

ABO-Rh Blood Typing with Synthetic Blood



TEACHER'S MANUAL
AND STUDENT GUIDE

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TEACHER'S MANUAL

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STUDENT GUIDE

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Photocopy the Student Guide as needed for use in your classroom.

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ABO-Rh Blood Typing with Synthetic Blood

Overview

This kit teaches students about the A, B, O, Rh system of human blood typing. In the process they learn about some of the components of the blood and some basic concepts of immunology. Students test four simulated blood samples to identify their ABO and Rh blood types. The test procedures used in this kit are the same as those used to test real blood. However, the kit contains synthetic blood and synthetic antisera, eliminating any risk associated with exposure to real blood or blood products.

The lab can be completed in two 50-minute class periods. The materials in the standard kit are sufficient for 30 students working in 15 pairs. The materials in the Classroom Kit are sufficient to repeat the lab with four classes of 30 students working in pairs. The Classroom Kit also contains materials for distributing aliquots of the synthetic blood and antisera to avoid classroom bottlenecks.

Correlation to the Next Generation Science Standards*

The activities in this kit address the following dimensions of the Next Generation Science Standards:

HS-LS1-1. Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Developing and Using Models</p> <ul style="list-style-type: none"> Use a model based on evidence to illustrate the relationships between systems or between components of a system. 	<p>LS1.A: Structure and Function</p> <ul style="list-style-type: none"> Systems of specialized cells within organisms help them perform the essential functions of life. 	<p>Structure and Function</p> <ul style="list-style-type: none"> Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem.

To view additional national and local standards met by this kit, visit www.carolina.com/correlations.

*"Next Generation Science Standards" is a registered trademark of Achieve. Neither Achieve nor the lead states and partners that developed the Next Generation Science Standards was involved in the production of, and does not endorse, this product.

Source: NGSS Lead States, 2013. *Next Generation Science Standards: For States, By States*. Washington, DC: The National Academies Press.

Objectives

Students' performance objectives are to

- synthesize information from experiments and simulations into a coherent understanding of the structural and functional components of blood.
- use reasoning to construct an explanation that blood cells are specialized cells with similar structure and functions, yet the specific antigens presented on the cell's surface may interact with specific antibodies as a function of the immune response.
- perform simulations of standard tests used for blood type identification.

Prerequisite Knowledge and Skills

Students should already possess basic familiarity with the fluid mosaic model of the cell membrane. Students should understand that an antigen is any substance to which the immune system might respond. It may be useful to project an image of the fluid mosaic model of the cell in order to review both peripheral proteins and glycoproteins before the lab activity. ABO blood group antigens are *sugars* determined by a person's genes. Rh group antigens are *proteins* determined by a person's genes. Some people possess a version of the Rh gene that does not produce a surface antigen on red blood cells.



Time Requirements

Teacher Preparation	90 minutes
Prelab	50 minutes
Laboratory Investigation	30 minutes
Assessment	20 minutes



Safety

Use this kit only in accordance with established laboratory safety practices, including appropriate personal protective equipment (PPE) such as gloves, chemical splash goggles, and lab coats or aprons. Ensure that students understand and adhere to these practices.

There are no biological materials in the synthetic blood or synthetic antisera that cause any health hazard to students or that affect the method of disposal. Materials in this kit may be discarded after use.

Download Safety Data Sheets (SDS) at carolina.com/sds or scan this code:



Digital Resources

Your kit includes a digital Teacher's Manual with hyperlinks to the following resources. Additional resources may be available. To use these resources, log on to the website below and enter your access code. See the Digital Resource Instruction Card for more information.

<http://www.carolinascienceonline.com>

Digital resources included with this kit:

RESOURCE	DESCRIPTION
Student Guide Copy Master	Student Guide PDF for printing
Fill-in Answer Sheets	A PDF that can be printed out or assigned digitally, with spaces for students to record their data and answers
Editable Assessment Questions	The assessment questions as a Microsoft® Word document
Whiteboard Resources	Color graphics for use with whiteboards