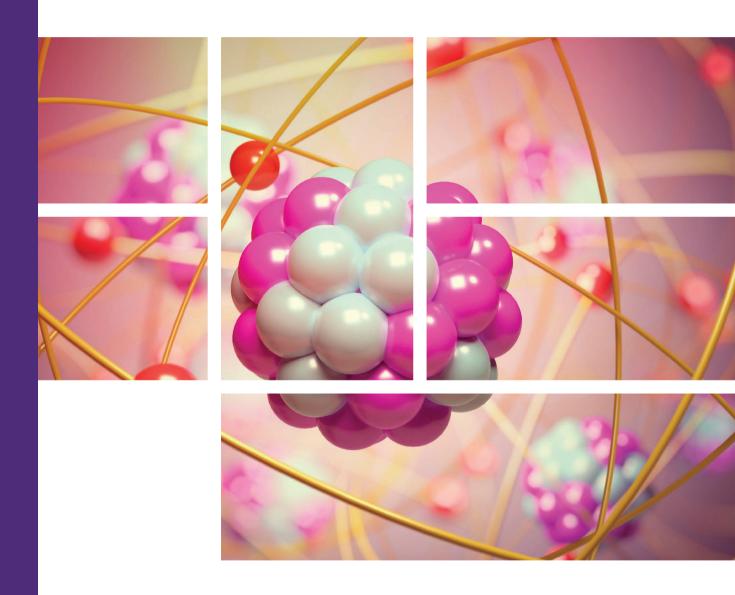
BEREAN CHEMISTRY

Level 355







Thank you for downloading this sample of Sonlight's Science 355 Schedule Plus (referred to as the Science Schedule Plus at this level). In order to give you a full perspective on our Instructor's Guides, this sample will include parts from every section that is included in the full IG.

Here's a quick overview of what you'll find in this sample.

- A Quick Start Guide START HERE
- A 3-week Schedule & Detailed Teaching Notes
- Sample Experiment Forms

SONLIGHT'S "SECRET" COMES DOWN TO THIS:

We believe most children respond more positively to great literature than they do to textbooks. To properly use this sample to teach your student, you will need the books that are scheduled in it. We include all the books you will need when you purchase a package from sonlight.com.

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Blessings!

Sarita Holzmann,

Co-founder and president of Sonlight Curriculum

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Science

Berean Chemistry Schedule Plus

By the Sonlight Team

Sonlight Curriculum® Science 355 "Berean Chemistry Schedule Plus," Second Edition

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"Do to others what you would have them do to you" (Matthew 7:12).

"The worker is worth his keep" (Matthew 10:10).

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For the latest information about changes in this guide, please visit www.sonlight.com/curriculum-updates. Please notify us of any errors you find not listed on this site. E-mail corrections to IGcorrections@sonlight.com and any suggestions you may have to IGsuggestions@sonlight.com.

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INSTRUCTOR'S GUIDES

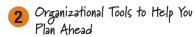
SCIENCE

Special features of Sonlight's Science Schedule Plus Guides:



) A Weekly Schedule & Detailed Teaching Notes

All your books and experiments are fully scheduled for the entire year. The weekly schedules let you see your entire week at a glance. The first column lists the titles of each book or assignment. Follow either the Textbook OR the CD-ROM version (but not both). The remaining columns include the day-by-day assigned pages or tasks.



See at a glance the supplies you need for experiments this week and the following week. Know what supplies you'll find in the Sonlight Science Kits, and which household items you'll want to have ready.

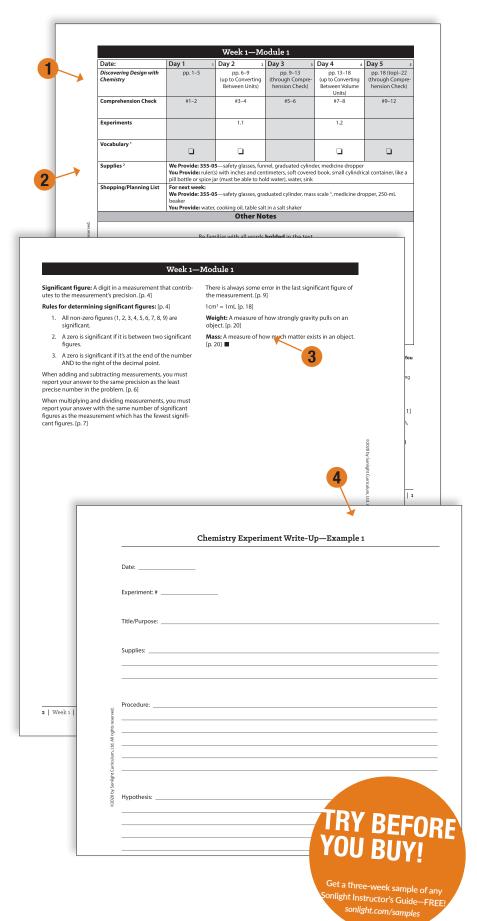
Extra Helps

Immediately following each week's schedule page, you will find vocabulary your children will need to memorize. Your primary task: read the assigned pages in the Textbook or on the computer (CD-ROM) listed in the schedule, then memorize the vocabulary terms. You'll find comprehension questions throughout the textbook or CD-ROM as well as tests for each module. Tests can be printed out from the CD-ROM or sold as a separate packet with the Textbook version.



Experiment Forms

The back section of the Science Schedule Plus includes experiment write-ups to use in conjunction with the labs you complete each week. Use the examples to help your student record pertinent information from their labs. Feel free to copy as many as your student needs. Each experiment is scheduled out for you.



At a Glance

Our goal in teaching science to high school students is to make them aware of the amazing realities around them and how complex and detailed this world is in which we live. You may want to join your student in this adventure, offer support as needed, or allow him to work through this book on his own since it is written to the student. Many of the science concepts he has been exposed to in the past will now come into sharper focus with more detailed study in certain disciplines.

- "Discovering Design with Chemistry" includes a basic study in the field of chemistry.
- It is a good place to start for students in high school.
- We stress mastery of concepts and vocabulary at this level.

Your student:

- · Will be introduced to atoms and molecules, chemical and physical changes, stoichiometry, atomic and molecular structure, acids and bases, as well as other related topics, along with the corresponding vocabulary.
- Will have concepts reinforced through the labs.
- Can use this class as a stepping-stone into Advanced Chemistry.

We include:

- · Sample Experiment Forms to be used as you work through the scheduled labs.
- · Weekly vocabulary lists.
- · A weekly planning list to determine the lab materials needed for the coming week, as well as a look ahead to the needed items for the next week.

An Overview of this Year's Studies

Each of the 16 modules is broken down into daily readings. Most modules are scheduled to be completed in two weeks, with four modules taking three weeks. It is important to read the introductory pages in the textbook and the Solution's Manual.

In each week's schedule, we have noted the science supplies needed from the Berean Chemistry Supplies Kit (*355-05*). You may have also purchased the optional rubber gloves. If you do not own the Chemistry Supplies Kit or the gloves, the book gives some other suggestions, such as glasses to take the place of beakers. Please heed the warnings about breakage. Also, note the instructions on cleaning and the reuse of household items after using them in an experiment. You will find this information in Appendix C of the textbook. If you do not have the kit, it will also mean there are still some things you will need to gather (like hydrogen peroxide), but you will only be able to do 27 of the 46 experiments listed in the text.

If you did purchase the chemistry kit (for this book) from Sonlight, take note of some of the materials like aluminum foil. You may think you have too much, but be aware that foil is used in several experiments and you were given enough to complete all of them. So, only use what is recommended in the experiment. To enable you to plan ahead, we will alert you to supplies we think you might need to purchase before you do the next week's experiments. We list these items the week before the experiment. We hope this feature will enable you to feel well-prepared and organized for your science adventure!

Your student will want to use a scientific calculator for this class. It is most helpful if it at least has the option to use parentheses, and put in exponents in addition to other basic functions. If you would like to use the same calculator for physics, then it should also have sin, cos, tan⁻¹, sin⁻¹, and square root capabilities. Tips for using the calculator follow, along with notes about typical pitfalls for many students.

You will also find **Experiment Forms** at the back of this guide. Guidelines for how you might expect your student to use them are in this Introduction. You are welcome to copy these as needed for your family's use. Or you may prefer to come up with your own form.

Testing

There is a test for each of the 16 modules throughout the year. Because of this, we have not scheduled any of the quarterly tests as this would have taken away some of the extra time given for some of the harder modules. You may add a quarterly test after every four modules, if you prefer. One way of scheduling would be to complete the three week modules in two weeks and placing a quarterly test after every fourth module.

While we do feel that the quarterly tests are a useful evaluation tool, we don't feel they are "required." Certainly the end-of-module study guide questions and tests are sufficient to determine your student's understanding of the material. If you are concerned about long-term retention, you may find the quarterly tests to be helpful.

Tips for Using your Calculator

It is very important that you become familiar with how to use the calculator due to the large amount of math in this course. Many times the final answer is wrong, not because of the set-up, but because it was entered into the calculator incorrectly.

There are numerous calculators on the market. Not all scientific calculators are marked the same way or have all the same options. Therefore the following may need to be adapted for yours in particular.

Here we offer help with the most common errors. We have not included units in these demonstration equations so you can generalize for any similar math set-up. However, it is very important to keep track of your units when doing the actual problem.

Basics

Whether you have a standard scientific calculator or a graphing calculator, you will need to find:

- parenthesis ()
- the EE, EXP, 10x (or something similar) button. Often any one of these might be used with the "2nd" or "shift" button.
- x^2 = this button will square the number you enter. i.e. $15^2 = 15 \text{ x}^2 = 225$
- ^ = this is used when you have to multiply a number by itself more than twice: i.e., $15^3 = 15 \land 3 = 3375$ (or 3.4×10^3) using significant figures
- Square root √
- · ANS (answer key; again may be in conjunction with the yellow "2nd" key)

Before You Begin

First check to make sure your calculator is in DEG (degree) mode. You can usually see the DEG on the screen once it is turned on. If it says anything different, check your manufacturer's directions for changing it back to Degree mode.

Let's Practice

A number is made negative by using the (-) or (+/-) button which is often found by the decimal point. Do not use the subtraction sign to designate a negative number.

You will enter multiple numbers that are in scientific notation (5.6 \times 10⁶). This is quickly entered by

Remember to get the EE, EXP, 10x or whatever your calculator uses for this function, you may need to push the "2nd" button or "shift" button first.

Try it as a number with a negative exponent: 5.6×10^{-6}

Remember the (-) is not the subtraction sign.

Some students are in the habit of using the "x 10 ^ "keys for these same numbers, but that is not recommended since it oftentimes results in wrong answers unless the student remembers to use parentheses when using that process. For an understanding of what is happening, the number 4.5 x 10³ is telling the calculator it has two numbers that are being multiplied together (4.5 is multiplied by 10³), whereas 4.5 EXP 3 is identifying the entry as one complete number.

Equations

$$\frac{0.15 \times 32}{27}$$
 = .15 x 32 ÷ 27=

And your answer should be .17777 rounded to .18

However, when you have multiple numbers in the denominator it is most efficient to use parentheses.

$$\frac{.15 \times 32}{27 \times 30}$$
 = (.15 x 32) ÷ (27 x .30) = .59

Many students want to put this type of problem in as follows: $.15 \times 32 \div 27 \times .30 = but$ their answer will be wrong (.053) because you have just multiplied .30 to the answer so far rather than dividing it out since it is in the denominator.

Your other option is to remember what you are doing (dividing out each number in the denominator).

$$.15 \times 32 \div 27 \div .30 = .59$$

Square Root

If you need to get the square root of the answer above (once you obtain the .59) then press the √ button (which may first require pressing the "2nd" or "shift" button). Then press the ANS button (which may first require pressing the "2nd" or "shift" button). This last button will take your previous answer and solve for the square root.

Remember your parentheses help to separate sections. It is also important to close the parentheses.

$$\frac{1.14^2}{.121 \text{ x } .234^3} = .14 \text{ x 2 } \div (.121 \text{ x } .234 \land 3) = 838$$

Corrections and Suggestions

Since we at Sonlight Curriculum are constantly working to improve our product development, we would love it if we could get you to help us with this process.

Whenever you find an error anywhere in one of our Instructor's Guides, please check our updates page for the latest information at www.sonlight.com/curriculum -updates. Report new information by sending a short e-mail to: IGcorrections@sonlight.com. It would be helpful if the subject line of your e-mail indicated where the problem is. For instance, "Berean Chemistry Schedule Plus/ Section Two/Week 1/Schedule."

If while going through our curriculum you think of any way we could improve our product, please e-mail your suggestions to: IGsuggestions@sonlight.com. If you know of a different book we should use, if you think we should read a book we assign at a different point in the year, or if you have any other ideas, please let us know.

How to Use the Experiment Forms

Ouestion/Title

This usually comes directly from the title of the experiment/lab title at the top of the experiment in the book. It may help to put it into a question so you can fit the pieces together when you get to the inference at the end. If the title isn't revealing enough, make sure you read the experiment carefully all the way through. Then look at the subheading and read the paragraph preceding the experiment. All those things will help you write a more informative title.

Materials

List those materials that help you identify the experiment.

Method

Briefly write down what is to be done during this experiment. It does not need to restate each step as listed in the book, as you should know what the experiment involves. If there are several parts to the procedure, write each down. For example: If you are to hold a comb just above small pieces of aluminum foil first without pulling the comb through your hair and then again after pulling the comb through your hair, write both parts down. Do not skip a part of the procedure even if you know nothing will happen.

Hypothesis

A hypothesis is an educated guess. Often you know what should happen after reading the experiment. Still, write down what you expect to happen. You do not need to write "why" because that will come later.

Do not add inference to your hypothesis. For instance: "The steady stream of water will bend toward the

charged comb because the partial positive charges are attracted to the negative charge in the comb whereas the steady stream of oil will not bend because it is a purely covalent compound ..."

Instead write down just what you expect to see.

"The steady stream of water will bend toward the charged comb, however there will be no change in the steady stream of oil."

Observation

Be detailed. Write down what you see in more than general terms.

For instance: to say something bubbled is not enough. That statement can cover small bubbles forming in a substance to bubbling so rapidly and violently it comes to the top of the beaker and spills over! So, you shouldn't use the same description for both of these scenarios. It is important to be detailed in your descriptions.

"The toilet bowl cleaner quickly foamed approximately halfway up the beaker where it stayed as it continued to react with the eggshell." -Or- "Once the yeast was added and the beaker swirled, then the reaction included large bubbles which rose quickly until they hit the watch glass and still pushed out of the spout to the outside of the beaker. Much of the yeast could still be seen sitting on the top of the bubbles."

Inference

This is the heart of the experiment. So far you wrote down what you were looking for (question), what you used (materials), what you did (procedure), what you expected to happen (hypothesis), and what actually did happen (observation/data). Now it is time to write up what you learned. This is not a place to say "... it is just as I expected" Or "... my hypothesis was correct." Write what you actually learned by tying your question and hypothesis together and then looking at your data.

Often you will find the information just following the experiment. The authors are careful to help you see what you should have learned. But sometimes you have to remind yourself what you were looking for. And you need to be complete.

To say that the yeast sped up the reaction, but nothing more, is not enough. Yeast doesn't necessarily cause every reaction it joins to speed up. You should mention that the yeast was the catalyst that sped up the decomposition of hydrogen peroxide while it didn't get used up in the process. This type of information an oftentimes be found in the title of the particular experiment.

The point of an experiment is to demonstrate and reinforce a concept you have learned in a particular section of your chemistry book. Take advantage of spending the time to see what you are supposed to be learning from each experiment. If you remember your experiments, you can refer back to them when reviewing the concepts. Remember the experiments are not put there for something to do, but rather to apply what you have learned in the written word by seeing it in action.

Berean Chemistry—Science Supplies

355-05 (Berean Chemistry Supplies Kit) Item	Week(s) Used
Safety glasses	Use these in every experiment!
Funnel	1, 3, 9, 20, 28
50-mL graduated cylinders	1, 2, 3, 11, 14, 16, 18, 19, 25, 33, 34
Medicine dropper	1, 2, 5, 11, 14, 16, 18, 24, 25, 35, 36
Mass scale (accurate to 0.1 g)	2, 3, 11, 14, 15, 16, 18, 19, 22, 25, 28, 30, 34
250-mL beaker	2, 3, 9, 10, 11, 12, 15, 16, 18, 24, 25, 26, 27, 28, 33, 34, 36
100-mL beaker	3, 5, 10, 11, 12, 14, 18, 24, 25, 26, 33, 34, 35, 36
Alcohol burner	3, 14, 18, 24, 28, 33, 36
Filter paper	3
Watch glass	3, 15, 16
Yeast	3, 22, 34
Toothpick	3
Cupric sulfate (cooper (II) sulfate)	5, 12, 14, 26, 27, 35
Strontium chloride	5, 18, 19
Feather	7
Index card	7
Aluminum foil	7, 14, 26, 33
Charcoal	7
9-volt battery	7, 8, 12
Plastic cup	8
Thumbtacks	8
Balloons	9, 14, 20, 22, 28
Thermometer	11, 19, 22, 28
Steel nail	12
Test tubes	12, 18, 24, 26, 33, 35, 36
Steel wool	12, 26
Pie tin	12
Stirring rod	14, 18, 26, 36
Wax paper	14, 30
Seltzer (effervescent) tablet	15
Sodium hydroxide	18, 24, 25, 30
Clay	20
Red litmus paper	23
Blue litmus paper	23
AA battery (1.5 volt)	27
Washer	28
Rubber band	32
Calcium (antacid) tablet	33

Week 1—Module 1					
Date:	Day 1 1		Day 3 3	Day 4	Day 5 5
Discovering Design with Chemistry	pp. 1–5	pp. 6–9 (up to Converting Between Units)	pp. 9–13 (through Compre- hension Check)	pp. 13–18 (up to Converting Between Volume Units)	pp. 18 (top)–22 (through Compre- hension Check)
Comprehension Check	#1–2	#3–4	#5–6	#7–8	#9–12
Experiments		1.1		1.2	
Vocabulary ¹					
Supplies 2 We Provide: 355-05—safety glasses, funnel, graduated cylinder, medicine dropper You Provide: ruler(s) with inches and centimeters, soft covered book, small cylindrical container, like a pill bottle or spice jar (must be able to hold water), water, sink					
Shopping/Planning List	For next week: We Provide: 355-05—safety glasses, graduated cylinder, mass scale ³ , medicine dropper, 250-mL beaker You Provide: water, cooking oil, table salt in a salt shaker				
	Other Notes				
	Be fam	iliar with all words	bolded in the text.		

- 1. Define vocabulary terms and names found in each day's reading, then place a check in the box.
- 2. When supplies are listed as "We provide:" they are materials found in your Berean Chemistry Supplies Kit (355-05). When supplies are listed as "You **provide:"** they are materials you can generally find around your home.
- 3. The mass scale provided in the Berean Chemistry Science Supply Kit 355-05 is accurate to 0.1g as the experiments require. We have provided you with the most cost effective scale complete the experiments. It is not a digital scale and so you can ignore the information in the textbook about fixing the batteries.

Vocabulary | Important Terms, Facts, and Principles

Word to be familiar with:

- precision [p. 2]
- English units, metric units [p. 3]
- accuracy [p. 5]
- unit conversion, factor-label method [p. 9]
- conversion relationship [p. 10]
- base unit, meter, centi, milli, kilo [p. 12]
- scientific notation [p. 13]
- area, derived units, volume [p. 15]

- graduated cylinder [p. 16]
- Newton, gram, slug [p. 20]

Matter: Anything that has mass and takes up space. [p. 1]

When using a ruler that is marked off in 16ths of an inch, report your answer to hundredths of an inch. [p. 2]

Unit: A quantity that describes the measurement being made. [p. 2]

The unit of a measurement is just as important as the number. You must always list the unit! [p. 3]

Week 1—Module 1

Significant figure: A digit in a measurement that contributes to the measurement's precision. [p. 4]

Rules for determining significant figures: [p. 4]

- 1. All non-zero figures (1, 2, 3, 4, 5, 6, 7, 8, 9) are significant.
- 2. A zero is significant if it is between two significant figures.
- 3. A zero is significant if it's at the end of the number AND to the right of the decimal point.

When adding and subtracting measurements, you must report your answer to the same precision as the least precise number in the problem. [p. 6]

When multiplying and dividing measurements, you must report your answer with the same number of significant figures as the measurement which has the fewest significant figures. [p. 7]

There is always some error in the last significant figure of the measurement. [p. 9]

 $1 \text{cm}^3 = 1 \text{mL} [p. 18]$

Weight: A measure of how strongly gravity pulls on an object. [p. 20]

Mass: A measure of how much matter exists in an object. [p. 20]

Week 2—Module 1					
Date:	Day 1 6	Day 2 7	Day 3 8	Day 4	Day 5 10
Discovering Design with Chemistry	pp. 22–25 (through Compre- hension Check)	pp. 25–26	p. 34 Review Questions (#1–12)	pp. 34–35 Review Questions (#13–22)	Module 1 Test
Comprehension Check	#13–14	#15			
Experiments		1.3			
Vocabulary					
Supplies	We Provide: 355-05 —safety glasses, graduated cylinder, mass scale ¹ , medicine dropper, 250-mL beaker You Provide: water, cooking oil, table salt in a salt shaker				
For next week: We Provide: 355-05—safety glasses, 100-mL beaker, 250-mL beaker, alcohol burner with stand ¹, funnel, filter paper, watch glass, mass scale, graduated cylinder, yeast ², toothpick You Provide: matches or lighter, denatured alcohol ³, 1/8 measuring spoon, salt, chervil (or chopped parsley [dried or fresh]), water, milk, vinegar, hydrogen peroxide, 1/4 measuring spoon, sink					
	Other Notes				

Vocabulary | Important Terms, Facts, and Principles

Word to be familiar with:

• weighing by difference [p. 25]

Density: A measure of how tightly packed the matter in a substance is. [p. 22]

Density =
$$\frac{mass}{volume}$$

^{1.} The mass scale provided in the Berean Chemistry Science Supply Kit **355-05** is accurate to 0.1g as the experiments require. We have provided you with the most cost effective scale to complete the experiments. It is not a digital scale and so you can ignore the information in the textbook about fixing the batteries.

^{2.} You have two packets of yeast to use in three different experiments. Use what you need for each experiment and save the rest until the next one.

^{3.} **Note for Module 2:** Each time you use the alcohol burner you will need denatured alcohol. The denatured alcohol can be found in any hardware store that sells paint. There will be times the experiment calls for the denatured alcohol when the alcohol burner is not being used.

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		Week 3—Mo	odule 2		
Date:	Day 1 11	Day 2 12	Day 3 13	Day 4 14	Day 5 15
Discovering Design with Chemistry	pp. 37–39	pp. 40–44 (through Compre- hension Check)	pp. 44–46	pp. 47–50	pp. 51–54 (through Compre- hension Check)
Comprehension Check	#1	#2-3	#4–5	#6–7	#8–9
Experiments	2.1	2.2		2.3	
Vocabulary	٠				
Supplies We Provide: 355-05—safety glasses, 100-mL beaker, 250-mL beaker, alcohol burner with stand ¹ , funnel, filter paper, watch glass, mass scale, graduated cylinder, yeast ² , toothpick You Provide: matches or lighter, denatured alcohol ¹ , 1/8 measuring spoon, salt, chervil (or chopped parsley [dried or fresh]), water, milk, vinegar, hydrogen peroxide, 1/4 measuring spoon, sink					
Shopping/Planning List	There are no experiments scheduled next week.				
		Other No	tes		

- 1. Note for Module 2: Each time you use the alcohol burner you will need denatured alcohol. The denatured alcohol can be found in any hardware store that sells paint. There will be times the experiment calls for the denatured alcohol when the alcohol burner is not being used.
- 2. You have two packets of yeast to use in three different experiments. Use what you need for each experiment and save the rest until the next one.

Vocabulary | Important Terms, Facts and Principles Word to be familiar with:

- classify [p. 37]
- greenhouse gas [p. 41]
- malleable, brittle [p. 45]

Pure substance: A substance whose properties are the same throughout. [p. 37]

Mixture: A combination of two or more pure substances. [p. 37]

Homogeneous mixture: A mixture whose composition is the same throughout the sample. [p. 40]

Heterogeneous mixture: A mixture whose composition is different in different parts of the sample. [p. 40]

Law of mass conservation: In any chemical or physical process, the total mass of everything involved must remain the same. [p. 42]

Element: A substance that cannot be chemically broken down into simpler substances. [p. 44]

Compound: a pure substance that is composed of two or more elements. [p. 44]

Law of Definite Proportions: A given compound will always have the same proportion of elements by mass. [p. 48]

Dalton's Atomic Theory: [p. 51]

- 1. All matter is made up of atoms, which are indestructible and indivisible.
- 2. All atoms of a given element are identical in all their properties.
- 3. Compounds are formed by a combination of two or more different kinds of atoms.

Week 3—Module 2

4. A chemical reaction is a rearrangement of the atoms that exist in the substances which are react-

Molecule: A combination of two or more atoms joined together. [p. 52]

Law of Multiple Proportions: When two elements combine to form different compounds, a fixed amount of one element will combine with the other element so that the ratio of the masses of the other element is a small whole number. [p. 53] ■

Chemistry Experiment Write-Up—Example 1

Date:	_		
Experiment: #			
Title/Purpose:		 	
Supplies:			
Procedure:			
Hypothesis:		 	

Chemistry Experiment Write-Up—Example 2

	Date:
	Experiment: #
	Purpose (from the introduction):
	Supplies:
	December 2015
	Procedure:
של המיווקיור כמווזכמימיון בנמ: איו ווקוונט וכטכן עכמי	
) (See 1	Observation/Data:
07070	(what happened)
	Conclusion:
	(what was learned)

SONLIGHT 2020-2021 CATALOG



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