Watson Ranch
Elementary Science

Science in the Age of Reason
Lab and Review Book

LEVEL 2

Property of:

When “license” is mentioned, “CC” refers to the Creative Commons Attribution-Share Alike license, and the number following represents the version of that license.
Section 1: Science in the Early 18th Century
Lesson 1

Halley’s Comet

1. The 3 phases of substances are __________, __________, and __________.

2. The process where a solid turns into a gas without first becoming a liquid is called ________________.

3. Comets have to get close to the __________ in order for us to see them.

4. What does sublimation have to do with comets?
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________

5. How did Halley figure out when the comet he observed in 1682 would appear again?
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
Section 1: Science in the Early 18th Century

Lesson 2

This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
Section 1: Science in the Early 18th Century

Lesson 3

1. What liquid did Fahrenheit use in his thermometer? Why did he use it?

________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________

2. Soap expands dramatically in the microwave because it has a lot of ____________ in it.

3. In the space below, draw a picture like the one in your book, illustrating how a Fahrenheit thermometer is made. Use the correct numbers for the Fahrenheit scale, which are different from the ones in the book, which illustrates how a Celsius thermometer is made.

4. Suppose you had a thermometer marked off in Fahrenheit’s original scale. If the mercury was halfway in between the mark made in freezing water and the mark made at normal body temperature, what would the temperature be? Check your answer and correct it if it is wrong.
1. A hybrid results when members of two ___________ species reproduce.

2. Thomas Fairchild made the first ______________ hybrid. He did this by manually transferring __________ from the flower of one plant to the flower of a different plant.

3. In the box below, draw two completely different flowers. Show pollen (it looks like dust) blowing off one and onto the other to illustrate how a hybrid plant could form.

4. You learned that a mule is a hybrid between a male donkey and a female horse. There is something that horses and donkeys can both do that a mule cannot. What is it? Check your answer and correct it if it is wrong.

_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
1. Smallpox is a deadly disease the causes ______________ on a person’s skin.

2. Inoculation is when a person is exposed to a ______________ on purpose with the goal of making it so the person will not catch a deadly case in the future.

3. Why was Lady Montagu important in making inoculation popular in England?
   ____________________________________________________________________________
   ____________________________________________________________________________
   ____________________________________________________________________________
   ____________________________________________________________________________
   ____________________________________________________________________________
   ____________________________________________________________________________

   Inoculation eventually led to a safer method of protecting people from disease. It’s called vaccination. Sometimes, people incorrectly call vaccination “inoculation.” Although inoculation led to vaccination, they are not the same thing.

4. If you were an English parent during this time period, would you inoculate your child?
   ____________________________________________________________________________
   ____________________________________________________________________________
   ____________________________________________________________________________
   ____________________________________________________________________________
   ____________________________________________________________________________
   ____________________________________________________________________________
   ____________________________________________________________________________
Section 1: Science in the Early 18th Century
Lesson 6

1. Two thousand years ago, natural philosophers thought the earth was flat.

   **TRUE** or **FALSE**

2. The earth is ________ at its poles and ________ around its middle.

3. In the boxes below, draw 2 pictures. In the box on the left, draw a picture of the contraption you built when it is still or spinning slowly. In the box on the right, draw a picture of the contraption when it is spinning fast. In the lines below the boxes, indicate how they relate to the shape of the earth.

   _______________________________________________________________________________
   _______________________________________________________________________________
   _______________________________________________________________________________
   _______________________________________________________________________________

4. What is polydactyly and how did Maupertuis use it to determine that children must inherit traits from both their father and their mother?

   _______________________________________________________________________________
   _______________________________________________________________________________
   _______________________________________________________________________________
   _______________________________________________________________________________
1. The temperature at which water freezes is the same everywhere.

**TRUE** or **FALSE**

2. The lower the pressure, the __________ the temperature at which water boils.

3. In the Celsius temperature scale as it is used today, water freezes at ______ degrees and boils at ______ degrees at sea level and when the atmospheric pressure is at its average value. Why is it important to include the pressure and sea level?

_____________________________________________________________________________
_____________________________________________________________________________
_____________________________________________________________________________
_____________________________________________________________________________

4. Suppose I tell you it is 35 degrees outside. Would it be hot or cold if I was using the Celsius temperature scale? _______________

Would it be hot or cold if I was using the Fahrenheit temperature scale? _______________

Check your answers and correct them if they are wrong.

Remember, Celsius was an astronomer, too. He made an important conclusion about the Northern Lights (Aurora Borealis) being related to the earth’s magnetic field.
1. The process of water evaporating from inside the leaves of a plant is called ________________.

2. In the box on the right, draw a stick of celery in a glass of water. The top needs to have some leaves. Use wavy lines to indicate water that is evaporating from the leaves. In the lines below, explain how that makes water travel up the plant.

   _______________________________________________________________________
   _______________________________________________________________________
   _______________________________________________________________________
   _______________________________________________________________________
   _______________________________________________________________________
   _______________________________________________________________________

3. Suppose you measured the water used by a plant on a very humid day and a very windy day. How would the measurements compare? Check your answer and correct it if it is wrong.

   _______________________________________________________________________
   _______________________________________________________________________
   _______________________________________________________________________
   _______________________________________________________________________
   _______________________________________________________________________
Lesson 9

This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
1. In order to avoid dental cavities, people shouldn’t eat too much _______________________.

2. ____________________ is the hardest substance in the body.

3. Write a story about a group of bacteria living in a person’s mouth. Tell what they do when the person eats a bunch of sugar.
   ____________________________________________________________________________
   ____________________________________________________________________________
   ____________________________________________________________________________
   ____________________________________________________________________________
   ____________________________________________________________________________
   ____________________________________________________________________________
   ____________________________________________________________________________
   ____________________________________________________________________________
   ____________________________________________________________________________

4. In the box on the right, draw a diagram of a tooth and label the root, the root canal, the blood vessels and nerves in the root canal, the enamel, and the dentin.
Section 1: Science in the Early 18th Century
Lesson 11

1. An electrical charge that doesn’t move is called a __________________________ charge.

2. Materials that allow charges to move inside them are called __________________________.

3. In the box on the right, draw a picture of what happened when you brought the charged foil ball near the stream of water. What did you do to charge the ball?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

4. Look at the picture on the left. The girl’s hair is sticking up because it has been electrically charged by the silver ball. Because each hair has the same charge, the hairs all __________ one another.

5. Look at the picture of Gray’s “flying boy” below the picture of the girl. Consider the things used to hang the boy. Were they insulators or conductors? Why?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
1. The faster a fluid moves, the _____________ the pressure it exerts. This is called the __________________ Effect.

2. According to Bernoulli, the particles that make up a gas are in constant __________________.

3. Explain why the water rose up the straw in your experiment.

4. Airplanes fly because of the Bernoulli effect. However, in order to start flying, the airplane has to roll down the runway. It will only start flying once it is moving fast. Why?

Author: Nathan Coats from Seattle, WA
License: CC 2.0
Section 1: Science in the Early 18th Century

Lesson 13

1. When a lens separates white light into colors, we call it

________________________  __________________________.

2. A lens that doesn’t separate white light into colors is called an

________________________  ____________.

3. Draw 2 pictures that represent your experiment. They should both have a magnifying glass with a black line. In the first it should be in the middle of the glass and the second should have the line at the edge. Be sure to add thin lines of color appropriately in the 2nd picture to demonstrate chromatic aberration.

4. The blue on the edge of the flower petal is a chromatic aberration. What would you see if an achromatic lens was used, and why did Euler think that such a lens must be possible?

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

Author: jkk
License: CC 3.0
This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
1. What was paper made from in the 1700s? ____________________________________________

2. What is paper made from today? ___________________________________________________

3. What inspired Réaumur to suggest that paper should be made from the material we use today?
   ________________________________________________________________________________
   ________________________________________________________________________________
   ________________________________________________________________________________
   ________________________________________________________________________________
   ________________________________________________________________________________
   ________________________________________________________________________________

4. What is regeneration, and how did Réaumur show that it does actually happen in some cases?
   ________________________________________________________________________________
   ________________________________________________________________________________
   ________________________________________________________________________________
   ________________________________________________________________________________
   ________________________________________________________________________________
   ________________________________________________________________________________

5. Once you are able to write something on the paper you made, tape it in the space on the right. If you have to cut it or fold it to make it fit, that’s fine.
1. What does a Leyden Jar store? ________________________________________________

2. During van Musschenbrock’s time in history, most scientists thought that electricity was some kind of ____________________________.

3. In the box on the left, draw the Leyden jar you made in your experiment. What does it do?

4. What did van Musschenbrock think a Leyden jar stored?

_______________________________________________________________________________

5. Will pure water (without anything dissolved in it) conduct electricity? Check your answer and correct it if it is wrong.

_______________________________________________________________________________
Record your observations from your experiment in the table below. You may use the terms “10”, “5” and “1” to describe the different stacks of pennies.

<table>
<thead>
<tr>
<th>Time</th>
<th>Hottest</th>
<th>Mid-Temp</th>
<th>Coolest</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 sec</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 sec</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45 sec</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60 sec</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 min 15 sec</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 min 30 sec</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 min 45 sec</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 min</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Which stack of pennies cooled off first?

Which cooled off last?

2. Buffon thought the earth was originally very hot because he thought the earth came from the ____________.

3. Explain Buffon’s experiments to determine the age of the earth.

4. If Buffon was right about the earth, what would that say about the chemicals found on earth compared to those found on the sun? Check your answer and correct it if it is wrong.
1. The Law of Biogenesis states that _________________ organisms only come from other _________________ organisms.

2. Organisms that are too small to see with the unaided eye are called _____________________________.

3. Organisms that we can see with the unaided eye are called _____________________________.

4. What is abiogenesis?

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

5. Is it possible for both the Law of Biogenesis and abiogenesis to be true?

______________________________________________________________________________

6. How did Buffon use microscopic organisms to support abiogenesis and why was he wrong?

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

______________________________________________________________________________
1. The Law of Charge Conservation states that electrical ______________ cannot be ______________ or ______________; it can only be _______________ from one place to another.

2. Ben Franklin’s kite experiment showed thunderstorms can produce a ______________

3. Lightning actually struck Ben Franklin’s kite. **True** OR **False**

4. Explain why everything we see (with the exception of light) has electrical charges in it, but most things do not feel like they have electrical charge.

   ___________________________________________________________________________
   ___________________________________________________________________________
   ___________________________________________________________________________
   ___________________________________________________________________________
   ___________________________________________________________________________
Section 2: Science in the Middle of the 18\textsuperscript{th} Century

Lesson 20

1. What made the best sparks in the experiment?

   The sharp end of the nail \textbf{OR} the side of the nail

2. Describe a lightning rod and how it protects a home or ship.

   __________________________________________________________________________________
   __________________________________________________________________________________
   __________________________________________________________________________________
   __________________________________________________________________________________
   __________________________________________________________________________________
   __________________________________________________________________________________

3. How does your experiment relate to the shape of a lightning rod?

   __________________________________________________________________________________
   __________________________________________________________________________________
   __________________________________________________________________________________
   __________________________________________________________________________________
   __________________________________________________________________________________
   __________________________________________________________________________________

4. Where did Franklin get the terms “positive” and “negative from”? Was he right?

   __________________________________________________________________________________
   __________________________________________________________________________________
   __________________________________________________________________________________
   __________________________________________________________________________________
   __________________________________________________________________________________
   __________________________________________________________________________________
1. The process of a liquid becoming a gas is called ____________________________.

2. In your experiment, evaporation made both of your fingers feel cooler. But the finger dipped in alcohol felt colder. This is because alcohol evaporates __________________ than water.

3. Describe the experiment done by Franklin and Hadley and explain how it tells us why we sweat.
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________

4. Suppose you used ether instead of water in the experiment. Which finger would have felt cooler? Check your answer and correct it if it is wrong.
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
Lesson 22

This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
Lesson 23

This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
1. Draw each flower in the boxes below. Include in each box how many petals each has. In addition, if you can find them, indicate the number of stamens and carpels in each, and which are taller.

Flower A  

Flower B  

2. List the ranks in Linnaeus’s classification system (in order)

(first) ___________________  (third) ___________________  (fifth) ___________________

(second) ___________________  (fourth) ___________________

3. Which rank has members that are most similar? ___________________

4. Which rank has members that are most different? ___________________

5. Do some research to answer this question: What is the genus name of the twinflower? Check your answer and correct it if it is wrong. ________________________

6. Does the genus name make sense? _________________________
Section 2: Science in the Middle of the 18th Century

Lesson 25

Fingerprint Classification

1. After examining all your finger tips on one hand identify each fingerprint as a whorl, arch or loop. Use the illustrations on pg. 76 to help.

   Thumb     Finger 1     Finger 2     Finger 3     Finger 4

2. Now determine what specific kind of whorl, arch or loop it is. Use the illustrations on pg 76 to help.

   Thumb     Finger 1     Finger 2     Finger 3     Finger 4

3. A ___________________ _______________ is composed of a genus name and a species name.

4. The members of a given species are all identical. True OR False

5. Give the binomial names of two animals and/or plants. Indicate what the genus is and what the species is for each one.

   Name: ______________________  _____________________

      Genus: ______________________ Species: ______________________

   Name: ______________________  _____________________

      Genus: ______________________ Species: ______________________

6. The species name of the dogs that we have as pets is familiaris. What is the binomial name for these dogs? Check your answer and correct it if it is wrong.

   ______________________  _____________________
1. Circle the citrus fruits: apples oranges lemons bananas

2. What disease did James Lind show that citrus fruits cured? ________________

3. Describe what you did in your experiment and how it shows that a fruit is a citrus fruit.

   __________________________________________________________________________________
   __________________________________________________________________________________
   __________________________________________________________________________________
   __________________________________________________________________________________
   __________________________________________________________________________________
   __________________________________________________________________________________
   __________________________________________________________________________________
   __________________________________________________________________________________

4. What is a clinical trial and how is it usually done today?

   __________________________________________________________________________________
   __________________________________________________________________________________
   __________________________________________________________________________________
   __________________________________________________________________________________
   __________________________________________________________________________________
   __________________________________________________________________________________
   __________________________________________________________________________________
   __________________________________________________________________________________
Section 2: Science in the Middle of the 18th Century

Lesson 27

1. _______________ was another deadly disease that plagued sailors. It was transmitted by bacterium in insects like lice and ticks.

2. What is the name of the process that Lind suggested for turning ocean water into drinking water? ________________________________

3. Draw a setup of that process as it would be seen in a chemistry lab.

4. What did James Lind suggest for fighting the disease you wrote in the blank for #1. Why did it work?

_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________

5. Why does the process you named in #2 turn salt water into freshwater?

_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
1. If you add energy to ice, what happens to the ice’s temperature while it melts?

   It Increases  OR  It Decreases  OR  It Stays The Same

2. ______________  _____________ must be absorbed by solids in order to melt and released by liquids in order to freeze.

3. Write a story from a water molecule’s perspective. Start with it as a part of ice, and then write what happens to the molecule’s motion and temperature as the ice melts. Include the words “latent heat.”

   __________________________________________________________________________________
   __________________________________________________________________________________
   __________________________________________________________________________________
   __________________________________________________________________________________
   __________________________________________________________________________________
   __________________________________________________________________________________
   __________________________________________________________________________________
   __________________________________________________________________________________

4. When water freezes, what happens to the temperature of the air and the other things surrounding the ice? Check your answer and correct it if it is wrong.

   __________________________________________________________________________________
   __________________________________________________________________________________
   __________________________________________________________________________________
1. A substance with a ________ specific heat will experience significant changes in temperature with the absorption of a small amount of energy.

2. A substance with a ________ specific heat will experience significant changes in temperature with the absorption of a large amount of heat energy.

3. Which has a higher specific heat? Water OR Sand

4. Describe your experiment and the specific heats of water and the balloon to explain the results.

_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________

5. Cooking oil has a lower specific heat than water. If you had used cooking oil instead of water in your experiments, would the results have changed? If so, how? Check your answer and correct it if it is wrong.

_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
1. Lodestone is a mineral that is naturally _________________. It is also sometimes referred to as ________________.

2. The farther a magnet is from the object, the _____________ it pulls on the object.

3. Describe your experiment using the word “levitate.” Also, explain why the paper clip first seemed to float in the air but then fell when it got far from the magnet.

_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________

4. Time for a little math! You learned the term “squared” in your lesson—it means to multiply a number by itself. Complete the following:

   2 squared = 4  
   3 squared = 9  

   5 squared = ___  
   6 squared = ___  

   4 squared = ___

Note: Do you see a pattern? Look how quickly the squared numbers increase compared to the original number. This should help you understand how important distance is when it comes to the strength with which a magnet can pull.
Lesson 32

This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
1. When charges travel from one charged object to another object, causing that other object to become charged, it is called charging by _______________________.

2. When the charges on a charged object don’t go anywhere, but instead they force the charges in the other object to move away (through a finger, for example), resulting in the other object becoming charged, it is called charging by _______________________.

3. Which of the 2 methods described above is the way the pie pan became charged in your experiment?

____________________________________________________________________________

4. For each of the situations below, indicate what charge the object you are charging will have (positive or negative). Check your answers and correct them if they are wrong.

(a) You use a positive object to charge another object by conduction.

________________________________

(b) You use a positive object to charge another object by induction.

________________________________

Charging by conduction: The charged object you are using touches the object you are charging.

Charging by induction: The charged object you are using never touches the object you are charging.
1. What does “inflammable” mean?

_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________

2. What 2 elements combine to make water?

_________________________________ and ______________________________________

3. Draw a picture of your experiment, showing the bubbles coming from the battery and the bottle top collecting the gas.

4. How did you find out that the hydrogen you collected was inflammable?

_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________

5. What chemical was made when you lit the hydrogen in the experiment? Check your answer and correct it if it is wrong.

_______________________________________________________________________________
1. What two gases make up most of the air that we breathe?

______________________________ and _____________________________

2. In order to rust, iron must react with water and ________________.

3. Draw “before” and “after” versions of your experiment:

<table>
<thead>
<tr>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Why did the bottle with steel wool have water pulled into it?

_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________

5. Would the bottle with steel wool ever fill up with water?

_______________________________________________________________________________
_______________________________________________________________________________

6. The earth’s density is 5.5, while Jupiter’s is 1.3. Would an earth-sized chunk of Jupiter weigh more or less than the earth? Check your answer and correct it if it is wrong.

_______________________________________________________________________________

_______________________________________________________________________________

_______________________________________________________________________________

_______________________________________________________________________________
Section 3: Science in the Mid-to-Late 18\textsuperscript{th} Century

Lesson 36

1. What caused the balloon in your experiment to inflate?

_______________________________________________________________________________

2. What caused the balloon in your experiment to deflate?

_______________________________________________________________________________

3. Draw two pictures of your experiment. One should be of the bottle and balloon after they came out of the microwave, and the other should be after the bottle was submerged in the ice.

After Microwave

After Ice

4. The experiment caused _________________ energy to be converted into _________________ energy.

5. How did Watt make steam engines useful for all sorts of tasks?

_______________________________________________________________________________

_______________________________________________________________________________

_______________________________________________________________________________

_______________________________________________________________________________

_______________________________________________________________________________
This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
Lesson 38

This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
1. The process in which yeast converts some chemicals into alcohol is called ____________________. As a part of this process, ________________ is released.

2. What did Priestly do with carbon dioxide to spawn a new industry?
________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________

3. Where did he get that carbon dioxide?
________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________

4. What term do we use to refer to the drinks made by the industry Priestly spawned?
________________________________________________________________________________

5. Why do those drinks go flat if they are left open for too long?
________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________
Section 3: Science in the Mid-to-Late 18th Century

Lesson 40

1. Plants take in carbon dioxide, water, and sunlight to make glucose and _________________.

2. Organisms that use oxygen need plants, and plants need the organisms that use oxygen.

   **True OR False**

3. Draw a picture and use it to explain photosynthesis.

   ____________________________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________

4. Why did the bubbles form only on the underside of the leaf? Check your answer and correct it if it is wrong.

   ____________________________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________
Section 3: Science in the Mid-to-Late 18th Century

Lesson 41

1. The scientific word for the process of burning is ____________________.

2. What two things are required for that process? __________________ and __________________

3. How does that process relate to the food you eat, the temperature of your body, and the energy you have?

   ___________________________________________________________________________________
   ___________________________________________________________________________________
   ___________________________________________________________________________________
   ___________________________________________________________________________________

4. What is a catalyst, and how did you use a catalyst in your experiment?

   ___________________________________________________________________________________
   ___________________________________________________________________________________
   ___________________________________________________________________________________
   ___________________________________________________________________________________
Section 3: Science in the Mid-to-Late 18th Century

Lesson 42

1. The law known as The Conservation of Mass says:

_____________________________________________________________________________
_____________________________________________________________________________
_____________________________________________________________________________
_____________________________________________________________________________

2. Matter is anything that takes up ____________ and has ______________.

3. ____________ is a measure of how much matter is in something.

4. Mass is the same as weight.   True   OR   False

5. Pounds are a unit for measuring ____________. Grams are a unit for measuring ____________.

6. When you burn wood, the ashes that remain have a lot less mass than the wood. Where did the mass go? Check your answer and correct it if it is wrong.

_____________________________________________________________________________
_____________________________________________________________________________
_____________________________________________________________________________
_____________________________________________________________________________

I like you just the weigh you are!
Section 3: Science in the Mid-to-Late 18th Century
Lesson 43

1. Something that cannot be decomposed (broken down) into simpler substances is an ________________.

2. Something that can be broken in simpler substances is a _____________________.

3. How does the conservation of mass help us determine what is an element and what is a compound?

   ___________________________________________________________________________________
   ___________________________________________________________________________________
   ___________________________________________________________________________________
   ___________________________________________________________________________________
   ___________________________________________________________________________________
   ___________________________________________________________________________________
   ___________________________________________________________________________________
   ___________________________________________________________________________________
   ___________________________________________________________________________________
   ___________________________________________________________________________________
   ___________________________________________________________________________________
   ___________________________________________________________________________________

4. You have 100 g of table salt, which you break down into its elements, sodium and chlorine. The sodium is a solid, and you collect 39 grams. The chlorine is a gas and floats away. How many grams of chlorine floated away? Check your answer and correct it if it is wrong.

   ___________________________________________________________________________________
   ___________________________________________________________________________________
   ___________________________________________________________________________________
1. ______________ _______________ travel along nerves and control muscles.

2. Galvani’s frog legs produced their own electricity, even though the frog was dead.

   True OR False

3. What happened to dead frog legs when Luigi Galvani applied an electrical shock to them?

   __________________________
   __________________________
   __________________________
   __________________________
   __________________________

4. Why did Galvani think the frog’s legs made their own electricity?

   __________________________
   __________________________
   __________________________
   __________________________
   __________________________

5. Describe your experiment and indicate what caused the popping and fizzing you heard.

   __________________________
   __________________________
   __________________________
   __________________________
   __________________________
   __________________________
   __________________________
   __________________________
   __________________________
1. ______________ is the main component (part) of natural gas.

Name 2 ways to get methane (HINT: Your experiment was one way)

I. _____________________________________________________________________________

II. _____________________________________________________________________________

2. Draw two pictures of your experiment. The first one should be of the initial setup. The other should depict what you saw four days later.

Initial  |  Four Days Later

3. Why was the balloon partially inflated four days later?

_______________________________________________________________________________

_______________________________________________________________________________

_______________________________________________________________________________

_______________________________________________________________________________

4. Name one way the fires on Mount Chimaera might have been ignited.

_______________________________________________________________________________

_______________________________________________________________________________
1. When Galvani thought the frogs’ legs were making electricity, where was it really coming from?
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________

2. The voltaic pile was improved to make what we call a ________________ today.

3. Draw the voltaic pile you made in your experiment

3. Many things that require batteries use several of them stacked together. Based on Volta’s experiments with his voltaic pile, what should stacking batteries together produce?
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
1. Photosynthesis requires water, carbon dioxide, and ___________________________.

2. Why do plants need chlorophyll to do photosynthesis?

_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________

3. Why do the red leaves on a Crimson King maple tree turn green in the fall? Check your answer and correct it if it is wrong.

_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________

In the drawing on the right, the arrows pointed towards the plant represent things needed for photosynthesis. The arrows pointing away from the plant represent something made by photosynthesis. Can you label what each set of arrows represent? HINT: There are no arrows that represent glucose.
1. What do scientists call the “mouths” of a leaf? ________________________________

2. When a leaf’s “mouths” are open, it can do photosynthesis, but it loses ________________.

3. Make a drawing like the picture on page 149. Point out the stomata.

4. Why do stomata open and close?

_____________________________________________________________________________
_____________________________________________________________________________

5. Compare the two leaves at the end of your experiment. If one of the leaves seemed less damaged than the other, try to explain why. Check your answer and correct it if it is wrong.

_____________________________________________________________________________
_____________________________________________________________________________
_____________________________________________________________________________
_____________________________________________________________________________
1. The collection of gases that surround the earth is called the ___________________________.

2. What happens to the temperature of a gas as it expands without being heated (like in your experiment)?

_______________________________________________________________________________

_______________________________________________________________________________

_______________________________________________________________________________

3. How do clouds form?

_______________________________________________________________________________

_______________________________________________________________________________

_______________________________________________________________________________

_______________________________________________________________________________

_______________________________________________________________________________

_______________________________________________________________________________

_______________________________________________________________________________

_______________________________________________________________________________

4. In Honokaa, Hawaii, the lowest temperature ever recorded was 13° Celsius (55° Fahrenheit). Less than 50 kilometers (30 miles) away, however, there is always snow on the ground. Why? Check your answer and correct it if it is wrong.

_______________________________________________________________________________

_______________________________________________________________________________

_______________________________________________________________________________

_______________________________________________________________________________

_______________________________________________________________________________

_______________________________________________________________________________

_______________________________________________________________________________

_______________________________________________________________________________
Lesson 50

This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
Lesson 51

This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
1. When two stars orbit one another we call it a __________________________. 

2. When three stars orbit one another we call it a __________________________. 

3. When more than three stars orbit one another we call it a __________________________. 

4. What planet did William and Caroline Herschel discover? __________________________

5. How was it determined that Uranus is a planet?

   ____________________________________________________________________________
   ____________________________________________________________________________
   ____________________________________________________________________________
   ____________________________________________________________________________
   ____________________________________________________________________________
   ____________________________________________________________________________

6. Why is it a good thing for earth that the sun is a single star?

   ____________________________________________________________________________
   ____________________________________________________________________________
   ____________________________________________________________________________
   ____________________________________________________________________________
   ____________________________________________________________________________
   ____________________________________________________________________________
1. We cannot see infrared light.  True OR False

2. In your experiment, why was the hand wrapped in foil warmer than the one wrapped in plastic?
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

3. Draw a rainbow in the box below. Then indicate where the infrared light would be by writing the letters “IR” (infrared) in the appropriate location.

4. Certain snakes have infrared detectors in their heads to detect prey. What kinds of animals would they use those detectors to find? Check your answer and correct it if it is wrong.
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
1. Write a story from the viewpoint of a microscopic organism that is on some dust floating through the air. It first lands on a sealed container. Then the wind blows and it falls into an open container of gravy. Write what happens in both cases, and what the organism does once it makes its home in the gravy. Use the phrase “cell division” in that part of the story.

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

2. Think about the way microscopic organisms reproduce. Suppose you started with just one organism and it could do cell division every 30 minutes. If this happened continuously:

How many would you have in an hour? ____________________

How many would you have in 2 hours? ____________________

Check your answers and correct them if they are wrong.
1. Describe what happens to your food from the time you start chewing to the point where it has been in your stomach for a while. Use the terms “physical digestion,” “chemical digestion,” “gastric juice,” “acid,” and “mastication” in your description.

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

2. When someone has heartburn, he or she can chew on a tablet to get some relief. What is this kind of tablet called, and why would it help to relieve heartburn? Check your answers and correct them if they are wrong.

______________________________________________________________________________

______________________________________________________________________________
Lesson 56

This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
1. The bubble in your experiment didn’t have an overall charge. True OR False

2. Which charges in the bubble were closer to the balloon? The Positive Ones OR The Negative Ones

3. Draw a diagram like the one on page 176 to show what happened in your experiment.

4. How would that affect the strength with which it was attracted to the balloon? Check your answer and correct it if it is wrong.

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
Section 4: Science in the Late 18th Century
Lesson 58

1. Write down Charles’s Law in your own words, being sure to make it as precise as possible.

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

2. What was Charles known for in his day?

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

3. Charles’s Law in mathematical form says that the volume of a gas divided by its temperature is always the same. Can you use this fact to explain why the Celsius and Fahrenheit temperature scales can’t be used in it? It has to do with a rule about division. Check your answer and correct it if it is wrong.

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

Hot air balloons are often brightly colored. Color this one any way you wish.
Section 4: Science in the Late 18th Century
Lesson 59

1. Heat only flows from hot things to cold things. True OR False

2. If an object loses more heat than it gains, it gets ____________.

3. Draw a picture like the one on page 181, and use it to explain why the man in the drawing gets warm. Don’t use the term “caloric fluid,” however, since heat isn’t actually a fluid. Also explain what will happen to the temperature of the fire, unless more fuel is added.

4. think of being outside on a cold, dry day. First, you touch the seat of a wooden bench that has been sitting outside. Next, you touch the metal armrests on the bench.

Which feels colder? ___________________

Is the part that feels colder really at a lower temperature? Why or why not?

______________________________________________________________________________

Check your answers and correct them if they are wrong.
Section 4: Science in the Late 18th Century
Lesson 60

1. From a chemical standpoint, what is the opposite of an acid?

________________________________________________________________________________

2. What is neutralization?

_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________

3. Explain the experiment you did, using the terms “acid,” “base,” “neutralize,” and “anthocyanins.”

_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________

4. Suppose you find out that it takes 55 grams of lye (a base) to neutralize 50 grams of stomach acid. How many grams of lye would it take to neutralize 100 grams of stomach acid? Check your answer and correct it if it is wrong.

_______________________________________________________________________________
1. When magma fills a crack in a rock and hardens, we call the result an __________________.

2. Rocks that form from magma are called ________________ rocks.

3. Draw a picture that illustrates an intrusion. It can be like the photo on page 188, or something more creative.

4. Assume that a worldwide Flood happened and that most of the rocks we see today were formed during that Flood. Explain how intrusions would be able to form. Check your explanation and correct it if it is wrong.

_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________

1. Hutton figured out that _______ changes not only soil, but also rocks.

2. Where did Hutton think the rocks of mountains that had sea creature fossils actually formed?

_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________

3. Explain how Hutton thought heat from underneath the earth and erosion worked together to constantly change the earth.

_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________

4. How do those who believe in a worldwide Flood explain sea creature fossils found on mountains.

_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________

Believe it or not, erosion caused this rock to be shaped like an elephant!
(Artist: Francesco Canu License: CC 3.0)
1. What kind of rock is like the dough you made in your experiment? ________________

2. What do we call the layers that sedimentary rocks form? ________________

3. List some differences between sedimentary and igneous rock.

   ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________

4. Explain how and where Hutton thought sedimentary rock formed, using the word “strata.”

   ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________

5. Draw a picture a bit like the one on page 195. It doesn’t need as much detail, but it should show horizontal strata of rock resting on top of vertical strata.
Section 5: Science at the End of the 18th Century

Lesson 64

This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
1. Edward Jenner noticed that when people had been exposed to ______________ they were immune to smallpox.

2. The fluid that Jenner administered to people was called a ________________.

3. Explain Jenner’s method for protecting people from smallpox and why it became popular over time.

4. Jenner’ process was similar to _________________, which Lady Mary Wortley Montagu (from lesson 5) championed. However, it is better. Why?
1. When two elements react, they can form only one chemical.

True OR False

2. What is the name of the law that Joseph Proust discovered?

________________________________________________________________________________________

________________________________________________________________________________________

3. A chemist makes two gases according to the following recipes:

| 100 grams carbon | + | 133 grams oxygen | makes | Gas A |
| 100 grams carbon | + | 267 grams oxygen | makes | Gas B |

Are Gas A and Gas B the same gas or different gases? Why? Check your answer and correct it if it is wrong.

________________________________________________________________________________________

________________________________________________________________________________________

________________________________________________________________________________________

________________________________________________________________________________________

4. Another chemist makes the following gas:

| 50 grams carbon | + | 66.5 grams oxygen | makes | Gas |

Is this Gas A or Gas B from above? Check your answer and correct it if it is wrong. ____________
Section 5: Science at the End of the 18th Century
Lesson 67

1. Lavoisier thought that heat was an _______________.

2. Davy thought that heat had something to do with _______________.

3. When an object is heated, the motion of its atoms and molecules?
_______________________________________________________________________________

4. Draw what the two bowls looked like in step 11 of the experiment, and explain why the bowl that had hot water in it had a more even distribution of color.

   Bowl with hot water
   
   Bowl with cold water

_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________

5. Explain Davy’s experiment and what he concluded.
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________


Lesson 68

Section 5: Science at the End of the 18th Century

This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
Section 5: Science at the End of the 18th Century
Lesson 69

1. The distinct types of material that you find in a living creature are called ________________.

2. Draw lines from the tissue on the left to its description on the right:

   Epithelial Tissue Helps connect one thing to another in the body
   Muscle Tissue Makes up the skin of the body and lines organs
   Connective Tissue Makes up your nerves, spinal cord & brain
   Nervous Tissue Made of long, “stringy” fibers; aids movement

3. The tissue that makes up the thin, transparent structure in your experiment is called _________________.

4. List the three types of muscle tissue and an organ that is made of each of them.

   Tissue: _______________________ Organ made of that muscle tissue: _____________________
   Tissue: _______________________ Organ made of that muscle tissue: _____________________
   Tissue: _______________________ Organ made of that muscle tissue: _____________________

Here is what the four types of tissue look like under a microscope:

Connective Tissue  Epithelial Tissue  Muscle Tissue  Nervous Tissue
1. Electrolysis is when we use _______________ to break down chemicals.

2. What two elements are made in the electrolysis of water?

_____________________________ and ___________________________

3. Make a drawing that represents the first part of your experiment. It should have the two foil wires going from the battery into the bowl of water.

4. What was necessary in order to see lots of bubbles? Why?

____________________________________

____________________________________

____________________________________

____________________________________

____________________________________

5. Make a drawing of the second part of the experiment (steps 13 – 17)

6. Why couldn’t electrolysis happen in that part of the experiment?

____________________________________

____________________________________

____________________________________

____________________________________

____________________________________
1. Besides the gases in the air, what gases were in the bottle that held the carbonated drink?

_______________________________________________________________________________
_______________________________________________________________________________
2. Dalton’s Law of Partial Pressure tells us that when gases are mixed together, they each exert their own pressure, and the total pressure is the ________________ of the individual pressures.

3. Explain your experiment and why the balloon covering the bottle with the carbonated drink was inflated more than the balloon covering the bottle with the water.

_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________

4. Consider two containers that cannot expand or contract. The first contains a certain number of molecules of carbon dioxide gas. The second is the same size as the first, and it contains the same number of molecules of carbon dioxide gas. However, it also contains an equal number of molecules of water vapor. Which container has the higher pressure? Check your answer and correct it if it is wrong.

_______________________________________________________________________________
Dalton’s Atomic Theory

1. __________________________________________________________________________
   __________________________________________________________________________
   __________________________________________________________________________

What is wrong with this principle: _________________________________________________
   __________________________________________________________________________
   __________________________________________________________________________

2. __________________________________________________________________________
   __________________________________________________________________________
   __________________________________________________________________________
   __________________________________________________________________________

Is this principle completely correct? ______________________________________________

3. __________________________________________________________________________
   __________________________________________________________________________
   __________________________________________________________________________
   __________________________________________________________________________

4. __________________________________________________________________________
   __________________________________________________________________________
   __________________________________________________________________________
   __________________________________________________________________________

There is something else you have to do for Lesson 72. It is on the next page.
Section 5: Science at the End of the 18th Century
Lesson 72 and 73

1. From lesson 72: Suppose you could see the atoms in a substance, and you see that they are not all the same. Could that substance be broken down into simpler substances? Check it and correct it if it is wrong.

______________________________________________________________________________
______________________________________________________________________________

From Lesson 73: Remember to update the previous page with the third principle from Dalton’s Atomic Theory.

2. From Lesson 73: Draw pictures of the five molecules you made in the experiment and give their chemical formulas under the drawings:

3. From lesson 73: The chemical formula of glucose (the sugar plants make in photosynthesis) is C₆H₁₂O₆. How many total atoms are there in a molecule of glucose? Check your answer and correct it if it is wrong.

______________________________________________________________________________
Section 5: Science at the End of the 18th Century
Lesson 74

Remember to update Lesson 72-74’s page with the fourth principle from Dalton’s Atomic Theory.

1. Explain what happened in your experiment, including what chemicals were made and how this demonstrates Dalton’s fourth principle.
   
   _____________________________________________________________________________
   
   _____________________________________________________________________________
   
   _____________________________________________________________________________
   
   _____________________________________________________________________________
   
   _____________________________________________________________________________
   
   _____________________________________________________________________________
   
   _____________________________________________________________________________
   
   _____________________________________________________________________________

2. How does Dalton’s fourth principle help us understand the Law of Mass Conservation?
   
   _____________________________________________________________________________
   
   _____________________________________________________________________________
   
   _____________________________________________________________________________
   
   _____________________________________________________________________________
Section 5: Science at the End of the 18th Century

Lesson 75

This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
Section 6: Science at the Turn of the 19th Century
Lesson 76

1. Why does a can of carbonated drink hiss when you open it?
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________

2. Why are carbonated drinks packaged that way? (Use Henry’s Law in your explanation.)
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________

3. Explain why the balloon never got any bigger after the first few shakes in your experiment, despite the fact that lots of bubbles kept forming inside the bottle.
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
1. Draw a picture like the one on page 238, labeling the cornea, retina, lens, and ciliary muscle.

2. Where is the light focused in the eye? __________________________

3. What does the lens do to change the distance at which it is focusing?
______________________________________________________________
______________________________________________________________
______________________________________________________________

4. Draw a second eye that is focused on something farther away than the eye you drew above.
1. Draw a picture like the one on the bottom of page 240. For one of the waves, label a crest and a trough.

2. When two waves overlap like that to make a new wave, what do we call it?

3. Which part of the drawing above illustrates what happened in the places where you saw an image of the light bulb in your experiment?
Section 6: Science at the Turn of the 19th Century

Lesson 79

1. Draw a wave below, indicating what the wavelength is.

2. What does wavelength determine for light?

   _____________________________

3. What is Mr. White Light’s Name?

   _____________________________

4. What does that name tell you about the wavelengths of the different colors of light?

   _____________________________
   _____________________________
   _____________________________
   _____________________________
   _____________________________

5. Assume the light wave you drew above represents red light. Draw another wave that could represent blue light.

   _____________________________
Section 6: Science at the Turn of the 19th Century

Lesson 80

1. The retina has two special kinds of cells called __________ and _____________. The ones that detect light are the __________. The ones responsible for how we see color are __________.

2. What three colors can the color-sensitive cells see?

___________________    ___________________    ___________________

3. How do those cells allow us to see any color of light?

_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________

4. When your eye sees something that is magenta (see the drawing above), compare how the three color-sensing cells are reacting relative to each other.

_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
Lesson 81

This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
Section 6: Science at the Turn of the 19th Century
Lesson 82

1. What kind of electricity did you make in the experiment?

_______________________________________________________________________________

2. What kind of electricity comes out of a battery?

_______________________________________________________________________________

3. What is the difference between these two kinds of electricity?

_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________

4. How did Wollaston show that they are both the same thing?

_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________

5. Why is frictional electricity not necessarily static electricity?

_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
1. A fascicle is a bundle of muscle _________________.

2. Write a conversation that might occur between a slow-twitch muscle fiber and a fast-twitch muscle fiber. Be sure the conversation includes what each type of fiber does.

_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________

3. Explain why muscles produce a low hum, especially when you squeeze them tightly.

_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
1. Draw a strip of rainbow colors like you see on page 257 to represent sunlight. Put a few of the black lines in the drawing.

2. Why are those black lines found in sunlight?

_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________

3. Use the diagram to explain what you saw in the last part of the experiment.

No light leaves the solution
All colors except blue absorbed

Light leaving red solution
All colors except red absorbed

Light from flashlight
Lesson 85

This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
1. Paste the paper from your experiment below, right over the lines. Use the lines that are left to explain what it represents. Also, indicate where Ceres would be.

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

2. Since there are so many asteroids in the asteroid belt, try to come up with an explanation as to why Ceres was the first one discovered. Check your explanation and correct it if it is wrong.

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
Lesson 87

1. What aspect of the earth’s magnetic field did Gauss measure?
________________________________________________________________________________

2. How has that been changing over time?
________________________________________________________________________________

3. What does the earth’s magnetic field do besides tell which way is north?
________________________________________________________________________________
________________________________________________________________________________

4. Explain what you did in your experiment and how it was a measure of the strength of the magnets you used.
________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________

5. Explain how the change in the earth’s magnetic field strength provides evidence that the earth is less than 10,000
________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________
1. What acid is found in Sprite (and all other carbonated drinks)? ________________________

2. Plants don’t take in anything by their roots except water. True OR False

3. Use the table below to list the things a plant needs to get from its environment and what part of the plant takes it in.

<table>
<thead>
<tr>
<th>What the plant must take in to grow</th>
<th>What part of the plant takes it in</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Why do plants take in oxygen at night and release it during the day?

_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
1. In your experiment, what happened to the air pressure inside the bottle when you cooled it?

_______________________________________________________________________________

2. What happens if you heat a gas in a container that can change volume?

_______________________________________________________________________________

_______________________________________________________________________________

3. What happens if you heat a gas in a container that can’t change volume?

_______________________________________________________________________________

_______________________________________________________________________________

4. What completely original observation did Gay-Lussac make?

_______________________________________________________________________________

_______________________________________________________________________________

_______________________________________________________________________________

_______________________________________________________________________________

_______________________________________________________________________________

5. Nitrogen monoxide has one nitrogen atom for each oxygen atom. How many liters of oxygen will react with 1 liter of nitrogen to make 1 liter of nitrogen monoxide? Check your answer and correct it if it is wrong.

_______________________
Lesson 90

This is a challenge lesson, so I want to challenge you to make your own notebook page for it!