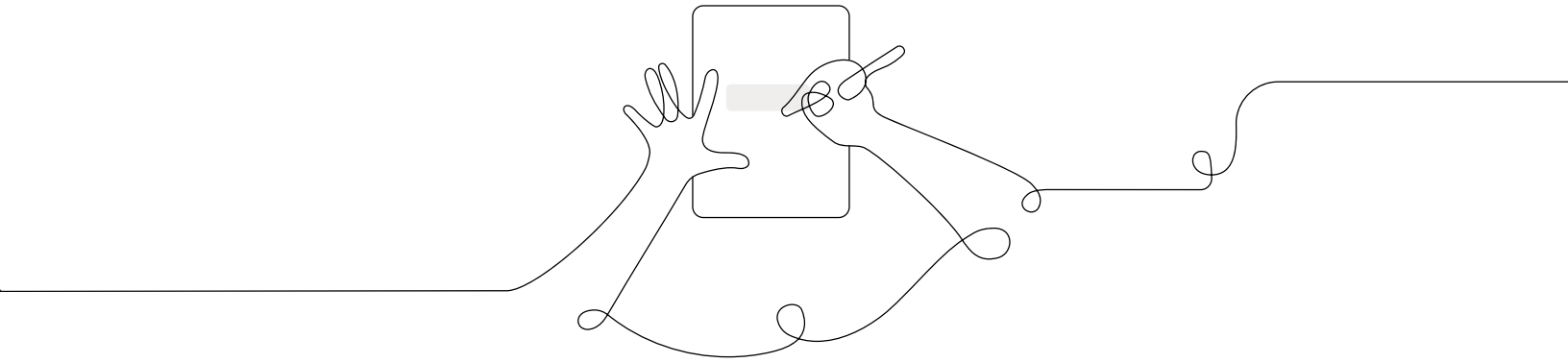
AmplifyScience

Participant Notebook

Unit Internalization and Guided Planning

Grade 7, Chemical Reactions



Unit Guide resources

Once a unit is selected, select **JUMP DOWN TO UNIT GUIDE** in order to access all unit-level resources in an Amplify Science unit.

Planning for the unit

Unit Overview	Describes what's in each unit, the rationale, and how students learn across chapters
Unit Map	Provides an overview of what students figure out in each chapter, and how they figure it out
Progress Build	Explains the learning progression of ideas students figure out in the unit
Getting Ready to Teach	Provides tips for effectively preparing to teach and teaching the unit in your classroom
Materials and Preparation	Lists materials included in the unit's kit, items to be provided by the teacher, and briefly outlines preparation requirements for each lesson
Science Background	Adult-level primer on the science content students figure out in the unit
Standards at a Glance	Lists Next Generation Science Standards (NGSS) (Performance Expectations, Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts), Common Core State Standards for English Language Arts, and Common Core State Standards for Mathematics

Teacher references

Lesson Overview Compilation	Lesson Overview of each lesson in the unit, including lesson summary, activity purposes, and timing
Standards and Goals	Lists NGSS (Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts) and CCSS (English Language Arts and Mathematics) in the unit, explains how the standards are reached
3-D Statements	Describes 3-D learning across the unit, chapters, and in individual lessons
Assessment System	Describes components of the Amplify Science Assessment System, identifies each 3-D assessment opportunity in the unit
Embedded Formative Assessments	Includes full text of formative assessments in the unit
Books in This Unit	Summarizes each unit text and explains how the text supports instruction
Apps in This Unit	Outlines functionality of digital tools and how students use them (in grades 2-5)

Printable resources

Copymaster Compilation	Compilation of all copymasters for the teacher to print and copy throughout the unit
Investigation Notebook	Digital version of the Investigation Notebook, for copying and projecting
Multi-Language Glossary	Glossary of unit vocabulary in multiple languages
Print Materials (8.5" x 11")	Digital compilation of printed cards (i.e. vocabulary cards, student card sets) provided in the kit
Print Materials (11" x 17")	Digital compilation of printed Unit Question, Chapter Questions, and Key Concepts provided in the kit

Unit Map

Why is there a mysterious reddish-brown substance in the tap water of Westfield?

In the role of student chemists, students explore how new substances are formed as they investigate a problem with the water supply in the fictional town of Westfield. They analyze a reddish-brown substance that is in the water, the iron that the town's pipes are made of, and a substance from fertilizer found to have contaminated the wells that are the source of the town's water, and use their findings to explain the source of the contaminating substance.

Chapter 1: What is the reddish-brown substance in the water?

Students figure out: The reddish-brown substance is different from the pipe substance (Fe) and from the contaminant of the water supply ($NaNO_3$). Evidence for this is that each of their properties (color and texture) is so different. In addition, the groups of atoms that make them up are different. The pipe substance is made of Fe; the contaminant is made of $NaNO_3$; and the reddish-brown substance is is made of Fe_2O_3.

How they figure it out: They make careful observations of substances, read about atom groups, and gather evidence in the Simulation about the atoms of substances found in the Westfield water.

Chapter 2: How did the rust form?

Students figure out: A chemical reaction occurred between the iron on the inside of the pipes and the sodium nitrate that was mixed in with the water flowing through the pipes. During this reaction, atoms from the pipes and sodium nitrate rearranged to form new groups of atoms resulting in the new reddish-brown substance. It has iron atoms just like the pipes, and oxygen atoms just like the contaminant, but the properties of the reddish-brown substance are different from both because the way that the atoms are grouped is different. This is true even though the iron and sodium nitrate were the substances that combined to produce the reddish-brown substance.

How they figure it out: They conduct chemical reactions and observe reactants and products both in hands-on tests and in the Simulation. They also gather evidence from a token-based physical model of a chemical reaction. They express their ideas about the Westfield water in the Modeling Tool and in writing.

Chapter 3: What was produced during the reaction between the iron pipes and the fertilizer?

Students figure out: The reddish-brown substance (Fe_2O_3) is in the water because it was formed in the reaction, but it can be filtered out. The substance $NaNO_3$ was used up in the reaction, but its atoms couldn't have been destroyed. So, another substance ($NaNO_2$) must be left behind. The NaCN can't be in the water because there were no carbon atoms in the water or the pipes, and atoms can't change types during chemical reactions.

How they figure it out: They read an article about combustion reactions that highlights conservation of atoms, and also gather related evidence by analyzing reactions in the Sim. They return to the token physical model. They analyze evidence from Westfield and express their conclusions by writing and creating a visual model.

Chapter 4: Students apply what they learn to a new question—Who might have used the unknown substance to steal the diamond?

Students solve a fictional theft. First, students identify a substance that jewelry thieves used to burn through a glass jewelry case. Next, they analyze evidence about substances that three different suspects had in order to solve who might have created the mystery substance through a chemical reaction. They engage in oral argumentation in a student-led discourse routine called a Science Seminar and then write final arguments.

Guided Unit Internalization Planner

Unit-level internalization

Unit title:

What is the phenomenon students are investigating in your unit?

Unit Question:

Student role:

By the end of the unit, students figure out ...

What science ideas do students need to figure out in order to explain the phenomenon?

Unit Guide Document

Unit Map

Lesson Overview Compilation

Progress Buld

Guided Unit Internalization

Part 1: Unit-level internalization

Unit title: Chemical Reactions

What is the phenomenon students are investigating in your unit?

There is a mysterious reddish-brown substance in Westfield's water.

Unit Question:

How do new substances form?

Student role:

Student chemists

By the end of the unit, students figure out ...

The reddish-brown substance in the water is rust. It formed because of a chemical reaction between the iron pipes and a fertilizer that has contaminated the wells in Westfield. During the chemical reaction, some of the atoms in the pipes and the fertilizer rearranged to form new groups of atoms resulting in the reddish-brown substance. Because of conservation of matter, the atoms that did not rearrange to form the rust must have rearranged to form another product, too.

What science ideas do students need to figure out in order to explain the phenomenon?

Different substances have different properties. This is because every substance is made of a unique group of a certain type and number of atoms. This group repeats to make up the substance. During chemical reactions, atoms that make up the starting substance(s) rearrange to form different groups of atoms that repeat, resulting in different substances(s). During chemical reactions, the ending substances are formed from the same type and number of atoms that made up the starting substances because atoms cannot be created or destroyed.

Multi-day planning, including planning for differentiation and evidence of student work

<table>
<tr><td colspan="4">Day _____</td></tr>
<tr><td colspan="2">Minutes for science: _____

Instructional format:
☐ Asynchronous
☐ Synchronous</td><td colspan="2">Minutes for science: _____

Instructional format:
☐ Asynchronous
☐ Synchronous</td></tr>
<tr><td colspan="2">Lesson or part of lesson:

Mode of instruction:
❏ Preview
❏ Review
❏ Teach full lesson live
❏ Teach using synchronous suggestions
❏ Students work independently using:
❏ @Home Packet
❏ @Home Slides and @Home Student Sheets
❏ @Home Videos</td><td colspan="2">Lesson or part of lesson:

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<tr><td>Students will...</td><td>Teacher will...</td><td>Students will...</td><td>Teacher will...</td></tr>
</table>

Look at the *Students will* columns. What are students working in the lesson(s) that you could collect, review, or provide feedback on?
See Some Types of Written Work in Amplify Science to the right for guidance.

If there isn't a work product listed above, do you want to add one? Make notes below.

Some Types of Written Work in Amplify Science

- Daily written reflections
- Homework tasks
- Investigation notebook pages
- Written explanations (typically at the end of Chapter)
- Diagrams
- Recording pages for Sim uses, investigations, etc

How will students submit this work product to you?
See the Completing and Submitting Written Work tables to the right for guidance on how students can complete and submit work.

Completing Written Work	**Submitting Written Work**
• Plain paper and pencil (videos include prompts for setup) • (6-8) Student platform • Investigation Notebook • Record video or audio file describing work/answering prompt • Teacher-created digital format (Google Classroom, etc)	• Take a picture with a smartphone and email or text to teacher • Through teacher-created digital format • During in-school time (hybrid model) or lunch/materials pick-up times • (6-8) Hand-in button on student platform

How will you differentiate this lesson for diverse learners? (Navigate to the lesson level on the standard Amplify Science platform and click on differentiation in the left menu.)

Day _____

Minutes for science: _____

Instructional format:
- ☐ Asynchronous
- ☐ Synchronous

Lesson or part of lesson:

Mode of instruction:
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  - ❏ @Home Videos

Students will…	Teacher will…

Minutes for science: _____

Instructional format:
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Suggestions for synchronous time

The following are some ideas for making the most of synchronous time with your students. As a general rule, the best way to use your synchronous time is to provide students opportunities to talk to one another, or to observe or visualize things they could not do independently.

Online synchronous time	Notes
Online discussions: It's worthwhile to establish norms and routines for online discussions in science to ensure equity of voice, turn-taking, etc. **Digital tool demonstrations:** You can share your screen and demonstrate, or invite your students to share their screen and think-aloud as they use a Simulation or other digital tool. **Interactive read-alouds**: Screen share a digital book or article, and pause to ask questions and invite discussion as you would in the classroom. **Shared Writing:** This is a great opportunity for a collaborative document that all your students can contribute to. **Co-constructed class charts:** You can create digital charts, or create physical charts in your home with student input.	

Chapters at a Glance

Unit Question

How do new substances form?

Chapter 1: Properties and Atoms

Chapter Question

What is the reddish-brown substance in the water?

Investigation Questions

- How can you tell one substance from another? (1.3)
- Why do different substances have different properties? (1.4, 1.5, 1.6)

Key Concepts

- Different substances have different properties. (1.3)
- Things that are too small (or too large) to see can be studied with models. (1.5)
- Substances have different properties because they are made of different groups of atoms. These groups vary in the type or number of atoms that make up the group. (1.6)
- Groups of atoms repeat to make up a substance. (1.6)

Chapter 2: Reactions

Chapter Question

How did the rust form?

Investigation Questions

- Can substances change into different substances? (2.1)
- How do substances change into different substances during chemical reactions? (2.2, 2.3)

Key Concepts

- During a chemical reaction, one or more starting substances (reactants) change into one or more different substances (products). (2.1)

- During a chemical reaction, atoms do not change from one type to another. (2.2)
- During a chemical reaction, atoms rearrange to form different groups of atoms. (2.2)

Chapter 3: Accounting for Atoms

Chapter Question

What was produced during the reaction between the iron pipes and the fertilizer?

Investigation Questions

- What happens to atoms during a chemical reaction? (3.1, 3.2, 3.3)

Key Concepts

- During a chemical reaction, all of the atoms that make up the reactants rearrange to form the products. (3.2)
- During a chemical reaction, atoms cannot be created or destroyed. (3.3)

Chapter 4: Science Seminar

Chapter Question

Who might have used the unknown substance to steal the diamond?

Investigation Questions

- Which suspect is most likely to have made the hydrofluoric acid? (4.1, 4.2, 4.3)

Chemical Reactions unit vocabulary

property (1.2)	model (1.5)	reactant (2.1)
atoms (1.4)	scale (1.5)	chemical reaction (2.2)
substance (1.4)	product (2.1)	rearrange (2.2)

Adapting the Amplify Science Approach for Remote Learning

In Amplify Science units, students figure out phenomena by using science and engineering practices. They gather evidence from multiple sources and make explanations and arguments through multiple modalities: doing, talking, reading, writing, and visualizing. They also make their learning visible by posting key concepts on the classroom wall. While we have retained this core approach in the @Home Lessons, enacting it at home will require adaptations.

The @Home Lessons provide general guidance for these adaptations, but you may need to set up expectations for specific routines or provide additional support to your students. Below are ideas for how different aspects of the Amplify Science approach might be adapted for your learners' particular contexts.

Student talk options

- Talk to a member of their household about their ideas.
- Call a friend or classmate and discuss their ideas.
- Talk in breakout groups in a video class meeting.
- Use asynchronous discussion options on technology platforms.

Student writing options

- Write in a designated science notebook.
- Photograph writing and submit digitally.
- Complete prompts in another format. (Teachers can convert prompts so they are completed in an on-line survey or an editable document so students can submit digitally.)
- Submit audio or video responses digitally, rather than submit a written response.
- Share a response orally with a family member or friend with no submission required.
- For students with technology access, complete written work in the students' Amplify accounts (links to corresponding student activities are provided in the @Home Slides).

Student reading options

- Read printed version of article, included with @Home Packets. (Note: although the articles are originally in color, they are provided in the @Home Packets in grayscale for ease of copying. Most articles translate well into grayscale but there will be some exceptions).

- Read printed or PDF version of article, included with @Home Student Sheets.
- Listen to the article being read aloud using the audio feature in the Amplify Science Library or read articles in digital format via the Amplify Science Library (links are provided in the @Home Slides).
- Read with a partner, classmate, or someone from their home.

Hands-on activity options

- Do the activity with simple materials students are likely to have at home. (For activities where this is feasible, instructions are provided.)
- Watch a video. (For some hands-on activities in the @Home Units, a video / images of the investigation are provided.)
- Do the activity using kit materials if available. For example,
    - If possible, send home materials to students who need them.
    - If you have access to your Amplify Science kit, and have opportunities to teach synchronously, demonstrate some hands-on activities with student input.

Classroom wall options

The classroom wall, which provides an important reference for students to track and reflect on their developing understanding of the unit's anchor phenomenon and content, has been reimagined as an @Home Science Wall. A complete list of Chapter Questions, key concepts, and vocabulary that have been introduced so far are provided in the last lesson of each chapter. To enhance students' experience of the @Home Science Wall, you could have students:

- Draw a picture or write their ideas on their @Home Science Wall pages.
- Highlight each question, key concept, or word that is introduced.
- Cut out each question, key concept, or word. These can be then posted on a wall, large sheet of paper, or refrigerator at home.

Additionally, if you are meeting with your class remotely, you could create a virtual @Home Science Wall.

Adaptations of other Amplify Science routines

- **Reading support.** In Amplify Science 6–8, support for student reading includes: teacher modeling; structured paired and whole group discussion of texts; multiple readings of text; an audio feature in the Amplify Library; as well as suggestions for additional

strategies for students who need more reading support. Some suggestions to offer similar supports with the @Home Lessons are:

    - Meet virtually as a class or in small groups and read the first part of the article with students, modeling how you would read the text.
    - Ask student pairs to meet after reading to discuss their annotations.
    - Have each student meet with someone in their home to read at least some of the text together and/or discuss their annotations after reading.

- **Talk routines.** In Amplify Science units students periodically talk in small groups using routines such as Word Relationships and Write and Share. You may consider including and adapting these routines by having students meet and talk to their peers in small groups or asking each student to conduct the routine with someone in their home.

- **Science Seminar.** Each core unit in Amplify Science 6–8 culminates with a Science Seminar, which is a whole-class, student-led argumentation routine. An adapted version of the Science Seminar has been included in the @Home Units. Some suggestions for implementing this are:
    - Hold your Science Seminar in class, if you are meeting in person some of the time.
    - Hold Seminars with your whole class, remotely. Students can participate all at the same time, or you might break the group up in thirds or in half and have the students who are not talking take notes using the Science Seminar Observations sheet.
    - Hold Seminars with pairs or small groups meeting on the phone, on video calls, or in virtual breakout rooms.
    - Have students talk to someone in their household about the Science Seminar evidence and claims.

@Home Units assessment considerations

Each Chapter Outline contains considerations for assessment and feedback in the Amplify Science units, and in some cases, the pre-unit and end-of-unit assessments. Generally, we recommend the following:

- You may need to adapt the format in which you collect student work. See the “Student writing options” above.

- When providing feedback to students, you may wish to focus on how students are attending to the Investigation and/or the Chapter Questions, if they are using evidence they have gathered to support their responses to questions, and if they are using appropriate unit vocabulary in their responses.

@Home Units guidance for synchronous and in-person learning

Each @Home Lesson contains suggestions for using these asynchronous resources in conjunction with virtual or in-person class sessions. If you are able to choose particular lessons to conduct together with students, we recommend:

- Holding discussions to engage students in figuring out the unit phenomenon.
    - At the beginning of each chapter so students can share their initial ideas or evolving ideas about the unit phenomenon.
    - At the end of the chapter so students can talk as they make sense of evidence, and/or synthesize various sources of information, and make an explanation or argument about the phenomenon.
- If you have access to kit materials, you can conduct hands-on demonstrations when hands-on materials are unavailable to students. Solicit student input as you demonstrate.
- If students do not have access to technology at home, when in-person, you can provide time for them to make observations and discuss ideas related to the simulations and digital tools.

Notes