START HERE

CALIFORNIA

Experience Chemistry in the Earth System

Look for these key features:

1

Anchoring Phenomenon

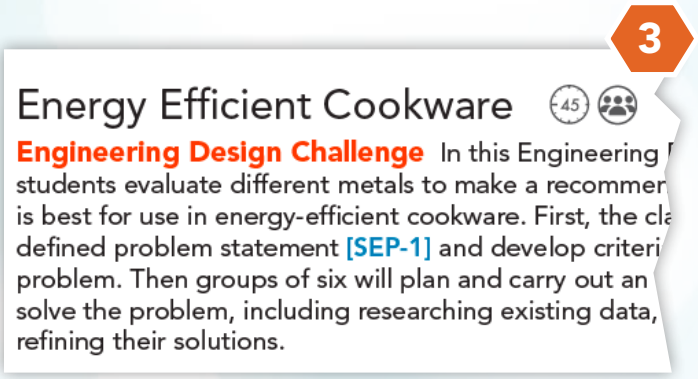
Launch each Instructional Segment with an engaging **Anchoring Phenomenon Video**. Introduce and unify the upcoming chemistry concepts and give students an opportunity to ask questions.

2

Investigative Phenomenon

Introduce every Investigation with an **Investigative Phenomenon Video** that supports students as they make meaning of the Anchoring Phenomenon.

3



Everyday Phenomena

How do students make sense of the Anchoring and Investigative Phenomena? They interact with hands-on and digital **Everyday Phenomena**. From engineering design challenges to inquiry performance tasks, students experience the concepts of chemistry.

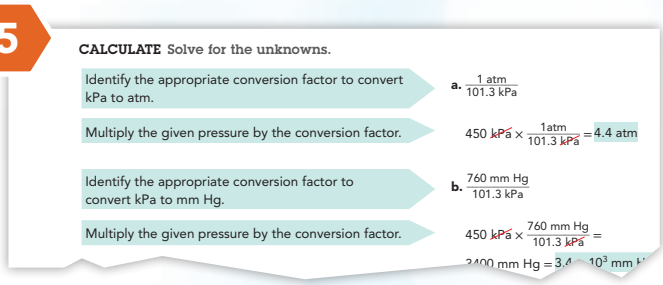
4

FLINN SCIENTIFIC

Flinn Scientific Partnership

Students engage with chemistry concepts through **inquiry labs**, engineering design challenges, performance-based assessments, virtual reality, and videos developed by Flinn Scientific.

5


CALCULATE Solve for the unknowns.

Identify the appropriate conversion factor to convert kPa to atm.

a. $\frac{1 \text{ atm}}{101.3 \text{ kPa}}$

Multiply the given pressure by the conversion factor.

$450 \text{ kPa} \times \frac{1 \text{atm}}{101.3 \text{ kPa}} = 4.4 \text{ atm}$

Identify the appropriate conversion factor to convert kPa to mm Hg.

b. $\frac{760 \text{ mm Hg}}{101.3 \text{ kPa}}$

Multiply the given pressure by the conversion factor.

$450 \text{ kPa} \times \frac{760 \text{ mm Hg}}{101.3 \text{ kPa}} =$

Math Support

Stepped-out examples break down **sample problems** for clarity and process guidance. **Problem Banks** give students additional practice to build mathematical fluency.

6


Revisit

INVESTIGATIVE PHENOMENON

GO ONLINE to Elaborate and Evaluate your knowledge of energy by completing the class discussion and data analysis activities.

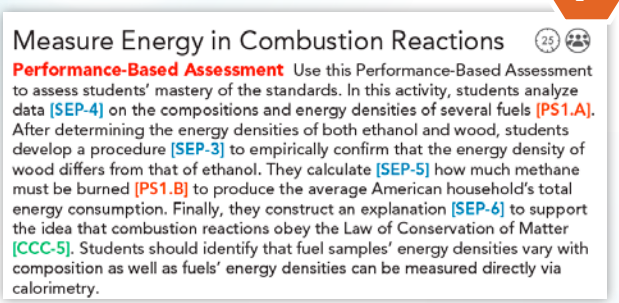
SEP Use Models T/K

1 Introduction to Energy 13

Revisit the Phenomenon

Students work on Claims-Evidence-Reasoning and Modeling Activities every time they **revisit** the Anchoring and Investigative Phenomena.

7

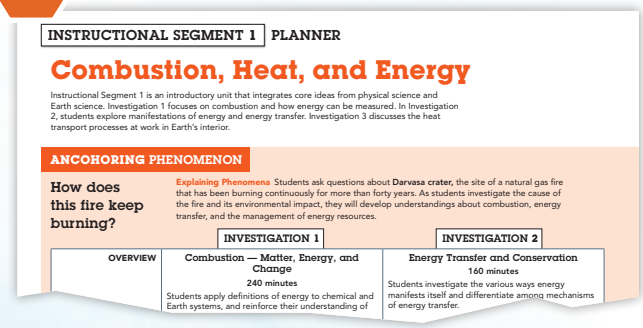

Measure Energy in Combustion Reactions

Performance-Based Assessment Use this Performance-Based Assessment to assess students' mastery of the standards. In this activity, students analyze data [SEP-4] on the compositions and energy densities of several fuels [PS1.A]. After determining the energy densities of both ethanol and wood, students develop a procedure [SEP-3] to empirically confirm that the energy density of wood differs from that of ethanol. They calculate [SEP-5] how much methane must be burned [PS1.B] to produce the average American household's total energy consumption. Finally, they construct an explanation [SEP-6] to support the idea that combustion reactions obey the Law of Conservation of Matter [CCC-5]. Students should identify that fuel samples' energy densities vary with composition as well as fuels' energy densities can be measured directly via calorimetry.

Performance-Based Assessments

Engineering and inquiry tasks give students opportunities to demonstrate California NGSS mastery by applying their understanding to a new situation.

8


INSTRUCTIONAL SEGMENT 1 PLANNER

Combustion, Heat, and Energy

Instructional Segment 1 is an introductory unit that integrates core ideas from physical science and Earth science. Investigation 1 focuses on combustion and how energy can be measured. In Investigation 2, students explore manifestations of energy and energy transfer. Investigation 3 discusses the heat transport processes at work in Earth's interior.

ANCHORING PHENOMENON

How does this fire keep burning?

Explaining Phenomena Students ask questions about **Darvasa crater,** the site of a natural gas fire that has been burning continuously for more than forty years. As students investigate the cause of the fire and its environmental impact, they will develop understandings about combustion, energy transfer, and the management of energy resources.

OVERVIEW	INVESTIGATION 1	INVESTIGATION 2
	Combustion — Matter, Energy, and Change 240 minutes Students apply definitions of energy to chemical and Earth systems, and reinforce their understanding of	Energy Transfer and Conservation 160 minutes Students investigate the various ways energy manifests itself and differentiate among mechanisms of energy transfer.

Planning Guides

Quick, at-a-glance Instructional Segment and Investigation **planner pages** use the 5E model so you can focus on providing additional learning experiences.

GOT MORE TIME? 9

Got More Time?

Dig deeper. Personalize and enhance your instructional plan by assigning additional activities with the **"Got More Time?"** green icon.

10

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