

FOCUSED REVIEW

Focused Review: Thermodynamic Processes and PV Diagrams — Foundational

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
---	--	---

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

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: THM-U09
TOPIC: Thermodynamic Processes and PV Diagrams
COURSE LEVEL: Foundational

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**

Match each process to its defining constraint.

Isochoric, isobaric, isothermal, adiabatic: which corresponds to constant volume, constant pressure, constant temperature, and no heat transfer?

WARM-UP 2**Common Mistakes**

Interpret the direction of motion on a P–V diagram.

What does motion to the right mean? What does motion to the left mean?

FR-04 • WARM-UP CHECK CONTINUED

WARM-UP 3

Quick Application

Connect diagram geometry to work.

Which does more positive work: an expansion through the same volume change at higher pressure or at lower pressure?

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

Four common process constraints

Isochoric, isobaric, isothermal, and adiabatic processes are distinguished by what is held fixed or by whether heat crosses the system boundary. These constraints determine the characteristic shape and interpretation of a process on a P–V diagram.

Isochoric: $\Delta V = 0$ • Isobaric: $\Delta P = 0$ • Isothermal: $\Delta T = 0$ • Adiabatic: $Q = 0$

EXAMPLE A vertical P–V segment is isochoric because the horizontal coordinate, volume, does not change.

SENSEI NOTE Adiabatic means no heat transfer; it does not mean the temperature must stay constant.

KEY CONCEPT 2

P–V diagrams show work and path dependence

The area under a process path represents work by the gas. Expansion gives positive work and compression gives negative work with the Physics Sensei sign convention used here. Different paths between the same endpoints can therefore involve different amounts of work.

Work by the gas = signed area under the P–V path; expansion: $W > 0$ • compression: $W < 0$

EXAMPLE Two expansions with the same volume change do different work if one occurs at a higher pressure.

SENSEI NOTE A vertical constant-volume segment has no area under it in the volume direction, so its work is zero.

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**

Trace the process one feature at a time.

A gas moves vertically upward on a P - V diagram and then horizontally to the right. Name each segment and state whether each segment does boundary work.

PRACTICE 2**Independent Check**

Compare two paths without calculating.

Path A expands from the same initial to final volume at a pressure above Path B for the entire expansion. Which path gives the larger work by the gas?

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

Process identification

Use the defining constraint.

A gas changes pressure while its volume stays fixed. What type of process is this, and what is the work by the gas?

CONFIDENCE CHECK 2

Cycle direction

Interpret the loop on the P–V diagram.

A closed P–V loop is traversed clockwise. Is the net work by the gas positive or negative?

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**Start with the process constraint**

Identify what is fixed—or whether heat transfer is zero—before choosing equations or interpreting the path.

KEY TAKEAWAY 2**Read work from the P–V geometry**

Rightward expansion gives positive work, leftward compression gives negative work, and a complete cycle has net work equal to the signed enclosed area.

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. Focus on the essential explanation behind each result.

WARM-UP • ACTIVITY 1

Key Ideas

Isochoric → constant volume; isobaric → constant pressure; isothermal → constant temperature; adiabatic → no heat transfer.

WHY IT WORKS Each process name is a shorthand for the condition that constrains the path.

WARM-UP • ACTIVITY 2

Common Mistakes

Right means expansion; left means compression.

WHY IT WORKS The horizontal axis is volume, so the path direction immediately tells you whether volume increases or decreases.

WARM-UP • ACTIVITY 3

Quick Application

The higher-pressure expansion does more positive work.

WHY IT WORKS Work by the gas is represented by area under the P - V path, so greater pressure gives more area for the same volume change.

SOLUTIONS • GUIDED PRACTICE

PRACTICE 1**Guided Example**

The vertical segment is isochoric and does zero work. The horizontal rightward segment is isobaric expansion and does positive work.

WHY IT WORKS Volume is unchanged on a vertical segment. A rightward horizontal segment increases volume at constant pressure.

PRACTICE 2**Independent Check**

Path A gives the larger positive work.

WHY IT WORKS Its area under the P - V path is larger over the same volume interval.

SOLUTIONS • CONFIDENCE CHECK

CONFIDENCE CHECK 1

Process identification

Isochoric; the work is zero.

WHY IT WORKS With $\Delta V = 0$ there is no boundary displacement, so no P–V work is done.

CONFIDENCE CHECK 2

Cycle direction

Positive.

WHY IT WORKS For a clockwise loop, expansion occurs at higher pressure than compression, giving a positive enclosed signed area.

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 →
---	---	---

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](#)