

FULL REVIEW

Full Review: Current, Resistance, and Ohm's Law — Foundational

Review the essential ideas, relationships, and problem-solving tools for Current, Resistance, and Ohm's Law.

 TIME 45–60 minutes	 BEST FOR A complete topic review	 FINISH WITH A readiness check
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After this full review, you'll be able to...

recall the essential ideas, apply them to representative problems, and determine what to study next.

HOW TO USE THIS GUIDE

Work through the stages in order. Write directly in the spaces provided, check your work in the Solutions section, and finish by choosing the next resource that matches your confidence.

Choose how you want to review: work through this guide, follow the online review, or watch the video review.

[Start the Review Online →](#)

[Watch the Video Review →](#)

YOU WILL NEED

Pencil or pen • Calculator if needed • Approximately 45–60 minutes

FR-02 • COURSE ALIGNMENT

Course Alignment

This Physics Sensei Unit Review is an independent learning resource. Use it to reinforce key concepts, prepare for homework, or review before a quiz or exam.

RESOURCE: Physics Sensei Unit Review
UNIT ID: EME-U06
TOPIC: Current, Resistance, and Ohm's Law
COURSE LEVEL: Foundational

BEST USED

- ✓ After learning the unit
- ✓ Before starting homework
- ✓ Before a quiz or exam

FR-03 • YOUR REVIEW PLAN

Your Review Plan

Complete these six stages in order. Each stage builds on the previous one and prepares you for the final readiness check.

6 stages • Approximately 45–60 minutes

1 Warm-Up Check Activate prior knowledge.	2 Core Concepts Review the essential ideas.	3 Guided Practice Apply what you learned.
4 Confidence Check Confirm your understanding.	5 Summary Review the key ideas.	6 Next Step Continue your learning.

PRINTING TIP

For student copies, print double-sided and keep the Solutions section after the student activities so learners attempt each activity before checking their work.

FR-04 • STAGE 1 OF 6

Warm-Up Check

Before you begin, take a moment to see what you already remember. Do not worry about getting everything right. This is only a starting point.

ACTIVITY 1**Name the moving quantity**

Recall the relevant definition or relationship, then answer in your own words.

What physical quantity must move across a cross-section for electric current to exist?

ACTIVITY 2**Separate current and voltage**

Recall the relevant definition or relationship, then answer in your own words.

Explain why a battery can have a voltage even if the switch is open.

FR-04 • WARM-UP CHECK CONTINUED

ACTIVITY 3

Direction check

Recall the relevant definition or relationship, then answer in your own words.

Electrons drift left in a metal wire. Which way is conventional current?

Ready to strengthen your understanding?

You've refreshed what you already know. Next, reinforce the essential concepts that will help you solve problems with confidence.

Continue to Core Concepts →

FR-05 • STAGE 2 OF 6

Core Concepts

Let's rebuild the key ideas one step at a time. Focus on understanding the relationships before worrying about solving problems.

KEY CONCEPT 1**What current means**

Electric current is the rate at which electric charge crosses a chosen surface. Conventional current points in the direction positive charge would move. In metal wires, electrons drift in the opposite direction.

$$I = \frac{\Delta Q}{\Delta t}$$

EXAMPLE A lamp can carry a steady current even though individual electrons drift slowly.

SENSEI NOTE Do not confuse conventional current direction with electron motion.

KEY CONCEPT 2**Voltage, resistance, and Ohm's law**

Potential difference is energy transferred per unit charge. Resistance describes how strongly a component opposes current. For an ohmic component at constant conditions, $V = I R$.

$$V = I R$$

EXAMPLE At the same resistance, doubling the applied voltage doubles the current.

SENSEI NOTE $V = I R$ is not a universal law for every device: a filament bulb may be non-ohmic.

FR-05 • CORE CONCEPTS CONTINUED

KEY CONCEPT 3

Material, shape, and energy

A longer uniform wire generally has more resistance, while a thicker wire has less resistance. Electric power is the rate at which electrical energy is transferred: $P = I V$.

$$P = I V$$

EXAMPLE A thin, long wire heats more at the same current than an otherwise identical short, thick wire.

SENSEI NOTE Power is not the same as current; both voltage and current matter.

Ready to apply these ideas?

You've reinforced the essential concepts. Now put them into practice by working through guided examples and building your problem-solving confidence.

[Continue to Guided Practice →](#)

FR-06 • STAGE 3 OF 6

Guided Practice

Now it's time to apply what you've reviewed. Work through each activity in order. The examples become gradually more challenging, and each prepares you for the final readiness check.

PRACTICE 1**Battery and lamp**

A 6 V battery is connected across an ohmic $3\ \Omega$ lamp. Determine current and identify the relationship used.

Worked method: $I = V/R = (6\ \text{V})/(3\ \Omega) = 2\ \text{A}$. Use Ohm's law because resistance is specified and constant. Check: verify the units and physical assumptions.

FR-06 • GUIDED PRACTICE CONTINUED

PRACTICE 2**Power check**

A device has a 12 V potential difference and carries 0.5 A. Find its power.

Your turn: solve independently. Record the formula, substitution, and units before checking the Solutions section.

PRACTICE 3**Wire comparison**

Two wires use the same material and thickness; one is three times as long. Compare their resistance.

Your turn: solve independently. Record the formula, substitution, and units before checking the Solutions section.

Ready to check your understanding?

You've practiced the essential skills with guidance. Now solve a few short problems on your own and confirm you're ready to move forward.

Continue to Confidence Check →

FR-07 • STAGE 4 OF 6

Confidence Check

You've rebuilt the key ideas and practiced them with guidance. Now try these short questions on your own to check your understanding before moving on.

QUICK CHECK 1**Current direction**

Work independently before consulting the solutions section.

In a copper wire electrons move to the right. State the conventional current direction.

QUICK CHECK 2**Resistance effect**

Work independently before consulting the solutions section.

An ohmic resistor is held at 8 V. Its resistance doubles. What happens to the current?

FR-07 • CONFIDENCE CHECK CONTINUED

QUICK CHECK 3

Energy rate

Work independently before consulting the solutions section.

A 10 V device draws 0.2 A. Calculate its power.

HOW DID IT GO?

I answered ____ of 3 questions correctly.

Use the Solutions section to check your reasoning, then take one final look at the essential ideas.

You've checked your understanding.

Take one final look at the essential ideas before deciding what to do next.

Continue to Summary →

FR-08 • STAGE 5 OF 6

Summary

Before moving on, take one final look at the most important ideas from this review.

KEY TAKEAWAY 1**Current**

Current measures charge flow per unit time; conventional current is opposite electron drift in metals.

KEY TAKEAWAY 2**Ohm's law**

For an ohmic resistor at fixed temperature, $V = I R$.

KEY TAKEAWAY 3**Power**

Power measures energy transfer per second, $P = I V$.

MY ONE-SENTENCE SUMMARY

In my own words, the most important idea is:

Ready for your next step?

You've reviewed the essential ideas one last time. Now choose the resource that best matches how confident you feel.

Continue to Next Step →

ANSWER KEY • CHECK AFTER ATTEMPTING

Solutions and Explanations

Use these solutions to check your reasoning—not only your final answer. Replace each placeholder with a concise answer and the essential explanation.

WARM-UP • ACTIVITY 1**Name the moving quantity**

Electric charge moves; in a metal, the mobile carriers are electrons.

WHY IT WORKS Current requires transport of electric charge across a surface, rather than motion of energy or voltage. Metals contain mobile electrons that carry this charge through the wire.

WARM-UP • ACTIVITY 2**Separate current and voltage**

The open switch interrupts a conducting path; the battery still provides a potential difference.

WHY IT WORKS A battery maintains a potential difference between its terminals even when no continuous conducting path exists. Opening the switch stops sustained current, not the separation of potential at the terminals.

WARM-UP • ACTIVITY 3**Direction check**

Conventional current is rightward, opposite leftward electron drift.

WHY IT WORKS The direction assigned to conventional current is the direction a positive charge would move. Because electrons carry negative charge, leftward electron drift corresponds to rightward conventional current.

SOLUTIONS • GUIDED PRACTICE

PRACTICE 1

Battery and lamp

$I = V/R = (6 \text{ V})/(3 \, \Omega) = 2 \text{ A}$. Use Ohm's law because resistance is specified and constant.

WHY IT WORKS For a component whose resistance is treated as constant, Ohm's law relates the potential difference and current by $V = IR$. Dividing 6 V by 3 Ω gives 2 A; this assumes the lamp is behaving ohmically under the stated conditions.

PRACTICE 2

Power check

$P = IV = (0.5 \text{ A})(12 \text{ V}) = 6 \text{ W}$.

WHY IT WORKS Electrical power is the rate of energy transfer. Each coulomb transfers 12 J at 12 V, and 0.5 C crosses per second, so the energy transferred per second is $(12 \text{ J/C})(0.5 \text{ C/s}) = 6 \text{ W}$.

PRACTICE 3

Wire comparison

The longer wire has three times the resistance under the same temperature conditions.

WHY IT WORKS For a uniform wire at constant temperature, resistance is proportional to length when resistivity and cross-sectional area remain unchanged. Tripling the length therefore triples resistance.

SOLUTIONS • CONFIDENCE CHECK

QUICK CHECK 1

Current direction

Left; conventional current follows positive charge.

WHY IT WORKS Conventional current is defined by the motion positive charge would have, so it points opposite the electron drift direction in a metal conductor.

QUICK CHECK 2

Resistance effect

It halves because $I = V/R$.

WHY IT WORKS For fixed voltage across an ohmic resistor, $I = V/R$ makes current inversely proportional to resistance. Doubling R while keeping V unchanged halves I .

QUICK CHECK 3

Energy rate

$P = IV = 2 \text{ W}$.

WHY IT WORKS Power delivered to the device is $P = VI$. Multiplying 10 V by 0.2 A gives 2 J/s, or 2 W.

READINESS GUIDE

3 correct: You're ready to continue. • 2 correct: Review the missed idea, then continue. • 0–1 correct: Revisit Core Concepts or choose more practice.

FR-09 • STAGE 6 OF 6

Next Step: Continue Learning

Great work! You've completed this review. Choose the next resource that best matches how confident you feel.

 I'm Still Unsure Review the key ideas and examples again. Review Again →	 I Need More Practice Continue with additional practice for this topic. Go to Practice →	 I'm Ready Continue to the next recommended resource. Continue →
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RECOMMENDED LINKS

[Review this topic again →](#)[Find additional practice →](#)[Choose another type of physics help →](#)

Continue reviewing with these companion resources.

[Start the Review Online →](#)[Watch the Video Review →](#)

PHYSICS HELP THAT MAKES SENSE

A Physics Sensei review never ends at the last question. It always guides you toward the next useful step.

PhysicsSensei.com