FOCUSED REVIEW

Focused Review: Mechanical Waves and Wave Speed

Review the most important ideas, reinforce the essential skills, and confirm you're ready to move on.

TIME	BEST FOR	FINISH WITH
15–20 minutes	Focused review	Greater confidence

After this focused review, you'll be able to…

identify mechanical-wave quantities, explain transverse and longitudinal motion, and reason with $v = f\lambda$ and medium effects.

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 15–20 minutes

FR-02 • COURSE ALIGNMENT

Course Alignment

This bundle is designed to complement the chapter listed below. Use it to reinforce key concepts, prepare for homework, or review before a quiz or exam.

TEXTBOOK: OpenStax University Physics Volume 1 **CHAPTER: Volume 1, Chapter 16** **TOPIC: Mechanical Waves and Wave Speed** **COURSE LEVEL: Foundational introductory college physics**	**BEST USED** ✓ After reading the chapter ✓ Before starting homework ✓ Before a quiz or exam

Read the OpenStax Chapter →

FR-03 • YOUR REVIEW PLAN

Your Review Plan

Complete these six focused stages in order. Each stage reinforces your understanding and prepares you for a final confidence check.

6 stages • Approximately 15–20 minutes

1 **Warm-Up Check — page 4** Refresh key ideas.	2 **Core Concepts — page 6** Reinforce the essentials.	3 **Guided Practice — page 7** Strengthen key skills.
4 **Confidence Check — page 8** Confirm your understanding.	5 **Summary — page 10** Remember the essentials.	6 **Next Step — page 14** Choose your next step.

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 minute to reactivate what you already know. This quick warm-up will help you focus on the most important ideas before moving on.

WARM-UP 1

Key Ideas

Recall the component definitions of velocity and acceleration.

A wave pulse moves along a rope. Does the rope itself travel with the pulse? Explain.

WARM-UP 2

Common Mistakes

Identify the relationship that controls the wave quantity.

A wave completes 4 cycles each second. What is its frequency and period?

WARM-UP 3

Quick Application

Distinguish circular speed from circular velocity.

A transverse wave moves to the right. In what direction do points on the medium oscillate?

Ready to strengthen your understanding?

You've refreshed the most important ideas. Now reinforce the concepts you'll use most often.

Continue to Core Concepts — page 6 →

FR-05 • STAGE 2 OF 6

Core Concepts

Let’s reinforce the most important concepts you’ll need to solve problems with confidence. Focus on the ideas that appear most often in homework, quizzes, and exams.

KEY CONCEPT 1

Wave Quantities and the Basic Speed Relation

Amplitude measures maximum displacement from equilibrium. Wavelength λ is the distance between repeating points, frequency f is cycles per second, and period T is time per cycle. A traveling wave moves one wavelength during one period, giving v = λ/T = fλ.

$$T=\frac{1}{f};v=f\,\lambda$$

EXAMPLE A 6.0 Hz wave with λ = 1.5 m travels at 9.0 m/s.

SENSEI NOTE For a fixed medium, changing the source frequency changes λ so that v remains set by the medium.

KEY CONCEPT 2

Transverse, Longitudinal, and Medium Effects

In a transverse wave, the medium oscillates perpendicular to propagation; in a longitudinal wave, it oscillates parallel to propagation, producing compressions and rarefactions. Wave speed depends on how strongly the medium restores disturbances and how much inertia the medium has.

stiffer restoring response → faster waves; greater inertia → slower waves.

EXAMPLE Increasing the tension of a string increases its wave speed; using a heavier string at the same tension decreases it.

SENSEI NOTE Do not confuse the speed of the wave with the speed of individual particles in the medium.

Ready to apply these ideas?

You’ve reinforced the essential concepts. Now strengthen your problem-solving skills by working through a few guided examples.

Continue to Guided Practice — page 7 →

FR-06 • STAGE 3 OF 6

Guided Practice

Now apply the key concepts you've just reviewed. Work through these focused practice activities to reinforce your problem-solving skills before the final confidence check.

PRACTICE 1

Guided Example

Use independent components connected by one elapsed time.

A wave has f = 8.0 Hz and λ = 2.5 m. Find its speed.

PRACTICE 2

Independent Check

Add the velocities in a common coordinate system.

A wave travels at 12 m/s with frequency 3.0 Hz. Find its wavelength.

Ready for a confidence check?

You've reinforced the essential skills through focused practice. Now confirm your understanding with two short questions.

Continue to Confidence Check — page 8 →

FR-07 • STAGE 4 OF 6

Confidence Check

You've reinforced the key concepts and practiced the essential skills. Now confirm you're ready to move forward by completing these short confidence checks.

CONFIDENCE CHECK 1

Wave Relationship Check

Identify velocity and acceleration at the top of the path.

A source doubles its frequency while the wave stays in the same medium. What happens to wave speed and wavelength?

CONFIDENCE CHECK 2

Circular and Relative Directions

State both directions explicitly.

State one difference between transverse and longitudinal mechanical waves.

HOW DID IT GO?

I answered ____ of 2 questions correctly.

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

You've confirmed your understanding.

Take one final look at the essential ideas before choosing your next step.

Continue to Summary — page 10 →

FR-08 • STAGE 5 OF 6

Summary

Before moving on, take one final look at the essential ideas you'll want to remember.

KEY TAKEAWAY 1

Describe the Wave With Four Linked Quantities

Use amplitude, wavelength, frequency, and period to describe a periodic wave; connect them with $T = 1/f$ and $v = f\lambda$.

KEY TAKEAWAY 2

Separate Medium Motion From Wave Motion

Matter oscillates locally while the disturbance and energy propagate through the medium.

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 14 →

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 check both the setup and the physical interpretation.

WARM-UP • ACTIVITY 1

Key Ideas

No. Individual rope elements move locally while the disturbance and energy travel along the rope.

WHY IT WORKS A mechanical wave transfers energy through a medium without transporting the medium as a whole.

WARM-UP • ACTIVITY 2

Common Mistakes

f = 4 Hz and T = 1/f = 0.25 s.

WHY IT WORKS Frequency counts cycles per second; period is the time for one cycle.

WARM-UP • ACTIVITY 3

Quick Application

Perpendicular to the direction the wave travels.

WHY IT WORKS Transverse describes the direction of medium motion relative to propagation.

SOLUTIONS • GUIDED PRACTICE

PRACTICE 1

Guided Example

$v = f\lambda = (8.0)(2.5) = 20$ m/s.

WHY IT WORKS A periodic wave advances one wavelength during each cycle.

PRACTICE 2

Independent Check

$\lambda = v/f = 12/3.0 = 4.0$ m.

WHY IT WORKS Rearrange $v = f\lambda$ while keeping the medium speed fixed.

SOLUTIONS • CONFIDENCE CHECK

CONFIDENCE CHECK 1

Wave Relationship Check

The speed stays the same; the wavelength is cut in half.

WHY IT WORKS The medium sets v, so λ = v/f decreases when f increases.

CONFIDENCE CHECK 2

Circular and Relative Directions

Transverse motion is perpendicular to propagation; longitudinal motion is parallel to propagation.

WHY IT WORKS The classification refers to the direction of particle motion relative to the direction energy travels.

READINESS GUIDE

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

FR-09 • STAGE 6 OF 6

Next Step: Continue Learning

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

?	◎	✓
I'm Still Unsure	**I Need More Practice**	**I'm Ready**
Review the focused review again to strengthen the essential concepts.	Build confidence with additional practice problems.	Continue to the next topic or learning resource.
Review again: return to Warm-Up Check on page 4.	**Go to Practice →**	**Continue →**

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