

FOCUSED REVIEW

Focused Review: Phase Changes and Latent Heat

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-U04
TOPIC: Phase Changes and Latent Heat
COURSE LEVEL: Calculus-based introductory physics

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**

Recall the latent-heat term.

What is the phase-change energy for mass m and latent heat L ?

WARM-UP 2**Common Mistakes**

Write the sensible-heat integral.

How do you write Q for a temperature change when $c = c(T)$?

FR-04 • WARM-UP CHECK CONTINUED

WARM-UP 3

Quick Application

Interpret the plateau derivative.

What does an idealized plateau imply about dT/dQ ?

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

Latent Heat at a Phase Boundary

At the transition, the phase-change contribution is $Q = mL$. At fixed pressure, L can be viewed as the specific enthalpy difference between the coexisting phases. The reverse transition changes the sign of Q for the system.

$$Q_{\text{phase}} = mL$$

EXAMPLE For condensation, $Q_{\text{system}} = -mL_v$ if heat into the system is positive.

SENSEI NOTE Separate the positive magnitude L from the sign of Q .

KEY CONCEPT 2

Piecewise Thermal Energy

Within a phase, $Q = m \int c(T) dT$. Crossing a phase boundary adds mL . A multistage path is the sum of all continuous and latent contributions.

$$Q_{\text{total}} = m \sum \int c(T) dT + m \sum L$$

EXAMPLE Heating solid $\rightarrow$ melting $\rightarrow$ heating liquid combines two sensible terms and one latent term.

SENSEI NOTE Do not smear the phase change into an ordinary ΔT term.

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 \$\rightarrow\$](#)

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**

Evaluate one latent term.

A 0.025 kg liquid vaporizes with $L_v = 2.26 \times 10^6$ J/kg. Find Q_{system} .

PRACTICE 2**Independent Check**

Set up a multistage expression.

Write Q for heating a solid from T_1 to T_m , melting it, then heating the liquid to T_2 , assuming constant c_s and c_l .

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

Condensation Sign

State the sign of Q_{system} .

With heat into the system positive, what sign does Q_{system} have during condensation?

CONFIDENCE CHECK 2

Path Decomposition

Name the three energy terms.

A path crosses one melting transition. What types of terms appear in Q_{total} ?

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 **$Q = mL$ is the phase-boundary contribution**

Latent heat changes phase at the transition condition, with the sign set by direction.

KEY TAKEAWAY 2**Use piecewise energy accounting**

Combine $m\int c(T)dT$ within phases and mL at the transition.

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

$Q = mL$, with sign determined by energy-transfer direction.

WHY IT WORKS Latent heat contributes a discrete energy amount at the transition.

WARM-UP • ACTIVITY 2

Common Mistakes

$Q = m \int c(T) dT$.

WHY IT WORKS The integral allows heat capacity to vary with temperature.

WARM-UP • ACTIVITY 3

Quick Application

$dT/dQ = 0$ during the idealized phase-change interval.

WHY IT WORKS Added energy changes phase fraction instead of temperature.

SOLUTIONS • GUIDED PRACTICE

PRACTICE 1

Guided Example

$$Q_{\text{system}} = 5.65 \times 10^4 \text{ J} = 56.5 \text{ kJ.}$$

WHY IT WORKS Vaporization requires energy input.

PRACTICE 2

Independent Check

$$Q = mc_s(T_m - T_1) + mL_f + mc_l(T_2 - T_m).$$

WHY IT WORKS The three terms correspond to solid heating, phase change, and liquid heating.

SOLUTIONS • CONFIDENCE CHECK

CONFIDENCE CHECK 1

Condensation Sign

Negative.

WHY IT WORKS Condensation releases energy from the system.

CONFIDENCE CHECK 2

Path Decomposition

Sensible heat before the boundary, mL_f at the boundary, and sensible heat after the boundary.

WHY IT WORKS Thermal paths are piecewise across a phase transition.

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