

FOCUSED REVIEW

Focused Review: Temperature and Thermal Equilibrium

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...

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-U01
TOPIC: Temperature and Thermal Equilibrium
COURSE LEVEL: Algebra-Based College 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 Celsius–kelvin and Celsius–Fahrenheit conversions.

Write the formulas that convert Celsius to kelvin and Celsius to Fahrenheit.

WARM-UP 2**Common Mistakes**

Identify common conversion and equilibrium errors.

Correct these claims: $20\text{ }^{\circ}\text{C} = 20\text{ K}$; a $10\text{ }^{\circ}\text{C}$ change = 283.15 K ; equilibrium means equal thermal energy.

FR-04 • WARM-UP CHECK CONTINUED

WARM-UP 3

Quick Application

Compare two temperatures expressed on different scales.

Which is warmer: 50 °F or 15 °C? Convert before deciding.

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

Linear Temperature Scales

Celsius, Fahrenheit, and kelvin are connected by linear transformations. Offsets locate the zero points; scale factors relate interval sizes. Keep temperature values separate from temperature changes.

$$T(\text{K}) = T(^{\circ}\text{C}) + 273.15; \quad T(^{\circ}\text{F}) = (9/5)T(^{\circ}\text{C}) + 32$$

EXAMPLE $-40^{\circ}\text{C} = -40^{\circ}\text{F}$, but it equals 233.15 K.

SENSEI NOTE Never add 273.15 to a temperature difference.

KEY CONCEPT 2

Thermal Equilibrium as a Comparison Rule

Thermal equilibrium requires equal temperature and no net heat transfer. The Zeroth Law allows a thermometer to compare systems that never touch each other directly.

If A and C equilibrate, and B and C equilibrate, then temperature of A = temperature of B

EXAMPLE Two samples that settle at the same thermometer reading share a temperature even if their masses differ.

SENSEI NOTE Equal temperature does not imply equal internal energy.

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**

Carry out a two-step scale conversion.

Convert 86 °F to degrees Celsius and kelvins.

PRACTICE 2**Independent Check**

Use a linear thermometer calibration.

A liquid column is 2.0 cm at 0 °C and 12.0 cm at 100 °C. Assuming linear response, what temperature corresponds to 7.0 cm?

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**Temperature Change**

Convert an interval, not an absolute value.

A sample warms by 18 °C. What is the change in kelvins and in Fahrenheit degrees?

CONFIDENCE CHECK 2**Equilibrium by Reference**

Use the Zeroth Law.

A and B each equilibrate with the same thermometer at 305 K. What happens initially if A touches B?

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**Convert Values with Offset and Scale**

Celsius and kelvin share interval size; Fahrenheit intervals are 9/5 as large as Celsius intervals.

KEY TAKEAWAY 2**Compare Temperatures Before Predicting Transfer**

Heat flows spontaneously from higher to lower temperature until thermal equilibrium is reached.

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.

WARM-UP • ACTIVITY 1

Key Ideas

$T(\text{K}) = T(^{\circ}\text{C}) + 273.15$ and $T(^{\circ}\text{F}) = (9/5)T(^{\circ}\text{C}) + 32$.

WHY IT WORKS The formulas account for both zero-point offsets and interval sizes.

WARM-UP • ACTIVITY 2

Common Mistakes

$20^{\circ}\text{C} = 293.15\text{ K}$; a 10°C change = 10 K ; equilibrium means equal temperature, not equal thermal energy.

WHY IT WORKS Temperature values and temperature changes follow different conversion rules.

WARM-UP • ACTIVITY 3

Quick Application

$50^{\circ}\text{F} = 10^{\circ}\text{C}$, so 15°C is warmer.

WHY IT WORKS A same-scale comparison prevents a misleading numerical comparison.

SOLUTIONS • GUIDED PRACTICE

PRACTICE 1

Guided Example

$86\text{ }^{\circ}\text{F} = 30\text{ }^{\circ}\text{C} = 303.15\text{ K}$.

WHY IT WORKS First remove the Fahrenheit offset, then apply the scale factor.

PRACTICE 2

Independent Check

The fraction is $(7-2)/(12-2)=0.50$, so the temperature is $50\text{ }^{\circ}\text{C}$.

WHY IT WORKS A linear thermometer maps equal fractions of its range to equal temperature fractions.

SOLUTIONS • CONFIDENCE CHECK

CONFIDENCE CHECK 1

Temperature Change

18 °C = 18 K and 32.4 Fahrenheit degrees.

WHY IT WORKS Kelvin intervals equal Celsius intervals; Fahrenheit intervals are multiplied by 9/5.

CONFIDENCE CHECK 2

Equilibrium by Reference

No initial net heat transfer; A and B have the same temperature.

WHY IT WORKS The shared reference temperature makes A and B mutually equilibrated.

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](#)