

Grade 7 Science

Unit 1: Chemical Reactions and Matter

Driving question: How can we make something new that was not there before?

19 lessons (investigations and weekly readings) and a words quiz. Use this pack with the unit's **Teacher Guide**, **Student Procedure Guide**, **Student Work Pages** and **Science Literacy Student Reader** (download them once from the course) to teach the whole unit without the internet.

What is in this pack

- A plan for each lesson: the lesson question, how many class days it takes, the Teacher Guide pages to follow, and the student pages to print.
- For each weekly reading: the Student Reader pages, words to know and the exercise page.
- The words quiz, ready to print, with its key at the back.

CKSci 6-8 was originally developed and authored by OpenSciEd (www.openscienced.org), licensed under a Creative Commons Attribution 4.0 International License (CC BY 4.0). Additions marked “Core Knowledge Science Literacy” are the work of the Core Knowledge® Foundation (www.coreknowledge.org), made available through licensing under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License. This does not in any way imply that OpenSciEd or the Core Knowledge Foundation endorses this work. PGAMO added the lesson pages, study packs and quizzes layout, and shares them under the same license. License: CC BY-NC-SA 4.0 (<https://creativecommons.org/licenses/by-nc-sa/4.0/>).

Lesson schedule

Each investigation lesson takes the number of class days shown (about 45 minutes a day). Do each reading over a week alongside the lessons. Tick each one off as you go.

	Lesson	Days	Student pages
☐	Reading: Science Literacy Preface: Put Yourself in This Scene	1 week	—
☐	Lesson 1: What happens when a bath bomb is added to water (and what causes it to happen)?	4	3 to print
☐	Lesson 2: Where is the gas coming from?	2	2 to print
☐	Reading: Science Literacy Collection 1: Noticing the Chemical World	1 week	1 to print
☐	Lesson 3: What's in a bath bomb that is producing the gas?	2	4 to print
☐	Lesson 4: Which combinations of the substances in a bath bomb produce a gas?	2	3 to print
☐	Reading: Science Literacy Collection 2: Chemistry Concepts	1 week	1 to print
☐	Lesson 5: What gas(es) could be coming from the bath bomb?	2	5 to print
☐	Lesson 6: How can we explain another phenomenon where gas bubbles appear from combining different substances together?	1	1 to print
☐	Lesson 7: How can we revise our model to represent the differences in the matter that goes into and comes out of the bath bomb system?	1	1 to print
☐	Lesson 8: How can particles of a new substance be formed out of the particles of an old substance?	1	4 to print
☐	Reading: Science Literacy Collection 3: Matter from One Place to Another	1 week	1 to print
☐	Lesson 9: Does heating liquid water produce a new substance in the gas bubbles that appear?	2	3 to print

	Lesson	Days	Student pages
☐	Lesson 10: When energy from a battery was added to water, were the gases produced made of the same particles as were produced from heating the water?	1	1 to print
☐	Lesson 11: How do Dalton's models of the particles that change in a reaction compare to the ones we developed?	2	3 to print
☐	Reading: Science Literacy Collection 4: Combinations of Atoms	1 week	1 to print
☐	Lesson 12: How can a new substance (a gas) be produced and the total mass of the closed system not change?	2	2 to print
☐	Lesson 13: Why do different substances have different odors and how do we detect them?	1	4 to print
☐	Lesson 14: What is happening to the Taj Mahal?	2	1 to print
☐	Words quiz	—	—

Page numbers are PDF page numbers of each file, so they match what your PDF reader shows.

Reading: Science Literacy Preface: Put Yourself in This Scene

Words to know

- **chemical** — a substance produced by a chemical process or producing a chemical effect
- **chlorine** — an element that occurs as a gas and makes up bleach and disinfectants
- **concentration** — the density of a material in another substance
- **dehydration** — the process of removing water demonstrate understanding in discussion and through writing
- **dilute** — to make thinner

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 29–32: the steps, materials and timing for this lesson.

Read

Read Science Literacy Student Reader, Preface: “Put Yourself in This Scene”: PDF pages 6–7. Look at the pictures and maps together.

Check for understanding

- Use one of today's words in a sentence of your own.

Lesson 1: What happens when a bath bomb is added to water (and what causes it to happen)?

LESSON QUESTION

What happens when a bath bomb is added to water (and what causes it to happen)?

Plan about **4 class days** for this lesson.

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 33–59: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 6–9
- Initial Model-based Explanation — Student Work Pages, PDF pages 7–8
- What happens to a bath bomb when put in water — Student Work Pages, PDF pages 9–10

For the teacher

- Teacher Reference — Teacher Guide, PDF pages 310–313

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation:
What happens when a bath bomb is added to water (and what causes it to happen)?

Lesson 2: Where is the gas coming from?

LESSON QUESTION

Where is the gas coming from?

Plan about **2 class days** for this lesson.

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 60–85: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 10–13
- Reference: Investigating Gas from Bath Bombs in a Bottle — Student Procedure Guide, PDF page 52

For the teacher

- Teacher Reference — Teacher Guide, PDF page 314
- Answer Key — Teacher Guide, PDF page 315

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation:
Where is the gas coming from?

Reading: Science Literacy Collection 1: Noticing the Chemical World

Words to know

- **atom** — basic unit of matter consisting of a positively charged nucleus and negatively charged electrons
- **base** — a substance that has a pH greater than 7.0
- **chemical** — a substance produced by a chemical process or producing a chemical effect
- **chemical energy** — energy released by a chemical reaction or absorbed during the formation of a chemical compound
- **cohesion** — the state of sticking together
- **dissolve** — to become or cause to become incorporated into a liquid
- **ecosystem** — all the organisms and the environment in which they are found
- **nutrient** — a substance that provides nourishment essential for an organism's life, including its growth
- **plasma** — a superheated gas that is conducting electricity or otherwise being affected by electromagnetic fields or energy
- **pressure** — the application of force due to direct contact
- **state** — a particular condition that something is in at a specific time
- **state of matter** — the form in which matter can be found, thermoreceptor, n. a sensory organ that perceives heat which occurs in nature as solid, liquid, gas, or plasma or cold

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 86–92: the steps, materials and timing for this lesson.

Read

Read Science Literacy Student Reader, Collection 1: “Noticing the Chemical World”: PDF pages 8–17. Look at the pictures and maps together.

Student pages to print

- Exercise Page 1 — Student Work Pages, PDF pages 37–38

Check for understanding

- Use one of today's words in a sentence of your own.

Lesson 3: What's in a bath bomb that is producing the gas?

LESSON QUESTION

What's in a bath bomb that is producing the gas?

Plan about **2 class days** for this lesson.

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 93–112: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 14–17
- Bath Bomb Ingredient Data — Student Work Pages, PDF pages 11–12
- Bath Bomb Recipes — Student Work Pages, PDF pages 13–14
- Reference: Lab Procedure for Mixing the Ingredients in the Water — Student Procedure Guide, PDF page 53

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation: What's in a bath bomb that is producing the gas?

Lesson 4: Which combinations of the substances in a bath bomb produce a gas?

LESSON QUESTION

Which combinations of the substances in a bath bomb produce a gas?

Plan about **2 class days** for this lesson.

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 113–132: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 18–21
- Combinations of Ingredients to Test — Student Work Pages, PDF pages 15–16
- Reference: Lemonade Mix Labels — Student Procedure Guide, PDF page 54

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation:
Which combinations of the substances in a bath bomb produce a gas?

Reading: Science Literacy Collection 2: Chemistry Concepts

Words to know

- **acid** — a substance that has a pH less than 7.0
- **atom** — basic unit of matter consisting of a positively charged nucleus and negatively charged electrons
- **base** — a substance that has a pH greater than 7.0
- **catalyst** — something that helps a chemical reaction occur
- **chemical** — a substance produced by a chemical process or producing a chemical effect
- **chemical reaction** — a chemical change in which two or more substances form a new substance with different properties
- **combustion** — a chemical reaction such as oxidation that produces heat and usually light
- **compound** — a distinct substance formed by the chemical union of two or more ingredients
- **dissolve** — to become or cause to become incorporated into a liquid
- **element** — a substance made of atoms of only one kind that cannot be made into simpler substances using ordinary means
- **elemental** — refers to things that are basic or primary; the most simplified versions or parts of things (also, elementary)
- **property** — a quality belonging to a particular thing

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 133–139: the steps, materials and timing for this lesson.

Read

Read Science Literacy Student Reader, Collection 2: “Chemistry Concepts”: PDF pages 18–27. Look at the pictures and maps together.

Student pages to print

- Exercise Page 2 — Student Work Pages, PDF pages 39–40

Check for understanding

- Use one of today's words in a sentence of your own.

Lesson 5: What gas(es) could be coming from the bath bomb?

LESSON QUESTION

What gas(es) could be coming from the bath bomb?

Plan about **2 class days** for this lesson.

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 140–161: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 22–26
- Alternate: My Predictive Explanations for the Gas from a Bath Bomb — Student Work Pages, PDF pages 17–18
- Discussion Protocol: Density and Flammability — Student Work Pages, PDF pages 19–20
- My Predictive Explanations for the Gas from a Bath Bomb — Student Work Pages, PDF pages 21–22
- Some Common Gases — Student Work Pages, PDF pages 23–24

For the teacher

- Answer Key — Teacher Guide, PDF pages 316–323

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation: What gas(es) could be coming from the bath bomb?

Lesson 6: How can we explain another phenomenon where gas bubbles appear from combining different substances together?

LESSON QUESTION

How can we explain another phenomenon where gas bubbles appear from combining different substances together?

Plan about **1 class days** for this lesson.

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 162–167: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 27–28

For the teacher

- Answer Key — Teacher Guide, PDF pages 324–328

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation:
How can we explain another phenomenon where gas bubbles appear from combining different substances together?

Lesson 7: How can we revise our model to represent the differences in the matter that goes into and comes out of the bath bomb system?

LESSON QUESTION

How can we revise our model to represent the differences in the matter that goes into and comes out of the bath bomb system?

Plan about **1 class days** for this lesson.

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 168–182: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 29–31

For the teacher

- Teacher Reference — Teacher Guide, PDF page 329

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation:
How can we revise our model to represent the differences in the matter that goes into and comes out of the bath bomb system?

Lesson 8: How can particles of a new substance be formed out of the particles of an old substance?

LESSON QUESTION

How can particles of a new substance be formed out of the particles of an old substance?

Plan about **1 class days** for this lesson.

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 183-191: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 32-33
- Circles as Particles — Student Work Pages, PDF pages 25-26
- Reading: Dalton's Investigations — Student Procedure Guide, PDF page 58
- Reading: A Summary of Some Historical Investigations and Discoveries into the Particle Nature of Matter — Student Procedure Guide, PDF pages 59-61

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation:
How can particles of a new substance be formed out of the particles of an old substance?

Reading: Science Literacy Collection 3: Matter from One Place to Another

Words to know

- **acid** — a substance that has a pH less than 7.0
- **atom** — basic unit of matter consisting of a positively charged nucleus and negatively charged electrons
- **base** — a substance that has a pH greater than 7.0
- **chemical** — a substance produced by a chemical process or producing a chemical effect
- **chemical energy** — energy released by a chemical reaction or absorbed during the formation of a chemical compound
- **chemical reaction** — a chemical change in which two or more substances form a new substance with different properties
- **chlorine** — an element that occurs as a gas and makes up bleach and disinfectants
- **combustion** — a chemical reaction such as oxidation that produces heat and usually light
- **compound** — a distinct substance formed by the chemical union of two or more ingredients
- **concentration** — the density of a material in another substance
- **convection current** — a stream of fluid that moves within surrounding fluid as a result of changes in temperature
- **density** — the amount of matter in a volume of a substance or object, often measured in grams per

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 192–198: the steps, materials and timing for this lesson.

Read

Read Science Literacy Student Reader, Collection 3: “Matter from One Place to Another”: PDF pages 28–37. Look at the pictures and maps together.

Student pages to print

- Exercise Page 3 — Student Work Pages, PDF pages 41–42

Check for understanding

- Use one of today's words in a sentence of your own.

Lesson 9: Does heating liquid water produce a new substance in the gas bubbles that appear?

LESSON QUESTION

Does heating liquid water produce a new substance in the gas bubbles that appear?

Plan about **2 class days** for this lesson.

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 199–216: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 34–38
- Density Calculations of Clear Liquids — Student Work Pages, PDF pages 27–28
- Evaluating and Improving Alternate Arguments — Student Work Pages, PDF pages 29–30

For the teacher

- Teacher Reference — Teacher Guide, PDF pages 330–331
- Answer Key — Teacher Guide, PDF page 332

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation:
Does heating liquid water produce a new substance in the gas bubbles that appear?

Lesson 10: When energy from a battery was added to water, were the gases produced made of the same particles as were produced from heating the water?

LESSON QUESTION

When energy from a battery was added to water, were the gases produced made of the same particles as were produced from heating the water?

Plan about **1 class days** for this lesson.

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 217–228: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 39–41

For the teacher

- Teacher Reference — Teacher Guide, PDF pages 333–338
- Answer Key — Teacher Guide, PDF pages 339–351

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation:
When energy from a battery was added to water, were the gases produced made of the same particles as were produced from heating the water?

Lesson 11: How do Dalton's models of the particles that change in a reaction compare to the ones we developed?

LESSON QUESTION

How do Dalton's models of the particles that change in a reaction compare to the ones we developed?

Plan about **2 class days** for this lesson.

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 229–245: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 42–44
- Representing Dalton's Atoms in Different Molecular Models of Water — Student Work Pages, PDF pages 31–32
- Reference: Molecular Models of Different Substances — Student Procedure Guide, PDF pages 55–56

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation: How do Dalton's models of the particles that change in a reaction compare to the ones we developed?

Reading: Science Literacy Collection 4: Combinations of Atoms

Words to know

- **atom** — basic unit of matter consisting of a positively charged nucleus and negatively charged electrons
- **chemical** — a substance produced by a chemical process or producing a chemical effect
- **chlorine** — an element that occurs as a gas and makes up bleach and disinfectants
- **compound** — a distinct substance formed by the chemical union of two or more ingredients
- **dehydration** — the process of removing water demonstrate understanding in discussion and through writing
- **dissolve** — to become or cause to become incorporated into a liquid
- **electrolyte** — a mineral that becomes an electrically conductive ion when dissolved in a solution
- **element** — a substance made of atoms of only one kind that cannot be made into simpler substances using ordinary means
- **model** — a representation of a real thing
- **molecule** — an arrangement of two or more atoms that share electrons
- **product** — a substance produced by a chemical reaction, different from the reactants
- **solvent** — the liquid substance in which a solute dissolves to form a solution

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 246–252: the steps, materials and timing for this lesson.

Read

Read Science Literacy Student Reader, Collection 4: “Combinations of Atoms”: PDF pages 38–47. Look at the pictures and maps together.

Student pages to print

- Exercise Page 4 — Student Work Pages, PDF pages 43–44

Check for understanding

- Use one of today's words in a sentence of your own.

Lesson 12: How can a new substance (a gas) be produced and the total mass of the closed system not change?

LESSON QUESTION

How can a new substance (a gas) be produced and the total mass of the closed system not change?

Plan about **2 class days** for this lesson.

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 253–270: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 45–47
- Reference: Comparing Molecular Ratios in a Chemical Reaction — Student Procedure Guide, PDF page 57

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation:
How can a new substance (a gas) be produced and the total mass of the closed system not change?

Lesson 13: Why do different substances have different odors and how do we detect them?

LESSON QUESTION

Why do different substances have different odors and how do we detect them?

Plan about **1 class days** for this lesson.

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 271–278: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 48–49
- Molecular Models of Different Substances — Student Work Pages, PDF pages 33–34
- Odor Lab — Student Work Pages, PDF pages 35–36
- Reading: How do we detect odors? — Student Procedure Guide, PDF pages 62–66

For the teacher

- Teacher Reference 1 — Teacher Guide, PDF pages 352–353
- Answer Key — Teacher Guide, PDF pages 354–367

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation:
Why do different substances have different odors and how do we detect them?

Lesson 14: What is happening to the Taj Mahal?

LESSON QUESTION

What is happening to the Taj Mahal?

Plan about **2 class days** for this lesson.

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 279–295: the steps, materials and timing for this lesson.

Student pages to print

- Student procedures for this lesson — Student Procedure Guide, PDF pages 50–51

For the teacher

- Teacher Reference — Teacher Guide, PDF page 368
- Answer Key 1 — Teacher Guide, PDF pages 369–370
- Answer Key 2 — Teacher Guide, PDF pages 371–372
- Answer Key 3 — Teacher Guide, PDF pages 373–381

Check for understanding

- Explain your answer to the lesson question, using evidence from your investigation:
What is happening to the Taj Mahal?

WORDS QUIZ

Chemical Reactions and Matter

Name: _____ Date: _____

Circle the letter of the best answer.

1. Which word means “the substance in a solution that dissolves in the solvent”?
 - a) chemical weathering
 - b) solute
 - c) dehydration
 - d) property
2. Which word means “a particular condition that something is in at a specific time”?
 - a) state
 - b) electrolyte
 - c) specific heat
 - d) compound
3. Which word means “a superheated gas that is conducting electricity or otherwise being affected by electromagnetic fields or energy”?
 - a) element
 - b) plasma
 - c) solute
 - d) convection current
4. Which word means “a chemical reaction such as oxidation that produces heat and usually light”?
 - a) chemical reaction
 - b) dehydration
 - c) acid
 - d) combustion
5. Which word means “the form in which matter can be found, thermoreceptor, n. a sensory organ that perceives heat which occurs in nature as solid, liquid, gas, or plasma or cold”?
 - a) temperature
 - b) model
 - c) chemical
 - d) state of matter
6. Which word means “refers to things that are basic or primary; the most simplified versions or parts of things (also, elementary)”?
 - a) convection current
 - b) chemical weathering
 - c) chemical reaction
 - d) elemental

- 7.** Which word means “the heat in calories necessary to raise the temperature of one gram of a substance by one degree Celsius”?
- a) electrolyte
 - b) substance
 - c) plasma
 - d) specific heat
- 8.** Which word means “the amount of matter in a volume of a substance or object, often measured in grams per”?
- a) chlorine
 - b) cohesion
 - c) density
 - d) chemical weathering
- 9.** Which word means “a transition from a state of matter to a different state of matter”?
- a) combustion
 - b) product
 - c) catalyst
 - d) phase change
- 10.** Which word means “to become or cause to become incorporated into a liquid”?
- a) dissolve
 - b) viscous
 - c) chlorine
 - d) solubility
- 11.** Which word means “how thick, sticky, and semifluid a substance is”?
- a) phase change
 - b) state
 - c) viscous
 - d) pressure
- 12.** Which word means “a substance, usually amorphous or crystalline, that separates out from a solution or suspension as a result of a chemical or physical change”?
- a) electrolyte
 - b) precipitate
 - c) olfactory
 - d) specific heat

FOR THE TEACHER

Answers

Unit quiz key

1. b 2. a 3. b 4. d 5. d 6. d 7. d 8. c 9. d 10. a 11. c 12. b