physcira

Physics in a Box ™

changing the paradigm of K-12 physics education

You know “WHAT” needs to be done. We know “HOW.”

A groundbreaking, collaborative effort of advocates, supporters, educators, policy makers, business owners, advisors, strategic partners, and the Physical Science Research Associates (Physcira) team

www.physcira.com

Year 1

Year 2

Year 3

Year 4

B.S. & M.S.
Physics & Math

Philosophy

Psychology

Pedagogy

Methodology

Pedagogical
Degree

Institute of Physics,
Moscow

Institute of Physics,
Saint-Petersburg

Institute of Physics,
Kyiv (Kiev)

South Korea

Japan

France

Germany

Italy and UK

2000 - USA

EDU
of
the
World

2010

6 Grade

100 of
Mechanics

7 Grade

100 of
Optics

8 Grade

100 of
Electricity
&
Magnetism

Pre-Algebra based,
Conceptual

9 Grade

10 Grade

Mechanics
Optics
Electricity & Magnetism
Thermal Physics

Algebra 1, 2 &
Geometry based

11-12 Grades

M – Physics
Tu – Earth Science
W – Physics
Th – Life Science
F - Physics

100 lessons of
Physics per
Academic Year

European / Asian Physics Curriculum (mandatory required by law in all developed countries)

3rd Grade

15 lessons of Elements of Mechanics

4th Grade

15 lessons of Elements of Optics

5th Grade

15 lessons of Elements of Electricity & Magnetism

- Conceptual, reinforcing addition, subtraction, multiplication, division, reducing fractions, measurements.
- Teaching how to read and analyze.

6th Grade

100 of Mechanics

7th Grade

100 of Optics

8th Grade

100 of Electricity & Magnetism

Pre-Algebra based, Conceptual

9th Grade / 10th Grade

Mechanics
Optics
Electricity & Magnetism
Thermal Physics

Algebra 1, 2 & Geometry based

11-12th Grades

M – Physics
Tu – Earth Science
W – Physics
Th – Life Science
F - Physics

100 lessons of Physics per Academic Year

European / Asian Physics Curriculum (mandatory required by law in all developed countries)

3rd Grade: 15 lessons of Elements of Mechanics

4th Grade: 15 lessons of Elements of Optics

5th Grade: 15 lessons of Elements of Electricity & Magnetism

- Conceptual, reinforcing addition, subtraction, multiplication, division, reducing fractions, measurements.
- Teaching how to read and analyze.

6th Grade: 100 of Mechanics (NGSS calls for **14** Benchmarks in Mechanics)

7th Grade: 100 of Optics (NGSS calls for **2** Benchmarks in Optics)

8th Grade: 100 of Electricity & Magnetism (NGSS calls for **2** Benchmarks in Electricity)

Pre-Algebra based, Conceptual

9th Grade, 10th Grade:

Mechanics
Optics
Electricity & Magnetism
Thermal Physics

Algebra 1, 2 & Geometry based

11-12th Grades

M – Physics
Tu – Earth Science
W – Physics
Th – Life Science
F - Physics

100 lessons of Physics per Academic Year

Why Physics?

Explains the world around us and connects science to everyday life:

Mechanics, Optics, Electricity & Magnetism, and Heat

Provides an application for math:

Pre-Algebra, Algebra 1, Geometry, Algebra 2, and later Pre-Calculus & Calculus

Increases reading proficiency of students:

Reading and following instructions, analyzing the text, working on wording problems, etc.

Builds critical-thinking skills (in different ways compared to other disciplines).

Prepares students for the jobs and challenges of the future.

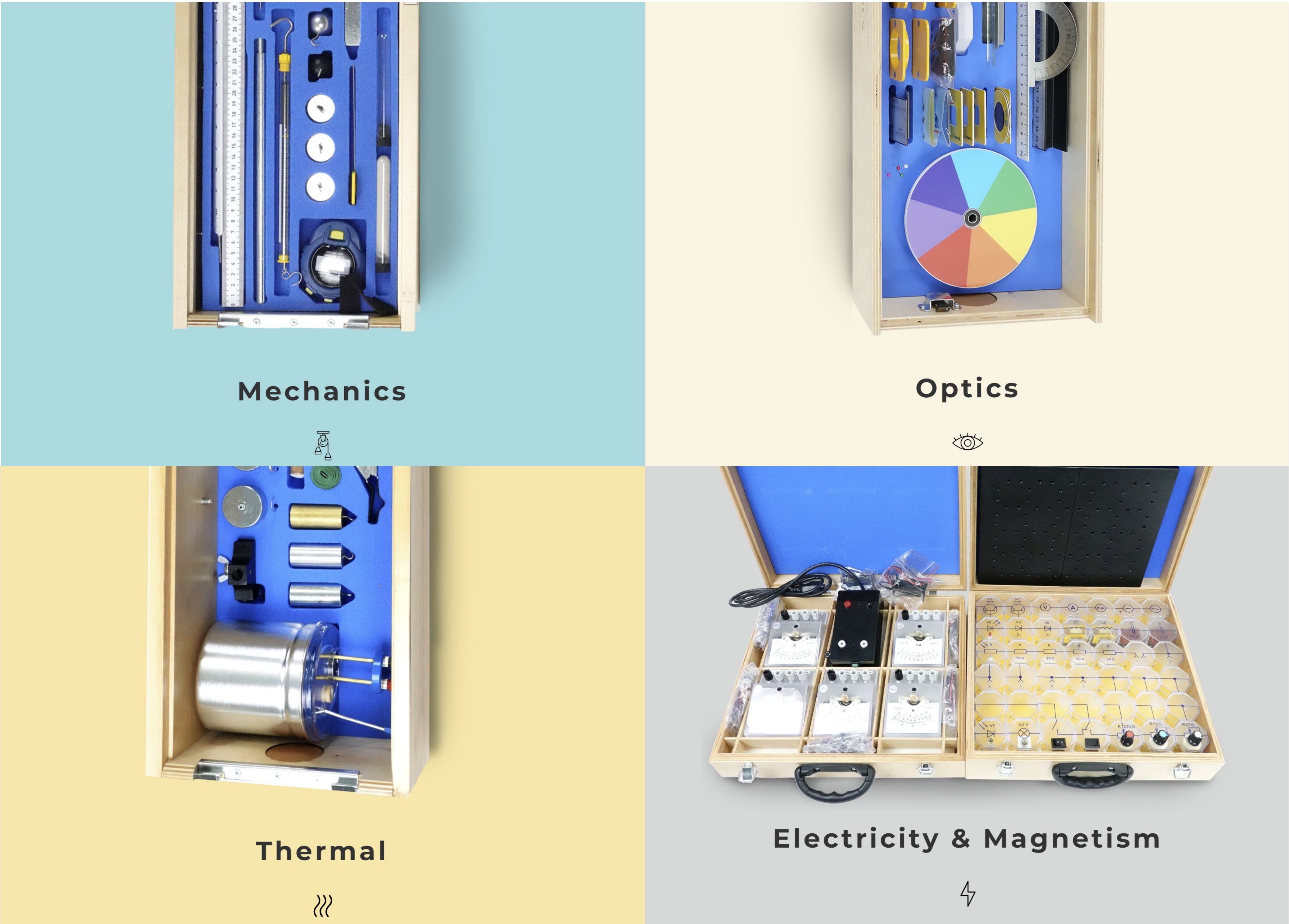
Physics in a Box

Entire Physics curriculum is taught as hands-on classes: elementary school, middle school, high school

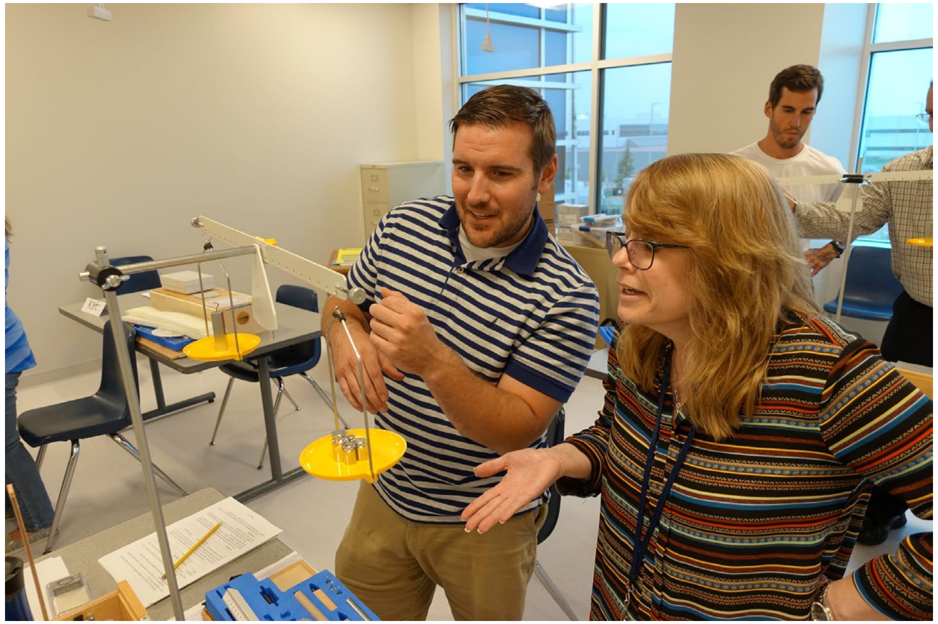
Provides a framework around which Math and other school subjects blossom

Loved by teachers and students

Guarantees immense growth of student success



Year-Round Weekly Professional-Development Sessions for Teachers



No prerequisites or formal science background is needed to become a physics teacher! All it takes is participation once a week in Physcira's supportive teacher-training sessions.

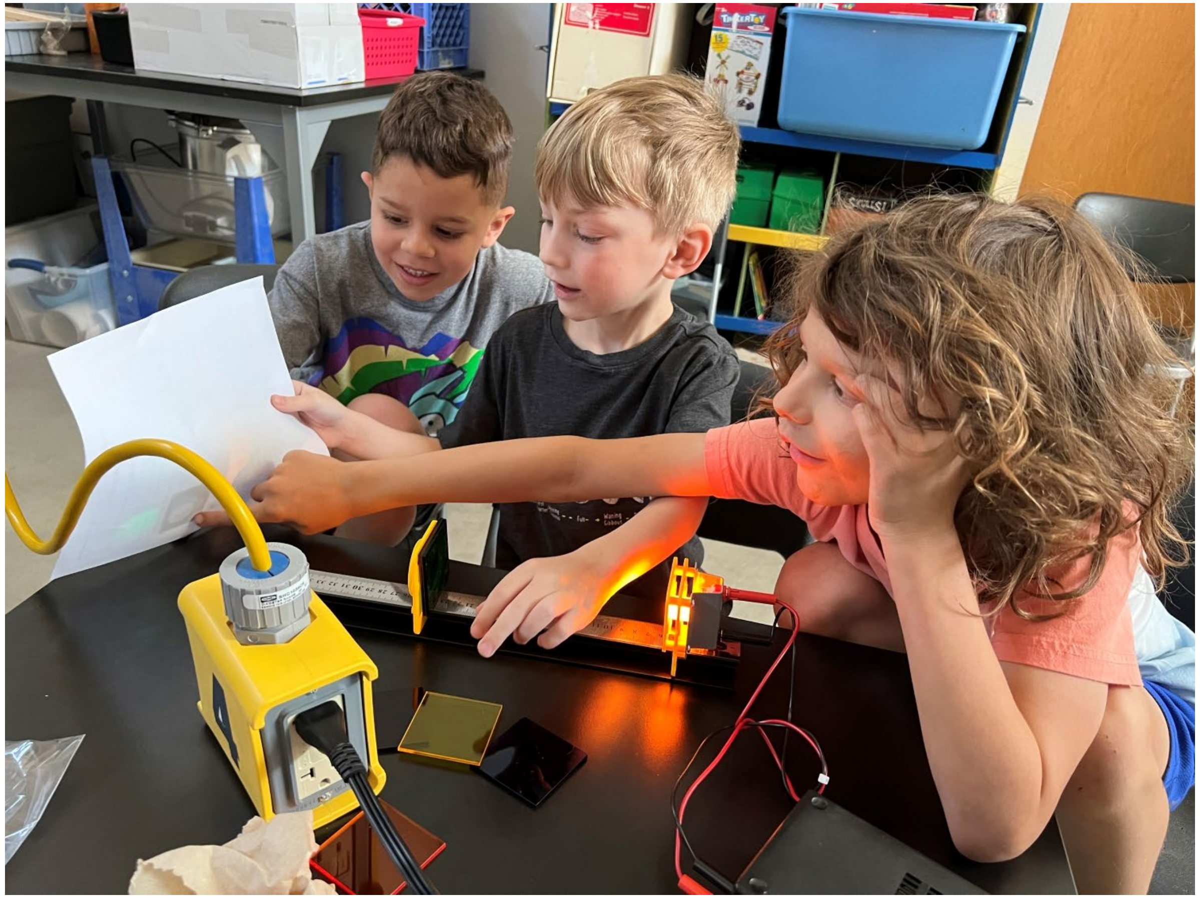
Teachers’ Physics Day at Zuni School District, NM (Jan. 3, 2024)

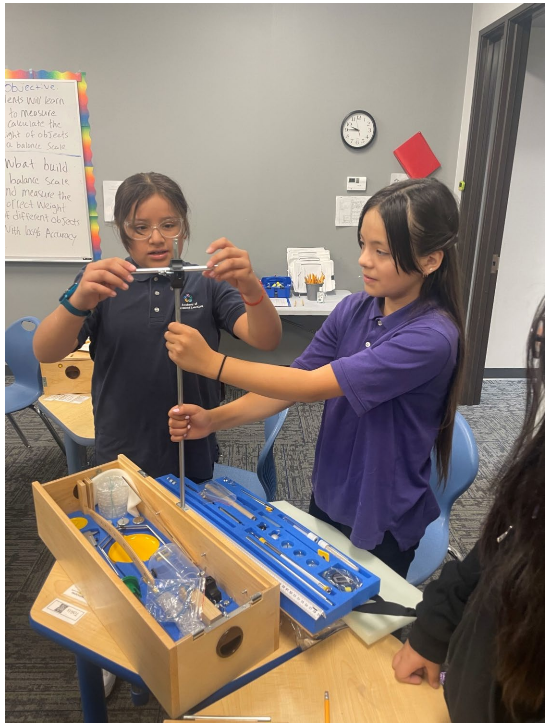
Teachers’ Physics Day at Zuni School District, NM (Jan. 3, 2024)


OSMOSIS
PART 1

ZMS
MECHANICS


THE ELEMENTS






Reebok

Implementation is Easy and Customizable

As part of a **core science curriculum** (**once a week**, twice a week, or three times a week)

As an addition to your existing science program (plug-and-play)

As part of STEM activities

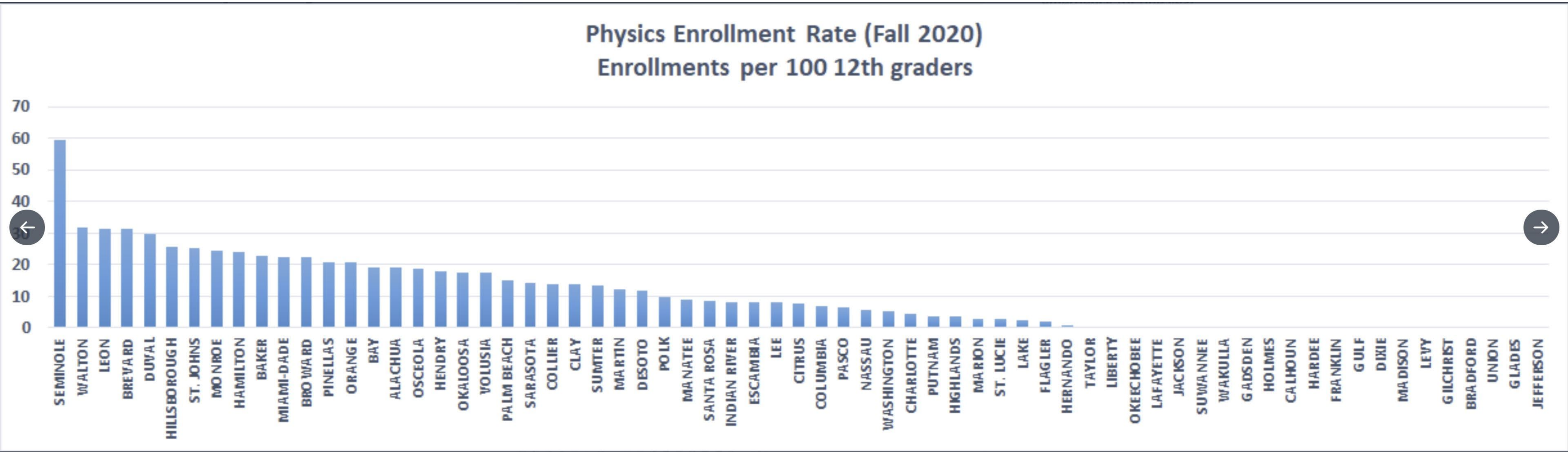
As an after-school program

As a supplement to your math curriculum

As part of other subjects (e.g., Engineering Design)

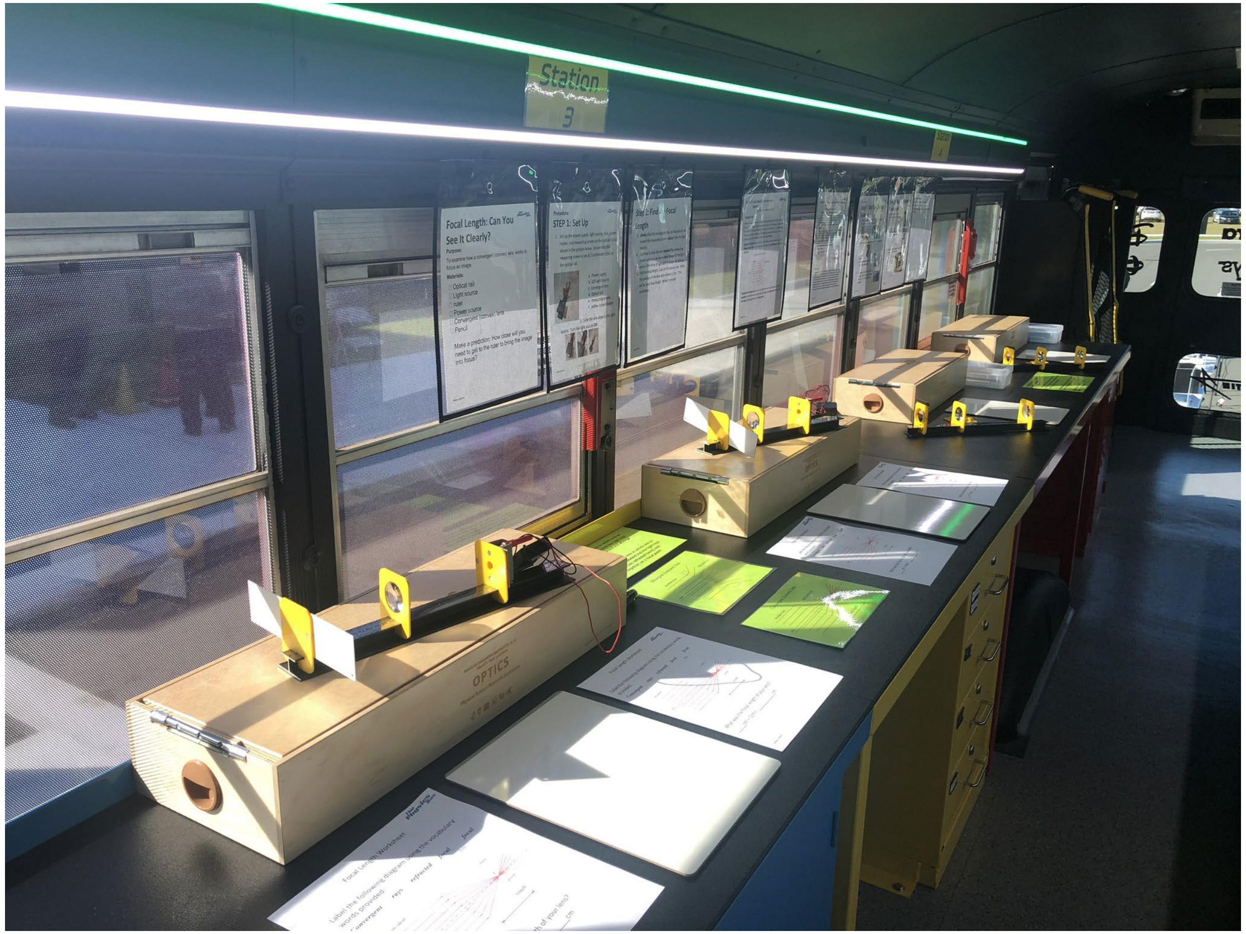
As a prerequisite to other programs (e.g., Robotics)

Results of the *Physics in a Box* Program: Seminole County (Florida) Public Schools were among the first districts to implement *Physics in a Box* in all middle schools. The result: an unprecedented jump in student enrollment in their high-school physics program – 60 percent compared to 30 percent or less for other Florida school districts.



School buses, equipped with *Physics in a Box* stations, travel from one elementary school to another, delivering elements of physics to students:

Physics in a Box - Optics stations in the second physics bus



Ribbon-cutting ceremony for the second bus, equipped with *Physics in a Box - Optics*, on January 29, 2021.

The first bus, equipped with *Physics in a Box – Mechanics*, was launched one year earlier, in January 2020.

The third bus, equipped with *Physics in a Box – Electricity & Magnetism*, is launched on April 1st 2022.

SCPS Info
@SCPSInfo

Today, we officially launched our 2nd Physics Bus: "The Optics Bus!" Thank you to all our sponsors who made this a reality!

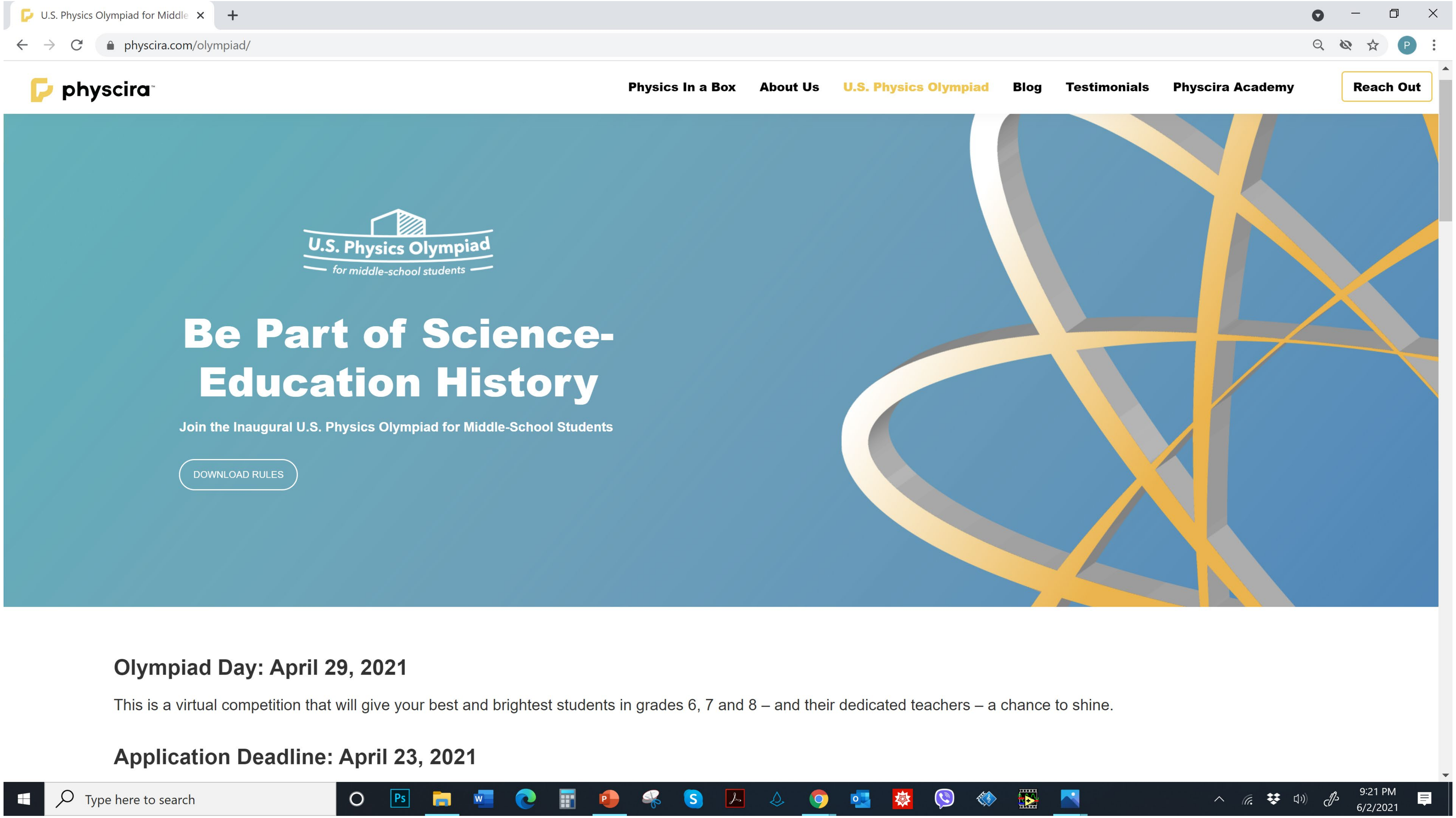
12:16 PM · Jan 29, 2021 · Twitter Web App

The third bus, equipped with *Physics in a Box – Electricity & Magnetism*, is launched on April 1st 2022.

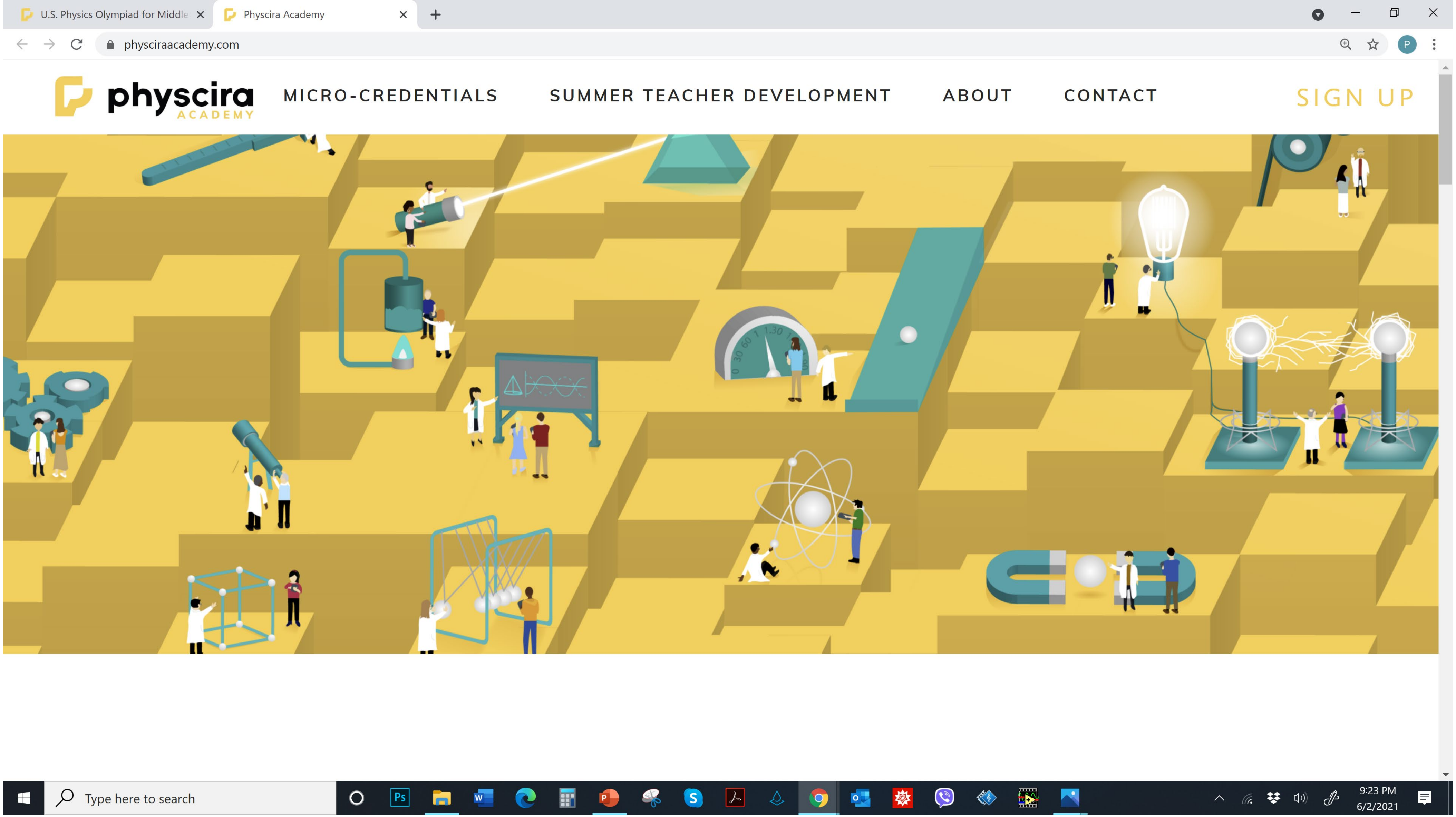
Other impactful initiatives run by the Physcira team:

- School buses, equipped with *Physics in a Box* stations
- Year-round, weekly teacher-training session on physics content and methodology
- Microcredential certifications for teachers
- Summer teacher professional-development programs
- National middle-school physics Olympiad

The inaugural national middle-school physics Olympiad, organized and hosted by Physcira on April 29, 2021, brought together more than 1,000 students from 48 states.



Physcira is committed to developing a new generation of world-class K-12 math and science teachers



I have not found anything that would have the potential impact that Physics in a Box program could have, and there is nothing that would even come close from a cost-benefit stand point.

[Video Testimonial]

Mark Lautman
Founder CELab
World-Renowned Thought Leader and Economic Architect

“Your groundbreaking move exemplifies all three areas for change that will lead us out of an era where a child’s zip code determines the quality of his or her education. Success starts with attracting and retaining talent to teaching, increasing local flexibility and spurring innovation by creating opportunities for people on the ground to try different things.”

Senator Michael Bennet
Colorado

"...What I would say to chief state school officers having sat in that chair and as a former superintendent: I truly believe that this product [Physics in a Box] is a game changer. And while I typically don't give testimonials – as a matter of fact, this is the only one I've ever done for a curriculum ever in my entire career...."

[Video Testimonial](#)

Dr. Veronica C. Garcia
Former Cabinet Secretary of Public Education, State of NM
Former Superintendent of Santa Fe Schools, State of NM

“For superintendents looking at this, here’s what I would say: I would challenge you to find another mechanism to deliver this many labs or experiments for the dollars you’re going to spend. In fact, I’m going to say it doesn’t exist. And being a former math teacher, I’ve searched for it.”

Video Testimonial

Travis L. Dempsey
NMSSA Superintendent of the Year 2020-2021

For more testimonials for *Physics in a Box* program

[>>> Click here]

"For me, I learn best when I can actually do hands-on things, when I can try and fail, and then try again. *Physics in a Box* helps that, because you can see what to change or where you may have gone wrong."
Andrea, 10th grade student,
Colorado Early Colleges Colorado Springs

"I would say, any school on the fence about getting the P*hysics in a Box* curriculum, if you want to reach every single one of your kids in your physics classes, this is your solution."
Video Testimonial
Danielle Springston, MTSS Coordinator, Science Department
Physics Teacher, Colorado Early Colleges, Colorado Springs

"We want to build a program where students want to be there, and that's what we are seeing with the *Physics in a Box* program. Our kids want to go to class, they want to do the experiments, they want to learn. This is always exciting!"
Video Testimonial
Jennifer Daugherty, Head of Schools
Colorado Early Colleges, Colorado Springs

"This is a beautiful set of materials (*Physics in a Box* was demonstrated). I think teachers and students will take this more seriously and learn more with materials like this."
Senator Mimi Stewart
New Mexico – Bernalillo

"We want to open Physics for ALL students. The *Physics in a Box* program gives something very unique to our students, because it is real!"
Video Testimonial
Dr. Anna-Marie Cote
Deputy Superintendent
for Instructional Excellence and Equity
Seminole County Public Schools

"Why is *Physics in a Box* so awesome? I think for me it was the connection between physics and math. […] I love how my struggling-in-math students are working on math in a fun and interactive way, without even knowing they are doing math."
Video Testimonial
Craig Johnson
Principal
Indian Trails Middle School

physcira

Physics in a Box™ - Mechanics

Hands-On Innovative Approach for K12

World's Best Practices

Unit 1. Basic methods of scientific research.

Unit 2. Density.

Unit 3. Mechanical motion.

Unit 4. Circular motion and oscillations.

Unit 5. Forces and interactions.

Unit 6. Mechanical work and energy.

Unit 7. Equilibrium and simple machines.

Unit 8. Application of Newton's laws.

Unit 9. Wave phenomena and sound.

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Unit 7. Equilibrium and simple machines.

Unit 8. Application of Newton's laws.

Unit 9. Wave phenomena and sound.

Unit 2. Density.

2.1 Measuring the density of regularly shaped solid bodies: cube and rectangular prism. Unit transformations: g/cm^3 and kg/m^3 .

2.2 Measuring the density of regularly shaped solid bodies: sphere.

2.3 Measuring the density of regularly shaped solid bodies: cylinder.

2.4 Measuring the density of complex solid bodies volume of which can be calculated.

2.5 Measuring the density of irregularly shaped solid bodies.

2.6 Measuring the density of fluids.

2.7 Measuring the density of salt water: dependence of the density on the amount of salt dissolved.

2.8 Measuring the effective density of sand, grains, and similar material.

2.1 Measuring the density of regularly shaped solid bodies: cube and rectangular prism. Unit transformations: $\frac{g}{cm^3}$ and $\frac{kg}{m^3}$.

Objectives:

Students will become familiar with the concept of density and master the equation $\rho = \frac{m}{V}$. Students will determine the density of three blocks with the same volume but made of different materials. To determine what material the blocks are made of, students will compare the calculated densities to those in a density chart.

Materials:

Physics notebook / lab paper / pencil / calculator / three blocks with a hook from mechanics box, caliper, digital scale, and metric ruler.

Background information:

Opening discussion: What is heavier - a metric ton of feathers or a metric ton of bowling balls? Neither-they both have the same mass, (1,000 kg) but have different volumes.

What is density? Density describes a physical property of matter that explains how tightly packed particles are in a substance. Different substances have different densities. A particular substance under certain conditions will always have a specific density regardless of size or shape. For example, copper will always have a density of 8.96 $\frac{g}{cm^3}$ at room temperature.

There are many examples of density. Brainstorm with your students to assess prior knowledge. Follow with a discussion of the examples below.

1. When **oil and water** meet each other (such as an oil spill in the ocean), oil will rise to the surface because it is less dense than water.

2. **Party balloons** are filled with helium. The balloons rise in the air because helium is less dense than air.

3. **A styrofoam cup** is less dense than water, but a ceramic cup has greater density. The Styrofoam cup floats in water while the ceramic cup will sink.

4. **Wood** will float on water because wood is less dense than water.

5. **Icebergs** – Generally, the density of a liquid substance is usually slightly less than its density as a solid. For example, the density of solid iron at room temperature is 7.87 $\frac{g}{cm^3}$ but when it becomes heated to a fluid its density becomes 6.98 $\frac{g}{cm^3}$. Water is the exception. The density of water is 1 $\frac{g}{cm^3}$, while the density of ice is 0.9340 $\frac{g}{cm^3}$. This explains why part of an iceberg floats above the water level while much of the iceberg is below.

The equation for density can be written two ways:

$$\rho = \frac{m}{V} \text{ or } d = \frac{m}{V}$$

In the first equation, the symbol ρ (*pronounced ROW*) is Greek and stands for density; in the second equation d stands for density as well. In K-12 school systems throughout the United States, we use the notation d for density. In college literature and international practice density is represented by the symbol ρ. In this physics course students will be introduced to the Greek alphabet symbols and we will use the density equation $\rho = \frac{m}{V}$. In both formulas, m stands for mass and V stands for volume. Mass is measured in kg and volume is measured in m^3 therefore the proper units for density are $\frac{kg}{m^3}$. We write

$$[\rho] = \frac{kg}{m^3}$$

Here square brackets show that we talk about the units of measurements for density.

On occasion, we need to measure m in grams and V in cm^3. Density is expressed in $\frac{g}{cm^3}$ in this situation:

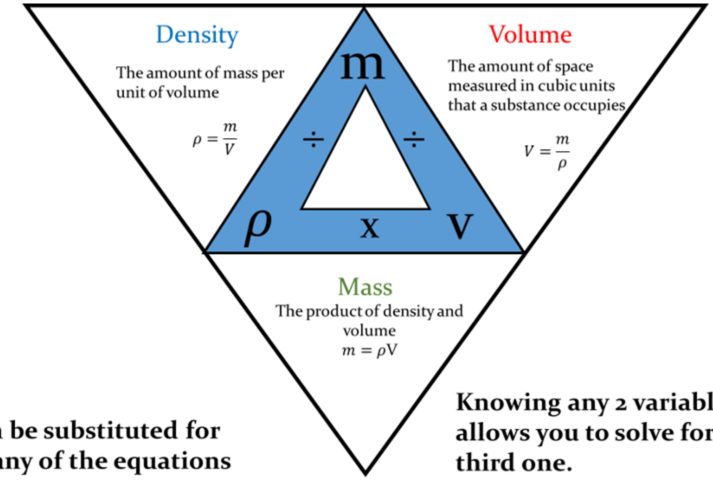
$$[\rho] = \frac{g}{cm^3}$$

We will teach students to transform the units of density from $\frac{g}{cm^3}$ into $\frac{kg}{m^3}$ and back.

The relationship between mass, volume & density

Mathematically, density is a ratio of mass over volume: $\rho = \frac{m}{V}$.

Starting with the equation for density, it is tempting to say density is proportional to mass and inversely proportional to volume. Under the same conditions of temperature and pressure, density of a material remains constant. If you double the mass, volume must double as well to keep the density ratio the same. Density is a material property determined mathematically as a ratio of mass to volume. The increase/decrease of mass must correspond to the change of volume.



d can be substituted for ρ in any of the equations

Knowing any 2 variables allows you to solve for the third one.

Students solve density problems using the equation:

$$\rho = \frac{m}{V}$$

Knowing mass and volume allows us to calculate density. When students know density and volume, they can determine mass using the equation:

$$m = \rho V$$

If mass and density are known, volume is calculated using the equation:

$$V = \frac{m}{\rho}$$

Name: ______________________________ Date: _________ Period: ________

Mechanics Lab 2.1

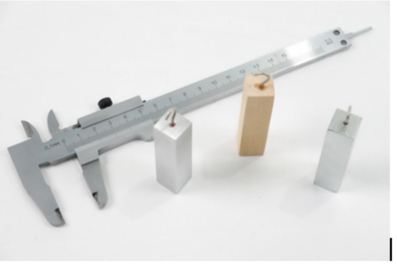
Investigate density of a rectangular prism

Objectives: Students will determine the density of three blocks which have the same volume but made of different materials. Students will compare the obtained densities with a density chart to determine the material of the blocks.

Materials: Physics notebook / lab paper / pencil / calculator, three blocks with a hook from mechanics box, caliper, digital scale, and metric ruler.

Procedure:

1. Measure the mass m of each bar using the digital scale.



2. Measure the length, width and the height of the block (without the hook) in cm using a caliper or a ruler, then record in Table 2.1.2.
3. Calculate the volume of the block (a): $V = l \cdot w \cdot h$ and record it in Table 2.1.2. Multiply all three dimensions measured in centimeters to provide the volume in cm^3.
4. Calculate the density of the block by dividing mass by volume $\rho = \frac{m}{V}$. Round to the hundredths place.
5. Repeat steps #1-4 for blocks b and c.
6. Research online for a chart of densities of different materials expressed in $\frac{g}{cm^3}$. Compare the values for densities of all three blocks with the data in the chart to determine what the material the blocks are made of.

   Another option is to refer to the data in Table 2.1.3 to find the closest match.

Name: ______________________________ Date: _________ Period: ________

Mechanics Lab 2.1 (page 2)

Table 2.1.2

Objects	Mass, m (g)	Measure-ments (cm)	Volume (cm^3) $V = l \cdot w \cdot h$	Density ($\frac{g}{cm^3}$) $\rho = \frac{m}{V}$	Closest value for density from chart	Identify Material
a) dull 		$l =$ $w =$ $h =$				
b) shiny 		$l =$ $w =$ $h =$				
c) brown 		$l =$ $w =$ $h =$				

Name: ______________________________ Date: _________ Period: _________

Mechanics Lab 2.1 (page 3)

Identification by density

If online data is not available, use the data in Table 2.1.3 to identify the substance of bars a, b, & c. (*Your answer may not be exact-- look for the closest match).*

Table 2.1.3

Common Metal Densities			Other Densities	
Metal	**Density ($\frac{g}{cm^3}$)**		**Substance**	**Density ($\frac{g}{cm^3}$)**
Aluminum	$2.70\,\frac{g}{cm^3}$		Wood (average)	$0.5\,\frac{g}{cm^3}$
Zinc	$7.14\,\frac{g}{cm^3}$		Water	$1.0\,\frac{g}{cm^3}$
Iron	$7.87\,\frac{g}{cm^3}$		Ice	$0.93\,\frac{g}{cm^3}$
Brass	$8.73\,\frac{g}{cm^3}$		Concrete	$2.3\,\frac{g}{cm^3}$
Copper	$8.96\,\frac{g}{cm^3}$		Basalt	$3.00\,\frac{g}{cm^3}$
Gold	$19.30\,\frac{g}{cm^3}$		Limestone	$2.71\,\frac{g}{cm^3}$
Platinum	$21.45\,\frac{g}{cm^3}$		Pyrite	$5.01\,\frac{g}{cm^3}$

Name: ______________________________ Date: _________ Period: _________

Mechanics Lab 2.1 (page 2) Answers

Table 2.1.2

Objects	Mass, m (g)	Measure-ments (cm)	Volume (cm^3) $V = l \cdot w \cdot h$	Density ($\frac{g}{cm^3}$) $\rho = \frac{m}{V}$	Closest value for density from chart	Identify Material
a) dull 	36.54 g	l=6.06 cm w=1.52 cm h=1.52 cm	6.06·1.52·1.52= 14.0 cm^3	$\frac{36.54\text{ g}}{14.0\text{ cm}^3} = 2.61\,\frac{g}{cm^3}$	$2.70\,\frac{g}{cm^3}$	Aluminum
b) shiny 	104.22 g	l=6.06 cm w=1.52 cm h=1.52 cm	6·1.5·1.5= 13.5 cm^3	$\frac{104.22\text{ g}}{14.0\text{ cm}^3} = 7.44\,\frac{g}{cm^3}$	$7.87\,\frac{g}{cm^3}$	Iron
c) brown 	8.29 g	l=6.06 cm w=1.52 cm h=1.52	6·1.5·1.5= 13.5 cm^3	$\frac{8.29\text{ g}}{14.0\text{ cm}^3} = 0.592\,\frac{g}{cm^3}$	$0.5\,\frac{g}{cm^3}$	Wood

The Structure and the Sequence of Mechanics Topics

Introduction

System International Units:

- for length: meter, m
  - -- mm, cm, m, km
  - -- mm^2, cm^2, m^2
  - -- mm^3, cm^3, m^3
  - -- ml (mL)
- for mass: kilogram, kg
  - -- mg, g, kg
- for temperature: Kelvin, K / Celsius, ^0C
  - -- K, ^0C, F
- for time: second, s
  - -- s, min, hour

Motion

- speed:

$$speed = \frac{distance}{time} \qquad [\text{speed}] = \frac{m}{s}$$

- velocity:

$$v = \frac{s}{t} \qquad [\text{v}] = \frac{m}{s}$$

- acceleration:

$$\text{a} = \frac{v_2 - v_1}{t}$$

- momentum:

$$p = m \cdot v$$

- law of conservation of momentum (collision)

Forces

- push and pull forces:

$$[\text{F}] = N$$

- gravitational force:

$$F_g$$

- normal force (reaction):

$$N$$

- tension force:

$$T$$

- weight:

$$W$$

- friction force:

$$F_f = \mu \cdot N$$

- elastic force:

$$F_{el} = k \cdot x$$

- oscillation (pendulum)

Newton's Laws

- first law (law of inertia):

$$\overrightarrow{F_1} + \overrightarrow{F_2} + \ldots. = 0 \quad \rightarrow \quad \vec{v} = const$$

- second law:

$$\overrightarrow{F_1} + \overrightarrow{F_2} + \ldots. \neq 0 \quad \rightarrow \overrightarrow{F_1} + \overrightarrow{F_2} + \ldots. = m \cdot \vec{a}$$

- third law:

$$\overrightarrow{F_{12}} = \overrightarrow{F_{21}}$$

Energy

- kinetic energy:

$$E_k = \frac{m \cdot v^2}{2}$$

- potential energy due to gravity:

$$E_p = m \cdot g \cdot h$$

- potential energy of a spring:

$$E_p = \frac{k \cdot x^2}{2}$$

- law of conservation of energy
- work

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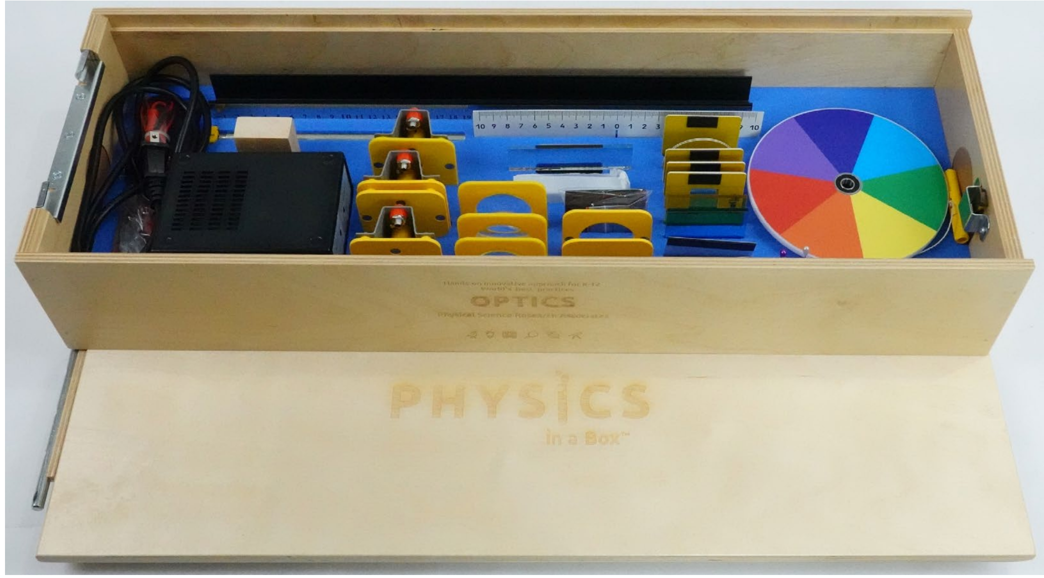
Physics in a Box™ - Optics

Hands-On Innovative Approach for K12

World's Best Practices



Unit 1. Optics phenomena in nature, light, and sources of light.

Unit 2. Colors of light.

Unit 3. Propagation of light.

Unit 4. Polarization of light.

Unit 5. Reflection of light and the law of reflection of light.

Unit 6. Concave and convex mirrors.

Unit 7. Refraction of light.

Unit 8. Prisms.

Unit 9. Dispersion of light.

Unit 10. Converging and diverging lenses.

Unit 11. More about lenses.

Unit 12. Interference and diffraction.

Unit 13. The eye as an optical system.

Unit 14. Optical instruments.

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Unit 10. Converging and diverging lenses.

10.1. Converging lenses. Elements of a converging lens.

10.2. Building images in a converging lens.

10.3. The lens equation applied to a converging lens.

10.4. Magnification of a converging lens.

10.5. Optical power of a converging lens.

10.6. Diverging lenses. Elements of a diverging lens.

10.7. Building images in a diverging lens.

10.8. The lens equation applied to a diverging lens.

10.9. Magnification of a diverging lens.

10.10. Optical power of a diverging lens.

An object is at the distance 2F from the lens.

F = 6 cm

2F = 12 cm

2F’ must be also 12 cm - ?

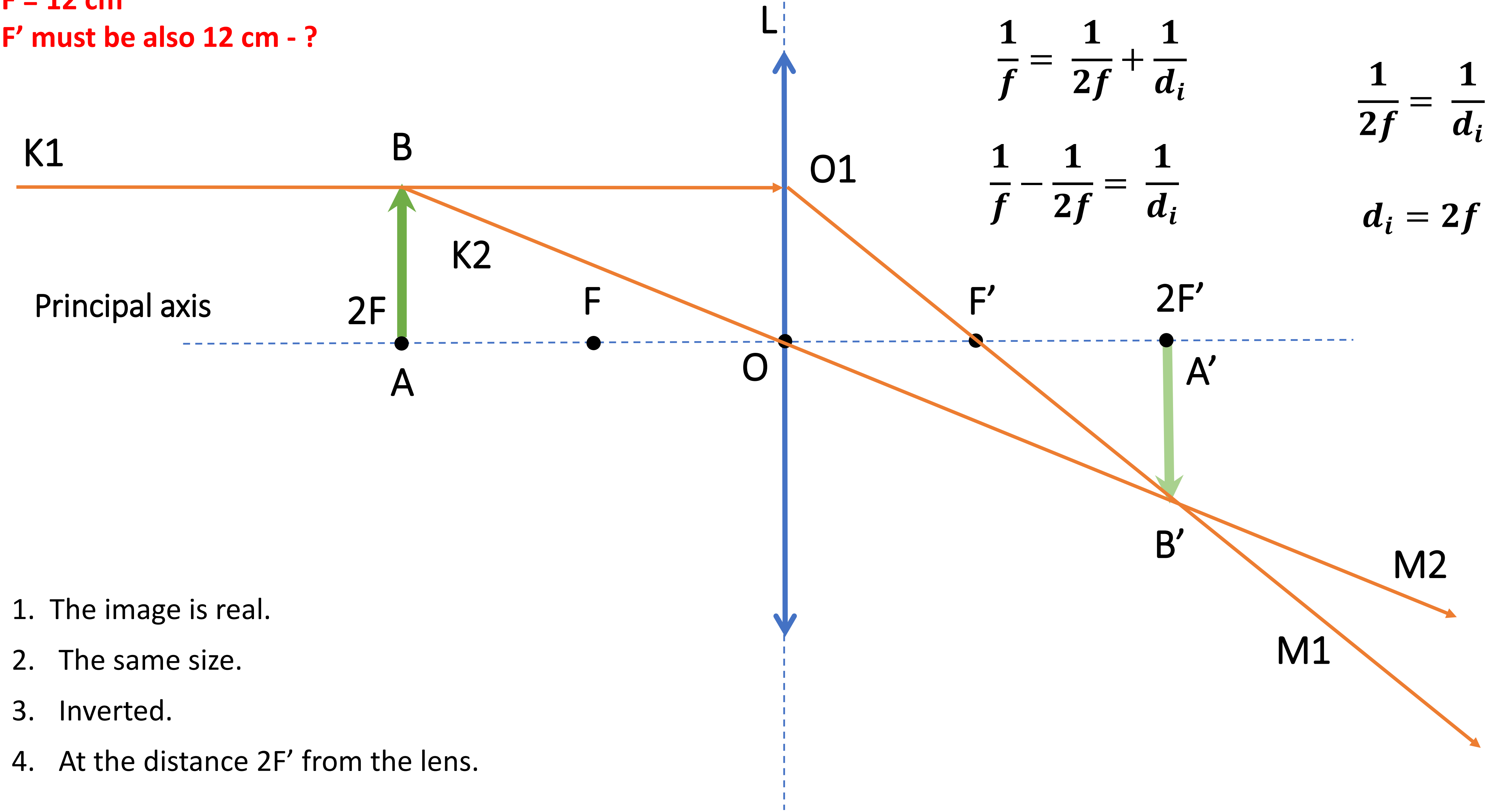
$$\frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i}$$

$$\frac{1}{f} = \frac{1}{2f} + \frac{1}{d_i}$$

$$\frac{1}{f} - \frac{1}{2f} = \frac{1}{d_i}$$

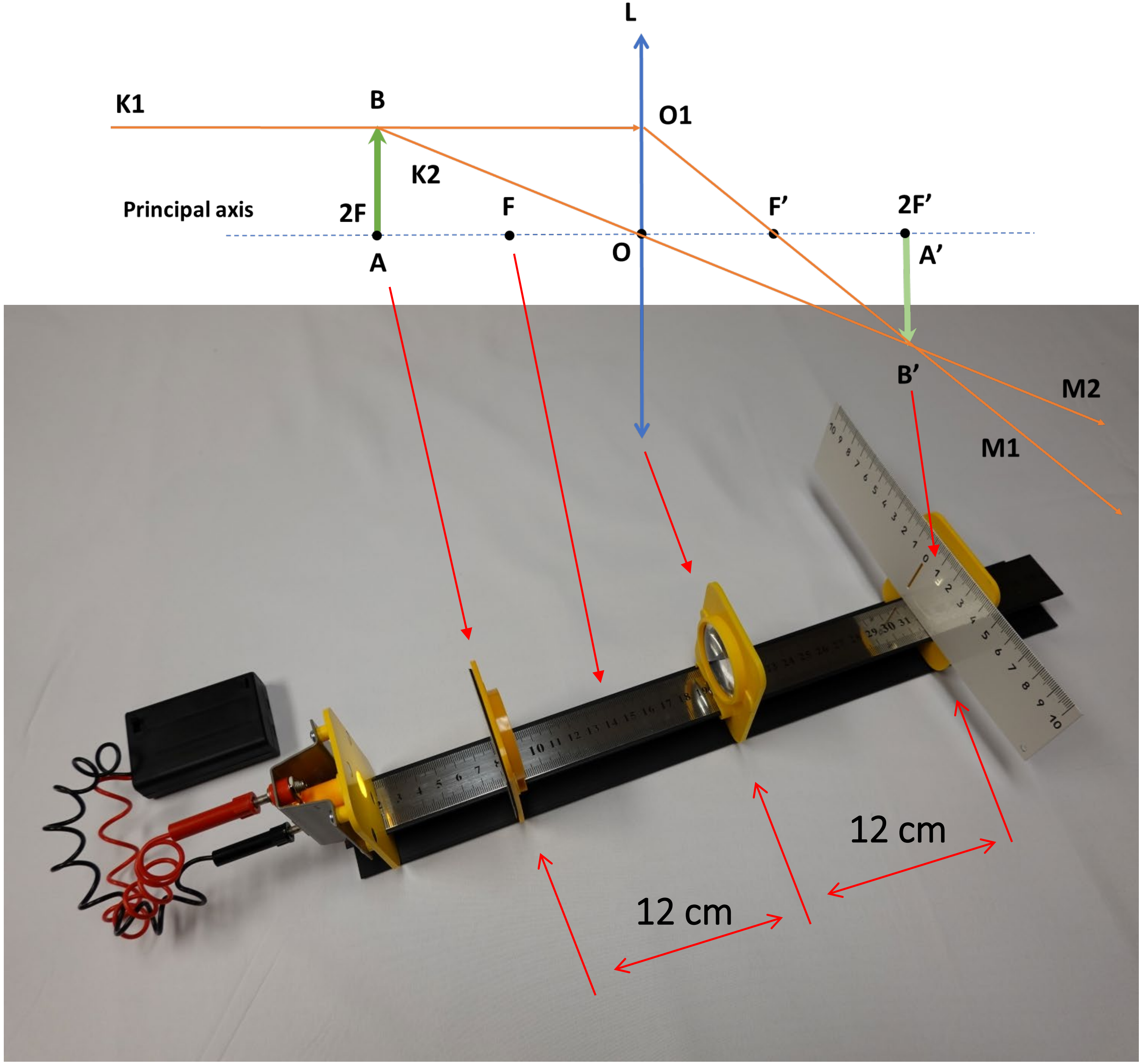
$$\frac{1}{2f} = \frac{1}{d_i}$$

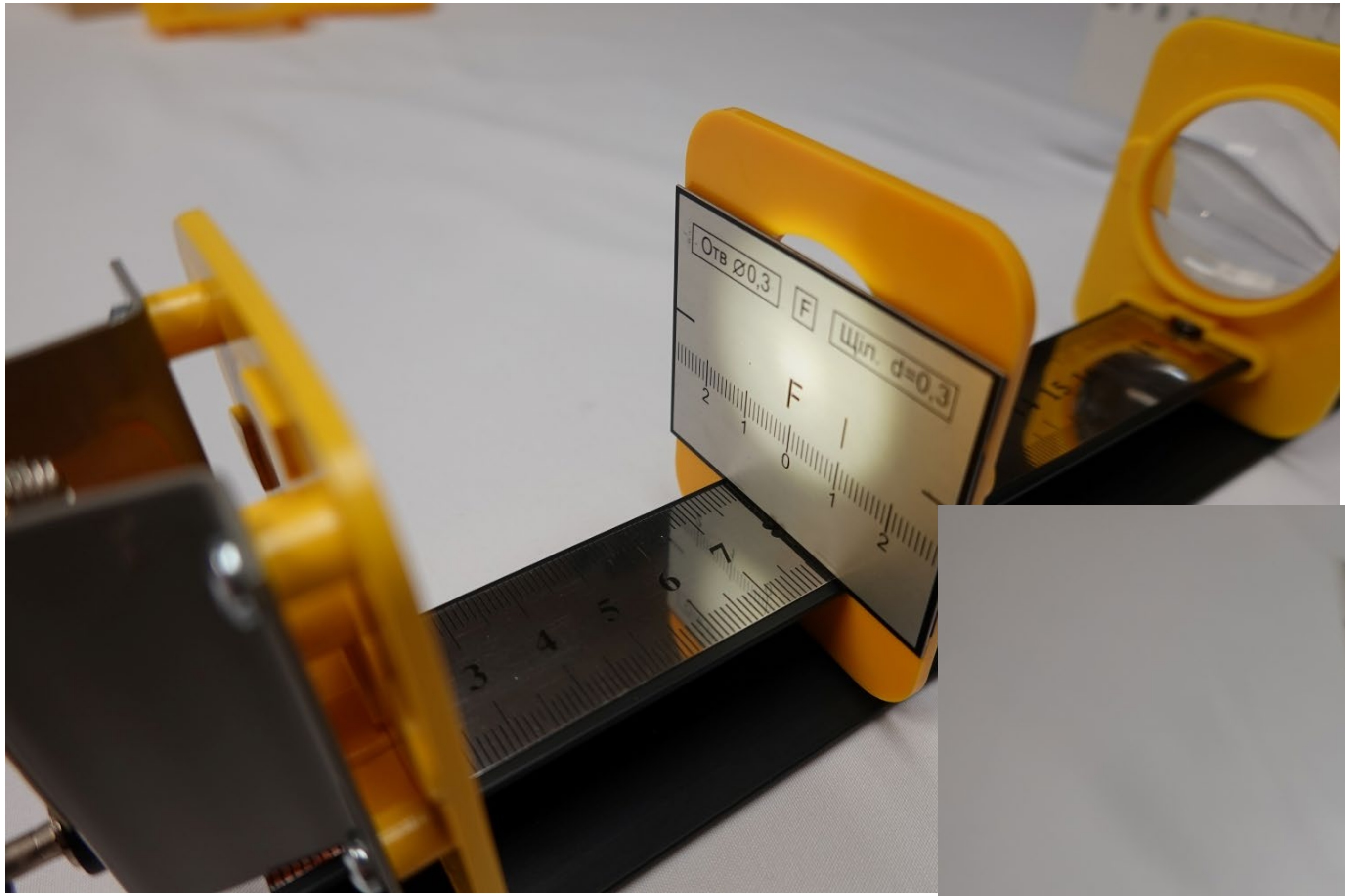
$$d_i = 2f$$



1. The image is real.
2. The same size.
3. Inverted.
4. At the distance 2F’ from the lens.

$$d_i = 2f = 12\ cm$$




Отв ⌀0.3
F
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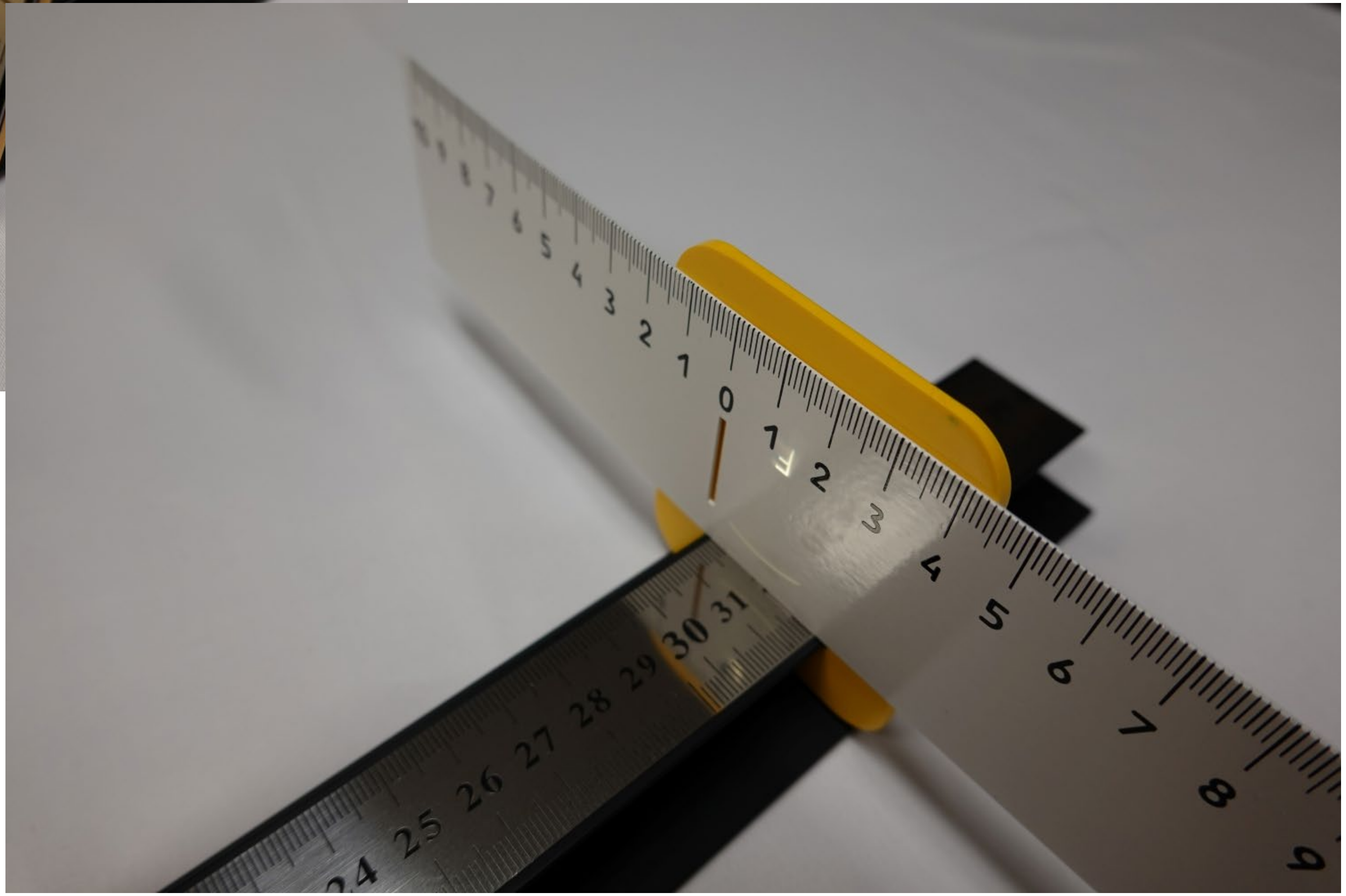
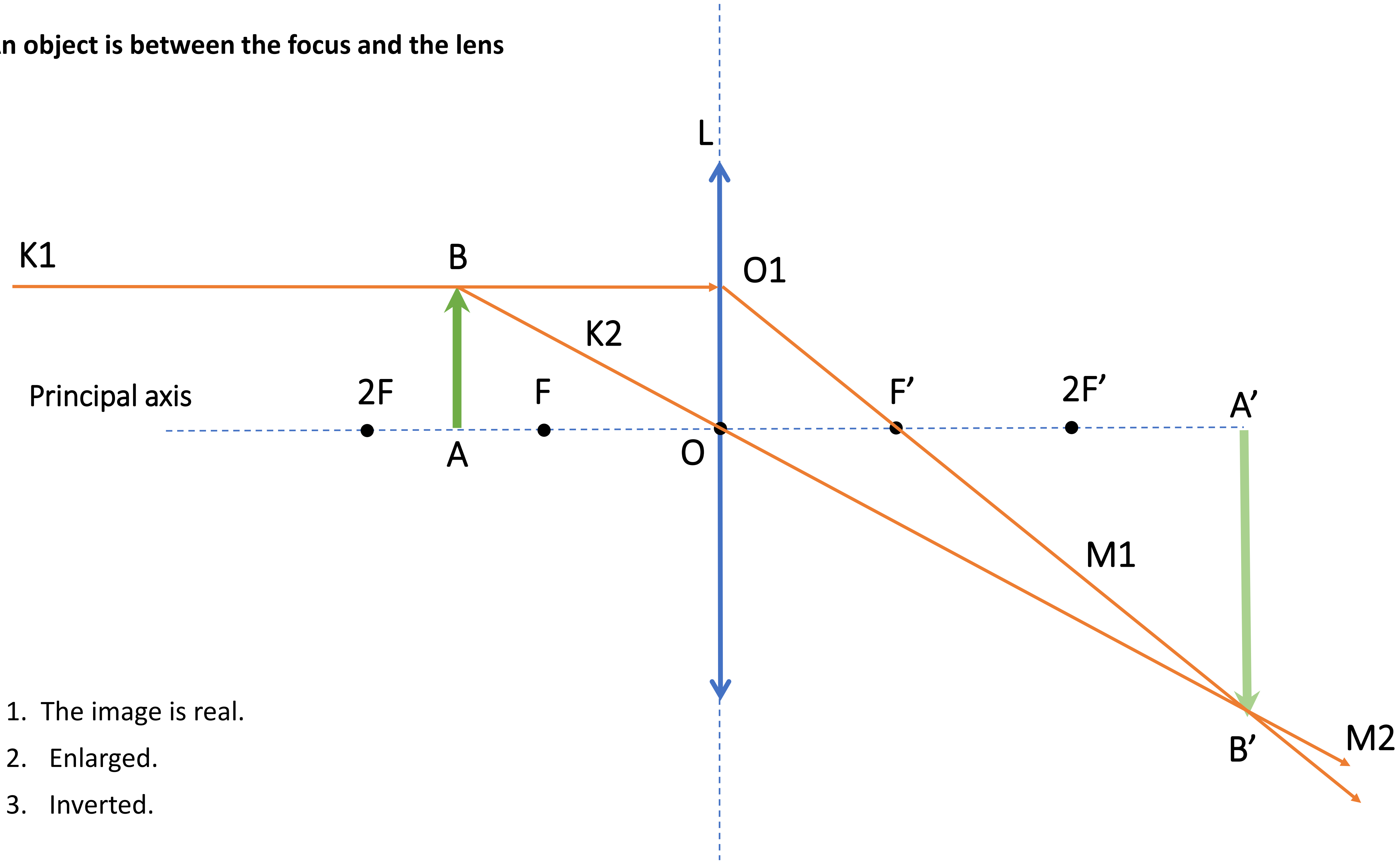
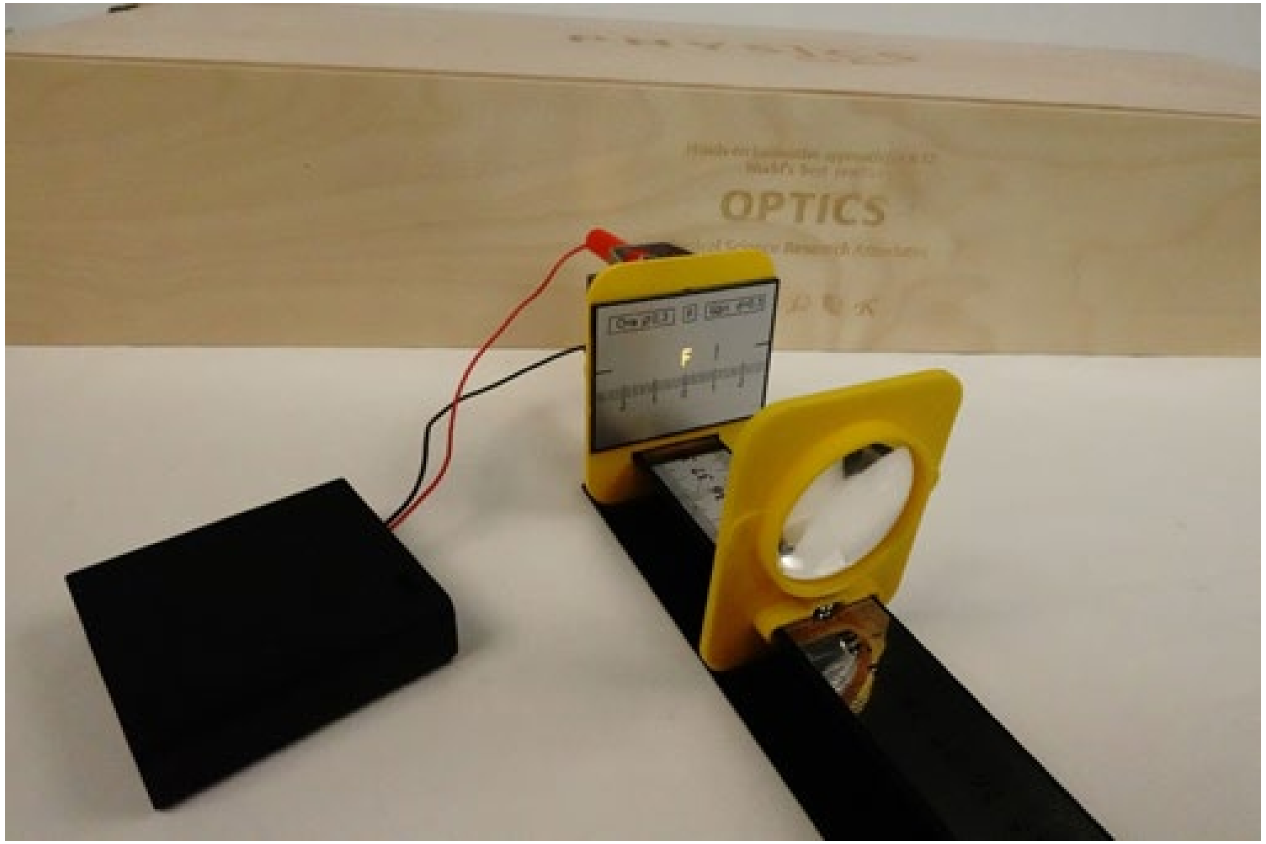


An object is between the focus and the lens



1. The image is real.
2. Enlarged.
3. Inverted.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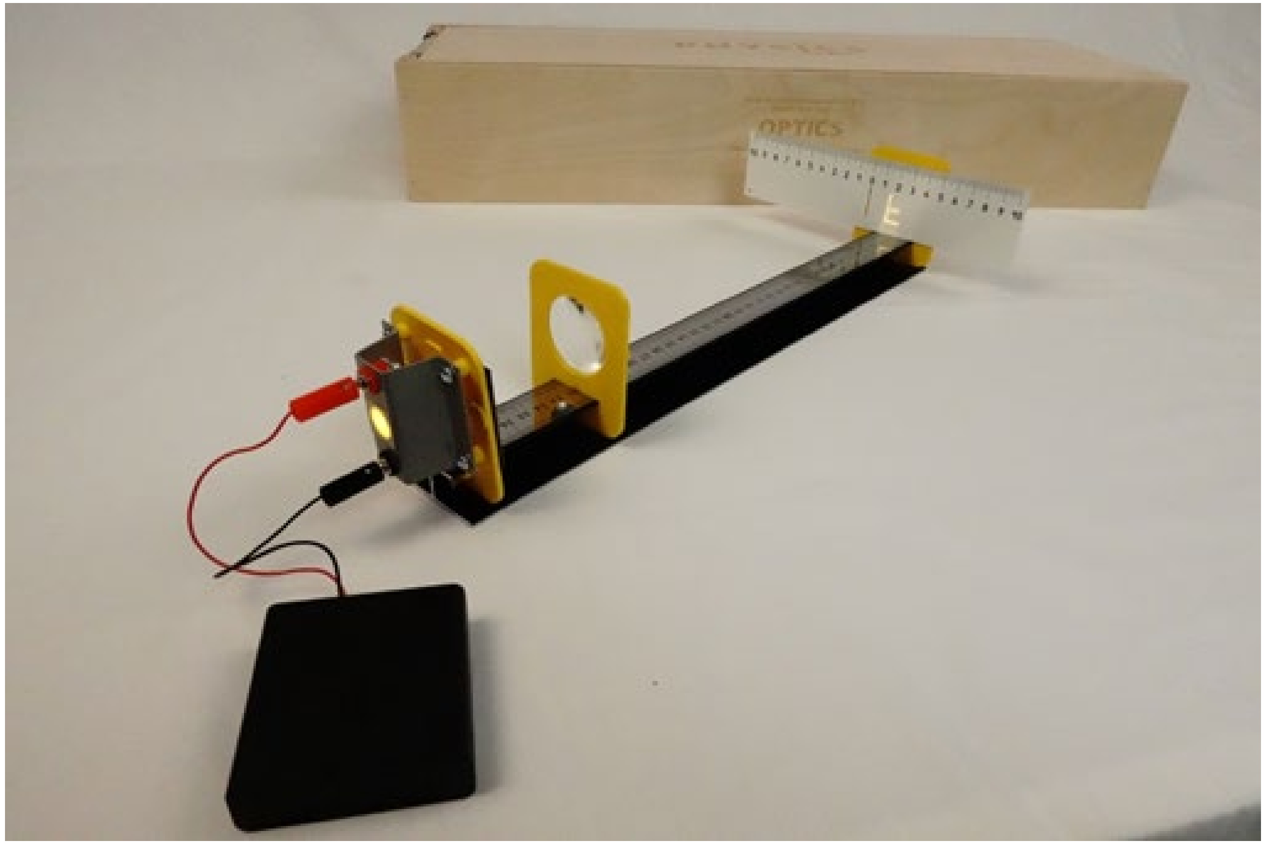
OPTICS

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Physics in a Box™ - Electricity & Magnetism

Hands-On Innovative Approach for K12

World’s Best Practices

Unit 1. Electricity & magnetism. Introduction to Physics in a Box – E&M toolset.

Unit 2. Current, voltage, and resistance in series circuits. Ohm’s law.

Unit 3. Current, voltage, and resistance in parallel circuits.

Unit 4. Combination of series and parallel circuits

Unit 5. *DC-circuits.

Unit 6. Magnets and magnetic field.

Unit 7. Alternative current basics.

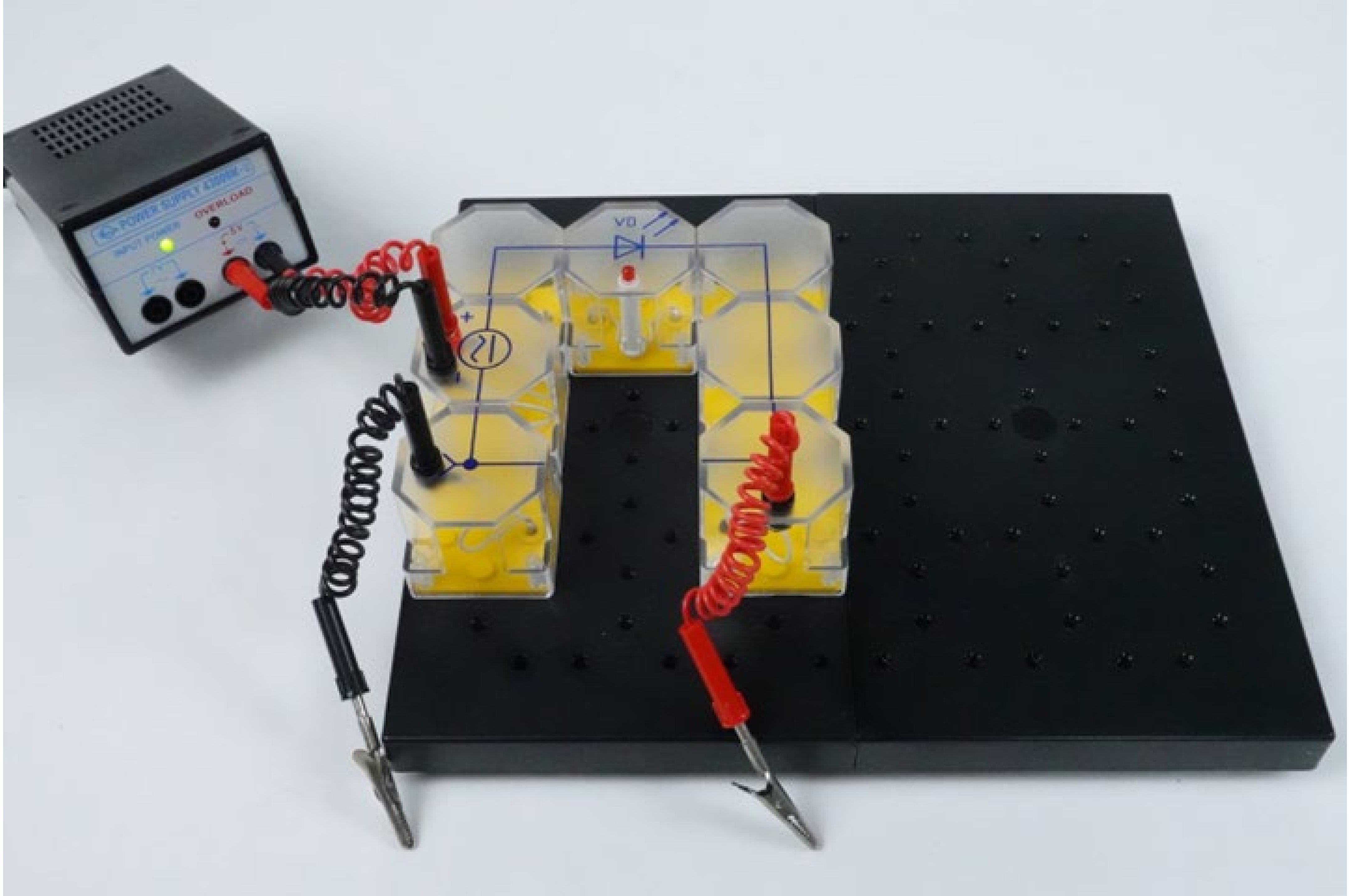
Unit 8. Inductances and transformers.

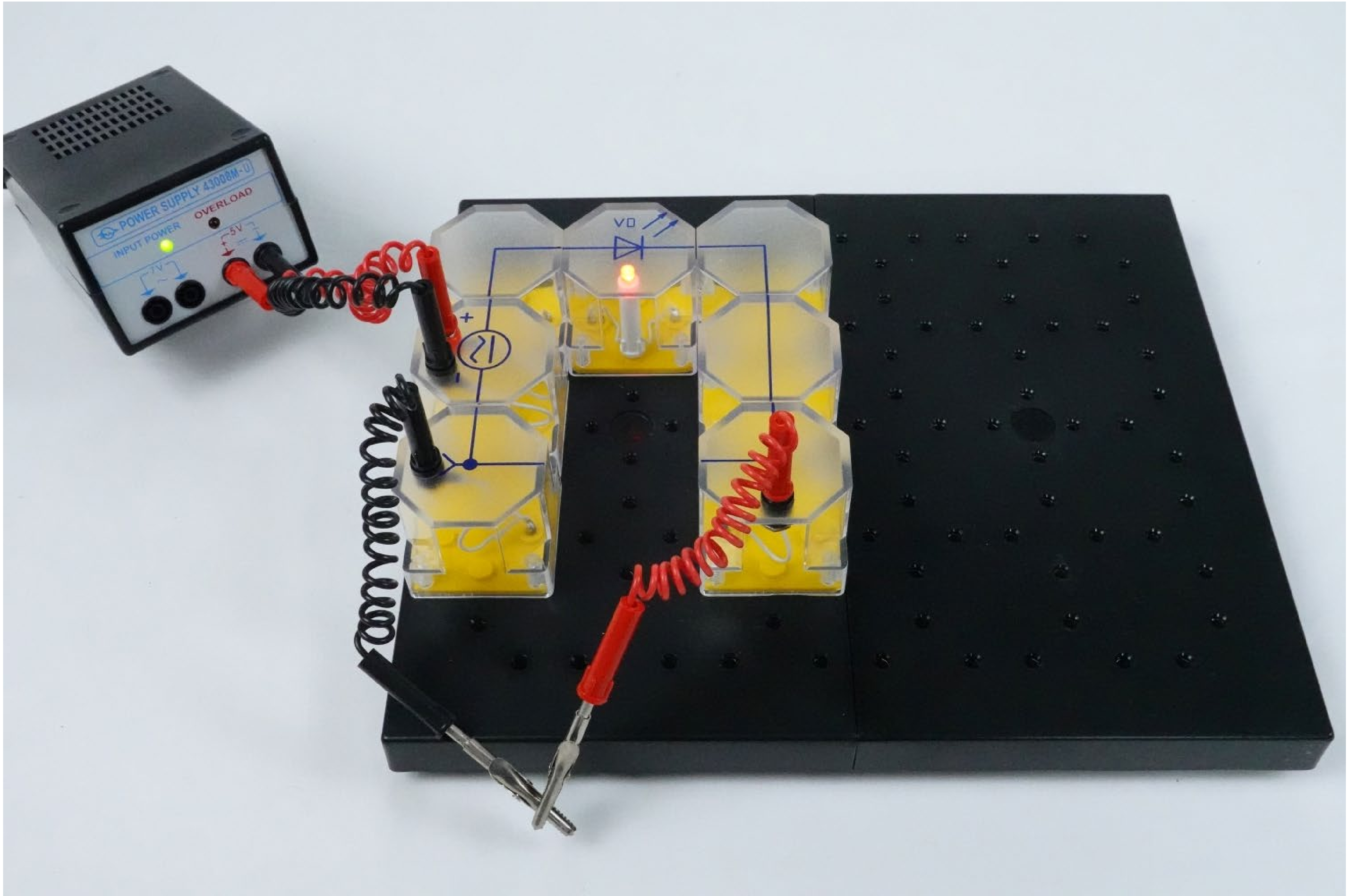
Unit 9. Reactance of a capacitor in an AC circuit.

Unit 10. Impedance of series RC, RL, and RLC circuits.

Unit 11. Impedance of parallel RC, RL, and RLC circuits.

Unit 12. Semiconductor elements.


OVERLOAD
VD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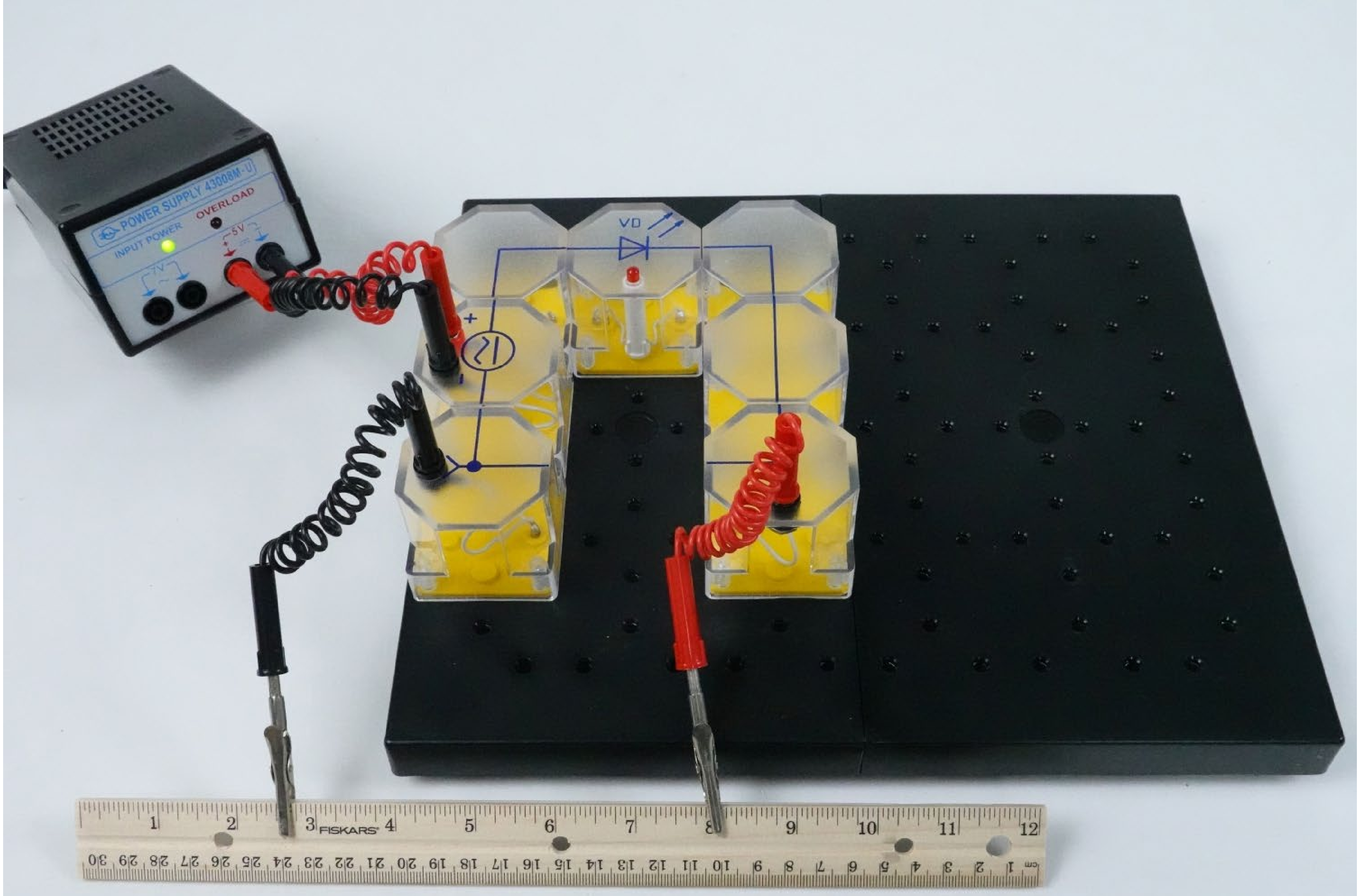
OVERLOAD
INPUT POWER
~7V
-5V
VD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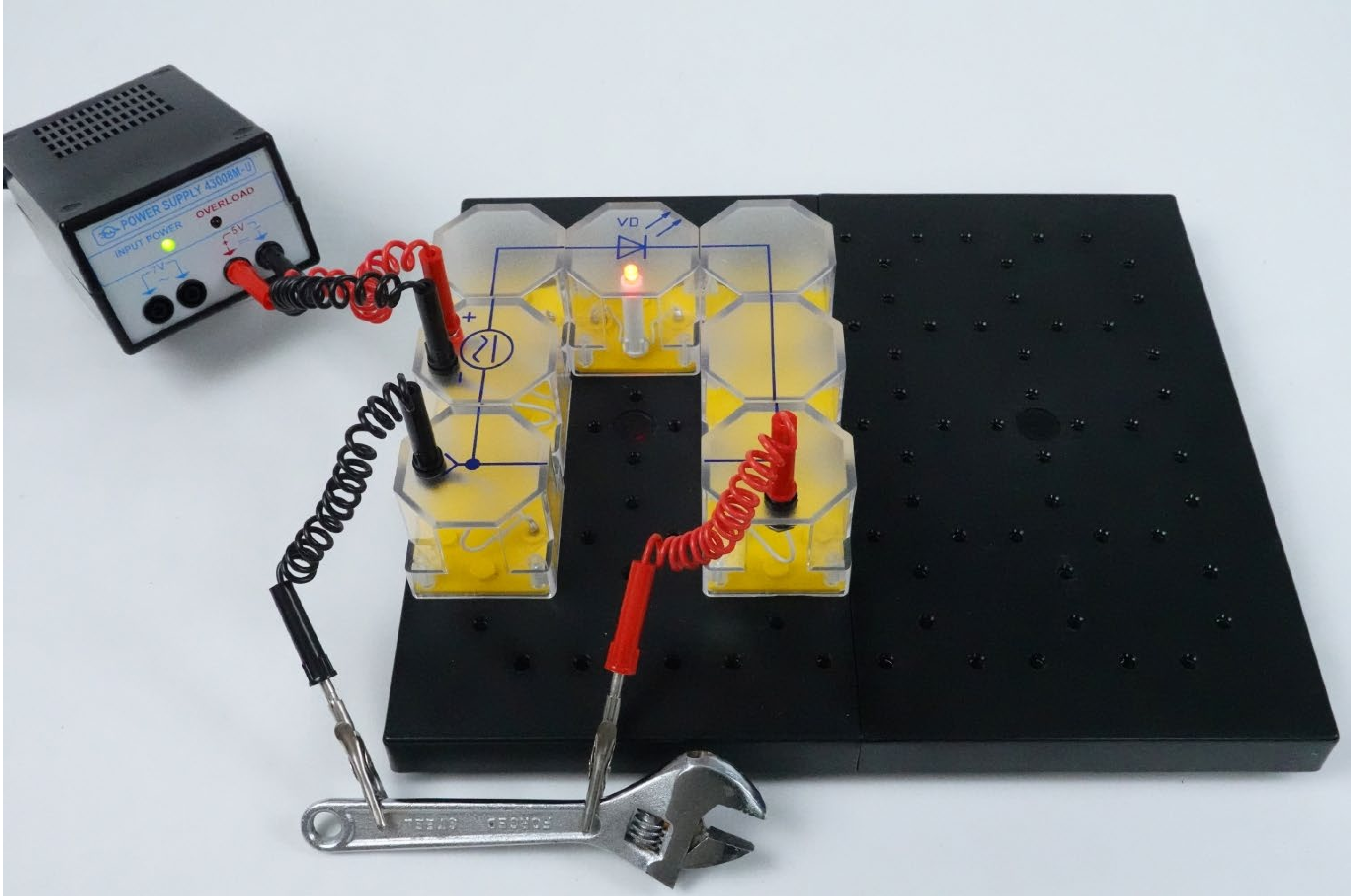
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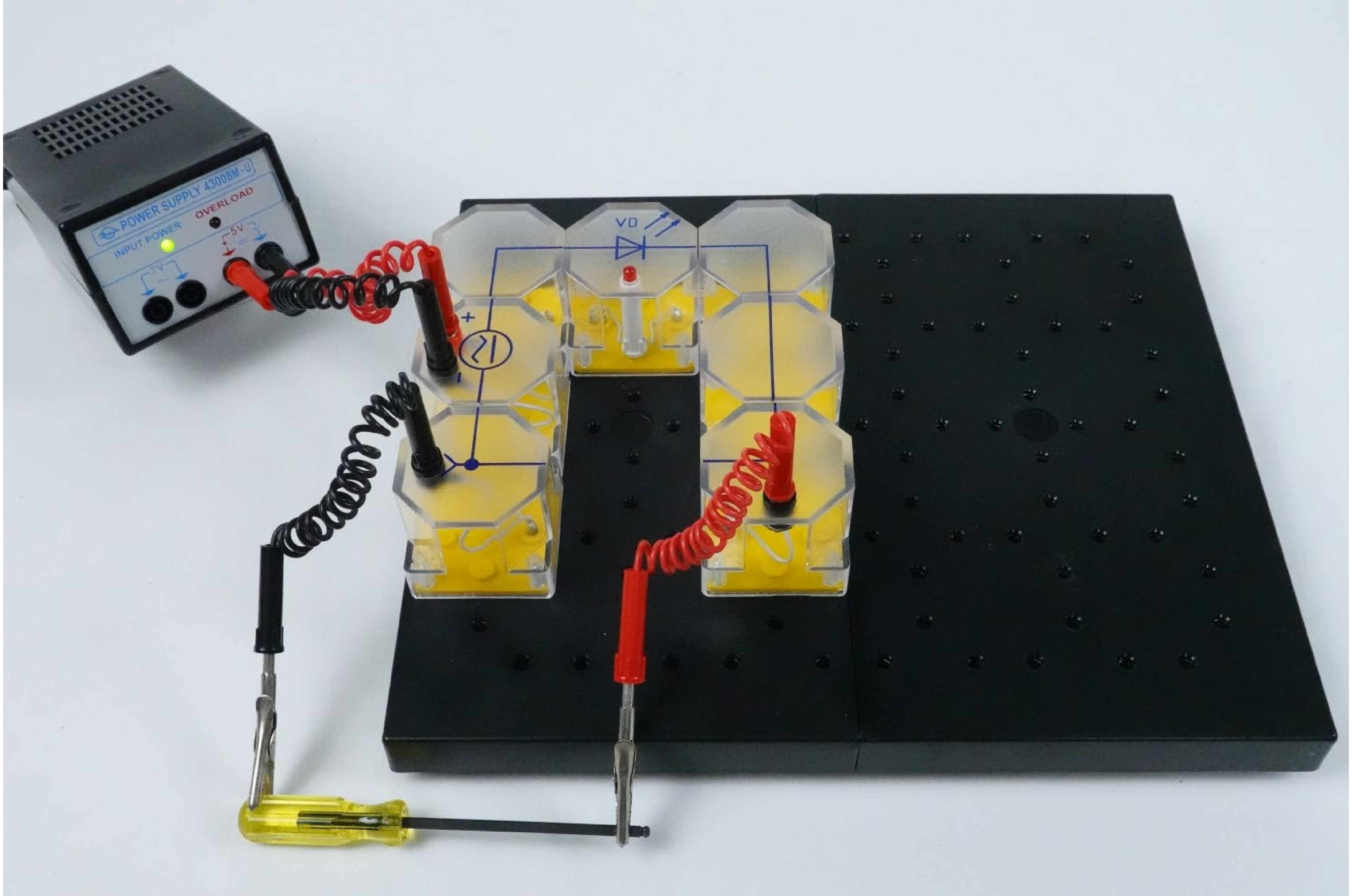
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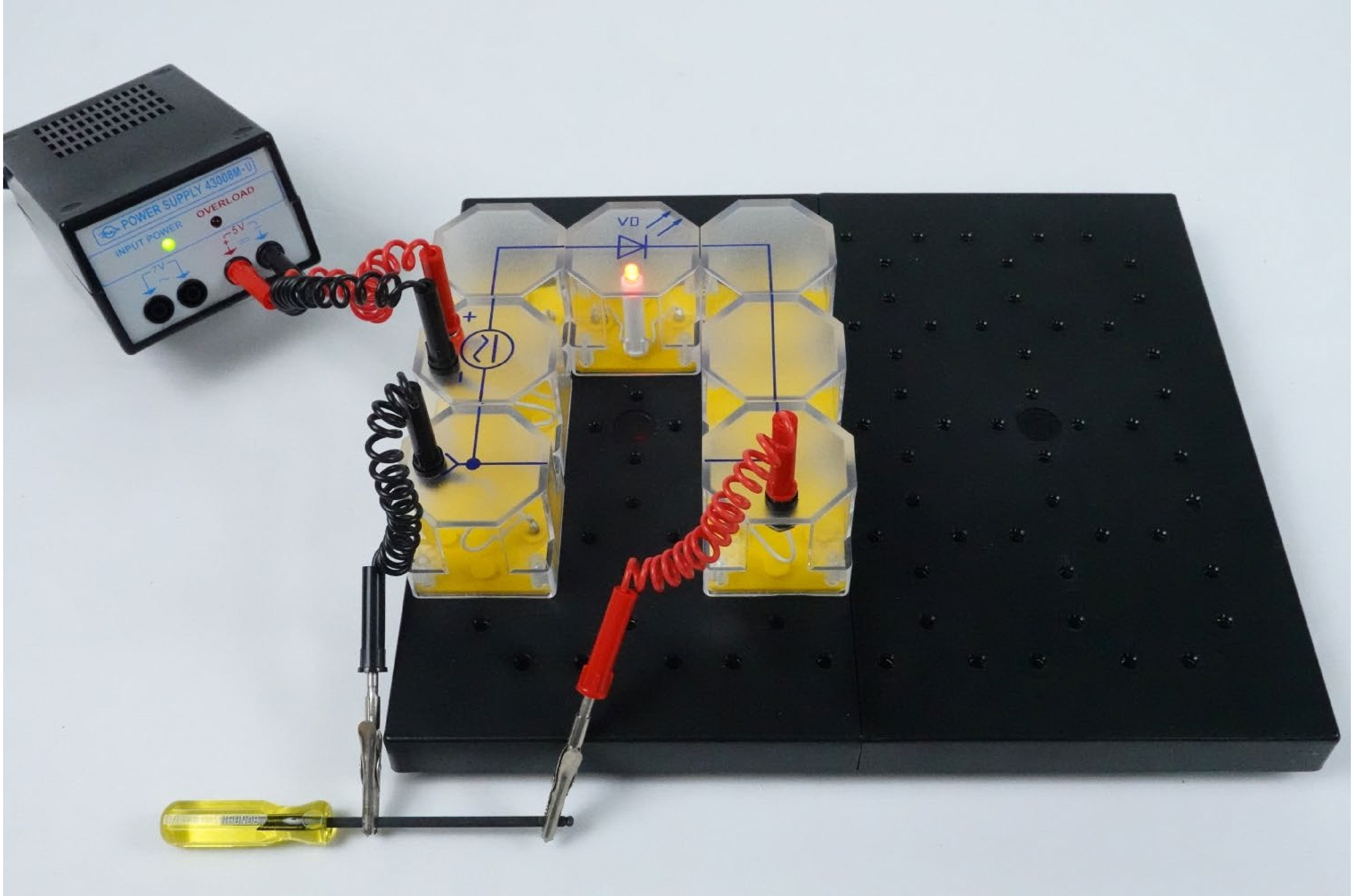
POWER SUPPLY 43008M-U
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Weekly *Physics in a Box* sessions for newcomers

Regular, weekly sessions for teachers who have just joined the program will start next **Tuesday (January 9) at 7 p.m. EST (5 p.m. Mountain Time)**. This start time reflects the need to accommodate colleagues from several time zones. Based on feedback from teachers who have been involved with the program, the investment of this hour of your valuable time will go a long way in helping you prepare to teach your physics classes and to grow your career.

The zoom link to register 24 hours in advance for each session is always the same:

https://us02web.zoom.us/meeting/register/tZYucOigrz8pHdNw0ploHafm9kABHy6J4z74

Meeting ID: 823 7181 4377
Passcode: 191620

Over the course of the next few weeks, we will cover the main topics of *Physics in a Box – Mechanics, Optics, and Electricity & Magnetism*.

Ongoing *Physics in a Box* sessions

At the same time, weekly *Physics in a Box* sessions that began last August are continuing. You are welcome to join them, as well! These sessions are held at 6 p.m. EST (4 p.m. Mountain Time). The zoom links for these sessions are the same every week, but please note that it is different from the link above:

Mechanics is on Tuesdays at 6 p.m. Eastern Time.

<Register 24 hours in advance for a Mechanics meeting>

Optics is on Wednesdays at 6 p.m. Eastern Time.

<Register 24 hours in advance for an Optics meeting>

Electricity & Magnetism is on Thursdays at 6 p.m. Eastern Time.

<Register 24 hours in advance for an Electricity & Magnetism meeting>

physcira

Our informative e-mails once a week, sent from Physical Science Research Associates (Physcira)

Hello, Colleagues,

This week, we will finish working on Unit 5 of the *Physics in a Box – Mechanics* program by considering the most important topics in the entire field of Mechanics: Newton's Laws. They are the fitting culmination of the Mechanics curriculum because they connect almost all the topics we have covered in previous units.

In particular, we will discuss how objects interact; how forces and motion are connected; and how forces cause acceleration. In addition, we will offer a helpful overview of Newton's Laws as we clear up some common misconceptions and analyze some real-life examples. Later, in Unit 8, we will consider each of Newton's Laws in more detail.

Newton's Laws are not only key topics in physics, they are fun to explore. You definitely do not want to miss this session!

In this week's Optics session, we are going to finish the *Physics in a Box – Optics* curriculum. Unit 14 is devoted to optical instruments, including magnifying glasses, binoculars, microscopes, and telescopes. We will consider the principles of operation of these devices, and draw and analyze diagrams of how light rays are processed.

In our Electricity & Magnetism session, we will talk about how alternative current is created and used.

Here is our schedule along with the Zoom links to join:

Mechanics is on Tuesdays at 6 p.m. Eastern Time: <Register 24 hours in advance for a Mechanics meeting>

Optics is on Wednesdays at 6 p.m. Eastern Time: <Register 24 hours in advance for an Optics meeting>

Electricity & Magnetism is on Thursdays at 6 p.m. Eastern Time: <Register 24 hours in advance for an Electricity & Magnetism meeting>

We look forward to seeing you!
Your Physcira Team

physcira

Physics in a Box ™

Powered by the Physcira Team

Please contact so we can begin the journey in raising the achievement of all our Students:

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Anatoliy Glushchenko
Founder
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719-310-7815