Watson Ranch Elementary Science

Science in the Industrial Age

Lab and Review Book

LEVEL 2

Property of:

_____

Section 1: Science in the Early 19th Century

Level 2

Lesson 1

1. Define extinct..

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2. What is paleontology?

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3. Who is the father of paleontology? _____ _____

4. Explain how Cuvier was able to show that mammoths were not just big elephants.

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5. Do some research and list differences between mammoths and mastodons.

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Lesson 2

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

Lesson 3

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

Section 1: Science in the Early 19th Century

Level 2

Lesson 4

1. The study of how life is distributed throughout the world is called _____.

2. Where is the earth's magnetic field the strongest: near the poles **OR** near the equator?

3. In the space below draw a picture of a needle hovering horizontally near a magnet (like in your experiment).

4. _____ was exerting a force and pulling the needle

down, but the magnetic force was _____ in the beginning, causing the needle to hover. The experiment also helped identify the weaker magnet, because the needle would fall

when it was _____ to that magnet.

5. What is the aurora borealis? _____

6. What is the aurora australis? _____

7. What causes auroras?

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Section 1: Science in the Early 19th Century

Level 2

Lesson 5

1. Which 2 elements combine to form rust: _____ and _____

2. Which has more oxygen in it: water **OR** hydrogen peroxide

3. Describe your experiment and its results. Using the chemical formula for water and the chemical formula for hydrogen peroxide, explain the results of your experiment.

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4. Carbon dioxide is a gas that we both inhale and exhale. Its chemical formula is CO_2. Carbon monoxide (whose chemical formula is CO) is a dangerous gas we shouldn't inhale. Explain what the two chemical formulas tell us about these compounds, and indicate which one is heavier.

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Lesson 6

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

Section 1: Science in the Early 19th Century

Level 2

Lesson 7

1. When you see bubbles forming in a liquid, then you know that a _____ is being formed.

2. A _____ speeds up a chemical reaction but doesn't get used up.

3. Explain why a catalyst might appear to be necessary for a chemical reaction but really isn't. Use the hydrogen peroxide part of your experiment as an example in your explanation.

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4. Suppose you have two bottles of hydrogen peroxide bought from the same drug store. They were never used, but one is several years older than the other. If the bottles are the same size, would you expect one to have more hydrogen peroxide in it than the other? If so, which one? Check your answer and correct it if it is wrong.

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Section 1: Science in the Early 19th Century

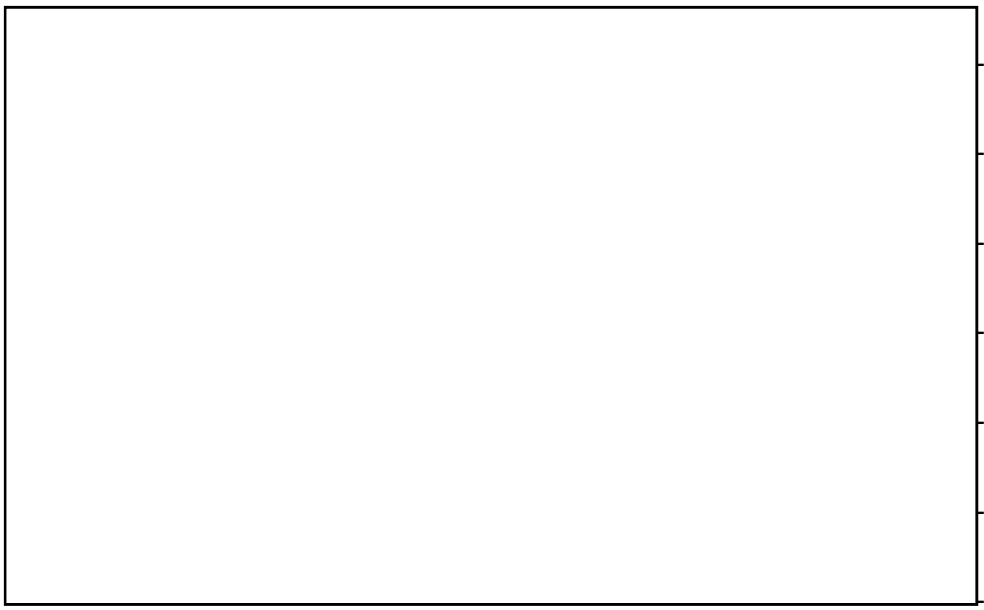
Level 2

Lesson 8

1. Animals with a backbone are called _____ and animals with no backbone are called _____.

2. A person like Lamarck who believes in a God who created the world but doesn't interact with it is called a _____.

3. Make a drawing in the box like the one on page 23, and use it to explain Lamarck's view of inheritance. Be sure to use the words "inheritance," "offspring," and "generations" in your answer.



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4. There are fish that live in ponds that are found in caves, where no light exists. As a result, they cannot use their eyes, because in order to see, your eyes must detect light reflecting off whatever you are seeing. Some of these "cave fish" have no eyes. How would Lamarck explain this?

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Section 1: Science in the Early 19th Century

Level 2

Lesson 9

1. What gas makes up most of the air you breathe? _____

2. Avogadro's Law states that equal _____ of gas contain equal numbers of

_____.

3. A _____ is an educated guess that attempts to explain an observation.

4. What did you do in your experiment, and how does it show that carbon dioxide molecules are heavier than nitrogen molecules?

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5. Do some research to find out what percentage of the air you breathe is made of nitrogen.

_____

Section 1: Science in the Early 19th Century

Level 2

Lesson 10

1. Dew is formed when grass and flowers are cool enough, causing

the _____ _____ in the surrounding air to condense.

2. Frost can form on the grass (or windows) when its temperature is low enough to

_____ water

3. Explain the term “dew point” in your own words:

_____

_____

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4. Suppose it is very cold outside. You wake up in the morning, expecting to see dew or frost on the grass, but there is none. The next morning is warmer, but there is dew on the ground. On which morning was there more water vapor in the air? Check your answer and correct it if it is wrong.

_____

Examples of frost (on the left) and dew (on the right).

Section 1: Science in the Early 19th Century

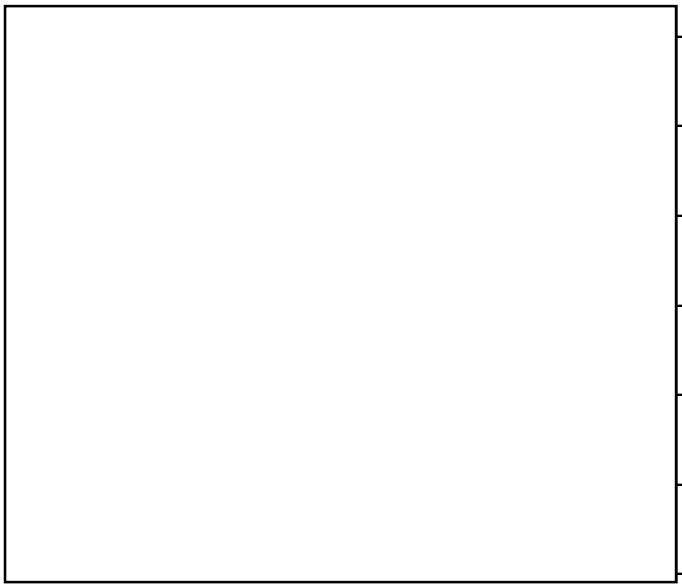
Level 2

Lesson 11

1. If a gas weighed 10 times as much as an equal volume of hydrogen gas, how many protyles would Prout say it was made of? _____

2. A fundamental particle is a particle out of which all _____ are made.

3. Make a drawing like the one on page 33, showing Prout's idea of a protyle using hydrogen and oxygen as examples. Oxygen weighs 16 times as much as an equal volume of hydrogen. Use that drawing to explain what Prout thought a protyle was.



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4. Why was Avogadro's Law was instrumental in helping Prout come up with the idea of the protyle?

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Section 1: Science in the Early 19th Century

Level 2

Lesson 12

1. The prefix *macro* means _____.

2. The macronutrients are _____, _____, and _____.

3. Why are those three things called “macronutrients?”

_____

_____

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_____

4. The prefix *micro* means _____.

5. Explain what micronutrients are and give an example.

_____

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This breakfast has all three of the macronutrients. Can you figure out which part of the breakfast contains which macronutrients? HINT: The eggs have two of them, the bread and potatoes have one, and the cheese has one.

Section 1: Science in the Early 19th Century

Level 2

Lesson 13

1. The earth's _____ field causes a compass needle to point north.

2. Explain what you did in your experiment and what it demonstrated.

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3. What is an electromagnet?

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4. Explain the shape of the magnetic force made by electricity flowing through a wire.

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Section 1: Science in the Early 19th Century

Level 2

Lesson 14

1. Explain what an alloy is, and describe the alloy you made in your experiment.

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2. What is the allow known as steel, and why is it used instead of pure iron?

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3. Do some research and find out how much carbon is found in steel. Compare that to the amount of carbon found in cast iron.

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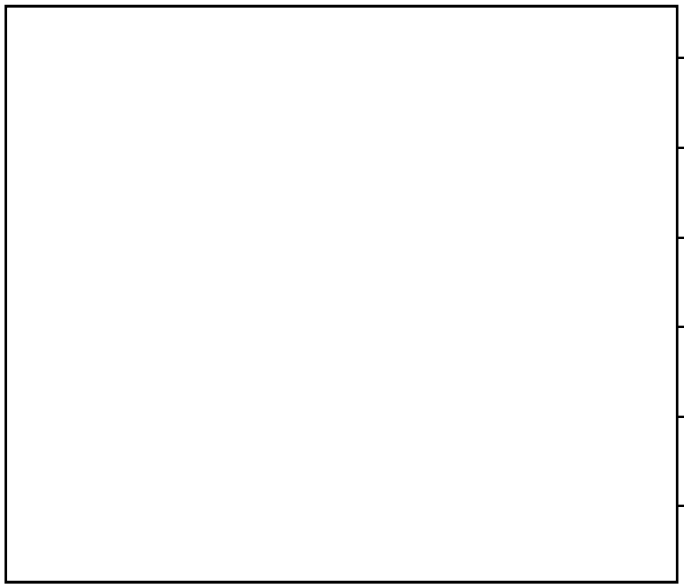
Section 1: Science in the Early 19th Century

Level 2

Lesson 15

1. Draw a picture of your experiment and explain why it worked the way that it did.



2. How does this relate to a motor?

3. What is symmetry and how does it relate to your experiment?

Section 2: Science in the Early-to-Mid 19th Century I

Level 2

Lesson 16

1. The pattern of magnetic force lines coming from a magnet is called a _____

_____.

2. Which pole of the magnet do magnetic force lines come out of? _____

3. Draw a picture of the pattern you saw in your experiment.

4. Explain what you did to get the pattern and what it means.

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5. Why is the earth's North Pole actually the south pole of its magnetic field?

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Lesson 17

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

Lesson 18

1. A Faraday cage blocks _____ _____.

2. Explain your experiment and what happened. Use it to demonstrate that a Faraday cage must be able to conduct electricity around the area it encloses.

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3. If an airplane were made out of nothing but plastic, would you get shocked if you were sitting inside when it was struck by lightning? Why or why not?

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Lesson 19

1. All magnetic fields (whether from a permanent magnet or from one created with external electricity) come from the movement of _____.

2. If the above is true, what makes a permanent magnet magnetic?

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3. Define electromagnetics.

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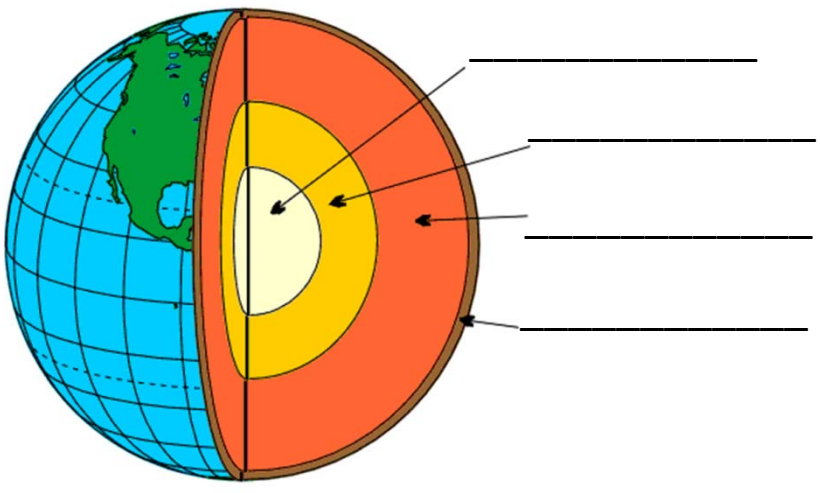
4. Label the diagram on the right with crust, mantle, outer core, and inner core.



5. Earth's magnetic field is a result of

_____

flowing in the

_____ _____.

Lesson 20

1. Describe the results of your experiment and what they demonstrate about the connection between the speed of the molecules in a substance and the temperature of that substance.

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2. What is absolute zero?

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3. Explain John Herapath shows us that science isn't infallible.

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Section 2: Science in the Early-to-Mid 19th Century I

Level 1

Lesson 21

1. Draw a diagram of the brain like the one found on the bottom of page 62. Label the cerebrum, cerebellum, and brain stem

2. Coordination between your muscles is controlled by the _____.

3. The part of your brain responsible for evaluating and using the information you get from your senses is the _____.

4. The _____ _____ controls the vital functions.

5. Consider involuntary muscles. These are muscles (like the ones in your stomach) that operate without you thinking about them at all. Write down what part of the brain you think is responsible for controlling your involuntary muscles. Check your answer and correct it if it is wrong.

_____

Section 2: Science in the Early-to-Mid 19th Century I

Level 2

Lesson 22

1. A _____ _____ produces motion based on a difference in temperature.

2. Describe your experiment and explain why what you made is an example of a heat engine.

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3. Give two other examples of a heat engine.

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4. Carnot showed that a heat engine works better the _____ the temperature difference between the hot area and the cold area.

5. Define thermodynamics

_____

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Lesson 23

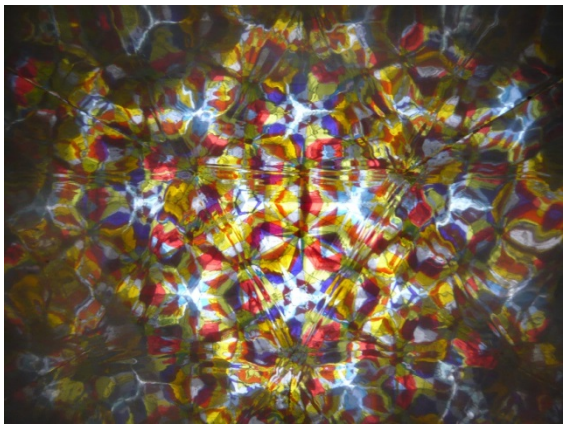
This is a challenge lesson, so I want to challenge you to make your own notebook page for it!

Lesson 24

1. Put your drawings of the experiment results below. In those drawings, point out places where the tightly-stretched balloon was vibrating a lot and where it wasn't vibrating much at all.

2. In your experiment, different sounds produced different patterns of _____, so the salt also formed different patterns.

3. Wheatstone's sound-visualization system was called a _____ because the patterns it formed were something like what was seen in a kaleidoscope.



A view through a kaleidoscope. Can you see how the patterns are similar?

Lesson 25

1. Electricity is a flow of tiny particles called _____.

2. Explain how the second part of your experiment illustrates the way electricity flows in a wire. Use that to explain how electricity can flow so quickly.

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3. Explain how hooking a wire up to one side of a battery but not the other side would not allow electricity to flow.

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Section 2: Science in the Early-to-Mid 19th Century I

Level 2

Lesson 26

1. The accurate judgement of the distance an object is from your body is called

_____ _____.

2. What is binocular vision?

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3. How does the answer to #1 come from the answer to #2?

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4. How is a 3-D movie made and viewed?

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Lesson 27

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

Section 2: Science in the Early-to-Mid 19th Century I

Level 1

Lesson 28

1. Which view of geology doesn't require long periods of time?

Catastrophism **OR** Uniformitarianism

2. What phrase best summarizes uniformitarianism?

_____

_____

_____

3. Which view of geology did Lyell believe? Catastrophism **OR** Uniformitarianism

4. What was Lyell's motivation for studying geology that way?

_____

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5. Suppose you knew that one sample of milk in your experiment had been left out for two days to curdle, while the other had been curdled quickly. Can you think of a way that you could tell which was which?

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Lesson 29

1. Define diffusion

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2. How did diffusion allow the ammonia to mix with the cabbage water in your experiment?

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3. What does Graham's Law say about the speed at which diffusion Occurs?

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4. The smell of gasoline mostly comes from a chemical known as benzene. A molecule of benzene is significantly heavier than a molecule of ammonia. If I open a container of gasoline and an identical container of ammonia that are both the same distance away from you, which will you smell first? Check your answer and correct it if it is wrong.

_____

Lesson 30

1. What is a colloid?

_____

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_____

2. How does it compare to a solution?

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3. Draw the flashlight part of your experiment, indicating which glass you saw the beam of light in.

4. Why did you see the light only in the milk and water mixture?

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Lesson 31

1. Describe your experiment and explain why you heard different sounds during it.

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2. What kind of light can bees see that we cannot?

_____

3. What do bees do with that light?

_____

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_____

4. Speculate on why pit vipers would want to see warm things at night. Check your speculations and correct them if they are wrong.

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Section 3: Science in the Early-to-Mid 19th Century II

Level 2

Lesson 32

1. What does pepsin do for digestion?

_____

_____

_____

2. Where is pepsin found in the body?

_____

3. What other parts of the body have chemicals like pepsin?

_____

_____

_____

4. Why does the body need so many chemicals like pepsin?

_____

_____

_____

5. Do some research and find out what the digestive enzyme in saliva is called.

_____

6. Speculate why it is also in the pancreas. Check your speculation and correct it if it is wrong.

_____

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Lesson 33

1. If you were able to print out a picture of your model, use glue or tape to put it below. Otherwise, sketch it below. Either way, point out the parts of the cell that are labeled in the drawing on page 100.

2. What kind of cell is that? Plant **OR** Animal

3. What does cell theory tell us?

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4. What is cytoplasm?

_____

5. What does the cell membrane do?

_____

_____

Lesson 34

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

Section 3: Science in the Early-to-Mid 19th Century II

Lesson 35

1. Write a story about a drop of blood. It starts in the lungs and is headed to a muscle that needs energy. In the story, tell what the blood is bringing to the muscle, what the muscle does with it, and what the blood takes from the muscle. Also, tell what happens when the drop of blood gets back to the lungs. If you don't want to write a story, draw a picture that gives the same information.

2. If combustion gives the body energy, does that mean there are fires going on in your body? Why or why not? Check your answer and correct it if it is wrong.

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Lesson 36

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

Lesson 37

1. What is the First Law of Thermodynamics?

_____

_____

_____

2. Explain why all the energy in living things actually comes from the sun. You can use just words, or you can use an illustration with words.

3. Suppose you mix two things together and the resulting solution gets cold. What would you say happened to the energy in the interaction between the molecules? Check your answer and correct it if it is wrong.

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Lesson 38

1. Draw a picture like the one on page 115 and use it to explain the Doppler effect.

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2. The same thing happens to light, as long as the source is traveling _____ enough.

3. While you can usually hear the Doppler effect easily, you can't see how the Doppler effect changes the color of light. Try to come up with an explanation as to why. Check your explanation and correct it if it is wrong.

_____

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Lesson 39

1. Describe your experiment, using the words “mechanical energy” and “thermal energy.” Use your experiment’s results to explain how Joule concluded that heat couldn’t be a fluid.

2. How is your experiment similar to Joule’s experiment?

Section 3: Science in the Early-to-Mid 19th Century II

Level 2

Lesson 40

1. Astronomers observed that the planet _____ wasn't behaving according to Newton's Universal Law of Gravitation. This led them to believe that there had to be another

_____.

2. Le Verrier used _____ to predict where an unseen planet would be found. He shared his findings with Galle who looked where he predicted and found a planet. We

now call that planet _____.

3. Describe your experiment and explain how it relates to how the scientists of Le Verrier's day interpreted the motion of Uranus.

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4. Try to come up with an explanation as to why Neptune had never been seen before. Check your explanation and correct it if itis wrong.

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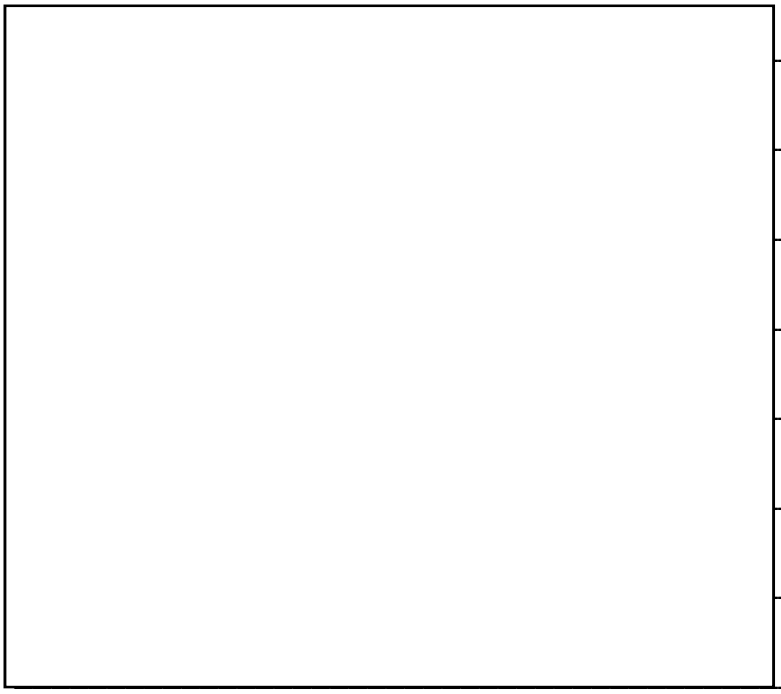
Section 3: Science in the Early-to-Mid 19th Century II

Level 2

Lesson 41

1. Draw your fountain as it was working, and explain where the energy that powered it came from.



2. Why did squeezing the balloon caused the water to come out faster and higher?

3. Explain how energy can be “lost” during a conversion, even though it can’t be destroyed.

Lesson 42

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

Section 3: Science in the Early-to-Mid 19th Century II

Level 2

Lesson 43

1. An _____ temperature scale is one in which a temperature of zero is

_____.

2. What is the lowest temperature possible on the Celsius scale? _____

3. Use the volume of a gas to explain why there is a limit to how low temperature can possibly go.

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4. Suppose the temperature outside is a very comfortable 25 °C. What would that temperature be in Kelvin? Check your answer and correct it if it is wrong.

_____

5. What would a temperature of 100 °C be in Kelvin? Check your answer and correct it if it is wrong.

_____

Section 3: Science in the Early-to-Mid 19th Century II

Level 2

Lesson 44

1. Draw the two models you made in step 6 of the experiment (which represent molecules like CH4) and then draw the two models you made in step 11 (which represent molecules like CH2IF).

2. Explain why the second set of models represents a chiral molecule and how that differs from the first set of models.

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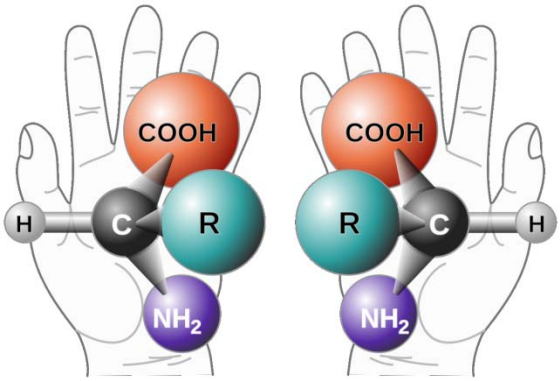

This picture shows how the chirality of chemicals and your hands are the same.

3. Suppose you had two samples of a chiral molecule. One comes from a living organism, and the other was made in a lab from non-chiral molecules. Explain how you could tell which was from a living organism and which was man-made.

_____

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Lesson 45

1. Explain your experiment and why one glass had bubbles in it but the other glass did not.

2. Explain what pasteurization does to a liquid that you will eventually drink.

3. What kind of bread doesn't use fermentation to rise the dough? (It's in the Bible)

4. Fermentation makes alcohol. Why isn't there alcohol in bread?

Section 4: Science in the Middle of the 19th Century

Level 2

Lesson 46

1. The idea that living things can be produced by non-living things is called

_____ _____.

2. Draw a picture that shows the two types of flasks that Pasteur used. Point out the one in which microorganisms grew.

3. Based on his experiment (and yours), where did the microorganisms in the broth actually come from?

_____

_____

_____

4. If you let your experiment sit out long enough, even the broth with the bent straw would get cloudy. Why? Check your answer and correct it if it is wrong.

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Section 4: Science in the Middle of the 19th Century

Level 2

Lesson 47

1. Silk comes from the _____ that silk worms form when they undergo the process of _____ where they change from a caterpillar into a silk moth.

2. A _____ _____ is an illness that can be passed from one person to another.

3. What is a quarantine?

_____

_____

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4. How did Pasteur use a quarantine to solve the French silk problem?

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The adult form of the silkworm.
Artist: Zivya License: CC 3.0

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5. Think about people drinking milk before Pasteur invented pasteurization. Why didn't the milk they drank need to be pasteurized? Check your answer and correct it if it is wrong.

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Section 4: Science in the Middle of the 19th Century

Level 2

Lesson 48

1. Explain how a vaccine protects you from the disease for which it is designed.

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2. Explain the difference between Jenner's smallpox vaccine and Pasteur's vaccines.

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3. What are the two major differences between viruses and bacteria?

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Section 4: Science in the Middle of the 19th Century

Level 2

Lesson 49

1. Make a drawing of two objects that are in contact with one another. Label one as hot and the other as cold. Draw an arrow to show which way heat travels.

2. How will the temperatures of the objects change over time?

_____

_____

_____

3. State the Second Law of Thermodynamics.

_____

_____

_____

4. What does the Second Law of Thermodynamics say about what will eventually happen to the universe?

_____

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Lesson 50

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

Section 4: Science in the Middle of the 19th Century

Level 2

Lesson 51

1. What do we call the “movie” that you made in your activity?

_____

2. How is each individual picture that you drew similar to Wallace’s observations?

_____

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_____

3. What did Wallace think an animation of his observations would show?

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4. Suppose you observe four groups of similar creatures: A, B, C, and D. Group D lives closest to group A (and is the most similar to group A), group B lives farther from group A (and is less similar), and group C lives the farthest from group A (and is the least similar). If group A was the first group to live in the region, in what order did the remaining groups appear, according to Wallace? Check your answer and correct it if it is wrong.

_____

_____

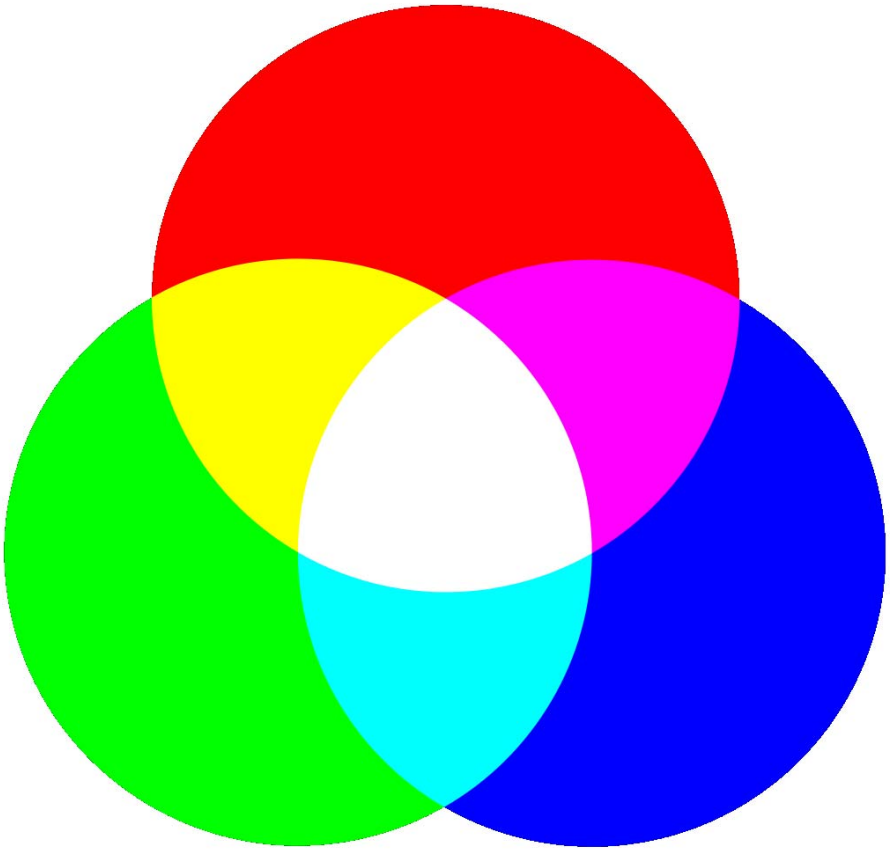
Section 4: Science in the Middle of the 19th Century

Level 2

Lesson 52

1. All the colors of creation can be formed from three _____ colors.
2. Are the primary colors for light the same as the ones for ink? Yes **OR** No
3. What do we call the primary colors used in light? _____
4. What are those colors? _____. _____, and _____.
5. What do we call the primary colors used in ink? _____
6. What are those colors? _____. _____, and _____.
7. Which set of primary colors is used by a television? _____
8. Which set of primary colors is used by a printer? _____

Except for white, these are all primary colors. Label them.



Lesson 53

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

Section 4: Science in the Middle of the 19th Century

Level 2

Lesson 54

1. Make a drawing that illustrates what makes up Saturn's rings.

2. How did Maxwell determined what Saturn's rings are made of?

_____

_____

_____

3. Why was it accepted as the correct explanation?

_____

_____

_____

4. Draw two pictures that illustrate what happened to the ball in your experiment:

Section 4: Science in the Middle of the 19th Century

Level 2

Lesson 55

1. Make a drawing that illustrates what scientists think light waves look like.

2. How can light travel through empty space?

_____

_____

_____

_____

3. Why is light called “electromagnetic radiation?”

_____

_____

_____

4. Suppose you put an alarm clock in a glass jar while the alarm is going off. Then, suppose you removed all the air from the jar. Would you notice any change? If so, what would it be? Check your answer and correct it if it is wrong.

_____

_____

Section 4: Science in the Middle of the 19th Century

Level 2

Lesson 56

1. Define natural selection.

_____

_____

_____

_____

2. How did Darwin use the experiences of breeders like pigeon breeders as evidence for natural selection?

_____

_____

_____

_____

_____

3. He called the kind of selection used by pigeon breeders _____

_____.

4. Explain why Darwin's view is often called "survival of the fittest." Check your explanation and correct it if it is wrong.

_____

_____

_____

_____

_____

_____

Lesson 57

1. Put your pictures or drawings from your activity below:

2. How is this like evolution by natural selection?

_____

_____

_____

3. How does Darwin's theory help us understand the Biblical account of the Ark?

_____

_____

_____

_____

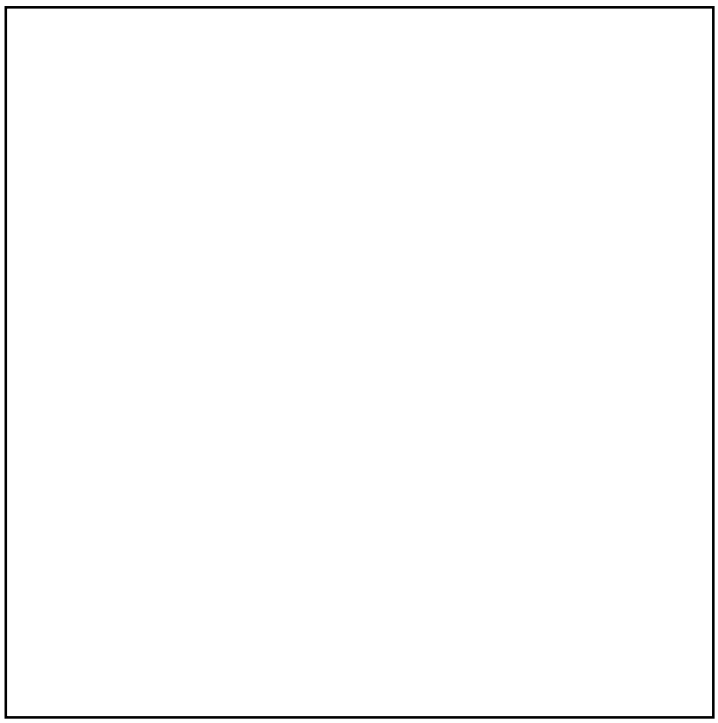
_____

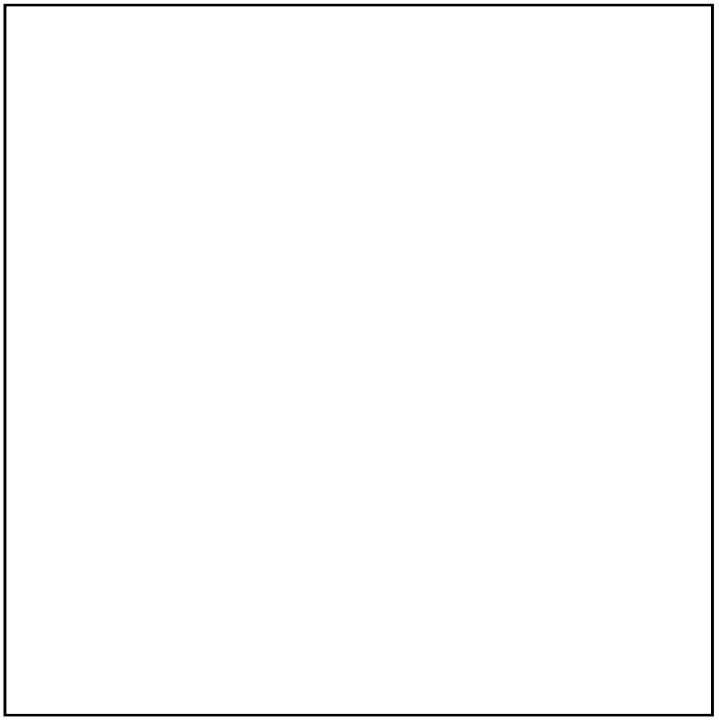
Section 4: Science in the Middle of the 19th Century

Level 2

Lesson 58

1. Draw two similar (but not identical) butterflies.





2. Use your drawings to explain mimicry.

_____

_____

_____

_____

_____

_____

3. What is acoustic mimicry?

_____

_____

_____

_____

Lesson 59

1. Explain your experiment and how it shows that rubbing alcohol is a good antiseptic.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

2. Why do doctors use it on a patient's skin before giving the patient a shot?

_____

_____

_____

3. Most First-Aid kits have an antiseptic cream that you can put on a cut before you put the Band-Aid on it. Find out why that is used on cuts instead of rubbing alcohol. Check your answer and correct it if it is wrong.

_____

_____

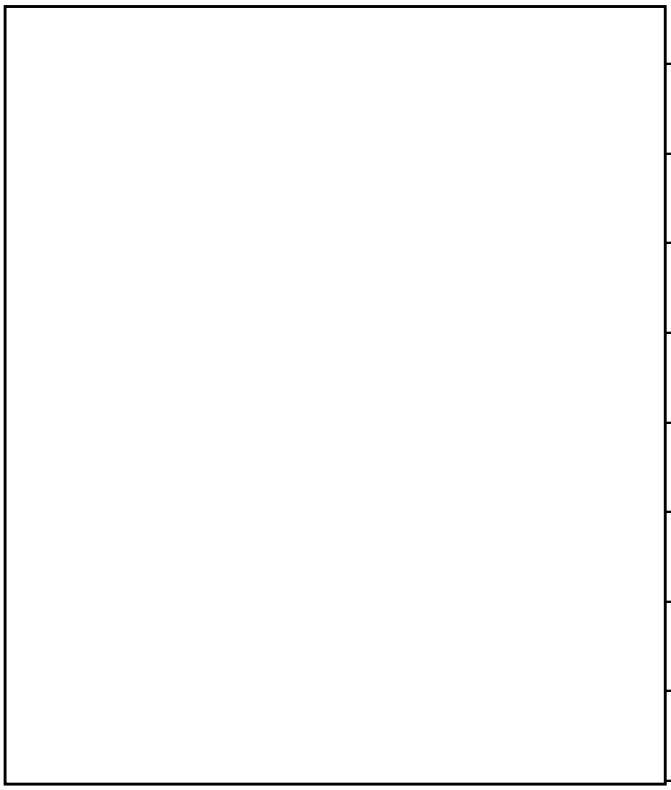
Lesson 60

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

Section 5: Science in the Latter Part of the 19th Century Level 2

Lesson 61

1. Make a drawing like the one on page 188 and use it to explain the results of your experiment.



2. How was your experiment like the work that Alfred Nobel did on explosives?

3. What is Alfred Nobel remembered for today? _____

4. Explain why putting a hole in the bottom of the bottle as soon as you turned it over would also result in the bottle emptying faster than it did in the first part of your experiment.

Section 5: Science in the Latter Part of the 19th Century Level 2

Lesson 62

1. The term _____ refers to a thin tube.

2. We have capillaries in our bodies that connect our _____ and _____.

3. Water is sucked into a paper towel because of _____ _____.

4. Suppose a paper towel was made from fibers that do not attract water. Would it be able to soak up water? Why or why not?

_____

_____

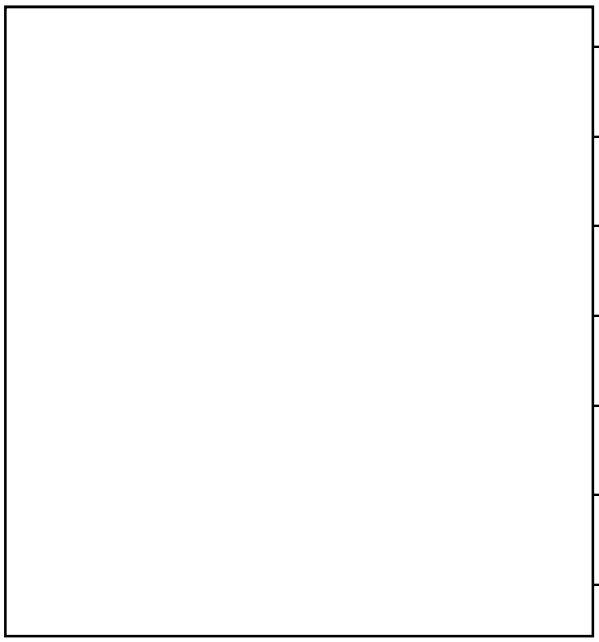
5. Suppose a paper towel had large gaps between the fibers. Would it soak up more or less water than a paper towel that had small gaps between the fibers? Why?

_____

_____

_____

6. Make a drawing like the one on page 192 and explain why the thinner the tube, the higher the water level in the tube.



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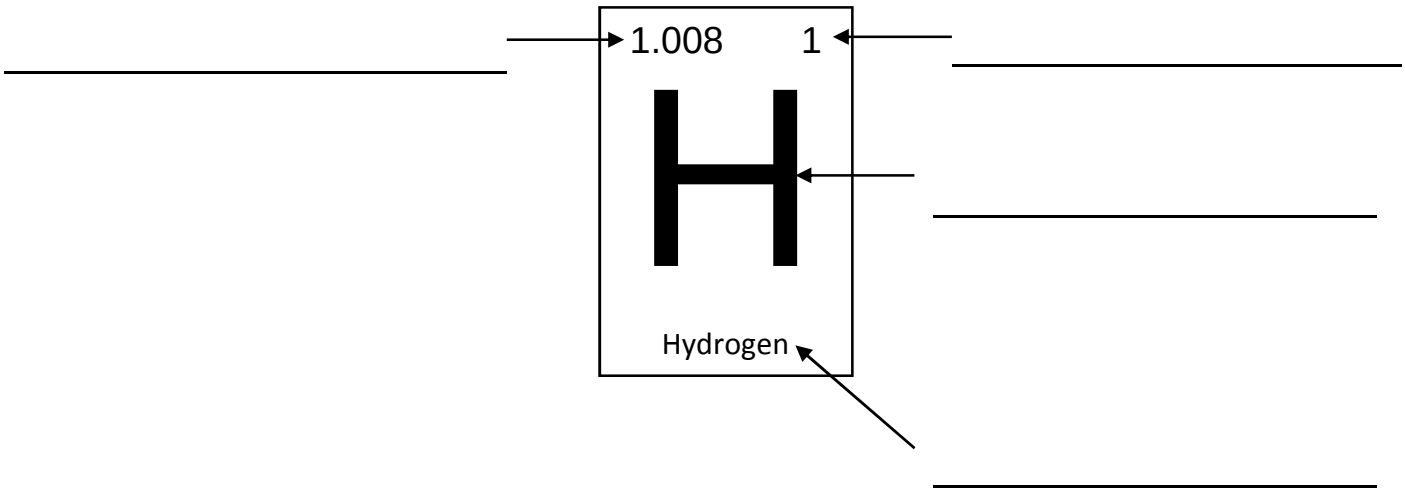
Section 5: Science in the Latter Part of the 19th Century

Level 2

Lesson 63

1. Label the things pointed out in the Periodic Table entry for Hydrogen:



2. Why does the Periodic Table of the Elements have the structure that it does?

_____

_____

_____

_____

_____

_____

_____

3. When lithium (Li) is mixed with water, bubbles of hydrogen gas are produced. Which of the following elements is most likely to have that same reaction when mixed with water: iron (Fe), carbon (C), sodium (Na), or beryllium (Be)? Why?

_____

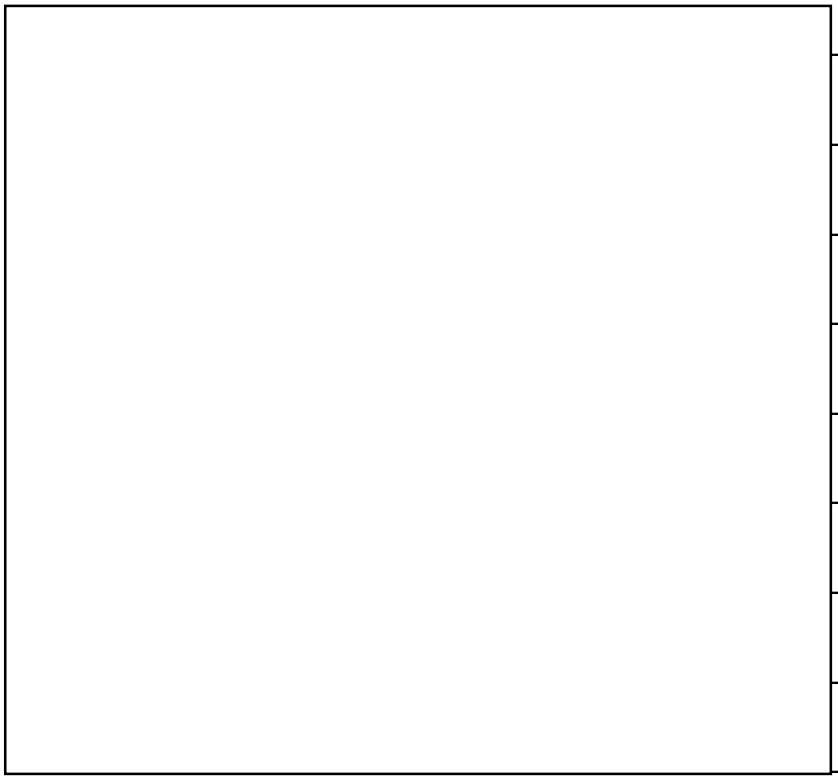
_____

_____

Section 5: Science in the Latter Part of the 19th Century Level 2

Lesson 64

1. Draw a picture like the one on page 198 and use it to explain how meteor showers occur.



2. Distinguish between a meteor and a meteorite.

3. When you end up watching the meteor shower you look up according to the instructions in the book, write down what you thought of it.

Section 5: Science in the Latter Part of the 19th Century Level 2

Lesson 65

1. A _____ is a natural waterway and a _____ is an artificial waterway (one that is built).

2. A mistranslation of the word meaning channel led many to believe that there was intelligent

life on _____.

3. Something that comes from a planet other than the earth is often called _____.

4. Both Schiaparelli and Lowell believed they saw something on the surface of Mars (either channels or canals). What do recent space studies show?

_____

_____

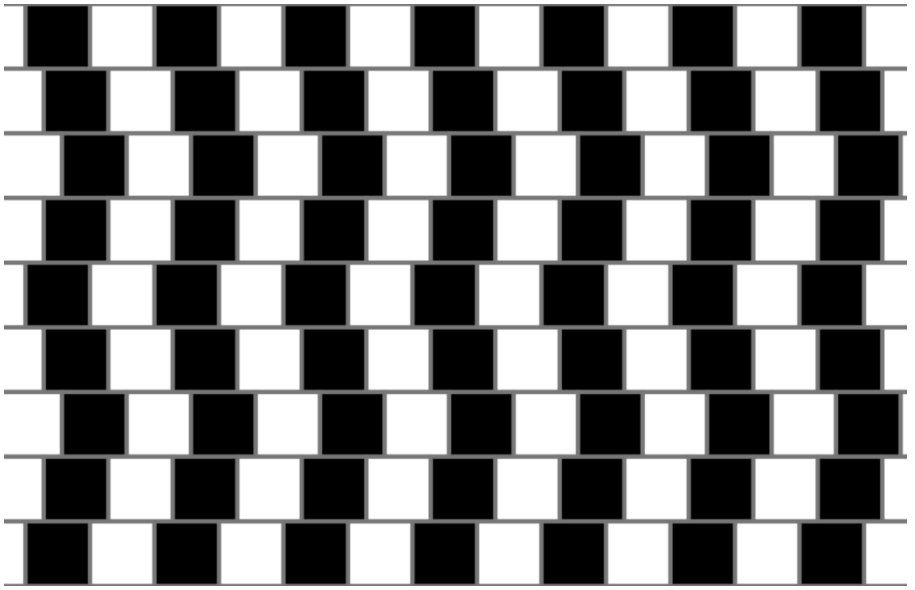
_____

_____

5. When you see something that isn't there, you are experiencing an _____

_____.

6. In the drawing on the right, the horizontal lines are all straight. Show it to some friends and see what they think

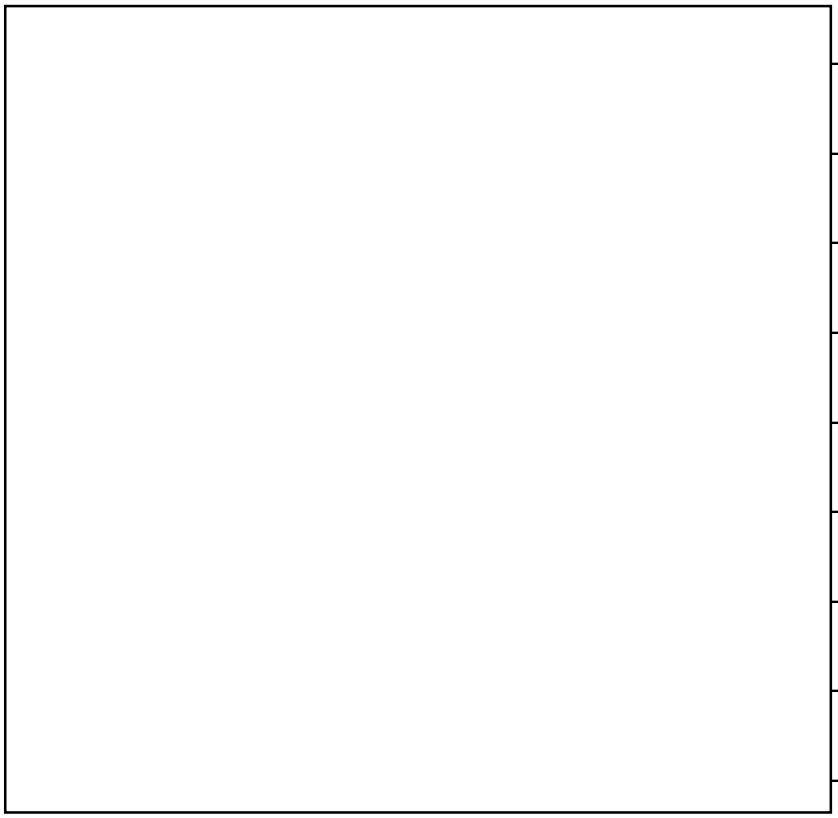


Author: Fibonacci License: CC 3.0

Section 5: Science in the Latter Part of the 19th Century Level 2

Lesson 66

1. Draw a picture of what you saw in your experiment and use it to explain what happened. Include the terms “refraction” and “index of refraction.”



2. Use what Lorenz did to explain how science can help us learn about things that we can’t see.

Section 5: Science in the Latter Part of the 19th Century Level 2

Lesson 67

1. Draw a neuron and label the cell body, dendrites, and axons.

2. What do neurons do and where can they be found in the body?

_____

_____

_____

_____

_____

3. What are the two parts of the nervous system? _____

_____

4. The peripheral nervous system contains two types of nerves: **sensory nerves** and **motor nerves**. Write down what you think they might do based just on their names. Check your answers and correct them if they are wrong.

_____

_____

Section 5: Science in the Latter Part of the 19th Century

Level 2

Lesson 68

1. What are the 2 types of blood cells? _____ and _____

2. Which type did Miescher study? _____

3. Which type has DNA in it? _____

4. What do the blood cells with DNA do?

_____

_____

_____

_____

5. How was Miescher able to isolate DNA, and how does that show DNA is an acid?

_____

_____

_____

_____

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_____

Lesson 69

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

Section 5: Science in the Latter Part of the 19th Century Level 2

Lesson 70

1. The motion involving the tilt of the head and the spinning of the body is called

_____ _____.

2. Your _____ _____ allow your body to sense the rotary motion of your head.

3. Name the structures that do it and explain how they work.

_____

_____

_____

_____

_____

_____

_____

_____

_____

4. The inner ear gives you the sense of _____.

5. Explain how the two otolith organs work and where they are located in the inner ear.

_____

_____

_____

_____

_____

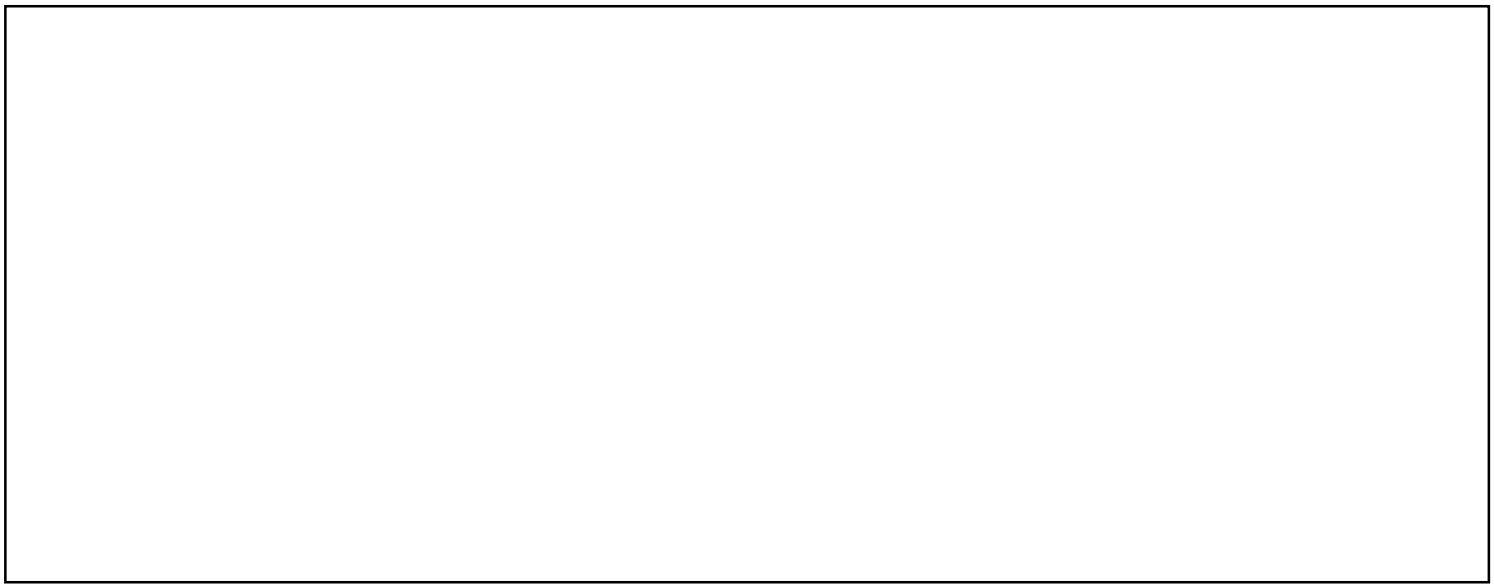
_____

Section 5: Science in the Latter Part of the 19th Century Level 2

Lesson 71

1. When something travels faster than sound, we say it is _____.

2. Make a drawing like the one at the top of page 219 and explain how something travelling supersonically makes a shock wave.



_____

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_____

_____

3. Suppose the speed of sound in air is 340 meters per second. If something is traveling at Mach 3, how fast is it going?

_____

Lesson 72

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

Section 5: Science in the Latter Part of the 19th Century Level 2

Lesson 73

1. The germ theory of disease says that _____ (and other germs) cause disease.

2. Explain what Koch did to add to the evidence for the germ theory of disease.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

3. Bacteria can form _____ which allow microscopic organisms to survive deadly conditions and contain everything necessary for life but don't do anything associated with living.

4. What does it mean to "culture" bacteria?

_____

_____

_____

_____

_____

Section 5: Science in the Latter Part of the 19th Century Level 2

Lesson 74

1. Make drawings that look like the cells labelled “1,” “3,” “6,” “7,” “8,” and “10” in the drawing on page 227. Point out what Flemming called chromatin, and explain why he called the process by which cells make duplicates of themselves “mitosis.”

1.	3.	6.	7.

8.	10.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

2. Where is chromatin found in the cell? _____

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 Late 19th Century

Level 2

Lesson 76

1. Describe how an incandescent light bulb works, using that term and explaining what it means.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

2. Explain why Edison is generally thought of as the inventor of the light bulb, even though he wasn't.

_____

_____

_____

_____

_____

_____

Section 6: Science in the Late 19th Century

Level 2

Lesson 77

1. Tap water is not pure water. True **OR** False

2. Describe your experiment and what it indicates about the difference between tap water and distilled water.

_____

_____

_____

_____

_____

_____

_____

_____

_____

3. Why is this important for scientists when they are making solutions with water?

_____

_____

_____

4. Suppose Ringer had been doing his experiments in another town. Before he started using distilled water, would his results have necessarily been the same? What about after he started using distilled water?

_____

_____

_____

Section 6: Science in the Late 19th Century

Level 2

Lesson 78

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

Section 6: Science in the Late 19th Century

Level 2

Lesson 79

1. How quickly living things burn their food for energy is called their _____

_____.

2. What relationship did Rubner find between an animal's surface area?

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

3. Why is that?

_____

_____

_____

4. Suppose you heat aluminum to a very high temperature and then let it cool in the air. One sample is a cube of aluminum, and the other is a sheet of aluminum foil. If they both have the same mass of aluminum, which stays hot longer?

_____

Section 6: Science in the Late 19th Century

Level 2

Lesson 80

1. Define paramagnetic.

_____

_____

_____

2. Define diamagnetic.

_____

_____

_____

3. Define ferromagnetic.

_____

_____

_____

4. What can you do to turn a ferromagnetic substance into a paramagnetic substance?

_____

_____

5. There is a word that is used to describe the process in which a voltage is produced when a crystal is compressed. The same word applies to the reverse process. Find out what that word is.

_____

The red block at the top of the picture on the right is a magnet. It has made the coins magnetic, so that they attract one another. That means the coins are ferromagnetic.

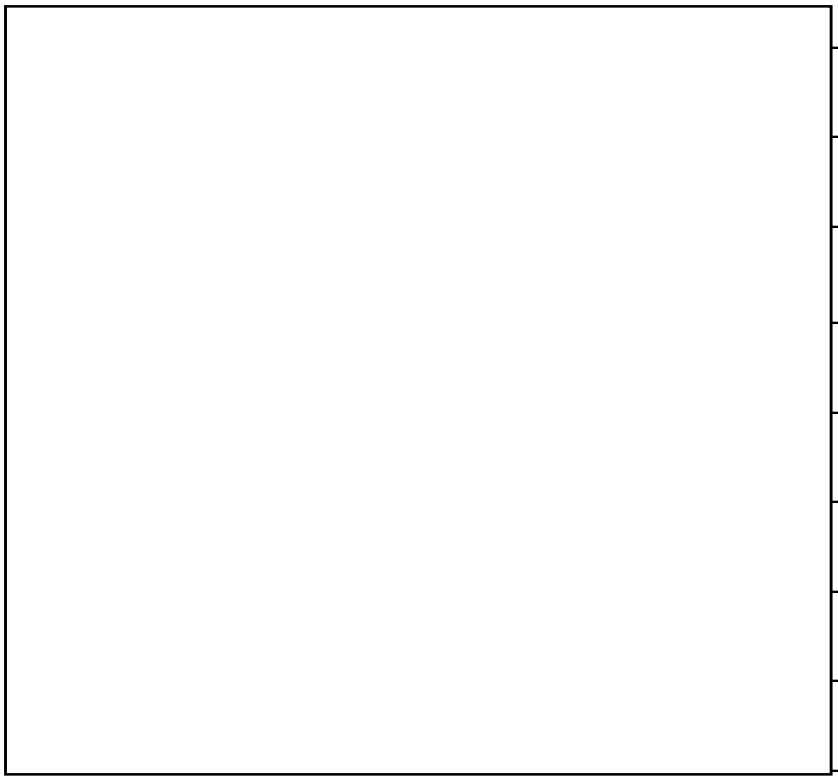
Author: Kentfrayn License: CC 3.0

Section 6: Science in the Late 19th Century

Level 2

Lesson 81

1. Make a drawing like the one on page 249. Use it to explain what an equilibrium is.



2. Which of the two processes in the drawing speed up when temperature is increased?

3. Define the term “saturated solution”

4. Indicate which of the solutions in your experiment (boiling solution with the film on it, cooler solution in the juice glass, warmer solution in the juice glass) was/were saturated.

Section 6: Science in the Late 19th Century

Level 2

Lesson 82

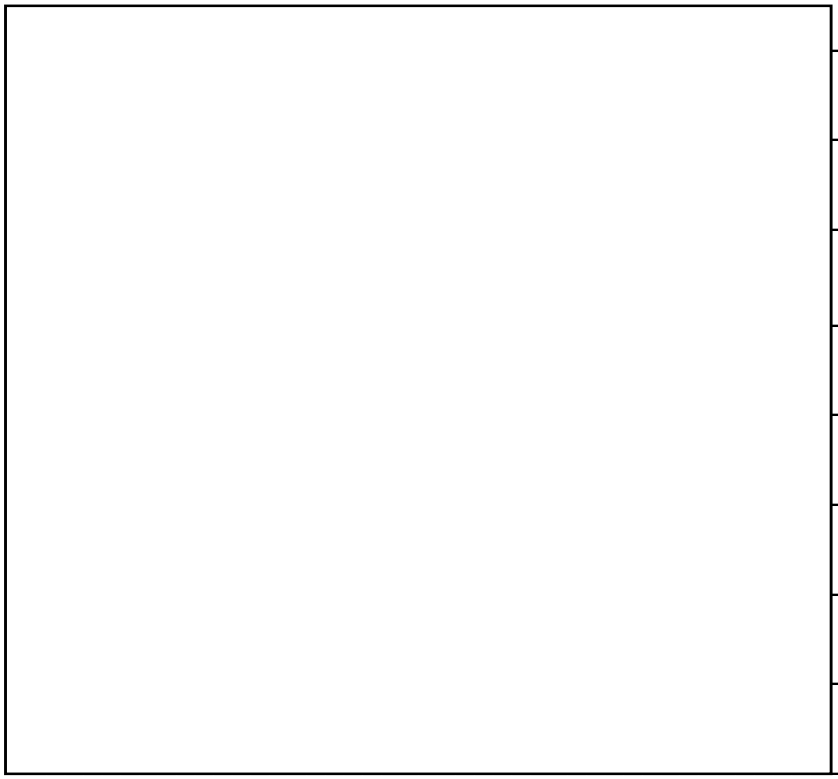
This is a challenge lesson, so I want to challenge you to make your own notebook page for it!

Section 6: Science in the Late 19th Century

Level 2

Lesson 83

1. Make a drawing like the one on page 256 that shows how salt dissolves in water. Explain the process using the terms “electrolyte” and “ion.”



2. Suppose you used tap water instead of distilled water in the first part of your experiment. What would you have seen?

3. Try it out to see of you were right. What did you see?

Section 6: Science in the Late 19th Century

Level 2

Lesson 84

1. The energy needed in order to start a chemical reaction is called _____

_____.

2. Use the motion of molecules to explain why all chemical reactions need it.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

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_____

_____

3. Where do plants get their activation energy for photosynthesis?

_____

_____

_____

_____

Section 6: Science in the Late 19th Century

Level 2

Lesson 85

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

Section 6: Science in the Late 19th Century

Level 2

Lesson 86

1. Radio waves are a form of _____ that you cannot see.

2. The waves that make up light are called _____ waves.

3. Describe your experiment and how it shows that electricity can make radio waves.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

4. Describe Hertz's experiment and indicate what things he used to perform the functions of the radio and the battery/nail device you used.

_____

_____

_____

_____

_____

_____

Section 6: Science in the Late 19th Century

Level 2

Lesson 87

1. X-rays are a form of _____ that has wavelengths too small for our eyes to see.

2. How is a medical X-ray done, and why does it show bones and not skin?

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

3. Microwaves are a form of light that has wavelengths too _____ for our eyes to see.

4. How does a microwave oven heat up food?

_____

_____

_____

_____

_____

_____

Section 6: Science in the Late 19th Century

Level 2

Lesson 88

1. Describe how Becquerel showed that uranium naturally makes something with charges.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

2. Why did this tell him that uranium was not emitting X-rays?

_____

_____

_____

3. Suppose you had connected the long wire to the positive side of the battery and the short one to the negative side in your experiment. If you did everything else the same, predict any difference you might see in the results. Check your prediction by looking in the *Helps&Hints* book that comes with this course and correct it if it is wrong.

_____

_____

_____

Section 6: Science in the Late 19th Century

Level 2

Lesson 89

1. What does a radioactive atom do?

_____

2. Who invented the term “radioactive”

_____

3. What part of Dalton’s atomic theory did Curie demonstrate was wrong?

_____

_____

_____

4. How did she do that?

_____

_____

_____

_____

_____

_____

_____

_____

5. The drawing on page 274 illustrates one type of radioactivity, which is called alpha emission. It results in a positive particle being emitted from the radioactive atom. There is another kind of radioactivity called beta emission. What kind of charge do you think is emitted in that form of radioactivity? Check your answer and correct it if it is wrong.

_____

Section 6: Science in the Late 19th Century

Level 2

Lesson 90

1. Explain how ionizing radiation can kill cells or make mutant cells.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

2. Why is a small amount of ionizing radiation is nothing to be worried about.

_____

_____

_____

3. Try to explain why lead is good at blocking X-rays. Check your explanation and correct it if it is wrong.

_____

_____

_____

_____