THE IMMUNE SYSTEM:

**READ, UNDERLINE, CIRLCE, HIGHLIGHT Answer Questions!**

1**Homeostasis** is one of the most important topics in biology. **Biology**, after all, is the study of life. Without a *stable internal environment*, life would not be able to exist. The inside of our body must always stay in *balance*. This is hard to do when the external environment is always changing. Not to mention, there are all sorts of pathogens that attempt to enter our bodies.

What is homeostasis?

What are pathogens?

What are 3 types of pathogens?

What is a host?

How do pathogens harm the host?

Why are skin, mucus, and cilia “nonspecific” defenses?

Which body system is responsible for “swelling?”

2**Pathogens** are foreign **microorganisms** (*micro* means small, *organisms* are living things) that can enter our bodies and cause disease. **Disease** causes our body to lose homeostasis. During disease, a pathogen harms the **host** that it enters by *killing cells, damaging tissues, and stealing organic nutrients* from the host. *Examples of pathogens* that can cause disease in our bodies are viruses, bacteria, yeast, and other **parasites**.

3Our body’s immune system is our defense against pathogens that try to, and sometimes do enter our bodies. We are designed with special *structures and* *mechanisms* that keep pathogens out of our system. They are not specific to any certain invader, but in general they do their best to keep pathogens away. Some examples are *skin, nose hairs, eyelashes, mucus, and tears.*

4If pathogens do get in our body, our immune system triggers *swelling and fever*. The **inflammatory response** is when an area of your body that is being harmed by a pathogen (like a bacteria or virus) becomes *swollen*. Blood and fluids *that carry things to help repair your body* are sent to the damaged area. *The extra fluid in the area is what causes the swelling.*

What is the purpose of a swelling?

What is the purpose of a fever?

What type of blood cells are found in the immune system?

What are antigens?

Where are antigens found?

5When a pathogen invades a host body, *it uses host cells* to replicate and divide. Very quickly, a virus can go from infecting one cell to infecting *thousands of cells*. Our bodies raise our internal temperature and cause a **fever** to try to *slow down the rate of infection.*

6The most important parts of our immune system are the **specific** defenses that we have. Remember that there are two types of blood cells- Red and White. **Red blood cells** carry oxygen and organic nutrients to cells for cellular respiration. The **white blood cells** are the *specialized cells in our immune system that recognize, attack, and remember pathogens*.

7An important part of the immune system is *to recognize who does not belong in the body.* **Antigens** are molecules found on pathogens that the immune systems recognizes as dangerous. Pathogens have antigens sticking out of their surfaces. The antigen is like an *ID card* for the pathogen. If our white blood cell recognizes an antigen on a pathogen in our body, it will trigger an **immune system attack**.

 8Special white blood cells called **B cells** *patrol our blood looking for dangerous antigens that might be floating through*. As we grow and develop, our bodies create millions of different B cells. Each type of B cell is designed to recognize a specific antigen. If a certain virus enters your body, the specific B cell that can match the antigen must be found.

What do B cells do when they see an antigen?

How are B cells specific?

What is an antibody?

What happens to a pathogen if it has an antigen attached to it?

What are antigens?

Who makes antibodies?

What does “engulf” mean?

What is the target of pathogens? (Where are they trying to get to?)

What happens if a pathogen is able to infect a cell?

9When a B cell recognizes a foreign antigen, it attaches something called an **antibody** to the antigen. An **antibody** is a flag that B cells attach to pathogens. It is a special flag that says “DESTORY THIS INVADER!” Special white blood cells will then come and **engulf**, or EAT the flagged pathogen!

So let’s pause, because this is a lot of new information! To summarize- Your body has **white blood cells** which seek and destroy invading pathogens. White blood cells look for molecules called **antigens**. Antigens are found on pathogens only, and *they trigger the immune system to respond*. When an antigen is spotted, a special white blood cell called a B cell will attach an antibody flag to the antigen. This antibody “flag” is a mark to tell other white blood cells, called engulfing cells, to come and destroy the pathogen. The B cell is the snitch!

10If the words are getting confusing, think… pathoGENs have antiGENs on their surface. B cells from the BODY make antiBODIES!

Where does a pathogen go if it is able to get past the B cells?

How can you stop a virus that had already infected a cell?

What do B cells and T cells do to launch a stronger attack?

What happens to these white blood cells after the attack is over?

What happens to all of the antibody flags?

If the same pathogen ever tries to invade the body again, what will happen to it?

11Some pathogens escape the B cell antibodies and infect our body cells, causing disease and harm. Special white blood cells called **killer** **T cells** *carry out the aTTack to destroy pathogens infecting cells*. The only way to kill a virus infecting a cell is to *destroy both the cell and virus together*. Like B cells, there is a specific T cell in the body that is designed to do the attack.

12During the invasion, *the single B cell and T cell able to do the job multiply to an army with millions of B and T cells.* After the attack is over, the millions of B and T cells made *will remain the body forever.* There are also millions of antibodies floating in the blood, ready to flag and destroy this virus if it ever attempts to enter the body again. Now that the body has seen and can recognize the virus, our body is **immune** to it. The body built up the defenses it needs to destroy that invader before any harm is done next time. The millions of new B cells and T cells that were created are called **memory cells**. Memory cells prevent the virus from ever causing disease in your body again.