

FULL REVIEW

Full Review: Current, Resistance, and Ohm's Law — Algebra-Based

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: Algebra-Based

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

Current expression

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

Write the definition of average current in terms of charge and elapsed time.

ACTIVITY 2

Ohm's law

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

Find I if 15 V is across a 5 Ω resistor.

FR-04 • WARM-UP CHECK CONTINUED

ACTIVITY 3

Resistance scaling

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

A uniform wire is stretched to twice its length while its volume stays fixed. How does resistance change?

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

Current, charge, and units

The average current through a surface is $I = \frac{\Delta Q}{\Delta t}$, with amperes equal to coulombs per second.

Conventional current is defined in the positive-charge direction; electrons in metallic conductors drift opposite to I.

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

EXAMPLE If 12 C crosses a cross-section in 4 s, the average current is 3 A.

SENSEI NOTE A negative carrier velocity does not mean a negative current without an explicitly chosen axis.

KEY CONCEPT 2

Ohm's law and the V–I graph

For an ohmic resistor at fixed temperature, $V = I R$; resistance equals the slope of a V-versus-I graph. For non-ohmic components that slope can vary.

$$V = I R; \frac{\Delta V}{\Delta I} = R$$

EXAMPLE An 18 V source across a 6 Ω resistor gives $I = 3$ A.

SENSEI NOTE The slope of I-versus-V is $1/R$, not R .

FR-05 • CORE CONCEPTS CONTINUED

KEY CONCEPT 3

Resistivity and power

For a uniform conductor $R = \frac{\rho L}{A}$, where ρ is resistivity, ℓ length, and A cross-sectional area.

Power relationships include $P = I V = I^2 R = \frac{V^2}{R}$ for ohmic resistors.

$$R = \frac{\rho L}{A}; P = I^2 R$$

EXAMPLE Doubling a wire's length and halving its area increases resistance by a factor of four.

SENSEI NOTE Use $P = \frac{V^2}{R}$ only when V is across the resistance R .

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**Current from charge**

A total of 24 C passes through a wire in 6.0 s. Find average current.

Worked method: $I = \frac{\Delta Q}{\Delta t} = 24 \text{ C} / 6.0 \text{ s} = 4.0 \text{ A}$. Check: verify the units and physical assumptions.

FR-06 • GUIDED PRACTICE CONTINUED

PRACTICE 2

Resistor power

A $12\ \Omega$ resistor is connected across 24 V. Determine current and power.

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

PRACTICE 3

Geometry change

A wire of resistance $5\ \Omega$ has its length doubled and area halved at constant resistivity. Find new 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**Graph slope**

Work independently before consulting the solutions section.

A resistor has $V = 9\text{ V}$ at $I = 1.5\text{ A}$. Determine resistance.

QUICK CHECK 2**Current and time**

Work independently before consulting the solutions section.

A steady 0.40 A flows for 30 s . How much charge passes?

FR-07 • CONFIDENCE CHECK CONTINUED

QUICK CHECK 3

Heating

Work independently before consulting the solutions section.

A $4\ \Omega$ resistor carries 3 A. Find the dissipated 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

Charge flow

$I = \frac{\Delta Q}{\Delta t}$; current is measured in amperes.

KEY TAKEAWAY 2

Material and geometry

$R = \frac{\rho L}{A}$; resistance depends on both resistivity and wire dimensions.

KEY TAKEAWAY 3

Energy transfer

$P = I V$; for ohmic R , also $I^2 R$ or $\frac{V^2}{R}$.

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

Current expression

$$I = \frac{\Delta Q}{\Delta t}, \text{ where } 1 \text{ A} = 1 \text{ C/s.}$$

WHY IT WORKS Average current is the net charge crossing a surface divided by elapsed time:

$$I_{avg} = \frac{\Delta Q}{\Delta t}. \text{ A coulomb per second is defined as one ampere.}$$

WARM-UP • ACTIVITY 2

Ohm's law

$$I = V/R = 15 \text{ V} / 5 \, \Omega = 3 \text{ A.}$$

WHY IT WORKS With a constant ohmic resistance, rearranging $V = IR$ gives $I = V/R$. The units V/Ω reduce to amperes, so 15 V across 5 Ω gives 3 A.

WARM-UP • ACTIVITY 3

Resistance scaling

Constant volume means A decreases by 2 when L doubles; $R'/R = 2/(1/2) = 4$.

WHY IT WORKS Fixed volume means AL is constant. If length doubles, area must halve; since

$$R = \frac{\rho L}{A} \text{ at fixed resistivity, the length factor 2 and inverse-area factor 2 multiply to 4.}$$

SOLUTIONS • GUIDED PRACTICE

PRACTICE 1

Current from charge

$$I = \frac{\Delta Q}{\Delta t} = 24 \text{ C} / 6.0 \text{ s} = 4.0 \text{ A}.$$

WHY IT WORKS Average current measures how rapidly charge passes a cross-section. Dividing 24 C by 6.0 s yields 4.0 C/s = 4.0 A.

PRACTICE 2

Resistor power

$$I = V/R = 2.0 \text{ A}; P = VI = (24 \text{ V})(2.0 \text{ A}) = 48 \text{ W}.$$

WHY IT WORKS Ohm's law first gives $I = 24 \text{ V} / 12 \Omega = 2.0 \text{ A}$. The resistor then dissipates electrical power $P = VI = 24 \text{ V} \times 2.0 \text{ A} = 48 \text{ W}$; equivalently $P = V^2/R$.

PRACTICE 3

Geometry change

$$\frac{R'}{R} = (2)/(1/2) = 4, \text{ so } R' = 20 \Omega.$$

WHY IT WORKS Resistance of a uniform conductor is $R = \frac{\rho L}{A}$. With ρ unchanged, doubling length multiplies R by 2 and halving area multiplies it by another 2, giving four times $5 \Omega = 20 \Omega$.

SOLUTIONS • CONFIDENCE CHECK

QUICK CHECK 1

Graph slope

$$R = V/I = 6 \, \Omega.$$

WHY IT WORKS For an ohmic resistor, the ratio of potential difference to current is its resistance. Thus $R = 9 \, \text{V} / 1.5 \, \text{A} = 6 \, \Omega$.

QUICK CHECK 2

Current and time

$$\Delta Q = I\Delta t = (0.40 \, \text{A})(30 \, \text{s}) = 12 \, \text{C}.$$

WHY IT WORKS For steady current, $I = \Delta Q / \Delta t$ can be rearranged as $\Delta Q = I\Delta t$. Multiplying 0.40 C/s by 30 s gives 12 C.

QUICK CHECK 3

Heating

$$P = I^2 R = (3 \, \text{A})^2 (4 \, \Omega) = 36 \, \text{W}.$$

WHY IT WORKS For an ohmic resistor, substitute $V = IR$ into $P = VI$ to obtain $P = I^2 R$. A current of 3 A in 4 Ω dissipates $9 \times 4 = 36 \, \text{W}$.

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