بِسۡمِ اللّٰہِ الرَّحۡمٰنِ الرَّحِیۡمِ

Quran Education Point

QuranEducationPoint.Com

Class	10th	Chapter	09
Subject	Biology	Board	Federal

CHAPTER 9: IMMUNITY AND THE IMMUNE SYSTEM

Section I: Multiple Choice Questions

Select the correct answer:

1. Cytotoxic cells are: A) the same as memory T cells B) suppresses the immune response C) T cells that are actively killing other cells D) inactive T cells carried in the plasma

Answer: C) T cells that are actively killing other cells

2. Antibodies provide adaptive immunity by: A) attaching with specific antigen B) killing pathogens after recognition C) neutralizing toxins by combining with them D) all of the above

Answer: D) all of the above

3. Innate Immune system can protect us from disease by acting on: A) specific pathogens only B) all types of invaders C) producing antibodies D) recognizing pathogens

Answer: B) all types of invaders

4. Fever is harmful for: A) our normal metabolism B) growth of pathogens C) our growth and development D) working of Immune system

Answer: A) our normal metabolism

5. Macrophages and dendritic cells are: A) lymphocytes B) granulocytes C) monocytes D) red blood cells

Answer: C) monocytes

6. After birth, all types of blood cells are formed in: A) thymus B) adenoids C) lymph nodes D) bone marrow

Answer: D) bone marrow

7. When one receives a booster dose of vaccine for COVID-19, which type of T cell is most directly stimulated? A) cytotoxic T cells B) memory T cells C) helper T cells D) suppressor T cells

Answer: B) memory T cells

8. Role of clotting in immunity is to prevent: A) loss of blood plasma B) entry of pathogens C) loss of blood cells D) spread of wound

Answer: B) entry of pathogens

9. Vaccination and disease exposure strengthens: A) first line of defence B) second line of defence C) third line of defence D) innate immunity

Answer: C) third line of defence

10. Allergy is overreaction of immune system to: A) harmless substances B) harmful substances C) pathogens D) virus and bacteria

Answer: A) harmless substances

QuranEducationPoint.Com

بِسۡمِ اللّٰہِ الرَّحۡمٰنِ الرَّحِیۡمِ

Section II: Short Answer Questions

Q1. Enlist the steps of immune response?

- **Recognition:** The immune system detects foreign antigens (pathogens) via specific receptors on lymphocytes.
- **Activation:** Lymphocytes multiply and differentiate upon recognizing the target antigen.
- **Effector Action:** Effector cells and antibodies neutralize or destroy the invading pathogen.
- **Memory Formation:** Long-lived memory cells remain to provide rapid protection against future infections.

Q2. Draw a flow chart of different types of white blood cells.

- **White Blood Cells (Leukocytes)**
  - **Granulocytes:** Neutrophils, Eosinophils, Basophils
  - **Agranulocytes:**
    - **Lymphocytes:** B Cells, T Cells (Helper, Cytotoxic, Suppressor, Memory), Natural Killer (NK) Cells
    - **Monocytes:** Differentiate into Macrophages and Dendritic Cells

Q3. How lymph nodes prevent the spread of pathogens in human body?

Lymph nodes act as biological filtration units along lymphatic vessels. As lymph fluid passes through them, resident macrophages, dendritic cells, and lymphocytes trap, filter, and destroy foreign particles and pathogens before the fluid is returned to the bloodstream, preventing localized infections from becoming systemic.

Q4. Name few vaccines and the diseases they control.

- **BCG Vaccine:** Controls Tuberculosis (TB)
- **Polio Vaccine (OPV/IPV):** Controls Poliomyelitis (Polio)
- **MMR Vaccine:** Controls Measles, Mumps, and Rubella
- **Hepatitis B Vaccine:** Controls Hepatitis B

Q5. What are the types of memory cells? Why are they important?

- **Types:** Memory B cells and Memory T cells.
- **Importance:** They persist in the body for years or decades after an initial infection or vaccination. Upon re-exposure to the same pathogen, they recognize it instantly and trigger a massive, rapid secondary immune response before symptoms can manifest.

Q6. Why booster doses of vaccine are important?

Immunity levels and antibody titers naturally decline over time following initial immunization. A booster dose re-stimulates memory B and T cells, restoring high antibody concentrations and ensuring long-lasting immunological protection.

Q7. What are the symptoms of allergy?

Symptoms vary depending on the allergen and exposure site, commonly including:

- Sneezing, runny/stuffy nose, and watery, itchy eyes (allergic rhinitis).
- Skin rashes, hives (urticaria), and swelling.

نوٹس حاصل کرنے کے لیے QuranEducationPoint.com لکھ کر سرچ کریں۔

- Wheezing, coughing, shortness of breath, and asthma flare-ups.
- Severe systemic reactions (anaphylaxis), leading to a dangerous drop in blood pressure and breathing difficulties.

Q8. Name different causes of allergy?

Allergies are caused by an overactive immune system reacting to harmless environmental antigens (allergens). Common triggers include:

- **Inhalants:** Pollen, mold spores, house dust mites, pet dander.
- **Ingestants:** Foods such as peanuts, tree nuts, shellfish, milk, and eggs.
- **Injectants & Contactants:** Insect stings (bees, wasps), latex, certain medications (penicillin), and cosmetics.

Q9. Which substances cause allergy? Enlist them.

Substances that trigger allergic reactions are known as **allergens**. Key examples include:

- Tree, grass, and weed pollen
- House dust mites and cockroach waste
- Animal dander and saliva
- Fungal and mold spores
- Food proteins (peanuts, milk, wheat, soy, fish)
- Insect venoms (bee and wasp stings)
- Medications (penicillin, aspirin)
- Contact substances (latex, nickel)

Q10. Write the differences between:

- **a. Granulocytes and lymphocytes:**
  - *Granulocytes:* White blood cells containing prominent cytoplasmic granules (neutrophils, eosinophils, basophils) involved in innate defense.
  - *Lymphocytes:* Agranulocytes lacking prominent granules (B cells, T cells) central to adaptive immunity.
- **b. Macrophages and dendritic cells:**
  - *Macrophages:* Large phagocytic cells derived from monocytes that engulf debris and pathogens in tissues.
  - *Dendritic Cells:* Professional antigen-presenting cells with branched projections that capture antigens and present them to T cells.
- **c. Allergy and allergen:**
  - *Allergy:* The abnormal, hypersensitive immune reaction itself.
  - *Allergen:* The specific harmless substance (e.g., pollen) that triggers the allergic response.
- **d. Cytotoxic T cells and helper T cells:**
  - *Cytotoxic T Cells:* Directly attack and destroy virus-infected or cancerous host cells.

- *Helper T Cells:* Release signaling chemicals (cytokines) to coordinate and activate other immune cells.

- **e. Plasma cells and memory B cells:**
  - *Plasma Cells:* Differentiated B cells acting as antibody factories that secrete large amounts of antibodies.
  - *Memory B Cells:* Long-lived dormant B cells that provide long-term immunity against future infections.
- **f. Primary and secondary immune response:**
  - *Primary Response:* Occurs upon first exposure; slow, weak, and produces lower antibody levels.
  - *Secondary Response:* Occurs upon subsequent exposure; rapid, robust, and produces massive antibody titers.
- **g. Innate immunity and acquired immunity:**
  - *Innate Immunity:* Non-specific, present from birth, acts rapidly without prior exposure.
  - *Acquired Immunity:* Specific, develops throughout life upon exposure, exhibits immunological memory.

QuranEducationPoint.Com

بِسۡمِ اللّٰہِ الرَّحۡمٰنِ الرَّحِیۡمِ

Section III: Extensive Answer Questions

Q1. Describe the role of immune system in human body.

The immune system is a sophisticated network of cells, tissues, and organs that plays vital roles in maintaining health:

- **Defense Against Pathogens:** Protects the body against infections by harmful bacteria, viruses, fungi, and parasites.
- **Removal of Cellular Debris:** Scavenges and clears dead, damaged, or senescent cells from tissues.
- **Tumor Surveillance:** Detects and destroys abnormal mutated cells before they can form tumors or cancers.
- **Homeostasis & Healing:** Collaborates with inflammatory pathways to repair injured tissues and restore normal physiological function.

Q2. Explain Immune system and its organs.

The immune system comprises primary and secondary lymphoid organs where immune cells are produced, matured, and deployed:

- **Primary Lymphoid Organs:**
  - *Bone Marrow:* The birthplace of all blood cells and maturation site for B cells.
  - *Thymus Gland:* The specialized organ where T lymphocytes mature and differentiate.
- **Secondary Lymphoid Organs:**
  - *Lymph Nodes:* Filter lymph fluid and house active lymphocytes and macrophages.
  - *Spleen:* Filters blood, destroys old red blood cells, and mounts immune responses against blood-borne pathogens.
  - *Tonsils and Adenoids:* Trap pathogens entering via the respiratory tract (MALT).
  - *Peyer's Patches & Appendix:* Monitor intestinal bacteria and protect the digestive tract.

Q3. Immune system is made up of white blood cells. What are the different types of white blood cells? Give their role.

White blood cells (leukocytes) serve specialized defensive functions:

- **Neutrophils:** Fast-acting phagocytic cells that form the primary cellular defense against acute bacterial infections (forming pus).
- **Eosinophils:** Combat parasitic infections and regulate allergic inflammatory responses.
- **Basophils:** Release histamine and heparin during allergic reactions and inflammation.
- **Monocytes (Macrophages & Dendritic Cells):** Engulf large pathogens and present antigens to T cells, bridging innate and adaptive immunity.
- **B Lymphocytes:** Produce specific antibodies that neutralize toxins and tag pathogens for destruction.
- **T Lymphocytes:**
  - *Helper T Cells:* Coordinate overall immune activity.

نوٹس حاصل کرنے کے لیے QuranEducationPoint.com لکھ کر سرچ کریں۔

- *Cytotoxic T Cells:* Directly destroy infected or cancerous host cells.

- **Natural Killer (NK) Cells:** Non-specifically target and destroy virus-infected and tumor cells.

Q4. Compare innate and adaptive immunity. Which type of immunity increases in most people when they reach adulthood?

- **Comparison Table:**

Feature	Innate Immunity	Adaptive Immunity
Specificity	Non-specific (acts on all invaders)	Highly specific to particular antigens
Response Time	Immediate / Rapid	Slower (takes days to develop)
Memory	Lacks immunological memory	Possesses long-term memory
Components	Skin, mucous membranes, phagocytes	T cells, B cells, antibodies

- **Adulthood Immunity: Adaptive immunity** increases significantly in most individuals as they reach adulthood, due to cumulative lifetime exposure to various environmental pathogens, infections, and vaccinations.

Q5. Explain three lines of defence and their components.

- **First Line of Defence (Physical & Chemical Barriers):** Non-specific barriers blocking pathogen entry. Components include intact skin, mucous membranes, ciliated respiratory passages, stomach acid, tears, saliva, and sweat.
- **Second Line of Defence (Innate Internal Defenses):** Non-specific internal mechanisms deployed if barriers are breached. Components include phagocytic white blood cells (neutrophils, macrophages), natural killer cells, inflammation, antimicrobial proteins, and fever.
- **Third Line of Defence (Adaptive Immunity):** Highly specific targeted defense. Components include T cells, B cells, antigen-presenting cells, circulating antibodies, and memory cells.

Q6. What is allergy? Explain its types.

- **Allergy:** An exaggerated, hypersensitive immune reaction triggered by normally harmless environmental substances (allergens) such as pollen, dust, or certain foods.
- **Types of Allergic Reactions:**
  - *Immediate (Type I / Anaphylactic) Hypersensitivity:* Mediated by IgE antibodies, causing rapid histamine release (e.g., hay fever, asthma, hives, anaphylaxis).

- *Cytotoxic (Type II) Hypersensitivity:* Mediated by IgG or IgM antibodies reacting with cell-surface antigens, causing cell lysis (e.g., blood transfusion reactions).
- *Immune Complex (Type III) Hypersensitivity:* Caused by antigen-antibody complex deposition in tissues leading to inflammation.
- *Delayed-Type (Type IV) Hypersensitivity:* Mediated by T cells rather than antibodies, appearing 24–72 hours later (e.g., contact dermatitis from poison ivy).

Q7. How vaccination helped humans to eradicate diseases like smallpox?

- **Mechanism:** Vaccines introduce harmless antigens (inactivated or weakened pathogens/subunits) into the body, safely stimulating the third line of defense and establishing memory B and T cells without causing illness.
- **Eradication of Smallpox:** Through global, coordinated mass immunization campaigns spearheaded by the World Health Organization (WHO), widespread herd immunity was achieved. Because smallpox exclusively infected humans and had no animal reservoir, vaccination successfully severed all transmission chains, leading to its complete global eradication in 1980.

QuranEducationPoint.Com