11.1 The immune system

Name: _____ Class: _____ Date: _____ **Total: 12 marks**

KEY WORDS immune response • immune system • antigen • self antigen • phagocyte

Objective

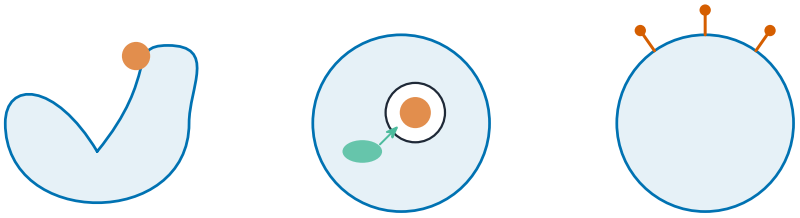
Build the skills to answer exam questions on **the immune system** – **phagocytes**, **antigens**, the **primary immune response**, and **memory cells**.

You must be able to:

- describe the mode of action of phagocytes and explain self vs non-self antigens
- describe the primary immune response (macrophages, B- and T-lymphocytes)
- explain the role of memory cells in the secondary response and long-term immunity

1 Key knowledge and worked examples

Phagocytes

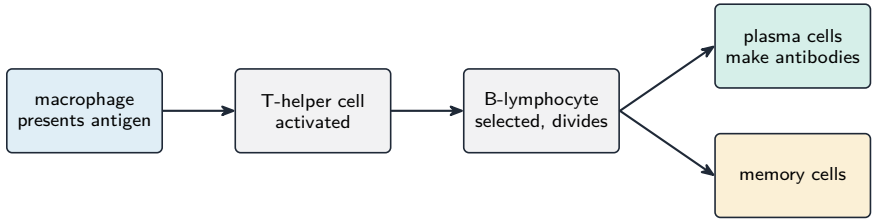


1. engulfs the pathogen
2. digests it with enzymes
3. displays the antigen

Phagocytosis: the phagocyte engulfs the pathogen, digests it, then displays its antigen

A phagocyte (macrophage or neutrophil) destroys a pathogen by **phagocytosis**: it engulfs the pathogen, digests it with enzymes, then displays its **antigen**. A **self antigen** is the body's own marker (ignored); a **non-self antigen** is foreign (triggers a response).

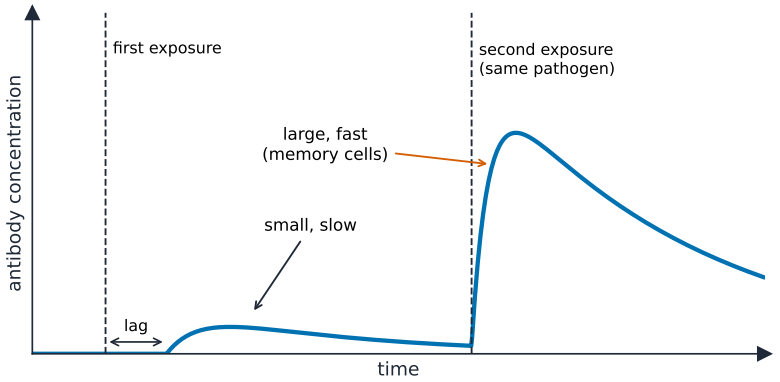
The primary immune response



Only the B-lymphocyte matching the antigen is selected and cloned into plasma cells and memory cells

A macrophage presents the antigen; a matching **T-helper cell** (T) activates the matching **B-lymphocyte**, which divides into **plasma cells** (make **antibodies**) and **memory cells**. **T-killer cells** destroy infected body cells.

Memory cells and the secondary response



secondary response: faster and larger (memory cells)

The secondary response is faster and larger because memory cells are ready

Memory cells stay for years; a second exposure to the **same** pathogen gives a faster, larger secondary response, destroying it before illness.

2 Practice

2.1 State what an antigen is, and the difference between a self and a non-self antigen. [2]

2.2 Name the cells that (a) make antibodies and (b) remain to give long-term immunity. [2]

3 Exam-style questions

3.1 What does a macrophage do **after** digesting a pathogen? [1]

- **A** makes antibodies
- **B** displays the pathogen's antigen on its surface
- **C** becomes a memory cell
- **D** divides to form plasma cells

3.2 Why is the secondary immune response faster than the primary response? [1]

- **A** there are more pathogens
- **B** memory cells are already present and respond quickly
- **C** phagocytes work faster the second time
- **D** the antigen has changed shape

3.3 Describe the sequence of events in the primary immune response, from a macrophage presenting an antigen to the production of antibodies. [4]

3.4 Explain why a person who has recovered from a disease is often immune to that same disease for many years. [2]