Science in the Ancient World

Lab and Lesson Book

LEVEL 1
(older students)

Property of:

_____

Section 1: Science Before Christ, Part 1

Lesson 1

1. Who is Thales?

_____

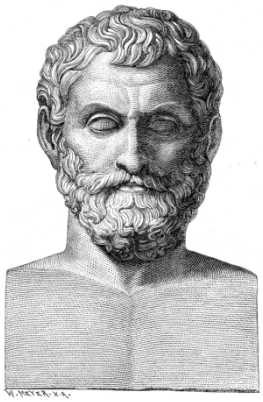
2. Why did he travel to Egypt?

_____

_____

_____

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 _____.

Section 1: Science Before Christ, Part 1

Lesson 2

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:

_____

_____

_____

_____

_____

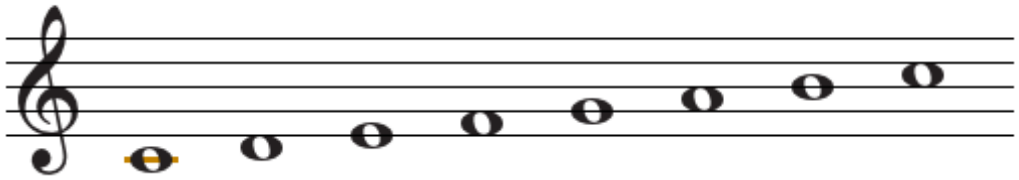
_____

_____

_____

Section 1: Science Before Christ, Part 1

Lesson 3



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.

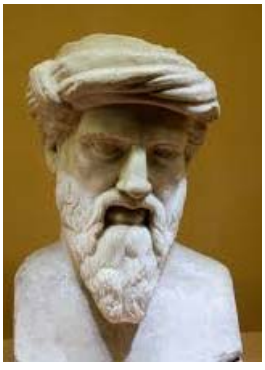
Explain what happened in the experiment:

_____

_____

_____

_____



Pythagoras

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

Section 1: Science Before Christ, Part 1

Lesson 4

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?

_____

_____

Section 1: Science Before Christ, Part 1

Lesson 5

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?

_____

Draw a picture like the one on page 14

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.

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.

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?

_____

_____

_____

_____

_____

_____

_____

Section 1: Science Before Christ, Part 1

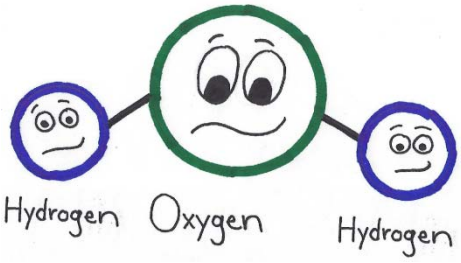
Lesson 7

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?

_____

_____

Section 1: Science Before Christ, Part 1

Lesson 8

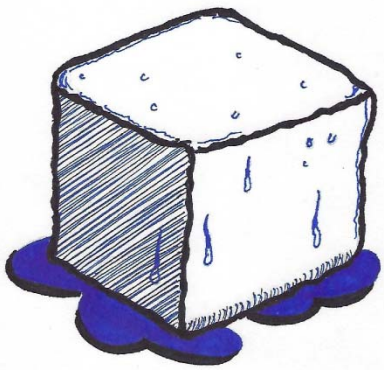
1. Which have more energy: the molecules in hot water or the molecules in cold water?

_____

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.



_____ _____ _____

Section 1: Science Before Christ, Part 1

Lesson 9

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.

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?

_____

_____

_____

Section 1: Science Before Christ, Part 1

Lesson 10

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?

_____

_____

_____

Section 1: Science Before Christ, Part 1

Lesson 11

1. What is the Hippocratic oath?

_____

_____

2. Who is thought to have written it?

_____

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

_____

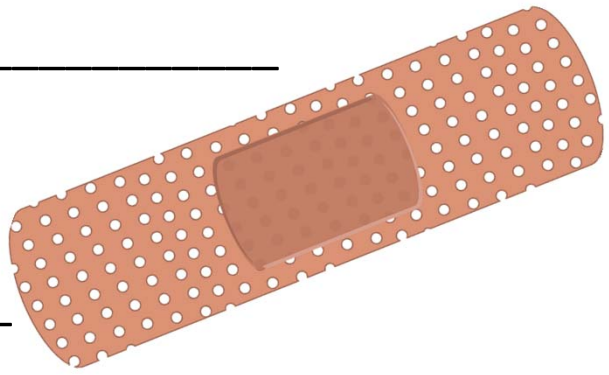
_____

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:

Section 1: Science Before Christ, Part 1

Lesson 13

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

Section 1: Science Before Christ, Part 1

Lesson 14

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

Section 1: Science Before Christ, Part 1

Lesson 15

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

Section 2: Science Before Christ, Part 2

Lesson 16

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 _____.

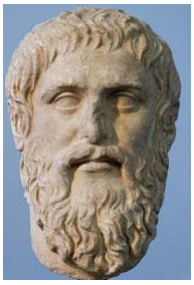
IV. Divide the result of step 3 by the number you chose (step 1). The result is _____.

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?

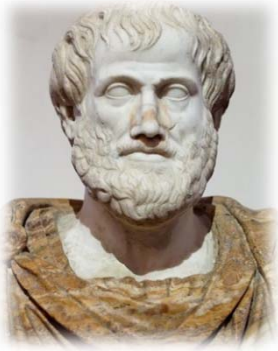
_____

_____

_____

Section 2: Science Before Christ, Part 2

Lesson 17



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

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?

_____

_____

_____

Section 2: Science Before Christ, Part 2

Lesson 18

1. Why do scientist 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.

_____

_____

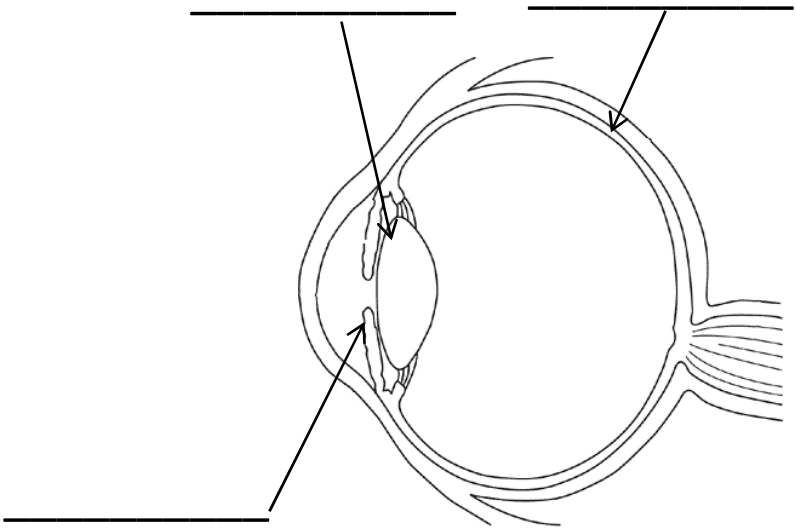
_____

Section 2: Science Before Christ, Part 2

Lesson 19

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?

_____

_____

_____

_____

Section 2: Science Before Christ, Part 2

Lesson 20

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:

Group 1:	Group 2:
_____	_____
_____	_____
_____	_____

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 _____

Section 2: Science Before Christ, Part 2

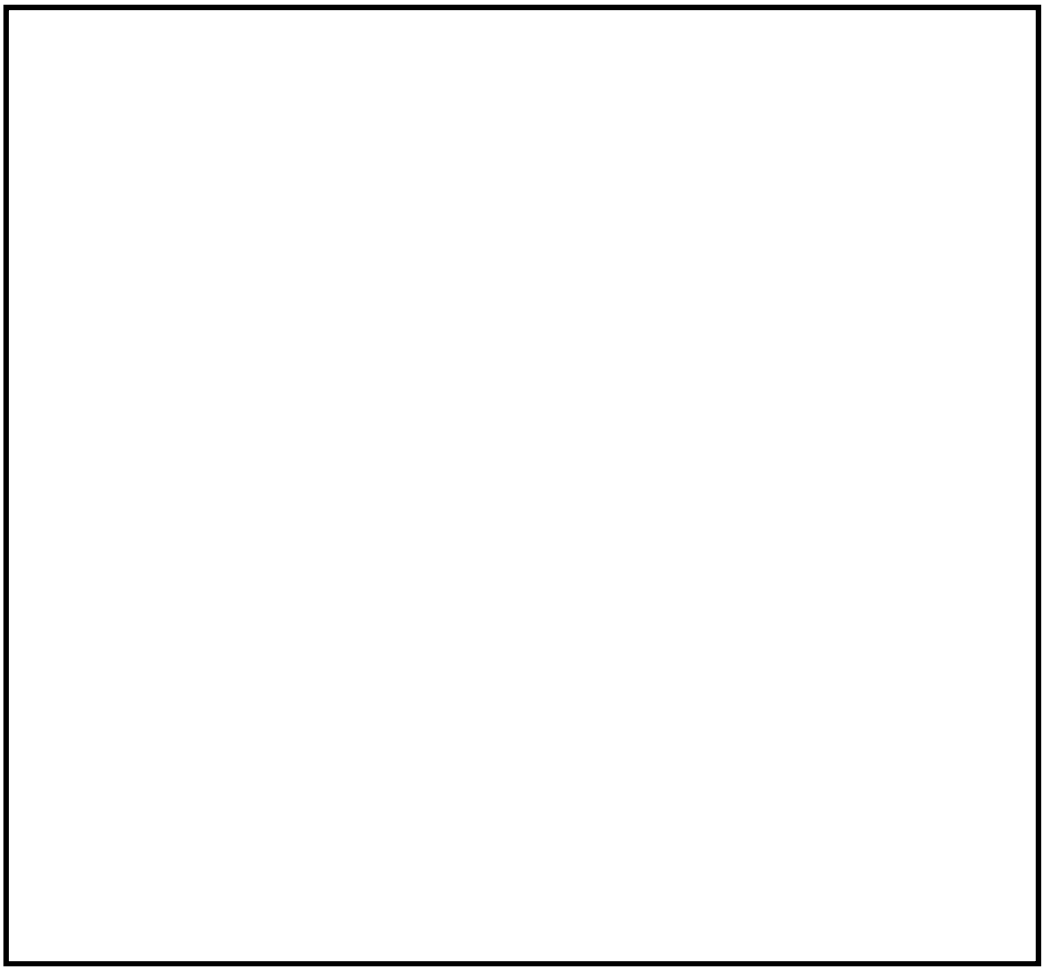
Lesson 21

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?

_____

_____

_____

_____

Section 2: Science Before Christ, Part 2

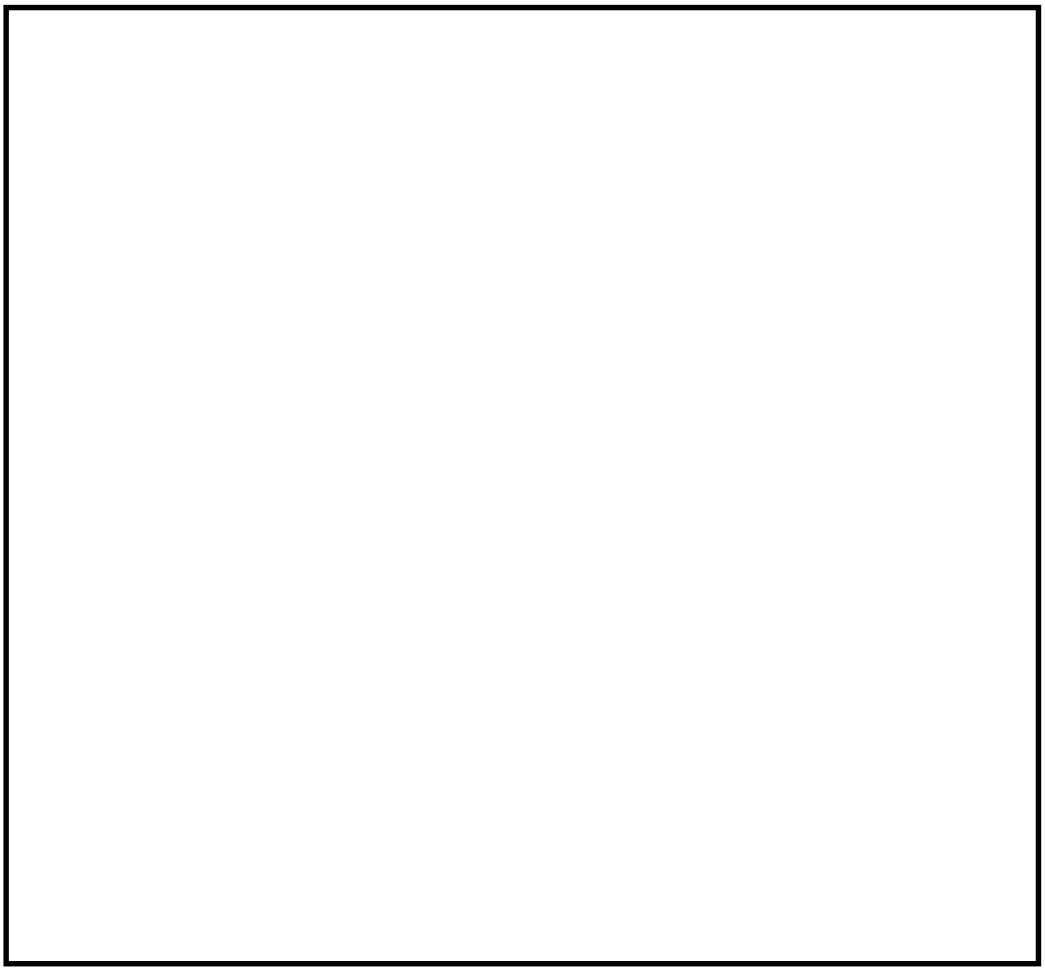
Level 1

Lesson 22

1. "Helios" means _____.

2. So, "Heliocentric" means _____.

Draw Aristarchus's View of the Universe



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

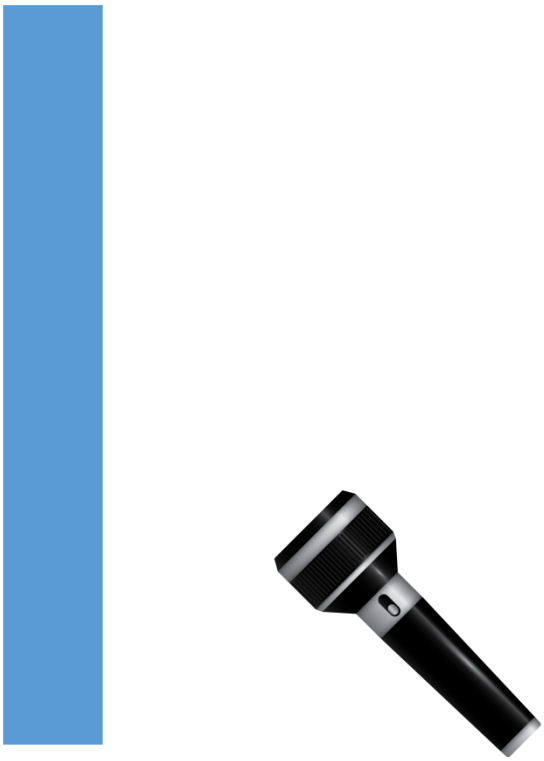
1. Write the Law of Reflection:

_____

_____

_____

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?

_____

Level 1

Section 2: Science Before Christ, Part 2

Lesson 24

Alrlindi 1999
https://commons.wikimedia.org/wiki/File:Eureka_arkimedi.jpg

1. Archimedes‘s Principle says:

_____

_____

_____

_____

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

_____

_____

First Experiment Drawing

Second Experiment Drawing

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?

Section 2: Science Before Christ, Part 2

Lesson 25

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

_____

_____

_____

Section 2: Science Before Christ, Part 2

Lesson 26

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

Section 2: Science Before Christ, Part 2

Lesson 27

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

Section 2: Science Before Christ, Part 2

Lesson 28

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

Level 1

Lesson 29

G.Gillet/ESO at WikiMedia Commons
https://commons.wikimedia.org/wiki/File:Moonset_over_ESO%27s_Very_Large_Telescope.jpg

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

2. Does the moon's size in the skyreally 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.

_____

_____

_____

_____

_____

Section 2: Science Before Christ, Part 2

Lesson 30

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

Section 3: Science Soon After Christ

Lesson 31

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?

_____

Section 3: Science Soon After Christ

Level 1

Lesson 32

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?

_____

_____

_____

Section 3: Science Soon After Christ

Lesson 33

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?

_____

_____

Draw a Picture of a Siphon

3. Why does poking a hole in a siphon make it stop working?

_____

_____

_____

Section 3: Science Soon After Christ

Level 1

Lesson 34

1. In our experiment, what made the pinwheel spin?

_____

_____

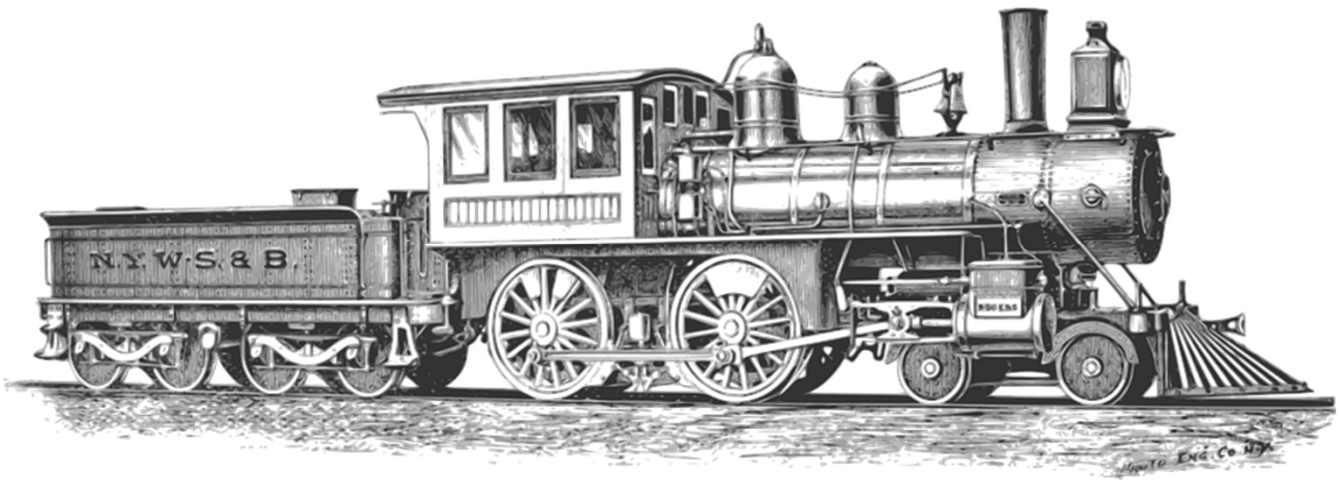
_____

_____

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 _____.

Section 3: Science Soon After Christ

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

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Section 3: Science Soon After Christ

Lesson 36

1. What do astronomers study? _____

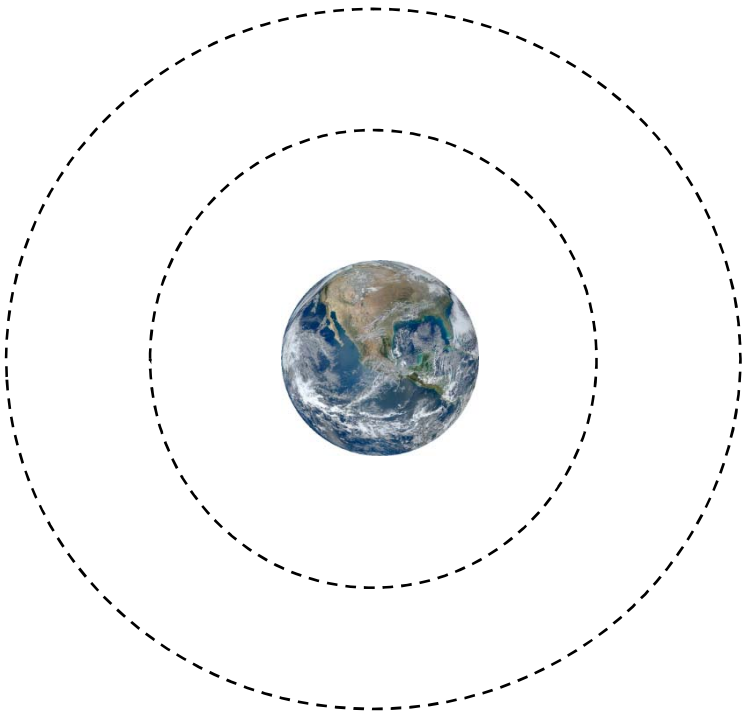
_____

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:



Section 3: Science Soon After Christ

Lesson 37

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?

Section 3: Science Soon After Christ

Level 1

Lesson 38

Use the outline below for the activity, and once you have glued the organs in place, label them.

Section 3: Science Soon After Christ

Lesson 38 (cont.)

An organ is a _____in the body that performs a _____.

Anatomy is the study of the _____of the body and where they are _____.

Section 3: Science Soon After Christ

Lesson 39

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 a 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.

Section 3: Science Soon After Christ

Lesson 40

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 bracchi _____ 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

Section 3: Science Soon After Christ

Lesson 41

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?

_____

Section 3: Science Soon After Christ

Lesson 42

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

Section 3: Science Soon After Christ

Lesson 43

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

Section 3: Science Soon After Christ

Lesson 44

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

Section 3: Science Soon After Christ

Lesson 45

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?

_____

_____

_____

_____

_____

Section 4: Science in the Early Middle Ages

Level 1

Lesson 46

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?

_____

_____

_____

_____

_____

_____

_____

Section 4: Science in the Early Middle Ages

Level 1

Lesson 47

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?

_____

_____

_____

_____

Section 4: Science in the Early Middle Ages

Level 1

Lesson 48

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?

_____

_____

_____

_____

_____

_____

Section 4: Science in the Early Middle Ages

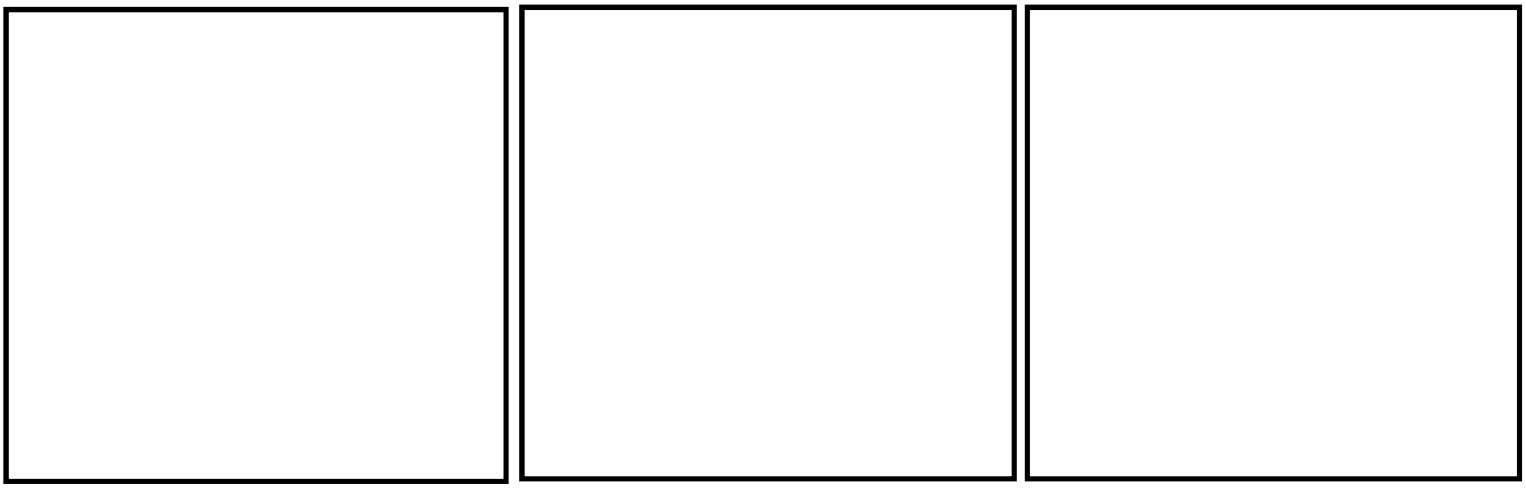
Lesson 49

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.

_____

_____

_____

_____

_____

Section 4: Science in the Early Middle Ages

Lesson 51

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

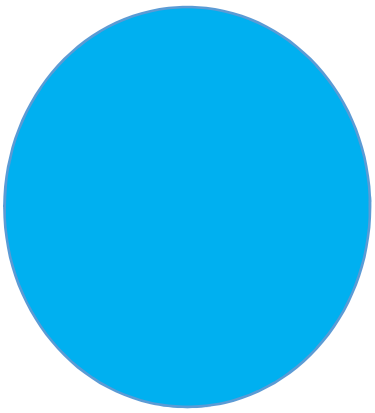
Level 1

Lesson 52

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:

Section 4: Science in the Early Middle Ages

Lesson 54

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

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).

Section 4: Science in the Early Middle Ages

Level 1

Lesson 56

1. To see a rainbow, the sun must be _____ you.

2. Why do rainbows usually form after it rains?

_____

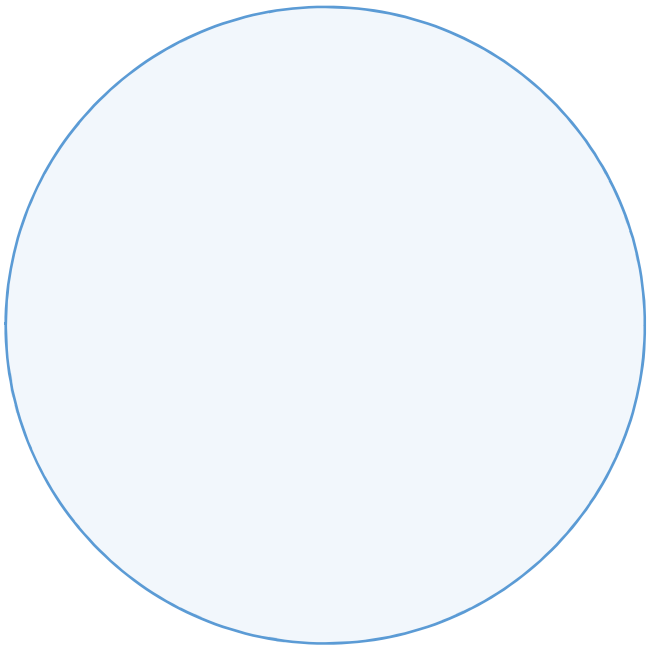
_____

_____

_____

_____

Draw how a rainbow forms in a drop of water.
Use the drawing on p. 170 as a guide.



Section 4: Science in the Early Middle Ages

Lesson 57

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!

Section 4: Science in the Early Middle Ages

Level 1

Lesson 58

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.

_____

_____

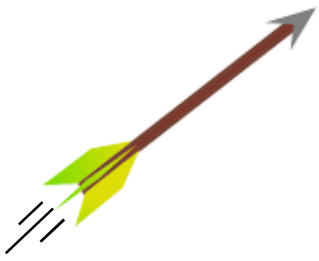
_____

_____

_____

_____

4. Use your own words to define the range of a projectile, like the arrow shown on the right.



_____

_____

_____

_____

_____

_____

Section 4: Science in the Early Middle Ages

Lesson 59

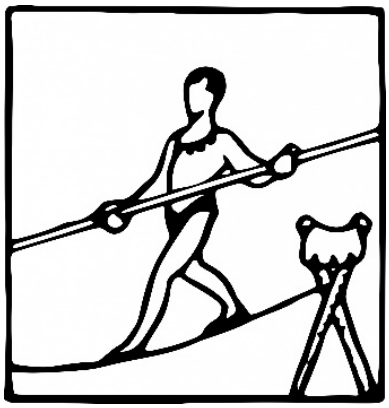
1. An object behaves like all its weight is concentrated at its

_____ _____ _____.

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.

Section 4: Science in the Early Middle Ages

Level 1

Lesson 60

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

_____

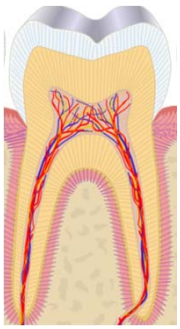
_____

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.)



_____

_____

_____

_____

_____

_____

_____

_____

_____

Tooth image by Goran Tek-en
https://commons.wikimedia.org/wiki/File:Cross_sections_of_teeth.svg

Section 5: Science in the Late Middle Ages

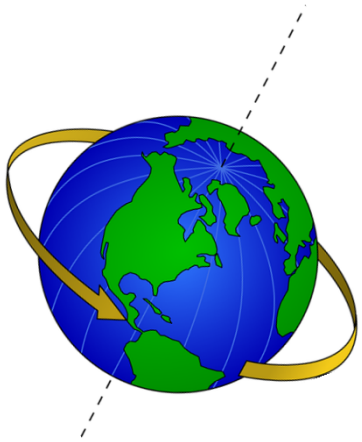
Level 1

Lesson 61

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?

_____

_____

_____

_____

_____

_____

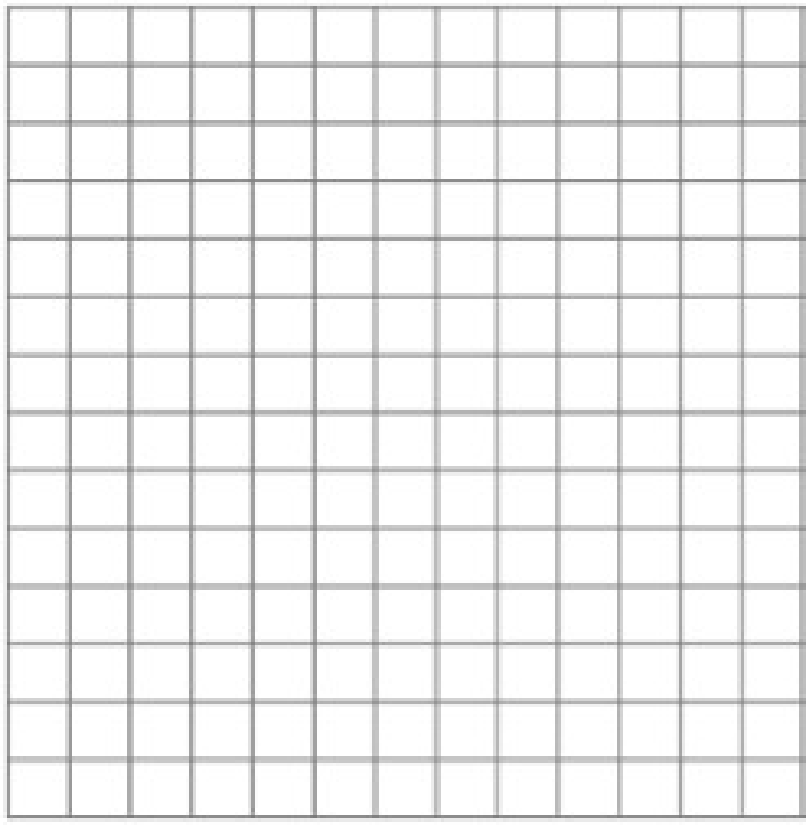
_____

_____

Section 5: Science in the Late Middle Ages

Lesson 62

Graphing Activity



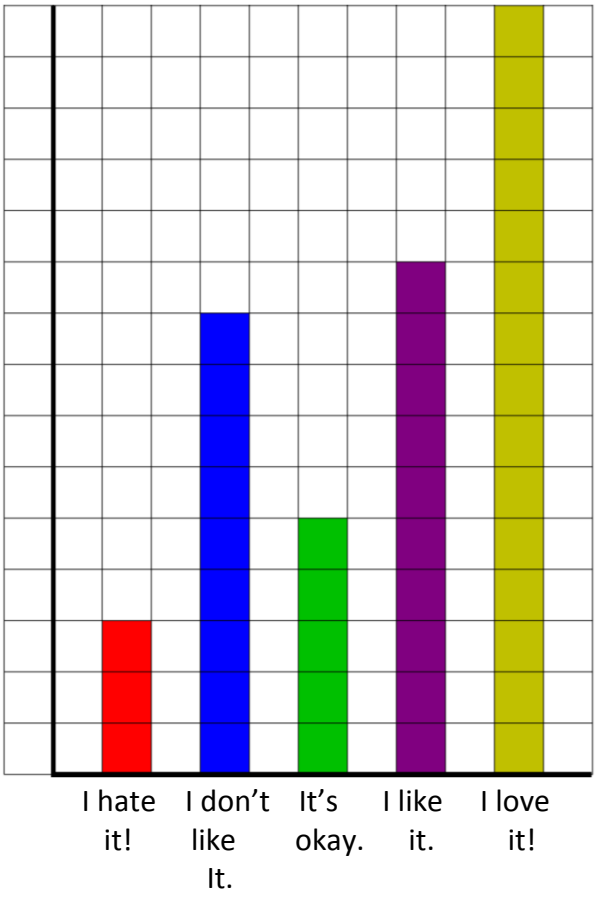
As you count the M & Ms in your package, color in one box for each candy above the appropriate color.

1. Which color is the most common?

_____

2. 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?"

3. What is on the horizontal axis?

_____

4. What is on the vertical axis?

_____

5. What is the most common answer?

_____

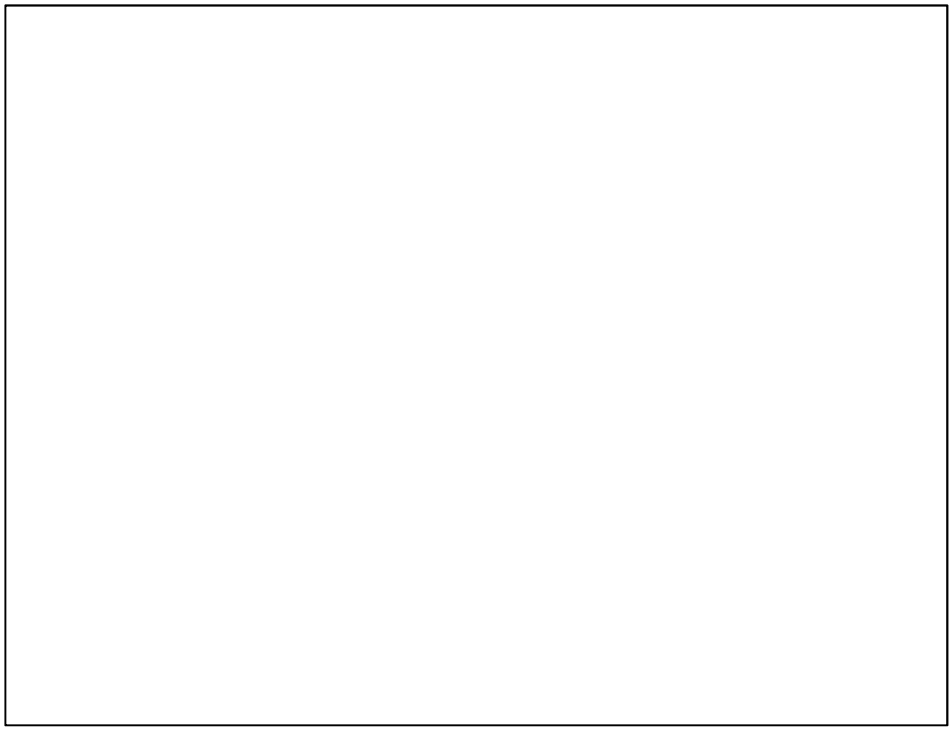
6. What is the least common answer?

_____

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?

_____

_____

_____

Section 5: Science in the Late Middle Ages

Level 1

Lesson 64

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?

_____

_____

_____

_____

Section 5: Science in the Late Middle Ages

Lesson 65

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

Level 1

Lesson 66

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?

_____

_____

_____

_____

_____

Section 5: Science in the Late Middle Ages

Level 1

Lesson 67

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?

_____

Section 5: Science in the Late Middle Ages

Lesson 67 (Cont.)

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.

Section 5: Science in the Late Middle Ages

Level 1

Lesson 68

1. How did Leonardo da Vinci's scientific studies help him with his painting?

_____

_____

_____

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

_____

_____

_____

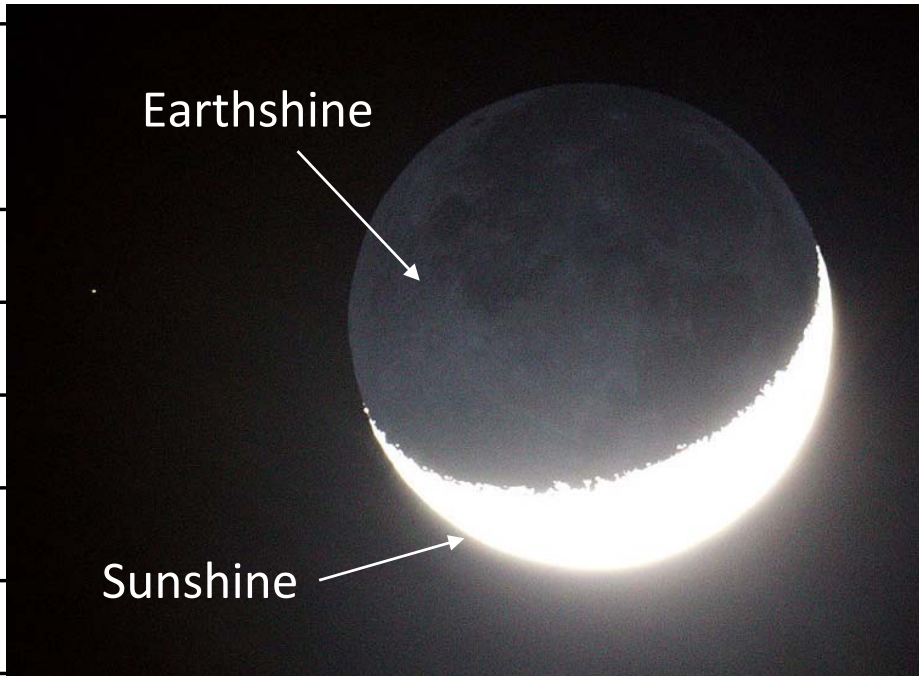
_____

_____

_____

_____

_____



_____

_____

_____

Photo by Radoslaw Ziomber https://commons.wikimedia.org/wiki/File:Earthshine_2011.jpg

Section 5: Science in the Late Middle Ages

Level 1

Lesson 69

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

Now copy “ƃɹǝɥɬ ollǝH “ 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.

Section 5: Science in the Late Middle Ages

Lesson 70 (Cont.)

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?

_____

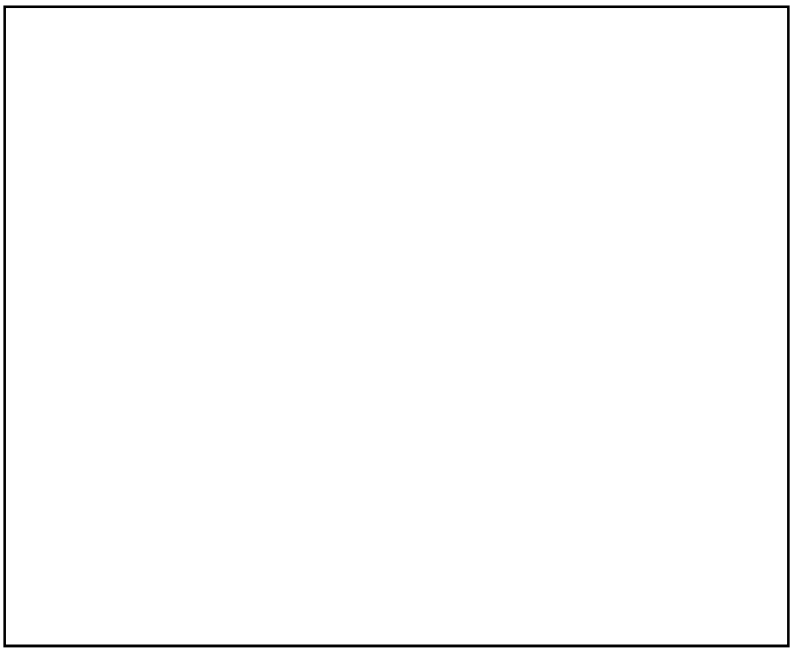
_____

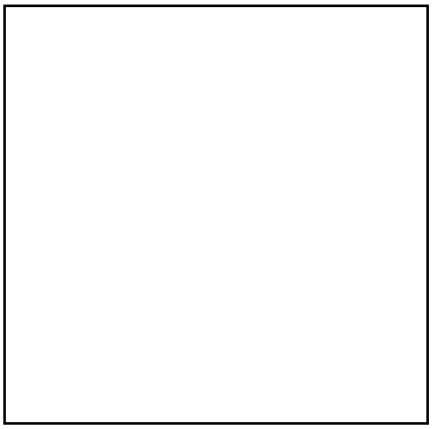
This is an image of the page in Leonardo da Vinci's notebook where he made his leaf print.

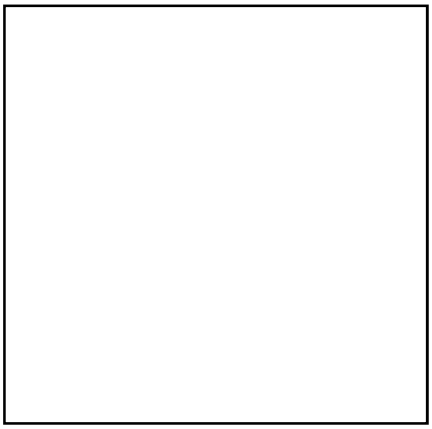
Section 5: Science in the Late Middle Ages

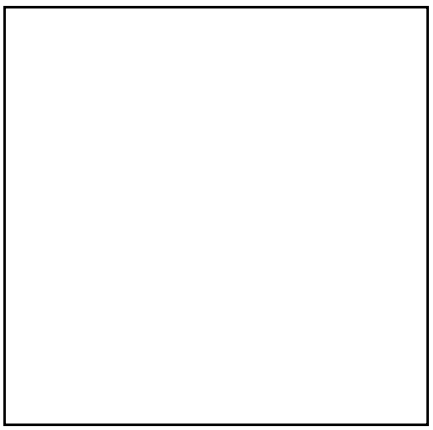
Lesson 71

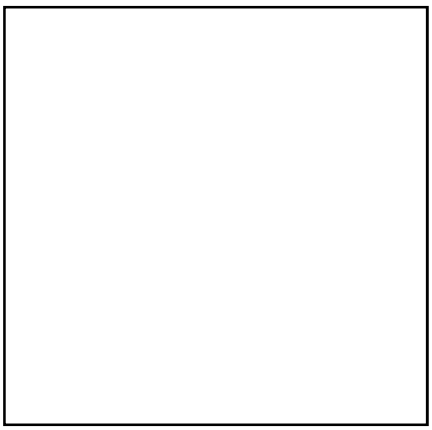
Use these boxes to make your drawings for the lesson activity. Use the bigger box for your drawing a thick branch splitting into two and the four smaller boxes for different leaf patterns.











Section 5: Science in the Late Middle Ages

Lesson 71 (Cont)

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?

Section 5: Science in the Late Middle Ages

Lesson 72

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

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?

_____

_____

Section 5: Science in the Late Middle Ages

Lesson 73

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 74

Draw a picture (like the one on pg. 225) that shows what happened in the experiment

1. What is an element?

_____

_____

_____

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

_____

_____

_____

_____

_____

Section 5: Science in the Late Middle Ages

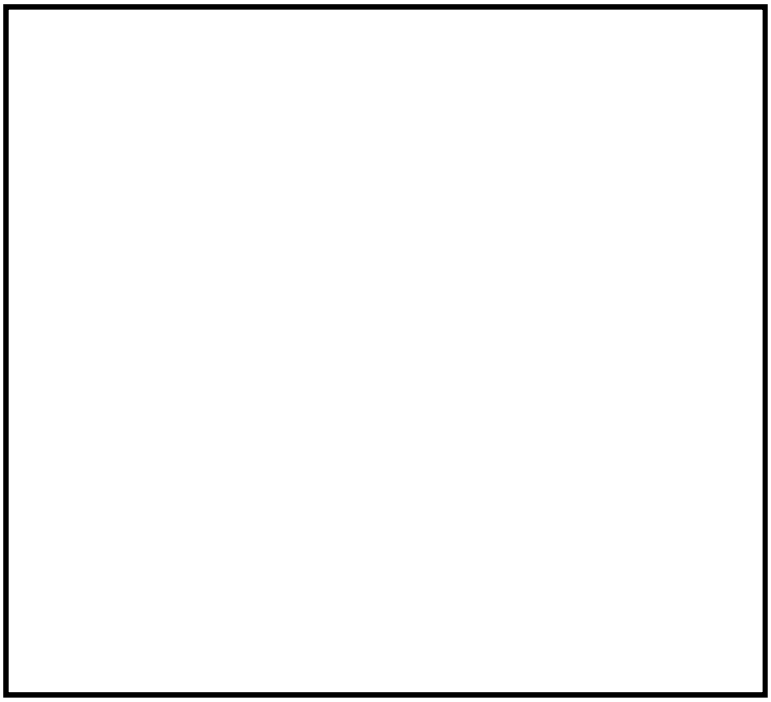
Lesson 75

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

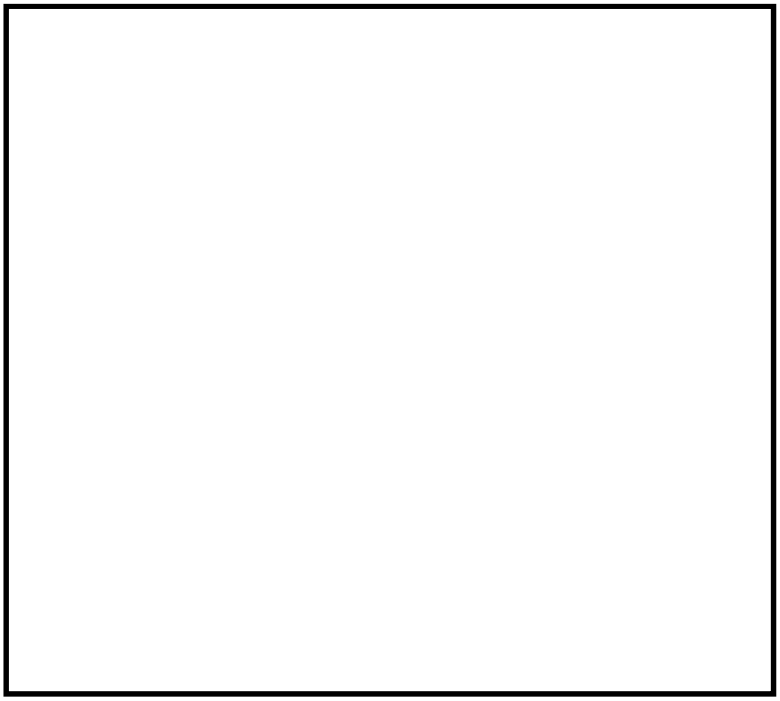
Section 6: Science in the Early Renaissance

Lesson 76

Draw the results of your experiment in the boxes below.



Fresh Water



Salt Water

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 _____

Section 6: Science in the Early Renaissance

Level 1

Lesson 77

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?

_____

_____

_____

_____

_____

Section 6: Science in the Early Renaissance

Level 1

Lesson 78

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?

a) _____

_____

_____

_____

b) _____

_____

_____

_____

The Grand Canyon

Section 6: Science in the Early Renaissance

Level 1

Lesson 79

Cut out the bones and paste them into the body below. Label them.

Section 6: Science in the Early Renaissance

Level 1

Lesson 79 (Cont)

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) _____

_____

_____

Section 6: Science in the Early Renaissance

Lesson 80

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

Section 6: Science in the Early Renaissance

Lesson 81

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

Level 1

Lesson 82

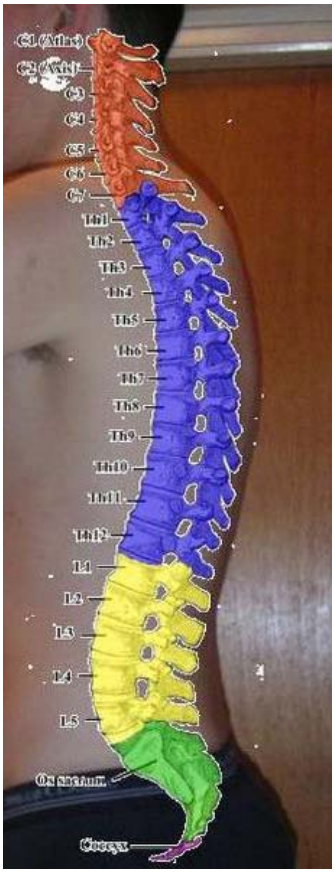
1. The individual bones of the vertebral column are called

   _____.

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?

_____

_____

_____

_____

Section 6: Science in the Early Renaissance

Lesson 83

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 84

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

Section 6: Science in the Early Renaissance

Level 1

Lesson 85

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?

_____

_____

_____

_____

_____

_____

_____

_____

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

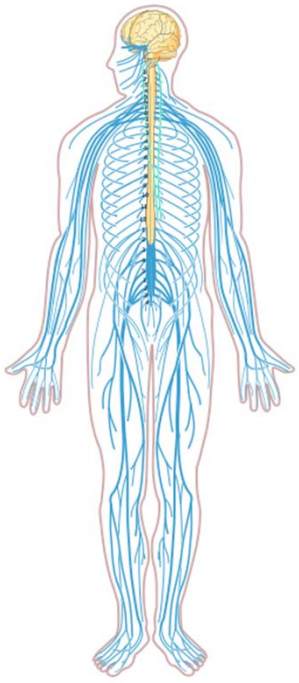


Illustration by William Crochot https://commons.wikimedia.org/wiki/File:Nervous_system_diagram_unlabeled.svg

Section 6: Science in the Early Renaissance

Level 1

Lesson 86

Number of Heartbeats counted

	Before Jumping Jacks	**After Jumping Jacks**
Listening	_____	_____
Feeling Pulse	_____	_____

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.

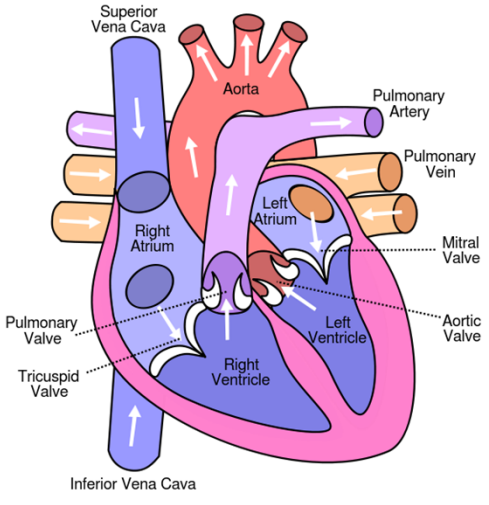


Illustration by Yaddah https://commons.wikimedia.org/wiki/File:Diagram_of_the_human_heart_(cropped).svg

Section 6: Science in the Early Renaissance

Lesson 87

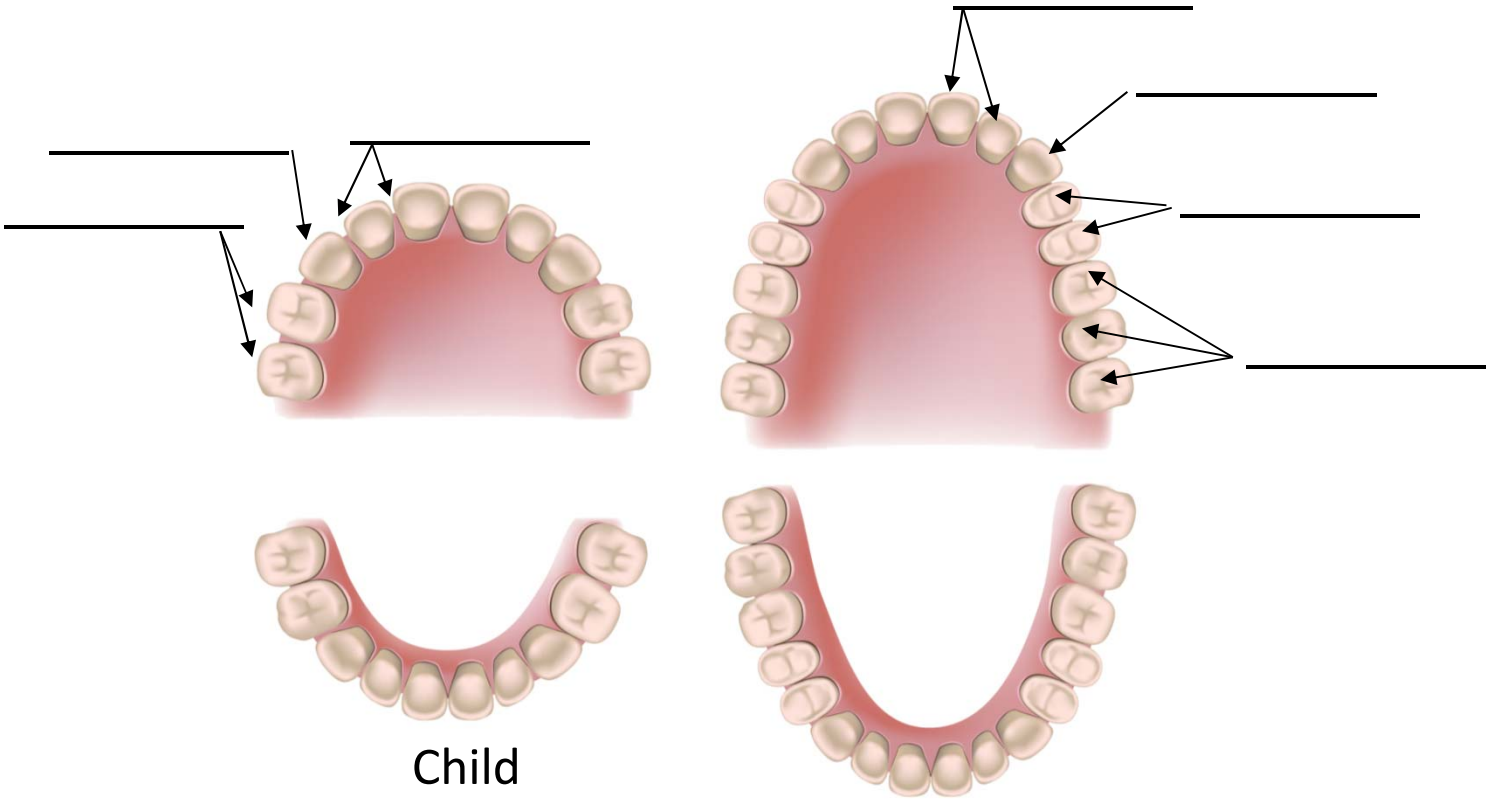
1. The specific pattern to a person's teeth is called a

   _____ _____.

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 _____

Section 6: Science in the Early Renaissance

Level 1

Lesson 88

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.

FKL India https://commons.wikimedia.org/wiki/File:Deep_Groove_Ball_Bearing.jpg

Section 6: Science in the Early Renaissance

Lesson 89

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?

_____

_____

_____

_____

_____

_____

_____

_____

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!

Created by Lisa Van Weelden

Science in the Ancient World

Lab and Review Book

LEVEL 2
(oldest students)

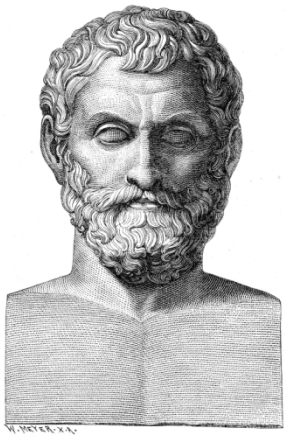
Property of:

_____

Section 1: Science Before Christ, Part 1

Level 2

Lesson 1



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=_____

Section 1: Science Before Christ, Part 1

Level 2

Lesson 2

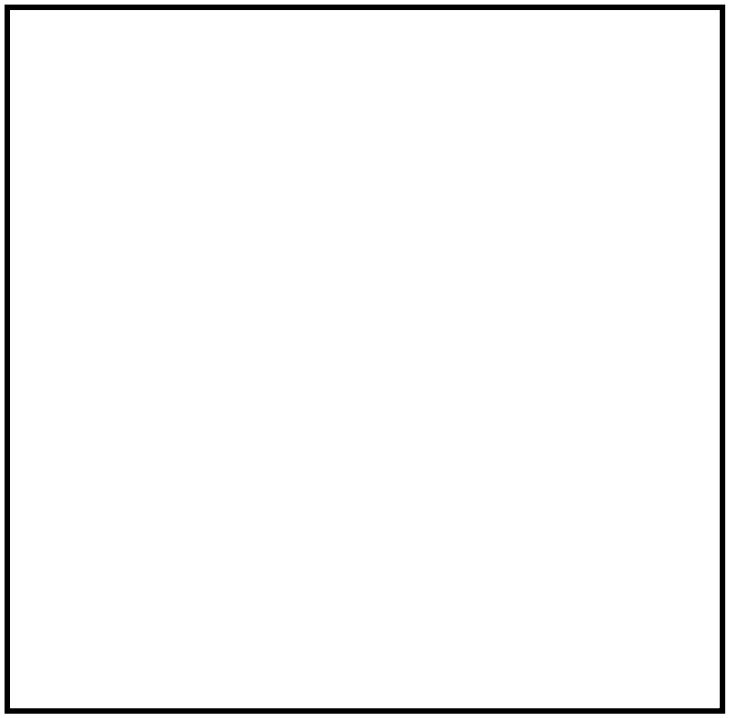
In lesson 1, we measured the height of a tree. What did Thales measure?

_____

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?

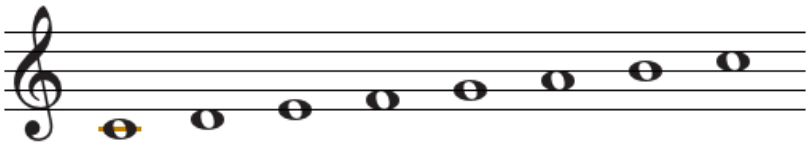
_____

_____

Level 2

Section 1: Science Before Christ, Part 1

Lesson 3



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:

_____

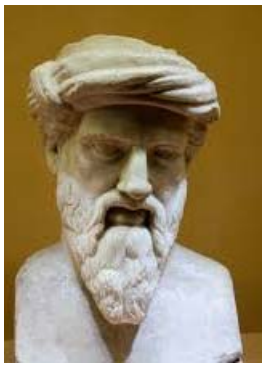
_____

_____

_____

_____

_____



Pythagoras

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

_____

_____

_____

_____

Section 1: Science Before Christ, Part 1

Level 2

Lesson 4

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?

_____

_____

Section 1: Science Before Christ, Part 1

Lesson 5

Draw a picture like the one on page 14

How does a vibrating string make a sound wave?

_____

_____

_____

_____

_____

_____

_____

Fill in the blanks: The faster the string vibrates, the _____ the pitch. The longer the distance over which it vibrates, the _____ the volume**.**

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.)

_____

_____

_____

Section 1: Science Before Christ, Part 1

Level 2

Lesson 6

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?

_____

_____

_____

_____

_____

_____

_____

_____

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

_____

_____

_____

Section 1: Science Before Christ, Part 1

Level 2

Lesson 7

First Experiment Drawing

Second Experiment Drawing

What made the foam in the experiment?

_____

_____

_____

Explain the difference between atoms and molecules.

_____

_____

_____

What does "indivisible" mean? Are atoms indivisible?

_____

_____

_____

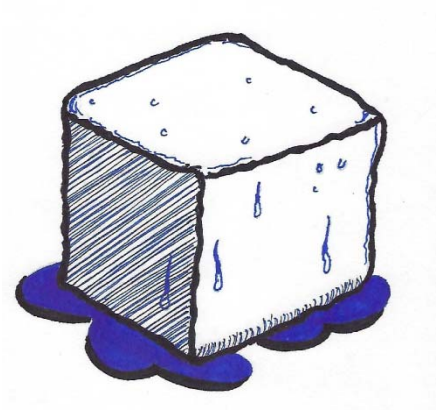
A thought to remember from your book: *Scientists believed a wrong idea about atoms for nearly 2000 years. Even incorrect ideas can eventually lead scientist to correct ideas!*

Section 1: Science Before Christ, Part 1

Level 2

Lesson 8

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?

_____

_____

_____

_____

_____

_____

Section 1: Science Before Christ, Part 1

Level 2

Lesson 9

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?

_____

_____

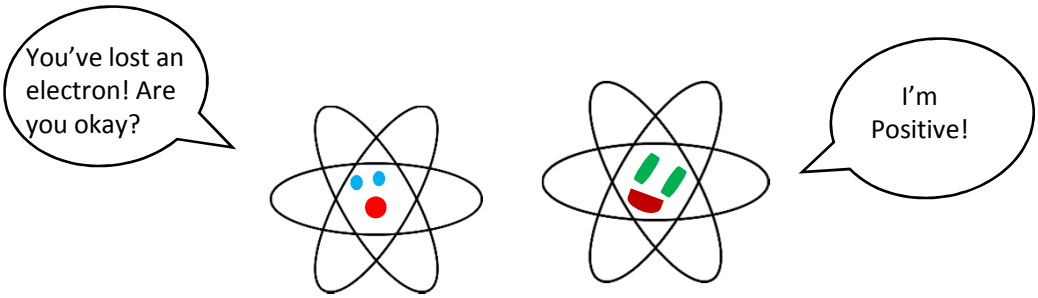
_____

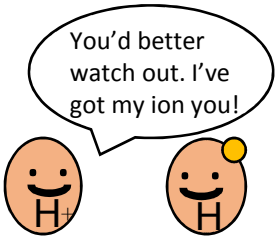
Draw the two carbon ions you made, indicating the charge of each.

Section 1: Science Before Christ, Part 1

Level 2

Lesson 10





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

Level 2

Lesson 11

What is the Hippocratic oath?

_____

_____

_____

Who is thought to have written it?

_____

Why does rest help a sick person get better?

_____

_____

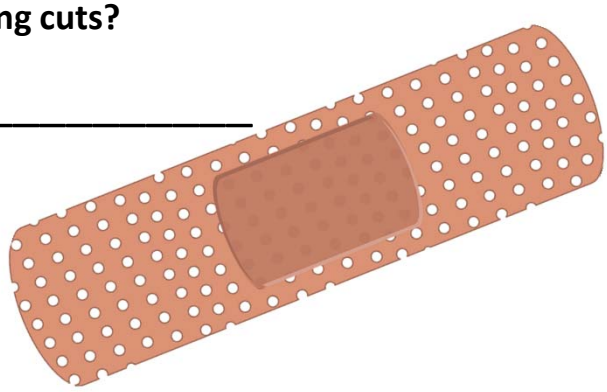
Why can bandages sprinkled with alcohol be good for healing cuts?

_____

_____

_____

_____



Find the Hippocratic Oath and read it. What are your thoughts on what it means?

_____

_____

_____

_____

_____

_____

Section 1: Science Before Christ, Part 1

Lesson 12

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?**

_____

_____

_____

_____

Section 1: Science Before Christ, Part 1

Lesson 13

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

Section 1: Science Before Christ, Part 1

Level 2

Lesson 14

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

Section 1: Science Before Christ, Part 1

Level 2

Lesson 15

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

Section 2: Science Before Christ, Part 2

Lesson 16

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 _____.

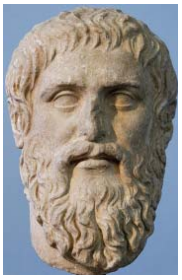
IV. Divide the result of step 3 by the number you chose (step 1). The result is _____.

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.

_____

_____

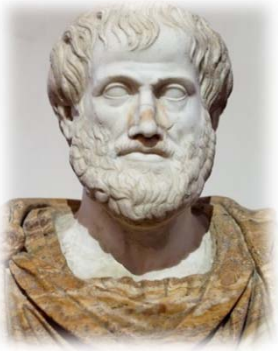
_____

Section 2: Science Before Christ, Part 2

Level 2

Lesson 17

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



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

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!

Section 2: Science Before Christ, Part 2

Lesson 18

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.

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

_____

_____

_____

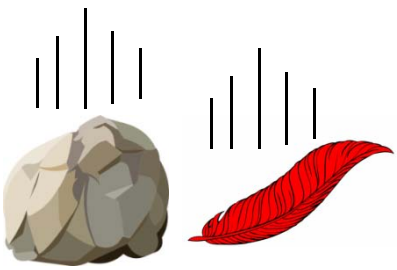
How does your experiment show that Aristotle wasn't correct.

_____

_____

_____

_____



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?

_____

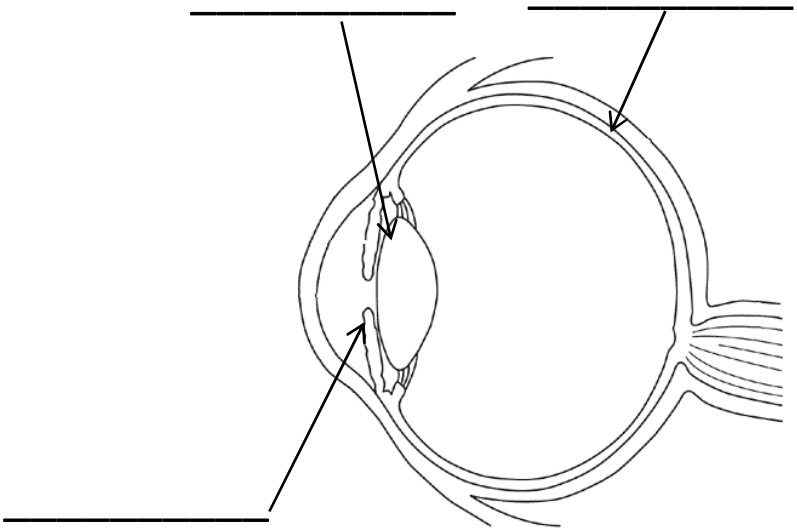
_____

Section 2: Science Before Christ, Part 2

Level 2

Lesson 19

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.



_____ (the opening)

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?

_____

_____

Section 2: Science Before Christ, Part 2

Lesson 20

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:

Group 1:	Group 2:

_____ _____

_____ _____

_____ _____

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?

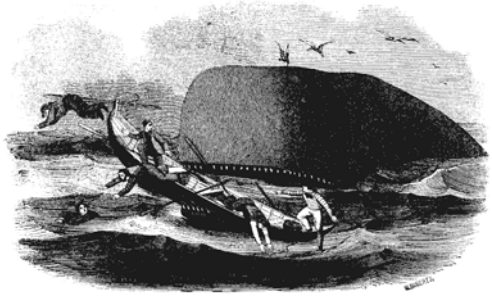
_____

_____

_____

The two basic groups that modern scientists recognize are:

_____ and _____



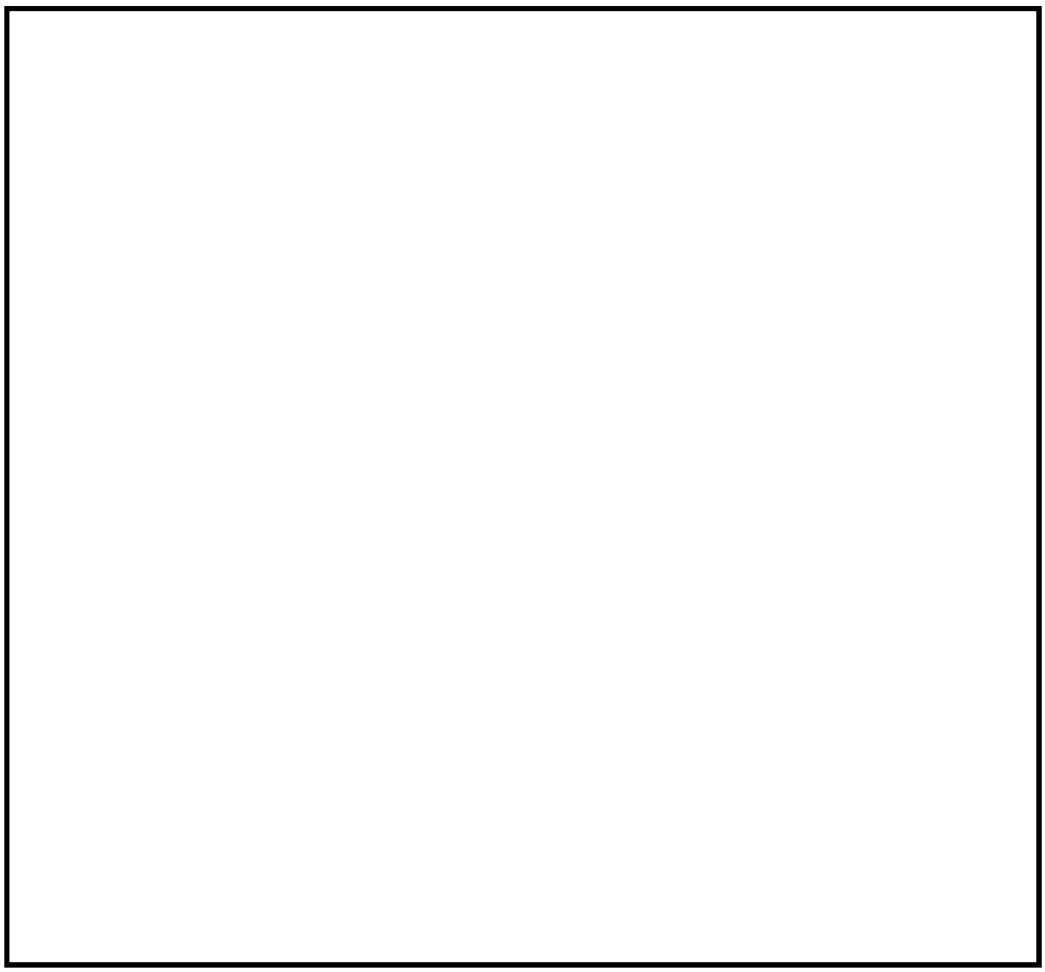
Moby Dick was a _____ whale

Section 2: Science Before Christ, Part 2

Level 2

Lesson 21

Draw Aristotle's View of the Universe



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?

_____

Section 1: Science Before Christ, Part 2

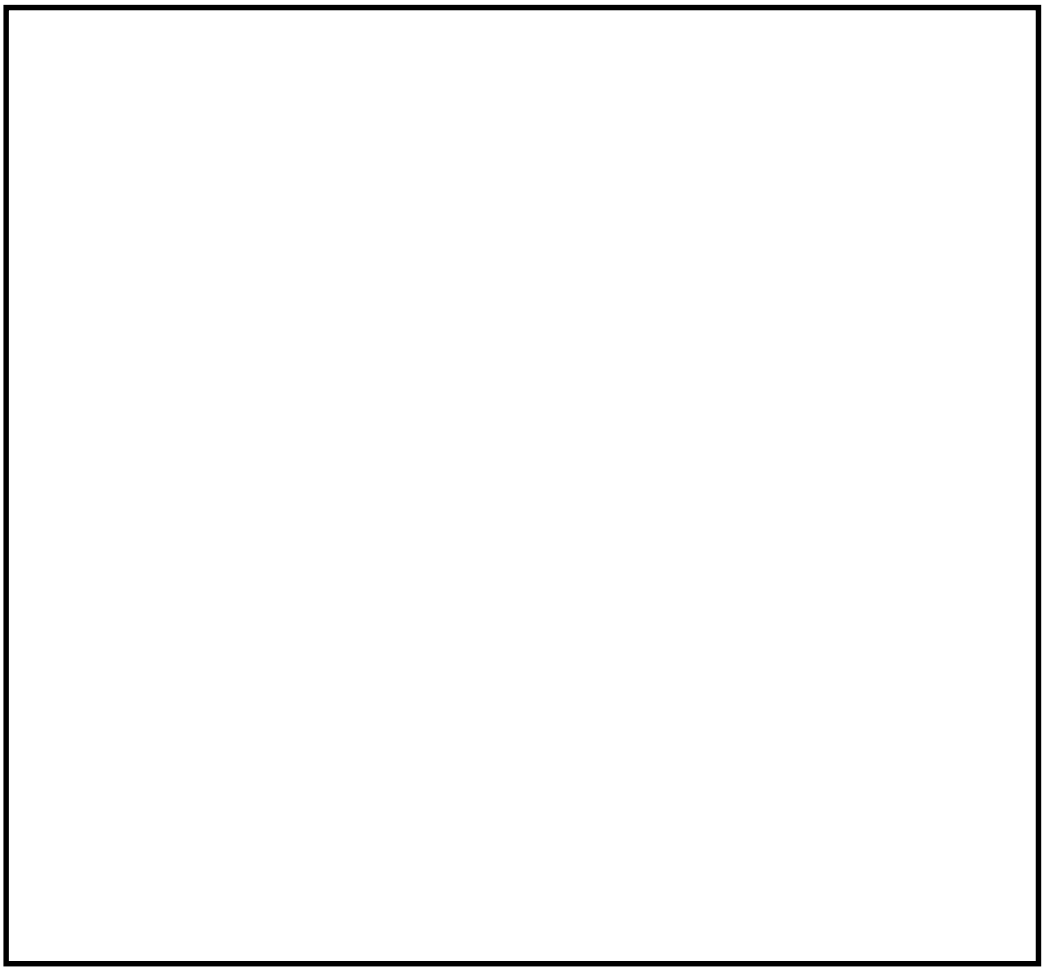
Level 2

Lesson 22

1. "Helios" means _____.

2. So, "Heliocentric" means _____.

Draw Aristarchus's View of the Universe



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

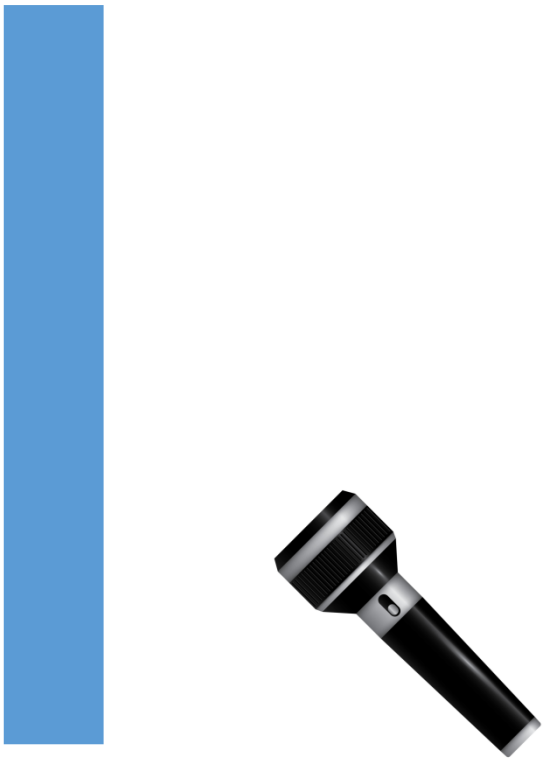
Write the Law of Reflection:

_____

_____

_____

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?

_____

_____

Section 2: Science Before Christ, Part 2

Level 2

Lesson 24

Alrlindi 1999
https://commons.wikimedia.org/wiki/File:Eureka_arkimedi.jpg

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?

_____

Section 2: Science Before Christ, Part 2

Level 2

Lesson 25

In order to make a lever, you need a _____ and a _____.

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

_____

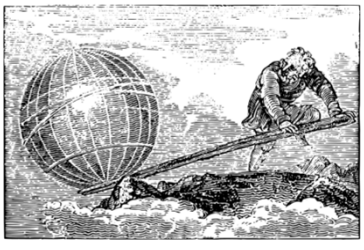
_____

_____

Compare the energy needed to move an object with your hand and with a lever.

_____

_____



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.

Section 2: Science Before Christ, Part 2

Level 2

Lesson 26

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

Section 2: Science Before Christ, Part 2

Level 2

Lesson 27

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

Section 2: Science Before Christ, Part 2

Lesson 28

What is the proper scientific and mathematical term for a ball?

_____

What is the circumference of a sphere?

_____

Tell Your Own Story About How Eratosthenes Measured the Circumference of the Earth

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!

Section 2: Science Before Christ, Part 2

Level 2

Lesson 29

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 - _____

_____

G.Gillet/ESO
https://commons.wikimedia.org/wiki/File:Moonset_over_ESO%27s_Very_Large_Telescope.jpg

Section 2: Science Before Christ, Part 2

Level 2

Lesson 30

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

Section 3: Science Soon After Christ

Level 2

Lesson 31

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?

_____

_____

_____

Section 3: Science Soon After Christ

Lesson 32

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

_____

_____

_____

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?

_____

Section 3: Science Soon After Christ

Level 2

Lesson 33

Draw a Picture of a Siphon

How does a siphon work?

_____

_____

_____

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

_____

_____

_____

Section 3: Science Soon After Christ

Level 2

Lesson 34

In our experiment, what made the pinwheel spin?

_____

_____

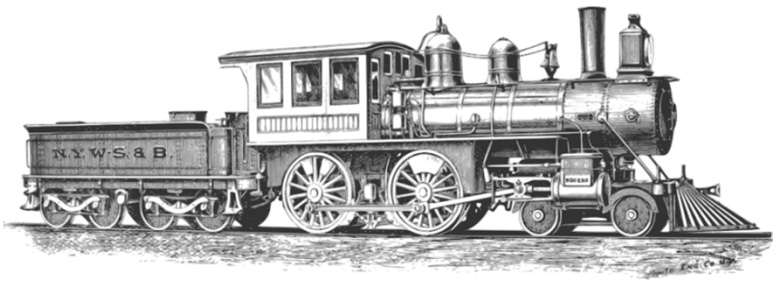
_____

_____

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?

_____

_____

_____

_____

_____

Section 3: Science Soon After Christ

Level 2

Lesson 35

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

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Section 3: Science Soon After Christ

Level 2

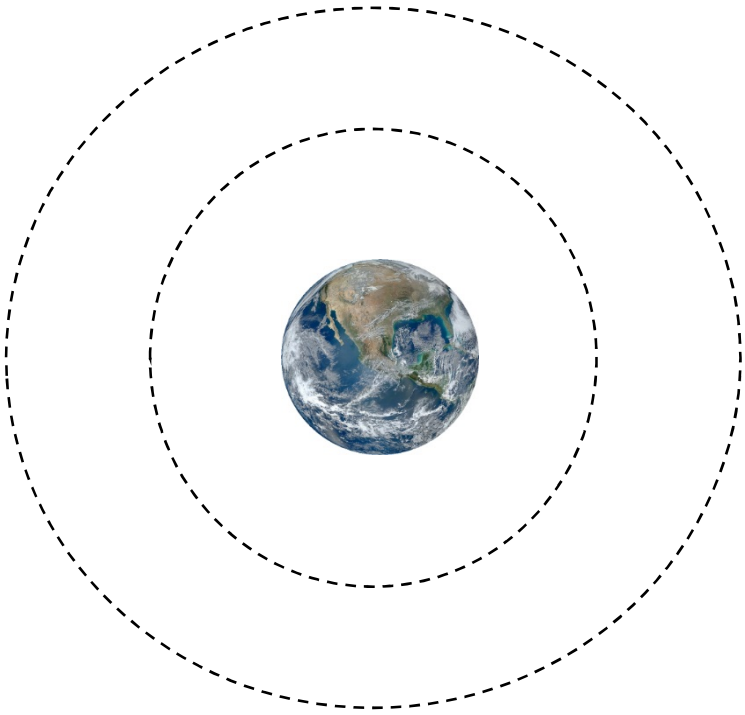
Lesson 36

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?

_____

Section 3: Science Soon After Christ

Level 2

Lesson 37

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?

Section 3: Science Soon After Christ

Lesson 38

Use the outline below for the activity, and once you have glued the organs in place, label them.

Section 3: Science Soon After Christ

Lesson 38 (Cont.)

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?

_____

_____

_____

_____

_____

_____

_____

_____

_____

Lesson 39

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 a 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?

_____

_____

_____

_____

_____

_____

Section 3: Science Soon After Christ

Lesson 40

In order to bend your arm at the elbow, your biceps bracchi _____ 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? _____

Section 3: Science Soon After Christ

Level 2

Lesson 41

Explain how your brain, spinal cord, and spinal nerves work together so you can move your legs the way you want to move them.

_____

_____

_____

_____

_____

_____

How was the motion you experienced in the experiment different?

_____

_____

_____

_____

Was it voluntary or involuntary motion?

_____

_____

Would a person whose spinal cord is broken near the shoulder be able to control his legs?

_____

Would that person have a reflex like you experienced in the experiment?

_____

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!

Section 3: Science Soon After Christ

Lesson 42

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

Section 3: Science Soon After Christ

Lesson 43

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

Section 3: Science Soon After Christ

Lesson 44

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

Section 3: Science Soon After Christ

Level 2

Lesson 45

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

Level 2

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?

_____

_____

_____

_____

_____

Section 4: Science in the Early Middle Ages

Level 2

Lesson 47

How did Aristotle think a projectile travels through the air?

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

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

Section 4: Science in the Early Middle Ages

Level 2

Lesson 48

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.

_____

_____

_____

_____

_____

_____

_____

_____

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?

_____

_____

_____

_____

_____

_____

Section 4: Science in the Early Middle Ages

Lesson 49

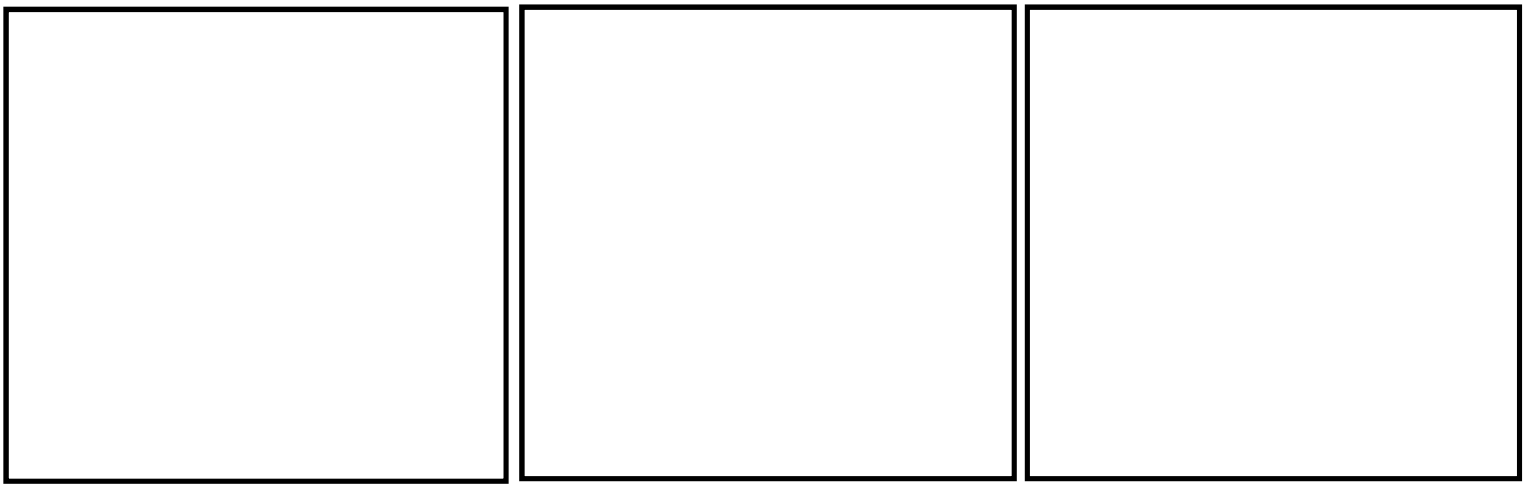
This is a challenge lesson, so I want to challenge you to make your own notebook page for it!

Section 4: Science in the Early Middle Ages

Level 2

Lesson 50

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?

_____

_____

Section 4: Science in the Early Middle Ages

Lesson 51

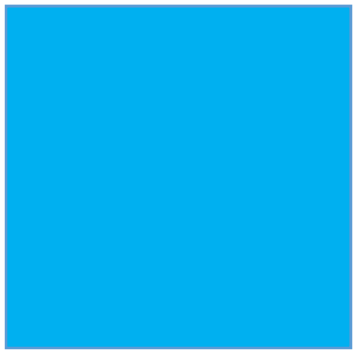
This is a challenge lesson, so I want to challenge you to make your own notebook page for it!

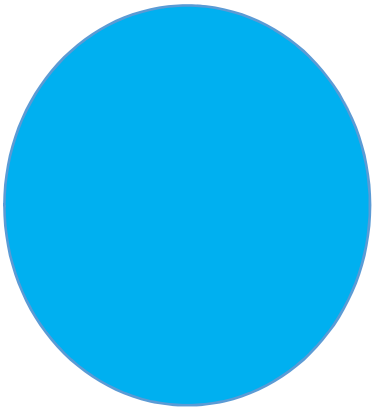
Section 4: Science in the Early Middle Ages

Level 2

Lesson 52

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?

_____

_____

_____

_____

_____

_____

Section 4: Science in the Early Middle Ages

Level 2

Lesson 53

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.

_____

_____

_____

_____

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?

_____

_____

_____

Section 4: Science in the Early Middle Ages

Level 2

Lesson 54

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

Level 2

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

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).

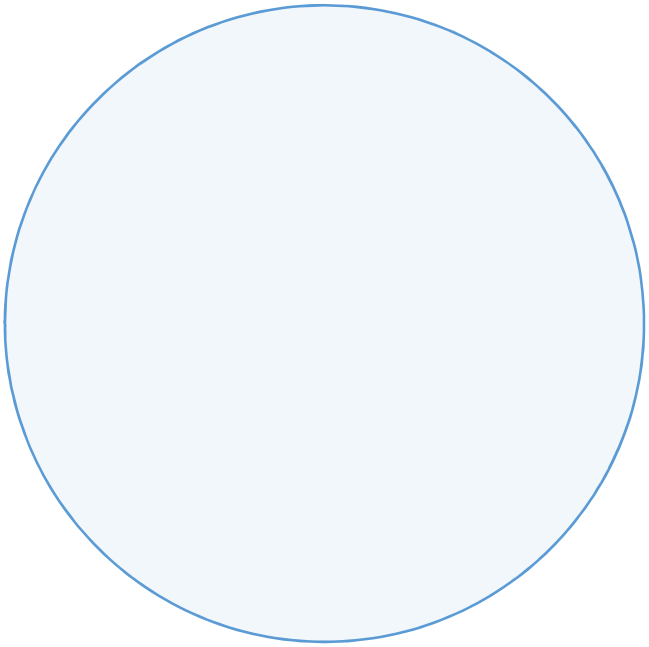
If you add 1 cup of one liquid to 1 cup of another liquid, can you get a solution that has a volume of more than 2 cups? Assume the molecules of the liquids don't change when the 2 liquids are mixed.

Section 4: Science in the Early Middle Ages

Level 1

Lesson 56

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?

_____

_____

_____

_____

_____

_____

_____

_____

_____

Section 4: Science in the Early Middle Ages

Level 2

Lesson 57

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!

Section 4: Science in the Early Middle Ages

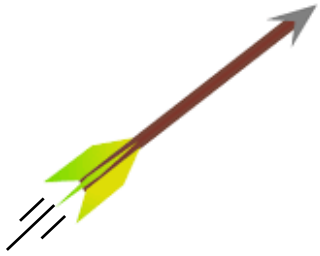
Level 2

Lesson 58

Use your own words to explain what impetus is.

What determines impetus?

Use your own words to define the range of a projectile, like the arrow shown on the right.



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

Section 4: Science in the Early Middle Ages

Level 2

Lesson 59

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.

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.

Section 4: Science in the Early Middle Ages

Level 2

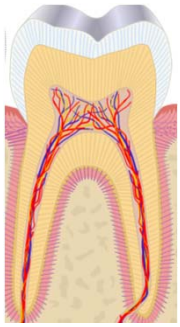
Lesson 60

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.

_____

_____

_____

_____

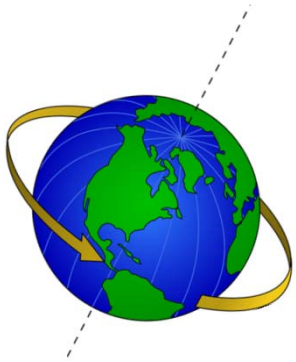
Tooth image by Goran Tek-en
https://commons.wikimedia.org/wiki/File:Cross_sections_of_teeth.svg

Section 5: Science in the Late Middle Ages

Level 2

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?

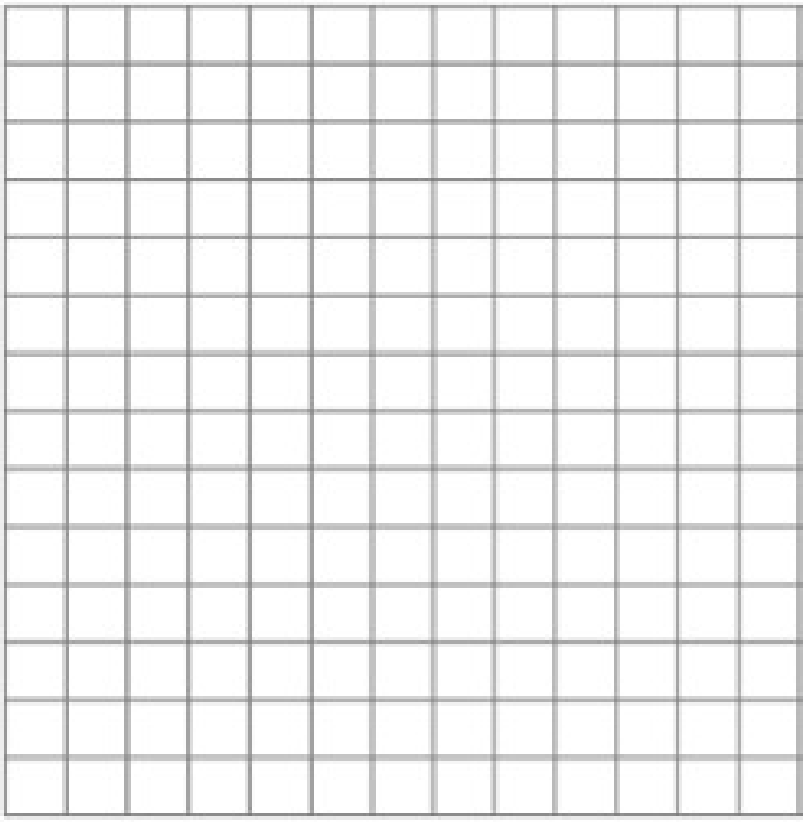
Can you find a Bible verse (or two) that says we shouldn't study astrology?

Section 5: Science in the Late Middle Ages

Level 2

Lesson 62

Graphing Activity



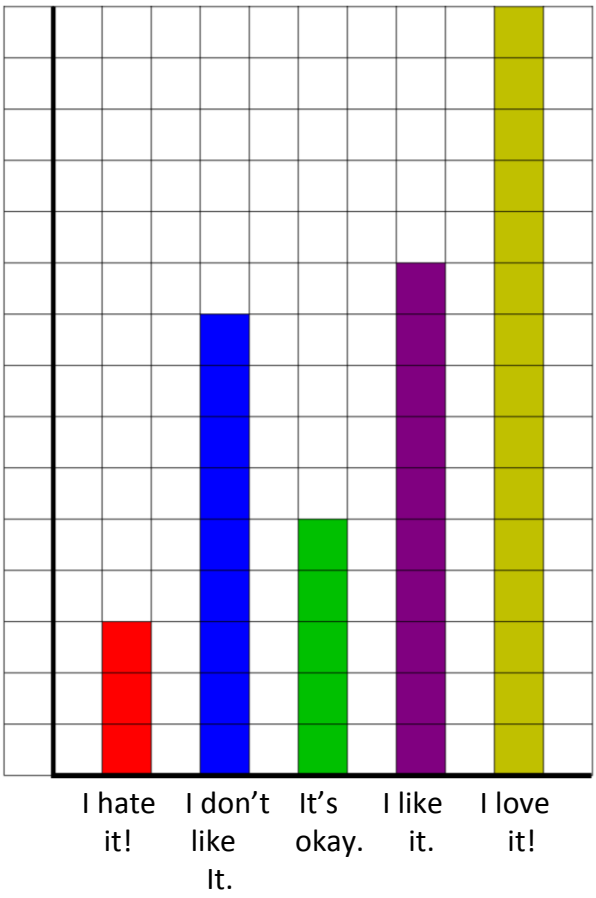
As you count the M & Ms in your package, color in one box for each candy above the appropriate color.

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?

_____

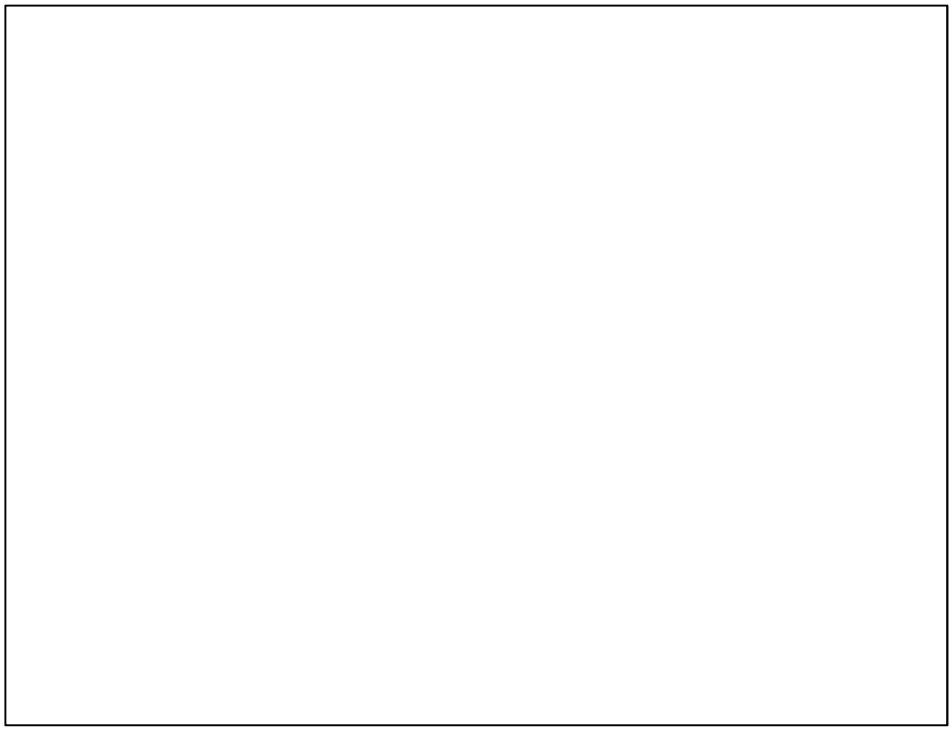
How many students answered the question?
Hint: think about what each filled-in square represents

_____

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.



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

Level 2

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?

_____

_____

Section 5: Science in the Late Middle Ages

Lesson 65

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

Level

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?

_____

_____

_____

_____

_____

What do plants absorb as they grow?

_____

What is hydroponics?

_____

_____

_____

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

_____

_____

_____

Section 5: Science in the Late Middle Ages

Level 2

Lesson 67

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?

_____

_____

_____

_____

Section 5: Science in the Late Middle Ages

Lesson 67 (Cont.)

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 would walk around to spin the central section and lower the paper onto the plates with the movable type.

Section 5: Science in the Late Middle Ages

Level 2

Lesson 68

How did Leonardo da Vinci's scientific studies help him with his painting?

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

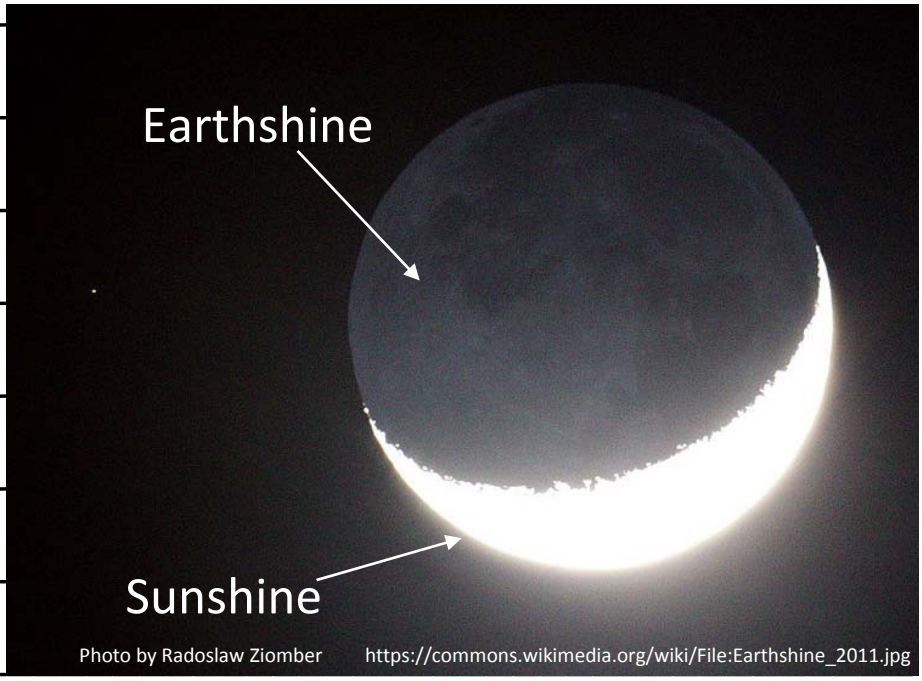


Photo by Radoslaw Ziomber https://commons.wikimedia.org/wiki/File:Earthshine_2011.jpg

If you watch a crescent moon for many nights, will the brightness of the dimly-lit part change?

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 “ ɘɿɘʜɈ ollɘH“ 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. ____

____

Section 5: Science in the Late Middle Ages

Level 2

Lesson 69 (cont.)

1. What is shorthand?

2. What is mirror writing?

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

4. Name 3 possible reasons why that well-known philosopher used mirror writing.

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.

Section 5: Science in the Late Middle Ages

Lesson 70 (Cont.)

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.

Section 5: Science in the Late Middle Ages

Level 2

Lesson 71

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.

Section 5: Science in the Late Middle Ages

Lesson 71 (Cont)

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?

_____

_____

_____

_____

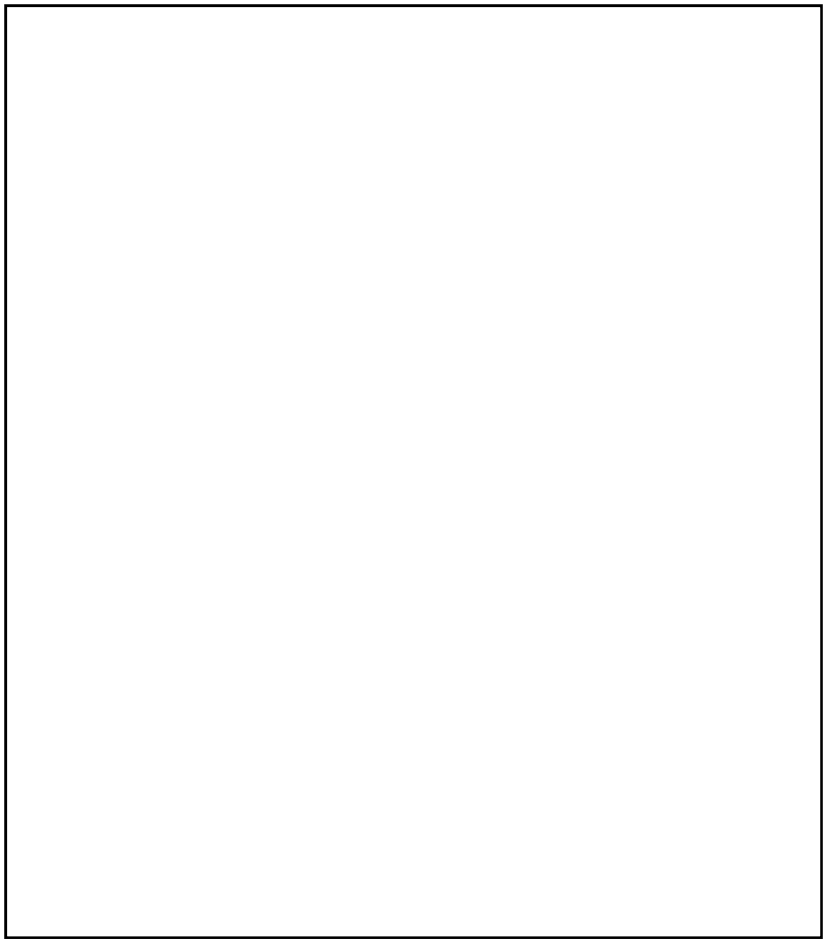
_____

Section 5: Science in the Late Middle Ages

Level 2

Lesson 72

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?

_____

_____

_____

_____

Section 5: Science in the Late Middle Ages

Level 2

Lesson 73

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

Level 2

Lesson 74

Draw a picture (like the one on pg. 225) that shows what happened in the experiment

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?

_____

_____

_____

_____

Section 5: Science in the Late Middle Ages

Level 2

Lesson 75

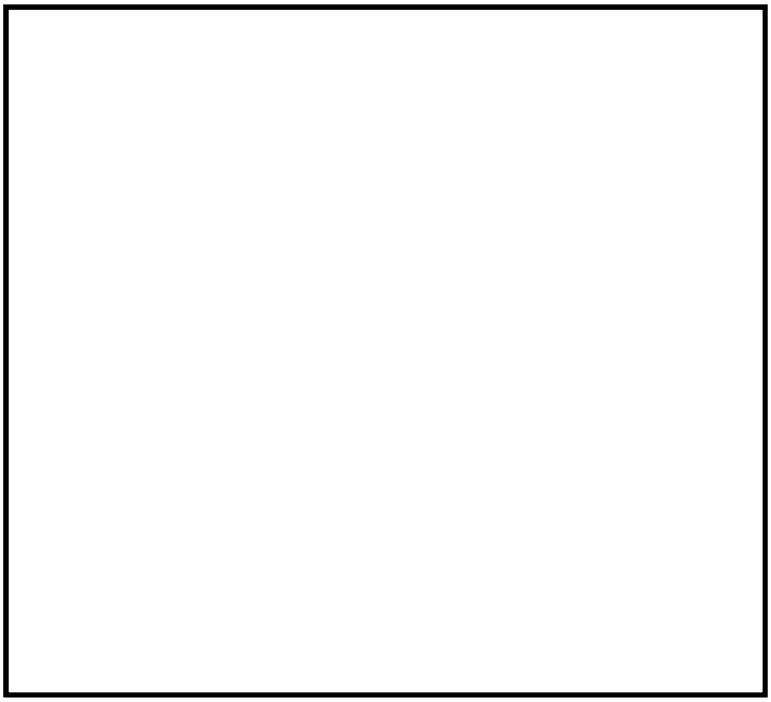
This is a challenge lesson, so I want to challenge you to make your own notebook page for it!

Section 6: Science in the Early Renaissance

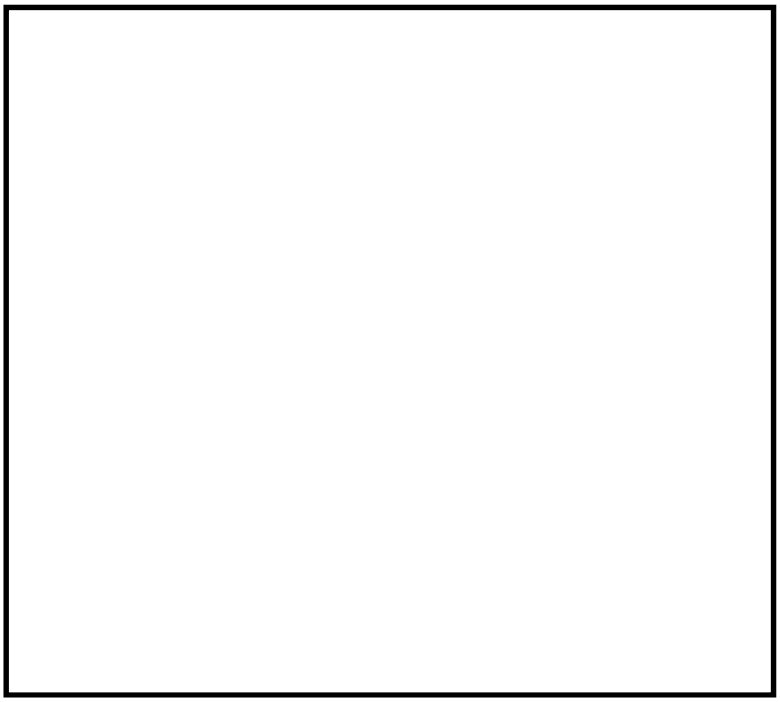
Level 2

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.

_____

Section 6: Science in the Early Renaissance

Level 2

Lesson 77

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 inLesson 63?

_____

_____

_____

Section 6: Science in the Early Renaissance

Level 2

Lesson 78

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.

_____

_____

_____

_____

_____

_____

The Grand Canyon

Section 6: Science in the Early Renaissance

Level 2

Lesson 79

Cut out the bones and paste them into the body below. Label them.

Section 6: Science in the Early Renaissance

Lesson 79 (Cont)

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?

_____

_____

_____

_____

Section 6: Science in the Early Renaissance

Level 2

Lesson 80

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.

_____

_____

Section 6: Science in the Early Renaissance

Level 2

Lesson 81

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

Level 2

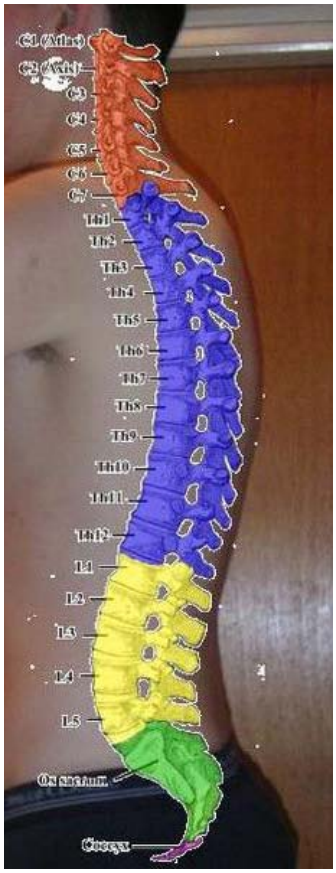
Lesson 82

What are the individual bones of the vertebral column called? _____

What does the vertebral column protect? _____

Draw a picture of the contraption you built

A different model of the vertebral column



How is your contraption like the vertebral column?

_____

_____

_____

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

_____

_____

Section 6: Science in the Early Renaissance

Level 2

Lesson 83

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 84

Explain your activity and why it is a good model for how you flex and extend your fingers.

_____

_____

_____

_____

_____

_____

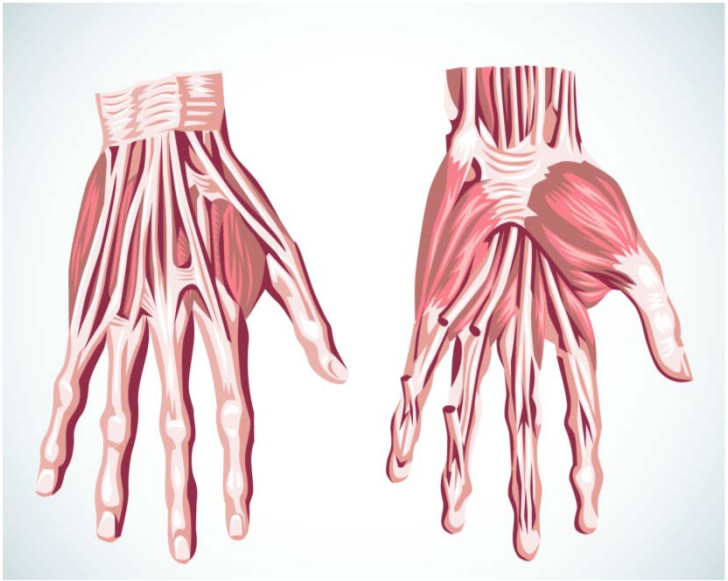
Explain the difference between the extrinsic and intrinsic muscles of the hand.

_____

_____

_____

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. © URRRRA via shutterstock.com

Section 6: Science in the Early Renaissance

Level 2

Lesson 85

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?

_____

_____

_____

_____

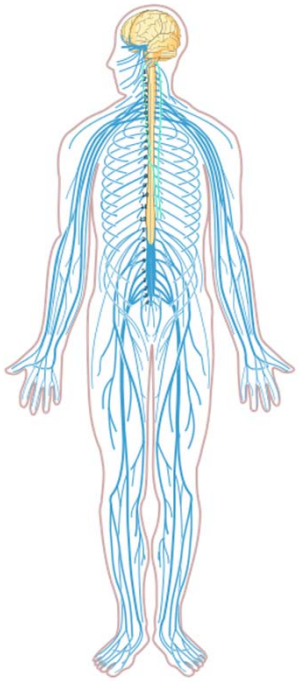
_____

_____

_____

_____

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?

_____

_____

Illustration by William Crochot https://commons.wikimedia.org/wiki/File:Nervous_system_diagram_unlabeled.svg

Section 6: Science in the Early Renaissance

Level 2

Lesson 86

Number of Heartbeats counted

	Before Jumping Jacks	**After Jumping Jacks**
Listening	_____	_____
Feeling Pulse	_____	_____

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.

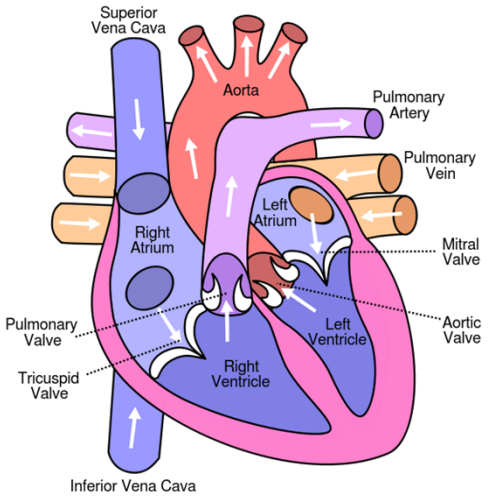


Illustration by Yaddah https://commons.wikimedia.org/wiki/File:Diagram_of_the_human_heart_(cropped).svg

Section 6: Science in the Early Renaissance

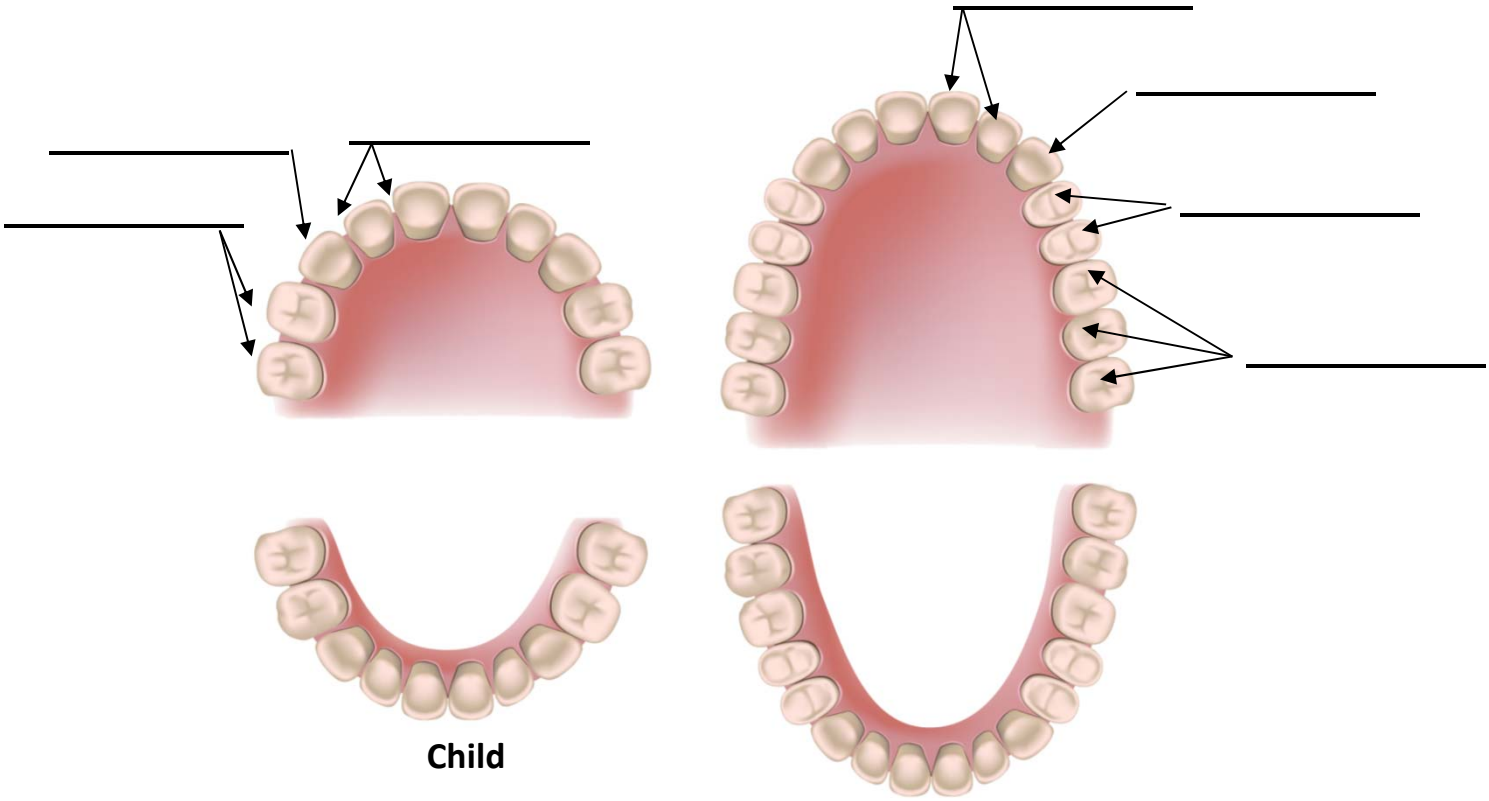
Level 2

Lesson 87

The specific pattern to a person's teeth is called a _____ _____.

A child has _____ teeth, while an adult has _____ teeth.

Label the diagrams below.



Child

Adult

Give the function for each type of tooth:

Molar _____

Incisor _____

Canine _____

What are deciduous teeth and why are they called that?

_____

_____

_____

Section 6: Science in the Early Renaissance

Level 2

Lesson 88

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

Section 6: Science in the Early Renaissance

Level 2

Lesson 89

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?

_____

_____

_____

_____

_____

_____

_____

_____

Leonardo da Vinci learned the following three things about friction:

1. _____

_____

_____

2. _____

_____

_____

3. _____

_____

_____

Section 6: Science in the Early Renaissance

Level 2

Lesson 90

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

Created by Lisa Van Weelden