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: Foundational	BEST USED ✓ Before homework on energy ideas ✓ Before a quiz or exam ✓ When you need to see where the energy goes

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

Signs of work

Use direction to decide the energy effect.

A force acts partly along an object's displacement. What makes its work positive, negative, or zero?

ACTIVITY 2

Energy forms

Identify where energy is stored.

Name the dominant energy form for a moving cart, a raised object, and a compressed spring.

FR-04 • WARM-UP CHECK CONTINUED

ACTIVITY 3

Power

Separate rate from amount.

Two machines do the same work, but one finishes in half the time. Which has greater average power?

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

Energy accounting starts with the system

Choose the system, identify initial and final states, and inventory kinetic, gravitational potential, elastic potential, and thermal/internal energy. Then identify any energy transferred across the system boundary.

Work changes kinetic energy • Potential energy stores energy

EXAMPLE For a falling object and Earth treated as one system, gravity is internal and gravitational potential energy changes within the system.

SENSEI NOTE A clear system choice tells you whether a force appears as internal energy conversion or external work.

KEY CONCEPT 2

Potential energy organizes conservative interactions

Gravitational and elastic potential energies let you replace detailed force-by-force motion with comparisons between states.

Mechanical energy: K + U • Power = energy transfer rate

EXAMPLE A cart descending a frictionless hill trades gravitational potential energy for kinetic energy.

SENSEI NOTE Only differences in potential energy matter, so choose a convenient zero reference.

FR-05 • CORE CONCEPTS CONTINUED

KEY CONCEPT 3

Mechanical energy is conserved only under the right conditions

When only conservative interactions redistribute energy inside the system, kinetic and potential energies trade off while their sum remains constant. Friction or external work requires broader energy accounting.

overturning moment = restoring moment

EXAMPLE On a frictionless ramp, a decrease in gravitational potential energy appears as an equal increase in kinetic energy.

SENSEI NOTE “Energy conserved” never means every individual energy form stays constant.

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

Energy on a hill

Reason from energy changes without calculating acceleration.

A skateboarder starts from rest at the top of a frictionless hill. Describe the changes in gravitational potential energy and kinetic energy as the rider descends.

FR-06 • GUIDED PRACTICE CONTINUED

PRACTICE 2

Spring launch

Follow stored energy into motion.

A compressed spring launches a cart on a level frictionless track. Describe the energy transformation after release.

PRACTICE 3

Friction and energy

Explain where the mechanical energy goes.

A sliding block slows to rest on a rough horizontal floor. What happens to its kinetic energy and to the total energy of the larger block-floor system?

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

Perpendicular force

Decide whether the force transfers energy through work.

An ideal normal force is perpendicular to a cart's instantaneous displacement. Does that normal force do work on the cart?

QUICK CHECK 2

Conservation test

Check the model.

A cart moves on a frictionless track under gravity and normal force. Is mechanical energy conserved?

FR-07 • CONFIDENCE CHECK CONTINUED

QUICK CHECK 3

Power comparison

Compare rate of energy transfer.

Machine A and Machine B each do the same work. Machine A takes twice as long. Which machine has greater 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

Energy is bookkeeping

Define a system and follow where energy is stored, transferred, and transformed.

KEY TAKEAWAY 2

Mechanical energy has conditions

Kinetic plus potential energy is conserved only for an appropriate conservative system.

KEY TAKEAWAY 3

Power is a rate

Power tells how quickly work is done or energy is transferred, not how much total energy is involved.

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

Signs of work

Work is positive when the force has a component along the displacement, negative when opposite, and zero when perpendicular.

WHY IT WORKS Only the component parallel or antiparallel to displacement transfers mechanical energy through work.

WARM-UP • ACTIVITY 2

Energy forms

Moving cart: kinetic energy. Raised object: gravitational potential energy. Compressed spring: elastic potential energy.

WHY IT WORKS Each energy form describes a different physical state or interaction.

WARM-UP • ACTIVITY 3

Power

The machine that finishes in half the time has twice the average power.

WHY IT WORKS Average power is work divided by elapsed time, so the same work in less time means greater power.

SOLUTIONS • GUIDED PRACTICE

PRACTICE 1

Energy on a hill

Gravitational potential energy decreases and kinetic energy increases; total mechanical energy remains constant.

WHY IT WORKS With no friction, the loss of gravitational potential energy becomes kinetic energy.

PRACTICE 2

Spring launch

Elastic potential energy decreases and kinetic energy increases; once the spring returns to its natural length, the stored spring energy has become kinetic energy.

WHY IT WORKS With no friction, the spring-cart system conserves mechanical energy.

PRACTICE 3

Friction and energy

The block's kinetic energy decreases to zero, while thermal/internal energy of the block-floor system increases. Total energy remains conserved.

WHY IT WORKS Friction transforms mechanical energy into thermal/internal energy rather than destroying it.

SOLUTIONS • CONFIDENCE CHECK

QUICK CHECK 1

Perpendicular force

No.

WHY IT WORKS A perpendicular force has no component along the displacement, so its work is zero.

QUICK CHECK 2

Conservation test

Yes, for the cart-Earth system.

WHY IT WORKS Gravity is conservative and the normal force does no work in the ideal model.

QUICK CHECK 3

Power comparison

Machine B.

WHY IT WORKS For the same work, the shorter completion time gives the greater average power.

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