



Open Educational Resources in Physics and Computer Science at Whittier College

Open-source, Free, and Fully Integrated

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March 1, 2021

Whittier College

Outline

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Demonstration of Open Access Material in the Classroom

1. *Open-access reading: HTML5 integrated textbook, Tutor*
2. *Whiteboard example: traditional format*
3. *Peer-instruction: Small group style discussion questions*
4. *PhET Simulation: HTML5 demonstration of concepts*

**Open-access reading: OpenStax
Physics**

Open-access reading

**Free textbooks.
Low-cost technology.
Support every step
of the way.**

Find your subject



- Wide variety of subjects (mention specifically First-Year Experience)
- Every format: HTML5, PDF, iOS, Android
- Integrated simulations: PhET
- Free, and with Tutor: 10 dollars

Open-access reading



Open-access reading

Please go to the following link: <https://openstax.org/details/books/university-physics-volume-2>

1. Navigate to the table of contents.
2. Scroll down to find Chapter 10: Direct-Current Circuits.
3. Follow along as we cover sections 10.1 and 10.2 ...

**Open-access reading: OpenStax
Physics *Tutor***

OpenStax Physics Tutor

Discover a new frontier in education.

OpenStax Tutor Beta is courseware for college and high school courses. Available for College Physics, Biology 2e, Introduction to Sociology 2e, AP U.S. History, AP Physics, and AP Biology.

LEARN MORE

LOG IN

openstax TUTOR Beta

RICE

FEATURES

How OpenStax Tutor works



DIGITAL READING

Keep your students on track with online readings that include videos, simulations and conceptual questions to check for understanding.



LMS INTEGRATION

Integrate your OpenStax Tutor course with your LMS to get single sign on and course average score sync.



PERSONALIZED HOMEWORK

Build homework assignments from our library of multiple choice and open-ended questions. **NEW:** Add your own questions or edit ours!



ANALYTICS

View assignment and section-level analytics to pinpoint questions and topics your students are struggling with.

[https://tutor.openstax.org/?](https://tutor.openstax.org/)

OpenStax Physics Tutor

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MATERIALS

Available Books



Anatomy and Physiology



Biology 2e



College Physics



Biology for AP® Courses



The AP Physics Collection



Psychology 2e



Introduction to Sociology
2e



Entrepreneurship



Life, Liberty, and the Pursuit of Happiness

<https://tutor.openstax.org/?>

OpenStax Physics *Tutor*

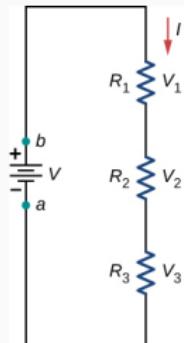
<https://tutor.openstax.org/?>

Demonstration

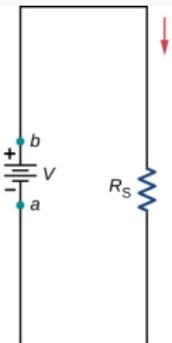
1. Set assignments
2. View as Student
3. Analytics and grading

Whiteboard example: traditional format

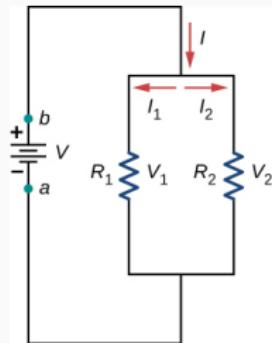
Whiteboard example: traditional format



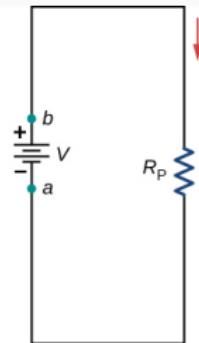
(a) Original circuit



(b) Equivalent circuit



(a) Original circuit



(b) Equivalent circuit

(a) Series DC

(b) Parallel DC

1. Ohm's Law: Relationship between voltage and current
 - Change in voltage (Volts, V) is equal to current (Amps, A) times resistance (Ohms, Ω).
2. Equivalent circuit to predict total current (power, energy consumption): combine resistors with two rules.

Whiteboard example: traditional format

$$R_S = R_1 + R_2 + R_3 + \cdots + R_{N-1} + R_N = \sum_{i=1}^N R_i.$$

10.2

(c) Series DC

$$R_P = \left(\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \cdots + \frac{1}{R_{N-1}} + \frac{1}{R_N} \right)^{-1} = \left(\sum_{i=1}^N \frac{1}{R_i} \right)^{-1}.$$

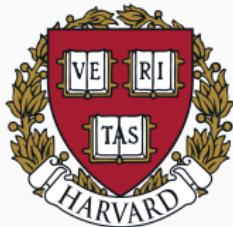
10.3

(d) Parallel DC

1. Ohm's Law: Relationship between voltage and current
 - Change in voltage (Volts, V) is equal to current (Amps, A) times resistance (Ohms, Ω).
2. Equivalent circuit to predict total current (power, energy consumption): combine resistors with two rules.

Peer-instruction: Small group style discussion questions

Peer-instruction



E. Mazur. 1997. *Peer Instruction: A User's Manual*. Prentice Hall.
[https://mazur.harvard.edu/publications/
peer-instruction-users-manual](https://mazur.harvard.edu/publications/peer-instruction-users-manual)

1. *Pose problem.*
2. *First round of answers.*
3. *Discussion in a small group.*
4. *Second round of answers.*

Peer-instruction

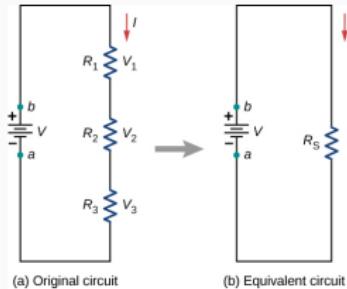


Figure 1

Suppose each resistor in the series circuit in Fig. 1 has a resistance of $50\ \Omega$. What is the total resistance?

- A: 50Ω
- B: 100Ω
- C: 150Ω
- D: 200Ω

Peer-instruction

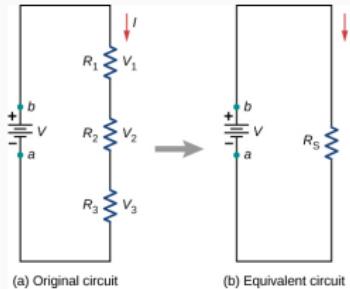


Figure 2

If the battery shown in Fig. 2 has a voltage of 15 Volts, how much current flows in the circuit?

- A: 1A
- B: 0.1A
- C: 0.01A
- D: 0.001A

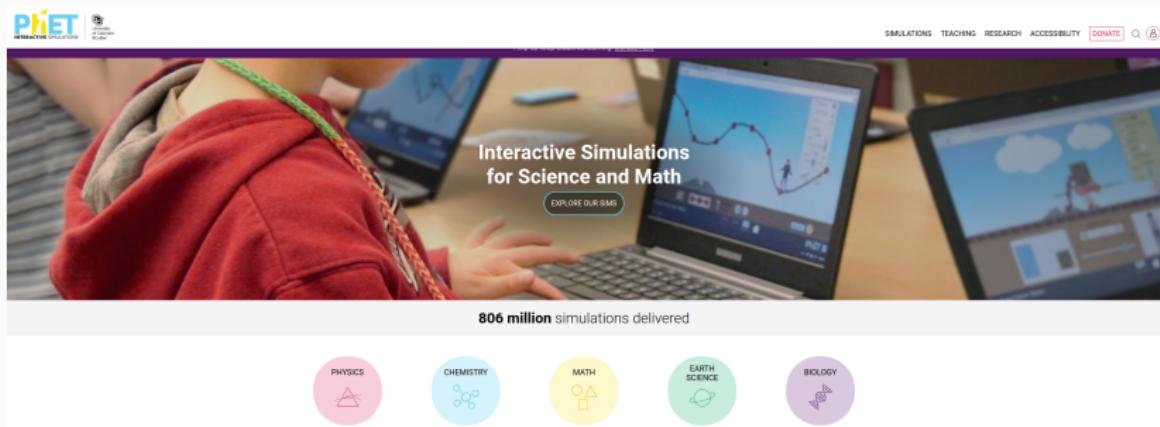
PhET Simulation: HTML5 demonstration of concepts

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Please follow this link:

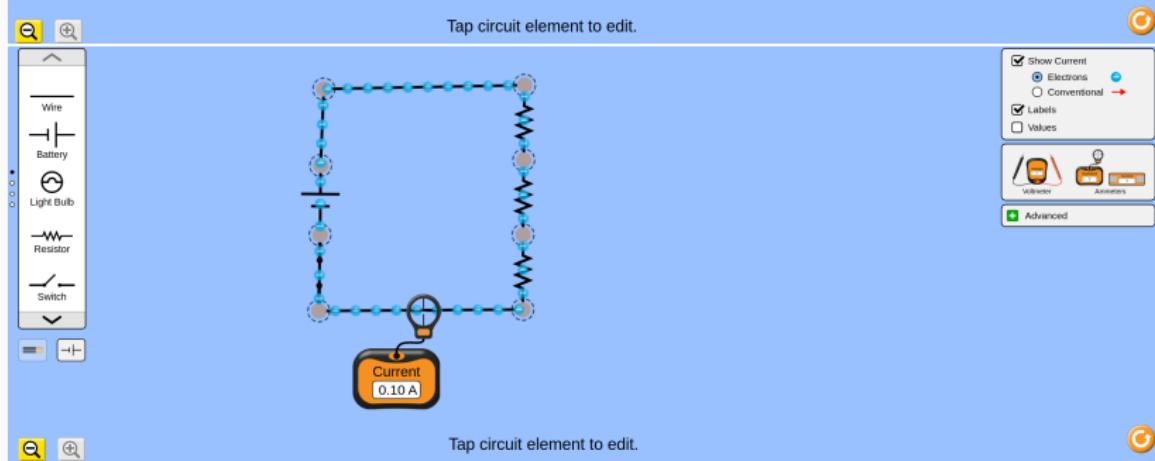
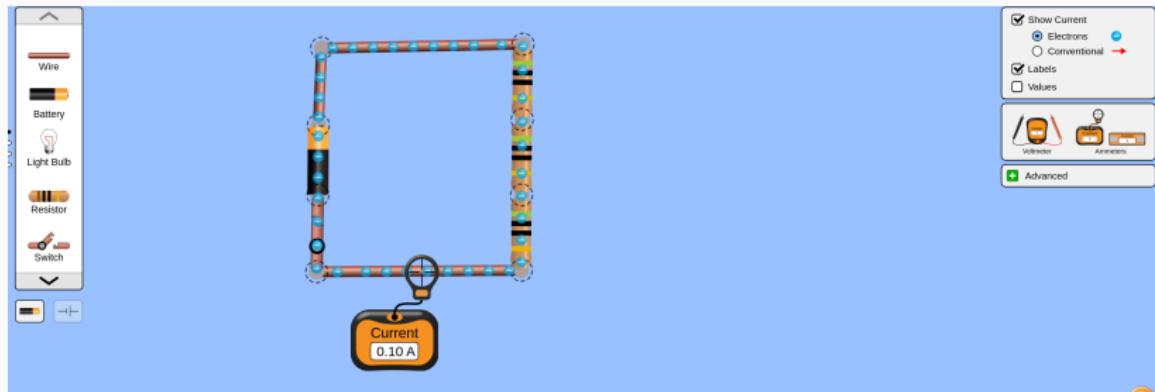
[https://phet.colorado.edu/en/simulation/
circuit-construction-kit-dc](https://phet.colorado.edu/en/simulation/circuit-construction-kit-dc)

PhET Simulation: HTML5 demonstration of concepts



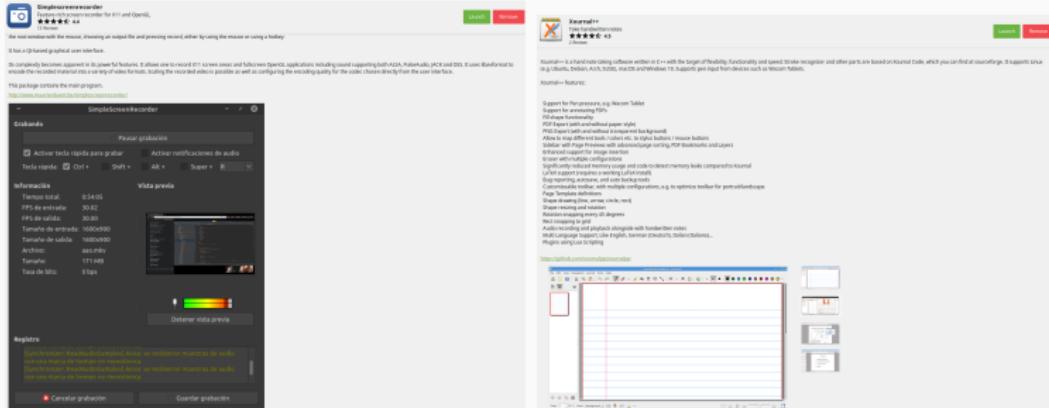
1. Concentrated on STEM subjects
2. HTML5 simulations integrated with OpenStax books
3. Simulations applicable to other subjects
 - Statistical distributions and curve fitting
4. Translated to many Languages

PhET Simulation: HTML5 demonstration of concepts



Other Tools: Simple Screen Recorder, Xournal++, LibreOffice

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<https://cms.whittier.edu/mod/resource/view.php?id=459174>
<https://cms.whittier.edu/mod/resource/view.php?id=459175>

Conclusion

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