UNIT 2 Exploring Matter

Using Your Appendices, pages 46–47

Tests may vary. Students should test only one variable at a time and get teacher approval before performing the test. Students should perform test several times and modify test as needed. Students' conclusions should indicate if the test results support their hypotheses.

Topic 2.1: In what ways do chemicals affect your life?

Reading Check, page 48–49

1. Matter is anything that has mass and volume.
2. Benzene is hazardous because it can cause cancer.
3. Answers may vary. For example: wear your safety goggles, never leave an open flame unattended, avoid contact with chemicals, or never taste chemicals.

Cloze Activity, page 50

1. matter
2. chemical
3. useful; hazardous
4. environment
5. decompose
6. polyvinyl alcohol (PVA)
7. safety goggles
8. fire
9. poisonous
10. materials
11. taste
12. lab apron; gloves

Interpreting Illustrations, page 51

Answers may vary.

Unsafe Situation	Possible Injury
1. Students are not wearing safety glasses.	Students' eyes could be harmed by chemicals.
2. Electrical cord is in the sink.	Students could be electrocuted.
3. Student is listening to MP3 player.	Student might harm herself or others because she did not hear teacher's instructions.
4. Student's hair is near the Bunsen burner.	Student's hair could catch on fire.

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Unsafe Situation	Possible Injury
5. Student is throwing a jar.	Jar could hit someone or knock over chemicals or equipment.
6. Student is drinking in lab.	Student's drink could be contaminated by chemicals, making her sick.
7. Student is pouring something down the sink.	Chemical could poison water supply or react with metal pipes.

Analyze the Information, page 52

1.

Plus	Minus	Interesting
PERC works better than water at removing oils and grease from clothes because its chemical structure is like oils and grease.	High levels of PERC can affect the nervous system.	Dry cleaning uses a liquid, so it is not really dry.
Dirty solvent is reused	PERC can cause dizziness, unconsciousness and death.	
New machines use 50% less solvent.	Some reports suggest PERC can cause cancer.	

2. Accept all reasonable answers. Students should support their opinions with evidence from the text.

Assessment, page 53

1. C

2. D

3. F

4. A

5. C

6. B

7. C

8. D

9. A

10. Answers may vary. For example:

a) food

b) electricity

11. Plastic bags do not decompose over time.

12. Answers could include effectiveness, impact on the environment, and price.

13. No. Every chemical has hazards and benefits.

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Topic 2.2: How do we use properties to help us describe matter?

Reading Check, page 54–55

1. Solubility
2. Combustibility
3. Salt particles dissolve in water but do not change into a new substance.

Comprehension, page 56

Description	Physical or Chemical Property?	How do you know?
1. Nitrogen is a gas.	Physical	No new substance formed.
2. Methanol burns easily in air.	Chemical	New substance formed. Clue is the light and heat produced.
3. Baking Soda reacts with vinegar, producing the gas carbon dioxide.	Chemical	New substance formed. Clue is the gas.
4. Sulfur is yellow	Physical	No new substance is formed.
5. An iron railing rusts.	Chemical	New substance is formed: rust.
6. Wooden spoons are used to stir hot food.	Physical	No new substance is formed.
7. Juice crystals dissolve in water.	Physical	No new substance is formed.
8. A metal anchor sinks in water.	Physical	No new substance is formed.
9. Sandpaper is scratchy.	Physical	No new substance is formed.
10. Fishing lures use shiny metal to attract fish.	Physical	No new substance is formed.

11. a) Both are white.

b) Sugar melts easily but salt does not.

c) Sugar burns but salt does not.

d) In the kitchen you could taste a small sample of each substance.

12. Answers may vary. Physical property: liquid; chemical property: combustible

Key Term Review, page 57

1. property
2. physical; chemical
3. conductivity
4. melting point; physical
5. less
6. texture

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7. physical
8. solubility
9. combustible
10. chemical
11. lustre

Applying Knowledge, page 58

Substance and property	How the property is useful
Glass is transparent.	Used in windows so that sunlight can come in.
Plastic is flexible.	Use to make strong containers.
Steel can be made into thin sheets.	Used to make bridges and cars.
Copper can be pulled into thin wires.	Used to make jewellery.
Wood floats.	Used to make boats.
Sugar dissolves.	Used to sweeten drinks.
Titanium is a strong metal.	Used to make strong airplane wings.
Windshield washer fluid has a freezing point of –40°C.	Used to de-ice car windshields in the winter.
Silk reflects light at many angles, making it shiny.	Used to make beautiful clothing.
Aluminum is a light metal.	Used for light weight sports equipment like baseball bats.
Vinegar slows the growth of bacteria.	Used to preserve food such as pickles and cabbage.
Bleach kills bacteria.	Used to disinfect bathrooms.

Assessment, page 59

1. C
2. A
3. E
4. B
5. D
6. Melting point
7. Copper is conductive.
8. A physical property involves no new substance being formed while a chemical property can only be determined when a new substance forms.
9. **a)** Floats in water, hard, brittle

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b) Combustible

c) Rubber is flexible so rubber tires absorb shocks on the road and give a smooth ride. Wood is hard and brittle. Wooden wheels break easily and cannot absorb shocks on the road.

10. a) Reacts with other substances.

b) A precipitate is formed.

11. a) Decomposition.

b) The nitrogen triodide breaks down into its component parts, nitrogen and iodine.

Topic 2.3: What are pure substances and how are they classified?

Reading Check, pages 60–61

1. A compound is made of two or more elements attached together and all the molecules are identical. A mixture is made of two different types of particles and the particles are different.

2. Answers may include: a metal is usually a solid but a non-metal can be a solid, a liquid or a gas; a metal is shiny or lustrous but a non-metal is dull; a metal will conduct heat and electricity but a non-metal will not conduct heat or electricity.

Applying Knowledge, page 62

Substance	Classification	Explanation
1. tap water	compound	Made of two elements that form identical molecules.
2. table salt	compound	Made of two elements that form identical molecules.
3. aluminum	element	Cannot be broken down further. On the periodic table.
4. sugar	compound	Made of many elements that form identical molecules.
5. magnesium	element	Cannot be broken down further. On the periodic table.
6. copper sulfate	compound	Made of two elements that form identical molecules.
7. powdered orange drink	mixture	Made of many different particles mixed into one substance.
8. chocolate chip cookie	mixture	Made of many different particles mixed into one substance.
9. gold	element	Cannot be broken down further. On the periodic table.
10. baking soda	compound	Made of three elements that form identical molecules.

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11. a) Diagrams should show only one type of atom, representing iron.

b) Diagrams should show pairs of two different atoms, representing lithium bromide.

12. An element is made of one type of atom and a compound in made of two or more types of atoms stuck together.

Cloze Activity, page 63

1. pure substances

2. malleable

3. elements

4. non-metal

5. liquid

6. compound; elements

7. lustrous, malleable or ductile

8. mixtures

9. compound

Analyze the Information, page 64

1.

Physical Properties	Metals	Non-metals
solid, liquid, or gas / solid	solid	solid, liquid, or gas
shiny / dull	shiny	dull
poor conductors / good conductors	good conductors	poor conductors
malleable / brittle	malleable	brittle
ductile / non ductile	ductile	non ductile

2.

Element	Metal	Non-metal	Explanation
oxygen		X	Gas
lead	X		Silvery, malleable
sulfur		X	Brittle, dull, non-conductor
zinc	X		Lustrous, conductor
nickel	X		Lustrous, conductor

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3. **a)** non-metal
   b) metal
   c) non-metal
   d) non-metal
   e) metal

Assessment, page 65

1. E
2. B
3. C
4. F
5. D
6. A
7. A non-metals, B metals
8. **a)** Drawings should show only one type of atom.
   b) Drawings should show several different types of particles.
9. Lustrous, malleable, conductor of heat and electricity, silvery colour
10. **a)** element
    b) compound
    c) element
    d) compound
11. A wooden spoon is best because it does not conduct heat. A metal spoon would conduct the heat from the stove to your hand.

Topic 2.4 How are properties of atoms used to organize elements into the periodic table?

Reading Check, pages 66–67

1. Positive, neutral, and negative.
2. Magnesium atom
3. They have the same number of energy levels.
4. They have the same number of electrons in their outer energy levels and share similar properties.

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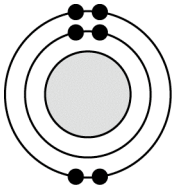
Comprehension, page 68

1. a) electron **b)** energy level **c)** proton **d)** neutron **e)** nucleus

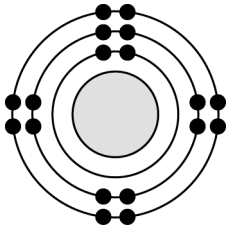
2.

	Proton	**Neutron**	**Electron**
Electric charge	Positive	Neutral	Negative
Location in the atom	In the nucleus	In the nucleus	In the space outside the nucleus
Relative mass	About 1	About 1	About $\frac{1}{2000}$

3. a)



b)



Interpreting Illustrations, page 69

1. a) 7 **b)** 7 **c)** 7 **d)** 2

2. a) 6 **b)** 6 **c)** 6 **d)** 2

3. a) 8 **b)** 8 **c)** 8 **d)** 2

4. a) 10 **b)** 10 **c)** 10 **d)** 2

5. The number of energy levels is the same for elements in the same period.

Analyze the Information, page 70

1.

Metals **Non-metals** **Metalloids**

	1																	18	
1	H	2											13	14	15	16	17	He	1
2	Li	Be											B	C	N	O	F	Ne	2
3	Na	Mg	3	4	5	6	7	8	9	10	11	12	Al	Si	P	S	Cl	Ar	3
4	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr	4
5	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe	5
6	Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn	6

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2. a) Group 1

b) Group 17

3. a) Period 4

b) 3

c) metals

d) potassium: 9; calcium: 10

4. a) Yes. It is in group 1, where metals are the most reactive.

b) Yes. It is in group 17, where non-metals are the most reactive.

Assessment, page 71

1. E

2. C

3. G

4. A

5. B

6. D

7. F

8. a) 9 **b)** 9

9. Sodium and beryllium are both metals, so they share the same properties. Sodium is more reactive because it is in the first column of the periodic table, and one row lower than beryllium.

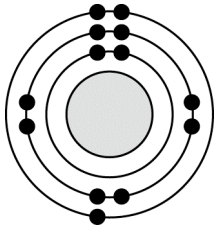
10. a) 2

b) 8

11. a) 13

b) 13

c)



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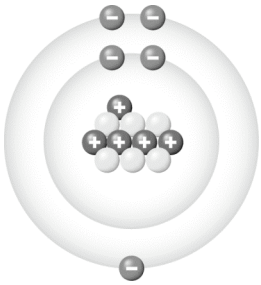
12.



13. Calcium and magnesium are both in group 2, which means they have similar properties. They are both strongly reactive metals and will react with acids in a similar way.

Topic 2.5: In what ways do scientists communicate about elements and compounds?

Reading Check, pages 72–73

1. The first letter of the element's name. The first letter and another letter of the element's name. One or two letters from the element's name in Latin.
2. A molecule is an element if the formula contains only one type of element.
3. The small numbers in a chemical formula tell you how many of each atom are in the chemical formula.

Comprehension, page 74

1. **a)** carbon
   b) sulfur
   c) oxygen
   d) iodine
   e) hydrogen
   f) nitrogen
2. **a)** helium
   b) lithium
   c) beryllium
   d) neon
3. **a)** chlorine
   b) magnesium
   c) zinc
   d) manganese
4. **a)** lead
   b) gold
   c) silver

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d) tin

e) copper

f) iron

g) sodium

h) potassium

5. Answers will vary.

Comprehension, page 75

Name of Substance	Chemical Formula	Compound or Element?	Elements present	How many atoms of each element?
water	H_2O	compound	hydrogen oxygen	2 atoms H 1 atom O
nitrogen	N_2	element	nitrogen	2 atoms of N
carbon dioxide	CO_2	compound	carbon oxygen	1 atom of C 2 atoms of O
potassium iodide	KI	compound	potassium Iodine	1 atom of K 1 atom of I
sucrose	$C_{12}H_{22}O_{11}$	compound	carbon hydrogen oxygen	12 atoms of C 22 atoms of H 11 atoms of O
neon gas	Ne	element	neon	1 atom of Ne
tri-nitro-toluene (TNT)	$C_7H_5N_3O_6$	compound	carbon hydrogen nitrogen oxygen	7 atoms of C 5 atoms of H 3 atoms of N 6 atoms of O
sulfuric acid	H_2SO_4	compound	hydrogen sulfur oxygen	2 atoms of H 1 atom of S 4 atoms of O
oxygen gas	O_2	element	oxygen	2 atoms of O
sulfur dioxide	SO_2	compound	sulfur oxygen	1 atom of S 2 atoms of O
sodium bicarbonate	$NaHCO_3$	compound	sodium hydrogen carbon oxygen	1 atom of Na 1 atom of H 1 atom of C 3 atoms of O
hydrogen peroxide	H_2O_2	compound	hydrogen oxygen	2 atoms of H 2 atoms of O
potassium nitrate	KNO_3	compound	potassium nitrogen oxygen	1 atom of K 1 atom of N 3 atoms of O
ammonia	NH_3	compound	nitrogen hydrogen	1 atom of N 3 atoms of H

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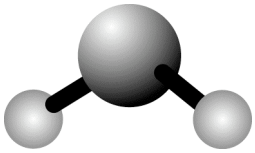
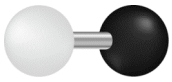
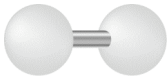
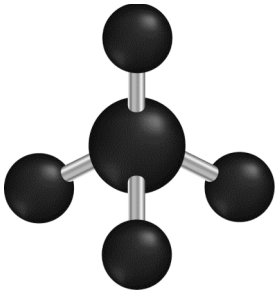
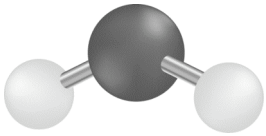
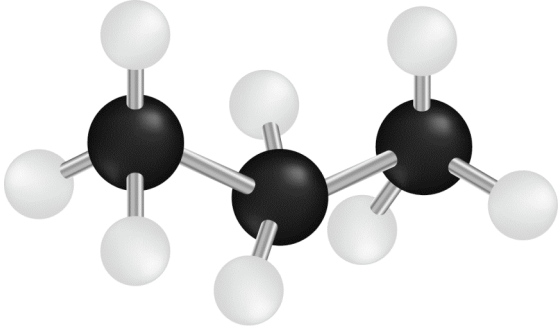
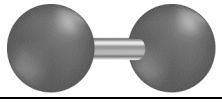
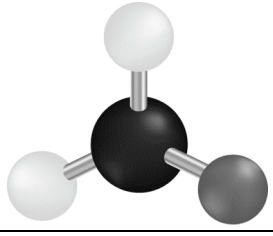
Applying Knowledge, page 76

Substance	Chemical Formula	Number and type of atom present	Drawing of molecule
water	H_2O	2 atoms of H 1 atom of O	
hydrochloric acid	HCl	1 atom of H 1 atom of Cl	
hydrogen	H_2	2 atoms of H	
carbon tetrachloride	CCl_4	1 atom of C 4 atoms of Cl	
hydrogen sulfide	H_2S	2 atoms of H 1 atom of S	
propane	C_3H_8	3 atoms of C 8 atoms of H	
oxygen	O_2	2 atoms of O	
formaldehyde	H_2CO	2 atoms of H 1 atom of C 1 atom of O	

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Assessment, page 77

1. I

2. G

3. F

4. A

5. D

6. J

7. C

8. H

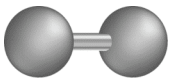
9. E

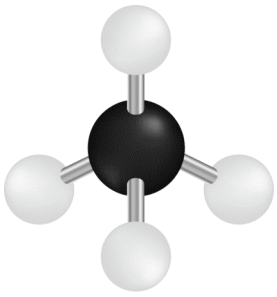
10. B

11. Answer could be the first letter of the element's name, or the first letter and another letter of the element's name, or one or two letters from the element's name in Latin.

12. There are 12 atoms of carbon, 22 atoms of hydrogen, and 11 atoms of oxygen in the molecule.

13. The symbol for sodium should be Na not NA and the 3 should be a subscript.

14. a) 

b) 

15. sodium, calcium, iron

Topic 2.6 What are some characteristics and consequences of chemical reactions?

Reading Check, pages 78–79

1. Place a glowing ember into the gas. If the ember lights on fire, it ix oxygen gas.

2. 

3. Answers will vary. For example, some people are unaware the product is harmful to the environment.

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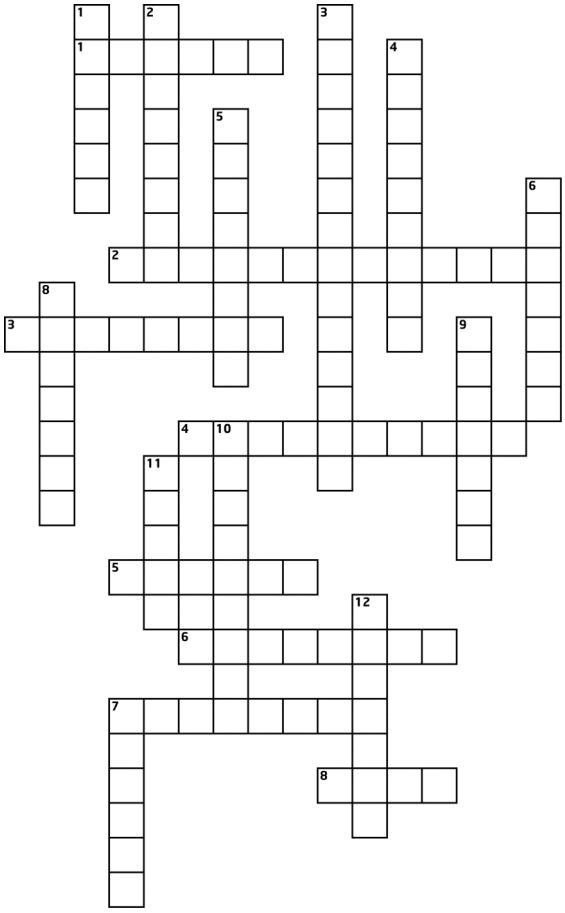
Key Term Review, page 80

Across
1. atomic
2. periodic table
3. non-metal
4. reactivity
5. matter
6. compound
7. physical
8. pure

Down
1. family
2. molecule
3. combustibility
4. conductor
5. chemical
6. element
7. period
8. soluble
9. mixture
10. electrons
11. metal
12. nucleus

Corrected Crossword Puzzle



Applying Knowledge, page 81

1. Explosive. The container can explode if heated or punctured.

2. Corrosive. The product inside the container can burn your skin and eyes.

3. Flammable. The product inside the container and its fumes will catch fire easily.

4. Poison. If you swallow, lick or in some cases, breath in the chemical, you could become very sick or die.

5. a) The upside down triangle

b) The other symbol tells you the product inside the container is dangerous.

Comprehension, page 82

1.

Plus	Minus	Interesting
Fertilizer helps grow enough food for the world population.	Extra nitrate can enter the water cycle and is toxic to aquatic animals.	Ammonia can be used to make nitrates, which are part of fertilizer.

2. Answers may vary. Students should use points from their PMI charts to support their opinions.

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Assessment, page 83

1. D

2. E

3. B

4. A

5. C

6. a) The light entertains us and helps us celebrate.

b) Yes. Fireworks create a lot of smoke and garbage.

7. a) Ammonia can be used to make nitrates which used in are fertilizers. Fertilizers help us grow enough food for the world population.

b) Ammonia is a poisonous gas.

8. Answers may vary. For example:

a) Photosynthesis produces oxygen.

b) Fuel is burned and releases carbon monoxide.

9. 

10. Answers may vary. For example:

a) ammonia window cleaner

b) vinegar and water

Literacy Test Preparation, page 85

1. C

2. D

3. C

4. A

5. Rubber is flexible, and easy to stretch and shape. It is also durable and returns to its original shape after being stretched. It can be made into a wide variety of things such as soles of shoes, door and window seals, tires and inner tubes, hoses and belts in cars, flooring in our houses, protective coating for wire, rubber gloves, elastic bands, and erasers.

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