

Real Science-4-Kids

PHYSICS



Pre-Level I Teacher's Manual



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Illustrations: Janet Money maker and Rebecca Keller

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Real Science-4-Kids: Physics Pre-Level I Teacher's Manual

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A note from the author

This curriculum is designed to provide an introduction to Physics for students in kindergarten through third grade. The student Laboratory Workbook is intended to be the first step in developing a framework for real science. The series of experiments in the Laboratory Workbook will help the students develop the skills needed for the first step in the scientific method: making good observations.

There are different sections in each chapter beginning with a section called "Observe it." This section helps the students explore how to make good observations. The second section, Think about it, provides questions for the students to think about before they begin the experiment. In some chapters there is a Test it section that directs the students in setting up the experiment, collecting any data, and observing what happens. In every chapter there is a "What did you discover?" section that gives the students an opportunity to summarize the observations they have made. And finally, in each chapter there is a section called Why? that provides a short explanation for what they may or may not have observed.

The experiments take up to 1 hour. The materials needed for each experiment are given on the next page.

Enjoy!

R. W. Keller, Ph.D.

Materials at a Glance

All of the materials needed for each experiment are given in the following chart:

Experiment 1	Experiment 2	Experiment 3	Experiment 4	Experiment 5	Experiment 6	Experiment 7	Experiment 8	Experiment 9	Experiment 10
rubber ball 2 tennis balls apple orange, cotton ball or feather	rubber ball tennis ball marshmallow lemon or lime rock banana pliers other objects	toy car stiff card- board or wood board (1 ft wide and 3 ft long)	1 large glass marble 1 small glass marble	copper pennies coated copper wire zinc wire wire clippers 3 large lemons LED (Radio Shack LED #276- 307 duct tape	2 rubber balloons thread or string scissors materials such as: cotton clothing wool cloth- ing silk clothing wooden surface plaster wall metal surface leather surface	Lemon battery from Chapter 5: copper pennies coated copper wire zinc wire wire clippers 3 large lemons LED (Radio Shack LED #276-307 duct tape materials: styrofoam plastic block cotton ball nickel coin metal paper clip plastic paper clip glass of water salt tablespoon	two bar magnets with poles labeled N and S	two plastic or glass prisms flashlight colored pencils or crayons optional: colored light bulb halogen light bulb mercury light bulb	two marbles three playing cards shallow jar top vinegar baking soda tablespoon suggested: dominoes blocks electric car

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Experiment 1

Falling objects

Materials needed:

- rubber ball
- 2 tennis balls
- orange
- apple

In this unit, the students will try to determine if Galileo was right.

The objectives of this lesson are:

- (1) to help students compare their observations with a scientific discovery.*
- (2) to help students compare different observations.*

I. Observe it

In this section the students will observe how two objects fall when they are released at the same time.

- ❶ Have the students hold two tennis balls in their hands at chest level.
- ❷ Have the students release the two tennis balls at the same time.
- ❸ Help them observe how the objects land on the ground. Ask them the following questions.
 - ❶ Did the objects land at the same time?
 - ❷ Is one object heavier or lighter than the other object?
 - ❸ Do you think it matters how high you hold the objects? Why or why not?
 - ❹ Do you think the shape of the object matters? Why or why not?
- ❹ Help the students record their observations in the “Observe it” section of their workbooks (see next page).
- ❺ Have the students repeat the experiment using different combinations of objects. Have them compare at least four different pairs of objects.

For each set of objects, help the students record their observations in the “Observe it” section of their workbook.

- ❶ Have the students write the names of the objects they are using in the spaces below “Object 1” and “Object 2.”
- ❷ Have the students draw or write a description of what they see. Help them make good observations by asking questions such as:
 - ❶ How heavy does Object 1 feel in your hand?
 - ❷ How heavy does Object 2 feel in your hand?
 - ❸ Does Object 1 feel heavier or lighter in your hand than Object 2?
 - ❹ Is it easy to release both objects at the same time? Why or why not?
 - ❺ Describe the shape of Object 1.
 - ❻ Describe the shape of Object 2.

Answers will vary.

Object 1	Object 2
<u>apple</u>	<u>tennis ball</u>
<i>The apple feels heavier in my hand than the tennis ball.</i> <i>When I drop the objects, I have a hard time seeing which one lands first. They look like they land together, but I am not sure.</i> <i>I can release the objects at the same time from my hands.</i> <i>The apple is shaped differently than the tennis ball, but they still land at the same time.</i>	

II. Think about it

- ➊ Help the students think about their experiment and make any observations about how easy or difficult it is to perform the experiment.
 - ① Can they see the objects fall to the floor?
 - ② Can they determine if both objects fall to the floor at the same time?
 - ③ Is it easy or difficult to release the objects from their hands at the same time?
- ➋ Help the students think about ways to vary their experiment.
 - ① If they can't see the objects fall to the floor, maybe they can get a parent, sibling or friend to make the observations.
 - ② What happens if the objects are higher? They could stand on a sturdy chair or bench to see if height makes a difference.
 - ③ What happens if the objects are lower? They can release the objects at their waist or at their knees.
- ➌ Help the students repeat the experiment for one of their object pairs. Have them vary only one parameter at a time for one set of objects. For example, they may want to hold the objects higher and have a friend observe how they fall. But this is changing two parameters (the height and the observer). Explain to them that scientists try to vary only one parameter at a time so that they can make comparisons to previous experiments noting what change, if any, the one parameter had on the experiment.
- ➍ Help the students record their observations.

III. What did you discover?

The questions can be answered verbally or in writing, depending on the writing ability of the student. With these questions help the students think about their observations. There are no right answers to these questions and it is important for the students to write or discuss what they actually observed.

IV. Why?

Help the students understand that two objects of different weights will fall to the earth at the same speed. Both objects have the same amount of gravity pulling on them at the same time. So both objects start with the same force. Because both objects have the same force, they will both fall to the earth at the same speed since the speed of an object is independent of its weight.

V. Just for fun

The students can try an experiment with an object that will be much lighter than the objects they have been using. A cotton ball or a feather would work. They will discover that if an object is too light, it will float to the ground and not fall at the same time as a heavier object. However, tell them that if the two objects are put in a vacuum, they will fall at the same time. Even an apple and a feather or cotton ball will fall at the same time. In the vacuum there is no air resistance. Outside the vacuum, the air pushes up on the cotton ball and, because the cotton ball is light enough, the air will slow it down.