

Immunology Final Exam Answer Key

Exercise 1: MCQs: Choose the correct answer. (5 pts)

<p>1. Who is credited with the birth of immunology as a science for developing the smallpox vaccine? c) Edward Jenner 0.5</p>	<p>2. The term "immunity" is derived from the Latin word "immunis," which originally meant: b) Protection 0.5</p>
<p>3. Which surface marker is commonly used to identify Hematopoietic Stem Cells (HSCs)? d) CD34 0.5</p>	<p>4. Which secondary lymphoid organ is specialized for trapping and filtering blood-borne antigens? c) Spleen 0.5</p>
<p>5. MHC Class I molecules are expressed on: b) Almost all nucleated cells 0.5</p>	<p>6. In the MHC Class I pathway, which protein transports peptides into the Endoplasmic Reticulum? c) TAP 0.5</p>
<p>7. Which chemical barrier in the innate immune response breaks down bacterial cell walls? b) Lysozyme 0.5</p>	<p>8. Which antibody class is the first to be produced during a primary immune response? d) IgM 0.5</p>
<p>9. Helper T cells that release IFN-γ to activate macrophages are classified as: a) Th1 cells 0.5</p>	<p>10. The tuberculin skin test is an example of which type of hypersensitivity? d) Type IV (Delayed-type) 0.5</p>

Exercise 2: Mark each statement as True or False. If False, provide a brief correction. (5 pts)

1. The bone marrow is the primary site for T lymphocyte maturation. False **0.5**

The thymus is the primary site for T lymphocyte maturation. **0.5**

2. MHC genes are inherited in a codominant manner, meaning both parental alleles are expressed. True **1**

3. Neutrophils are the most abundant white blood cells and act as the first responders to infection. True **1**

4. The secondary immune response is slower and weaker than the primary immune response. False **0.5**

The secondary immune response is faster and stronger due to memory cells. **0.5**

5. ELISA is a high-sensitivity diagnostic test that uses enzyme-conjugated antibodies. True **1**

Exercise 3: Complete the sentences below by filling in the blanks with the correct words. (8 pts)

1. In the MHC Class II pathway, the **Invariant chain (Ii)** initially binds to the MHC II molecule in the ER to prevent premature peptide binding. **1**

2. The process of coating a pathogen with antibodies (like IgG) to enhance its destruction by phagocytes is called **Opsonization**. **1**

3. Many cytokines use the **JAK-STAT** signaling pathway to initiate gene transcription in the nucleus. **1**

4. Visible clumping of particles due to antibody-antigen binding is a laboratory principle known as **Agglutination**. **1**
5. The laboratory principle characterized by the visible clumping of particles, such as latex beads or red blood cells, due to antibody-antigen binding is known as **Agglutination**. **1**
6. A highly sensitive diagnostic technique that uses enzyme-conjugated antibodies to produce a colorimetric signal proportional to the concentration of the target is called **ELISA**. **1**
7. To quantify specific immunoglobulins like IgG or IgM, the **Radial Immunodiffusion (RID)** technique allows an antigen to diffuse into agar containing antibodies, creating a measurable precipitation ring. **1**
8. In **Indirect Immunofluorescence**, a primary antibody first binds to the target antigen, followed by a fluorescent secondary antibody that amplifies the signal for visualization under UV light. **1**

Exercise 4: Fill in the missing information regarding MHC molecules. (2 pts)

Feature	MHC Class I	MHC Class II
Chain Composition	Heavy α -chain + β 2-microglobulin 0.25	α and β chains 0.25
Expression (Location)	Almost all nucleated cells 0.25	All immune cells primarily on APCs 0.25
Antigen Source	Endogenous (e.g., viral)	Exogenous (e.g., bacterial) 0.25
Target T cell	CD8 ⁺ Cytotoxic T cells 0.25	CD4 ⁺ Helper T cells 0.25
Binding Groove	α 1 and α 2 domains	α 1 and β 1 domains 0.25