**Chapter 9 - Immunity and the Immune System**

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**MCQs:**

1. C
2. D
3. B
4. A
5. C
6. D
7. B
8. B
9. C
10. B

**Short Questions:**

**1. Enlist the steps of the immune response.** The immune response begins when the body recognises a foreign antigen. This recognition activates lymphocytes, which multiply to form an army of immune cells. These activated cells then attack and destroy the invading pathogen. Finally, some cells become memory cells, ensuring a faster response if the same pathogen infects the body again.

**2. Draw a flow chart of different types of white blood cells.** White blood cells, or leukocytes, are divided into two main groups: granulocytes and agranulocytes. Granulocytes include neutrophils, eosinophils, and basophils, while agranulocytes include lymphocytes and monocytes. Each type plays a specific defensive role in protecting the body from infections.

**3. How lymph nodes prevent the spread of pathogens in the human body?** Lymph nodes act as biological filters that trap and destroy harmful microorganisms and foreign particles present in lymph fluid. They contain large numbers of lymphocytes and macrophages that identify and eliminate pathogens before the lymph is returned to the bloodstream. This prevents infections from spreading throughout the body.

**4. Name a few vaccines and the diseases they control.** Vaccines are biological preparations that protect against specific diseases. For example, the BCG vaccine prevents tuberculosis, the Polio vaccine protects from poliomyelitis, and the Hepatitis B vaccine guards against liver infection. The MMR vaccine prevents measles, mumps, and rubella, while COVID-19 vaccines protect against coronavirus infection.

**5. What are the types of memory cells? Why are they important?** There are two main types of memory cells: memory B cells and memory T cells. These cells remain in the body for years after an infection or vaccination. When the same pathogen re-enters the body, memory cells quickly recognise it and trigger a faster and stronger immune response, preventing reinfection.

**6. Why are booster doses of vaccines important?** Booster doses are important because they reactivate and strengthen the immune system’s memory against a specific pathogen. Over time, antibody levels can decline, and boosters help to restore and increase immunity. This ensures long-lasting protection against diseases such as tetanus, hepatitis, and COVID-19.

**7. What are the symptoms of an allergy?** Common allergy symptoms include sneezing, watery eyes, skin rashes, and itching. Some individuals may also experience coughing, swelling, or breathing difficulties. In severe cases, an allergic reaction may lead to a dangerous condition called anaphylaxis, which requires immediate medical attention.

**8. Name different causes of allergy.** Allergies can be caused by a wide range of substances found in the environment. Common causes include pollen, dust, animal dander, insect stings, food items like nuts and seafood, and certain medications. Each person’s immune system reacts differently to these allergens.

**9. Which substances cause an allergy? Enlist them.** Substances that commonly trigger allergic reactions are called allergens. Examples include pollen grains, dust mites, pet hair, perfumes, latex, insect venom, peanuts, shellfish, and some antibiotics. These harmless substances are mistakenly identified by the immune system as threats.

**10. Write the differences between:**

* **Granulocytes and lymphocytes:** Granulocytes have granules in their cytoplasm and are involved in nonspecific defence, while lymphocytes lack granules and are part of specific immune responses.
* **Macrophages and dendritic cells:** Macrophages engulf and digest microbes, while dendritic cells present antigens to activate T cells.
* **Allergy and allergen:** Allergy is an overreaction of the immune system, whereas an allergen is the substance that causes it.
* **Cytotoxic T cells and helper T cells:** Cytotoxic T cells directly kill infected cells, while helper T cells activate B cells and coordinate immune responses.
* **Plasma cells and memory B cells:** Plasma cells produce antibodies during infection, while memory B cells remain in the body for future protection.
* **Primary and secondary immune response:** The primary response is slow during the first exposure, while the secondary response is faster and stronger due to memory cells.
* **Innate immunity and acquired immunity:** Innate immunity is present from birth and nonspecific, while acquired immunity develops after exposure and is specific.

## **Extensive Answer Questions**

**1. Describe the role of the immune system in the human body.** The immune system plays a vital role in defending the body against bacteria, viruses, fungi, and other harmful invaders. It identifies foreign antigens and works through a complex network of cells and organs to neutralise them. Immune cells destroy infected or damaged cells and help in tissue repair. The system also develops memory after infections or vaccinations, providing long-term protection. Without it, even minor infections could become life-threatening.

**2. Explain the immune system and its organs.** The immune system is a defence network made up of organs, cells, and tissues that protect the body from disease. Its main organs include the bone marrow, where blood cells are produced, and the thymus, where T cells mature. The spleen filters the blood and removes damaged cells, while lymph nodes trap pathogens present in lymph fluid. Other organs such as tonsils and adenoids also help in trapping and destroying germs entering through the mouth or nose. Together, these organs coordinate the body’s defence.

**3. The immune system is made up of white blood cells. What are the different types of white blood cells? Give their role.** White blood cells, also called leukocytes, are the main soldiers of the immune system. They include neutrophils, eosinophils, basophils, lymphocytes, and monocytes. Neutrophils destroy bacteria through phagocytosis, eosinophils fight parasitic infections, and basophils release histamine during allergic reactions. Lymphocytes include B and T cells that provide specific immunity, while monocytes become macrophages that clean up dead cells and microbes. Each type works together to maintain health and resist infection.

**4. Compare innate and adaptive immunity. Which type of immunity increases in most people when they reach adulthood?** Innate immunity is the body’s natural, inborn defence mechanism that provides a quick, nonspecific response against all pathogens. It includes barriers like skin, mucus, and immune cells such as macrophages. Adaptive immunity, on the other hand, is developed through exposure to diseases or vaccinations. It targets specific pathogens and forms memory for long-term protection. As people age and are exposed to more infections or vaccines, adaptive immunity becomes stronger and more effective than innate immunity.

**5. Explain three lines of defence and their components.** The body has three lines of defence to fight infections. The first line includes physical and chemical barriers such as skin, mucus, and stomach acid that prevent pathogen entry. The second line involves nonspecific responses like inflammation, fever, and phagocytosis by macrophages. The third line of defence is specific and adaptive, consisting of lymphocytes (B and T cells) and antibodies that target particular pathogens. Together, these three lines form a complete and efficient immune defence system.

**6. What is an allergy? Explain its types.** An allergy is a hypersensitive reaction of the immune system to harmless substances known as allergens. The immune system mistakenly treats these substances as threats and releases chemicals like histamine, causing symptoms such as sneezing, itching, or rashes. There are two main types: immediate hypersensitivity, which occurs within minutes of exposure (like asthma or hay fever), and delayed hypersensitivity, which develops hours or days later (like skin rashes caused by metals).

**7. How has vaccination helped humans to eradicate diseases like smallpox?** Vaccination trains the immune system by introducing a weakened or inactive form of a pathogen, allowing the body to produce antibodies and memory cells without causing illness. When exposed to the real pathogen later, the immune system quickly recognises and destroys it, preventing disease. Large-scale vaccination campaigns built herd immunity, breaking the chain of transmission. This scientific approach successfully eradicated smallpox worldwide and continues to protect against many deadly diseases today.



