Lesson Plan 1: Introduction to the Immune System

AQA Links:

- 4.3.1.1 Communicable diseases
- 4.3.1.6 Human defence systems

Learning Outcomes:

1) Describe the role of the immune system in protecting the body.
2) Explain how white blood cells recognise and respond to pathogens.
3) Understand the basic sequence of events in an immune response.

Materials Needed:

- Scissors
- Whiteboard/equivalent
- Printer
- Powerpoint presentation and screen

Introduction

Starter Discussion: *"What happens when you catch a cold and what helps you recover?"*

Encourage students to describe symptoms (e.g. runny nose, coughing, tiredness) and how they recover from a cold (resting, staying hydrated, taking remedies to alleviate symptoms).

Play the following animated video to introduce topics below:
https://youtu.be/k1oCiR9Y2zQ?si=oW5snQryrJlYnTwN

- **Pathogens (bacteria/viruses/fungi):** *Tiny organisms that can cause illness.*
- **White blood cells:** *Special cells in the blood that fight off germs and keep you healthy.*
- **Antigens and antibodies:** *Antigens are markers on germs that identify them; antibodies are proteins made by the body to attack them.*
- **Toxins:** *Harmful substances produced by some pathogens that can make you feel ill.*
- **Mucus:** *A sticky substance that traps dust and germs in your nose, throat, and lungs.*
- **Natural barriers:** *The body's first line of defence, like skin and stomach acid, that help stop germs from getting in.*

Activity 1: Immune Response Timeline Sort (LO1, LO3)

Objective: Students will understand the consecutive nature of the immune response

Instructions: Give each student the premade, mixed-up set of "event cards" describing stages of an infection and immune response. Students must arrange the cards in the correct chronological order. Once done, have them first briefly explain the sequence to a peer. Then, ask students to answer the questions on their worksheet about the order of immune response.

Answer: C, E, D, G, F A, D

Extension: Students add extra information regarding symptoms you feel at each point.

Activity 2: Becoming an Immune Cell – Role Play (LO1, LO2)

Instructions: Assign students — or allow them to self-assign — individual roles in groups of 8 using activity 2 role play cards. If short on numbers, have students double up on roles, such as combining *pathogen* and *toxin*, as well as *lymphocyte* and *antibody*.

Prompt students to create a scene that demonstrates how the immune system overcomes infection. Explain to students the following success criteria for the scene:

1. **Understanding of the Immune Response.** Do the performers clearly show how the immune system overcomes infection (e.g. pathogen enters → immune response → recovery)?

2. **Accuracy of Roles.** Are the roles of Antibody, Host, Mucus, Phagocyte, Lymphocyte, Toxin, Pathogen, and Antigen correctly shown and explained?

3. **Creativity and Communication.** Is the scene imaginative, engaging, and easy to understand?

4. **Teamwork and Participation.** Did everyone take part and contribute equally?

5. **Clarity of Scientific Ideas.** Were key ideas (such as how white blood cells recognise and respond to pathogens, antibodies binding to antigens, destruction of pathogens) communicated clearly?

Allow students 10 minutes to design a scene that can be performed start-to-finish in 2 minutes. Prompt students to consider: what causes an infection? How does the immune system respond, and in what order? What does each individual role do?

Extension: Students create a label on their worksheets with an image and description of their role.

Allow students 5 minutes to rehearse their scene. Each group then performs their scene. While watching the scenes, ask students to fill out the scoring tables on their worksheets.

Plenary: Quick Quiz

Quiz Questions (on whiteboards):

1. What is a pathogen? *A pathogen is a tiny organism, like a virus, bacteria, or fungus, that can enter your body and make you sick.*
2. How do white blood cells recognise pathogens? *White blood cells spot pathogens by detecting special markers (called antigens) on their surface that don't belong to your body.*
3. What do antibodies do? *Antibodies are special proteins made by white blood cells that stick to pathogens, helping to destroy them or stop them from spreading.*
4. Why does your body produce mucus? *Your body makes mucus to trap dust, dirt, and germs, helping to stop them from getting into your lungs and making you ill.*

Summary

Write 1 thing you learned, and 1 question you still have.

Lesson 1, Activity 1 resource - Immune Response Timeline cards

A

Antibodies Attach to Pathogens

The antibodies stick to the pathogens, marking them so they can be destroyed.

B

Phagocytes Engulf and Digest the Pathogen

Some white blood cells, called phagocytes, surround the pathogen and break it down.

C

Pathogen Enters the Body

A virus or bacterium gets into your body through a cut, your mouth, or your nose.

D

Pathogens are Destroyed

The antibodies and white blood cells work together to kill the invading microbes.

E

Pathogen Reproduces and Spreads

The pathogen multiplies quickly, making you feel unwell.

F

Lymphocytes Produce Antibodies

Other white blood cells, called lymphocytes, make antibodies that are specific to the pathogen.

G

White Blood Cells Detect the Pathogen

White blood cells recognise the foreign invader in your body.

Lesson 1, Activity 2 resource—Becoming an Immune Cell Role Play

Role: Pathogen

- I am the invader (e.g. a virus or bacterium).
- I produce antigens on my surface.
- I may release toxins to make the person feel ill.

Role: Antigen

- I am a protein marker on the surface of a pathogen.
- I tell the immune system that this microbe is not part of the body.
- I help white blood cells recognise the pathogen.

Role: Toxin

- I'm a poison released by pathogens.
- I make the person feel sick (e.g. fever, aches).
- The immune system needs to neutralise me.

Role: Mucus

- I line the nose and throat to trap pathogens.
- I am part of the body's first line of defence.
- I get moved by cilia or sneezed/coughed out.

Role: White Blood Cell (Phagocyte)

- I detect pathogens in the blood.
- I engulf and digest pathogens using enzymes.
- I'm like a clean-up crew for the body.

Role: White Blood Cell (Lymphocyte)

- I produce antibodies that match the pathogen's antigen.
- I help fight infection and form memory cells after.
- I take longer to act but make specific responses.

Role: Antibody

- I'm a Y-shaped protein made by lymphocytes.
- I stick to antigens and mark pathogens for destruction.
- I'm specific – I only bind to one type of antigen.

Role: The Host (The Human Body)

- I'm the person being infected.
- I show symptoms when pathogens spread (e.g. cough, fever).
- My immune system is fighting to keep me healthy.

Introduction to the Immune System

Learning Outcomes:

1. Describe the role of the immune system in protecting the body
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Lesson Key Words:

Pathogen - a microorganism that causes disease

Antigen - a protein on the surface of a substance (often a pathogen) that triggers an immune response

Antibody - a protein produced by the immune system in humans (and other animals) that attacks antigens that get into the body

Lymphocyte (B-cell or T-cell) - white blood cells which attach pathogens by producing antibodies

Phagocyte - white blood cells that engulf and absorb harmful microorganisms, waste material, or other foreign bodies in the bloodstream and tissues

Immune System - the body's defence against entry of any foreign body, including pathogens. Its role is to prevent disease

Activity 1

1. Write down the correct order of the immune response cards.

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2. What is the first step of the body's immune response?

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3. What are the different ways that body get rid of pathogens?

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4. If one step didn't happen properly, e.g. the body didn't recognise the pathogen, what would happen?

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Lesson created by Holly Sedgwick, University of Manchester, Olivia Shorthouse, University of Manchester and Rachel Hindmarsh, University of Oxford
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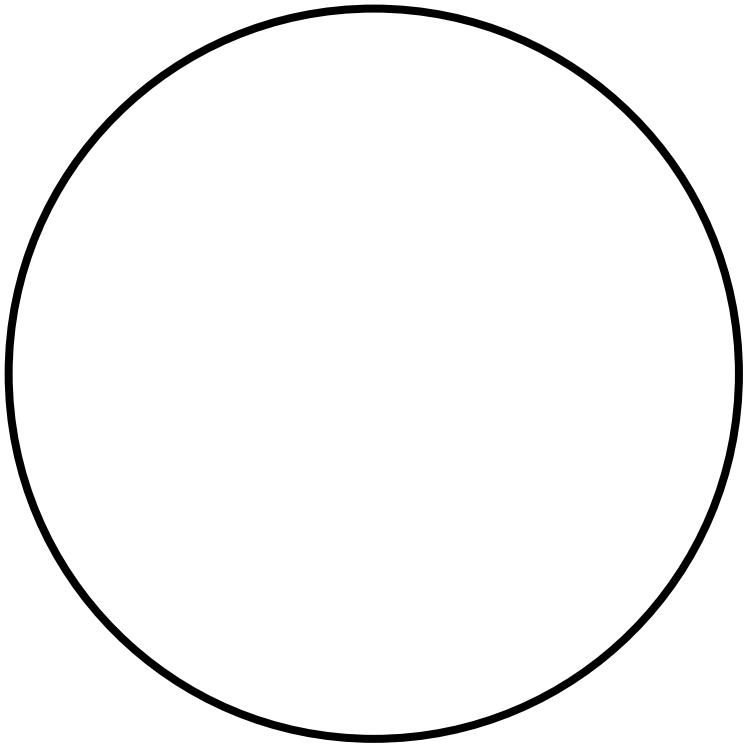
Introduction to the Immune System

Activity 2

Category	What to Look For	Score	Feedback
Under-standing of the Immune Response	Do the performers clearly show how the immune system overcomes infection (e.g. pathogen enters → immune response → recovery)?	1, 2, 3, 4, 5	
Accuracy of Roles	Are the roles of Antibody, Host, Mucus, Phagocyte, Lymphocyte, Toxin, Pathogen, and Antigen correctly shown and explained?	1, 2, 3, 4, 5	
Creativity and Communi-cation	Is the scene imaginative, engaging, and easy to understand?	1, 2, 3, 4, 5	
Teamwork and Participation	Did everyone take part and contribute equally?	1, 2, 3, 4, 5	
Clarity of Scientific Ideas	Were key ideas (such as how white blood cells recognise and respond to pathogens, antibodies binding to antigens, destruction of pathogens) communicated clearly?	1, 2, 3, 4, 5	

Introduction to the Immune System

Activity 2: Extension



I am a .....

Description of my role:

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Reflection

1. Write down one thing you have learnt.

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2. And one question you still have!

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