

## **Teacher Resource Packet**

**Includes**

**Teacher Notes from the Immune System PowerPoint**

**Student Guided Notes for the PowerPoint**

**Student Activities and Worksheets**



## Teacher Notes from PowerPoint

### Slide 1:

Assessment Slides are inserted throughout the PowerPoint.

Background information for the immune system can be found at the following web links.

- <http://www.nobelprize.org/educational/medicine/immunity//immune-overview.html>
- <http://www.nobelprize.org/educational/medicine/immunity//immune-detail.html>

### Slide 2:

Prior Knowledge required: Basic understanding of the Lymphatic system (Short Review is hyperlinked)

- Movie: Time 8:35 <http://kidshealth.org/kid/htbw/ISmovie.html>
- Quiz: [http://kidshealth.org/kid/htbw/\\_bfs\\_ISquizsource.html](http://kidshealth.org/kid/htbw/_bfs_ISquizsource.html) (Quiz is 10 questions)
- Matching Activity: [http://kidshealth.org/kid/htbw/\\_bfs\\_ISactivity.html?tracking=K\\_RelatedArticle](http://kidshealth.org/kid/htbw/_bfs_ISactivity.html?tracking=K_RelatedArticle)

Articles:

- [http://kidshealth.org/kid/cancer\\_center/HTBW/immune.html](http://kidshealth.org/kid/cancer_center/HTBW/immune.html)
- [http://kidshealth.org/teen/flu\\_center/about\\_flu/immune.html](http://kidshealth.org/teen/flu_center/about_flu/immune.html)

Interactive Activity

- Immune Platoon On-line Activity: <http://www.cdc.gov/bam/diseases/immune/learnhow.html>

### Slide 3

Movies:

- Parasite: <http://videos.howstuffworks.com/animal-planet/41042-monsters-inside-me-trichanella-spiralis-video.htm>
- Bacteria: <http://www.neok12.com/php/watch.php?v=zX065d1b4547625169575f77&t=Microorganisms>
- Flu Virus: <http://www.microbeworld.org/component/jlibrary/?view=article&id=10035>

### Slide 4

Notes:

- Functions of Saliva: What then are the important functions of saliva? Actually, saliva serves many roles:  
Lubrication and binding: the mucus in saliva is extremely effective in binding food into a slippery bolus that (usually) slides easily through the esophagus without inflicting damage to the mucosa. Saliva also coats the oral cavity and esophagus, and food basically never directly touches the epithelial cells of those tissues.
- Oral hygiene: The oral cavity is almost constantly flushed with saliva, which floats away food debris and keeps the mouth relatively clean. Flow of saliva diminishes considerably during sleep, allowing populations of bacteria to build up in the mouth -- the result is dragon breath in the morning. Saliva also contains lysozyme, an enzyme that neutralizes many bacteria and prevents overgrowth of oral microbial populations.
- Skin, the largest body organ, provides both a physical and a chemical barrier against the outside world. The skin forms a protective layer that completely wraps around the body, shielding blood vessels, nerves, muscles,

organs, and bones. When cuts or tears in the surface of the skin provide an entrance for infective agents, glands beneath the skin produce an enzyme \* that helps kill bacteria.

- Mucous membranes, the moist linings of the respiratory system, produce mucus, a sticky substance that traps irritants that enter through the nose. Structures like tiny hairs, called cilia, line the body's airways and constantly wave foreign particles and mucus away from the lungs to where they can be swallowed safely. Most harmful microbes that make it to the stomach are destroyed by stomach acids.

#### Extra Resources: Articles

- <http://kidshealth.org/kid/talk/qa/sneeze.html>
- <http://kidshealth.org/kid/talk/yucky/booger.html>
- [http://kidshealth.org/kid/talk/qa/eyes\\_water.html#](http://kidshealth.org/kid/talk/qa/eyes_water.html#)

#### Slide 5

Assessment Slide: Writing activity or as a type of Think-Pair-Share with the teacher monitoring the groups.

- Think-Pair Share (Short Explanation)
  - Students will write their response : approximately 5 min. (or less)
  - Students pair with a partner to share their answers: approximately 5 min. (or less)
  - Students share with another group or the whole class: approximately 5-15 min. (or less)

#### Slide 6

Articles:

- [http://kidshealth.org/kid/ill\\_injure/sick/fever.html#](http://kidshealth.org/kid/ill_injure/sick/fever.html#)
- [http://kidshealth.org/teen/your\\_body/medical\\_care/wounds.html#](http://kidshealth.org/teen/your_body/medical_care/wounds.html#)

#### Slide 7

Assessment: Answers

- External Defenses: Skin, Tears, Saliva, Mucus Membrane. All provide protection from pathogens entering the body.
- Internal Defenses: Inflammation, Fever, White blood Cells.
- Both: Protect the body from pathogens.
- Homeostasis is the ability to maintain a constant internal environment in response to environmental changes. The nervous and endocrine systems control homeostasis in the body through feedback mechanisms involving various organs and organ systems. Examples of homeostatic processes in the body include temperature control, pH balance, water and electrolyte balance, blood pressure, and respiration. The Immune system is also involved with maintaining Homeostasis by using the thymus gland to send chemical messages to the white blood cells to attack invaders.

#### Slide 8

Assess:

- Use the Think-Pair-Share method for one type of formative assessment or use these questions as an exit card or as a bellringer to review.
  - Exit cards: Students write the answers to the questions for the teacher to review. The following class time, the teacher will review any concepts the students has trouble answering.
  - Bellringers: An opening activity used to review the previous day's concepts.

### Slide 9

Sixth grade students need to focus on the macrophages.

As mature white blood cells, granulocytes circulate in the blood until they receive chemical signals that provide further instructions. These signals come from sites of infection or inflammation, and may be chemicals secreted by pathogens or by other cells of the immune system.

Dendritic cells are highly specialized white blood cells found in the skin, mucosa, and lymphoid tissues that initiates a primary immune response by activating lymphocytes and secreting substances that signal invaders are present.

The macrophages are a type of white blood cell that ingests foreign material. Macrophages are key players in the immune response to foreign invaders of the body, such as infectious microorganisms. They are normally found in the liver, spleen, and connective tissues of the body. Macro mea

### Slide 10

At this point an interactive activity can be performed.

An antigen is any substance that causes your immune system to produce antibodies against it. An antigen may be a foreign substance from the environment such as chemicals, bacteria, viruses, or pollen. An antigen may also be formed within the body, as with bacterial [toxins](#) or tissue cells.

- [http://www.exploratorium.edu/ti/conf/csta08/tory-immune/Antigens\\_and\\_Antibodies.pdf](http://www.exploratorium.edu/ti/conf/csta08/tory-immune/Antigens_and_Antibodies.pdf)
  - To save time, the antibody and antigen pieces can be prepared ahead of time.

### Slide 13

Assess: Using Thumbs up/Thumbs down (Thumbs up is a True answer. Thumbs down is a false answer. Thumbs sideways represents "I don't know")

Answers: 1. False 2. True 3. False 4. True 5. True 6. True 7. False

### Slide 17

Video:

- [http://www.cdc.gov/CDCTV/VSI\\_Vaccination/index.html](http://www.cdc.gov/CDCTV/VSI_Vaccination/index.html)
- <http://video.mit.edu/watch/how-a-vaccine-works-10952/>
- <http://www.youtube.com/watch?v=SduMbjW2V9A>

Articles:

- [http://kidshealth.org/kid/stay\\_healthy/body/guide\\_shots.html](http://kidshealth.org/kid/stay_healthy/body/guide_shots.html)
- [http://kidshealth.org/teen/school\\_jobs/college/immunizations.html](http://kidshealth.org/teen/school_jobs/college/immunizations.html)

## Slide 18

Immune Deficiency: Primary Immune Deficiency is genetic. Acquired immune deficiencies occur after infections or environmental exposures in people who were previously completely healthy.

## Slide 19

Assess: write

- Circulatory: carries white blood cells to the scene of the infection
- Lymphatic: Site of mature white blood cells (T-cells and B cells) that trigger the immune system and attacks invaders. Lymph fluid and nodes break down and “clean” the blood of foreign particles.
- Respiratory: External defense with mucus membrane. Also provides oxygen for the cells so the cells will have the energy they need to reproduce.
- Skeletal: Blood cells are produced in the bone marrow.
- Musculatory: Voluntary muscle movement pushes the lymph fluid through the body
- Skin is the first line of external defense for the body.

## Slide 20

Articles:

- <http://www.dummies.com/how-to/content/what-organs-are-part-of-the-lymphatic-system.html>
- [http://kidshealth.org/teen/your\\_body/body\\_basics/spleen.html](http://kidshealth.org/teen/your_body/body_basics/spleen.html)

Teacher Information for the Lymph system: You tube video

- Part 1: <http://www.youtube.com/watch?v=BX8fBlme9vQ>

Part 2: <http://www.youtube.com/watch?v=T1DJaXZd7HQ>

Name : \_\_\_\_\_ Date: \_\_\_\_\_ Class Period: \_\_\_\_\_

### Guided Notes: The Immune System PowerPoint

#### Immune System (Slide 2):

To be immune means to be \_\_\_\_\_. The body system that helps fight sickness is called the \_\_\_\_\_ system. The immune system is made up of a network of cells, tissues, and organs that work together to protect the body.

#### Review of the Lymphatic System (Slide 20):

The lymphatic system includes a system of lymphatic capillaries, vessels, nodes, and ducts that \_\_\_\_\_ and \_\_\_\_\_ lymph fluid. It works along with the rest of the immune system (mainly, the white blood cells) to fight \_\_\_\_\_.

There are many clusters of lymph nodes. The most abundant places lymph nodes are found are in the \_\_\_\_\_, the \_\_\_\_\_, and the groin. Swelling of these nodes indicates \_\_\_\_\_.

Lymphatic tissue is also found in the \_\_\_\_\_, spleen, \_\_\_\_\_, and appendix, along with some special tissue in the gut.

#### How does Lymph Fluid Move? How does the Lymph nodes work?(Slide 21)

The lymph fluid moves through the vessels as you move the \_\_\_\_\_ muscles in your body. Ever go on a plane and have your feet swell up? Because you are sitting in one place and not moving around, fluid collects in your feet and they swell. The more you move, the more \_\_\_\_\_ your lymphatic system becomes.

Lymph nodes work like a \_\_\_\_\_ system. When the body is invaded by foreign organisms, painful swelling can sometimes be felt in the neck, armpits, groin, or \_\_\_\_\_. The swelling comes from \_\_\_\_\_ being trapped inside the lymph nodes. Eventually these organisms are destroyed by a type of \_\_\_\_\_ blood cell that lines the walls of the lymph node causing the swelling and pain to go away.

#### Pathogen (Slide 3)

A pathogen is an \_\_\_\_\_, \_\_\_\_\_, or \_\_\_\_\_ that can make you sick.

Name four pathogens and give an example for each.

Pathogen	Disease Example
1.	
2.	
3.	
4.	

#### External Defenses (Slide 4)

What are your external defenses against pathogens?

## Internal Defenses (Slide 6)

1. \_\_\_\_\_: Blood rushes to the cut where the pathogen entered. Platelets seal the open wound to prevent more invaders from entering.
2. \_\_\_\_\_: The body increases its internal temperature which slows down the growth of bacteria and some other pathogens.
3. \_\_\_\_\_: Specialized cells made in the bone marrow that fight disease are produced to fight diseases.

## How do our defenses help us maintain homeostasis? (Slide 7)

- \_\_\_\_\_ is the ability to maintain a constant internal environment.
- The nervous and \_\_\_\_\_ systems control homeostasis in the body through feedback mechanisms involving various organs and organ systems.
  - Examples of homeostatic processes in the body include \_\_\_\_\_ control, pH balance, water and electrolyte balance, blood pressure, and respiration.
- The \_\_\_\_\_ system is also involved with maintaining homeostasis by using the thymus gland (part of the endocrine system) to send chemical messages to the white blood cells to attack invaders.

## Types of White Blood Cells (Slide 9)

The \_\_\_\_\_ attack any invaders in large numbers, and "eat" until they die. The \_\_\_\_\_ in an infected wound consists chiefly of dead granulocytes

The macrophages are the \_\_\_\_\_ of invaders. They are larger, live longer, and alert the rest of the immune system of invaders.

The dendritic cells are also "eater" cells and devour intruders. And like the macrophages, the dendritic cells help with the \_\_\_\_\_ of the rest of the immune system. They \_\_\_\_\_ body fluids to clear them of foreign organisms and particles.

## White Blood cells (Lymphocytes) (Slide 10)

White blood cells called \_\_\_\_\_ originate in the \_\_\_\_\_ but migrate to parts of the lymphatic system such as the lymph nodes, spleen, and thymus.

\_\_\_\_\_: Invading particle

\_\_\_\_\_: A large Y shaped protein that is produced by the immune system to mark \_\_\_\_\_.

Each lymphocyte cell is made to \_\_\_\_\_ up to a specific type of antigen.

## Lymphocytes T-cells (Slide 11)

T cells are produced in the bone marrow and move to the \_\_\_\_\_ gland (part of the lymphatic system) when they mature.

\_\_\_\_\_ are the main regulators of the immune defense. Their primary task is to activate B cells and killer T cells. The helper T cells are activated when a \_\_\_\_\_ or dendritic cell, which has eaten an invader, travels to the nearest lymph \_\_\_\_\_ to present information about the captured pathogen.

\_\_\_\_\_ are specialized for attacking cells infected by \_\_\_\_\_ and \_\_\_\_\_. It also attacks cancer cells. The killer T cell has receptors that are used to search each cell that it meets. If a cell is \_\_\_\_\_, it is swiftly killed.

### **Lymphocytes B-cells (Slide 12)**

- The B lymphocyte cell searches for \_\_\_\_\_ matching its receptors. If it finds such antigen it connects to it, and inside the B cell a triggering \_\_\_\_\_ is set off.
- The \_\_\_\_\_ cell (created by a “triggered” B cell) is specialized in producing an \_\_\_\_\_, that matches an invader. Plasma cells produce antibodies at an amazing rate and can release tens of thousands of antibodies per second.
- The \_\_\_\_\_ are a cell type produced by the division of B cells. These cells have a prolonged life span and can thereby \_\_\_\_\_ specific intruders. T cells can also produce memory cells with an even longer life span than B memory cells. The second time an intruder tries to invade the body, B and T memory cells help the \_\_\_\_\_ system to activate much faster. The invaders are wiped out before the infected human feels any symptoms. The body has achieved \_\_\_\_\_ against the invader.

### **Thumbs up/Thumbs down (Slide 13)**

- An antigen is one of our body’s defense cells.
- A macrophage is a white blood cell that does lives longer than other cells and is called a “big eater”.
- T cells mature to make plasma cells and memory cells.
- B cells form places on their surface to allow them to connect to invading cells to “mark” them so they can be destroyed.
- Helper T cells are found in the Thymus gland and they activate the immune response.
- Antibodies are Y shaped proteins produced by the immune system to attach to antigens.
- Lymphocyte cells can match up to many different antigens.

**Slide 14, 15, 16: Sketch or map the path the virus takes through the body.**



## Vaccine (Slide 17)

How does a vaccine work?

A \_\_\_\_\_ is prepared using a \_\_\_\_\_ or weakened pathogen and is given as a shot.

The \_\_\_\_\_ system responds by making T cells, B cells, and Memory cells.

If the pathogen enters the body after the vaccination, \_\_\_\_\_ cells identify it and T cells and B cells begin to attack the invader.

## Challenges to the Immune System (Slide 18)

- \_\_\_\_\_: the immune system reacts to foreign particles that are not dangerous to most people. When you have allergies, the immune system \_\_\_\_\_ and tries to "fight" ordinary things like grass, pollen, certain foods, or medicine. This causes the sneezing, itching, and other reactions that you get with allergies.
- \_\_\_\_\_: Cancer happens when cells that are not normal grow and spread very fast. Normal body cells grow and divide and know to stop growing. Over time, they also die. Unlike these normal cells, cancer cells just continue to grow and divide out of \_\_\_\_\_ and don't die when they're supposed to.
- \_\_\_\_\_: Immunodeficiency disorders are a group of disorders in which part of the immune system is missing or \_\_\_\_\_. Therefore, the body's ability to fight \_\_\_\_\_ is impaired. As a result, the person with an immunodeficiency disorder will have frequent infections that are generally more severe and last longer than usual.
- \_\_\_\_\_: The immune system attacks the body's own cells. When the immune system makes a mistake and attacks part of the body, it is called \_\_\_\_\_. One example of an autoimmune disease is type 1 \_\_\_\_\_, in which the immune system destroys the cells in the pancreas that produce \_\_\_\_\_.

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Class Period: \_\_\_\_\_

Movie Interactive Quiz (Printed copy): <http://kidshealth.org/kid/htbw/bfs/ISquizsource.html>

1. The purpose of the immune system is to:
  - a. Help germs invade your body
  - b. Fight off sickness
  - c. Make your nose run
  - d. Give you diarrhea
2. The immune system is made up of
  - a. Tissues
  - b. Organs
  - c. Cells
  - d. All of the above
3. As part of the immune system, white blood cells fight germs. Another name for white blood cells is:
  - a. Rhinovirus
  - b. Leukocytes
  - c. Glands
  - d. Nodes
4. Leukocytes are found in lots of places, including an organ in your belly that filters blood and helps fight infections known as the:
  - a. Heart
  - b. Spleen
  - c. Kidneys
  - d. Brain
5. The four main types of germs are:
  - a. Viruses, bacteria, parasites, and fungi
  - b. Viruses, parasites, fungi, and phagocytes
  - c. Parasites, bacteria, lymphocytes, and fungi
  - d. Small, medium, large, and extra large
6. Getting these when you are young, helps your immune system fight off diseases:
  - a. Stickers
  - b. Bandages
  - c. Shots(immunizations)
  - d. Cough drops
7. To be "immune" means what?
  - a. That you are infected
  - b. That you are bald
  - c. That you are more likely to get sick
  - d. That you are protected
8. Lymph nodes are found in the:
  - a. Neck
  - b. Armpits
  - c. Groin
  - d. All of the above
9. When someone's immune system overreacts to something harmless it's called:
  - a. Overreactus maximus
  - b. An allergy
  - c. A sneeze
  - d. The measles
10. Which of the following will not help your immune system?
  - a. Playing sports video games
  - b. Exercising
  - c. Eating healthy food
  - d. Regularly washing your hands

Name: \_\_\_\_\_ Period: \_\_\_\_\_ Class Period: \_\_\_\_\_

<http://kidshealth.org/kid/htbw/bfs/1sactivity.html?tracking=K> [Related Article](#)

Movie: Printed copy of Matching Activity

## How the body works

### Cells That Keep You Well

**Directions:** Match the immune system cell with its function. Draw a line from the cell to its mission

B cell

Mission: To devour invaders and launch the immune system attack

Killer cell

Mission: To coordinate immune system attack by recruiting and activating other immune system cells.

Cytotoxic T cell

Mission: To tag invaders with antibodies so other immune system cells will know to destroy them.

Macrophage

Mission: To devour invaders or release toxic chemicals that kill invaders.

Memory cell

Mission: To destroy infected body cells before the virus has a chance to multiply.

Helper T cell

Mission: To make immune responses faster next time invader comes around.

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Class Period: \_\_\_\_\_

Imagine! Think-Pair-Share

If you were a pathogen, what external defenses of the host's body would you have to get past?

Choose one external defense and describe your journey into the body.

Notes must be written at each stage of Think-Pair-Share.



<b>Think</b>	<b>Pair</b>	<b>Share</b>
Think about how you would answer this question.	Pair with your partner to discuss the ideas both of you came up with.	Share with another group your answers

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

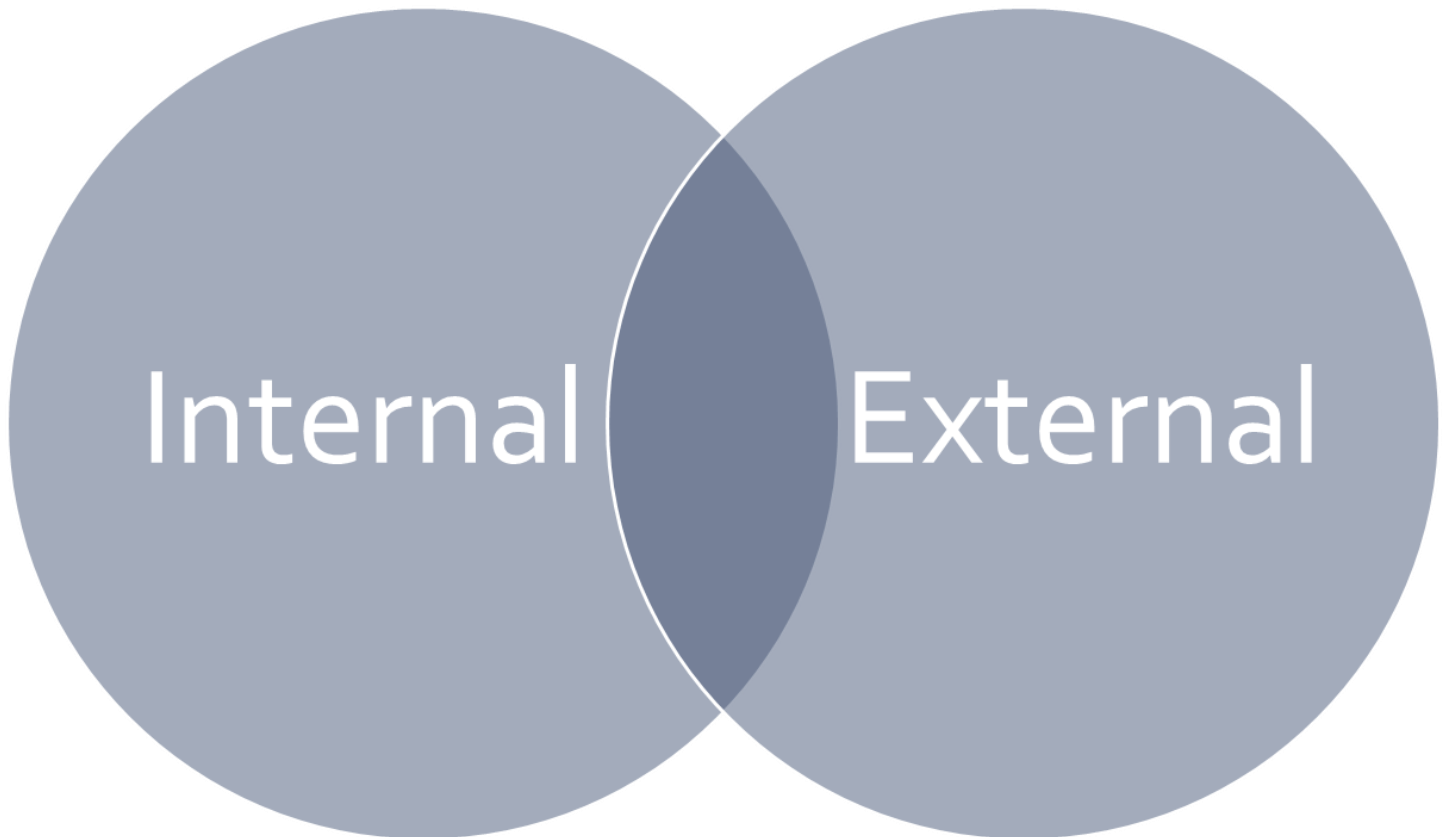
Activity: Compare/Contrast Defenses

Internal and External Defenses Venn diagram:

In the Internal Circle, place the defenses that occur inside the body.

In the External Circle, place the defenses that help keep pathogens from entering our body.

In the center area, explain what both type of defenses do for our body.



**Give an example of how these defenses help us maintain homeostasis:**

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Class Period \_\_\_\_\_

Name 4 types of pathogens.



Where are white blood cells produced?

How does having a Fever help your body defend against pathogens?

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Class Period \_\_\_\_\_

Name 4 types of pathogens.



Where are white blood cells produced?

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Name: \_\_\_\_\_ Date: \_\_\_\_\_ Class Period \_\_\_\_\_

Name 4 types of pathogens.



Where are white blood cells produced?

How does having a Fever help your body defend against pathogens?

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period \_\_\_\_\_

Working together

The systems of the human body work together to defend us from pathogens that causes disease. Each system has specific jobs that help the immune system keep us healthy. From the list below, choose 2 (or more) systems and explain how the system helps the immune system keep us safe.

Circulatory    Lymphatic    Respiratory    Skeletal    Musculatory    Skin (Integumentary)

Rubric:

Category	4 pts. (Extraordinary)	3pts. (Good Job)	2pts. (Not Quite)	1 pt. (Try Harder!)
System Comparison	Two or more systems were compared with no mistakes.	Two systems were compared with no mistakes.	Two systems were compared with minor mistakes.	Two systems were compared with major mistakes or only one system was compared.
Explanations	Explanations were thorough and well thought out.	Explanations were lacking in details.	Explanations were short and lacking in details.	Explanations were missing or incomplete.
Grammar	The response was grammatically correct. Complete sentences were used with no spelling errors.	The response was mostly grammatically correct. Complete sentences were used with minor spelling errors.	The response had grammatical errors. Complete sentences were not always used and the response had spelling errors.	The response had major grammatical errors. Punctuation and capital letters were missing with many spelling errors.
Neatness	The response was neat and easily read.	The response could be read.		

Calculate Grade: Total number of points earned/Total number of points possible (After calculating grade, add 5 points to the average).

Example: You earned 14 points out of a total of 16. 14 divided by 16 is equal to 0.875. Your grade would be 87 +5=92%