

FULL REVIEW

Full Review: Units and Measurements — Algebra-Based

Review the essential ideas, relationships, and problem-solving tools for units, measurement, dimensional reasoning, precision, and estimation.

 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...

solve multistep unit conversions, apply dimensional analysis, manage significant figures and uncertainty, and make quantitative estimates.

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: MEC-U01 TOPIC: Units and Measurements COURSE LEVEL: Algebra-based introductory college physics	BEST USED ✓ After learning the unit ✓ Before starting homework ✓ Before a quiz or exam
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[Start the Unit Review Online →](#)

Physics Sensei organizes this material as an independent learning unit rather than following an external textbook chapter sequence.

Physics Sensei • MEC-U01 Full Review • Units and Measurements • Algebra Based

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 — page 4 Activate prior knowledge.	2 Core Concepts — page 6 Review the essential ideas.	3 Guided Practice — page 8 Apply what you learned.
4 Confidence Check — page 10 Confirm your understanding.	5 Summary — page 12 Review the key ideas.	6 Next Step — page 16 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

Recall Activity 1

Use scientific notation and a metric prefix.

Write 0.0000725 m in scientific notation and in micrometers.

ACTIVITY 2

Recall Activity 2

Build a complete conversion chain.

Convert 90.0 km/h to m/s.

FR-04 • WARM-UP CHECK CONTINUED**ACTIVITY 3****Recall Activity 3**

Use dimensional symbols before numbers.

State the dimensions of acceleration and density.

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 — page 6 →

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**SI Units, Prefixes, and Scientific Notation**

SI units standardize physical measurement. Prefixes represent powers of ten, and scientific notation separates significant digits from scale. Derived quantities combine base dimensions, so their units can be reduced to combinations such as m/s, m/s², or kg/m³.

$$7.25 \times 10^{-5} \text{ m} = 72.5 \text{ }\mu\text{m}; 1 \text{ cm}^3 = 10^{-6} \text{ m}^3.$$

EXAMPLE 72.5 micrometers = $72.5 \times 10^{-6} \text{ m} = 7.25 \times 10^{-5} \text{ m}$.

SENSEI NOTE Keep the significant digits unchanged while moving only the power of ten.

KEY CONCEPT 2**Conversion Factors and Dimensional Analysis**

A conversion factor is a ratio of equivalent quantities and equals one. Multiply by factors until unwanted units cancel. Dimensional analysis independently checks the physical type of each term in an equation.

$$[v] = \text{L T}^{-1}; [a] = \text{L T}^{-2}; [\rho] = \text{M L}^{-3}.$$

EXAMPLE 90.0 km/h = 25.0 m/s. Also, each term in $x = x_0 + v_0 t + (1/2)at^2$ has dimension L.

SENSEI NOTE For area and volume conversions, square or cube the entire conversion factor.

FR-05 • CORE CONCEPTS CONTINUED**KEY CONCEPT 3****Significant Figures, Uncertainty, and Estimation**

Measured inputs limit meaningful output precision. Multiplication and division are generally limited by significant figures; addition and subtraction by decimal place. Relative uncertainty is absolute uncertainty divided by the measured value. Estimates provide an independent magnitude check.

$$\text{percent uncertainty} = (\Delta x / x) \times 100\%; \text{ keep guard digits, then round once.}$$

EXAMPLE $24.6 \pm 0.3 \text{ cm}$ has percent uncertainty about 1.2%.

SENSEI NOTE Carry guard digits during intermediate steps and round the final result once.

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 — page 8 →

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**Worked Example**

Convert compound units carefully.

Convert 15.0 m/s to km/h.

FR-06 • GUIDED PRACTICE CONTINUED**PRACTICE 2****Guided Problem**

Convert density from cgs-style units to SI.

Convert 2.70 g/cm³ to kg/m³.

PRACTICE 3**Independent Problem**

Use dimensional reasoning to infer an exponent.

Suppose the period T of a pendulum depends only on length L and gravitational acceleration g . Use dimensions to determine how T scales with L and g .

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 — page 10 →

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**Significant Figures**

Apply the correct rule.

Evaluate $18.2/3.45$ and report the result appropriately.

QUICK CHECK 2**Area Conversion**

Square the factor.

Convert 250 cm^2 to m^2 .

FR-07 • CONFIDENCE CHECK CONTINUED**QUICK CHECK 3****Equation Check**

Test every term.

Is $E = mv$ dimensionally consistent with energy? Explain.

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 — page 12 →

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**Write the Units Before the Arithmetic**

Conversion chains reveal mistakes through cancellation before numbers are multiplied.

KEY TAKEAWAY 2**Dimensions Expose Impossible Equations**

Every term being added or equated must have compatible dimensions.

KEY TAKEAWAY 3**Precision and Estimation Protect the Final Answer**

Report justified digits and compare the magnitude against a rough independent estimate.

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 — page 16 →

ANSWER KEY • CHECK AFTER ATTEMPTING

Solutions and Explanations

Use these solutions to check your reasoning—not only your final answer. Use each answer and explanation to identify the step that supports the result.

WARM-UP • ACTIVITY 1**Recall Activity 1**

$0.0000725 \text{ m} = 7.25 \times 10^{-5} \text{ m} = 72.5 \text{ micrometers.}$

WHY IT WORKS One micrometer is 10^{-6} m .

WARM-UP • ACTIVITY 2**Recall Activity 2**

$90.0 \text{ km/h} = 25.0 \text{ m/s.}$

WHY IT WORKS Multiply by 1000 m/1 km and 1 h/3600 s .

WARM-UP • ACTIVITY 3**Recall Activity 3**

Acceleration: L/T^2 . Density: M/L^3 .

WHY IT WORKS Acceleration is velocity per time; density is mass per volume.

SOLUTIONS • GUIDED PRACTICE**PRACTICE 1****Worked Example**

$15.0 \text{ m/s} = 54.0 \text{ km/h.}$

WHY IT WORKS Multiply by 1 km/1000 m and 3600 s/1 h .

PRACTICE 2**Guided Problem**

$2.70 \text{ g/cm}^3 = 2.70 \times 10^3 \text{ kg/m}^3$.

WHY IT WORKS Converting grams to kilograms contributes 10^{-3} , while converting cm^3 to m^3 contributes 10^{-6} in the denominator, for a net factor 10^3 .

PRACTICE 3

Independent Problem

T is $\propto \sqrt{L/g}$.

WHY IT WORKS Let $T \propto L^a g^b$. Matching dimensions gives $1 = -2b$ and $0 = a + b$, so $b = -1/2$ and $a = 1/2$.

SOLUTIONS • CONFIDENCE CHECK**QUICK CHECK 1****Significant Figures**

$18.2/3.45 = 5.28$.

WHY IT WORKS Both inputs have three significant figures, so the quotient is reported with three.

QUICK CHECK 2**Area Conversion**

$250 \text{ cm}^2 = 0.0250 \text{ m}^2$ if 250 carries three significant figures.

WHY IT WORKS $(1 \text{ m}/100 \text{ cm})^2 = 10^{-4} \text{ m}^2/\text{cm}^2$.

QUICK CHECK 3**Equation Check**

No.

WHY IT WORKS mv has dimensions ML/T , which are momentum dimensions, not energy dimensions ML^2/T^2 .

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: return to Warm-Up Check on page 4.	⊙ 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 again: return to Warm-Up Check on page 4.

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