

Physics for the Rhetoric Stage



by Bradley Hudson

Physics for the Rhetoric Stage

First Edition, 2018

Copyright © Elemental Science, Inc.

Email: support@elementalscience.com

Digital Edition

Printed in the USA for worldwide distribution

For more copies write to:

Elemental Science

PO Box 79

Niceville, FL 32578

support@elementalscience.com

Copyright Policy

All contents copyright © 2018 by Elemental Science. All rights reserved.

No part of this document or the related files may be reproduced or transmitted in any form, by any means (electronic, photocopying, recording, or otherwise) without the prior written permission of the author. The author does give permission to the original purchaser to photocopy the quizzes and appendix materials for use within their immediate family only.

Limit of Liability and Disclaimer of Warranty: The publisher has used its best efforts in preparing this book, and the information provided herein is provided “as is.” Elemental Science makes no representation or warranties with respect to the accuracy or completeness of the contents of this book and specifically disclaims any implied warranties of merchantability or fitness for any particular purpose and shall in no event be liable for any loss of profit or any other commercial damage, including but not limited to special, incidental, consequential, or other damages.

Trademarks: This book identifies product names and services known to be trademarks, registered trademarks, or service marks of their respective holders. They are used throughout this book in an editorial fashion only. In addition, terms suspected of being trademarks, registered trademarks, or service marks have been appropriately capitalized, although Elemental Science cannot attest to the accuracy of this information. Use of a term in this book should not be regarded as affecting the validity of any trademark, registered trademark, or service mark. Elemental Science is not associated with any product or vendor mentioned in this book.

Table of Contents

Introduction

Introduction to the Parents	5
Introduction to the Students	8

Unit 1: Introduction to Physics

Week 1 Assignment Sheet - Introduction to Physics, Part 1	12
Week 2 Assignment Sheet - Introduction to Physics, Part 2	14
Week 3 Assignment Sheet - One Dimensional Motion, Part 1	16
Week 4 Assignment Sheet - One Dimensional Motion, Part 2	18
Week 5 Assignment Sheet - Two Dimensional Motion	20
Week 6 Assignment Sheet - Newton's Laws	22
Week 7 Assignment Sheet - Forces in Two Dimensions	24
Week 8 Assignment Sheet - Work and Energy	26
Week 9 Assignment Sheet - Momentum	28

Unit 2: Motion

Week 1 Assignment Sheet - Angular Motion and Statics	34
Week 2 Assignment Sheet - Newton's Universal Law of Gravity	36
Week 3 Assignment Sheet - Periodic Motion Part 1	38
Week 4 Assignment Sheet - Periodic Motion Part 2	40
Week 5 Assignment Sheet - Vibrations and Sound	42
Week 6 Assignment Sheet - Fluid Mechanics, Part 1	44
Week 7 Assignment Sheet - Fluid Mechanics, Part 2	46
Week 8 Assignment Sheet - Heat, Part 1	48
Week 9 Assignment Sheet - Heat, Part 2	50

Unit 3: Electricity

Week 1 Assignment Sheet - Thermodynamics	56
Week 2 Assignment Sheet - Electrostatics	58

Week 3 Assignment Sheet - Electric Potential, Part 1	60
Week 4 Assignment Sheet - Electric Potential, Part 2	62
Week 5 Assignment Sheet - Circuits, Part 1	64
Week 6 Assignment Sheet - Circuits, Part 2	66
Week 7 Assignment Sheet - Magnetism	68
Week 8 Assignment Sheet - Electromagnetism	70

Unit 1: Quantum and Atomic Physics

Week 1 Assignment Sheet - Geometric Optics	76
Week 2 Assignment Sheet - Physical Optics	78
Week 3 Assignment Sheet - Special Theory of Relativity, Part 1	80
Week 4 Assignment Sheet - Special Theory of Relativity, Part 2	82
Week 5 Assignment Sheet - Quantum Physics	84
Week 6 Assignment Sheet - Atomic Physics	86
Week 7 Assignment Sheet - Nuclear Physics, Part 1	88
Week 8 Assignment Sheet - Nuclear Physics, Part 2	90
Week 9 Assignment Sheet - Biophysics	92

Appendix


What a full Lab Report should include	97
More Information on Lab Reports	99
The In-depth Project	100
The Research Report	101
The Scientist Biography Report	102
Adding Current Events into your Science Studies	104
Optional Hands-on Experiments Supply List	105
Scientist Biography Report Grading Rubric	109
Science in the News Template	113

Introduction to the Parents

In *Success in Science: A Manual for Excellence in Science Education*, we state, “The high school student is a law student. They have access to a great deal of organized, filed away information, but they are still learning the advanced techniques, as well a learning when to use the material and how to apply it.”¹ The goals of science instruction at the rhetoric level are to make sure that the students know and understand the key principles and laws at work in science and to teach them how to relate what they have learned to what they see around them. *Physics for the Rhetoric Stage* integrates the above goals into high school science instruction, as suggested in our book.

Textbook


For this study, we have chosen to use a widely available, standard text book, *CK-12 Physics*. You can find the links to the textbook, the teacher edition of the textbook, the problem sets, the test packet, and the solutions manual on the resources page here:

 <https://elementalscience.com/blogs/resources/prs>

The students will complete their reading assignment and then answer several of the questions from the text. Their answers should be added to the reading section of their science notebooks. They will also define several of the key terms from the chapter, which should be added to the glossary section of their notebook.

Labs

Many of the labs come from PhET or from Late Nite Labs, both of which are excellent programs for online labs. Access to the Late Nite Labs can be purchased through our website:

 <https://elementalscience.com/blogs/resources/how-to-sign-up-for-late-nite-labs-1>

Access to the PhET labs is free through their website.

In several weeks, no online lab is planned. Instead, we have scheduled hands-on experiments for the students to complete. Here is a list of the supplies you will need for these weeks:

- ✓ Unit 3 Week 2 through 9 - Choose one of the following Snap Circuit Kits:
 - Snap Circuits Snaptricity Electronics Discovery Kit
 - Snap Circuits 3D M.E.G. Electronics Discovery Kit
 - Snap Circuits Alternative Energy Green
 - Snap Circuits PRO SC-500 Electronics Discovery Kit

We have also included optional hands-on experiments for each week. You can see a list of the supplies you will need for these in the Appendix on pg. 105.

¹Bradley R. Hudson and Paige Hudson, *Success in Science: A Manual for Excellence in Science Education* (Elemental Science, 2012), 86

If you have used one of our rhetoric stage programs before, you will see that no full lab reports are scheduled in this program. This is because we would like the students to focus on the work presented in this course. However, if you want your students to complete a full lab report, we have included an article explaining what a full lab report; this can be found in the Appendix on pp. 97-99.

Events in Science





This guide gives two options for the Events in Science section. One will familiarize the students with current events in science as they search the Internet for information about the various topics. The other will familiarize the students with the key historical figures in physics. We recommend that you choose one or the other to assign to your students, as completing both options will be quite a lot of additional work for your students.

Possible Schedules

You should expect the students to take approximately 6 to 7 hours each week to complete the given work. We have included two possible schedules for your reference: a two-days-a-week and a five-days-a-week schedule. Please feel free to alter this to suit each student's needs.

The Science Notebook

This year, the students will each create their own science notebooks. Each notebook should contain the following sections:

-  Reading - This section of the notebook will contain any notes the student has taken, along with the answers to the questions the student is assigned each week.
-  Lab - This section of the notebook will house the student's notes from the labs they have done, along with any other materials relating to the labs.
-  Events - This section of the notebook will include either the current events article summaries or the historical reports the student has done.
-  Glossary - This section of the notebooking will have the definitions for the assigned vocabulary words.

The science notebook can be a composition book divided into the required sections or a three-ring binder with dividers.

Grading and Credits

This course meets the requirements for a full credit of high school physics or a full credit of lab science, depending upon which your student needs. Each week, the student will answer questions and define vocabulary that can count towards a class work grade for the course. For each lab, the student will complete a multiple choice section, which you can use for the lab grade

for the course. We have prepared a packet of chapter tests, which you can use for the exam grade for the course. You can download this test packet on the resource page. We suggest you use the following percentages to come up with a final grade for the course:

- ☞ Class work: 35 %
- ☞ Lab Grade: 35 %
- ☞ Exams: 30 %

Note - The multiple choice sections from the lab are graded automatically through Lab Nite Labs. The answers for the exams can be found in the chapter test packet, and a grading rubric for the Scientist Biography Reports can be found on pg. 109 of the Appendix.

Science-Oriented Students





If you have a student who plans to go on to major in the sciences, we suggest that you add an in-depth project and a research report to this program. An explanation of the in-depth project can be found on pg. 100 of the Appendix in this guide. An explanation of the research report can be found on pg. 101 of the Appendix in this guide.

Final Thoughts

If you find that this program contains too much work, please tailor it to the needs of your students. As the authors and publishers of this curriculum, we encourage you to contact us with any questions or problems that you might have concerning *Physics for the Rhetoric Stage* at support@elementalscience.com. We will be more than happy to answer you as soon as we are able. We trust that you and your students will enjoy *Physics for the Rhetoric Stage*!





Introduction to the Students

Welcome to physics! This year, you will learn about motion, heat, electricity, and much more. In this guide, you will find assignment sheets for each week. Each sheet is divided into four sections - textbook, labs, events in science, and possible schedules. Let's look closer at each one:

-  Textbook - For this study, we have chosen to use a widely available, standard text book, *CK-12 Physics*. You will complete your reading assignment and then answer several of the questions from the text. You will also define several of the key terms from the chapter.
-  Lab - The labs in the program are almost all virtual. These come from PhET or from Late Nite Labs, both of which are excellent programs for online labs. Within the Late Nite Labs platform, you will find background information for each lab, the procedure, and space for you to take notes.
-  Events in Science - There are two options for the Events in Science section. One will familiarize you with current events in science as you research on the internet for the various topics. The other will familiarize you with the key historical figures in physics. Please check with your teacher to see which option you would be expected to complete.
-  Possible Schedules - You should count on taking approximately 6 to 7 hours each week to complete the given work in this course. We have included two possible schedules for your reference: a two-days-a-week and a five-days-a-week schedule. Please feel free to alter this to suit your needs.

The Science Notebook

This year, you will create a science notebook containing your work from the course. The notebook should contain the following sections:

-  Reading - This section of the notebook will contain any notes you have taken, along with the answers to the questions you have been assigned each week.
-  Lab - This section of the notebook will house your notes from the labs you have done, along with any other materials relating to the labs.
-  Events - This section of the notebook will include either the current events article summaries or the historical reports you have done.
-  Glossary - This section of the notebook will have the definitions for the assigned vocabulary words.

For your science notebook, you can use a composition book and divide it into the required sections or use a three-ring binder with dividers.

Final Thoughts

We hope that you will enjoy your journey through physics with *Physics for the Rhetoric Stage*. If you have any questions or problems as you complete the work in this program, please email us at support@elementalscience.com. We will be more than happy to answer them as soon as we are able.

Physics for the Rhetoric Stage

Unit 1 - Introduction to
Physics

Unit 1: Introduction to Physics

Overview of Study

Week 1 Assignment Sheet - Introduction to Physics, Part 1	12
Week 2 Assignment Sheet - Introduction to Physics, Part 2	14
Week 3 Assignment Sheet - One Dimensional Motion, Part 1	16
Week 4 Assignment Sheet - One Dimensional Motion, Part 2	18
Week 5 Assignment Sheet - Two Dimensional Motion	20
Week 6 Assignment Sheet - Newton's Laws	22
Week 7 Assignment Sheet - Forces in Two Dimensions	24
Week 8 Assignment Sheet - Work and Energy	26
Week 9 Assignment Sheet - Momentum	28

Week 1 Assignment Sheet - Introduction to Physics, Part 1

Textbook Assignments

Reading

 CK-12 Physics Sections 1.1, 1.2, 1.3

Written

After you finish reading, answer the even questions #1-16 in the problem sets workbook and file your work in the reading section of your science notebook. Then, define the following terms in the glossary section of your science notebook:


- | | |
|---|--|
| <input type="checkbox"/> Theory | <input type="checkbox"/> Hypothesis |
| <input type="checkbox"/> Dimensional Analysis | <input type="checkbox"/> Conversion Factor |
| <input type="checkbox"/> Scalar | <input type="checkbox"/> SI Units |
| <input type="checkbox"/> Vector | |

Lab - Sample Lab, Part 1

Purpose

The purpose of this lab is to familiarize you with how a virtual lab works and to get you comfortable with using Late Nite Labs.


Pre-Reading

 Read the background and procedure sections for the “Sample Lab” in Late Nite Labs.


Procedure

- ✓ Work on the lab entitled “Sample Lab” in Late Nite Labs. (*You have two weeks to complete this assignment.*)


Lab Notebook

-  Write down your notes on a sheet of paper or type them out in Late Nite Labs as you do the lab. After you are done, print out your lab notes and add them to the lab section of your science notebook.

Lab Exam


-  Complete the multiple choice section of the “Sample Lab” in Late Nite Labs. (*You have two weeks to complete this assignment.*)

Optional Hands-on

- ✂ Practice units of measurements using the free printable packet along with the information in the following post:
 <https://elementalscience.com/blogs/science-activities/units-of-measurement>

Events in Science

Current Events

-  Find a current events article relating to the field of chemistry and complete the article summary sheet found on pg. 113 of the Appendix. Once you are done, add the sheet to

the events section of your science notebook.

Historical Figures

- ⌚ Begin to research the life and work of Albert Einstein, who originally developed the theory of relativity, among other discoveries. You will have five weeks to complete your research. After that, you will have three weeks to prepare a two to three page paper on this scientist and his contributions to the field of physics.

Possible Schedules

Two Days a Week

Day 1	Day 2
<input type="checkbox"/> Read <i>CK-12 Physics</i> Section 1.1, 1.2 <input type="checkbox"/> Add the vocabulary to the glossary section of your science notebook. <input type="checkbox"/> Read the background and procedure sections for the week's lab. <input type="checkbox"/> Do the current events assignment and add the sheet to the events section of your science notebook.	<input type="checkbox"/> Read <i>CK-12 Physics</i> Section 1.3. <input type="checkbox"/> Answer the assigned questions in the reading section of your science notebook. <input type="checkbox"/> Work on the "Sample Lab" in Late Nite Labs. <input type="checkbox"/> Record what you have done in the lab section of your science notebook and complete your lab exam for the week.


Five Days a Week

Day 1	Day 2	Day 3	Day 4	Day 5
<input type="checkbox"/> Read <i>CK-12 Physics</i> Section 1.1. <input type="checkbox"/> Add the vocabulary to the glossary section of your science notebook.	<input type="checkbox"/> Read <i>CK-12 Physics</i> Section 1.2. <input type="checkbox"/> Answer the assigned questions in the reading section of your science notebook.	<input type="checkbox"/> Read <i>CK-12 Physics</i> Section 1.3. <input type="checkbox"/> Read the background and procedure sections for the week's lab.	<input type="checkbox"/> Work on the "Sample Lab" in Late Nite Labs. <input type="checkbox"/> Record what you have done in the lab section of your science notebook.	<input type="checkbox"/> Work on your lab exam for the week. <input type="checkbox"/> Do the optional Hands-on Assignment.
<h4>Throughout the Week</h4> <input type="checkbox"/> Choose one of the Events in Science assignments to do and add your work to the events section of your science notebook.				

Week 2 Assignment Sheet - Introduction to Physics, Part 2

Textbook Assignments

Reading

 *CK-12 Physics* Sections 1.4, 1.5

Written

After you finish reading, answer the even questions #30-46 in the problem sets workbook and file your work in the reading section of your science notebook. Then, define the following terms in the glossary section of your science notebook:


- | | |
|---|---------------------------------------|
| <input type="checkbox"/> Uncertainty | <input type="checkbox"/> Random error |
| <input type="checkbox"/> Significant digits | <input type="checkbox"/> Precision |
| <input type="checkbox"/> Systematic error | <input type="checkbox"/> Accuracy |

Lab - Sample Lab, Part 2

Purpose

The purpose of this lab is to master the use of the virtual lab.


Pre-Reading

 Read the background and procedure sections for the “Sample Lab” lab in Late Nite Labs.


Procedure

- ✓ Finish the lab entitled “Sample Lab” in Late Nite Labs.


Lab Notebook

 Write down your notes on a sheet of paper or type them out in Late Nite Labs as you do the lab. After you are done, print out your lab notes and add them to the lab section of your science notebook.

Lab Exam


-  Complete the multiple choice section of the “Sample Lab” lab in Late Nite Labs. Submit the grade to your teacher.

Optional Hands-on

- ✂ Practice significant figures using this tutorial from Khan Academy:
 https://www.khanacademy.org/math/arithmetic-home/arith-review-decimals/arithmetic-significant-figures-tutorial/e/significant_figures_1

Events in Science

Current Events

-  Find a current events article relating to the field of physics and complete the article summary sheet found on pg. 113 of the Appendix. Once you are done, add the sheet to the events section of your science notebook.

Historical Figures

- ⌚ Continue to research the life and work of Albert Einstein.

Possible Schedules

Two Days a Week

Day 1	Day 2
<input type="checkbox"/> Read <i>CK-12 Physics</i> Section 1.4. <input type="checkbox"/> Add the vocabulary to the glossary section of your science notebook. <input type="checkbox"/> Do the current events assignment and add the sheet to the events section of your science notebook.	<input type="checkbox"/> Read <i>CK-12 Physics</i> Section 1.5. <input type="checkbox"/> Answer the assigned questions in the reading section of your science notebook. <input type="checkbox"/> Finish the “Sample Lab” lab in Late Nite Labs. <input type="checkbox"/> Record what you have done in the lab section of your science notebook and complete your lab exam for the week. <input type="checkbox"/> Take the Chapter 1 Test.

Five Days a Week

Day 1	Day 2	Day 3	Day 4	Day 5
<input type="checkbox"/> Read <i>CK-12 Physics</i> Section 1.4. <input type="checkbox"/> Add the vocabulary to the glossary section of your science notebook.	<input type="checkbox"/> Read <i>CK-12 Physics</i> Section 1.5. <input type="checkbox"/> Answer the assigned questions in the reading section of your science notebook.	<input type="checkbox"/> Choose one of the Events in Science to assignments to do and add your work to the events section of your science notebook.	<input type="checkbox"/> Finish the “Sample Lab” lab in Late Nite Labs. <input type="checkbox"/> Record what you have done in the lab section of your science notebook.	<input type="checkbox"/> Complete your lab exam for the week. <input type="checkbox"/> Do the optional Hands-on Assignment. <input type="checkbox"/> Take the Chapter 1 Test.
Throughout the Week				
<input type="checkbox"/> Choose one of the Events in Science assignments to do and add your work to the events section of your science notebook.				

Week 3 Assignment Sheet - One Dimensional Motion, Part 1

Textbook Assignments

Reading

 CK-12 Physics Section 2.1, 2.2, 2.3

Written

After you finish reading, answer the even questions #1-20 in the problem sets workbook and file your work in the reading section of your science notebook. Then, define the following terms in the glossary section of your science notebook:

☐ Displacement

☐ Distance

☐ Vector

☐ Average Speed

☐ Average Velocity


☐ Instantaneous Velocity

Lab - Error Analysis, Part 1

Purpose

The purpose of this lab is to investigate sources of experimental error, to learn how to calculate standard deviation and investigate various types of error made while conducting experiments.


Pre-Reading

 Read the background and procedure sections for the “Error Analysis” lab in Late Nite Labs.


Procedure

- ✓ Work on the lab entitled “Error Analysis” in Late Nite Labs. (*You have two weeks to complete this assignment.*)

Lab Notebook

 Write down your notes on a sheet of paper or type them out in Late Nite Labs as you do the lab. After you are done, print out your lab notes and add them to the lab section of your science notebook.

Lab Exam

-  Work on the multiple choice section of the “Error Analysis” lab in Late Nite Labs. (*You have two weeks to complete this assignment.*)

Optional Hands-on

✂ See displacement in action using a large container with measurement marks, water, and several objects. Fill your container about halfway with water and write down the exact measurement of the water level in your science notebook. (*If your container does not have measurement marks, leave a ruler in the water to use to measure the water level.*) Next, add one of the objects you selected, observe the displacement caused by the object, and record the new measurement in your science notebook. Repeat this process for the remaining objects you selected.

Events in Science

Current Events

- 🕒 Find a current events article relating to the field of physics and complete the article summary sheet found on pg. 113 of the Appendix. Once you are done, add the sheet to the events section of your science notebook.

Historical Figures

- 🕒 Continue to research the life and work of Albert Einstein.

Possible Schedules

Two Days a Week

Day 1	Day 2
<input type="checkbox"/> Read <i>CK-12 Physics</i> Section 2.1, 2.2 <input type="checkbox"/> Add the vocabulary to the glossary section of your science notebook. <input type="checkbox"/> Read the background and procedure sections for the week's lab. <input type="checkbox"/> Do the current events assignment and add the sheet to the events section of your science notebook.	<input type="checkbox"/> Read <i>CK-12 Physics</i> Section 2.3. <input type="checkbox"/> Answer the assigned questions in the reading section of your science notebook. <input type="checkbox"/> Work on the "Error Analysis" in Late Nite Labs. <input type="checkbox"/> Record what you have done in the lab section of your science notebook and complete your lab exam for the week.

Five Days a Week

Day 1	Day 2	Day 3	Day 4	Day 5
<input type="checkbox"/> Read <i>CK-12 Physics</i> Section 2.1, 2.2. <input type="checkbox"/> Add the vocabulary to the glossary section of your science notebook.	<input type="checkbox"/> Read <i>CK-12 Physics</i> Section 2.3. <input type="checkbox"/> Answer the assigned questions in the reading section of your science notebook.	<input type="checkbox"/> Read the background and procedure sections for the week's lab. <input type="checkbox"/> Work on a current events article summary and the historical figures project.	<input type="checkbox"/> Work on the "Error Analysis" lab in Late Nite Labs. <input type="checkbox"/> Record what you have done in the lab section of your science notebook.	<input type="checkbox"/> Work on your lab exam for the week. <input type="checkbox"/> Do the optional Hands-on Assignment.
<h3>Throughout the Week</h3> <input type="checkbox"/> Choose one of the Events in Science assignments to do and add your work to the events section of your science notebook.				

Physics for the Rhetoric Stage

Appendix

Optional Hands-on Experiments Supply List

Unit 1: Introduction to Physics

Week	Supplies Needed
1	<i>Units of Measurement</i> printable packet
2	<i>No supplies needed.</i>
3	large container with measurement marks, water, several objects
4	cardboard or plastic track, several blocks or thick books, toy car, stopwatch
5	plastic spoon, small object (pom-pom, small marshmallow, or bead)
6	Jenga block with the eyehook, string, 2 toy cars, egg
7	balloon, penny
8	several balloons, variety of LEGOs (including wheels for a vehicle)
9	raw egg, various shock absorbing materials (such as cotton balls, newspaper, packing peanuts or fabric), 1 plastic 1-quart container (the type that fruit is typically packed in), masking tape

Unit 2: Motion

Week	Supplies Needed
1	2 plastic 1-Liter bottles, scissors, string, craft supplies (optional)
2	several objects from nature
3	<i>No supplies needed.</i>
4	5 foot ribbon, Slinky, bowl, water
5	oatmeal container or plastic jar, a piece of latex material large enough to cover the lid of the jar, 1" plastic tubing, rubber band, air-dry clay, salt
6	cup, water, egg, salt
7	aluminum foil, pennies, plastic tub
8	heavy book, round pencils, block of wood, nail, screw, brick or concrete block, wooden board
9	3 glasses, red and blue food coloring, ice cold water, hot water

Unit 3: Electricity

Week	Supplies Needed
1	marshmallow, large needleless syringe, 2 balloons, water, ice
2	plastic comb, piece of wool
3	lemon, galvanized nail (coated with zinc), copper wire, LED light bulb

Unit 3: Electricity (continued)

Week	Supplies Needed
4	old, unused electronic, screwdriver, newspaper
5	watch battery, cardboard, tape, LED light bulb
6	empty deli meat container, double AAA battery holder, 2 AAA batteries, LED bulb, pin, stiff, unshielded wire, flexible, shielded wire, duct tape, wire strippers, wire cutters, and needle nose pliers
7	2 bar magnets, iron filings
8	D-battery, 2 safety pins, rubber band, bobbin, bare copper wire

Unit 4: Quantum and Atomic Physics

Week	Supplies Needed
1	4 pencils, 4 clear glasses, water, oil, alcohol, corn syrup
2	printed color book, currency detection scope (or microscope)
3	<i>No supplies needed.</i>
4	<i>No supplies needed.</i>
5	<i>No supplies needed.</i>
6	sugar cookies, white icing, 3 different colors of M&M's
7	timer, 32 bite-sized pieces of food, such as raisins, cereal puffs, or M&M's
8	<i>No supplies needed.</i>
9	vegetable oil, cornstarch, water, food coloring, plastic bag, eyedropper