Who is Thales and why did he go to Egypt?

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

Experiment Information

DATA:
Length of the ruler’s shadow: ________
Length of the ruler: _______
Length of my shadow: _______
My height: ______________
Length of tree’s shadow: _______

Factor = length of ruler/length of shadow = _______
My calculated height = length of my shadow x Factor = _____________
My actual height: _______________ Are these numbers close? _______
Tree’s calculated height = length of tree’s shadow x factor = ___________
In lesson 1, we measured the height of a tree. What did Thales measure?

______________________________________________________________________

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:

______________________________________________________________________

______________________________________________________________________

______________________________________________________________________

______________________________________________________________________

______________________________________________________________________

What other chemical (besides water) is made when wax is burned? Why didn’t you see it in the experiment?

______________________________________________________________________

______________________________________________________________________
What does the word pitch mean when it comes to music?
________________________________________________________________________________
________________________________________________________________________________

Write (in order of their pitch) the seven letters that are used to identify the basic musical notes
MUSICAL NOTES: _____ _____ _____ _____ _____ _____ _____

What is an octave?
________________________________________________________________________________
________________________________________________________________________________

Explain what happened in the experiment:
________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________

What did Pythagoras figure out about the length of a musical string and the octave?
________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________

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?

Why do you take a deep breath before shouting really loudly?
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.

What is another property of a string that affects how quickly it vibrates? (Hint: Think about how a stringed instrument is tuned.)

Fill in the blanks: The faster the string vibrates, the _______ the pitch. The longer the distance over which it vibrates, the _______ the volume.
Why do scientists think that atoms are real, even though we can’t see them?

________________________________________________________________________

________________________________________________________________________

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If a printer makes a picture using 300 dots per inch, what is the widest each dot can be?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

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________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Make a pointillist drawing or paste one here

How does a pointillist drawing illustrate the concept of atoms?
A thought to remember from your book: *Scientists believed a wrong idea about atoms for nearly 2000 years. Even incorrect ideas can eventually lead scientist to correct ideas!*

What made the foam in the experiment?

_________________________________________________________

_________________________________________________________

_________________________________________________________

Explain the difference between atoms and molecules.

_________________________________________________________

_________________________________________________________

_________________________________________________________

What does “indivisible” mean? Are atoms indivisible?

_________________________________________________________

_________________________________________________________

_________________________________________________________
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.

Why does increasing the temperature of something change it from solid to liquid to gas?
Draw the atoms indicated below, and below the drawing, write down the number of protons, neutrons, and electrons in each.

Hydrogen

Helium

Carbon

# protons _______ # protons _______ # protons _______
# neutrons _______ # neutrons _______ # neutrons _______
# electrons _______ # electrons _______ # electrons _______

Why can’t all six electrons in the carbon atom fit in the first circle?

_________________________________________________________________________

_________________________________________________________________________

_________________________________________________________________________

Draw the two carbon ions you made, indicating the charge of each.
Why did the pennies in the experiment get shiny?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

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

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Suppose you have negative ions in a solution of water. What would you need to do to make them come out of the solution as atoms?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Section 1: Science Before Christ, Part 1
Lesson 11

What is the Hippocratic oath?

Who is thought to have written it?

Why does rest help a sick person get better?

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

Find the Hippocratic Oath and read it. What are your thoughts on what it means?
What vessels carry blood away from the heart? ______________

What vessels carry blood towards the heart? ____________

Write a story about a drop of blood traveling through the body:

5. Why do arteries get smaller the farther they are from the heart?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
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!!

Is this a trick or is it always true? ________________________________

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)? ________________

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

_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

Can you understand the explanation of why this works? If so, try to explain it yourself.

_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________
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 3: __________ Where it belongs: __________

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

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

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

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Check to see if your home has a fire extinguisher. Read the label and see what is in it. Is it a carbon dioxide fire extinguisher? Read what kinds of fires it can be used on. Do not play with it! Fire extinguishers can be dangerous if you don’t use them correctly!

“We are what we repeatedly do; excellence then, is not an act but a habit.”
~Aristotle
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.

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

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

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

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

If you dropped a rock and a feather in a tall container that had no air, would the rock hit the bottom of the container first?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
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.

Even though things appear on your retina upside down, you don’t see the world upside down. Why?

How important would the towel in your experiment be on a sunny day?

How important would the towel in your experiment be on a cloudy day?
Lesson 20
Level 2

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>

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

The two basic groups that Aristotle split animals into were:

_________________________ and _________________________

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

The two basic groups that modern scientists recognize are:

_________________________ and _________________________

Moby Dick was a ____________ whale
Why is it called a geocentric view?

Why did the spheres in Aristotle’s universe spin?

If two different planets attached to two different spheres returned to their original position in the same amount of time, do their spheres spin at the same speed?
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?
   _________________________________
   _________________________________
   _________________________________
Lesson 23

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.

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

____________________________________________________________________________________

A sheet of paper is bumpy and rough under a microscope. Will the Law of Reflection work when light reflects off paper? Why or why not?

____________________________________________________________________________________
Archimedes’s Principle says:

________________________________________
________________________________________
_______________________________________
______________________________________________________

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

______________________________________________________
_______________________________________________________
_______________________________________________________

First Experiment Drawing

Second Experiment Drawing

How does Archimedes’s Principle explain the experiment?

______________________________________________________
_______________________________________________________
_______________________________________________________

A 150-pound object is underwater. It displaces 145 pounds of water. If you lift it, how much will it feel like it weighs?

______________________________________________________
Archimedes said, “Give me a lever and a place to stand and I will move the earth”. Sometimes we can solve the most difficult problems with simple solutions. Think about how this principle might work in your life.
Lesson 26

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!
There are many who think that ancient people believed the earth is flat. That’s just not true. The ancients understood it is a sphere, which is why Eratosthenes wanted to measure its circumference. If you were taught that people opposed Columbus because they thought the earth is flat, that’s wrong, too!
How was your device a way of measuring the size of a distance object?

_________________________________________________________
_________________________________________________________
_________________________________________________________
_________________________________________________________
_________________________________________________________

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

_________________________________________________________
_________________________________________________________
_________________________________________________________
_________________________________________________________
_________________________________________________________

Draw the moon’s orbit and compare it to a circle

Define the following terms:

Apogee - ___________________________________________________________________
_________________________________________________________

Perigee - ___________________________________________________________________
This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
Lesson 31

Section 3: Science Soon After Christ

Level 2

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.

What does AD stand for?

_______________________________________________________

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

_______________________________________________________

Suppose Christ was born in 4 BC, as most historians suggest. Luke 3:23 says that He was about 30 years old when he was baptized. Assume he was exactly 30 years old and his birthday had already passed. In what year AD was he baptized?

_______________________________________________________

_______________________________________________________

_______________________________________________________
Lesson 32

Section 3: Science Soon After Christ

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

________________________________________________________________________________________

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________________________________________________________________________________________

What did you do in your experiment?

________________________________________________________________________________________

________________________________________________________________________________________

________________________________________________________________________________________

Which glass had an interesting result?

________________________________________________________________________________________

________________________________________________________________________________________

________________________________________________________________________________________

Why?

________________________________________________________________________________________

________________________________________________________________________________________

________________________________________________________________________________________

Based on their color and what you have learned in this lesson, do grapes contain acid or base?

________________________________________________________________________________________
How does a siphon work?

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

Why does poking a hole in it make it stop working?

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________
In our experiment, what made the pinwheel spin?


A steam engine converts _______________ energy into _______________ energy.

What was the power source for the first trains?


These days, we use a lot of steam to generate _______________.

If you didn’t keep adding fuel to the fire under Hero’s aeolipile, what would you see after a long time? Why?


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

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

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

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

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:

Which is faster in Ptolemy’s system – the motion of the planet around the earth or the motion of the planet in its epicycle?
Refraction is the process by which _____________ bends when it starts traveling through a different substance.

Draw the three different results in your experiment.

Why were the results different?

________________________________________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________

Does light travel faster in water or in vegetable oil?

________________________________________________________________________________________

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.
Why did Galen’s dissection of apes help him learn about human anatomy but ended up causing him to be wrong when it came to some things?

__________________________________________________________________________________________________________________________

__________________________________________________________________________________________________________________________

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__________________________________________________________________________________________________________________________
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: ________

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

On this photograph of a person’s hand, mark where you would find the pulse.

How does your pulse rate change over the course of your life?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

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________________________________________________________________________

________________________________________________________________________
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**

What does “biceps” mean? ____________________________________________

What does “triceps” mean? ____________________________________________

What does “brachii” mean? ____________________________________________
Did you know there are scientists who are studying how to repair nerve damage so that those with spinal cord injuries can walk again? Is that something you think would be a neat job? There’s all kinds of careers that use science!
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!
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

How does Boethius’s view of sound explain your answer above?

If your friend blows a whistle right next to you and then moves across the room and blows it again, the pitch will be:

Higher or lower or the same

How does Boethius’s view of sound explain your answer above?
Section 4: Science in the Early Middle Ages
Lesson 46

Is the earth eternal?

Yes or No

What argument did John Philoponus use to support that idea?

Why did Philoponus actually believe the earth is not eternal?

Why didn’t Philoponus use that reason when arguing with natural philosophers?
How did Aristotle think a projectile travels through the air?

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Describe your experiment and explain how it shows that Aristotle was wrong.

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Airplanes often fly very high on long trips, because there is less air the higher you are. Why is that important for an airplane?

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____________________________________________________________________________________
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?

______________________________________________________

Describe your experiment and explain how it shows that the sun heats the earth with its light, not its heat.

______________________________________________________

______________________________________________________

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______________________________________________________

______________________________________________________

______________________________________________________

______________________________________________________

Explain why it isn’t surprising that someone who was a very important person in the Christian church is considered by some to be the person who came up with the method by which modern science is done?

______________________________________________________

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______________________________________________________
This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
Draw the different setups that you used for the candle in your experiment in the boxes below:

Why did the candle go out when you covered it?

__________________________________________________________________________________

__________________________________________________________________________________

Which candle burned longest and why?

__________________________________________________________________________________

__________________________________________________________________________________

__________________________________________________________________________________

Rewrite Bacon’s quote on the top of page 151 in your own words.

__________________________________________________________________________________

__________________________________________________________________________________

__________________________________________________________________________________

__________________________________________________________________________________

Why does pouring water on a fire usually put it out?

__________________________________________________________________________________

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

Is the glass in a magnifying glass flat or curved?

_____________________________________________________________________________

Why?

_____________________________________________________________________________

_____________________________________________________________________________

_____________________________________________________________________________

_____________________________________________________________________________

_____________________________________________________________________________
Write the Basic Law of Magnetism and use it to explain why the magnets were first attracted to each other in the experiment but were later repelled by each other.

________________________________________________________________________

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________________________________________________________________________

________________________________________________________________________

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

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Draw a magnet next to the one below so that the magnets will be attracted to one another:

Suppose you have a very strong magnet and a very weak one. You put them together so that their like poles are closest to each other, and you hold them in place for a very long time. What will eventually happen?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
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 55

Explain why ½ cup of water plus ½ cup of alcohol did not result in 1 full cup of alcohol/water solution in the experiment

_________________________________________________________________________
_________________________________________________________________________
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_________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________

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).

If you add 1 cup of one liquid to 1 cup of another liquid, can you get a solution that has a volume of more than 2 cups? Assume the molecules of the liquids don’t change when the 2 liquids are mixed.
Draw how a rainbow forms in a drop of water. Use the drawing on p. 170 as a guide.

Why are the colors in a primary rainbow always the same, with red on top and violet on bottom?

_______________________________________________________

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_______________________________________________________
Bradwardine taught that different causes of motion can lead to the same ______________.

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

What is the difference between kinematics and dynamics?

__________________________________________________________________________________________

__________________________________________________________________________________________

__________________________________________________________________________________________

__________________________________________________________________________________________

Do some research and find the name of another member of the Oxford Calculators. Some sources call them the “Merton Calculators.”

__________________________________________________________________________________________

Understanding motion and how things move can help you be very good at some games!
Use your own words to define the range of a projectile, like the arrow shown on the right.

____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________

What determines impetus?

____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________

Use your own words to explain what impetus is.

____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________

Why does pulling back harder on a bow make the arrow fly farther when the bow is released?

____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
Lesson 59

Why was the can able to tilt once some water was added to it?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

If you stood the can straight up in a freezer and let the water freeze, would the can be able to tilt?

________________________________________________________________________

If you are able, put the can in a freezer overnight and then do the experiment to see if you were right!

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.
Why did Guy de Chauliac have better anatomy knowledge than Galen?

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.)

Can you think of any common household items that might break if the temperature is changed too quickly? List them below.
Section 5: Science in the Late Middle Ages
Lesson 61

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

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

What is the difference between astrology and astronomy?

Can you find a Bible verse (or two) that says we shouldn’t study astrology?
Section 5: Science in the Late Middle Ages
Lesson 62

Graphing Activity

As you count the M & Ms in your package, color in one box for each candy above the appropriate color.

Which color is the most common?

Which color is the least common?

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

What is on the horizontal axis?

What is on the vertical axis?

What is the most common answer?

What is the least common answer?

How many students answered the question?
Hint: think about what each filled-in square represents
Why did the water come out of the holes differently?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

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

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Why is it dangerous for an unprotected diver to go deeper than about 300 meters?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Section 5: Science in the Late Middle Ages
Lesson 64

What is humidity?
______________________________________________________
______________________________________________________
______________________________________________________

Why do water drops form on the outside of a cold glass?
______________________________________________________
______________________________________________________
______________________________________________________

Nicolas of Cusa invented the first hygrometer. What does it measure?
______________________________________________________
______________________________________________________
______________________________________________________

How does high humidity affect you on a hot day?
______________________________________________________
______________________________________________________
______________________________________________________
______________________________________________________

How does high humidity affect you on a cold day?
______________________________________________________
______________________________________________________
This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
Section 5: Science in the Late Middle Ages
Lesson 66

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

__________________________________________________________________________________________________________

__________________________________________________________________________________________________________

__________________________________________________________________________________________________________

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

__________________________________________________________________________________________________________

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What do plants absorb as they grow?

__________________________________________________________________________________________________________

__________________________________________________________________________________________________________

__________________________________________________________________________________________________________

What is hydroponics?

__________________________________________________________________________________________________________

__________________________________________________________________________________________________________

__________________________________________________________________________________________________________

In hydroponics, why aren’t the roots of a plant submerged in water?

__________________________________________________________________________________________________________

__________________________________________________________________________________________________________

__________________________________________________________________________________________________________

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__________________________________________________________________________________________________________
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: ________

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

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?

__________________________________________________________________________

What does it mean when someone says that a product has been mass produced?

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
How did Gutenberg’s printing press change the world?

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

This is a replica of Guttenburg’s press. The boy is holding a sample page made on the press.
How did Leonardo da Vinci’s scientific studies help him with his painting?

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.

If you watch a crescent moon for many nights, will the brightness of the dimly-lit part change?
Write the phrase “Hello There” in the box. Hold up to a mirror.

Now copy “Hello” in the box below. It may be difficult, but you should be able to do it. Hold up to a mirror.

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

______________________ writing is when the letters and words are written backwards.

Leonardo da Vinci used both shorthand and mirror writing in his journals. What reasons have people suggested for his use of mirror writing?

1. __________________________________________________________________________

2. __________________________________________________________________________

3. __________________________________________________________________________
1. What is shorthand?

2. What is mirror writing?

3. What well-known philosopher/inventor is known for using mirror writing in his journals?

4. Name 3 possible reasons why that well-known philosopher used mirror writing.
Tape/glue your leaf images here. Use the back of this page if you have more.
How did you make the leaf prints on the previous page?

_______________________________________________________

_______________________________________________________

_______________________________________________________

_______________________________________________________

How did Leonardo da Vinci make the ink that he use for his leaf prints?

_______________________________________________________

_______________________________________________________

_______________________________________________________

_______________________________________________________

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.
For the leaf patterns you drew on the previous page, label them as “Opposite,” “Alternate,” or “Whorled.”

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

What is Da Vinci’s rule?

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

What is a possible reason trees were designed according to Da Vinci’s rule?

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________
Draw a picture of the tree stump/branch you examined below.

Why do trees form rings?
______________________________________________________
______________________________________________________
______________________________________________________
______________________________________________________
______________________________________________________
______________________________________________________
______________________________________________________

What do the rings tell us about the weather when they formed?

__________________________________________________________________
__________________________________________________________________
__________________________________________________________________

Why is it easier to see the rings on a deciduous tree as opposed to an evergreen tree?

__________________________________________________________________
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________
This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
How did our experiment demonstrate what Leonardo da Vinci figured out? (That air is not an element)

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Natural philosophers in Da Vinci’s time thought that earth is an element. Why were they wrong?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Draw a picture (like the one on pg. 225) that shows what happened in the experiment.
Section 5: Science in the Late Middle Ages

Lesson 75

This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
Section 6: Science in the Early Renaissance
Lesson 76

Draw the results of your experiment in the boxes below.

Fresh Water

Salt Water

What explains the difference in the two drawings?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

How is the straw/Playdoh thing you made a hydrometer?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Vegetable oil floats on water. Compare how your hydrometer would float in vegetable oil compared to fresh water and salt water.

________________________________________________________________________
What is irrigation?

______________________________________________________

State the Law of Continuity in your own words. Explain why it works.

______________________________________________________

______________________________________________________

______________________________________________________

______________________________________________________

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?

______________________________________________________

______________________________________________________

______________________________________________________

______________________________________________________

Would the Law of Continuity work in the experiment you did in Lesson 63?

______________________________________________________

______________________________________________________

______________________________________________________

______________________________________________________

Photo ©Sarah Ackerman
https://www.flickr.com/photos/sackerman519/6247803468/in/photolist-aw6Cis-dRScuE-jz1hs3-5XQTSs-aw41Mi-pohAUS-5kBVja-9xPHLp-auktwm-dn42pL-pErvtz-6pV7Si-3jQHkC-3IQNSj-jSNp9z-91vdT8-6naw9LGPcE-7SXYrz-dRrbE9-6Ae71h-hM1nxC-dDL Pon-a88b89-a88cpo-3f3wwy-aw6Qkm-3f3BcG-aJ8V6-5kkLD-6A9vKk-3f3H8m-3eY-5kqAF-a8BbMW-3f3N7G-3eYrjk-hM1wl2-3eYyjt-91vdNv-3f3QX7-3eYwJT-3f3LCQ-6AdHV9-a88ce7-81pwC3-a8ykxz-3eYnB8-8MW4Kp-a8yjWK-5q72oo
Define erosion.
__________________________________________________________________________________________
__________________________________________________________________________________________

What two things determine how much erosion takes place as water flows over land?

a)________________________________________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________

b)________________________________________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________

Two scientists are discussing the Grand Canyon. One says it took millions of years for a river to erode the rock and make the canyon. The other says it formed in just a few months. Explain each scientist’s assumption about how water flowed while it was forming the canyon.
________________________________________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________
Cut out the bones and paste them into the body below. Label them.
People who combine their knowledge of science and their artistic abilities (like Leonardo da Vinci) are called __________________________ __________________________.

What are the 2 main jobs of the skeleton?

a) ____________________________________________________

b) ____________________________________________________

How many bones are in the human skeleton?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

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

Does the elbow allow for any other type of movement? ________________

What kind of joint is the elbow? ________________

Name another joint in the body that is the same kind of joint as the elbow.

________________________________________________________________________

________________________________________________________________________
This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
What are the individual bones of the vertebral column called? ______________________

What does the vertebral column protect? _________________________________________

A different model of the vertebral column

Draw a picture of the contraption you built

How is your contraption like the vertebral column?

_____________________________________________________________________________

_____________________________________________________________________________

_____________________________________________________________________________

What’s wrong with the shape of your contraption compared to the vertebral column?

_____________________________________________________________________________

_____________________________________________________________________________
This is a challenge lesson, so I want to challenge you to make your own notebook page for it!
Explain your activity and why it is a good model for how you flex and extend your fingers.

______________________________________________________
______________________________________________________
______________________________________________________
______________________________________________________
______________________________________________________

Explain the difference between the extrinsic and intrinsic muscles of the hand.

______________________________________________________
______________________________________________________
______________________________________________________

In the illustration below, which side shows the tendons that flex your fingers?

This illustration shows the tendons (white) and intrinsic muscles (red) of the hands. The drawing on the left shows the hand palm down, while the drawing on the right shows it palm up with some of the tendons cut. © URRRA via shutterstock.com
We’re still talking about Leonardo da Vinci! Wasn’t he amazing?!

Why did Leonardo da Vinci think that the spinal cord was just an extension of the brain?

_______________________________________________________
_______________________________________________________
_______________________________________________________

Was he correct?

_______________________________________________________

How was your experiment a model of the spinal cord?

_______________________________________________________
_______________________________________________________
_______________________________________________________
_______________________________________________________
_______________________________________________________

We have nerves all over our body! This diagram shows the nerves in blue and the brain & spinal cord in yellow.

_______________________________________________________
_______________________________________________________
_______________________________________________________
_______________________________________________________
_______________________________________________________

A person in an accident has his spinal cord cut halfway down. How does that affect the way he moves?

_______________________________________________________
Section 6: Science in the Early Renaissance
Lesson 86

Number of Heartbeats counted

<table>
<thead>
<tr>
<th>Before Jumping Jacks</th>
<th>After Jumping Jacks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Listening</td>
<td></td>
</tr>
<tr>
<td>Feeling Pulse</td>
<td></td>
</tr>
</tbody>
</table>

What is the name of the tool that a doctor uses to listen to your heartbeat?
______________________________________________________________

The heart is made of muscle.   TRUE or FALSE

What is the purpose of the valves in your heart?
______________________________________________________________
______________________________________________________________
______________________________________________________________
______________________________________________________________

What were you actually listening to in the experiment?
______________________________________________________________

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.

Illustration by Yaddah  https://commons.wikimedia.org/wiki/File:Diagram_of_the_human_heart_(cropped).svg
The specific pattern to a person’s teeth is called a ____________________  ____________________.

A child has _________ teeth, while an adult has ___________ teeth.

Label the diagrams below.

[Diagram of child and adult teeth with labels to be completed]

Give the function for each type of tooth:

Molar ____________________________________________________________

Incisor __________________________________________________________

Canine __________________________________________________________

What are deciduous teeth and why are they called that?

________________________________________________________________

________________________________________________________________

________________________________________________________________
The resistance (rubbing) two surfaces experience when they are moving against one another is called _____________________.

Draw ball bearings between the two surfaces on the right.

What is the purpose of ball bearings?

Why is there less friction between two surfaces that are already moving against one another as compared to two surfaces that aren’t yet moving against one another?

These are deep-groove ball bearings.

FKL India https://commons.wikimedia.org/wiki/File:Deep_Groove_Ball_Bearing.jpg
When you put 10 pennies on the CD case, it didn’t take 10 more pennies to get the case moving again. Why?

Leonardo da Vinci learned the following three things about friction:

1. _______________________________________________________
   _______________________________________________________
   _______________________________________________________

2. _______________________________________________________
   _______________________________________________________
   _______________________________________________________

3. _______________________________________________________
   _______________________________________________________
   _______________________________________________________

Draw a picture of your experiment
Section 6: Science in the Early Renaissance

Lesson 90

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