SIRIUS

SAMPLER
Use with Your Students!

GRADE 8 SCIENCE

STAAR® Preparation and Practice

2018 Streamlined TEKS

- Instruction and practice in all tested TEKS (Grades 6–8)
- Over 250 authentic STAAR practice test items
- 3-step approach for remediation

STAAR GRADE 8 SCIENCE REFERENCE MATERIALS

FORMULAS

Density = $\frac{\text{mass}}{\text{volume}}$	$D = \frac{m}{V}$
Average speed = $\frac{\text{total distance}}{\text{total time}}$	$s = \frac{d}{t}$
Net force = (mass)(acceleration)	$F = ma$

SIRIUS

GRADE 8 SCIENCE

STAAR® Preparation and Practice

Streamlined TEKS
2018 Edition

SAMPLER
Use with Your Students!

Printed in Texas.

ISBN: 978-1-943008-20-9

Sampler

Contents in Brief

Included in Sampler

Table of Contents and TEKS Correlations iv
Welcome Letter ix
Using This Book for STAAR Success x
Strategies for Solving STAAR Problems xiii
Answering Griddable Questions xvi
Student Progress Monitoring Chart xviii

Unit 1 Matter and Energy 1
1.1 Describing Matter *(8.5D)* 6
1.2 Physical Properties of Matter *(6.6A, 6.6B)* 14
1.3 Structure of Atoms *(8.5A)* 22
1.4 Chemical Properties of Matter *(8.5B, 8.5C)* 30
1.5 Chemical Reactions *(7.6A, 8.5E)* 40

Unit 2 Force, Motion, and Energy 57
2.1 Energy *(6.8A, 6.9C)* 62
2.2 Motion *(6.8C, 8.6B, 6.8D)* 69
2.3 Force and Newton's Laws *(8.6C, 8.6A)* 78
1–2 CUMULATIVE REVIEW 97

Unit 3 Earth and Space 101
3.1 The Universe *(8.8C, 8.8A, 8.8B)* 108
3.2 Earth, Sun, and Moon *(6.11B, 8.7A, 8.7B, 8.7C)* 117
3.3 Formation of Earth's Surface *(8.9A, 8.9B)* 129
3.4 Earth's Landforms *(7.8C, 8.9C)* 139
3.5 Earth's Atmosphere and Oceans *(8.10A, 8.10B, 8.10C)* 150
1–3 CUMULATIVE REVIEW 168

Unit 4 Organisms and Environments 173
4.1 Classification of Organisms *(6.12D, 7.11A)* 181
4.2 Variation and Heredity *(7.14C, 7.14B, 7.11C)* 190
4.3 Structure and Function of Cells *(7.12F, 7.12D)* 199
4.4 Human Body Systems *(7.12B)* 206
4.5 Relationships Between Living and Nonliving Things *(8.11A, 7.5B)* 212
4.6 Change and Stability in Ecosystems *(7.10C, 7.10B)* 224
4.7 Effects of Environmental Change *(8.11B, 8.11C)* 231
1–4 CUMULATIVE REVIEW 248
English/Spanish Glossary 254
Student Answer Sheets 275

Table of Contents

Included in Sampler

TEKS Correlations viii
Welcome Letter ix
Using This Book for STAAR Success x
Strategies for Solving STAAR Problems xiii
Answering Griddable Questions xvi
Student Progress Monitoring Chart xviii

Unit 1

Matter and Energy

Vocabulary Review and Preview 2
Diagnostic Test 3

1.1 Describing Matter 6
Types of Matter *(8.5D)*
Chemical Symbols and Formulas *(8.5D)*

1.2 Physical Properties of Matter 14
Metals, Nonmetals, and Metalloids *(6.6A)*
Density *(6.6B)*

1.3 Structure of Atoms 22
Parts of an Atom *(8.5A)*
Numbers of Protons, Neutrons, and Electrons *(8.5A)*

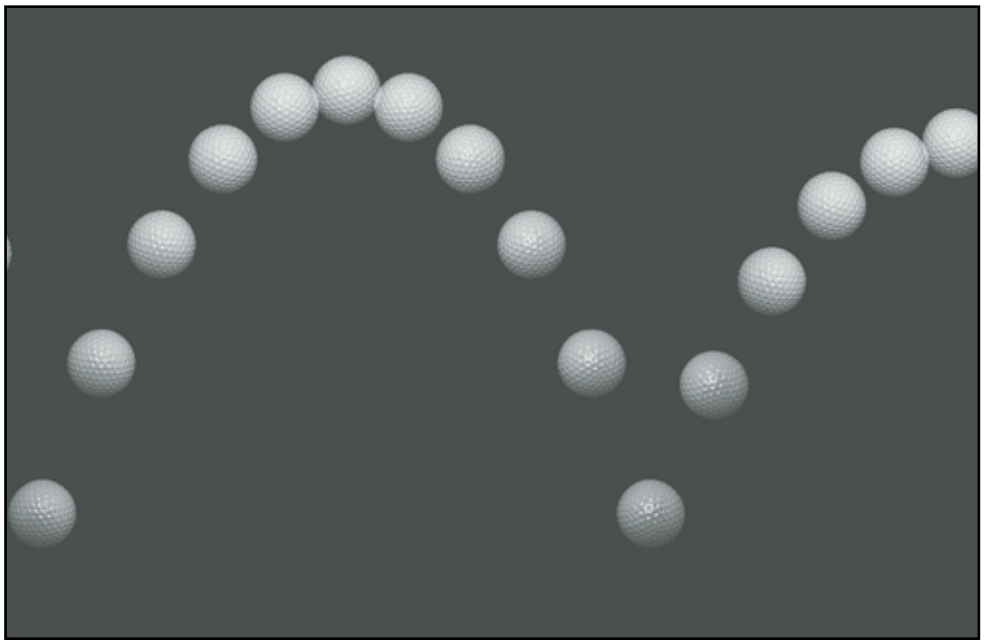
1.4 Chemical Properties of Matter 30
Chemical Properties *(8.5B)*
The Periodic Table *(8.5C)*

1.5 Chemical Reactions 40
Physical and Chemical Changes *(7.6A)*
Evidence of Chemical Reactions *(8.5E)*

Study Guide & Review 50
Active Review 52
Post Test 53

Unit 2

Force, Motion, and Energy



Vocabulary Review and Preview 58

Diagnostic Test 59

2.1 Energy 62
Kinetic Energy and Potential Energy *(6.8A)*
Energy Transformations *(6.9C)*

2.2 Motion 69
Speed *(6.8C)*
Velocity and Acceleration *(8.6B)*
Graphing Motion *(6.8D)*

2.3 Force and Newton's Laws 78
Newton's Laws of Motion *(8.6C)*
How Forces Affect Motion *(8.6A)*

Study Guide and Review 91

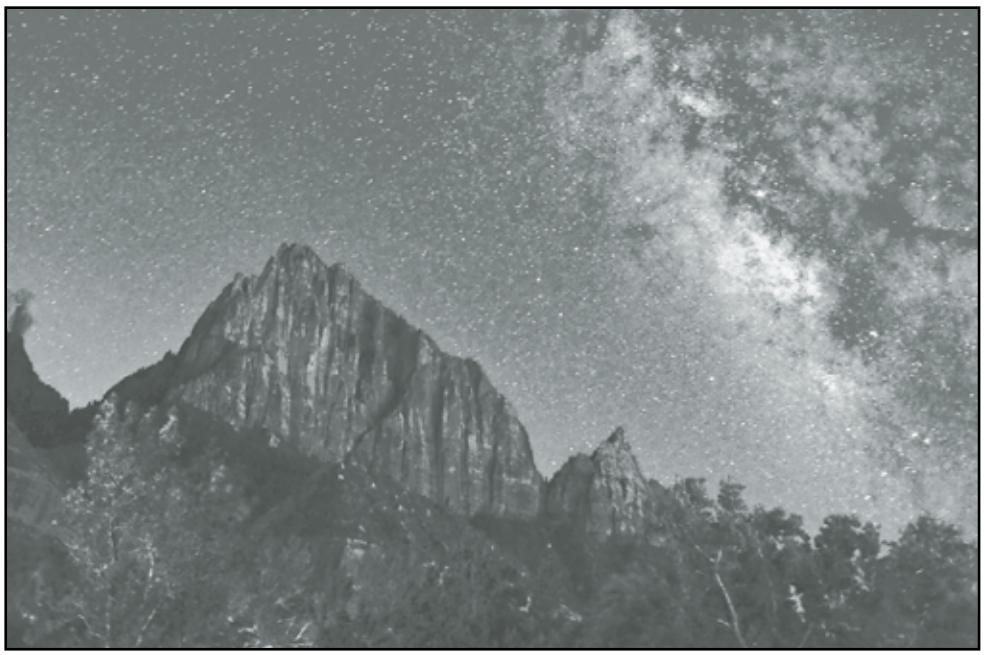
Active Review 93

Post Test 94

1–2 Cumulative Review 97

Unit 3

Earth and Space



Vocabulary Review and Preview 102
Diagnostic Test 103

3.1 The Universe 108
The Electromagnetic Spectrum *(8.8C)*
Stars and Galaxies *(8.8A, 8.8B)*

3.2 Earth, Sun, and Moon 117
Our Solar System *(6.11B)*
Earth's Motions *(8.7A)*
The Lunar Cycle *(8.7B)*
Ocean Tides *(8.7C)*

3.3 Formation of Earth's Surface 129
Plate Tectonics *(8.9A)*
Formation of Crustal Features *(8.9B)*

3.4 Earth's Landforms 139
Groundwater and Surface Water *(7.8C)*
Weathering and Erosion *(8.9C)*

3.5 Earth's Atmosphere and Oceans 150
Winds and Ocean Currents *(8.10A)*
Weather *(8.10B)*
Oceans and Weather Systems *(8.10C)*

Study Guide & Review 159
Active Review 161
Post Test 162

1–3 Cumulative Review 168

Unit 4

Organisms and Environments

Vocabulary Review and Preview 174
Diagnostic Test 175

4.1 Classification of Organisms 181
Classifying Living Things *(6.12D)*
Identifying Organisms *(7.11A)*

4.2 Variation and Heredity 190
Heredity *(7.14C)*
Reproduction *(7.14B)*
Changes in Genetic Traits *(7.11C)*

4.3 Structure and Function of Cells 199
Cell Theory *(7.12F)*
Cell Structures *(7.12D)*

4.4 Human Body Systems 206
Body Parts Work Together *(7.12B)*

4.5 Relationships Between Living and Nonliving Things 212
Resources Needed for Survival *(8.11A)*
Energy Flow in Ecosystems *(7.5B)*

4.6 Change and Stability in Ecosystems 224
Ecological Succession *(7.10C)*
Biodiversity and Sustainability of Ecosystems *(7.10B)*

4.7 Effects of Environmental Change 231
Effects of Environmental Change on Populations *(8.11B)*
Humans and Ecosystems *(8.11C)*

Study Guide & Review 239
Active Review 242
Post Test 243

1–4 Cumulative Review 248

English/Spanish Glossary 254
Student Answer Sheets 275
STAAR Reference Materials . . . . . **inside front & back cover**

TEKS Correlations

Included in Sampler

The 14 Readiness TEKS are highlighted in these tables and comprise 60–65% of the STAAR test questions.

Reporting Category 1: Matter and Energy		
TEKS	Lesson	Page
8.5A	1.3	22
8.5B	1.4	30
8.5C	1.4	34
8.5D	1.1	6, 9
8.5E	1.5	43
7.5B*	4.5	217
7.6A	1.5	40
6.6A	1.2	14
6.6B	1.2	17

Reporting Category 2: Force, Motion, and Energy		
TEKS	Lesson	Page
8.6A	2.3	84
8.6B	2.2	71
8.6C	2.3	78
6.8A	2.1	62
6.8C	2.2	69
6.8D	2.2	72
6.9C	2.1	64

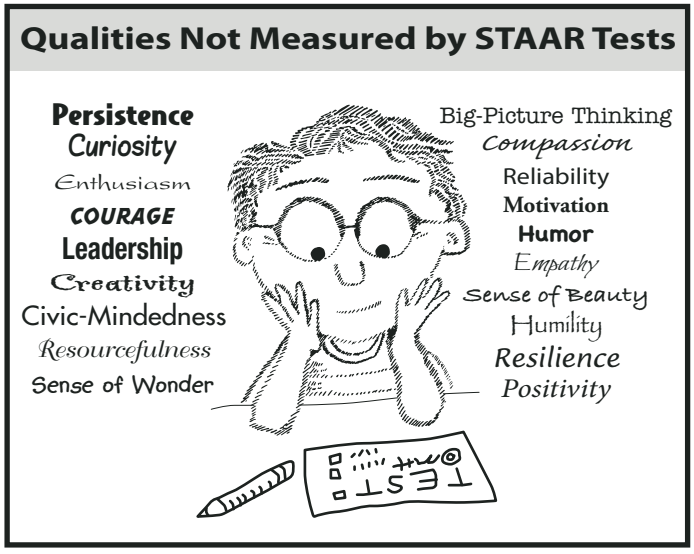
Reporting Category 3: Earth and Space		
TEKS	Lesson	Page
8.7A	3.2	119
8.7B	3.2	122
8.7C	3.2	123
8.8A	3.1	110
8.8B	3.1	110
8.8C	3.1	108
8.9A	3.3	129
8.9B	3.3	134
8.9C	3.4	143
8.10A	3.5	150
8.10B	3.5	153
8.10C	3.5	155
7.8C	3.4	139
6.11B	3.2	118

Reporting Category 4: Organisms and Environments		
TEKS	Lesson	Page
8.11A	4.5	212
8.11B	4.7	231
8.11C	4.7	234
7.10B	4.6	227
7.10C	4.6	224
7.11A	4.1	185
7.11C	4.2	194
7.12B	4.4	206
7.12D	4.3	201
7.12F	4.3	199
7.14B	4.2	192
7.14C	4.2	190
6.12D	4.1	181

* 7.5B is taught in Unit 4, but belongs to Reporting Category 1.

Dear Students,

The STAAR Grade 8 Science assessment measures your knowledge of the Grades 6–8 science standards (TEKS). STAAR tests are not designed to measure many important qualities of character and intelligence — as this cartoon shows. But performing well on the STAAR tests is important, so you want to do all you can to succeed on them. That's where this workbook comes in!



What are some other important qualities of character and intelligence missing in STAAR tests?

This workbook was designed to help you prepare for the STAAR Grade 8 Science test by

- reviewing the skills and concepts you need to answer STAAR test questions, and
- providing practice questions that are similar to those you will answer on the actual STAAR test.

Practicing Smart Is the Secret to STAAR Success

There is a secret to success on the STAAR tests—practice, practice, and more practice. This is good news, because you are in control of how much effort you put into practicing. But not all practice is the same… you need to practice smart.

First, practice with test questions that are very similar to the actual STAAR test. That's easy because this workbook is full of them! Next, focus on your weaknesses—spend extra time on questions you have trouble with. Think of it like this: if your basketball shot needs improvement, you don't practice dribbling. Instead, you practice shooting.

Focusing on your weaknesses also means carefully analyzing each test question you get wrong. Why did you get it wrong? Why is another answer correct? You can learn more from test questions you get wrong, so don't be afraid of making mistakes. If your basketball shot is off, you identify what you are doing wrong (too far left), and correct it with your next shot (aim further right).

When you practice, give each question your full attention. Do not take a break until *after* you answer the question. Your attention is like a muscle that you can build by using it, one practice test question at a time. Do you believe unfocused, sloppy practice of your basketball shot will help you perform during a big game? No! Your attention is your greatest power. You develop it with practice.

Preparing for the STAAR test can actually be a fun challenge. And when you practice smart, you are building life skills while you prepare for the STAAR test!

Your partners in STAAR success,

The Sirius Education Team

Using This Book for STAAR Success

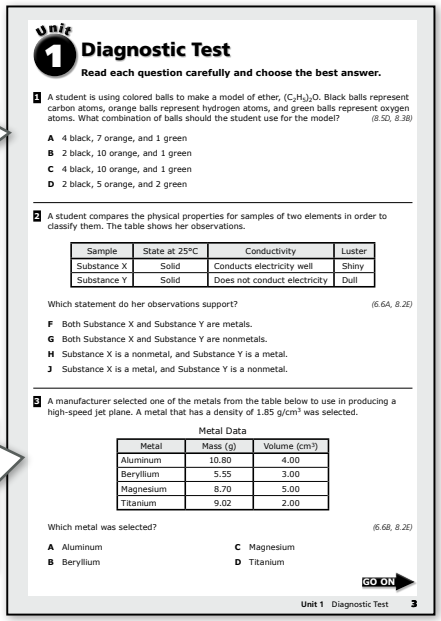
This interactive workbook includes **instruction** and **practice** in **all tested TEKS** (grades 6–8).
It is **easily adapted** for different needs and includes a **3-step approach** to efficiently **prioritize** and **individualize remediation** when preparation time is limited.

STEP 1 Identify Your Needs—Unit Diagnostic Tests

Use each of the 4 Unit Diagnostic Tests to identify what you know and what you need to review. Record your results in the Student Progress Monitoring Chart. (All tested TEKS are included.)

One item for each tested TEKS

Each item correlates to a section within a lesson.


Unit 1 Diagnostic Test

Read each question carefully and choose the best answer.

1 A student is using colored balls to make a model of ether, $(C_2H_5)_2O$. Black balls represent carbon atoms, orange balls represent hydrogen atoms, and green balls represent oxygen atoms. What combination of balls should the student use for the model? (8.5D, 8.3B)

A 4 black, 7 orange, and 1 green
B 2 black, 10 orange, and 1 green
C 4 black, 10 orange, and 1 green
D 2 black, 5 orange, and 2 green

2 A student compares the physical properties for samples of two elements in order to classify them. The table shows her observations.

Sample	State at 25°C	Conductivity	Luster
Substance X	Solid	Conducts electricity well	Shiny
Substance Y	Solid	Does not conduct electricity	Dull

Which statement do her observations support? (6.6A, 8.2E)

F Both Substance X and Substance Y are metals.
G Both Substance X and Substance Y are nonmetals.
H Substance X is a nonmetal, and Substance Y is a metal.
J Substance X is a metal, and Substance Y is a nonmetal.

3 A manufacturer selected one of the metals from the table below to use in producing a high-speed jet plane. A metal that has a density of 1.85 g/cm³ was selected.

Metal Data

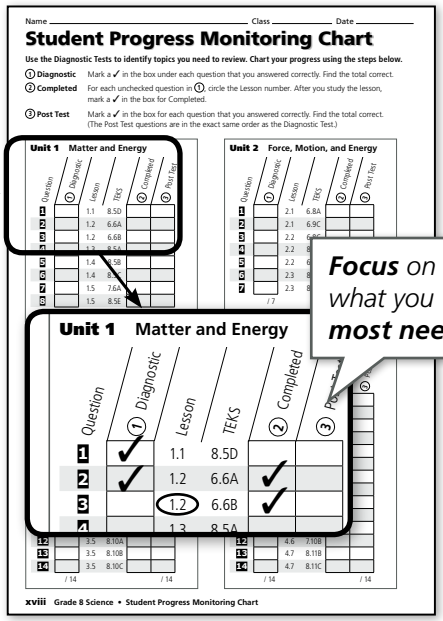
Metal	Mass (g)	Volume (cm³)
Aluminum	10.80	4.00
Beryllium	5.55	3.00
Magnesium	8.70	5.00
Titanium	9.02	2.00

Which metal was selected? (6.6B, 8.2E)

A Aluminum
B Beryllium
C Magnesium
D Titanium

GO ON

Unit 1 Diagnostic Test 3


Student Progress Monitoring Chart

Use the Diagnostic Tests to identify topics you need to review. Chart your progress using the steps below.

① Diagnostic Mark a ✓ in the box under each question that you answered correctly. Find the total correct.
② Completed For each unchecked question in ①, circle the Lesson number. After you study the lesson, mark a ✓ in the box for Completed.
③ Post Test Mark a ✓ in the box for each question that you answered correctly. Find the total correct. (The Post Test questions are in the exact same order as the Diagnostic Test.)

Unit 1 Matter and Energy

Question	① Diagnostic	Lesson	TEKS	② Completed	③ Post Test
1	✓	1.1	8.5D		
2	✓	1.2	6.6A	✓	
3		1.2	6.6B	✓	
4		1.3	8.5A		
5		1.4	8.5B		
6		1.4	8.5C		
7		1.5	7.6A		
8		1.5	8.5E		
9		3.5	8.10A		
10		3.5	8.10B		
11		3.5	8.10C		
12		4.6	7.10B		
13		4.7	8.11B		
14		4.7	8.11C		

Unit 2 Force, Motion, and Energy

Question	① Diagnostic	Lesson	TEKS	② Completed	③ Post Test
1		2.1	6.8A		
2		2.1	6.9C		
3		2.2	6.8A		
4		2.2	6.8B		
5		2.2	6.8C		
6		2.3	8.3A		
7		2.3	8.3B		

Focus** on what you **most need.

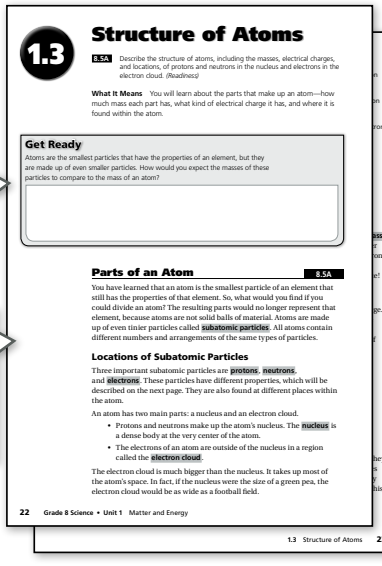
xviii Grade 8 Science • Student Progress Monitoring Chart

STEP 2 Focus Your Remediation—Instruction and Practice

Use your Diagnostic Test results to focus TEKS instruction and STAAR practice to meet your unique needs.

Interactive Get Ready activity

Student-friendly TEKS instruction


1.3 Structure of Atoms

8.5A Describe the structure of atoms, including the masses, electrical charges, and locations, of protons and neutrons in the nucleus and electrons in the electron cloud. (Readiness)

What It Means You will learn about the parts that make up an atom—how much mass each part has, what kind of electrical charge it has, and where it is found within the atom.

Get Ready

Atoms are the smallest particles that have the properties of an element, but they are made up of even smaller particles. How would you expect the masses of these particles to compare to the mass of an atom?

Parts of an Atom 8.5A

You have learned that an atom is the smallest particle of an element that still has the properties of that element. So, what would you find if you could divide an atom? The resulting parts would no longer represent that element, because atoms are not solid balls of material. Atoms are made up of even tinier particles called **subatomic particles**. All atoms contain different numbers and arrangements of the same types of particles.

Locations of Subatomic Particles

Three important subatomic particles are **protons**, **neutrons**, and **electrons**. These particles have different properties, which will be described on the next page. They are also found at different places within the atom.

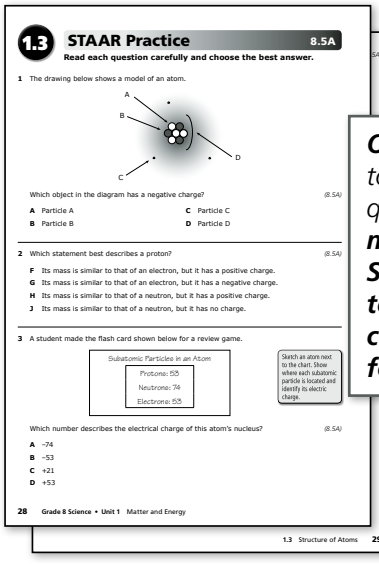
An atom has two main parts: a nucleus and an electron cloud.

- Protons and neutrons make up the atom's nucleus. The **nucleus** is a dense body at the very center of the atom.
- The electrons of an atom are outside of the nucleus in a region called the **electron cloud**.

The electron cloud is much bigger than the nucleus. It takes up most of the atom's space. In fact, if the nucleus were the size of a green pea, the electron cloud would be as wide as a football field.

22 Grade 8 Science • Unit 1 Matter and Energy

1.3 Structure of Atoms 23


1.3 STAAR Practice 8.5A

Read each question carefully and choose the best answer.

1 The drawing below shows a model of an atom.

Which object in the diagram has a negative charge? (8.5A)

A Particle A
B Particle B
C Particle C
D Particle D

2 Which statement best describes a proton? (8.5A)

F Its mass is similar to that of an electron, but it has a positive charge.
G Its mass is similar to that of an electron, but it has a negative charge.
H Its mass is similar to that of a neutron, but it has a positive charge.
J Its mass is similar to that of a neutron, but it has no charge.

3 A student made the flash card shown below for a review game.

Subatomic Particles in an Atom
Protons: 55
Neutrons: 74
Electrons: 55

Sketch an atom next to the chart. Show where each subatomic particle is located and identify its electric charge.

Which number describes the electrical charge of this atom's nucleus? (8.5A)

A −74
B −53
C +21
D +53

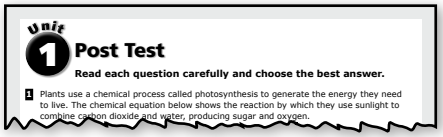
28 Grade 8 Science • Unit 1 Matter and Energy

1.3 Structure of Atoms 29

Over 230** total STAAR questions **match** the **STAAR tests** in **content** and **format.

STEP 3 Monitor Your Progress—Unit Post Tests

Use each Unit Post Test to monitor your progress and to identify additional lessons for review. The Post Test questions cover the same TEKS in the same order as the Diagnostic Test.


Unit 1 Post Test

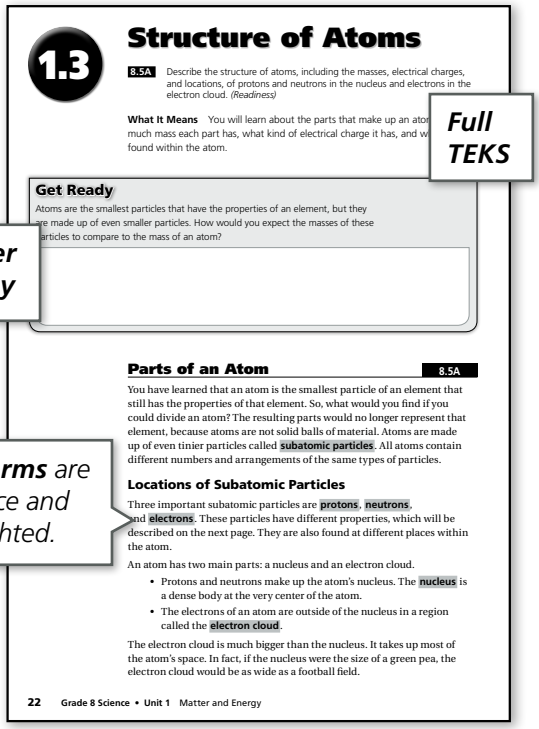
Read each question carefully and choose the best answer.

1 Plants use a chemical process called photosynthesis to generate the energy they need to live. The chemical equation below shows the reaction by which they use sunlight to combine carbon dioxide and water, producing sugar and oxygen.

20 Lessons with TEKS Instruction and STAAR Practice

TEKS Instruction—Engaging Interactive Learning

Concise and **student-friendly** instruction reviews each tested TEKS. Students actively participate in learning with **interactive** and **scaffolded** Your Turn questions.


1.3

Structure of Atoms

8.5A Describe the structure of atoms, including the masses, electrical charges, and locations, of protons and neutrons in the nucleus and electrons in the electron cloud. *(Readiness)*

What It Means You will learn about the parts that make up an atom, how much mass each part has, what kind of electrical charge it has, and where it is found within the atom.

Get Ready

Atoms are the smallest particles that have the properties of an element, but they are made up of even smaller particles. How would you expect the masses of these particles to compare to the mass of an atom?

Parts of an Atom 8.5A

You have learned that an atom is the smallest particle of an element that still has the properties of that element. So, what would you find if you could divide an atom? The resulting parts would no longer represent that element, because atoms are not solid balls of material. Atoms are made up of even tinier particles called **subatomic particles**. All atoms contain different numbers and arrangements of the same types of particles.

Locations of Subatomic Particles

Three important subatomic particles are **protons**, **neutrons**, and **electrons**. These particles have different properties, which will be described on the next page. They are also found at different places within the atom.

An atom has two main parts: a nucleus and an electron cloud.

- Protons and neutrons make up the atom's nucleus. The **nucleus** is a dense body at the very center of the atom.
- The electrons of an atom are outside of the nucleus in a region called the **electron cloud**.

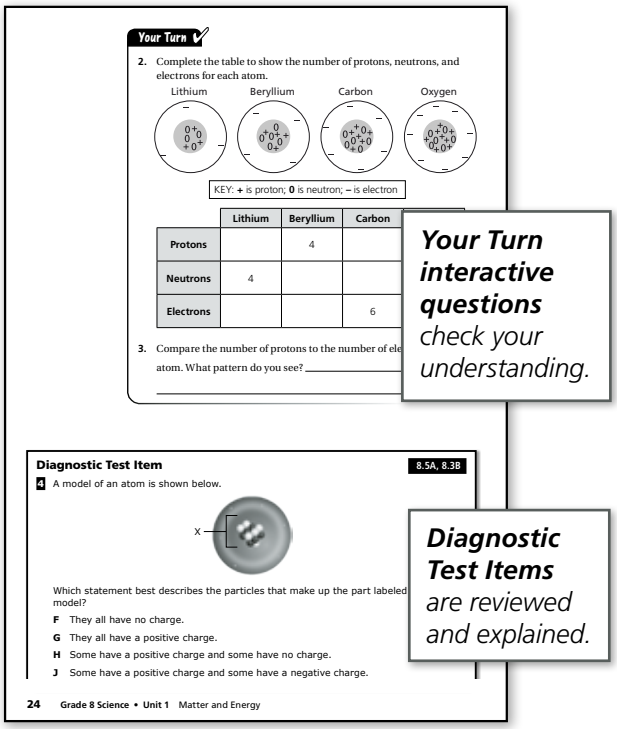
The electron cloud is much bigger than the nucleus. It takes up most of the atom's space. In fact, if the nucleus were the size of a green pea, the electron cloud would be as wide as a football field.

22 Grade 8 Science • Unit 1 Matter and Energy

Full TEKS

Opener activity

***Key terms** are boldface and highlighted.*


Your Turn

2. Complete the table to show the number of protons, neutrons, and electrons for each atom.

Lithium Beryllium Carbon Oxygen

KEY: + is proton; 0 is neutron; – is electron

	Lithium	Beryllium	Carbon
Protons		4	
Neutrons	4		
Electrons			6

3. Compare the number of protons to the number of ele atom. What pattern do you see?

Diagnostic Test Item 8.5A, 8.3B

4 A model of an atom is shown below.

X

Which statement best describes the particles that make up the part labeled model?

F They all have no charge.
G They all have a positive charge.
H Some have a positive charge and some have no charge.
J Some have a positive charge and some have a negative charge.

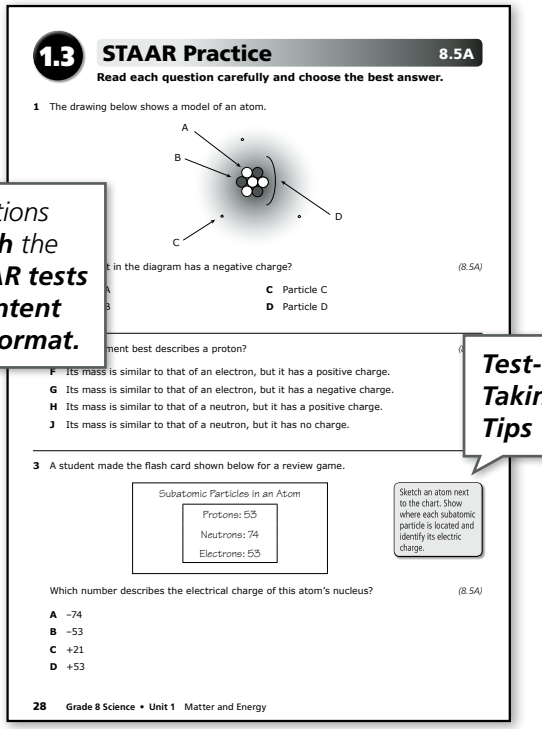
24 Grade 8 Science • Unit 1 Matter and Energy

***Your Turn interactive questions** check your understanding.*

***Diagnostic Test Items** are reviewed and explained.*

STAAR Practice—Abundant and Systematic Practice

Each lesson includes **authentic STAAR practice** with **test-taking tips** and and practice filling in grids.


1.3 STAAR Practice 8.5A

Read each question carefully and choose the best answer.

1 The drawing below shows a model of an atom.

A B C D

t in the diagram has a negative charge? (8.5A)

C Particle C
D Particle D

ment best describes a proton? (

F Its mass is similar to that of an electron, but it has a positive charge.
G Its mass is similar to that of an electron, but it has a negative charge.
H Its mass is similar to that of a neutron, but it has a positive charge.
J Its mass is similar to that of a neutron, but it has no charge.

3 A student made the flash card shown below for a review game.

Subatomic Particles in an Atom
Protons: 53
Neutrons: 74
Electrons: 53

Sketch an atom next to the chart. Show where each subatomic particle is located and identify its electric charge.

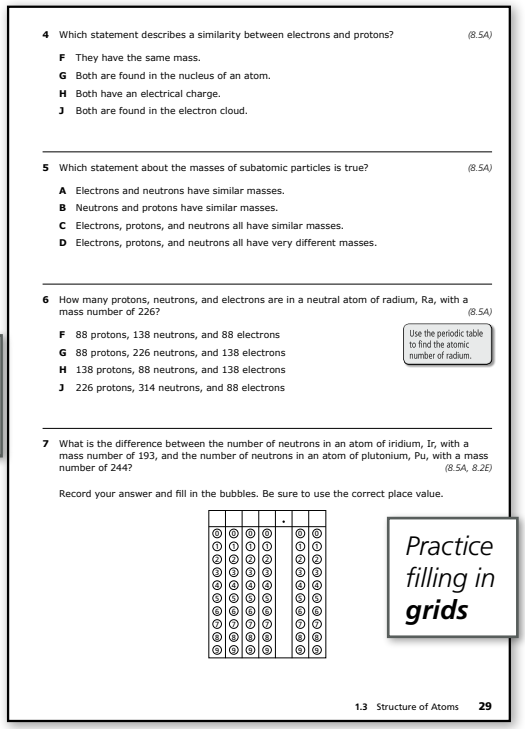
Which number describes the electrical charge of this atom's nucleus? (8.5A)

A –74
B –53
C +21
D +53

28 Grade 8 Science • Unit 1 Matter and Energy

Test-Taking Tips

*Questions **match** the **STAAR tests** in **content** and **format**.*


4 Which statement describes a similarity between electrons and protons? (8.5A)

F They have the same mass.
G Both are found in the nucleus of an atom.
H Both have an electrical charge.
J Both are found in the electron cloud.

5 Which statement about the masses of subatomic particles is true? (8.5A)

A Electrons and neutrons have similar masses.
B Neutrons and protons have similar masses.
C Electrons, protons, and neutrons all have similar masses.
D Electrons, protons, and neutrons all have very different masses.

6 How many protons, neutrons, and electrons are in a neutral atom of radium, Ra, with a mass number of 226? (8.5A)

Use the periodic table to find the atomic number of radium.

F 88 protons, 138 neutrons, and 88 electrons
G 88 protons, 226 neutrons, and 138 electrons
H 138 protons, 88 neutrons, and 138 electrons
J 226 protons, 314 neutrons, and 88 electrons

7 What is the difference between the number of neutrons in an atom of iridium, Ir, with a mass number of 193, and the number of neutrons in an atom of plutonium, Pu, with a mass number of 244? (8.5A, 8.2E)

Record your answer and fill in the bubbles. Be sure to use the correct place value.

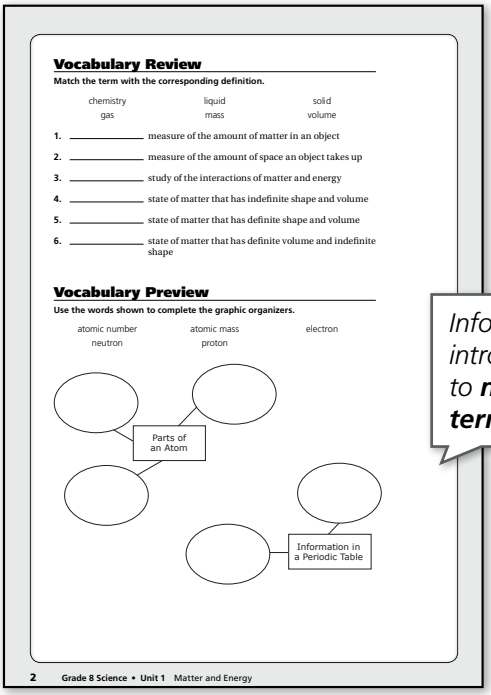
1.3 Structure of Atoms 29

*Practice filling in **grids***

Additional Resources for STAAR Success

Unit Opener—Vocabulary

Review prerequisite vocabulary and **preview new key terms** with an engaging activity.



Vocabulary Review

Match the term with the corresponding definition.

chemistry, gas, liquid, mass, solid, volume

1. _____ measure of the amount of matter in an object
2. _____ measure of the amount of space an object takes up
3. _____ study of the interactions of matter and energy
4. _____ state of matter that has indefinite shape and volume
5. _____ state of matter that has definite shape and volume
6. _____ state of matter that has definite volume and indefinite shape

Vocabulary Preview

Use the words shown to complete the graphic organizers.

atomic number, neutron, atomic mass, proton, electron

Parts of an Atom

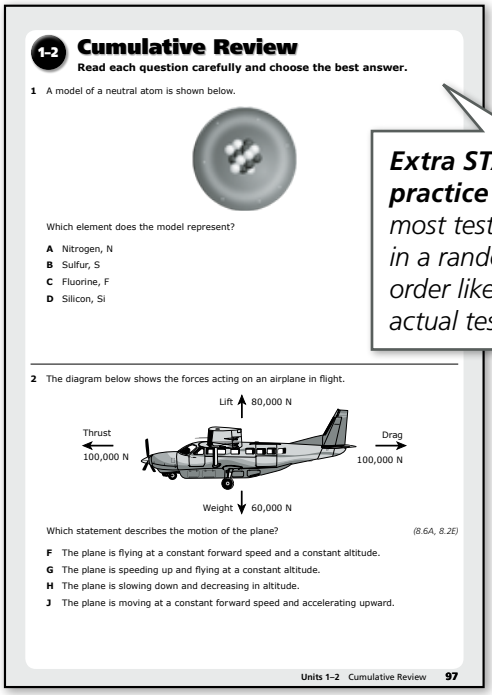
Information in a Periodic Table

2 Grade 8 Science • Unit 1 Matter and Energy

*Informal introduction to **new terms***

Cumulative STAAR Review

Mixed practice provides spaced review to help students remember what they learn.



1-2 Cumulative Review

Read each question carefully and choose the best answer.

1 A model of a neutral atom is shown below.

Which element does the model represent?

A Nitrogen, N
B Sulfur, S
C Fluorine, F
D Silicon, Si

2 The diagram below shows the forces acting on an airplane in flight.

Lift 80,000 N
Thrust 100,000 N
Drag 100,000 N
Weight 60,000 N

Which statement describes the motion of the plane? *(8.6A, 8.2E)*

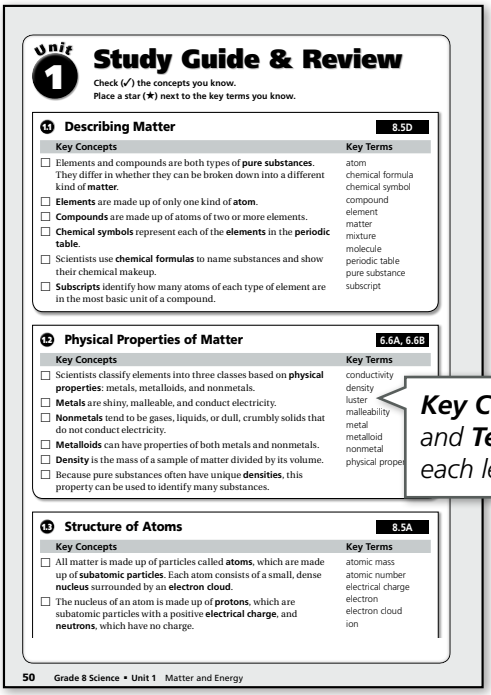
F The plane is flying at a constant forward speed and a constant altitude.
G The plane is speeding up and flying at a constant altitude.
H The plane is slowing down and decreasing in altitude.
J The plane is moving at a constant forward speed and accelerating upward.

Units 1–2 Cumulative Review 97

***Extra STAAR practice** for the most tested TEKS in a random order like the actual test*

Unit Study Guide & Review

Checklists organize the lesson content for quick review of **Key Concepts** and **Key Terms.**



Unit 1 Study Guide & Review

Check (✓) the concepts you know.
Place a star (★) next to the key terms you know.

11 Describing Matter 8.5D

Key Concepts	Key Terms
☐ Elements and compounds are both types of **pure substances**. They differ in whether they can be broken down into a different kind of **matter**.	atom
☐ **Elements** are made up of only one kind of **atom**.	chemical formula
☐ **Compounds** are made up of atoms of two or more elements.	chemical symbol
☐ **Chemical symbols** represent each of the **elements** in the **periodic table**.	compound
☐ Scientists use **chemical formulas** to name substances and show their chemical makeup.	element
☐ **Subscripts** identify how many atoms of each type of element are in the most basic unit of a compound.	matter
	mixture
	molecule
	periodic table
	pure substance
	subscript

12 Physical Properties of Matter 6.6A, 6.6B

Key Concepts	Key Terms
☐ Scientists classify elements into three classes based on **physical properties**: metals, metalloids, and nonmetals.	conductivity
☐ **Metals** are shiny, malleable, and conduct electricity.	density
☐ **Nonmetals** tend to be gases, liquids, or dull, crumbly solids that do not conduct electricity.	luster
☐ **Metalloids** can have properties of both metals and nonmetals.	malleability
☐ **Density** is the mass of a sample of matter divided by its volume.	metal
☐ Because pure substances often have unique **densities**, this property can be used to identify many substances.	metalloid
	nonmetal
	physical prope

13 Structure of Atoms 8.5A

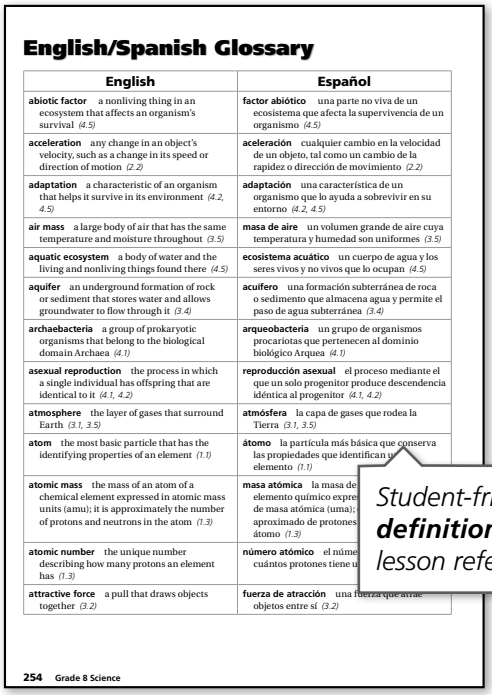
Key Concepts	Key Terms
☐ All matter is made up of particles called **atoms**, which are made up of **subatomic particles**. Each atom consists of a small, dense **nucleus** surrounded by an **electron cloud**.	atomic mass
☐ The nucleus of an atom is made up of **protons**, which are subatomic particles with a positive **electrical charge**, and **neutrons**, which have no charge.	atomic number
	electrical charge
	electron
	electron cloud
	ion

50 Grade 8 Science • Unit 1 Matter and Energy

***Key Concepts** and **Terms** for each lesson*

English/Spanish Glossary

English/Spanish glossary has definitions for over 225 terms.



English/Spanish Glossary

English	Español
abiotic factor a nonliving thing in an ecosystem that affects an organism's survival *(4.5)*	**factor abiótico** una parte no viva de un ecosistema que afecta la supervivencia de un organismo *(4.5)*
acceleration any change in an object's velocity, such as a change in its speed or direction of motion *(2.2)*	**aceleración** cualquier cambio en la velocidad de un objeto, tal como un cambio de la rapidez o dirección de movimiento *(2.2)*
adaptation a characteristic of an organism that helps it survive in its environment *(4.2, 4.5)*	**adaptación** una característica de un organismo que lo ayuda a sobrevivir en su entorno *(4.2, 4.5)*
air mass a large body of air that has the same temperature and moisture throughout *(3.5)*	**masa de aire** un volumen grande de aire cuya temperatura y humedad son uniformes *(3.5)*
aquatic ecosystem a body of water and the living and nonliving things found there *(4.5)*	**ecosistema acuático** un cuerpo de agua y los seres vivos y no vivos que lo ocupan *(4.5)*
aquifer an underground formation of rock or sediment that stores water and allows groundwater to flow through it *(3.4)*	**acuífero** una formación subterránea de roca o sedimento que almacena agua y permite el paso de agua subterránea *(3.4)*
archaebacteria a group of prokaryotic organisms that belong to the biological domain Archaea *(4.1)*	**arqueobacteria** un grupo de organismos procariotas que pertenecen al dominio biológico Arquea *(4.1)*
asexual reproduction the process in which a single individual has offspring that are identical to it *(4.1, 4.2)*	**reproducción asexual** el proceso mediante el que un solo progenitor produce descendencia idéntica al progenitor *(4.1, 4.2)*
atmosphere the layer of gases that surround Earth *(3.1, 3.5)*	**atmósfera** la capa de gases que rodea la Tierra *(3.1, 3.5)*
atom the most basic particle that has the identifying properties of an element *(1.1)*	**átomo** la partícula más básica que conserva las propiedades que identifican a un elemento *(1.1)*
atomic mass the mass of an atom of a chemical element expressed in atomic mass units (amu); it is approximately the number of protons and neutrons in the atom *(1.3)*	**masa atómica** la masa de elemento químico expre de masa atómica (uma); aproximado de protones átomo *(1.3)*
atomic number the unique number describing how many protons an element has *(1.3)*	**número atómico** el núme cuántos protones tiene u
attractive force a pull that draws objects together *(3.2)*	**fuerza de atracción** una objetos entre sí *(3.2)*

254 Grade 8 Science

*Student-friendly **definitions** with lesson references*

Name _____ Class _____ Date _____

Student Progress Monitoring Chart

Use the Diagnostic Tests to identify topics you need to review. Chart your progress using the steps below.

① **Diagnostic** Mark a ✓ in the box under each question that you answered correctly. Find the total correct.

② **Completed** For each unchecked question in ①, circle the Lesson number. After you study the lesson, mark a ✓ in the box for Completed.

③ **Post Test** Mark a ✓ in the box for each question that you answered correctly. Find the total correct. (The Post Test questions are in the exact same order as the Diagnostic Test.)

Unit 1 Matter and Energy

Question	① Diagnostic	Lesson	TEKS	② Completed	③ Post Test
1		1.1	8.5D		
2		1.2	6.6A		
3		1.2	6.6B		
4		1.3	8.5A		
5		1.4	8.5B		
6		1.4	8.5C		
7		1.5	7.6A		
8		1.5	8.5E		
	/ 8				/ 8

Unit 2 Force, Motion, and Energy

Question	① Diagnostic	Lesson	TEKS	② Completed	③ Post Test
1		2.1	6.8A		
2		2.1	6.9C		
3		2.2	6.8C		
4		2.2	8.6B		
5		2.2	6.8D		
6		2.3	8.6C		
7		2.3	8.6A		
	/ 7				/ 7

Unit 3 Earth and Space

Question	① Diagnostic	Lesson	TEKS	② Completed	③ Post Test
1		3.1	8.8C		
2		3.1	8.8A		
3		3.1	8.8B		
4		3.2	6.11B		
5		3.2	8.7A		
6		3.2	8.7B		
7		3.2	8.7C		
8		3.3	8.9A		
9		3.3	8.9B		
10		3.4	7.8C		
11		3.4	8.9C		
12		3.5	8.10A		
13		3.5	8.10B		
14		3.5	8.10C		
	/ 14				/ 14

Unit 4 Organisms and Environments

Question	① Diagnostic	Lesson	TEKS	② Completed	③ Post Test
1		4.1	6.12D		
2		4.1	7.11A		
3		4.2	7.14C		
4		4.2	7.14B		
5		4.2	7.11C		
6		4.3	7.12F		
7		4.3	7.12D		
8		4.4	7.12B		
9		4.5	8.11A		
10		4.5	7.5B		
11		4.6	7.10C		
12		4.6	7.10B		
13		4.7	8.11B		
14		4.7	8.11C		
	/ 14				/ 14

Unit 1

Matter and Energy

Reporting Category 1
The student will demonstrate an understanding of the properties of matter and energy and their interactions.

1.1 Describing Matter (8.5D)
1.2 Physical Properties of Matter (6.6A, 6.6B)
1.3 Structure of Atoms (8.5A)
1.4 Chemical Properties of Matter (8.5B, 8.5C)
1.5 Chemical Reactions (7.6A, 8.5E)

In this unit, you will learn about matter and energy. Matter is the stuff that makes up all objects and materials. Energy is the ability to do work or cause changes in matter. Matter can have different characteristics and ways of behaving. When matter gains or loses energy or comes into contact with other kinds of matter, its characteristics can change.

A firefighter battles flames so hot they change the density of the surrounding air. When a fuel burns in air, it is chemically changed and releases energy in the form of bright flames and a scorching heat.

Get Ready

Name three materials that you have come across today—one that is a solid, one that is a liquid, and one that is a gas.

Vocabulary Review

Match the term with the corresponding definition.

chemistry	liquid	solid
gas	mass	volume

1. _____ measure of the amount of matter in an object

2. _____ measure of the amount of space an object takes up

3. _____ study of the interactions of matter and energy

4. _____ state of matter that has indefinite shape and volume

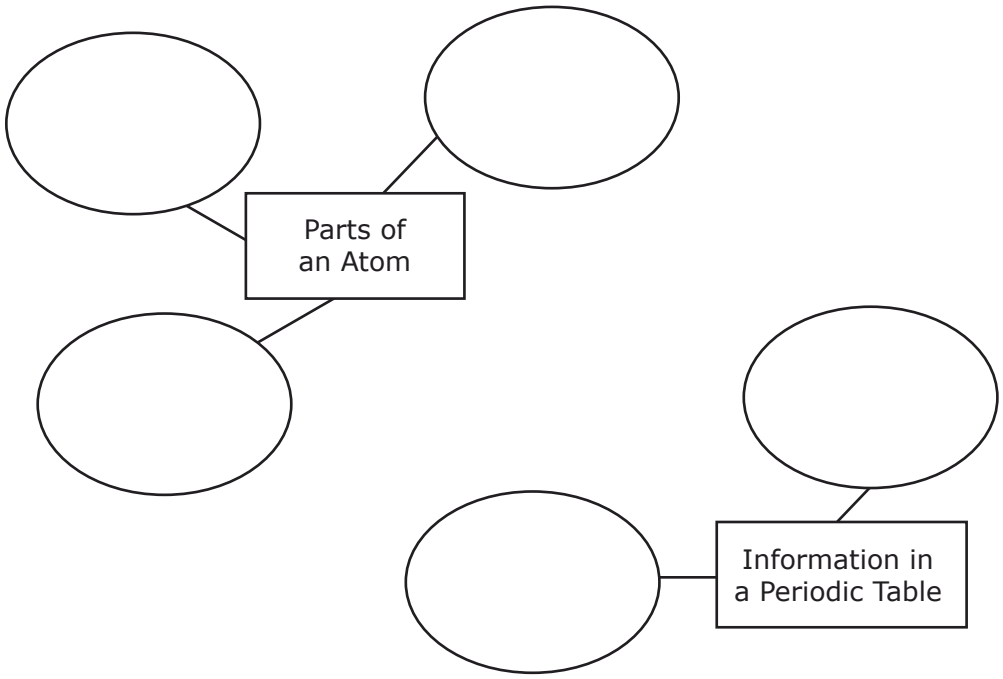
5. _____ state of matter that has definite shape and volume

6. _____ state of matter that has definite volume and indefinite shape

Vocabulary Preview

Use the words shown to complete the graphic organizers.

atomic number	atomic mass	electron
neutron	proton	



1.3 Structure of Atoms

8.5A Describe the structure of atoms, including the masses, electrical charges, and locations, of protons and neutrons in the nucleus and electrons in the electron cloud. *(Readiness)*

What It Means You will learn about the parts that make up an atom—how much mass each part has, what kind of electrical charge it has, and where it is found within the atom.

Get Ready

Atoms are the smallest particles that have the properties of an element, but they are made up of even smaller particles. How would you expect the masses of these particles to compare to the mass of an atom?

Parts of an Atom 8.5A

You have learned that an atom is the smallest particle of an element that still has the properties of that element. So, what would you find if you could divide an atom? The resulting parts would no longer represent that element, because atoms are not solid balls of material. Atoms are made up of even tinier particles called **subatomic particles**. All atoms contain different numbers and arrangements of the same types of particles.

Locations of Subatomic Particles

Three important subatomic particles are **protons**, **neutrons**, and **electrons**. These particles have different properties, which will be described on the next page. They are also found at different places within the atom.

An atom has two main parts: a nucleus and an electron cloud.

- Protons and neutrons make up the atom's nucleus. The **nucleus** is a dense body at the very center of the atom.
- The electrons of an atom are outside of the nucleus in a region called the **electron cloud**.

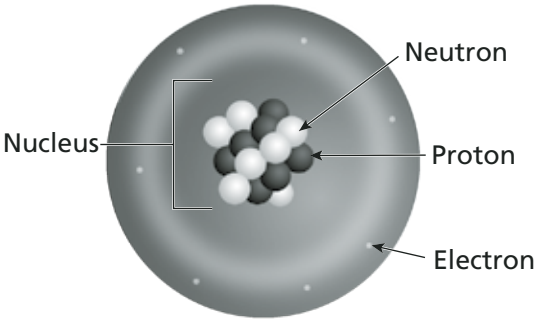
The electron cloud is much bigger than the nucleus. It takes up most of the atom's space. In fact, if the nucleus were the size of a green pea, the electron cloud would be as wide as a football field.

Modeling the Atom

Fun Fact

78% of the air we breathe is nitrogen, and only 21% is oxygen.

The drawing shows a model of an atom of nitrogen. It has a nucleus that consists of seven protons and seven neutrons. The electron cloud surrounding the nucleus contains seven electrons.



Your Turn

1. The nucleus of an atom is much larger than | smaller than the electron cloud.

Properties of Subatomic Particles

Subatomic particles differ in mass, or how much matter they contain. Protons and neutrons have about the same mass—about one **atomic mass unit** (**amu**), which is equal to about 1.7×10^{-27} kg. Electrons, on the other hand, are much less massive. Compared to protons and neutrons, electrons barely have any mass at all. As a result, the nucleus of an atom contains almost all of the atom's mass. The atom as a whole is mostly empty space!

Another way subatomic particles differ is in their **electrical charge**. Electrical charge is a property of matter that can be either positive or negative. Protons have a positive charge. Electrons have a negative charge. Neutrons are **neutral**, which means they do not have a charge. Because the nucleus of an atom consists of only protons and neutrons, it has an overall positive charge. The chart below summarizes three properties of subatomic particles.

Properties of Subatomic Particles

Subatomic Particle	Location	Mass (amu)	Electrical Charge
Proton	nucleus	1	+1
Electron	electron cloud	$\frac{1}{1{,}836}$	–1
Neutron	nucleus	1	0 (no charge)

Think On This

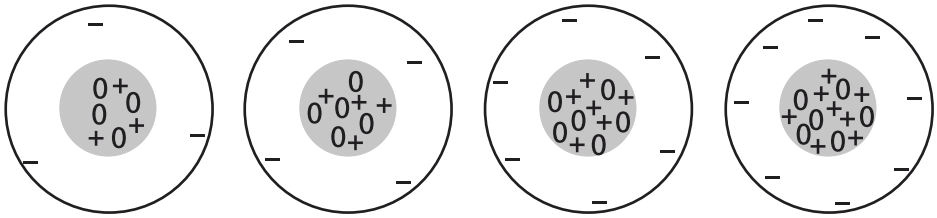
Objects with the same electrical charge repel one another. So what keeps protons together in the nucleus? It turns out there is another force, called the strong nuclear force, that overcomes the electrical repulsion between protons.

The electrical charges of protons and electrons are important because they help hold an atom together. Objects that have opposite electrical charges attract one another. This attraction pulls electrons (which are negatively charged) toward the nucleus of an atom (which is positively charged). This means that even though electrons are constantly moving around the nucleus, they do not fly off.

Your Turn

2. Complete the table to show the number of protons, neutrons, and electrons for each atom.

Lithium Beryllium Carbon Oxygen



KEY: **+** is proton; **0** is neutron; **–** is electron

	Lithium	Beryllium	Carbon	Oxygen
Protons		4		
Neutrons	4			
Electrons			6	

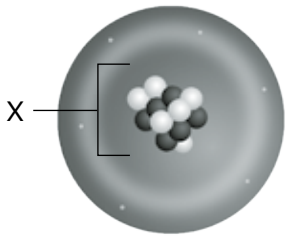
3. Compare the number of protons to the number of electrons in each atom. What pattern do you see? _____

_____

Diagnostic Test Item

8.5A, 8.3B

4 A model of an atom is shown below.



Which statement best describes the particles that make up the part labeled X in the model?

F They all have no charge.

G They all have a positive charge.

H Some have a positive charge and some have no charge.

J Some have a positive charge and some have a negative charge.

Explanation

F The nucleus does contain neutrons, which have no charge, but it also contains protons, which have a positive charge.

G The nucleus does contain protons, which have a positive charge, but it also contains neutrons, which have no charge.

H Correct! The nucleus of an atom is made up of protons, which have a positive charge, and neutrons, which have no charge.

J The nucleus does contain protons. However, there are no electrons in the nucleus, so it does not contain particles that have a negative charge.

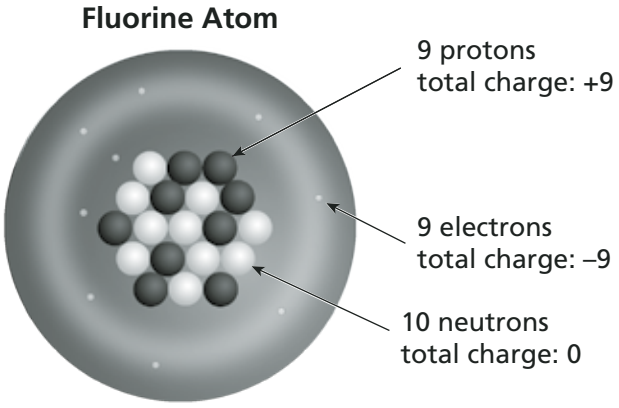
Numbers of Protons, Neutrons, and Electrons 8.5A

Protons

The properties of elements differ because of differences in their atomic structures. One important difference is the number of protons they have. In fact, the number of protons in an atom tells you what element it is. *Every element has a unique number of protons.* This number is called the element's **atomic number**.

Electrons

Although atoms are made up of charged particles, many atoms have no overall electric charge. For example, the fluorine atom shown below has 9 protons and 9 electrons. The +9 charge of the protons and the –9 charge of the electrons cancel out to give a total charge of 0. This makes the atom electrically neutral. *Every neutral atom has the same number of electrons as protons.*



Total charge of atom: +9 + (–9) + 0 = 0

Because the number of electrons in a neutral atom is the same as the number of protons, the number of electrons is also equal to the element's atomic number.

Atoms sometimes gain or lose electrons when they interact with other substances. When they do so, they become charged particles known as **ions**. An atom that has lost one or more electrons is a positive ion, while an atom that has extra electrons is a negative ion.

Neutrons

Did You Know?

Hydrogen is the most abundant element in the universe. It is also the only element whose atoms do not have any neutrons.

While the number of protons and electrons is the same in every neutral atom of a particular element, this is not true for neutrons. *Different atoms of the same element can have different numbers of neutrons.*

The **mass number** of an atom is the sum of the number of protons and neutrons it contains. Because protons and neutrons each have a mass of about one atomic mass unit, while electrons have very little mass, the mass number of an atom is very close to the atom's total mass in atomic mass units.

If you know a neutral atom's mass number and its atomic number, you can determine the number of protons, neutrons, and electrons it has. This is summarized in the box below.

number of protons = atomic number
number of electrons = atomic number
number of neutrons = mass number – atomic number

Your Turn

4. Increasing the number of neutrons in an atom increases its
atomic number | mass number | electrical charge .

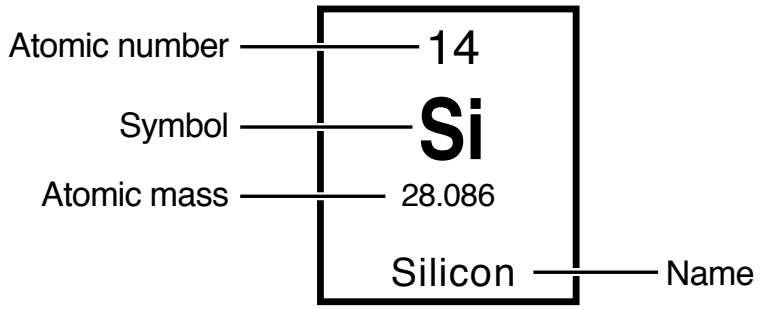
5. Complete the table for a neutral atom of each element.

	Iridium, Ir	Gold, Au	Calcium, Ca
Atomic number	77	79	20
Mass number	192	197	
Number of protons		79	
Number of neutrons	115		20
Number of electrons			

Using the Periodic Table

Inside the back cover of this book, as well as in the Reference Materials for the Science STAAR test, you'll find a chart called the **periodic table**. It arranges all the elements in order of their atomic numbers. Take a look at the information inside one box in the table.

Each box in the periodic table represents an element. In the center of the box is the element's chemical symbol, and at the bottom is the element's name. There are also two numbers in the box. At the top is the element's atomic number. Below the chemical symbol is the element's atomic mass.



The **atomic mass** shown for each element is the *average* mass of one atom of that element. It is similar to an atom's mass number, but not quite the same. You may notice that most of the atomic masses shown are decimals, rather than whole numbers. That is because each one is a weighted average of the masses of all the atoms of an element.

For example, the element boron, B, has an atomic number of 5. This means every neutral atom of boron has 5 protons and 5 electrons. However, not all boron atoms have the same number of neutrons. Some have 5 neutrons, for a total mass of 5 + 5 = 10 amu. Others have 6 neutrons, for a total mass of 5 + 6 = 11 amu. It turns out that in a sample of boron, there are about four times as many of the heavier boron atoms as the lighter boron atoms. Averaging the mass of the two kinds of boron atoms gives the atomic mass of 10.812 listed in the periodic table.

Your Turn ✓

6. The numbers 208 and 207.2 both relate to the mass of an atom of lead (Pb). Complete the statements to explain how you know which one is the mass number and which one is the average atomic mass.

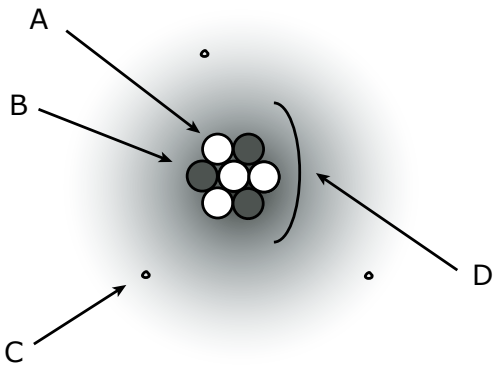
The whole number, _____, is the _____.

The decimal, _____, is the _____.

1.3 STAAR Practice 8.5A

Read each question carefully and choose the best answer.

1 The drawing below shows a model of an atom.



Which object in the diagram has a negative charge? *(8.5A)*

A Particle A

B Particle B

C Particle C

D Particle D

---

2 Which statement best describes a proton? *(8.5A)*

F Its mass is similar to that of an electron, but it has a positive charge.

G Its mass is similar to that of an electron, but it has a negative charge.

H Its mass is similar to that of a neutron, but it has a positive charge.

J Its mass is similar to that of a neutron, but it has no charge.

---

3 A student made the flash card shown below for a review game.

Subatomic Particles in an Atom

Protons: 53

Neutrons: 74

Electrons: 53

Sketch an atom next to the chart. Show where each subatomic particle is located and identify its electric charge.

Which number describes the electrical charge of this atom's nucleus? *(8.5A)*

A –74

B –53

C +21

D +53

4 Which statement describes a similarity between electrons and protons? *(8.5A)*

F They have the same mass.

G Both are found in the nucleus of an atom.

H Both have an electrical charge.

J Both are found in the electron cloud.

---

5 Which statement about the masses of subatomic particles is true? *(8.5A)*

A Electrons and neutrons have similar masses.

B Neutrons and protons have similar masses.

C Electrons, protons, and neutrons all have similar masses.

D Electrons, protons, and neutrons all have very different masses.

---

6 How many protons, neutrons, and electrons are in a neutral atom of radium, Ra, with a mass number of 226? *(8.5A)*

Use the periodic table to find the atomic number of radium.

F 88 protons, 138 neutrons, and 88 electrons

G 88 protons, 226 neutrons, and 138 electrons

H 138 protons, 88 neutrons, and 138 electrons

J 226 protons, 314 neutrons, and 88 electrons

---

7 What is the difference between the number of neutrons in an atom of iridium, Ir, with a mass number of 193, and the number of neutrons in an atom of plutonium, Pu, with a mass number of 244? *(8.5A, 8.2E)*

Record your answer and fill in the bubbles. Be sure to use the correct place value.

				•		
⓪	⓪	⓪	⓪		⓪	⓪
①	①	①	①		①	①
②	②	②	②		②	②
③	③	③	③		③	③
④	④	④	④		④	④
⑤	⑤	⑤	⑤		⑤	⑤
⑥	⑥	⑥	⑥		⑥	⑥
⑦	⑦	⑦	⑦		⑦	⑦
⑧	⑧	⑧	⑧		⑧	⑧
⑨	⑨	⑨	⑨		⑨	⑨

Unit 1

Study Guide & Review

Check (✓) the concepts you know.
Place a star (★) next to the key terms you know.

1.1 Describing Matter

8.5D

Key Concepts	Key Terms
☐ Elements and compounds are both types of **pure substances**. They differ in whether they can be broken down into a different kind of **matter**.	atom
☐ **Elements** are made up of only one kind of **atom**.	chemical formula
☐ **Compounds** are made up of atoms of two or more elements.	chemical symbol
☐ **Chemical symbols** represent each of the **elements** in the **periodic table**.	compound
☐ Scientists use **chemical formulas** to name substances and show their chemical makeup.	element
☐ **Subscripts** identify how many atoms of each type of element are in the most basic unit of a compound.	matter
	mixture
	molecule
	periodic table
	pure substance
	subscript

1.2 Physical Properties of Matter

6.6A, 6.6B

Key Concepts	Key Terms
☐ Scientists classify elements into three classes based on **physical properties**: metals, metalloids, and nonmetals.	conductivity
☐ **Metals** are shiny, malleable, and conduct electricity.	density
☐ **Nonmetals** tend to be gases, liquids, or dull, crumbly solids that do not conduct electricity.	luster
☐ **Metalloids** can have properties of both metals and nonmetals.	malleability
☐ **Density** is the mass of a sample of matter divided by its volume.	metal
☐ Because pure substances often have unique **densities**, this property can be used to identify many substances.	metalloid
	nonmetal
	physical property

1.3 Structure of Atoms

8.5A

Key Concepts	Key Terms
☐ All matter is made up of particles called **atoms**, which are made up of **subatomic particles**. Each atom consists of a small, dense **nucleus** surrounded by an **electron cloud**.	atomic mass
☐ The nucleus of an atom is made up of **protons**, which are subatomic particles with a positive **electrical charge**, and **neutrons**, which have no charge.	atomic number
	electrical charge
	electron
	electron cloud
	ion

1.3 Structure of Atoms, *continued*

8.5A

Key Concepts	Key Terms
☐ **Electrons**, which have a negative charge, are found in the **electron cloud**.	mass number
☐ The **atomic number** of an element is the number of protons in an atom of that element. In a neutral atom, the number of electrons is equal to the number of protons.	neutral
☐ The **mass number** of an atom is the sum of the number of protons and the number of neutrons.	neutron
	nucleus
	proton
	subatomic particle

1.4 Chemical Properties of Matter

8.5B, 8.5C

Key Concepts	Key Terms
☐ The number of protons in the nucleus of an atom (the **atomic number**) identifies which element it is.	atomic number
☐ **Valence electrons** are the electrons in the outermost **energy level** of an atom. The number of valence electrons determines the **chemical properties** of an element, including its **reactivity**.	chemical bond
☐ Scientists arrange the elements in the **periodic table** by increasing atomic number.The rows of the periodic table are called **periods**, while the columns are called **groups**.	chemical property
☐ Period number identifies the number of energy levels an element's electrons occupy.	energy level
☐ Group number helps identify the number of valence electrons an element has. Elements in a group have similar properties.	group
	period
	periodic table
	reactivity
	valence electron

1.5 Chemical Reactions

7.6A, 8.5E

Key Concepts	Key Terms
☐ A **physical change** affects the physical properties of a substance without changing its identity. Changes in size or shape, changes of state, mixing, and separating are physical changes.	chemical change
☐ A **chemical change** or **chemical reaction** is a process in which one or more substances change to form one or more new substances with different chemical makeups.	chemical equation
☐ Evidence of a chemical reaction includes a change in properties, formation of a new material, or a change in energy.	chemical reaction
☐ Scientists use **chemical equations** to describe how **reactants** undergo change to form **products** in a chemical reaction.	coefficient
☐ According to the **law of conservation of mass**, matter cannot be created or destroyed. This means that the reactants have the same mass as the products and are made up of the same numbers and types of atoms.	law of conservation of mass
	physical change
	product
	reactant

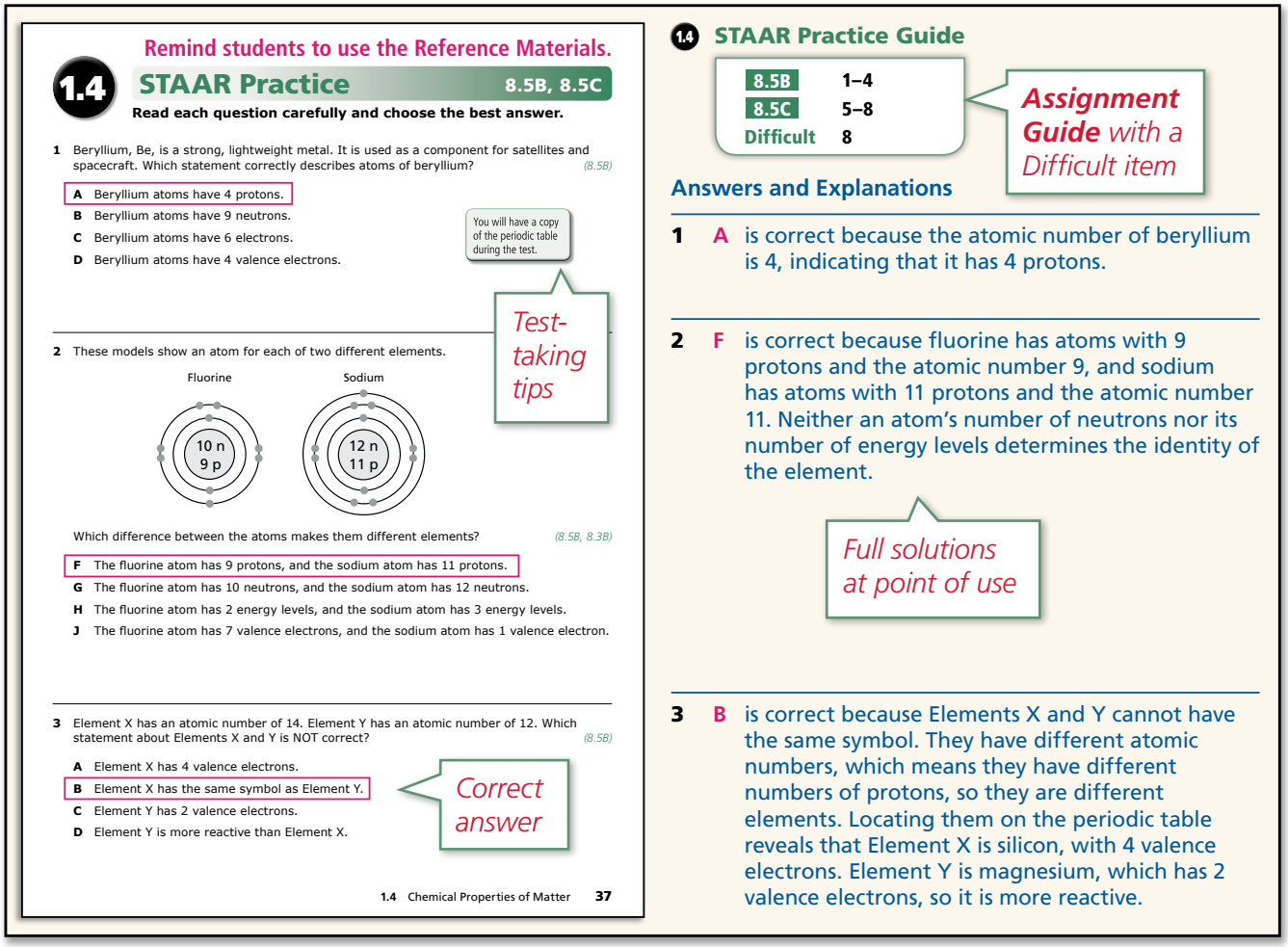
Using This Teacher's Edition

This workbook was created to support teachers in helping students succeed on the STAAR Grade 8 Science exam. It provides comprehensive and systematic **instruction** and **practice** for all 43 tested content TEKS from **Grades 6, 7, and 8**.

The workbook is organized into **four units** that align with the four Reporting Categories. Each unit begins with a **Diagnostic Test** that can serve as a baseline or to identify students' needs, followed by **Lessons** with ample STAAR Practice, and finally a **Post Test** to monitor progress. (The Post Test questions are in the exact same order as the Diagnostic Test and include all tested TEKS.)

STAAR Practice Support for Teachers

This workbook contains **over 225 STAAR** test items that closely match released STAAR tests. About 50% of the items include a stimulus such as diagrams, tables, graphs, photos, etc. Each STAAR item includes a **full solution** to help teachers or tutors facilitate understanding.



Unit 1

Matter and Energy

Reporting Category 1
The student will demonstrate an understanding of the properties of matter and energy and their interactions.

1.1 Describing Matter (8.5D)
1.2 Physical Properties of Matter (6.6A, 6.6B)
1.3 Structure of Atoms (8.5A)
1.4 Chemical Properties of Matter (8.5B, 8.5C)
1.5 Chemical Reactions (7.6A, 8.5E)

In this unit, you will learn about matter and energy. Matter is the stuff that makes up all objects and materials. Energy is the ability to do work or cause changes in matter. Matter can have different characteristics and ways of behaving. When matter gains or loses energy or comes into contact with other kinds of matter, its characteristics can change.

A firefighter battles flames so hot they change the density of the surrounding air. When a fuel burns in air, it is chemically changed and releases energy in the form of bright flames and a scorching heat.

Get Ready

Name three materials that you have come across today—one that is a solid, one that is a liquid, and one that is a gas.

I have come across solid copper in a penny, liquid water in the shower, and gaseous air that I am breathing.

Vocabulary Review

Match the term with the corresponding definition.

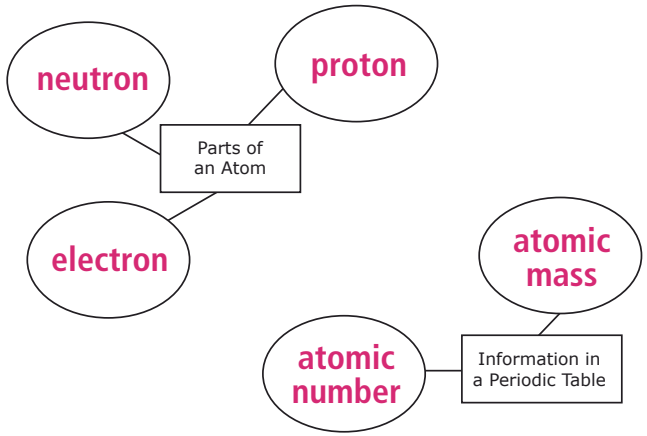
chemistry gas liquid mass solid volume

1. mass — measure of the amount of matter in an object
2. volume — measure of the amount of space an object takes up
3. chemistry — study of the interactions of matter and energy
4. gas — state of matter that has indefinite shape and volume
5. solid — state of matter that has definite shape and volume
6. liquid — state of matter that has definite volume and indefinite shape

Vocabulary Preview

Use the words shown to complete the graphic organizers.

atomic number neutron atomic mass proton electron



1.3 Structure of Atoms

8.5A Describe the structure of atoms, including the masses, electrical charges, and locations, of protons and neutrons in the nucleus and electrons in the electron cloud. *(Readiness)*

What It Means You will learn about the parts that make up an atom—how much mass each part has, what kind of electrical charge it has, and where it is found within the atom.

Get Ready

Atoms are the smallest particles that have the properties of an element, but they are made up of even smaller particles. How would you expect the masses of these particles to compare to the mass of an atom?

The combined mass of all of the particles that make up an atom is equal to the mass of the atom.

Parts of an Atom 8.5A

You have learned that an atom is the smallest particle of an element that still has the properties of that element. So, what would you find if you could divide an atom? The resulting parts would no longer represent that element, because atoms are not solid balls of material. Atoms are made up of even tinier particles called **subatomic particles**. All atoms contain different numbers and arrangements of the same types of particles.

Locations of Subatomic Particles

Three important subatomic particles are **protons**, **neutrons**, and **electrons**. These particles have different properties, which will be described on the next page. They are also found at different places within the atom.

An atom has two main parts: a nucleus and an electron cloud.

- Protons and neutrons make up the atom's nucleus. The **nucleus** is a dense body at the very center of the atom.
- The electrons of an atom are outside of the nucleus in a region called the **electron cloud**.

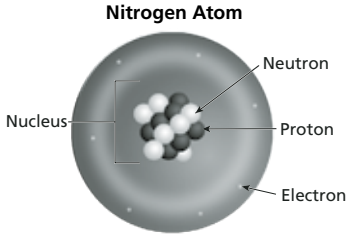
The electron cloud is much bigger than the nucleus. It takes up most of the atom's space. In fact, if the nucleus were the size of a green pea, the electron cloud would be as wide as a football field.

Modeling the Atom

Fun Fact

78% of the air we breathe is nitrogen, and only 21% is oxygen.

The drawing shows a model of an atom of nitrogen. It has a nucleus that consists of seven protons and seven neutrons. The electron cloud surrounding the nucleus contains seven electrons.



Your Turn

1. The nucleus of an atom is much larger than | smaller than the electron cloud.

Properties of Subatomic Particles

Subatomic particles differ in mass, or how much matter they contain. Protons and neutrons have about the same mass—about one **atomic mass unit** (**amu**), which is equal to about 1.7×10^{-27} kg. Electrons, on the other hand, are much less massive. Compared to protons and neutrons, electrons barely have any mass at all. As a result, the nucleus of an atom contains almost all of the atom's mass. The atom as a whole is mostly empty space!

Another way subatomic particles differ is in their **electrical charge**. Electrical charge is a property of matter that can be either positive or negative. Protons have a positive charge. Electrons have a negative charge. Neutrons are **neutral**, which means they do not have a charge. Because the nucleus of an atom consists of only protons and neutrons, it has an overall positive charge. The chart below summarizes three properties of subatomic particles.

Think On This

Objects with the same electrical charge repel one another. So what keeps protons together in the nucleus? It turns out there is another force, called the strong nuclear force, that overcomes the electrical repulsion between protons.

Properties of Subatomic Particles

Subatomic Particle	Location	Mass (amu)	Electrical Charge
Proton	nucleus	1	+1
Electron	electron cloud	$\frac{1}{1,836}$	–1
Neutron	nucleus	1	0 (no charge)

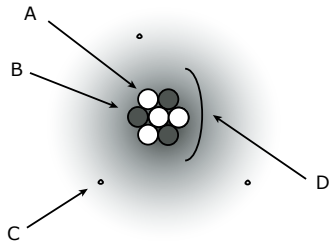
The electrical charges of protons and electrons are important because they help hold an atom together. Objects that have opposite electrical charges attract one another. This attraction pulls electrons (which are negatively charged) toward the nucleus of an atom (which is positively charged). This means that even though electrons are constantly moving around the nucleus, they do not fly off.

Remind students to use the Reference Materials.

1.3 STAAR Practice 8.5A

Read each question carefully and choose the best answer.

1 The drawing below shows a model of an atom.



Which object in the diagram has a negative charge? *(8.5A)*

A Particle A
B Particle B
C Particle C
D Particle D

2 Which statement best describes a proton? *(8.5A)*

F Its mass is similar to that of an electron, but it has a positive charge.
G Its mass is similar to that of an electron, but it has a negative charge.
H Its mass is similar to that of a neutron, but it has a positive charge.
J Its mass is similar to that of a neutron, but it has no charge.

3 A student made the flash card shown below for a review game.

Subatomic Particles in an Atom

Protons: 53
Neutrons: 74
Electrons: 53

Sketch an atom next to the chart. Show where each subatomic particle is located and identify its electric charge.

Which number describes the electrical charge of this atom's nucleus? *(8.5A)*

A −74
B −53
C +21
D +53

1.3 STAAR Practice Guide

8.5A	1–7
Difficult	7

Answers and Explanations

1 **C** is correct because electrons, which are located in the electron cloud of an atom, have a negative charge.

2 **H** is correct because protons and neutrons have similar masses, but neutrons do not have a charge, while protons have a positive charge.

3 **D** is correct because the nucleus consists of neutrons and protons, and each proton has a charge of +1.

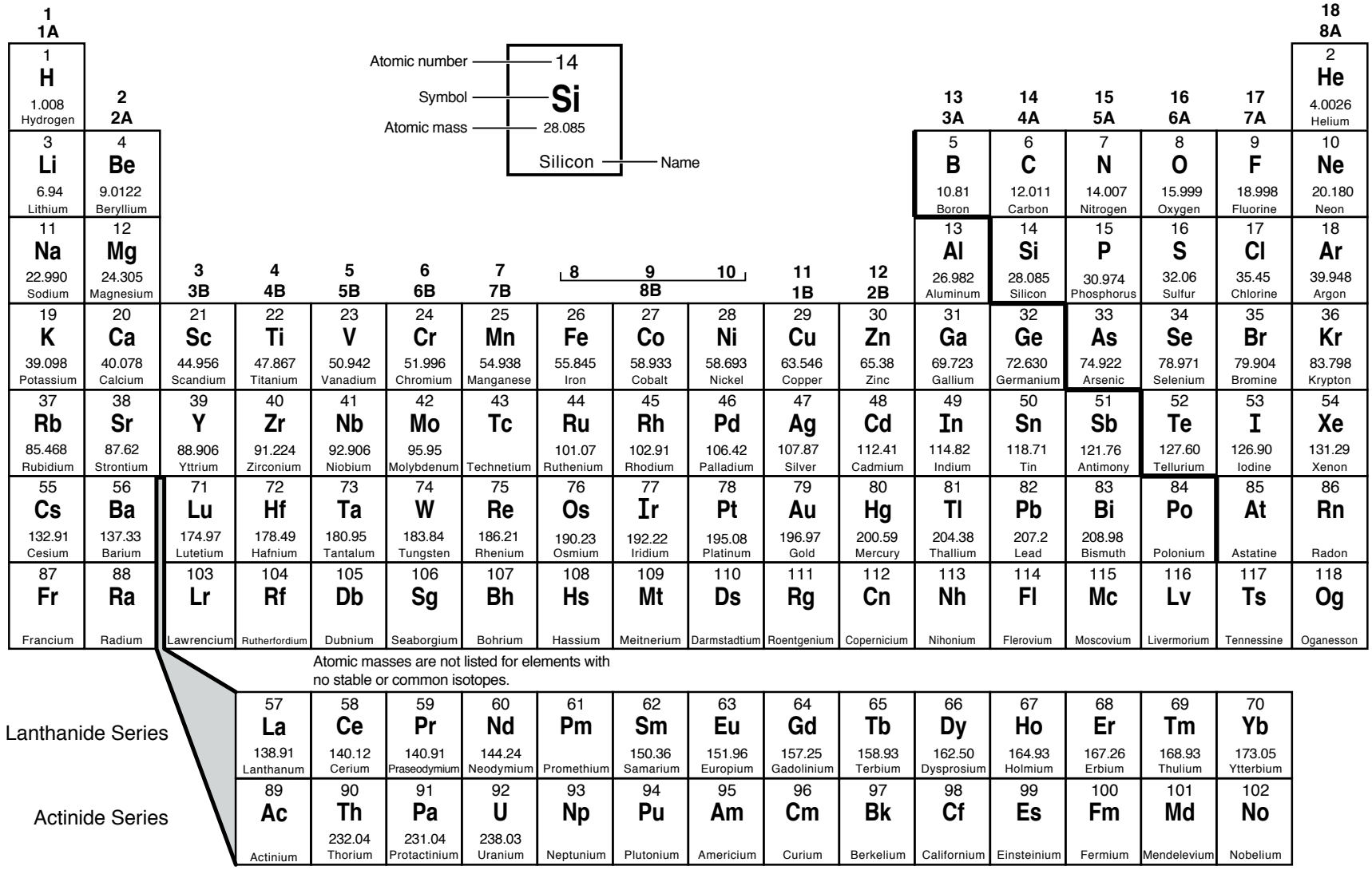
To obtain a copy of the remaining answers to this Sampler, email:

Teachers@SiriusEducationSolutions.com

Teacher's Edition Sampler

STAAR GRADE 8 SCIENCE REFERENCE MATERIALS

PERIODIC TABLE OF THE ELEMENTS



	1 1A												13 3A	14 4A	15 5A	16 6A	17 7A	18 8A
1	1 H 1.008 Hydrogen	2 2A																2 He 4.0026 Helium
2	3 Li 6.94 Lithium	4 Be 9.0122 Beryllium											5 B 10.81 Boron	6 C 12.011 Carbon	7 N 14.007 Nitrogen	8 O 15.999 Oxygen	9 F 18.998 Fluorine	10 Ne 20.180 Neon
3	11 Na 22.990 Sodium	12 Mg 24.305 Magnesium	3 3B	4 4B	5 5B	6 6B	7 7B	8	9 8B	10	11 1B	12 2B	13 Al 26.982 Aluminum	14 Si 28.085 Silicon	15 P 30.974 Phosphorus	16 S 32.06 Sulfur	17 Cl 35.45 Chlorine	18 Ar 39.948 Argon
4	19 K 39.098 Potassium	20 Ca 40.078 Calcium	21 Sc 44.956 Scandium	22 Ti 47.867 Titanium	23 V 50.942 Vanadium	24 Cr 51.996 Chromium	25 Mn 54.938 Manganese	26 Fe 55.845 Iron	27 Co 58.933 Cobalt	28 Ni 58.693 Nickel	29 Cu 63.546 Copper	30 Zn 65.38 Zinc	31 Ga 69.723 Gallium	32 Ge 72.630 Germanium	33 As 74.922 Arsenic	34 Se 78.971 Selenium	35 Br 79.904 Bromine	36 Kr 83.798 Krypton
5	37 Rb 85.468 Rubidium	38 Sr 87.62 Strontium	39 Y 88.906 Yttrium	40 Zr 91.224 Zirconium	41 Nb 92.906 Niobium	42 Mo 95.95 Molybdenum	43 Tc Technetium	44 Ru 101.07 Ruthenium	45 Rh 102.91 Rhodium	46 Pd 106.42 Palladium	47 Ag 107.87 Silver	48 Cd 112.41 Cadmium	49 In 114.82 Indium	50 Sn 118.71 Tin	51 Sb 121.76 Antimony	52 Te 127.60 Tellurium	53 I 126.90 Iodine	54 Xe 131.29 Xenon
6	55 Cs 132.91 Cesium	56 Ba 137.33 Barium	71 Lu 174.97 Lutetium	72 Hf 178.49 Hafnium	73 Ta 180.95 Tantalum	74 W 183.84 Tungsten	75 Re 186.21 Rhenium	76 Os 190.23 Osmium	77 Ir 192.22 Iridium	78 Pt 195.08 Platinum	79 Au 196.97 Gold	80 Hg 200.59 Mercury	81 Tl 204.38 Thallium	82 Pb 207.2 Lead	83 Bi 208.98 Bismuth	84 Po Polonium	85 At Astatine	86 Rn Radon
7	87 Fr Francium	88 Ra Radium	103 Lr Lawrencium	104 Rf Rutherfordium	105 Db Dubnium	106 Sg Seaborgium	107 Bh Bohrium	108 Hs Hassium	109 Mt Meitnerium	110 Ds Darmstadtium	111 Rg Roentgenium	112 Cn Copernicium	113 Nh Nihonium	114 Fl Flerovium	115 Mc Moscovium	116 Lv Livermorium	117 Ts Tennessine	118 Og Oganesson

Lanthanide Series	57 La 138.91 Lanthanum	58 Ce 140.12 Cerium	59 Pr 140.91 Praseodymium	60 Nd 144.24 Neodymium	61 Pm Promethium	62 Sm 150.36 Samarium	63 Eu 151.96 Europium	64 Gd 157.25 Gadolinium	65 Tb 158.93 Terbium	66 Dy 162.50 Dysprosium	67 Ho 164.93 Holmium	68 Er 167.26 Erbium	69 Tm 168.93 Thulium	70 Yb 173.05 Ytterbium
Actinide Series	89 Ac Actinium	90 Th 232.04 Thorium	91 Pa 231.04 Protactinium	92 U 238.03 Uranium	93 Np Neptunium	94 Pu Plutonium	95 Am Americium	96 Cm Curium	97 Bk Berkelium	98 Cf Californium	99 Es Einsteinium	100 Fm Fermium	101 Md Mendelevium	102 No Nobelium

SAMPLER

GRADE 8 SCIENCE CONTENTS

Unit 1 Matter and Energy

1.1 Describing Matter
1.2 Physical Properties of Matter
1.3 Structure of Atoms
1.4 Chemical Properties of Matter
1.5 Chemical Reactions

Unit 2 Force, Motion, and Energy

2.1 Energy
2.2 Motion
2.3 Force and Newton's Laws

Unit 3 Earth and Space

3.1 The Universe
3.2 Earth, Sun, and Moon
3.3 Formation of Earth's Surface
3.4 Earth's Landforms
3.5 Earth's Atmosphere and Oceans

Unit 4 Organisms and Environments

4.1 Classification of Organisms
4.2 Variation and Heredity
4.3 Structure and Function of Cells
4.4 Human Body Systems
4.5 Relationships Between Living and Nonliving Things
4.6 Change and Stability in Ecosystems
4.7 Effects of Environmental Change

Use with your class for free!

Visit SiriusEducationSolutions.com for additional Grade 8 STAAR resources.

SIRIUS EDUCATION SOLUTIONS

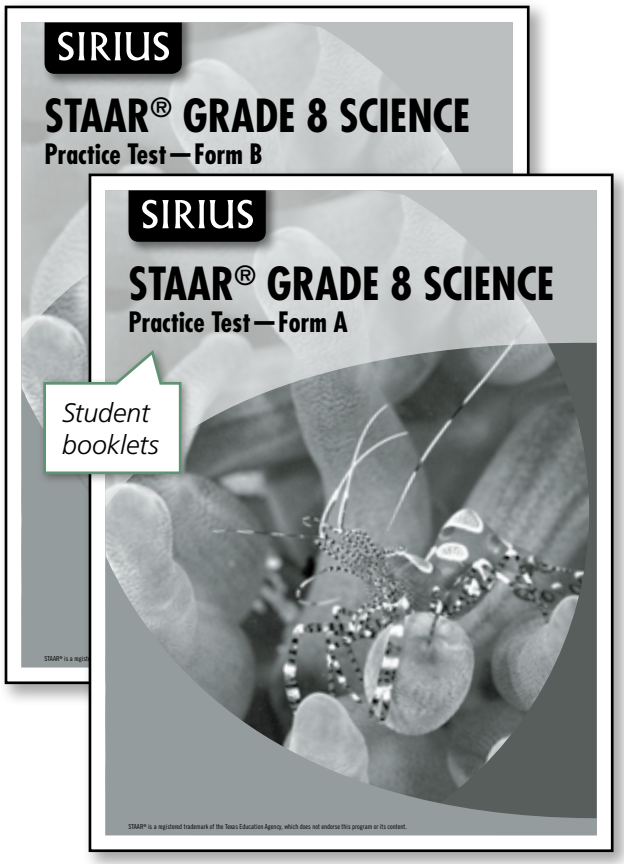
Printed in Texas on recycled paper.

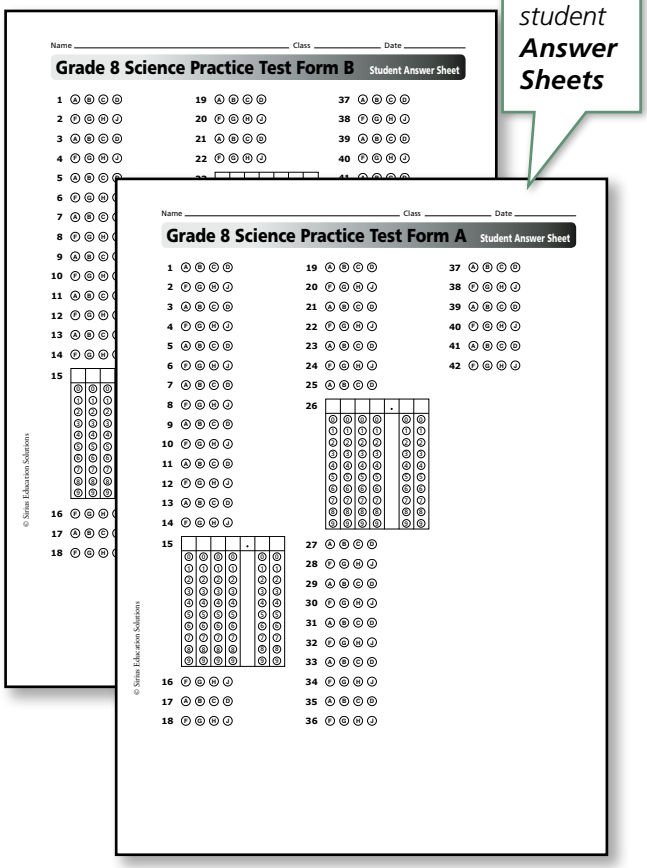
9 781943 008209 >

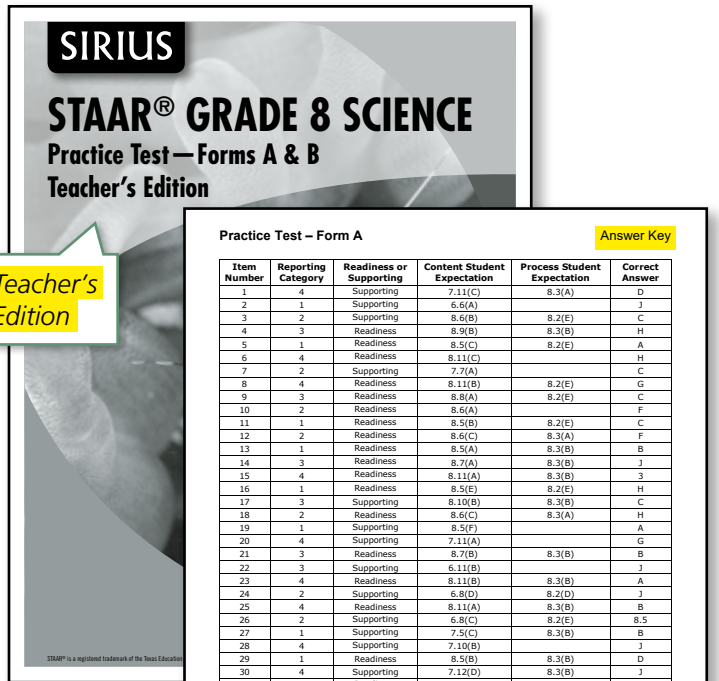
STAAR GRADE 8 SCIENCE

STAAR Practice Tests Forms A & B

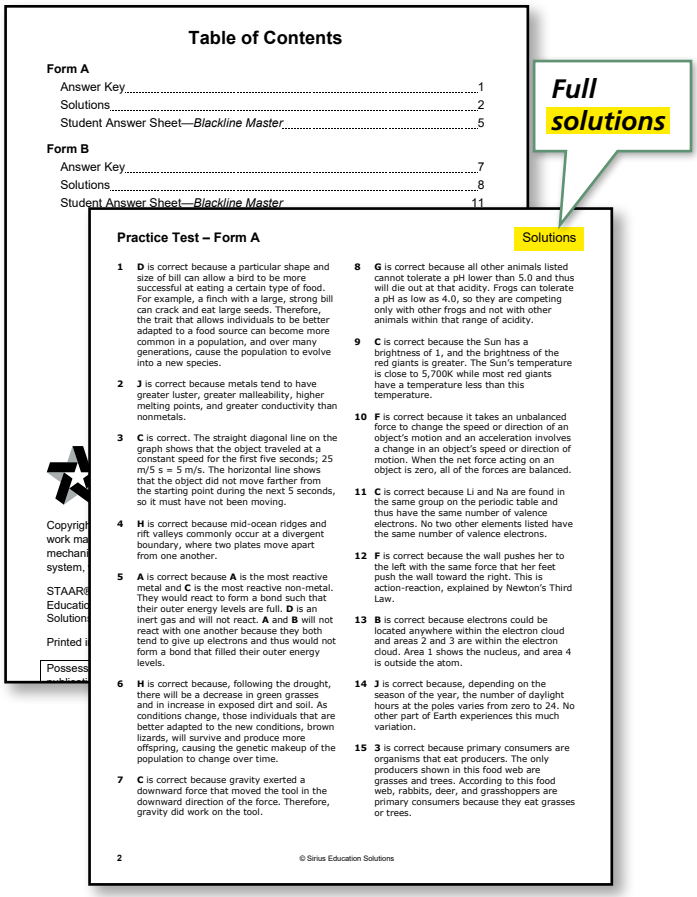
Two distinct secure form tests that closely match the released STAAR test items and blueprint.







Item Number	Reporting Category	Readiness or Supporting	Content Student Expectation	Process Student Expectation	Correct Answer
1	4	Supporting	7.11(C)	8.3(A)	D
2	1	Supporting	6.6(A)		J
3	2	Supporting	8.6(B)	8.2(E)	C
4	3	Readiness	8.9(B)	8.3(B)	H
5	1	Readiness	8.5(C)	8.2(E)	A
6	4	Readiness	8.11(C)		H
7	2	Supporting	7.7(A)		C
8	4	Readiness	8.11(B)	8.2(E)	G
9	3	Readiness	8.8(A)	8.2(E)	C
10	2	Readiness	8.6(A)		F
11	1	Readiness	8.5(B)	8.2(E)	C
12	2	Readiness	8.6(C)	8.3(A)	F
13	1	Readiness	8.5(A)	8.3(B)	B
14	3	Readiness	8.7(A)	8.3(B)	J
15	4	Readiness	8.11(A)	8.3(B)	3
16	1	Readiness	8.5(E)	8.2(E)	H
17	3	Supporting	8.10(B)	8.3(B)	C
18	2	Readiness	8.6(C)	8.3(A)	H
19	1	Supporting	8.5(F)		A
20	4	Supporting	7.11(A)		G
21	3	Readiness	8.7(B)	8.3(B)	B
22	3	Supporting	6.11(B)		J
23	4	Readiness	8.11(B)	8.3(B)	A
24	2	Supporting	6.8(D)	8.2(D)	J
25	4	Readiness	8.11(A)	8.3(B)	B
26	2	Supporting	6.8(C)	8.2(E)	8.5
27	1	Supporting	7.5(C)	8.3(B)	B
28	4	Supporting	7.10(B)		J
29	1	Readiness	8.5(B)	8.3(B)	D
30	4	Supporting	7.12(D)	8.3(B)	J
31	3	Readiness	8.9(B)	8.3(B)	D
32	2	Readiness	8.6(A)	8.3(B)	G
33	1	Readiness	8.5(C)	8.3(B)	D
34	3	Supporting	7.8(C)	8.3(B)	J
35	4	Readiness	8.11(A)		D
36	1	Supporting	6.5(C)	8.3(B)	J
37	3	Readiness	8.8(A)		B
38	4	Readiness	8.11(C)		G
39	3	Readiness	8.7(A)	8.3(B)	A
40	1	Readiness	8.5(E)	8.2(E)	G
41	3	Supporting	8.7(C)	8.3(B)	A
42	2	Readiness	8.6(A)		F



Practice Tests are sold in 10-packs: 10 Form A & 10 Form B student booklets with bubble sheets, and 1 Teacher's Edition