FULL REVIEW

Full Review: Work, Energy, and Power

Review the essential ideas, relationships, and problem-solving tools for Work, Energy, and Power.

TIME	BEST FOR	FINISH WITH
45–60 minutes	A complete topic review	A readiness check

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 • TOPIC ALIGNMENT

Topic Alignment

This bundle is aligned to the approved Physics Sensei topic specification below. Use it to recover the topic structure, reinforce key decisions, and confirm readiness for the next study task.

ARCHITECTURE: Physics Sensei Independent Mechanics UNIT: MEC-U06 — Work, Energy, and Power TOPIC: Unit Review — Work, Energy, and Power PROFILE: Algebra-Based	BEST USED ✓ Before algebra-based energy homework ✓ Before a quiz or exam ✓ When you need a fast equation-selection strategy

Review Prerequisites →

Physics Sensei is an independent educational resource designed to complement independently authored Physics Sensei materials. Physics Sensei content is independently authored and organized under the approved topic architecture.

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

Constant-force work

Use the angle between force and displacement.

Write the constant-force work equation and identify when the work is zero.

ACTIVITY 2

Mechanical-energy conservation

Recognize the frictionless model.

Write the initial-to-final equation used when only conservative interactions matter.

FR-04 • WARM-UP CHECK CONTINUED

ACTIVITY 3

Power

Connect work and time.

Write the average-power equation and the force-speed form for parallel force and velocity.

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

Work changes kinetic energy

For a constant force, $W = Fd\cos\theta$. Sum the work of all forces to obtain net work, then use $W_{net} = \Delta K$.

$$W = Fd\cos\theta \quad • \quad W_{net} = \Delta K$$

EXAMPLE A 50 N force acts 60° above the displacement for 8.0 m. Its work is $(50)(8.0)\cos 60° = 200$ J.

SENSEI NOTE Do not confuse the work of one force with net work.

KEY CONCEPT 2

Energy conservation connects states directly

Use $K_i + U_i = K_f + U_f$ when only conservative interactions redistribute mechanical energy. Include friction or external work explicitly when needed.

$$K + U = \text{constant} \quad • \quad P = W/\Delta t$$

EXAMPLE A 2.0 kg object dropped 5.0 m from rest has $v = \sqrt{(2gh)} \approx 9.90$ m/s just before impact if air resistance is neglected.

SENSEI NOTE Choose the zero level for gravitational potential energy wherever it simplifies the algebra.

KEY CONCEPT 3

Nonconservative work and power

When external or nonconservative work changes mechanical energy, use $W_{nc} = \Delta K + \Delta U$ for the chosen model. Average power is $W/\Delta t$, and $P = Fv$ for parallel force and velocity.

overturning moment = restoring moment

EXAMPLE A 600 W motor can transfer 1800 J of energy in 3.0 s.

SENSEI NOTE Mechanical energy can decrease while total energy remains conserved if energy becomes thermal/internal energy.

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

Angled-force work

Use the force-displacement angle.

A 75 N force pulls a crate 12 m at 30° above horizontal. Find the work done by that force.

FR-06 • GUIDED PRACTICE CONTINUED

PRACTICE 2

Conservation with gravity

Solve for final speed.

A 3.0 kg object starts from rest 8.0 m above a reference level and slides frictionlessly downward. Find its speed at the reference level.

PRACTICE 3

Spring plus friction

Account for nonconservative work.

A 0.50 kg block is launched by a spring with k = 400 N/m compressed 0.20 m. Friction removes 3.0 J before the block reaches a measurement point. Find the block's kinetic energy there.

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

Net work to speed

Apply $W_{net} = \Delta K$.

A 2.0 kg object moving at 3.0 m/s experiences 16 J of net work. Find its final speed.

QUICK CHECK 2

Spring energy

Use elastic potential energy.

A spring with k = 200 N/m is compressed 0.10 m. How much elastic potential energy is stored?

QUICK CHECK 3

Average power

Use work divided by time.

A motor does 900 J of work in 3.0 s. What is its average 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 — 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

Use work for kinetic-energy change

$W_{net} = \Delta K$ is the direct bridge from forces and displacement to speed.

KEY TAKEAWAY 2

Use energy conservation for state-to-state motion

$K_i + U_i = K_f + U_f$ avoids unnecessary acceleration and time calculations.

KEY TAKEAWAY 3

Add nonconservative work when needed

Friction, applied work, and power require explicit energy-transfer accounting.

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. Replace each placeholder with a concise answer and the essential explanation.

WARM-UP • ACTIVITY 1

Constant-force work

$W = Fd \cos \theta$. The work is zero when $\theta = 90°$.

WHY IT WORKS Only the force component parallel to displacement contributes to work.

WARM-UP • ACTIVITY 2

Mechanical-energy conservation

$K_i + U_i = K_f + U_f$.

WHY IT WORKS Kinetic and potential energies may change individually while their sum remains constant.

WARM-UP • ACTIVITY 3

Power

$P_{avg} = W/\Delta t$ and $P = Fv$ for parallel force and velocity.

WHY IT WORKS Power measures the rate of energy transfer.

SOLUTIONS • GUIDED PRACTICE

PRACTICE 1

Angled-force work

779 J.

WHY IT WORKS $W = Fd\cos\theta = (75)(12)\cos30° \approx 779$ J.

PRACTICE 2

Conservation with gravity

12.5 m/s.

WHY IT WORKS $mgh = \frac{1}{2}mv^2$, so $v = \sqrt{(2gh)} = \sqrt{(156.8)} \approx 12.5$ m/s.

PRACTICE 3

Spring plus friction

5.0 J.

WHY IT WORKS Initial spring energy is $\frac{1}{2}kx^2 = 8.0$ J. After 3.0 J is transformed by friction, K = 5.0 J.

SOLUTIONS • CONFIDENCE CHECK

QUICK CHECK 1

Net work to speed

5.0 m/s.

WHY IT WORKS $K_i = 9$ J and $K_f = 25$ J, so $\frac{1}{2}(2.0)v_f^2 = 25$ and $v_f = 5.0$ m/s.

QUICK CHECK 2

Spring energy

1.0 J.

WHY IT WORKS $U_s = \frac{1}{2}kx^2 = \frac{1}{2}(200)(0.10)^2 = 1.0$ J.

QUICK CHECK 3

Average power

300 W.

WHY IT WORKS $P_{avg} = W/\Delta t = 900/3.0 = 300$ 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	**I Need More Practice**	**I'm Ready**
Review the key ideas and examples again.	Continue with additional practice for this topic.	Continue to the next recommended 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