D) allergies

28. The diagram below represents how HIV, the virus that causes AIDS, interacts with a certain type of white blood cell called a helper T-cell.



What is one possible result of the cellular activity represented in the diagram?

A) Immune responses of an infected individual will be weakened.
B) The red blood cells of a person infected with AIDS will no longer be able to make antibodies.
C) This virus will strengthen future immune responses against blood-related diseases.
D) Immune responses will prevent the spread of AIDS in humans.

29. A 6-year-old child ate a peanut butter sandwich at snack time in school. Five minutes later, her throat became swollen and she collapsed. This allergic reaction occurred because her body

A) recognized an antigen in peanut butter and produced antibiotics against it
B) digested the white blood cells that can recognize an antigen in peanut butter
C) did not recognize an antigen in peanut butter and could not produce antibodies against it
D) recognized an antigen in peanut butter and produced an immune response

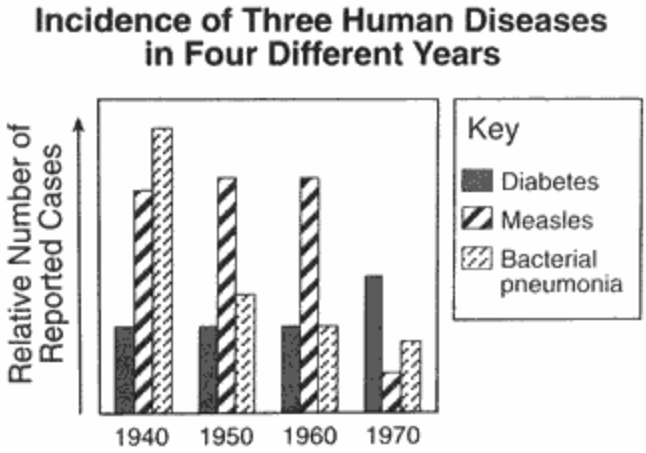
Base your answers to questions **30** and **31** on the statement below.

The immune system protects against foreign substances and even some cancers. Explain how the immune system functions.

30. Identify *one* way the immune system fights pathogens.

31. Describe the response of the immune system to the vaccine.

32. Base your answer to the following question on the graph below.



Which statement provides the best possible reason for the decrease in number of cases of bacterial pneumonia from 1940 to 1970?

A) As a result of genetic engineering, humans became immune to the bacteria.

B) Antibiotics were made available for the treatment of bacterial infections.

C) The bacteria did not respond to medical treatments.

D) As a result of sexual reproduction, the bacteria evolved into a harmless form.

33. The immune system of humans may respond to chemicals on the surface of an invading organism by

A) releasing hormones that break down these chemicals

B) synthesizing antibodies that mark these organisms to be destroyed

C) secreting antibiotics that attach to these organisms

D) altering a DNA sequence in these organisms

Answer Key
Immune System

1. **A**
2. **D**
3. **A**
4. **B**
5. **B**
6. – Veins and arteries may be blocked and tissue damage may result.
   – The body may reject the new organ.
7. To prevent rejection of a transplanted organ.
8. – The drug might weaken the ability of the body to fight diseases.
   – The drug may leave the patient less able to fight infection.
9. – The organs would not be rejected.
   – Organs produced by this process would not be foreign material and would not be attacked by the patient's immune system.
10. **B**
11. *Examples:* – A vaccine contains weakened microbes or parts of microbes that stimulate the immune system to produce antibodies. – Vaccines contain the source of the disease in a dead or weakened form. When introduced into the body, the vaccine triggers the body's immune system to produce antibodies that are specific to the source of the disease.
12. **B**
13. **A**
14. **A**
15. **C**
16. **D**
17. **A**
18. **B**
19. *Examples:* — engulf foreign substances — produce antibodies — recognize pathogens/antigens
20. **B**
21. — Antibodies are produced against the virus. — increase in number of white blood cells — produces a primary immune response — It builds up immunity.
22. **A**
23. **C**
24. – do not have a cat or dog – lower the amount of moisture in the air in the home – do not have carpet on the floor – vacuum often – clean or remove dust often – wash bedding frequently
25. – dead/weakened virus/germ – antigens – small pieces of the virus/viral coat
26. **D**
27. **D**
28. **A**
29. **D**
30. – White blood cells engulf pathogens. – Antibodies fight invaders. – produces antibodies
31. – The vaccine stimulates the immune system to produce antibodies. – It causes the body to make antibodies.
32. **B**
33. **B**