Activity Guide At-a-Glance

Take an adventure-filled journey to learn about science!

1. & 2. Scheduling Options

Choose from a grid-style schedule (1) or a list-style schedule (2). Either way, these scheduling options will make planning your weekly science adventure a snap! These schedule sheets include a summary of the chapter in case your students are reading the novel or listening to the audiobook on their own.

Read

3. Reading Assignments

Know what to read each week in the corresponding Sassafras Science novel. Plus, get options for additional encyclopedia pages to read and for books to check out from the library. The novel contains the essential information for each week, but if you want to dig deeper, we've got you covered!

Write

4. SCIDAT Logbook Info

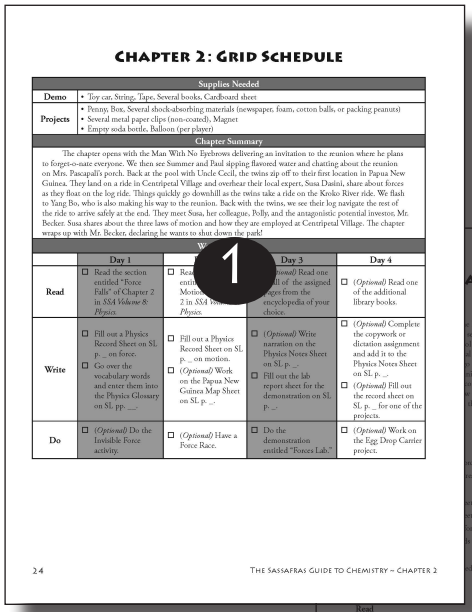
Have confidence that your students are grasping the key points from the reading with the information in the notebooking section. Here, you will find the scientific details that were shared in the chapter, which could be included in your students' narrations or list of facts.

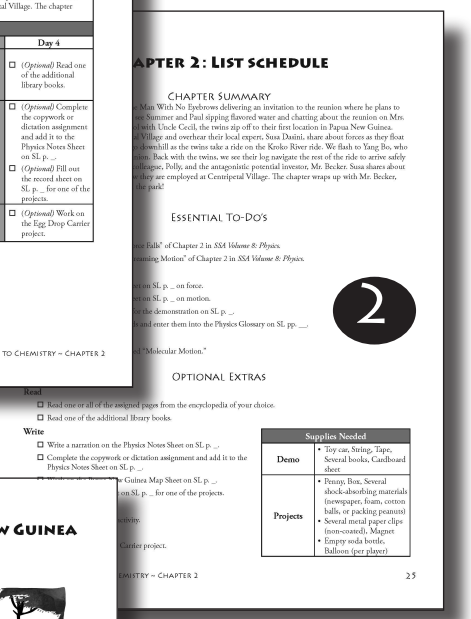
5. Relevant Vocabulary

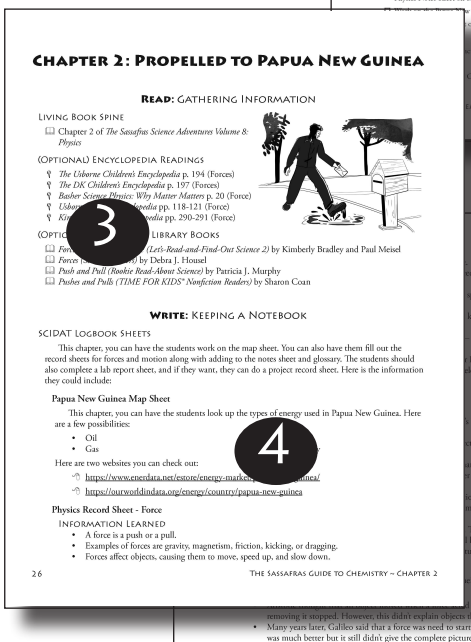
Build your students' science vocabulary with words relevant to the topics the students are studying.

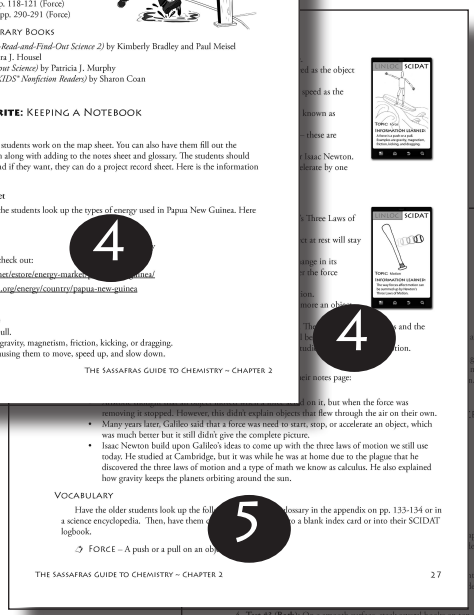
6. Copywork

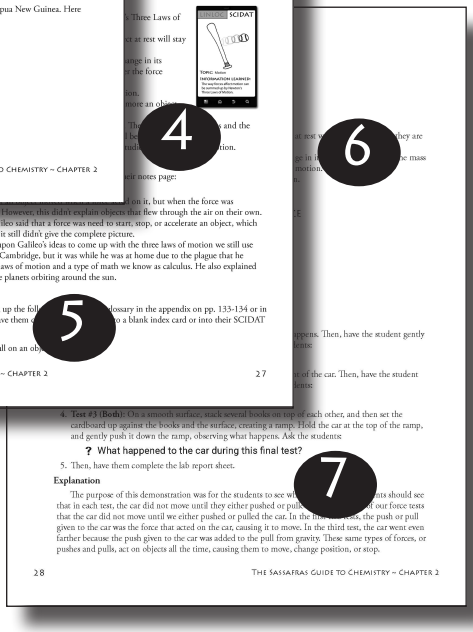
Use these selections as memory work, copywork, or dictation—it's up to you!



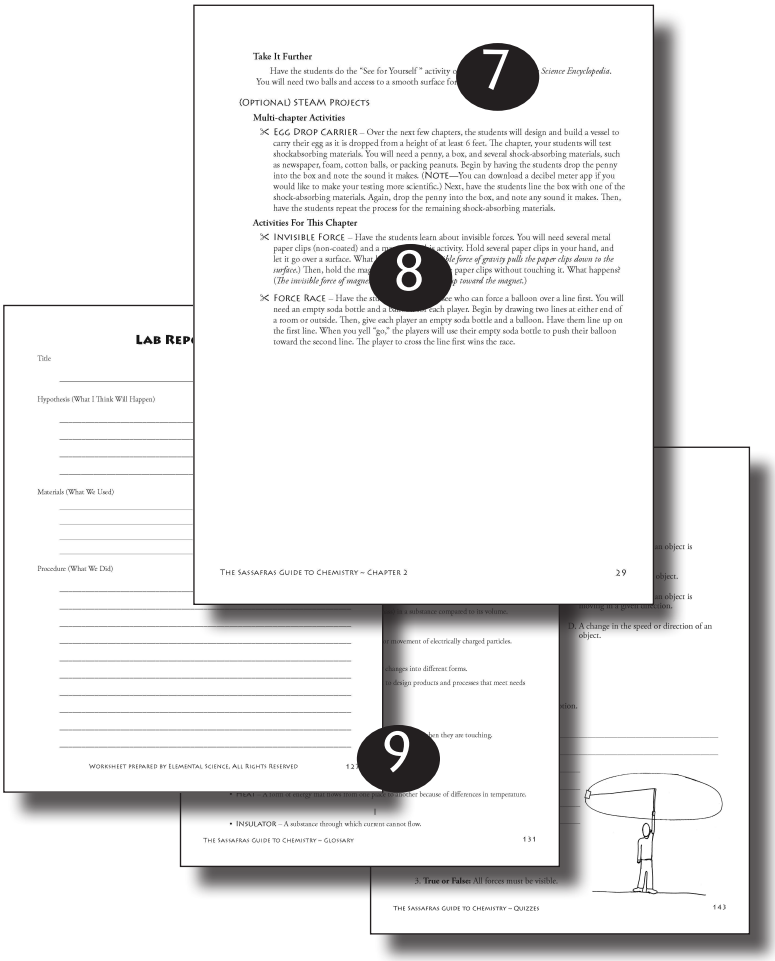








Activity Guide At-a-Glance



DO

7. Related Scientific Demonstrations

Know what materials you will need to do a weekly hands-on science activity that coordinates with the topic. This section lists the supplies you will need, provides easy-to-follow steps, and explanations to make it a snap to complete the scientific demonstration.

8. Coordinating STEAM* Activities

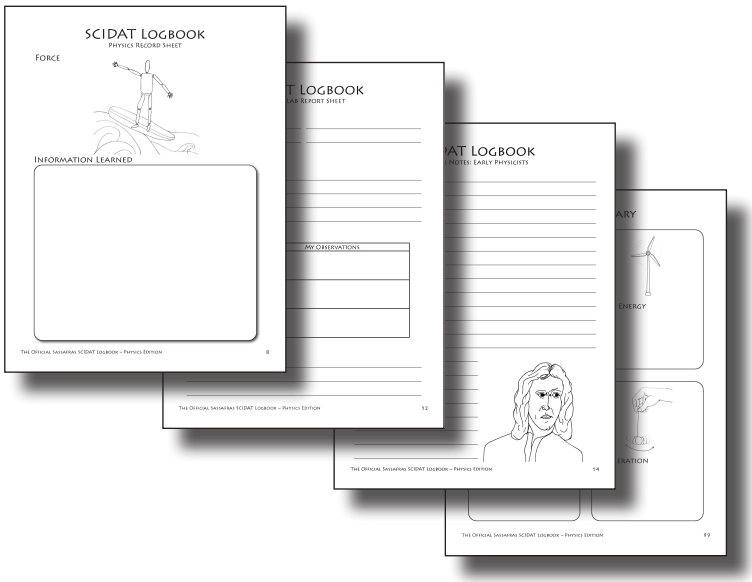
Add in a bit of STEAM with these optional activity ideas. You will find ideas for projects that last throughout the novel and ones specific to the chapter (week) you are on.

9. Templates and More

In the guide's appendix, you will find templates for the projects, a full glossary, and a set of quizzes to use along the journey.

*STEAM: Science, Technology, Engineering, Art, and Math

The SCIDAT* Logbook



Don't forget the SCIDAT logbook for your students!!

The SCIDAT logbook will serve as a record of your students' journey! It contains all the pages the students will need as they follow like Blaine and Tracey. Each page has been attractively illustrated for you so you don't have to track down pictures for the students to use! Get it all at:

https://elementalscience.com/collections/sassafras-science

*SCIDAT: Scientific Data

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The Sassafras Guide to Physics

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Quick Start Guide

Welcome to your super, scientific journey with the Sassafras Twins!! The information and activities in this guide will help you turn a simple adventure novel into a complete science program for your elementary students. Let's start by answering three pressing questions!

What Will We Learn?

Students will learn about physics through a study of basic principles, like force, motion, light, and sound. See p. _ for a list of the topics explored in this program.

What Do I Need?

In addition to this activity guide, you will need the following materials:

1. **Novel –** *The Sassafras Science Adventures Volume 8: Physics* - All the main reading assignments are from this book. You can get the paperback novel, the Kindle version, or the audiobook.
2. **Student Materials –** You can have your students use a blank notebook or you can purchase a copy of *The Official Sassafras SCIDAT Logbook: Physics Edition* for each student. Get a glimpse of this option on p. 7. (SCIDAT stands for scientific data and it comes from the Sassafras Twins' journey.)
3. **Demonstration Supplies –** See p. 12 for a full list, or save yourself time and get the *Sassafras Science Year 4 Experiment Kit*, which includes the materials for both volume 7 and volume 8.

If you want more information than what is already in the novel, the following encyclopedias are scheduled in this guide:

- *The Usborne Children's Encyclopedia, 2014 Edition (best for 1st through 3rd grades)*
- *The DK Children's Encyclopedia, 2022 Edition (best for 1st through 3rd grades)*
- *Basher Science Physics: Why Matter Matters (best for 2nd through 4th grades)*
- *Usborne Science Encyclopedia (best for 3rd through 5th grades)*
- *Kingfisher Science Encyclopedia (best for 4th through 6th grades)*

If you want to add more fun with optional STEAM* projects, you can find a list of the project supplies on p. 13.

*STEAM: Science, Technology, Engineering, Art, and Math

What Will a Week Look Like?

Each week you and your students will:

- **Read** scientific information from an adventure-filled novel, also known as a living book, and discuss what you read.
- **Write** down what the students have learned and seen in a way that is appropriate for their skills by keeping a notebook, or rather a SCIDAT Logbook.
- **Do** hands-on science through demonstrations using the directions found in this guide.

You can also add in the optional copywork, library books, and STEAM projects if you want to dig deeper into a topic. For a more detailed explanation of the components in each lesson, we highly recommend checking out the peek inside this guide on pp. 6-7 and reading the introduction on pp. 8-10 The chapter lessons begin on p. 17.

THE SASSAFRAS SCIENCE ADVENTURES

The Sassafras Guide to Physics
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The Sassafras Guide to Physics Introduction

Our living books method of science instruction was first proposed in *Success in Science: A Manual for Excellence in Science Education*. This approach is centered on living books that are augmented by notebooking and scientific demonstrations. The students read (or are read to) from a science-oriented living book, such as *The Sassafras Science Adventures Volume 8: Physics*. Then, they write about what they have learned and complete a related scientific demonstration or hands-on project. If time and interest allow, the teacher can add in non-fiction books that coordinate with the topic, do an additional activity, or memorize related information. If you want to learn more about how this works, you can listen to this free conference session on using living books for science:

- Inspiring your students to love science through living books: https://youtu.be/Dvk1LfYGONw

The books in *The Sassafras Science Adventures* series are designed to give you the tools you need to employ the living books method of science instruction with your elementary students. For this reason, we have written an activity guide and a logbook that corresponds to each novel. This particular activity guide contains 18 chapters of activities, reading assignments, scientific demonstrations, and so much more for studying physics.

Each of the chapters in this guide corresponds directly to the chapters in *The Sassafras Science Adventures Volume 8: Physics*. They were written to give you the information you need to turn the adventure novel into a full science course for your elementary students. They will provide you with a buffet of options you can use to teach the students about the forces, motion, energy, light, sound, electricity, engineering, and robotics. So pick and choose what you know you and your students will enjoy!

What Each Chapter Contains

Each chapter begins with two schedule sheets for the corresponding chapter in *The Sassafras Science Adventures Volume 8: Physics*. On the schedule sheets, you will find a chapter summary, plus an overview of the supplies you will need for the demonstration, projects, and activities for the chapter. After that, you will find the optional schedules – one laid out as a four-day grid schedule and one laid out as a list to check off. These schedules are included to give you an idea of how your week could be organized, so please feel free to alter them to suit your needs.

After the scheduling information, you will find the information for the reading, notebooking, and activities for the particular chapter. This information is divided into the following sections:

Read: Gathering Information

- Living Book Spine – This section contains the corresponding chapter in *The Sassafras Science Adventures Volume 8: Physics*.

- (Optional) Encyclopedia Readings – This section contains possible reading assignments from:
  - *The Usborne Children's Encyclopedia* (best for 1st through 3rd grades)
  - *The DK Children's Encyclopedia* (best for 1st through 3rd grades)
  - *Basher Science Physics: Why Matter Matters* (best for 2nd through 4th grades)
  - *Usborne Science Encyclopedia* (best for 3rd through 5th grade)

- *Kingfisher Science Encyclopedia* (best for 4th through 6th grades)

You can choose to read them to the students or have the students read them on their own.

📖 (Optional) Additional Library Books – This section contains a list of books that coordinate with what is being studied in the chapter. You can check these books out of your local library.

Write: Keeping a Notebook

📓 SCIDAT Logbook Information – This section has the information that the students could have included in their SCIDAT logbooks. (SCIDAT stands for scientific data and it comes from the Sassafras Twins' journey.) The students may or may not have the same information on their notebooking sheets, which is fine. You want their SCIDAT logbooks to be a record of what they have learned. The logbook information is included as a guide for you to use as you check their work. For more information about notebooking, please read the following article:

- What is notebooking? – https://elementalscience.com/blogs/news/what-is-notebooking
- How to use notebooking with different ages – https://elementalscience.com/blogs/news/notebooking-with-different-ages

✏ Vocabulary – This section includes vocabulary words that coordinate with each chapter. If the students are older, we recommend that you have them create a glossary of terms using a blank sheet of lined paper or the glossary sheets provided in *The Official Sassafras Student SCIDAT Logbook: Physics Edition*. You can also have them memorize these words and their definitions.

☞ (Optional) Copywork – This section contains a short copywork passage and a longer dictation passage for you to use. Some students may use the shorter passages for dictation or the longer passages for copywork. Feel free to tailor the selections to your students' abilities. You can also use the selections as memory work assignments for the students.

⌛ (Optional) Quiz – This section contains the answers for the quizzes included in the appendix. These simple, short quizzes are optional. You can use them as graded quizzes or as review sheets.

Do: Playing with Science

☑ Scientific Demonstration – This section includes a list of materials, the instructions, and an explanation for a scientific demonstration that coordinates with the chapter. There is a customized lab report sheet provided for you in *The Official Sassafras Student SCIDAT Logbook: Physics Edition* or you can use the blank one in the appendix on pp. 127-128. If you student has followed the twins' journey so far, they are mostly likely at the age where they should be officially recording all of the demonstrations they do. If this is too much for your student, feel free to skip the lab reports.

✂ (Optional) STEAM* Projects – These sections contain additional STEAM projects and activities that correspond to the topics in the chapter. There are multi-chapter activities that students can do over the course of several chapters or over the full novel. Plus, there are activities that coordinate with each specific chapter. Pick and choose the activities that interest you and your students.

*STEAM: Science, Technology, Engineering, Art, and Math

Additional Materials

We have provided a few additional materials in the back of this guide for your convenience. First, you will find the templates you need for the projects suggested in this guide. Next, you will find a glossary of terms, which you can use with the students as they define the words for each chapter. And finally, you will find a set of eight simple quizzes you can use with the students to verify they are retaining the material.

Quick Links

View all the links mentioned in this guide in one place and get a digital copy of the templates, glossary, and quizzes by visiting the following page:

- https://elementalscience.com/blogs/resources/volume-8-links

For the students

The SCIDAT logbook is meant to be a record of the students' journey through their study of physics. It is explained in more detail in Chapter 1 of this guide. You can choose to make your own or purchase a premade logbook from Elemental Science. *The Official Sassafras SCIDAT Logbook: Physics Edition* has all the pages the students will need to create their own logbook. Each page has been attractively illustrated for you so you don't have to track down pictures for the students to use. This way they can focus on the information they are learning.

Final Thoughts

As the author and publisher of this curriculum I encourage you to contact me with any questions or problems that you might have concerning *The Sassafras Guide to Physics* at support@elementalscience.com. I, or a member of our team, will be more than happy to assist you. I hope that you and your students enjoy your journey through physics with the Sassafras twins!

~ Paige Hudson

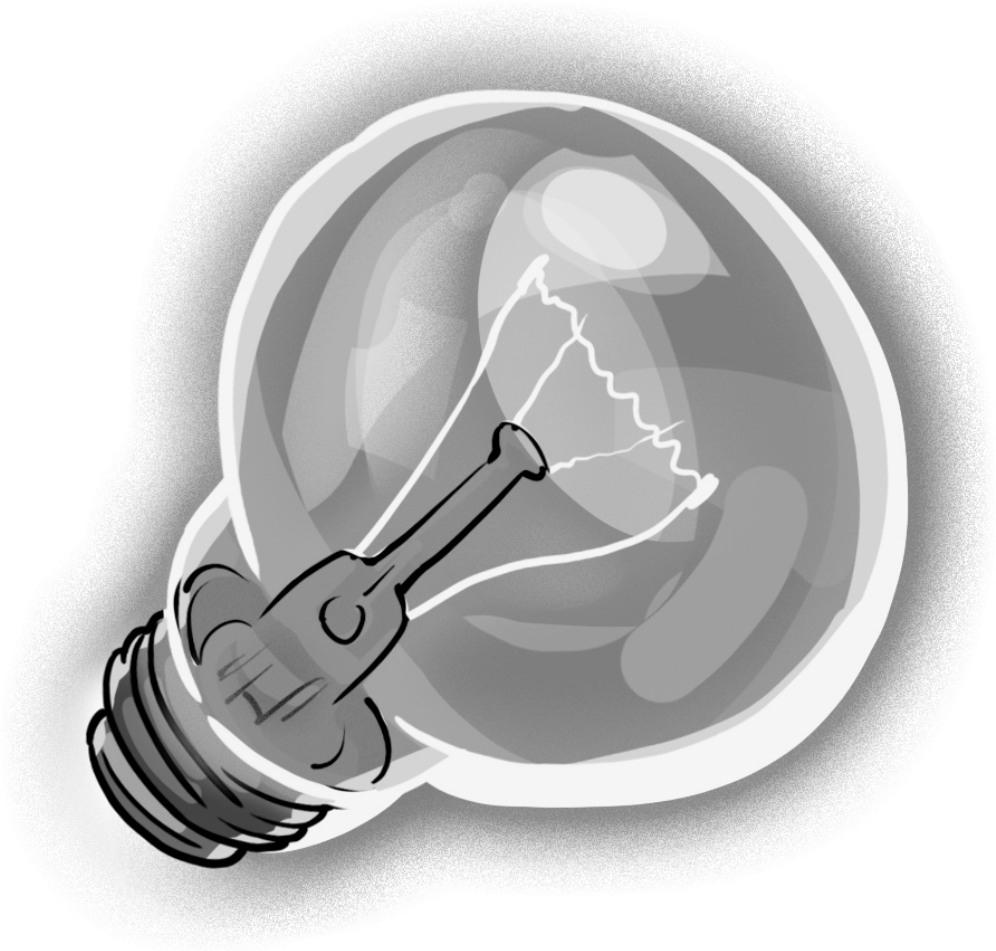
Topical List

The Sassafras Science Adventures Volume 8:Physics covers a variety of aspects of physics, such as:

- Motion
- Forces
- Energy
- Light
- Sound
- Electricity
- Engineering
- Robotics
- Coding

In the process, you will learn about the following specific topics:

- Three Laws of Motion
- Speed
- Velocity
- Acceleration
- Circular motion
- Forces
- Balance
- Gravity
- Friction
- Floating
- Potential energy
- Kinetic energy
- Heat
- Changes in states of matter
- Light
- Colors
- Refraction
- Reflection
- Lenses
- Mirrors
- Sound
- Waves
- Wave behavior
- Musical instruments
- Electricity
- Circuits
- Batteries
- Electronics
- Simple machines
- Engineering design
- Bridges
- Arches
- Computers
- Coding
- Artificial Intelligence (AI)
- Robots



Demonstration Supplies Listed By Chapter

Chapter	Supplies Needed
1: Wind Energy	Pinwheel template from appendix, Chopstick or thin dowel rock, Straight pin, Bead
2: Forces Lab	Toy car, String, Tape, Several books, Cardboard sheet
3: Circular Penny	Balloon, Penny
4: Friction Roll	Marble, Cookie sheet (or smooth cutting board), Paper, Felt, Book
5: Floating Ship	Balloon, Old CD, 2-L soda bottlecap, Thin nail, Glue
6: Energy Relocation	String (3 ft.), Tape, 2 Small bouncy balls
7: Hot or Cold	3 Bowls, Hot-to-the-touch (but not scalding) water, Ice-cold water, Room-temperature water
8: Whirling Colors	Poster board or thin cardboard, Red and blue paint (or markers), Pencil, Scissors
9: Refraction Action	Straw, Clear glass, Water
10: Sound Energy	Tuning fork, Water, Bowl
11: Hearing Interference	Tuning fork, Thick cardboard, Styrofoam (or plastic) cup, Scissors (or knife)
12: Invisible Current	Tissue paper, Balloon, Scissors
13: Simple Circuit	Watch battery, Thin cardboard, Tape, LED light bulb
14: Straw Bridge	10 Straws, Tape, 2 Cups or plastic bins, Small paper cup, Pennies
15: Nails versus Screw	Thick cardboard, Nail, Screw, String
16: Penny Boat	Aluminum foil, Pennies, Plastic tub
17: ArtBot	Cup, Electrical tape, 3 Markers, AA battery, 1.5-V to 3-V DC motor with wires, Clothespin, Paper
18: Build-a-rocket Kit	A build-a-rocket kit (purchase one from Rainbow Resources or Amazon)

STEAM Project Supplies Listed By Chapter

The multi-chapter and specific chapter STEAM projects listed in this guide are optional, so you may not need all of these supplies. However, this list has been provided for your convenience. If you do decide to do these projects, in addition to the items listed each week you will need glue, scissors, a variety of paint colors, and a set of markers.

Chapter	Supplies Needed
1	Scissors, Plastic wrap, Aluminum foil, Tape, Old pizza box, Black construction paper, Glass or metal pie plate, Marshmallows or a piece of buttered toast
2	Penny, Box, Several shock-absorbing materials (newspaper, foam, cotton balls, or packing peanuts), Several metal paper clips (non-coated), Magnet, Empty soda bottle, Balloon
3	Sharpened pencil, Thin cardboard, Scissors, Posterboard, String, Washer, Parachute materials (such as paper, fabric, or plastic wrap)
4	Several pom-poms, Paper, Paint, 3-foot section of a 2x4 board, A1x2x4 block (average-sized wooden block), Sandpaper, Washcloth, Several large books, Timer
5	Bag of gumdrops, Toothpicks, Paper plate, Cardstock, Scissors, 2 Pennies, Putty, Markers, Crayons, Colored pencils, Cup, Water, Egg, Salt
6	Plastic spoon, A small, light object (a marshmallow or a bead), Poster, Markers
7	Small plastic bottle, Clear straw, Air-dry clay, Food coloring, 2 Bowls, Water, Permanent marker, Warm water, Salt
8	Oatmeal container, Tissue paper, Aluminum foil, Pin, Knife, Tape, Black construction paper, Flashlight, Printed page, Magnifying glass
9	Container of bubbles, Glass plate, Toilet paper roll, Thick mylar sheet, Scissors, Tape, Cardstock, Straw, Markers, 2 Mirrors of the same size, Cardboard, Ruler, Hot glue gun
10	Snap Circuits Jr. SC-100 Electronics Discovery Kit, Bowl of water, Small pebble, A group of friends
11	Snap Circuits Jr. SC-100 Electronics Discovery Kit, String, Popsicle sticks, Ruler, Pencil, Hot glue gun
12	Snap Circuits Jr. SC-100 Electronics Discovery Kit, Balloon, Compact fluorescent light bulb, Game of Operation
13	Snap Circuits Jr. SC-100 Electronics Discovery Kit, White glue, Water, Iron filings, Borax, Magnets, Old electronic device, Screwdriver, Newspaper
14	K'nex: Intro to Simple Machines: Gears Kit Container of floss, 25 Uncooked spaghetti, Cotton balls
15	K'nex: Intro to Simple Machines: Gears Kit, LEGO® bricks (including several wheels), Balloons, Block, Wooden board, Stairs, 2 Paper towel tubes, Ribbon, Straw, String, Tape, Scissors, Small basket
16	K'nex: Intro to Simple Machines: Gears Kit, Several sheets of paper, 2 Colors of beads, Elastic jewelry cord
17	K'nex: Intro to Simple Machines: Gears Kit, Paper, Pen, Smartphone or GPS device, Geo-caching app
18	Materials will vary depending on the project chosen

The Sassafras Guide to the Characters Found in Volume 8: Physics

Cecil's Neighborhood (Chapter 1)

- **Mr. Ernest Womberfraggle**[§] – He's a middle school science teacher who once had students named Cecil, Summer, Thaddeus, Paul, and Yang Bo.
- **Mrs. Wilma Womberfraggle**[§] – She's the local librarian.
- **Tracey Sassafras**[§] **–** The female twin of the almost famous duo known as the Sassafras twins who models, solves riddles, and operates cameras. She is also known as Blaisey, Fish Hook, and Tracey the Plucky.
- **Blaine Sassafras**[§] **–** The older and handsomer, in his own mind, twin of the almost famous duo known as the Sassafras twins. He is also known as Train, Rowboat, Blaine the Handsome, and the Little Brother.
- **Cecil Sassafras**[§] **–** The inventor and scientist responsible for the twins' summer of science. He is also the Sassafras twins' uncle who will probably never get their names right.
- **President Lincoln**[§] **–** The brilliant, but quiet prairie dog who serves as Uncle Cecil's right-hand paw. He is the legendary mammal also known as The Prez and Linc Dog.
- **Thaddeus Wazeezy**[§] **–** Also known as The Man With No Eyebrows and the Dark Cape. His plans for revenge are about to culminate in the most forgettable way.

Papua New Guinea (Chapters 2-3)

- **Summer Beach**[§] **–** She is a most unique, sandwich-loving scientist! She has brought her infectious energy to every leg of the twins' journey so far. She's Cecil's schoolmate turned best friend and a *pro re nata* agent for the Triple S (Swiss Secret Service).
- **Paul Sims**[§] – He is the museum curator at the National Air and Space Museum. He is also a friend and schoolmate of Cecil's and Summer's who is hiding quite a bit.
- **Mrs. Pascapali (paz-kah-pah-LEE)**[§] **–** She is Uncle Cecil's neighbor who lives at 1106 North Pecan Street.
- **Susa Dasini** – She is the chief scientist and engineer at Centripetal Village.
- **Polly Glot** – She is Susa's friend and in charge of marketing at Centripetal Village.
- **Bavo Becker** – He is the dour potential investor in Centripetal Village.
- **Alwin Aldrich** – He is a friend of Mr. Becker and another potential investor.

Camp Zip Fire in Montana (Chapters 4-5)

- **Hattie Cates –** One of the twin's local experts for their time in Montana. She is also a regular Camp Zip Fire counselor for the Appaloosa tribe.
- **Joanna, Janna, Marci, and DeeDee –** Tracey's camp buddies from their years at Camp Zip Fire.
- **Chaz Throckmorton –** One of the twin's local experts for their time in Montana. He is also a regular Camp Zip Fire counselor for the Mustang tribe.
- **Jamal, Jarod, Matt, and Davy –** Blaine's camp buddies from their years at Camp Zip Fire.

[§] These characters appear throughout the novel. We have chosen to share about them in the chapter where they first appear.

* These characters are only mentioned in the text but are not a part of this leg of the journey.

- ✯ **Grizz –** The bearded and burly Camp Zip Fire staffer, who does anything and everything required to keep the campground up and running.
- ✯ **Timmy and Gretta Brown –** The brother and sister who join the Appaloosa and Mustang tribes for that summer.

Brazil (Chapters 6-7)

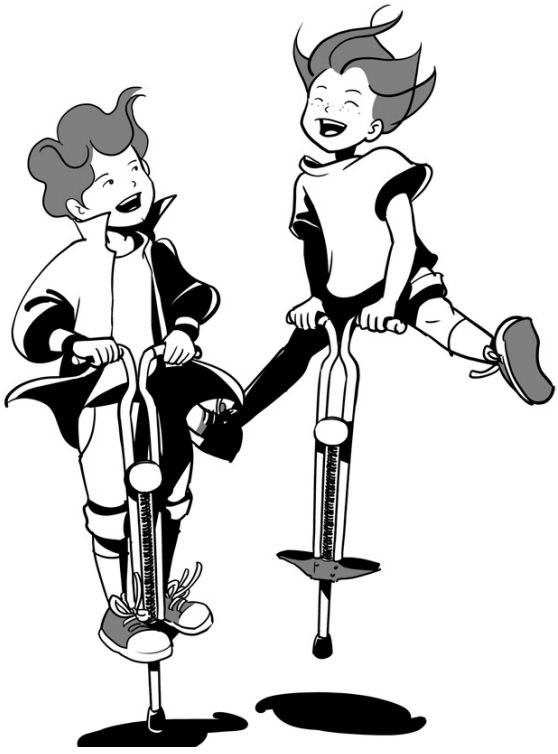
- ✯ **Augustus McShane** – A science-loving special agent who serves as the twins' local expert for their time near Iguazu.
- ✯ **Adelina Ferreira** – A tour guide with Ferreira Tours. She leads the tour of Iguazu Falls and Itaipu Dam.
- ✯ **Ox** – He is the helicopter pilot provided by Colt and Barlow.
- ✯ **Colt Belford** – He is one half of the tourist duo who aren't what they seem.
- ✯ **Barlow Hennessy** – He is the other half of the tourist duo who aren't what they seem.

Greenland (Chapters 8-9)

- ✯ **Ari Jensen** – He is a cameraman who serves as the twins' local expert for their leg in Nuuk.
- ✯ **Rozing Kleist** – She is the talent manager for Stependous.
- ✯ **Hans Lyberth** – He is the mayor of Nuuk, Greenland.
- ✯ **Justus –** He is the frontman of Stependous.
- ✯ **Faro –** He is known as the heartthrob of Stependous.
- ✯ **Anse –** He is known as the bad boy of Stependous.
- ✯ **Pilu –** He is known as the shy one of Stependous.

Spain (Chapters 10-11)

- ✯ **Esperanza Tambor** – She is an orphan who serves as their local expert for the twins' leg in Barcelona.
- ✯ **Alejandra and Maya** – Two of the girls who live with Esperanza.
- ✯ **Valentina** – A taller girl, who serves as the leader of sorts for the ragtag group of orphans in Spain known as *Los Granujos*.
- ✯ **Maria Aldana** – She works at the *Palau de la Musica Catalana* and also helps the group of ragamuffins.
- ✯ **Maestro Martinez** – He is the conductor at the *Palau de la Musica Catalana*.



South Africa (Chapters 12-13)

- ✯ **Lubanzi LeRoux** – He is the radio host for Cape Town the Whole Night Through and the twins' local expert in Cape Town.
- ✯ **John Z** – The audio mixer for the Cape Town the Whole Night Through radio show.
- ✯ **Chester and Lenny** – Owners of Chester and Lenny's Good Morning Products, one of the sponsors of the Cape Town the Whole Night Through radio show.
- ✯ **Dakari the Truckdriver** – A faithful listener and frequent caller for the Cape Town the Whole Night Through radio show.

- ✯ **Lindiwe** – A cat lady who often calls into the Cape Town the Whole Night Through radio show.
- ✯ **Junior** – A rugby player who often calls into the Cape Town the Whole Night Through radio show.
- ✯ **Bandile Botha** – A former rival DJ to the Cape Town the Whole Night Through radio show.
- ✯ **The Candy Line** – A group of night shift line workers at the Cape Candies food processing plant who often call into the Cape Town the Whole Night Through radio show.
- ✯ **Kati the Go-Getter** – A lady who often calls into the Cape Town the Whole Night Through radio show.

Cambodia (Chapters 14-15)

- ✯ **Jaya (J.T.) Tang** – He loves science and math, but doesn't share the same passion with his brothers. He serves as the twins' local expert while they are in Siem Reap.
- ✯ **Kosal** – The foreman of the work crew at Angkor Wat.
- ✯ **Captain Marolf§ –** He is the head of the Triple S. He also appeared in the twins' earth science and astronomy legs.
- ✯ **Evan DeBlose§ –** The lead Triple S agent and earth science local expert, who took down the rogue Agent Adrianne Archer and the nefarious Yuroslav Bogdanovich.
- ✯ **Q-Tip§ –** The Triple S's expert in technologizing and good friend of Agent DeBlose.

Mexico (Chapters 16-17)

- ✯ **Verano Playa** – The mysterious local expert during the twins' visit to Mexico. They have met her multiple times in their adventures, but they usually find her in a much cooler place.
- ✯ **El Asistente –** This mythical Arctic ground squirrel lends a paw and hangs out in robotics forums.
- ✯ **Matteo Perez** – The wheelchair-using friend of Summer. He has designed *El Fausto*.
- ✯ **Solana** – Matteo's mother.
- ✯ **Choncho Caldas** – Matteo's competitor in the *Lucha Libre* contest. He has designed *El Caliente Picante*.
- ✯ **Gordo Gomez** – Matteo's friend and competitor in the *Lucha Libre* contest. He has designed *El Burrito*.
- ✯ **Gonzalo Viejo** – The referee for the *Lucha Libre* contest.
- ✯ **Kevin Maye** – Matteo's competitor in the *Lucha Libre* contest. He has designed *El Texican*.
- ✯ **REESE –** The robotic creation of President Lincoln and Ulysses S. Grant. His name stands for Robotic Exploration, Entertainment, and Scientific Enhancement.

Pecan Street (Chapter 18)

- ✯ **Yang Bo –** He is the astronaut who served as the twins' local expert on the International Space Station. He is also a former classmate of Uncle Cecil and Summer from middle school.

Chapter Lessons

Chapter 1: Grid Schedule

Supplies Needed	
Demo	• Pinwheel template from appendix, Chopstick or thin dowel rock, Straight pin, Bead
Projects	• Scissors, Plastic wrap, Aluminum foil, Tape, Old pizza box, Black construction paper, Glass or metal pie plate, Marshmallows or a piece of buttered toast

Chapter Summary

The chapter opens with Ernest and Wilma Womberfraggle walking down the street towards their respective jobs. Wilma turns to go to the library and Ernest continues on to the middle school. At the library, Mrs. Womberfraggle finds Cecil, President Lincoln, Blaine, and Tracey. They proceed inside and Uncle Cecil gives the twins their review presentation. We switch to the Man With No Eyebrows to learn of his plan to use the Forget-O-Nator to erase everyone's memories. Then, we rejoin the twins as they head to the local pool to see where chemistry and physics collide!

Weekly Schedule

	Day 1	Day 2	Day 3	Day 4
Read	☐ Read the section entitled "Poetic Presentation" of Chapter 1 in *SSA* Volume 8: Physics.*	☐ (*Optional)* Read one or all of the assigned pages from the encyclopedia of your choice.	☐ Read the section entitled "Foundational Physics" of Chapter 1 in *SSA Volume 8: Physics.*	☐ (*Optional)* Read one of the additional library books.
Write	☐ Set up your students' SCIDAT logbooks.	☐ (*Optional)* Write a narration on the Physics Notes Sheet on SL** p. 5. ☐ Fill out the lab report sheet for the demonstration on SL p. 7.	☐ Go over the vocabulary words and enter them into the Physics Glossary on SL p. 101.	☐ (*Optional)* Complete the copywork or dictation assignment and add it to the Physics Notes Sheet on SL p. 6.
Do	☐ (*Optional)* Play "I Spy."	☐ Do the demonstration entitled "Wind Energy."	☐ (*Optional)* Make a Solar Oven.	

**SSA = The Sassafras Science Adventures*

***SL = The Official Sassafras SCIDAT Logbook: Physics Edition*

Chapter 1: List schedule

Chapter Summary

The chapter opens with Ernest and Wilma Womberfraggle walking down the street towards their respective jobs. Wilma turns to go to the library and Ernest continues on to the middle school. At the library, Mrs. Womberfraggle finds Cecil, President Lincoln, Blaine, and Tracey. They proceed inside and Uncle Cecil gives the twins their review presentation. We switch to the Man With No Eyebrows to learn of his plan to use the Forget-O-Nator to erase everyone's memories. Then, we rejoin the twins as they head to the local pool to see where chemistry and physics collide!

Essential To-Do's

Read

- ☐ Read the section entitled "Poetic Presentation" of Chapter 1 in *SSA* Volume 8: Physics.*
- ☐ Read the section entitled "Foundational Physics" of Chapter 1 in *SSA Volume 8: Physics.*

Write

- ☐ Set up your students' SCIDAT logbooks.
- ☐ Fill out the lab report sheet for the demonstration on SL** p. 7.
- ☐ Go over the vocabulary words and enter them into the Physics Glossary on SL p. 101.

Do

- ☐ Do the demonstration entitled "Wind Energy."

Optional Extras

Read

- ☐ Read one or all of the assigned pages from the encyclopedia of your choice.
- ☐ Read one of the additional library books.

Write

- ☐ Write a narration on the Physics Notes Sheet on SL p. 5.
- ☐ Complete the copywork or dictation assignment and add it to the Physics Notes Sheet on SL p. 6.

Do

- ☐ Play "I Spy."
- ☐ Make a Solar Oven.

Supplies Needed	
Demo	• Pinwheel template from appendix, Chopstick or thin dowel rock, Straight pin, Bead
Projects	• Scissors, Plastic wrap, Aluminum foil, Tape, Old pizza box, Black construction paper, Glass or metal pie plate, Marshmallows or a piece of buttered toast

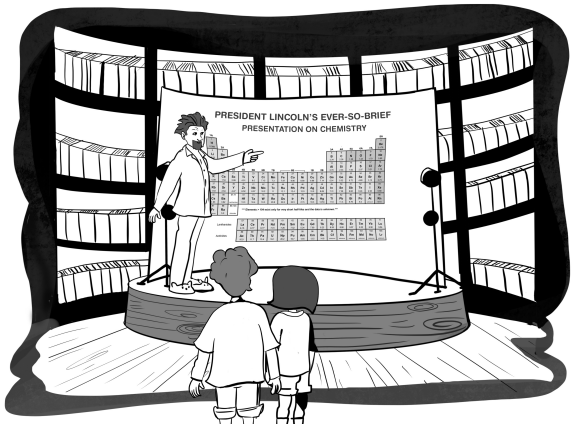
**SSA = The Sassafras Science Adventures*
***SL = The Official Sassafras SCIDAT Logbook: Physics Edition*

Chapter 1: A Trip to the Library

Read: Gathering Information

Living Book Spine

- 🕮 Chapter 1 of *The Sassafras Science Adventures Volume 8: Physics*



(Optional) Encyclopedia Readings

- *The Usborne Children's Encyclopedia* (No pages scheduled)
- *The DK Children's Encyclopedia* p. 97 (Fossil Fuels)
- *Basher Science Physics: Why Matter Matters* (No pages scheduled)
- *Usborne Science Encyclopedia* pp. 108-109 (Energy Resources)
- *Kingfisher Science Encyclopedia* pp. 242-243 (Heat and Light from the Sun)

(Optional) Additional Library Books

- 🕮 *Isaac Newton: The Scientist Who Changed Everything (National Geographic World History Biographies)*
- 🕮 *Quantum Physics for Smart Kids: A Little Scientist's Guide to Atoms, Molecules, Matter, and More* by Carlos Pazos
- 🕮 *Wind Energy: Blown Away! (Powering Our World)* by Amy S. Hansen
- 🕮 *Solar Energy: Running on Sunshine (Powering Our World)* by Amy S. Hansen

Write: Keeping a Notebook

SCIDAT Logbook Sheets

This chapter, you will set up the students' SCIDAT logbooks. You can use blank sheets of copy paper with dividers for each section or purchase *The Official Sassafras Student SCIDAT Logbook: Physics Edition* with all the pages and pictures from Elemental Science. For each of these sheets, you can have the students enter information only from *The Sassafras Science Adventures Volume 8: Physics*, or you can have them do additional research to gather more facts. The following video shares a peek inside a 2nd-grader's SCIDAT Logbook:

🖱 https://www.youtube.com/watch?v=0m4nj-K7s58

What you choose to do will depend upon the ages and abilities of your students. Below is an explanation of each of the student sheets.

Physics Record Sheets

The purpose of these sheets is for the students to record what they have learned about the topics that are introduced in *The Sassafras Science Adventures Volume 8: Physics*.

Information Learned: The students should color the picture above the box, if they desire, and enter any information that they have learned about the particular topic.

Customized Lab Report Sheets

The purpose of these sheets is for the students to record the demonstrations they have done during the course of their study of physics.

Map Sheets

The purpose of these sheets is to give your students an opportunity to do a bit of research because the answers for these will not all be covered in the novel. Instead, the students will need to look them up on the Internet or in an atlas that shows a region's industry and resources, such as *DK Children's Illustrated Atlas*.

WORLD MAP IMAGE: Have the students color the region where the twins have traveled.

ENERGY: Have the students look up and write down any types of energy used in the region.

INTERESTING FACTS: Have the students add any interesting facts they learned about the region.

Physics Notes Sheets

The purpose of these sheets is for the students to record any additional information that they have learned during their study of physics. You can use these sheets to record additional narrations, copywork, or dictation assignments.

Project Record Sheets

The purpose of these sheets is for the students to record the projects they have done during the course of their study of physics.

Physics Glossary

The purpose of the glossary is for the students to create a dictionary of terms that they have encountered while reading *The Sassafras Science Adventures Volume 8: Physics*. They can look up each term in a science encyclopedia or in the glossary included on pp. 133-135 of this guide. Then have the students copy each definition onto a blank index card or into their SCIDAT logbooks. They should also illustrate each of the vocabulary words. (NOTE—In *The Official Sassafras Student SCIDAT Logbook: Physics Edition*, these pictures are already provided.)

VOCABULARY

Have the older students look up the following terms in the glossary in the appendix on pp. 133-135 or in a science encyclopedia. Then, have them copy the definition onto a blank index card or into their SCIDAT logbook.

- SOLAR ENERGY – Energy from the sun.
- WIND ENERGY – Energy from the wind.

(OPTIONAL) COPYWORK

Copywork Selection

A renewable source of energy can generate power without being used up.

Dictation Passage

A renewable source of energy can generate power without being used up. Examples of renewable

sources of energy are solar, wind, or water. A nonrenewable source of energy can be used only once to generate power. Examples of nonrenewable energy sources are coal, oil, or gas.

Do: Playing with Science

Scientific Demonstration: Wind Energy

Materials

- ☑ Pinwheel template from appendix p. 129
- ☑ Chopstick or thin dowel rod
- ☑ Straight pin
- ☑ Bead

Procedure

1. Begin by making a pinwheel. Cut out the pinwheel template found on p. 129 of the appendix. (Cut on the dashed lines, not the solid ones.) Then, bring every other corner to the center and pin them in place with a straight pin. Roll the pin around a bit to enlarge the hole so that the pinwheel can spin freely. Next, add a bead to the pin on the opposite side of the pin head and push the tip of the pin into the top of the chopstick to create a pinwheel.
2. Now, have the students face the blades of the pinwheel toward themselves and blow on it, and observe what happens. Ask the students:
   - ? Does the pinwheel spin?
   - ? Which way does it spin?
3. Next, have the students face the front of the pinwheel toward themselves and blow on it, and observe what happens. Ask the students:
   - ? Does the pinwheel spin?
   - ? Which way does it spin?
4. Finally, have the students angle the pinwheel slightly away from them so that they will blow halfway between the front and the blades. Have them blow on the pinwheel and observe what happens. Ask the students:
   - ? Does the pinwheel spin?
   - ? Which way does it spin?
5. Have the students fill out a lab report sheet.

Explanation

The purpose of this demonstration was for the students to see wind energy in action. The students should have seen that when they blew on the blades of the pinwheel from the side, the pinwheel turned quickly. When they blew at the pinwheel from other directions, it didn't move nearly as well. A pinwheel is a simple look at how we can harness wind energy. In general, wind blows, and the blades are positioned to capture the wind, causing the wheel to turn. A windmill or wind turbine work the same way as the pinwheel, except these devices harness wind energy and turn it into electrical energy.

Take It Further

Have the students watch the following video to learn more about wind energy:

- https://www.youtube.com/watch?v=SQpbTTGe_gk

(Optional) STEAM Projects

Activities For This Chapter

- I Spy – Play a game of "I Spy" to help the students work on their observation skills.
- Solar Oven – Have the students build their own solar oven out of an old pizza box. You will need scissors, plastic wrap, aluminum foil, tape, an old pizza box, black construction paper, a glass or metal pie plate, and a few marshmallows or a piece of buttered toast. Use the scissors to make a flap out of the top of the pizza box by cutting three sides, leaving about an inch away from the sides. Then, fold the flap back, and cover the flap with aluminum foil. Next, cover the open hole in the top with plastic wrap. After that, line the bottom of the box with black construction paper. Now, place your marshmallows or piece of buttered toast on the pie plate, set the plate inside the oven, and take the oven outside. Finally, position the box and flap so that the sun's rays are directed toward the plastic-wrap-covered opening. Check the oven every 10 to 15 minutes to see when the food is done. Use a hot mitt to remove the food, and enjoy the solar-powered meal!

Chapter 2: Grid Schedule

Supplies Needed	
Demo	• Toy car, String, Tape, Several books, Cardboard sheet
Projects	• Penny, Box, Several shock-absorbing materials (newspaper, foam, cotton balls, or packing peanuts) • Several metal paper clips (non-coated), Magnet • Empty soda bottle, Balloon (per player)

Chapter Summary

The chapter opens with the Man With No Eyebrows delivering an invitation to the reunion where he plans to forget-o-nate everyone. We then see Summer and Paul sipping flavored water and chatting about the reunion on Mrs. Pascapali's porch. Back at the pool with Uncle Cecil, the twins zip off to their first location in Papua New Guinea. They land on a ride in Centripetal Village and overhear their local expert, Susa Dasini, share about forces as they float on the log ride. Things quickly go downhill as the twins take a ride on the Kroko River ride. We flash to Yang Bo, who is also making his way to the reunion. Back with the twins, we see their log navigate the rest of the ride to arrive safely at the end. They meet Susa, her colleague, Polly, and the antagonistic potential investor, Mr. Becker. Susa shares about the three laws of motion and how they are employed at Centripetal Village. The chapter wraps up with Mr. Becker, declaring he wants to shut down the park!

Weekly Schedule

	Day 1	Day 2	Day 3	Day 4
Read	☐ Read the section entitled "Force Falls" of Chapter 2 in *SSA Volume 8: Physics.*	☐ Read the section entitled "Streaming Motion" of Chapter 2 in *SSA Volume 8: Physics.*	☐ (*Optional)* Read one or all of the assigned pages from the encyclopedia of your choice.	☐ (*Optional)* Read one of the additional library books.
Write	☐ Fill out a Physics Record Sheet on SL p. 8 on force. ☐ Go over the vocabulary word and enter it into the Physics Glossary on SL p. 101.	☐ Fill out a Physics Record Sheet on SL p. 9 on motion. ☐ (*Optional)* Work on the Papua New Guinea Map Sheet on SL p. 16_.	☐ (*Optional)* Write narration on the Physics Notes Sheet on SL p. 14. ☐ Fill out the lab report sheet for the demonstration on SL p. 12.	☐ (*Optional)* Complete the copywork or dictation assignment and add it to the Physics Notes Sheet on SL p. 14. ☐ (*Optional)* Fill out the record sheet on SL p. 17 for one of the projects.
Do	☐ (*Optional)* Do the Invisible Force activity.	☐ (*Optional)* Have a Force Race.	☐ Do the demonstration entitled "Forces Lab."	☐ (*Optional)* Work on the Egg Drop Carrier project.

Chapter 2: List schedule

Chapter Summary

The chapter opens with the Man With No Eyebrows delivering an invitation to the reunion where he plans to forget-o-nate everyone. We then see Summer and Paul sipping flavored water and chatting about the reunion on Mrs. Pascapali's porch. Back at the pool with Uncle Cecil, the twins zip off to their first location in Papua New Guinea. They land on a ride in Centripetal Village and overhear their local expert, Susa Dasini, share about forces as they float on the log ride. Things quickly go downhill as the twins take a ride on the Kroko River ride. We flash to Yang Bo, who is also making his way to the reunion. Back with the twins, we see their log navigate the rest of the ride to arrive safely at the end. They meet Susa, her colleague, Polly, and the antagonistic potential investor, Mr. Becker. Susa shares about the three laws of motion and how they are employed at Centripetal Village. The chapter wraps up with Mr. Becker, declaring he wants to shut down the park!

Essential To-Do's

Read

- ☐ Read the section entitled "Force Falls" of Chapter 2 in *SSA Volume 8: Physics.*
- ☐ Read the section entitled "Streaming Motion" of Chapter 2 in *SSA Volume 8: Physics.*

Write

- ☐ Fill out a Physics Record Sheet on SL p. 8 on force.
- ☐ Fill out a Physics Record Sheet on SL p. 9 on motion.
- ☐ Fill out the lab report sheet for the demonstration on SL p. 12.
- ☐ Go over the vocabulary word and enter it into the Physics Glossary on SL p. 101.

Do

- ☐ Do the demonstration entitled "Molecular Motion."

Optional Extras

Read

- ☐ Read one or all of the assigned pages from the encyclopedia of your choice.
- ☐ Read one of the additional library books.

Write

- ☐ Write a narration on the Physics Notes Sheet on SL p. 14.
- ☐ Complete the copywork or dictation assignment and add it to the Physics Notes Sheet on SL p. 14.
- ☐ Work on the Papua New Guinea Map Sheet on SL p. 16.
- ☐ Fill out the record sheet on SL p. 17 for one of the projects.

Do

- ☐ Do the Invisible Force activity.
- ☐ Have a Force Race.
- ☐ Work on the Egg Drop Carrier project.

Supplies Needed	
Demo	• Toy car, String, Tape, Several books, Cardboard sheet
Projects	• Penny, Box, Several shock-absorbing materials (newspaper, foam, cotton balls, or packing peanuts) • Several metal paper clips (non-coated), Magnet • Empty soda bottle, Balloon (per player)

Chapter 2: Propelled to Papua New Guinea

Read: Gathering Information

Living Book Spine

📖 Chapter 2 of *The Sassafras Science Adventures Volume 8: Physics*



(Optional) Encyclopedia Readings

- *The Usborne Children's Encyclopedia* p. 194 (Forces)
- *The DK Children's Encyclopedia* p. 197 (Forces)
- *Basher Science Physics: Why Matter Matters* p. 20 (Force)
- *Usborne Science Encyclopedia* pp. 118-121 (Force)
- *Kingfisher Science Encyclopedia* pp. 290-291 (Force)

(Optional) Additional Library Books

- 📖 *Forces Make Things Move (Let's-Read-and-Find-Out Science 2)* by Kimberly Bradley and Paul Meisel
- 📖 *Forces (Science Readers)* by Debra J. Housel
- 📖 *Push and Pull (Rookie Read-About Science)* by Patricia J. Murphy
- 📖 *Pushes and Pulls (TIME FOR KIDS® Nonfiction Readers)* by Sharon Coan

Write: Keeping a Notebook

SCIDAT Logbook Sheets

This chapter, you can have the students work on the map sheet. You can also have them fill out the record sheets for forces and motion along with adding to the notes sheet and glossary. The students should also complete a lab report sheet, and if they want, they can do a project record sheet. Here is the information they could include:

Papua New Guinea Map Sheet

This chapter, you can have the students look up the types of energy used in Papua New Guinea. Here are a few possibilities:

- Oil
- Gas
- Biomass
- Electricity

Here are two websites you can check out:

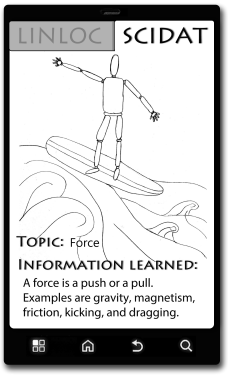
- https://www.enerdata.net/estore/energy-market/papua-new-guinea/
- https://ourworldindata.org/energy/country/papua-new-guinea

Physics Record Sheet - Force

Information Learned

- A force is a push or a pull.
- Examples of forces are gravity, magnetism, friction, kicking, or dragging.
- Forces affect objects, causing them to move, speed up, and slow down.

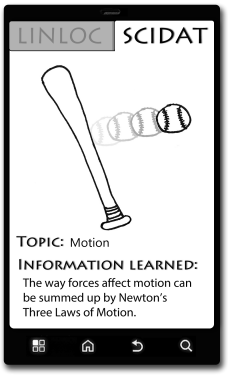
- Forces can also make objects change directions and shape.
- A push force can start objects moving or change their speed as the object moves away from the force.
- A pull force can also start objects moving or change their speed as the object moves toward the source of the force.
- Some forces act visibly by touching the object – these are known as contact or direct forces.
- Some act invisibly and can affect objects from a distance – these are known as distant or indirect forces.
- Forces are measured in Newtons, which were named after Isaac Newton. One newton of force causes a one kilogram object to accelerate by one meter per second per second.



Physics Record Sheet - Motion

Information Learned

- How forces affect motion can be summed up by Newton's Three Laws of Motion:
  1. An object in motion will stay in motion and an object at rest will stay at rest unless they are acted on by an outside force.
  2. The greater the force on an object, the greater the change in its motion. The greater the mass of an object, the greater the force needed to change its motion.
  3. For every action, there is an equal but opposite reaction.
- Inertia is the tendency of an object to resist motion. The more an object weighs, the greater the force it takes to get it moving.
- Momentum is the tendency of an object to keep moving. The more an object weighs and the faster it goes, the more momentum it has, meaning it will be harder to stop.
- Dynamics is the part of physics that looks at motion. It studies how forces affect motion.



Physics Notes - Early Physicists

The following is information that the students could add to their notes page:

- Ancient scientists were puzzled by motion.
- Aristotle thought that an object moved when a force acted on it, but when the force was removed it stopped. However, this didn't explain objects that flew through the air on their own.
- Many years later, Galileo said that a force was needed to start, stop, or accelerate an object, which was much better but it still didn't give the complete picture.
- Isaac Newton built upon Galileo's ideas to come up with the three laws of motion we still use today. He studied at Cambridge, but it was while he was at home due to the plague that he discovered the three laws of motion and a type of math we know as calculus. He also explained how gravity keeps the planets orbiting around the sun.

Vocabulary

Have the older students look up the following terms in the glossary in the appendix on pp. 133-135 or in a science encyclopedia. Then, have them copy each definition onto a blank index card or into their SCIDAT logbook.

- Force – A push or a pull on an object.

(Optional) Copywork

Copywork Sentence

A force is a push or a pull.

Dictation Selection

Newton's Three Laws of Motion:

1. An object in motion will stay in motion and an object at rest will stay at rest unless they are acted on by an outside force.
2. The greater the force on an object, the greater the change in its motion. The greater the mass of an object, the greater the force needed to change its motion.
3. For every action, there is an equal but opposite reaction.

Do: Playing with Science

Scientific Demonstration: Forces Lab

Materials

- ☑ Toy car
- ☑ String
- ☑ Tape
- ☑ Several books
- ☑ Cardboard sheet

Procedure

1. Have the students perform each of the three tests on the toy car:
2. **Test #1 (Push):** Set the car on a flat surface, and observe what happens. Then, have the student gently push the back of the car and observe what happens. Ask the students:

   ? What happened to the car?

3. **Test #2 (Pull):** Use the tape to attach a piece of string to the front of the car. Then, have the student gently pull on the string and observe what happens. Ask the students:

   ? What happened to the car this time?

4. **Test #3 (Both):** On a smooth surface, stack several books on top of each other, and then set the cardboard up against the books and the surface, creating a ramp. Hold the car at the top of the ramp, and gently push it down the ramp, observing what happens. Ask the students:

   ? What happened to the car during this final test?

5. Then, have them complete the lab report sheet.

Explanation

The purpose of this demonstration was for the students to see what forces do. The students should have seen that in each test, the car did not move until they either pushed or pulled the car. In the first two tests, the push or pull given to the car was the force that acted on the car, causing it to move. In the third test, the car went even farther because the push given to the car was added to the pull from gravity. These same types of forces, or pushes and pulls, act on objects all the time, causing them to move, change position, or stop.

Take It Further

Have the students do the "See for Yourself " activity on p. 118 of the *Usborne Science Encyclopedia*. You will need two balls and access to a smooth surface for this activity.

(Optional) STEAM Projects

Multi-chapter Activities

✂ Egg Drop Carrier – Over the next few chapters, the students will design and build a vessel to carry their egg as it is dropped from a height of at least 6 feet. This chapter, your students will test shockabsorbing materials. You will need a penny, a box, and several shock-absorbing materials, such as newspaper, foam, cotton balls, or packing peanuts. Begin by having the students drop the penny into the box and note the sound it makes. (Note—You can download a decibel meter app if you would like to make your testing more scientific.) Next, have the students line the box with one of the shock-absorbing materials. Again, drop the penny into the box, and note any sound it makes. Then, have the students repeat the process for the remaining shock-absorbing materials.

Activities For This Chapter

✂ Invisible Force – Have the students learn about invisible forces. You will need several metal paper clips (non-coated) and a magnet for this activity. Hold several paper clips in your hand, and let it go over a surface. What happens? (*The invisible force of gravity pulls the paper clips down to the surface*.) Then, hold the magnet just over one of the paper clips without touching it. What happens? (*The invisible force of magnetism pulls the paper clip up toward the magnet*.)

✂ Force Race – Have the students compete to see who can force a balloon over a line first. You will need an empty soda bottle and a balloon for each player. Begin by drawing two lines at either end of a room or outside. Then, give each player an empty soda bottle and a balloon. Have them line up on the first line. When you yell "go," the players will use their empty soda bottle to push their balloon toward the second line. The player to cross the line first wins the race.

Chapter 3: Grid Schedule

Supplies Needed	
Demo	• Balloon, Penny
Projects	• Sharpened pencil, Thin cardboard, Scissors • Posterboard • String, Washer, Parachute materials (such as paper, fabric, or plastic wrap)

Chapter Summary

The chapter opens with Polly convincing Mr. Becker to give the park a chance. They head over to the next ride, which is a roller coaster named the Ring of Paia. Susa shares about speed and acceleration before the twins take a ride on the Ring of Fire! When they step off, Mr. Becker calls Alwin Aldrich, another investor, to share his concerns. As they speak, the twins meet the park's mascot, Matschie, who is a tree kangaroo. We zip to Uncle Cecil, where he is opening his mailbox to find an invitation to the middle school reunion. Back at Centripetal Village, the twins ride the Merry-go Matschie and then head to the Colossal Cone, where they learn about centripetal force. Mr. Becker is still not pleased, but he cannot convince Mr. Aldrich to shut down the park. Mr. Aldrich appears in Centripetal Village, saying he supports opening the park. The chapter ends with everyone riding the Colossal Cone.

Weekly Schedule

	Day 1	Day 2	Day 3	Day 4
Read	☐ Read the section entitled "Amusement Acceleration" of Chapter 3 in *SSA Volume 8: Physics.*	☐ Read the section entitled "Centripetal Center" of Chapter 3 in *SSA Volume 8: Physics.*	☐ (*Optional)* Read one or all of the assigned pages from the encyclopedia of your choice.	☐ (*Optional)* Read one of the additional library books.
Write	☐ Fill out a Physics Record Sheet on SL p. 10 on speed and acceleration. ☐ Go over the vocabulary words and enter them into the Physics Glossary on SL pp. 101-102.	☐ Fill out a Physics Record Sheet on SL p. 11 on centripetal force. ☐ (*Optional)* Work on the Papua New Guinea Map Sheet on SL p. 16.	☐ (*Optional)* Write narration on the Physics Notes Sheet on SL p. 15. ☐ Fill out the lab report sheet for the demonstration on SL p. 13.	☐ (*Optional)* Complete the copywork or dictation assignment and add it to the Physics Notes Sheet on SL p. 15. ☐ (*Optional)* Fill out the record sheet on SL p. 18 for one of the projects. ☐ (*Optional)* Take Physics Quiz #1.
Do	☐ (*Optional)* Create a Speed Poster.	☐ (*Optional)* Make some Spinning Shapes.	☐ Do the demonstration entitled "Circular Penny."	☐ Work on the Egg Drop Carrier project.

Chapter 3: List schedule

Chapter Summary

The chapter opens with Polly convincing Mr. Becker to give the park a chance. They head over to the next ride, which is a roller coaster named the Ring of Paia. Susa shares about speed and acceleration before the twins take a ride on the Ring of Fire! When they step off, Mr. Becker calls Alwin Aldrich, another investor, to share his concerns. As they speak, the twins meet the park's mascot, Matschie, who is a tree kangaroo. We zip to Uncle Cecil, where he is opening his mailbox to find an invitation to the middle school reunion. Back at Centripetal Village, the twins ride the Merry-go Matschie and then head to the Colossal Cone, where they learn about centripetal force. Mr. Becker is still not pleased, but he cannot convince Mr. Aldrich to shut down the park. Mr. Aldrich appears in Centripetal Village, saying he supports opening the park. The chapter ends with everyone riding the Colossal Cone.

Essential To-Do's

Read

- ☐ Read the section entitled "Amusement Acceleration" of Chapter 3 in *SSA Volume 8: Physics.*
- ☐ Read the section entitled "Centripetal Center" of Chapter 3 in *SSA Volume 8: Physics.*

Write

- ☐ Fill out a Physics Record Sheet on SL p. 10 on speed and acceleration.
- ☐ Fill out a Physics Record Sheet on SL p. 11 on centripetal force.
- ☐ Fill out the lab report sheet for the demonstration on SL p. 13.
- ☐ Go over the vocabulary words and enter them into the Physics Glossary on SL pp. 101-102.

Do

- ☐ Do the demonstration entitled "Circular Penny."
- ☐ Work on the Egg Drop Carrier project.

Optional Extras

Read

- ☐ Read one or all of the assigned pages from the encyclopedia of your choice.
- ☐ Read one of the additional library books.

Write

- ☐ Write a narration on the Physics Notes Sheet on SL p. 15.
- ☐ Complete the copywork or dictation assignment and add it to the Physics Notes Sheet on SL p. 15.
- ☐ Fill out the record sheet on SL p. 18 for one of the projects.
- ☐ Work on the Papua New Guinea Map Sheet on SL p. 16.
- ☐ Take Physics Quiz #1.

Do

- ☐ Create a Speed Poster.
- ☐ Make some Spinning Shapes.

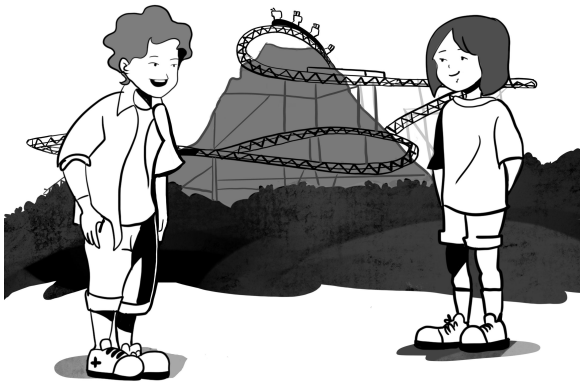
Supplies Needed	
Demo	• Balloon, Penny
Projects	• Sharpened pencil, Thin cardboard, Scissors • Posterboard • String, Washer, Parachute materials (such as paper, fabric, or plastic wrap)

Chapter 3: Consulting in the Centripetal Village

Read: Gathering Information

Living Book Spine

📖 Chapter 3 of *The Sassafras Science Adventures Volume 8: Physics*



(Optional) Encyclopedia Readings

- *The Usborne Children's Encyclopedia* - No pages scheduled.
- *The DK Children's Encyclopedia* - No pages scheduled.
- *Basher Science Physics: Why Matter Matters* p. 16 (Speed, p. 18 (Acceleration)
- *Usborne Science Encyclopedia* pp. 126-127 (Motion), p. 129 Centripetal Force
- *Kingfisher Science Encyclopedia* - No pages scheduled.

(Optional) Additional Library Books

📖 *Motion (Blastoff! Readers: First Science)* by Kay Manolis
📖 *Vroom! Speed and Acceleration (TIME FOR KIDS® Nonfiction Readers)* by Stephanie Paris
📖 *Full Speed Ahead!: How Fast Things Go* by Cruschiform

Write: Keeping a Notebook

SCIDAT Logbook Sheets

This chapter, you can have the students finish the map sheet. You can also have them fill out the record sheets for the speed and centripetal force, along with adding to the notes sheet and glossary. The students should also complete a lab report sheet, and if they want, they can do a project record sheet. Here is the information they could include:

Papua New Guinea Map Sheet

This chapter have the students look up and add several interesting facts about Papua New Guinea. Here is a website you can check out:

🖱 https://kids.britannica.com/kids/article/Papua-New-Guinea/345764

Or you can read the following page from the suggested atlas:

📖 *DK Countries of the World* p. 174 (Papua New Guinea)

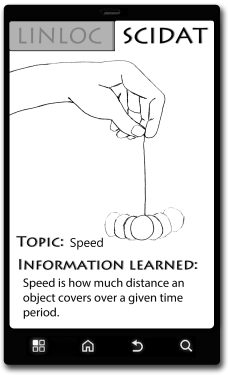
Physics Record Sheet - Speed and Acceleration

Information Learned

- Speed is how much distance an object covers over a given time period.
- Average speed is used because an object, like a car, can speed up and slow down in small amounts

over that time period.

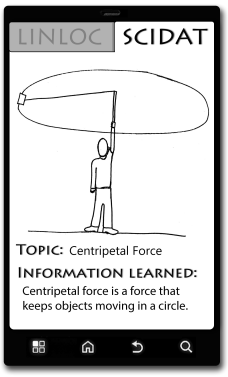
- Instantaneous speed, like the speed measured by a speedometer, is speed an object is traveling at a given moment.
- Speed that is in a particular direction is called velocity.
- Acceleration is when an object changes speed.
- It is called acceleration when the velocity is increasing. It is called deceleration when the velocity is decreasing.
- Acceleration happens when forces are unbalanced.



Physics Record Sheet - Centripetal Force

Information Learned

- Centripetal force is a force that keeps objects moving in a circle.
- Merry-go-rounds, spinning tops, and wheels all go around in circles. All of these have a force that pulls the objects in toward the center of the circle, called centripetal force.
- This force holds a person onto a roller coaster and the coaster cart on the track as it goes around a loop. It seems like something is pushing the objects up, but really the centripetal force in this case is inertia trying to make the coaster cart with the person in it go straight ahead.
- Gyroscopes are devices that use centripetal force. They have spinning wheels that resist the pull of gravity. They can be simple or electrically driven. Electric ones are used in navigation or to help boats stay upright in rolling seas.



Physics Notes - Quantities

The following is information that the students could add to their notes page:

- A vector quantity is a force that has both size and direction; things like acceleration and velocity are vector quantities.
- A scalar quantity has size, but no direction; things like temperature, time, and mass are scalar quantities.

Vocabulary

Have the older students look up the following terms in the glossary in the appendix on pp. 133-135 or in a science encyclopedia. Then, have them copy each definition onto a blank index card or into their SCIDAT logbook.

- Acceleration – A change in the speed or direction of an object.
- Speed – A measure of how fast an object is moving.
- Velocity – A measure of how fast an object is moving in a given direction.

(Optional) Copywork

Copywork Sentence

Speed is how much distance an object covers over a given time period.

Dictation Selection

Speed is how much distance an object covers over a given time period. Acceleration is when an object changes speed. It is called acceleration when the velocity is increasing. It is called deceleration when

the velocity is decreasing.

(Optional) Quiz

This chapter, you can give the students a quiz based on what they learned in Chapters 2 and 3. You can find the quiz in the appendix on p. 145.

Quiz #1 Answers

1. D,B,A,C
2. Students' answers should include one of the following:
   - ⇨ An object in motion will stay in motion and an object at rest will stay at rest unless they are acted on by an outside force.
   - ⇨ The greater the force on an object, the greater the change in its motion. The greater the mass of an object, the greater the force needed to change its motion.
   - ⇨ For every action, there is an equal but opposite reaction.
3. False (*Forces can be visible, such as a contact force, or invisible, such as gravity*.)
4. Contact
5. True
6. All three
7. Centripetal force is a force that keeps an object moving in a circle.

Do: Playing with Science

Scientific Demonstration: Circular Penny

Materials

- ☑ Balloon
- ☑ Penny

Procedure

1. Have the students place the penny inside the balloon.
2. Then, blow the balloon up, and tie it off for the students so that the penny won't come out.
3. Now, have the students move the balloon side to side or back-and-forth to get the penny rolling along the outside of the balloon in a circular path.
4. Then, have them stop and observe what happens to the penny.

? What is the penny doing?

Explanation

The purpose of this demonstration was for the students to see centripetal force. The students should have seen the penny continuously moving in a circle, even after they stopped moving it. The force that kept the penny in motion long after the student stopped moving the balloon is called centripetal force. This is a special type of force that keeps objects moving in a circle.

Take It Further

Have the students do the "See for Yourself " activity on p. 129 of the *Usborne Science Encyclopedia*. You will need a marble and a plastic bowl for this activity.

(Optional) STEAM Projects

Multi-chapter Activities

- ✂ Egg Drop Carrier – This chapter, the students will test out materials to use a parachute. You will need string, a washer, and parachute materials, such as paper, fabric, or plastic wrap. For each material, have the students cut out an 8" by 8" square. Have them poke holes in the four corners of one of the squares. Then, have them cut out two 2-foot lengths of string and use these strings to attach the washer to the corners of the square so that it hangs in the center. Once the parachute is completed, have them hold out the washer at shoulder level and drop the washer. Have them record the time it takes for the washer to hit the ground. Have the students repeat the process for the remaining parachute materials. Finally, have them drop just the washer and see how this compares to the parachute results.

Activities For This Chapter

- ✂ Speed Poster – Have the students make a poster depicting the differences among speed, velocity, and acceleration. Divide a piece of poster board or paper into three sections. Begin by titling the first section “Speed” and add the definition of speed along with a picture of a ball in motion. Next, title the second section “Velocity” and add the definition of velocity along with a picture of a ball in motion and an arrow showing its direction. Finally, title the third section “Acceleration” and add the definition of acceleration along with a picture of a ball being hit by a bat.

- ✂ Spinning Shapes – Have the students test different shapes to see how shape affects spin. You will need a sharpened pencil, thin cardboard, and scissors for this activity. Cut out several shapes from the cardboard, such as a circle, a square, and a triangle. Mark the center of each shape and use the pointed end of the scissors to poke a hole in the center of each shape big enough for the pencil to fit through. Then, let the students test the spinning capabilities of each shape by seeing which one stays up the longest.

Physics Quiz #1

Chapters 2 and 3

1. Match the terms.

____ Acceleration

____ Force

____ Speed

____ Velocity

A. A measure of how fast an object is moving.

B. A push or a pull on an object.

C. A measure of how fast an object is moving in a given direction.

D. A change in the speed or direction of an object.

2. Write one of Newton's Three Laws of Motion.

_____

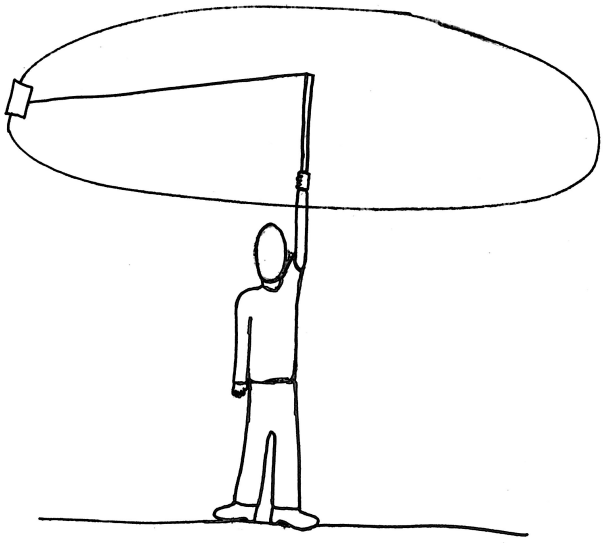
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3. **True or False:** All forces must be visible.

4. A _____ force is a force that needs two objects to touch.

5. **True or False:** Acceleration is a change in an object's speed or direction.

6. Scientists use an object's _____ to describe its motion.

speed velocity acceleration all three

7. What is a centripetal force?

_____

_____