

DNA Necklace Kit

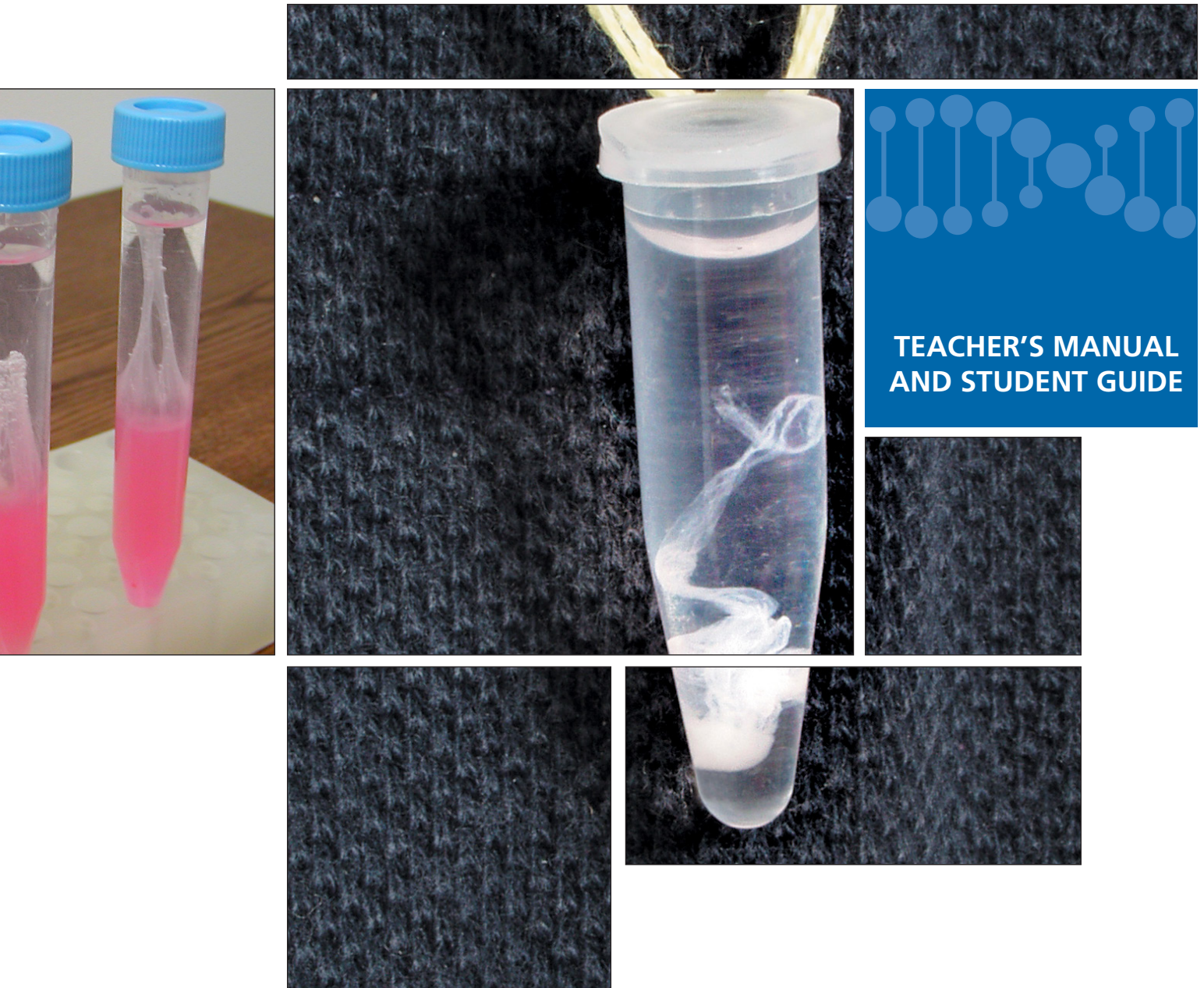


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STUDENT GUIDE

Prelab	S-1
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Photocopy the Student Guide as needed for use in your classroom.

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DNA Necklace Kit

Overview

Using this kit, students isolate their own genomic DNA and create wearable DNA necklaces. Each student follows a simple procedure to extract crude DNA from his or her own cheek cells. During the Prelab, students use 6 feet of thread and a microcentrifuge tube to model and contemplate the process of DNA packaging. During the Laboratory Investigation, students lyse a sample of their cheek cells and watch as wispy white strands of their own chromosomal DNA precipitate out of solution in the presence of ethanol. Each student transfers his or her DNA to a plastic microcentrifuge tube and fashions the tube and a thread into a DNA pendant necklace.

The Classroom Kit (211138) is designed for a class of 32 students working in pairs for the Prelab activity, and independently during the Laboratory Investigation. The Demonstration Kit (211134) includes materials sufficient to conduct one teacher demonstration or for one student to perform the lab.

Correlation to the Next Generation Science Standards*

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

High school students who demonstrate understanding can:

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.

Middle school students who demonstrate understanding can:

MS-LS1-1. Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Developing and Using Models</p> <ul style="list-style-type: none"> • Develop a model to describe phenomena. • Develop a model to describe unobservable mechanisms. 	<p>Structure and Function</p> <ul style="list-style-type: none"> • All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). 	<p>Structure and Function</p> <ul style="list-style-type: none"> • Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function.

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

- use evidence to construct an explanation that all cells contain DNA.
- conduct an investigation and use models to illustrate biological processes and concepts related to DNA packaging.
- understand that science is a process, and that scientific procedures must be implemented in a stepwise and logical sequence in order to extract and visualize DNA from their own cheek cells.

Prerequisite Knowledge and Skills

- basic cell structure
- the role of the nucleus



Time Requirements

Teacher Preparation	20 minutes
Prelab	30 minutes
Laboratory Investigation	
Cheek cell collection	5 minutes
Optional: Cell pelleting	10–30 minutes
Cell lysis and addition of ethanol to lysate	20 minutes
DNA precipitation	10 minutes minimum
DNA transfer; necklace assembly	10–15 minutes
Assessment	30 minutes



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

Safety

Use this kit only in accordance with established laboratory safety practices. Ensure that students understand and adhere to these practices.

Although a sports drink is used to collect cheek cells, neither the solutions used in the procedure nor the extracted DNA should be ingested. Students should not eat, drink, or chew gum in the lab and should wash their hands after entering and before exiting the lab.

Each student should work only with his or her own cheek cells. Once the cells have been collected and transferred to the 15-mL tube, the collection cups

should be discarded. Know and follow all federal, state, and local regulations as well as school district guidelines for the disposal of laboratory wastes.

Ethanol is a flammable alcohol that must be kept away from heat and flames at all times. Remind students that their DNA pendant necklaces contain a small amount (0.5 mL) of ethanol.

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



Materials

Your kit includes a digital Teacher's Manual and Student Guide. See the Digital Resource Instruction Card for more information.

Included in the kit:	Classroom Kit	Demonstration Kit
<input type="checkbox"/> microcentrifuge pendant tubes	32	2
<input type="checkbox"/> 15-mL tubes	32	2
<input type="checkbox"/> 1-oz plastic cups	32	2
<input type="checkbox"/> 3-mL graduated pipets	40	6
<input type="checkbox"/> thread	4 packs	1 pack
<input type="checkbox"/> bottle of sports drink	1	1
<input type="checkbox"/> 25-mL bottle of cell lysis solution	3	1
<input type="checkbox"/> 70% ethanol	300 mL	30 mL
<input type="checkbox"/> Digital Resource Instruction Card	1	1
<input type="checkbox"/> Teacher's Manual and Student Guide	1	1

Needed, but not supplied:

- timer
- freezer or container of ice for chilling ethanol
- scissors for cutting embroidery thread
- marker or labels for labeling 15-mL tubes
- test tube rack(s) or beaker(s) to hold tubes upright

