

FOCUSED REVIEW

Focused Review: Angular Momentum and Conservation

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

 TIME 15–20 minutes	 BEST FOR Focused review	 FINISH WITH Greater confidence
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After this focused review, you'll be able to...

explain angular momentum, recognize the conservation condition, and apply calculus-based relationships with confidence.

recognize the key concepts, reinforce your problem-solving skills, and continue with greater confidence.

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 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-U21
TOPIC: Angular Momentum and Conservation
COURSE LEVEL: Calculus-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 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 Refresh key ideas.	2 Core Concepts Reinforce the essentials.	3 Guided Practice Strengthen key skills.
4 Confidence Check Confirm your understanding.	5 Summary Remember the essentials.	6 Next Step 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

Define angular momentum and state the conservation condition.

Write a brief response in the space below.

WARM-UP 2

Common Mistakes

Is “no external force” the correct conservation condition? Explain.

Write a brief response in the space below.

FR-04 • WARM-UP CHECK CONTINUED

WARM-UP 3

Quick Application

If rotational inertia decreases with negligible external torque, predict the change in angular speed.

Write a brief response in the space below.

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 →

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

Vector Angular Momentum

For a particle, $L = r \times p$. For a system, total L is the vector sum over particles.

$$L = r \times p; \tau_{\text{ext}} = dL/dt; \Delta L = \int \tau_{\text{ext}} dt; \text{fixed axis: } L = I\omega.$$

EXAMPLE If r is perpendicular to p , $|L| = mvr$.

SENSEI NOTE L depends on the chosen origin.

KEY CONCEPT 2

Torque Theorem and Conservation

The general law is $\tau_{\text{ext}} = dL/dt$. Zero net external torque conserves the total angular-momentum vector.

$$L = r \times p; \tau_{\text{ext}} = dL/dt; \Delta L = \int \tau_{\text{ext}} dt; \text{fixed axis: } L = I\omega.$$

EXAMPLE For fixed-axis shape changes, $I_{\text{initial}}\omega_{\text{initial}} = I_{\text{final}}\omega_{\text{final}}$.

SENSEI NOTE Conservation is vector conservation unless symmetry reduces the problem.

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 →](#)

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**

$\mathbf{r} = (0.40 \text{ m})\mathbf{i}$ and $\mathbf{p} = (0, 3.0, 0) \text{ kg}\cdot\text{m/s}$. Find L .

Show your setup and reasoning in the space below.

PRACTICE 2**Independent Check**

I changes from $4.0 \text{ kg}\cdot\text{m}^2$ at 3.0 rad/s to $1.5 \text{ kg}\cdot\text{m}^2$. Find ω_{final} .

Show your setup and reasoning in the space below.

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 →

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

Torque Theorem

Solve or explain.

$L(t) = (2t^2)k \text{ kg}\cdot\text{m}^2/\text{s}$. Find τ_{ext} at $t = 3 \text{ s}$.

CONFIDENCE CHECK 2

Vector Conservation

Solve or explain.

What is constant when $\tau_{\text{ext}} = 0$?

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 →

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

Definitions

For a particle, $L = r \times p$. For a system, total L is the vector sum over particles.

KEY TAKEAWAY 2

Conservation

The general law is $\tau_{\text{ext}} = dL/dt$. Zero net external torque conserves the total angular-momentum vector.

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

Key Ideas

Angular momentum measures rotational motion about a chosen origin or axis; conservation requires zero or negligible net external torque.

WHY IT WORKS This checks the defining idea or conservation condition.

WARM-UP • ACTIVITY 2

Common Mistakes

No. The relevant condition is zero net external torque about the chosen origin or axis.

WHY IT WORKS This checks the defining idea or conservation condition.

WARM-UP • ACTIVITY 3

Quick Application

Angular speed increases.

WHY IT WORKS This checks the defining idea or conservation condition.

SOLUTIONS • GUIDED PRACTICE

PRACTICE 1

Guided Example

$$L = 1.2 \text{ k kg} \cdot \text{m}^2/\text{s}.$$

WHY IT WORKS Identify the system and axis, then use the appropriate angular-momentum relation.

PRACTICE 2

Independent Check

$$\omega_{\text{final}} = 8.0 \text{ rad/s}.$$

WHY IT WORKS Identify the system and axis, then use the appropriate angular-momentum relation.

SOLUTIONS • CONFIDENCE CHECK

CONFIDENCE CHECK 1

Torque Theorem

12k N·m.

WHY IT WORKS The result follows from the defining relation or conservation rule.

CONFIDENCE CHECK 2

Vector Conservation

The total angular-momentum vector.

WHY IT WORKS The result follows from the defining relation or conservation rule.

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 Review the focused review again to strengthen the essential concepts. Review Again →	🎯 I Need More Practice Build confidence with additional practice problems. Go to Practice →	✓ I'm Ready Continue to the next topic or learning 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