QUICK REVIEW

Quick Review: Mechanical Waves and Wave Speed

Refresh the most important ideas, relationships, and problem-solving strategies for mechanical waves and wave speed in just a few minutes.

◷	◎	✓
TIME	**BEST FOR**	**FINISH WITH**
5–10 minutes	A rapid refresh	Key ideas refreshed

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

interpret a traveling-wave function, relate k and ω to λ and f, and calculate wave speed from medium properties with confidence.

HOW TO USE THIS GUIDE

Work through the four stages in order. Write directly in the spaces provided, check your work in the Quick Answers 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 5–10 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: Calculus-based introductory university 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 four stages to quickly refresh the essential ideas and confirm you're ready to continue.

4 stages • Approximately 5–10 minutes

1 **Quick Recall — page 4** Refresh what you already know.	2 **Essential Idea — page 5** Review the most important concept.
3 **Confidence Check — page 6** Confirm you're ready to move on.	4 **Next Step — page 8** Continue your learning.

PRINTING TIP

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

FR-04 • STAGE 1 OF 4

Quick Recall

Let’s quickly refresh what you already know. This short recall activity will bring the most important ideas back to mind before you review them.

QUICK RECALL

Recall Activity

Complete the three statements from memory before revealing the answer.

1) k = ____. 2) ω = ____. 3) A wave y(x,t) = A sin(kx – ωt) moves in the __x direction.

Ready to refresh the essentials?

Great! Now review the most important idea you’ll want to remember.

Continue to Essential Idea — page 5 →

FR-05 • STAGE 2 OF 4

Essential Idea

Take one last look at the most important concept from this topic. If you remember this idea, the rest will come back much more easily.

ESSENTIAL IDEA

Read the Traveling-Wave Function

A sinusoidal traveling wave can be written y(x,t) = A sin(kx – ωt + ϕ). The spatial and temporal rates are k = 2π/λ and ω = 2πf. A point of constant phase moves at v = ω/k = fλ. For a stretched string, v = √(F_T/μ). Particle velocity comes from ∂y/∂t and differs from the wave propagation speed.

$$k=\frac{2\pi}{\lambda};\omega=2\pi f;v=\frac{\omega}{k}=f\lambda;v_{string}=\sqrt{\frac{F_T}{\mu}}$$

EXAMPLE For y = 0.030 sin(4.0x – 20t), k = 4.0 rad/m and ω = 20 rad/s, so v = ω/k = 5.0 m/s in +x.

SENSEI NOTE ∂y/∂t is the transverse velocity of a string element; ω/k is the speed of the wave pattern.

Ready to check your memory?

You've refreshed the essential idea. Now see how much you remember before moving on.

Continue to Confidence Check — page 6 →

FR-06 • STAGE 3 OF 4

Confidence Check

You've refreshed the essential idea. Now answer this quick confidence check to confirm you're ready to move on.

CONFIDENCE CHECK

Five-Minute Readiness Check

Answer all three without notes.

For y = 0.020 sin(5.0x – 30t), identify the propagation direction and wave speed. Then write the maximum transverse speed of a string element.

Ready for your next step?

Great work! You've refreshed the essential idea. Now choose the resource that best matches what you'd like to do next.

Continue to Next Step — page 8 →

QUICK ANSWERS • CHECK AFTER ATTEMPTING

Quick Answers and Explanations

Use these concise answers to check your recall and confidence—not only your final response.

QUICK RECALL

Recall Activity

1) 2π/λ; 2) 2πf; 3) +.

WHY IT WORKS k describes spatial phase change, ω describes temporal phase change, and the sign between kx and ωt sets the propagation direction.

CONFIDENCE CHECK

CONFIDENCE CHECK

Five-Minute Readiness Check

The wave moves in +x with v = ω/k = 30/5.0 = 6.0 m/s. The maximum transverse particle speed is Aω = (0.020)(30) = 0.60 m/s.

WHY IT WORKS Constant phase gives x/t = ω/k, while differentiating y with respect to time gives the local particle velocity.

READINESS GUIDE

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

FR-07 • STAGE 4 OF 4

Next Step: Continue Learning

Great work! You've completed this quick 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 essential idea again.	Continue with additional practice for this topic.	Continue to the next recommended resource.
Review again: return to Essential Idea on page 5.	**Go to Practice →**	**Continue →**

RECOMMENDED LINKS

Review again: return to Essential Idea on page 5.

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