Science in the Ancient World

Lab and Lesson Book

LEVEL 1
(older students)

Property of:
1. Who is Thales?

__________________________________________________________________________

2. Why did he travel to Egypt?

__________________________________________________________________________

__________________________________________________________________________

Here’s what he looked like:

What I learned from the experiment

Note to parent/helper. Read this statement to your student and help them fill in the blank. It’s okay for you to write it if they need help.

3. If I can compare the real height of a smaller object to the length of its _________________________ then I can know the height of a very tall object if I can measure its ____________.
1. We measured trees before. What did Thales measure?

___________________________________________________

2. What is one of the chemicals made when wax is burned?

___________________________________________________

Draw a picture of the experiment you did

Explain what happened in the experiment:

___________________________________________________

___________________________________________________

___________________________________________________

___________________________________________________

___________________________________________________

___________________________________________________

___________________________________________________

___________________________________________________

___________________________________________________

___________________________________________________

___________________________________________________

___________________________________________________

___________________________________________________
1. What does the word pitch mean when it comes to music?

______________________________________________________________________________

______________________________________________________________________________

2. Fill in the blanks: Of the seven basic notes in music, ____ has the lowest pitch and ____ has the highest pitch.

**Pythagoras**

**Explain what happened in the experiment:**

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

**Fill in the blank:** The longer the portion of rubber band I plucked, the ____ the pitch of the sound it made.

Pythagoras
Fill in the blanks: The clumps of air in a sound wave are called ___________, and the areas of spread-out air are called ___________.

Draw a picture of a sound wave, labelling the crests and troughs.

What is frequency?

How does frequency relate to pitch?

How does the amount of air in the crests relate to volume?
1. When a string vibrates quickly, does it produce a sound with a high pitch or low pitch?  

___________________________________________________

2. When you pluck a string gently, does it make a loud sound or a soft sound?  

___________________________________________________

On Your Own: If you can, peek inside a piano. What do you see? What happens on the inside when you press a key?

A piano is a ___________ instrument.

How does a vibrating string make a sound wave?

___________________________________________________

___________________________________________________

___________________________________________________

___________________________________________________

___________________________________________________

Fill in the blank: The longer the distance over which a string vibrates, the _________ the volume.
Section 1: Science Before Christ, Part 1
Lesson 6

1. Should you believe something is real just because you see it?

2. Why do scientists think that atoms are real, even though we can’t see them?

Make a pointillist drawing or paste one here

How does a pointillist drawing illustrate the concept of atoms?

________________________________________________________

________________________________________________________

________________________________________________________

________________________________________________________
1. When atoms join together, what do they make?

________________________________________________________

2. What do scientists call the process in which a molecule breaks down into smaller things?

________________________________________________________

Hydrogen atoms link with an oxygen atom to make a water molecule. Molecules can be broken down into atoms. And even atoms can be broken apart!

First Experiment Drawing

Second Experiment Drawing

What made the foam in the experiment?
1. Which have more energy: the molecules in hot water or the molecules in cold water?

______________________________________________________

2. Which has the most motion in its molecules: a liquid, a solid, or a gas?

______________________________________________________

3. The drawings below show water in its three phases. Below each drawing, write the name of the phase, and then below that, draw a picture that illustrates what its molecules look like, as shown on page 24.

---

<table>
<thead>
<tr>
<th>Ice</th>
<th>Liquid</th>
<th>Gas</th>
</tr>
</thead>
</table>

---
1. What three things make up atoms?
_________________, _________________, and ________________

2. Indicate which two have charge and the kind of charge each has.
____________________  ______________________

3. Draw the atoms indicated below, and below the drawing, write down the number of protons, neutrons, and electrons in each.

<table>
<thead>
<tr>
<th>Hydrogen</th>
<th>Helium</th>
<th>Carbon</th>
</tr>
</thead>
<tbody>
<tr>
<td># protons</td>
<td>______</td>
<td># protons</td>
</tr>
<tr>
<td># neutrons</td>
<td>______</td>
<td># neutrons</td>
</tr>
<tr>
<td># electrons</td>
<td>______</td>
<td># electrons</td>
</tr>
</tbody>
</table>

Why can’t all six electrons in the carbon atom fit in the first circle?
________________________________________________________
________________________________________________________
________________________________________________________
1. What kind of atoms do you find in a penny?

_____________________________________________________

2. If an atom loses an electron (which is negative), does it become a positive ion or a negative ion?

_____________________________________________________

Why did the pennies in the experiment get shiny?

_____________________________________________________

_____________________________________________________

_____________________________________________________

Why did the part of the nail that soaked in solution look like copper?

_____________________________________________________

_____________________________________________________

_____________________________________________________

_____________________________________________________

_____________________________________________________
1. What is the Hippocratic oath?

________________________________________________________

________________________________________________________

2. Who is thought to have written it?

________________________________________________________

3. Why does rest help a sick person get better?

________________________________________________________

________________________________________________________

4. Why can bandages sprinkled with alcohol be good for healing cuts?

________________________________________________________

________________________________________________________

________________________________________________________
Section 1: Science Before Christ, Part 1
Lesson 12

1. What does blood do for the body?

2. What vessels carry blood away from the heart? ______________

3. What vessels carry blood towards the heart? ______________

Write a story about a drop of blood traveling through the body:
This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
Do this Math Exercise with your parent (it’s okay if your mom or dad needs to use a calculator):

Starting with any number, the answer is 5!

I. Choose any number (not 0). It can be small if you want the math to be easy or it can be large if you want to test how well this works. My number is ________.

II. Multiply that number by itself. The answer is _____.

III. Add the number you chose (step 1) to the result of step 2. The result is _______.

IV. Divide the result of step 3 by the number you chose (step 1). The result is _______.

V. Add 24 to the result of step 4. The result is _______.

VI. Subtract the number you chose from the result of step 5. The result is _______.

VII. Now divide by 5. The result is _______. I told you!!

1. Is this a trick or is it always true? __________________________

2. Did Plato think that mathematics was discovered (something that existed and man figured out) or invented (made like a lego creation or a blanket fort)? __________________________

3. How does Plato’s idea about mathematics fit with a Christian point of view?

_________________________________________________________

_________________________________________________________

_________________________________________________________
1. Did Aristotle agree with Plato about studying the world around us? ______

2. In the spaces below, write down the five elements Aristotle thought existed in nature and where they each belong.

   Element 1: __________ Where it belongs: __________
   Element 2: __________ Where it belongs: __________
   Element 3: __________ Where it belongs: __________
   Element 4: __________ Where it belongs: __________
   Element 5: __________ Where it belongs: __________

3. How did Aristotle use the things you wrote above to explain motion?

   ___________________________________________________________
   ___________________________________________________________
   ___________________________________________________________

4. How does your experiment show that Aristotle wasn’t correct?

   ___________________________________________________________
   ___________________________________________________________
   ___________________________________________________________
1. Why do scientists often repeat the same experiment many times?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

2. Why does a feather fall more slowly than a rock?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

The next time you’re in the bathtub, move your hand through the water with your palm facing the bottom of the tub. Then rotate your hand so that your palm is facing the side of the tub. Which one was easier to move through the water? That’s because of water resistance—which is a lot like air resistance.

3. How did Aristotle think the weight of an object affects the speed at which it falls?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

4. How does your experiment show that Aristotle wasn’t correct.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
1. What is the opening in your eye called? ________________

2. In the sketch below, draw two lines that represent light. One should come from the top of the tree and pass through the pupil to hit the retina. The other should come from the bottom of the tree and pass through the pupil to hit the retina. See page 57 for guidance.

3. Even though things appear on your retina upside down, you don’t see the world upside down. Why?
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________
My Classification of Animals

List the two groups you decided to use in the activity, and below each group, list the specific animals you put there:

<table>
<thead>
<tr>
<th>Group 1:</th>
<th>Group 2:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. What do we call it when scientists put living things into different groups? ________________________________

2. The two basic groups that Aristotle split animals into were:
   ___________________________ and ___________________________

3. What is right and what is wrong about Aristotle’s groups?
   ________________________________________________________
   ________________________________________________________
   ________________________________________________________

4. The two basic groups that modern scientists recognize are:
   ___________________________ and ___________________________
1. “Geo” means __________________.

2. “Centric” means in the __________________.

Aristotle thought that the universe was geocentric, with the earth at its center. We now know that Aristotle wasn’t right.

**Draw Aristotle’s View of the Universe**

Why did the spheres in Aristotle’s universe spin?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
1. “Helios” means ________________.

2. So, “Heliocentric” means ________________________.

3. Why is this called a heliocentric view?
   __________________________________________________________
   __________________________________________________________

4. Which is correct – geocentric or heliocentric? ________________

5. What is still wrong with the drawing above?
   ____________________________________________________________________
   ____________________________________________________________________
Section 2: Science Before Christ, Part 2
Lesson 23

1. Write the Law of Reflection:

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

The bar on the left is the mirror in your experiment. Draw a line coming from the flashlight, hitting the mirror, and reflecting. Use curves to represent angles (see page 68), and indicate what angles are equal.

________________________________________________________________________

2. If a beam of light hits a mirror at an angle of 35 degrees, what will be the angle of reflection?

________________________________________________________________________
1. Archimedes’s Principle says:

____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

2. How much water does an object displace when it goes under?

____________________________________________________________________

3. How does Archimedes’s Principle explain the experiment?

____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

Bathtub Science: The next time you take a bath use a washable marker (check with your mom) or a piece of tape to mark where the water is BEFORE you get in. Watch how it changes after you get in. Can you guess the weight of the water that moved up?
1. In order to make a lever, you need a _________ and a __________.

2. If you want to lift something heavy, should the fulcrum be close to what you are trying to lift or far away? ______________________

**Draw A Lever and Label Its Two Parts**

When using a lever to lift a heavy object, what is the relationship between the distance you need to push the lever and the distance the object moves?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
1. What is the proper scientific and mathematical term for a ball?

2. What is the circumference of a sphere?

Tell Your Own Story About How Eratosthenes Measured the Circumference of the Earth
Section 2: Science Before Christ, Part 2

Lesson 29

1. Does the moon orbit the earth in a perfect circle? _____

2. Does the moon’s size in the sky really change as much as it looks like it does? _____

3. How was your device a way of measuring the size of a distance object?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

4. How did Hipparchus show that the moon doesn’t change in the sky very much.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
Construct a timeline according to the activity’s directions:

Fredicus the Silly  |  Christ’s birth

Once you have read the lesson, fix your labels if they aren’t correct.

1. What does AD stand for?
   
   

2. In our calendar, what year comes right after 1 BC?
   
   

1. Different parts of plants have different _______________. So when using a plant for _______________ it is important to use the right part!

2. Why did Dioscorides test everything he used instead of accepting the word of someone else?

   __________________________________________________________
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________

3. What did you do in your experiment?

   __________________________________________________________
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________

4. Which glass had an interesting result?

   __________________________________________________________
   __________________________________________________________
   __________________________________________________________

5. Why?

   __________________________________________________________
   __________________________________________________________
   __________________________________________________________
1. A siphon drains liquid from a _______ place to a _______ place.

2. When a hole is poked in a siphon that is working what will happen?

3. Why does poking a hole in a siphon make it stop working?
1. In our experiment, what made the pinwheel spin?
   __________________________________________________________________________
   __________________________________________________________________________
   __________________________________________________________________________
   __________________________________________________________________________

2. A steam engine converts ___________ energy into ___________ energy.

3. What was the power source for the first trains?
   __________________________________________________________________________

4. These days, we use a lot of steam to generate ________________.
Lesson 35

1. If I put an object 12 cm in front of a flat mirror, its image will appear to be _____ cm _______ the mirror.

2. What Law did Hero use to demonstrate where an object’s image is in a flat mirror? ___________________________________________

3. Explain your experiment and how it showed that an object’s image in a flat mirror appears to be the same distance behind the mirror as the object is in front of the mirror

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
1. What do astronomers study? _____________________________

2. Retrograde motion happens when planets are seen moving one direction in the night sky, but would then appear to stop and __________ direction.

3. What did Ptolemy add to the geocentric model to account for retrograde motion?

4. The drawing below shows the earth in Ptolemy’s system. The circles are the orbits of two planets. Draw each planet in an epicycle, as is done on p. 110:
1. Refraction is the process by which _____________ bends when it starts traveling through a different substance.

2. Which refracts light more: water or vegetable oil?
   ____________________________________________

Draw the three different results in your experiment.

3. Why were the results different?
   ____________________________________________
   ____________________________________________
   ____________________________________________
   ____________________________________________

The next time you have a glass of water with a straw or play in the pool, check out the refraction that happens. The pencil in this picture tells you what you might see. Can you explain why this is caused by refraction?
Use the outline below for the activity, and once you have glued the organs in place, label them.
An organ is a ________________ in the body that performs a ________________.

Anatomy is the study of the ______________ of the body and where they are ________________.
Lab Data: Your Pulse

Your resting 30-sec pulse count: ________
Multiply the number by 2 to get your resting pulse rate: _______

Your 30-sec pulse count after exercise: _______
Multiply the number by 2 to get your after-exercise pulse rate: ______

Adult resting 30-sec pulse count: ________
Multiply the number by 2 to get adult’s resting pulse rate: ______

Adult 30-sec pulse count after exercise: _______
Multiply the number by 2 to get adult’s after-exercise pulse rate: _____

1. Pulse rate measures how much your body is using what is in your _________. It gets ___________ the more vigorous your exercise.

2. What is a doctor doing when diagnosing a patient’s illness?

_________________________________________________________

_________________________________________________________

3. What does the word “physiology” mean?_____________________

_________________________________________________________

_________________________________________________________

4. On this photograph of a person’s hand, mark where you would find the pulse.
1. Tendons are tissues that connect ___________ to ___________.

2. When a muscle gets shorter, we say it ____________.

3. When a muscle stops using energy and is easily stretched, we say it is ________________.

4. In order to bend your arm at the elbow, your biceps brachii ________________ and your triceps brachii ________________.

**Draw Two Pictures Like the Ones on Page 122.**  
Point out the tendons, and indicate for each muscle if it is contracted or relaxed
1. When you want to move a leg muscle, your brain sends a message down your _________ _________, which then sends a message to the muscle using a ______________ nerve.

2. What kind of motion can you control:

   voluntary motion   or   involuntary motion

3. What is the difference between the reflex you experienced in your experiment and the normal way you move your legs?

   __________________________________________________________
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________

4. Was the motion you experienced in the experiment a voluntary or involuntary motion?

   __________________________________________________________
This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
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This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
1. When you drop something in water, the ripples spread out in ________________.

2. The ripples in water get ____________ as they form larger circles.

3. If your friend blows a whistle right next to you and then moves across the room and blows it again, the sound will be: louder or softer or the same

4. How does Boethius’s view of sound explain your answer to #3?

   __________________________________________________________
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________
1. What does the word “infinite” mean?

2. Why did John Philoponus believe the earth is not eternal. I don’t want you to give his argument. I want you to indicate why he believed the way he did.

3. Is the earth eternal?
   Yes or No

4. What argument did John Philoponus use to support that idea?
1. Which is a projectile:
   An airplane flying
   or
   a ball that has been thrown in the air

2. A medium is something through which an object ______________.

3. When a projectile travels through a medium, what does the medium do?
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________

4. How did Aristotle think a projectile travels through the air?
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________

5. How did your experiment show that Aristotle was wrong?
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
1. What is the name of the man (pictured on the right) who is considered to be the father of the method used in modern science?

_________________________________________

2. What is the big difference between the way a normal mirror reflects light and the way a magnifying mirror reflects light?

________________________________________________________
________________________________________________________
________________________________________________________
________________________________________________________

3. How does the sun warm the earth?

   with its heat or with its light

4. How did your experiment show that?

   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
Lesson 49

This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
Section 4: Science in the Early Middle Ages
Lesson 50

Draw the different setups that you used for the candle in your experiment in the boxes below:

1. Why did the candle go out when you covered it?

2. Which candle burned longest and why?

3. Rewrite Bacon’s quote on the top of page 151 in your own words.
This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
1. If you look at things through a flat piece of glass they will be magnified. True or False?

2. A circle of glass (or gelatin) directs light that hits it straight on to a point called the __________ __________.

3. Draw arrows that represent beams of light traveling from left to right through both pieces of glass below. For the one that has focused light beams, label the focal point:
Section 4: Science in the Early Middle Ages
Lesson 53

1. ___________ poles of a magnet attract one another, but ___________ poles repel each other.

2. What law did you use to fill in the blanks for #1?

3. How does a magnet attract a piece of metal that is not a magnet?
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________

4. Draw a magnet next to the one below so that the magnets will be attracted to one another:
This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
1. When you add 1 cup of a liquid to 1 cup of another kind of liquid, will the volume always be 2 cups? _________

2. In between the molecules of a substance, you will find ______________  _______________.

3. What explains your answer to #1?

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

When you add ice to a drink it can help you remember this idea. Just like our experiment, the beverage you’re drinking (representing smaller molecules) slips in between the gaps of the ice (representing larger molecules).
1. To see a rainbow, the sun must be _____________ you.

2. Why do rainbows usually form after it rains?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Draw how a rainbow forms in a drop of water.
Use the drawing on p. 170 as a guide.
1. Bradwardine taught that different causes of motion can lead to the same ________________.

2. The group of philosophers that Bradwardine was a part of was called the ________    _______________.

3. Bradwardine and the other Oxford Calculators thought that _________ was very important in the study of science.

4. What is the difference between kinematics and dynamics?
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________

Understanding motion and how things move can help you be very good at some games!
1. The range of a projectile depends on the _________ that the thrower gives it.

2. Impetus is determined by a projectile’s _______ and _________.

3. Use your own words to explain what impetus is.
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________

4. Use your own words to define the range of a projectile, like the arrow shown on the right.
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
1. An object behaves like all its weight is concentrated at its _______________ ______ _____________.

2. An object’s center of gravity is always at the center of the object.
   True or False

Draw pictures like the ones on p. 179 to show why the can in the experiment could tilt once some water was added to it. Point out the center of gravity in each picture.

A tightrope walker uses a long pole to adjust his or her center of gravity so it is always above the rope. It’s the same reason why when you are walking on a curb or along a beam or any higher and/or narrower place that you stick your arms out.
1. Why did Guy de Chauliac have better anatomy knowledge than Galen?

2. When a hard substance changes temperature quickly, what can happen?

3. Why did Guy de Chauliac say you shouldn’t eat or drink something hot and then follow it with something cold? (Use the concepts of expansion and contraction.)
1. Did Nicole Oresme believe that the earth rotates? Yes or No

2. _______________ is the science of studying the objects in the sky and the universe as a whole, while _______________ is the belief that the movements of the stars and planets in the sky affect how we live our lives.

The earth rotates while it orbits the sun. The rotation is what turns day into night.

3. Even though the above statement is true, an arrow shot straight up in the sky will land where it was fired. Why?

_______________________________________________________

_______________________________________________________

_______________________________________________________

_______________________________________________________

_______________________________________________________

_______________________________________________________

_______________________________________________________

_______________________________________________________

_______________________________________________________
The graph on the left shows the answers students gave to the question “How much do you like science?”

3. What is on the horizontal axis?  

4. What is on the vertical axis?  

5. What is the most common answer?  

6. What is the least common answer?
Section 5: Science in the Late Middle Ages
Lesson 63

Draw a picture of the bottle from the experiment and what the water looked like coming from the different holes.

1. Why did the water come out of the holes differently?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

2. How does this show the way a bathometer measures the depth of water?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
1. Where did the frost on the glass in your experiment come from?
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

2. What is humidity?
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

3. Why do water drops form on the outside of a cold glass?
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

4. Nicolas of Cusa invented the first hygrometer. It is a tool to measure the _______________ in the air.

5. How does high humidity affect you on a hot day?
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
1. Plants need soil in order to grow. True or False

2. What do a plant’s roots absorb from the soil?

_______________________________________________________
_______________________________________________________
_______________________________________________________

3. How do we know that plants must absorb something as they grow?

_______________________________________________________
_______________________________________________________
_______________________________________________________
_______________________________________________________
_______________________________________________________

4. How did your experiment show that plants don’t absorb the soil in which they grow?

_______________________________________________________
_______________________________________________________
_______________________________________________________
_______________________________________________________
_______________________________________________________
_______________________________________________________
Copy the sentence indicated in your textbook. Your handwriting should be neat. Have a helper time you.

_______________________________________________________

_______________________________________________________

Record the time it took to write the sentence in seconds: ________

Now use the cutout letters to form the same sentence and tape them down. Have a helper time you.

Record the time it took to do that in seconds: ________

1. If you had to make one copy of the sentence, which way would be faster? ______________

2. Imagine that instead of paper the letters were metal and you could cover them with ink and stamp the phrase. If you had to make 100 copies of that sentence which way would be faster? _______________________________
3. What does it mean when someone says that a product has been mass produced?

____________________________________________________
____________________________________________________
____________________________________________________
____________________________________________________

4. How did Gutenberg’s printing press change the world?

____________________________________________________
____________________________________________________
____________________________________________________
____________________________________________________

This is a replica of Guttenburg’s press. The boy is holding a sample page made on the press.

The girl is holding the handle of the press. When making a copy, the person operating the press walked around to spin the central section and lower the paper onto plates with the movable type.

Both photos ©Lisa Van Weelden, 2015
1. How did Leonardo da Vinci’s scientific studies help him with his painting?

________________________________________________________________________

________________________________________________________________________

2. Use the photo to explain what earthshine is and why it allows us to see the rest of the moon dimly, even when it isn’t lit by the sun.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Section 5: Science in the Late Middle Ages
Lesson 69

Write the phrase “Hello There” in the box. Hold up to a mirror.

Now copy ‘ɘɿɘʜƚ ollɘ̀lH ɘ’ in the box below. It may be difficult, but you should be able to do it. Hold up to a mirror.

1. ______________________ is a way of abbreviating words so that you don’t have to write every letter in the word.

2. ________________ writing is when the letters and words are written backwards.

3. Did Leonardo da Vinci use mirror writing, shorthand, or both in his journals?
   ___________________________________________________
Section 5: Science in the Late Middle Ages
Lesson 70

Tape/glue your leaf images here.
Use the back of this page if you have more.
1. How did you make the leaf prints on the previous page?

_______________________________________________________

_______________________________________________________

_______________________________________________________

_______________________________________________________

2. Why did da Vinci make a print of a leaf in his notebook?

_______________________________________________________

_______________________________________________________

_______________________________________________________

_______________________________________________________

3. What is soot?

_______________________________________________________

_______________________________________________________

This is an image of the page in Leonardo da Vinci’s notebook where he made his leaf print.
Use these boxes to make your drawings for the lesson activity. Use the bigger box for your drawing a thick branch splitting into two and the four smaller boxes for different leaf patterns.
1. For the leaf patterns you drew on the previous page, label them as “Opposite,” “Alternate,” or “Whorled.”

2. If you didn’t have one or more of the leaf patterns listed above, draw what they would have looked like.

3. You see two trees. One has leaves in an opposite arrangement and the other in an alternate way. Are they the same type of tree? Yes or No

4. Which of the following logs has the smallest area?
1. If a tree has 139 rings, how old is it?

2. What is the difference between a deciduous tree and an evergreen tree?

3. Why do trees form rings?

4. What do the rings tell us about the weather when they formed?
This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
1. What is an element?

_______________________________________________________
_______________________________________________________
_______________________________________________________

2. How did our experiment demonstrate what Leonardo da Vinci figured out? (That air is not an element)

_______________________________________________________
_______________________________________________________
_______________________________________________________
_______________________________________________________
_______________________________________________________
This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
Draw the results of your experiment in the boxes below.

1. What explains the difference in the two drawings?
   ____________________________________________________________________
   ____________________________________________________________________
   ____________________________________________________________________
   ____________________________________________________________________
   ____________________________________________________________________

2. Two objects have exactly the same volume, but the first one is heavier. Which has the lowest density?
   ____________________________________________________________________

3. A hydrometer measures ________________
1. Irrigation is when you bring _______________ from one place to _______________.

2. When water flows through pipes, the amount of water leaving the pipe has to be _______________ ________ the amount entering the pipe.

3. What is the statement above called?

__________________________________________________

4. These are the fountains at the Bellagio in Las Vegas, Nevada. What is one of the ways that you think they get the water to go so high?

__________________________________________________

__________________________________________________

__________________________________________________

__________________________________________________
1. The process by which rocks and soil are broken up and washed away is called ____________________.

2. Water is strong enough to cut through metal and rock.
   True or False

3. What two things determine how much erosion takes place as water flows over land?
   The Grand Canyon

   a) ______________________________
      ______________________________
      ______________________________
      ______________________________

   b) ______________________________
      ______________________________
      ______________________________
      ______________________________
Cut out the bones and paste them into the body below. Label them.
1. People who combine their knowledge of science and their artistic abilities (like Leonardo da Vinci) are called ______________________
______________________________.

2. What are the 2 main jobs of the skeleton?

a) ____________________________________________________
   ____________________________________________________
   ____________________________________________________

b) ____________________________________________________
   ____________________________________________________
   ____________________________________________________
1. What do we call the parts of your skeleton that allow bones to move in relation to one another?

________________________________________________

2. What kind of joint is the elbow?

________________________________________________

Draw a picture like the one on pg. 244 (including the labels) that shows how the elbow allows the forearm and arm to move.

3. Does the elbow allow for any other type of movement? Yes or No
This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
1. The individual bones of the vertebral column are called ____________________________________________.

2. The vertebral column protects the _____________  ____________.

   Draw a picture of the contraption you built

   A different model of the vertebral column

3. How is your contraption like the vertebral column?
   __________________________________________________________________________________
   __________________________________________________________________________________
   __________________________________________________________________________________
   __________________________________________________________________________________
This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
1. Where are the intrinsic muscles of the hand found?

______________________________________________________________________________

2. The muscles that are located in your forearm that control your hand are called ________________ ________________.

3. If you play tug of war which muscles will help you keep a strong grip on the rope?

   Intrinsic or Extrinsic

4. Which muscles give you the fine control you need for your hands?

   Intrinsic or Extrinsic
We’re still talking about Leonardo DaVinci! Wasn’t he amazing?!

1. The spinal cord is made of the same basic material as the brain. TRUE or FALSE

2. What does the spinal cord do in order to allow the brain to control muscles in the body?

   ________________________________
   ________________________________
   ________________________________
   ________________________________

3. How was your experiment a model of the spinal cord?

   ________________________________
   ________________________________
   ________________________________
   ________________________________
   ________________________________
   ________________________________
   ________________________________
   ________________________________
   ________________________________
   ________________________________
1. What is the name of the tool that a doctor uses to listen to your heartbeat?

___________________________________________________

2. The heart is made of muscle. TRUE or FALSE

3. What is the purpose of the valves in the heart?

___________________________________________________

___________________________________________________

___________________________________________________

___________________________________________________

This diagram has a lot of words that may not make sense right now. But it is helpful to look at the white arrows to see how the blood flows through the heart. It’s also helpful to look at the white “arch-shaped” parts and know those are the valves. By looking at the shape and placement of them, you can better understand what they do and how they do it.
1. The specific pattern to a person’s teeth is called a ______________________."  

2. Who has more teeth, a child or an adult?  
   ____________________________________________________________

3. Label the diagrams below.

   _______ _______ _______ _______ _______ _______

   _______ _______ _______ _______ _______ _______

   _______ _______ _______ _______ _______ _______

   Child                        Adult

4. Give the function for each type of tooth:
   Molar ____________________________________________________
   Incisor __________________________________________________
   Canine _________________________________________________
1. The resistance (rubbing) two surfaces experience when they are moving against one another is called ____________________.

2. A ball that sits between two surfaces that have to move against each other is called a _______ ____________________.

3. Draw ball bearings between the two surfaces on the right.

4. What is the purpose of ball bearings?

________________________________________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________

These are deep-groove ball bearings.
1. In the experiment, the weight of the pennies in the Ziploc bag was used to overcome the _____________ between the countertop and the CD case.

2. The only thing that determines the friction between an object and the surface it is sliding on is the nature of the surface.

   TRUE or FALSE

   Draw a picture of your experiment

   When you put 10 pennies on the CD case, it didn’t take 10 more pennies to get the case moving again. Why?

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