Infecious Diseases

1 An infection in the body might result in a sudden
(1) decrease in the activity of antigens produced by the mitochondria
(2) decrease in the amount of DNA present in the nuclei of cells
(3) increase in the activity of white blood cells
(4) increase in the number of red blood cells

Base your answers to questions 2 on the information below and on your knowledge of biology.

Bird Flu

Researchers are not sure when the H7N9 virus, referred to as bird flu, hit the China poultry markets. In February of 2012, the virus was found to have spread from birds to humans. All cases resulted from direct contact with infected poultry.

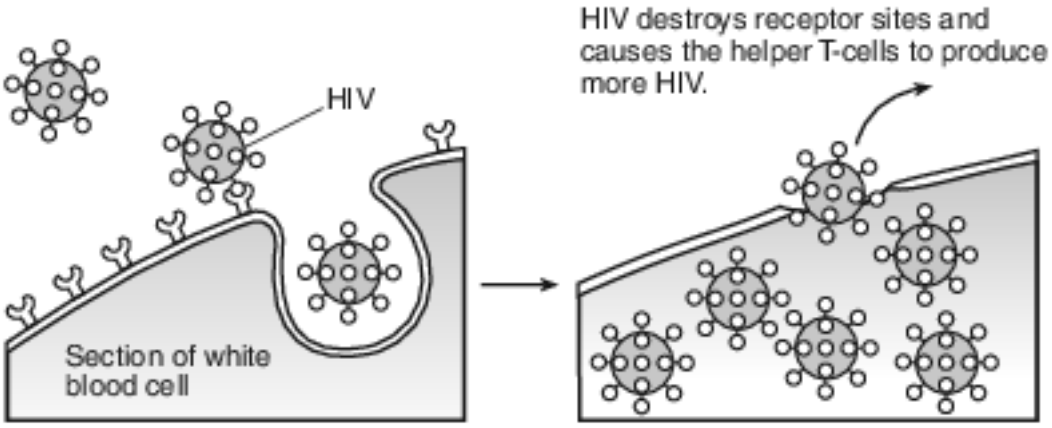
The bird flu can cause severe respiratory illness in humans. Since flu viruses constantly mutate, it would be difficult to develop a vaccine ahead of time. Scientists are worried that the virus could spread easily among people, causing a worldwide outbreak of the disease.

2 The fact that the H7N9 virus has only recently infected humans helps explain why
(1) it is highly transmissible through both the air and water
(2) it is found only in the U.S.
(3) humans have little or no immunity to the virus
(4) the human population has formed antibodies against the virus

3 Which statement best describes why pathogens are harmful?
(1) All of the cells of an organism infected by pathogens become pathogens.
(2) Pathogens cannot be controlled once they enter the cells of an organism.
(3) Pathogens produce antibodies that will kill the host organism.
(4) Pathogens can interfere with normal life functions.

4 An individual recovers from the common cold, which is caused by rhinovirus A. The person then becomes infected with the avian influenza virus, which causes the bird flu. Which statement best describes what will most likely happen to this person?
(1) He will have the symptoms of the bird flu because he is not immune to the avian influenza virus.
(2) He will have the symptoms of the common cold because he is not immune to the avian influenza virus.
(3) He will not have the symptoms of the bird flu because he is immune to rhinovirus A.
(4) He will not have the symptoms of the common cold because the avian influenza virus causes it.

5 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?
(1) Immune responses of an infected individual will be weakened.
(2) The red blood cells of a person infected with AIDS will no longer be able to make antibodies.
(3) This virus will strengthen future immune responses against blood-related diseases.
(4) Immune responses will prevent the spread of AIDS in humans.

6 Pneumocystis is an organism normally found in the human lungs that can cause pneumonia. It seldom causes problems in individuals with healthy immune systems. However, people with AIDS sometimes become seriously ill with pneumonia. This is most likely due to the fact that individuals with AIDS have
(1) inherited a tendency to contract pneumonia
(2) difficulty fighting off infections
(3) an allergy to this organism
(4) hormones that strengthen the infection

7 Which type of pathogenic microbe causes AIDS?
(1) a bacterium
(2) a virus
(3) a multicellular fungus
(4) a single-celled algae

Base your answers to questions 8 on the information below and on your knowledge of biology.

Raw eggs and undercooked poultry may contain Salmonella bacteria. These bacteria can cause food poisoning by invading the cells lining the small intestine and producing a toxin that causes inflammation in the intestine. Symptoms usually appear 24 to 48 hours after the bacteria are ingested. Symptoms include fever, diarrhea, vomiting, dehydration, and abdominal pain that may last for several days.

8 Explain why Salmonella bacteria are described as pathogens. [1]

Base your answers to questions 9 on the information below and on your knowledge of biology

Fungi are interesting organisms that interact with humans in many ways. Yeasts are fungi used in the food industry to produce products such as bread and certain beverages. Some fungi are valuable in medicine. For example, the drug cyclosporine, which is capable of suppressing the response of the immune system to foreign antigens, and the antibiotic penicillin are both products from fungi. Other fungi are less welcomed by humans. The irritation of athlete's foot is caused by a fungus, and a number of allergies are caused by reproductive spores released by fungi.

9 Explain the difference between an infection caused by a fungus and an allergy caused by a fungus. [1]

Base your answers to questions 10 on the illustration and information below and on your knowledge of biology. The illustration is of a Tasmanian devil.

Source: http://www.statelibrary.tas.gov.au

The Tasmanian devil is the largest surviving carnivorous marsupial in Australia. It is in danger of extinction due to an unusual type of cancer called Devil Facial Tumor Disease (DFTD). It can be passed from one individual to another through wounds that occur when they fight over food. Tumor cells in the mouth of an infected animal break off and enter the wound on an uninfected animal. The tumor cells multiply in the body of the newly infected devil, forming new tumors that eventually kill the animal.

Recent research has shown that the immune system of a Tasmanian devil accepts tumor cells from another devil as if they were cells from its own body. The tumor cells are ignored by the immune system. No immune response develops against them, and the cancerous cells multiply. Scientists predict that DFTD could wipe out all the remaining Tasmanian devils in 25 years, unless a treatment is developed.

10 Describe one possible way to maintain a population of healthy, uninfected Tasmanian devils until a treatment or cure can be found. [1]

Base your answers to questions 11 on the article below and on your knowledge of biology.

Bats Devastated by Deadly Fungus

The most common bat species in North America, the little brown bat, could be facing extinction because of a fungus. The fungus, called white-nose syndrome, grows on the exposed skin of bats as they hibernate in cool caves or mines. Infected bats develop lesions (sores) on their wings, which play important roles in water balance, circulation and heat reg- ulation. These lesions on a bat's wings or on its nose cause the bat to wake up during hiber- nation. Waking up early forces the bat to use up the energy it has stored as fat for its long sleep, exhausting the animal and eventually killing it.

In some infected caves, 90 percent to 100 percent of bats die. On average, the disease takes out 73 percent of the bat population at a given hibernation site. If infection continues at current rates, the researchers predict that the little brown bat population will drop below 0.01 percent of its current numbers by 2026.

The loss of the little brown bat would be harmful for humans because bats eat their body weight in insects each night. Many of these bugs are agricultural pests or carriers of human disease.

One way to decrease the spread of the disease would be for the researchers who visit infected caves to decontaminate their clothes and gear with antiseptics. It has also been sug- gested that a small number of these bats could be placed in an artificial hibernating area and medicated to protect them.

11 Describe one way that an infection with the white-nose fungus can cause death in little brown bats. [1]

Base your answers to questions 12 on the information below and on your knowledge of biology.

Bye – Bye Bananas?

The world's most popular type of banana is facing a major health crisis. According to a new study, a disease caused by a powerful fungus is killing the Cavendish banana, which accounts for 99% of the banana market around the globe. The disease, called tropical race 4 (TR4), has affected banana crops in southeast Asia for decades. In recent years, it has spread to the Middle East and the African nation of Mozambique. Now experts fear the disease will show up in Latin America, where the majority of the world's bananas are grown. …

…Once a banana plant is infected with TR4, it cannot get nourishment from water and nutrients, and basically dies of thirst. TR4 lives in soil, and can easily end up on a person's boots. If the contaminated boots are then worn on a field where Cavendish bananas are grown, the disease could be transferred. "Once a field has been contaminated with the disease, you can't grow Cavendish bananas there anymore," Randy Ploetz [scientist] says. "The disease lasts a long time in the soil."…

…But Cavendish [banana] is also particularly vulnerable to TR4. The banana is grown in what is called monoculture. "You see a big field of bananas and each one is genetically identical to its neighbor" Ploetz says. "And they are all uniformly susceptible to this disease. So once one plant gets infected, it just runs like wildfire throughout that entire plantation."…

Source: http://www.timeforkids.come/new/bye-bye-bananas/3311666

12 State how the TR4 fungus threatens homeostasis within the banana plant. [1]

Base your answers to questions 13 on the information below and on your knowledge of biology.

"Cancer is a disease of genes gone wrong. When certain genes mutate, they make cells behave in odd ways. The cells divide swiftly, they hide from the immune system that could kill them and they gain the nourishment they need to develop into tumors.…"

Source: Carl Zimmer, NY Times, February 6, 2014

13 Explain why the body of a person infected with HIV, the virus that causes AIDS, would have a different immune response to the presence of cancer cells than a person not infected with HIV. [1]

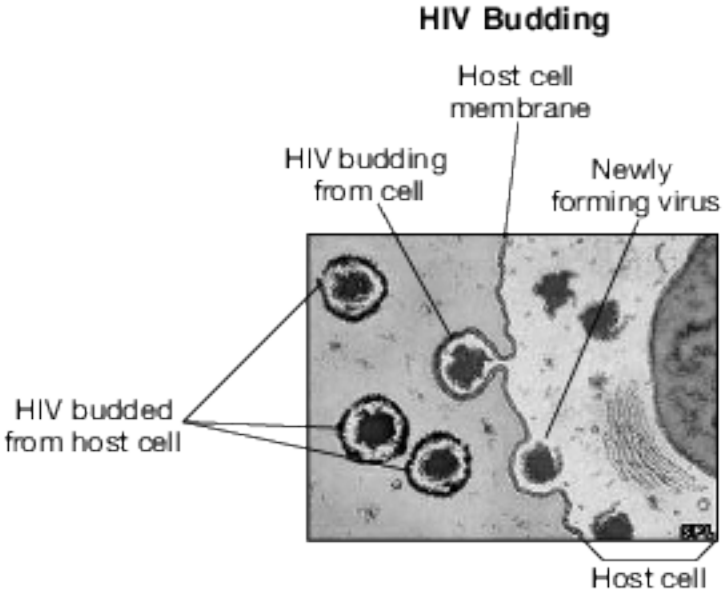
14-17 The immune system protects against foreign substances and even some cancers. Explain how the immune system functions. In your answer, be sure to:
- identify one way the immune system fights pathogens [1]
- identify the substance in a vaccine that stimulates the immune system [1]
- describe the response of the immune system to the vaccine [1]
- identify one disease that damages the immune system and state how it affects this system [1]

Base your answers to questions 18 on the information and diagram below and on your knowledge of biology.

HIV Infection

The human immunodeficiency virus (HIV), which can lead to AIDS, is a type of virus that adds its genetic material to the DNA of the host cell. HIV reproduces within the host cell and exits through a process called budding.

In the process of budding, the newly forming virus merges with the host cell membrane and pinches off, taking with it a section of the host-cell membrane. It then enters into circulation.



Source: Adapted from http://news.bbc.co.uk/2/hi/health/5221744.stm

18 Describe one specific way that HIV makes the body unable to deal with other pathogens and cancer. [1]

Answer Keys

1 3

2 3

3 4

4 1

5 1

6 2

7 2

8 Allow 1 credit. Acceptable responses include, but are not limited to:
- — It is an organism that causes disease.
- — produces toxins that cause fewer and other symptoms
- — because it invades cells and causes food poisoning
- — Salmonella makes people sick.

9 Allow 1 credit. Acceptable responses include, but are not limited to:
- — An infection involves an actual pathogen that attacks the human organism. An allergy is an
- immune response to a harmless substance in the environment.
- — An infection is caused by a microbe and an allergy is an immune response.
- — An infection is usually caused by a harmful organism and an allergy is a response to a
- substance that is not usually harmful.

10 Allow 1 credit. Acceptable responses include, but are not limited to:
- — Move some uninfected animals to an area where they will not come into contact with infected
- animals.
- — Remove baby devils from the population and place them in a zoo or wildlife refuge.
- — Separate the animals while they are feeding.
- — Provide more food to decrease competition/fighting.

11 Allow 1 credit. Acceptable responses include, but are not limited to:
- — Lesions interfere with water balance.
- — makes them wake up during hibernation and use up energy
- — Lesions interfere with heat regulation/circulation.

12 Allow 1 credit. Acceptable responses include, but are not limited to:
- — The TR4 fungus interferes with the transport of water and other materials within the
- banana plant.
- — The fungus that attacks the banana plant interferes with the plant’s normal functions and
- the plant basically dies of thirst.
- — The fungus prevents water from reaching the leaves, preventing photosynthesis.
- — The plant cannot get nourishment from water and nutrients.

13 Allow 1 credit. Acceptable responses include, but are not limited to:
- — HIV/AIDS attacks the immune system directly and the body is unable to deal with the
- invaders.
- — AIDS damages the immune system so it does not respond as effectively.
- — AIDS damages the immune system so it cannot produce antibodies/enough antibodies to
- fight disease or cancer.

14-17 The student’s response to the bulleted items in the question need not appear in the following order.

- 14. Allow 1 credit for identifying one way the immune system fights pathogens. Acceptable responses
- include, but are not limited to:
- — White blood cells engulf pathogens.
- — Antibodies fight invaders.
- — produces antibodies
- 15. Allow 1 credit for identifying the substance in a vaccine that stimulates the immune system.
- Acceptable responses include, but are not limited to:
- — dead/weakened pathogen
- — antigens
- — a small piece of the virus/viral coat
- Note: Do not accept “a little bit of the disease” or “a small amount of the virus.”
- 16. Allow 1 credit for describing the response of the immune system to the vaccine. Acceptable
- responses include, but are not limited to:
- — The vaccine stimulates the immune system to produce antibodies.
- — It causes the body to make antibodies.
- 17. Allow 1 credit for identifying one disease that damages the immune system and for stating how it
- affects this system. Acceptable responses include, but are not limited to:
- AIDS/HIV
- — attacks the immune system so it cannot fight off diseases
- cancer/leukemia
- — destroys immune system cells, which weakens immune responses

18 Allow 1 credit. Acceptable responses include, but are not limited to:

- — HIV destroys white blood cells/helper T cells/B cells.
- — HIV weakens the immune system.