How Our Immune System and Vaccines Protect Us From Diseases

Name: _____

Date: _____

Student Quiz—*Answer Key*

1. Match the following terms with the right description. Write the letter representing the right description for each term in the table below.

Term	Description #
Antibody	*F*
Antigen	*J*
Pathogen	*H*
Primary immune response	*G*
Innate immune response	*B*
Adaptive immune response	*K*
Antigenic drift	*L*
Vaccine	*E*
Memory cells	*A*

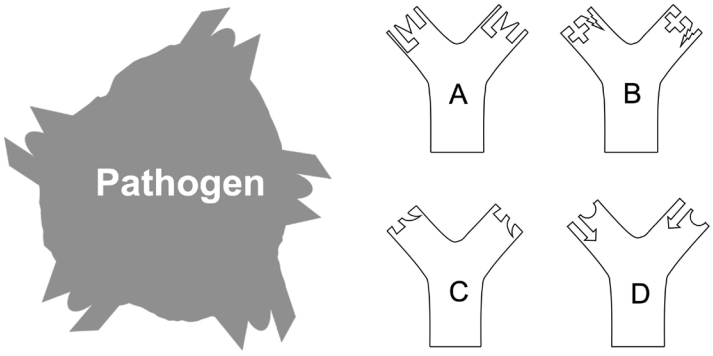
Description	#
Adaptive immune cells that remain long-term after an infection. Can be quickly reactivated upon re-exposure to a specific antigen.	A
The first line of defense of our immune system. Includes the skin, mucous membranes, and innate immune cells, such as phagocytes. Is non-specific and has no memory. Response time usually minutes or hours.	B
Protects us from certain diseases. Usually, contains antigens that trigger a primary immune response against a pathogen without causing an actual infection or disease.	E
A y-shaped protein produced by B cells. Consists of a constant region and a variable region that includes specific antigen-binding sites.	F
Name for the immune response that happens when the immune system encounters a specific pathogen for the first time.	G
A harmful microorganism (like a bacteria, virus, or fungus) that can make us sick.	H
Any foreign substance or molecular structure that triggers an immune response. Example: specific features or molecular structures on a pathogen's cell surface.	J
The second line of defense of our immune system. Its key players are T cells and B cells. Is specific and can remember pathogens. Response time usually days or weeks.	K
A slight change of a pathogen's antigen structure due to an accumulation of genetic mutations. Results in the emergence of pathogen variants that can escape existing immunities.	L

Name: _____

2. In your own words, describe at least three main differences between the innate and adaptive immune responses.

Innate immune response	*Adaptive immune response*
First line of defense against pathogens	*Second line of defense against pathogens*
Rapid response time (minutes to hours)	*Slow response time (days to weeks)*
Key players: Skin, mucous membranes, phagocytes (special white blood cells)	*Key players: T cells and B cells (antibodies)*
Non-specific	*Specific*
Cannot remember pathogens (no memory)	*Can remember pathogens via memory cells (long-term memory)*

3. Which of the following antibodies can target the depicted pathogen?



a. Antibody A
b. Antibody B
c. Antibody C
d. Antibody D
e. None

Name: _____

4. Which of the following are types of vaccines?
   a. Inactivated vaccines: contain inactive forms of the pathogen
   b. Live-attenuated vaccines: contain active but weakened forms of the pathogen
   c. Active vaccines: contain active forms of the pathogen
   d. mRNA vaccines: contain mRNA that instructs our body to make the pathogen's antigen
   e. T cell vaccines: contain T cells specific to the pathogen

5. Explain below why we need an annual flu shot.

   The influenza virus that causes the flu is constantly changing and evolving due to the accumulation of genetic mutations in its genome. These genetic mutations can change the structure of their antigens. This process is called antigenic drift, and it results in many different influenza virus variants, each with a slightly different genetic makeup. If a genetic mutation affects the antigen, the new influenza virus variant becomes capable of escaping an existing immunity. The new antigens will no longer bind to the antibodies or immune cell receptors. As a result, the new influenza virus variant is able to infect people who were immune to the original strain of the virus because of prior infection or vaccination. Antigenic drift makes it easier for a virus to spread throughout partially immune populations. To counteract antigenic drift of the influenza virus, a new flu shot is developed every year to make sure new virus variants are covered in the vaccine.