Grade 5 Science
Content Review Notes for Parents and Students

1st Nine Weeks
2017-2018

Note: The Fifth Grade Standard of Learning test covers material taught in fourth and fifth grade.
Grade 5 Science Content Review Notes
for Parents and Students
First Nine Weeks
2017-2018

This resource is intended to be a guide for parents and students to improve content knowledge and understanding. The information below is detailed information about the Standards of Learning taught during the 1st grading period and comes from the *Science Standards of Learning Curriculum Framework, Grade 5* issued by the Virginia Department of Education. The Curriculum Framework in its entirety can be found at the following website.

http://www.doe.virginia.gov/testing/sol/standards_docs/science/index.shtml

**Standard 5.1**
The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which

- a) items such as rocks, minerals, and organisms are identified using various classification keys;
- b) estimates are made and accurate measurements of length, mass, volume, and temperature are made in metric units using proper tools;
- c) estimates are made and accurate measurements of elapsed time are made using proper tools;
- d) hypotheses are formed from testable questions;
- e) independent and dependent variables are identified;
- f) constants in an experimental situation are identified;
- g) data are collected, recorded, analyzed, and communicated using proper graphical representations and metric measurements;
- h) predictions are made using patterns from data collected, and simple graphical data are generated;
- i) inferences are made and conclusions are drawn;
- j) models are constructed to clarify explanations, demonstrate relationships, and solve needs; and
- k) current applications are used to reinforce science concepts.
Overview
The skills in standard 5.1 are intended to define the “investigate” component and the understanding of the nature of science for all of the other fifth-grade standards. The intent of standard 5.1 is for students to continue to develop a range of inquiry skills, achieve proficiency with those skills, and develop and reinforce their understanding of the nature of science in the context of the concepts developed at the fifth-grade level. It is also intended that by developing these skills, students will achieve a greater understanding of scientific inquiry and the nature of science and will more fully grasp the content-related concepts.

- Science assumes that the natural world is understandable. Scientific inquiry can provide explanations about nature. This expands students’ thinking from just knowledge of facts to understanding how facts are relevant to everyday life.

- Systematic investigations require standard measures and consistent and reliable tools. Metric measures are a standard way to make measurements and are recognized around the world.

- A **classification key** is an important tool used to help identify objects and organisms. It consists of a branching set of choices organized in levels, with most levels of the key having two choices. Each level provides more specific descriptors, eventually leading to identification.

- A **hypothesis** is an educated guess/prediction about what will happen based on what you already know and what you have already learned from your research. It must be worded so that it is “testable.” The hypothesis can be written as an “If..., then....” statement, such as “If all light is blocked from a plant for two weeks, then the plant will die.”

- An **independent variable** is the factor in an experiment that is altered by the experimenter. The independent variable is purposely changed or manipulated.

- A **dependent variable** is the factor in an experiment that changes as a result of the manipulation of the independent variable.

- The **constants** in an experiment are those things that are purposefully kept the same throughout the experiment.

- A **scientific prediction** is a forecast about what may happen in some future situation. It is based on the application of factual information and principles and recognition of trends and patterns.

- An **inference** is a tentative explanation based on background knowledge and available data.
- A **conclusion** is a summary statement based on the results of an investigation. Scientific conclusions are based on verifiable observations.

**Standard 5.2**

The student will investigate and understand how sound is created and transmitted, and how it is used. Key concepts include

a) compression waves;
b) vibration, compression, wavelength, frequency, amplitude;
c) the ability of different media (solids, liquids, and gases) to transmit sound; and
d) uses and applications of sound waves.

**Overview**

This standard introduces the concept of what sound is and how sound is transmitted. The students are introduced to scientific vocabulary and the phenomena of compression waves, frequency, waves, wavelength, and vibration in this standard. Students should make predictions about and experiment with the transmission of sound. It is intended that students will actively develop and utilize scientific investigation, reasoning, and logic skills (5.1) in the context of the key concepts presented in this standard.

- **Sound** is a form of energy produced and transmitted by vibrating matter.

- Sound waves are **compression** (longitudinal) **waves**.

- When compression (longitudinal) waves move through matter (solid, liquid, or a gas), the molecules of the matter move backward and forward in the direction in which the wave is traveling. As sound waves travel, molecules are pressed together in some parts (compression) and in some parts are spread out (rarefaction). A child’s toy in the form of a coil is a good tool to demonstrate a compression (longitudinal) wave.

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![Compression (Longitudinal) Wave](image)
- The **frequency of sound** is the number of wavelengths in a given unit of time.

- The **wavelength of sound** is the distance between two compressions or between two rarefactions. The wavelength can be measured from any point on a wave as long as it is measured to the same point on the next wave.

- When we talk, sound waves travel in air. Sound also travels in liquids and solids. Sound waves must have a medium through which to travel. In a vacuum sound cannot travel because there is no matter for it to move through.

- **Pitch** is determined by the frequency of a vibrating object. Objects vibrating faster have a higher pitch than objects vibrating slower. A change in frequency of sound waves causes an audible sensation—a difference in pitch.

- **Amplitude** is the amount of energy in a compression (longitudinal) wave and is related to intensity and volume. For example, when a loud sound is heard, it is because many molecules have been vibrated with much force. A soft sound is made with fewer molecules being vibrated with less force.

- Sound travels more quickly through solids than through liquids and gases because the molecules of a solid are closer together. Sound travels the slowest through gases because the molecules of a gas are farthest apart.

- Some animals make and hear ranges of sound vibrations different from those that humans can make and hear.

Musical instruments vibrate to produce sound. There are many different types of musical instruments and each instrument causes the vibrations in different ways. The most widely accepted way to classify musical instruments is to classify them by the way in which the sound is produced by the instrument. The four basic classifications are percussion instruments (e.g., drums, cymbals), stringed instruments (e.g., violin, piano, guitar), wind instruments (e.g., flute, clarinet, trumpet, trombone), and electronic instruments (e.g., electronic organ, electric guitar).
1. Blowing through a straw will produce a sound. Which straw will make the highest pitch?

A. \[\text{\includegraphics[width=1cm]{straw1.png}}\]
B. \[\text{\includegraphics[width=1cm]{straw2.png}}\]
C. \[\text{\includegraphics[width=1cm]{straw3.png}}\]
D. \[\text{\includegraphics[width=1cm]{straw4.png}}\]

2. Which material will sound travel through the fastest?

A. Water
B. Air
C. Steel
D. Cloth

3. Which of these best shows how sound travels along the string?

A. \[\text{\includegraphics[width=1cm]{string1.png}}\]
B. \[\text{\includegraphics[width=1cm]{string2.png}}\]
C. \[\text{\includegraphics[width=1cm]{string3.png}}\]
D. \[\text{\includegraphics[width=1cm]{string4.png}}\]

Follow this link to find practice tests:
http://www.doe.virginia.gov/testing/sol/practice_items/index.shtml#science
Standard 5.3

The student will investigate and understand basic characteristics of visible light and how it behaves. Key concepts include

a) transverse waves;
b) the visible spectrum;
c) opaque, transparent, and translucent;
d) reflection of light from reflective surfaces; and
e) refraction of light through water and prisms.

Overview

Concepts related to light are introduced at the fifth-grade level. Standard 5.3 focuses on the characteristics of visible light and the tools that aid in the production and use of light. Instruction should center on the basic science concerning light energy and how we use light in our daily lives. A related science standard is 4.2, which focuses on forms of energy and provides a foundation for understanding that light is energy. It is intended that students will actively develop and utilize scientific investigation, reasoning, and logic skills (5.1) in the context of the key concepts presented in this standard.

- Light has properties of both a wave and a particle. Recent theory identifies light as a small particle, called a photon. A photon moves in a straight line. In both the light wave and photon descriptions, light is energy.

- Because light has both electric and magnetic fields, it is referred to as **electromagnetic radiation**. Light waves move as transverse waves and travel through a vacuum at a speed of approximately 186,000 miles per second (2.99 x 10^8 meters per second). Compared to sound, light travels extremely fast. It takes light from the sun less than 8½ minutes to travel 93 million miles (150 million kilometers) to reach Earth.

- Unlike sound, light waves travel in straight paths called rays and do not need a medium through which to move. A ray is the straight line that represents the path of light. A beam is a group of parallel rays.

- Light waves are characterized by their wavelengths and the frequency of their wavelengths
• The size of a wave is measured as its **wavelength**, which is the distance between any two corresponding points on successive waves, usually crest-to-crest or trough-to-trough. The wavelength can be measured from any point on a wave as long as it is measured to the same point on the next wave.

![Transverse Wave](image)

• **Frequency** is the number of waves passing a given point every second. The greater the frequency, the greater the amount of energy.

• **Light waves** are waves of energy. The amount of energy in a light wave is proportionally related to its frequency: high frequency light has high energy; low frequency light has low energy. The more wavelengths in a light wave in a given period of time, the higher the energy level. Thus gamma rays have the most energy, and radio waves have the least. Of visible light, **violet** has the most energy and **red** the least.

![Light Wave Energy](image)
The entire range of electromagnetic radiation (light) is called the electromagnetic spectrum.

- The only difference between the various types of electromagnetic radiation is the amount of energy. Sunlight consists of the entire electromagnetic spectrum.

- We see visible light as the colors of the rainbow. Each color has a different wavelength. Red has the longest wavelength and violet has the shortest wavelength. The colors of the visible spectrum from the longest wavelength to the shortest wavelength are: red, orange, yellow, green, blue, and violet (ROYGBV). Most scientists no longer include the color indigo, which used to be included between blue and violet.

- Black and white are not spectral colors. Black is when a material absorbs all the visible light and no light is reflected back. Black is a total absence of reflected light. White is a reflection of all visible light together.

- Light travels in straight paths until it hits an object, where it bounces off (is reflected), is bent (is refracted), passes through the object (is transmitted), or is absorbed as heat.

- The term **reflected light** refers to light waves that are neither transmitted nor absorbed, but are thrown back from the surface of the medium they encounter. If the surface of the medium contacted by the wave is smooth and polished (e.g., a mirror), each reflected wave will be reflected back at the same angle as the incident wave. The wave that strikes the surface of the medium (e.g., a mirror) is called the **incident wave**, and the one that bounces back is called the **reflected wave**.
• **Refraction** means the bending of a wave resulting from a change in its velocity (speed) as it moves from one medium to another (e.g., light moving from the air into water). The frequency of the wave does not change.

The amount of bending of the light wave (refraction) depends on:

1. The density of the material it is entering;
2. The wavelength of the light wave; and
3. The angle at which the original light wave enters the new medium.

Some examples of refraction are when:

1. Refraction causes a setting sun to look flat.
2. A spoon appears to bend when it is immersed in a cup of water. The bending seems to take place at the surface of the water, or exactly at the point where there is a change of density.
3. Shadows on the bottom of a pool are caused because air and water have different densities.
4. A glass prism disperses white light into its individual colors. As visible light exits the prism, it is refracted and separated into a display of colors.

A rainbow is an example of both refraction and reflection. Sunlight is first refracted when it enters the surface of a spherical raindrop, it is then reflected off the back of the raindrop, and once again refracted as it leaves the raindrop.

• A **prism** can be used to refract and disperse visible light. When the different wavelengths of light in visible light pass through a prism, they are bent at different angles (refracted). Dispersion occurs when we see the light separated into a display of colors: ROYGBV.

• **Dispersion** is the separation of light. Dispersion occurs with transparent surfaces that are not parallel to each other, such as a prism or gemstone facets.

• Light passes through some materials easily (**transparent materials**), through some materials partially (**translucent materials**), and through some not at all (**opaque materials**). The relative terms transparent, translucent, and opaque indicate the amount of light that passes through an object.

1. Examples of **transparent materials** include clear glass, clear plastic food wrap, clean water, and air.

2. Examples of **translucent materials** include wax paper, frosted glass, thin fabrics, some plastics, and thin paper.

3. Examples of **opaque materials** include metal, wood, bricks, aluminum foil, and thick paper.
**Light travels in straight paths until it hits an object where it may be:**

<table>
<thead>
<tr>
<th>definition</th>
<th>Reflected</th>
<th>Refracted</th>
<th>Transmitted</th>
<th>Absorbed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>example</strong></td>
<td>A mirror reflects visible light.</td>
<td>A prism refracts light and produces the spectrum of visible light waves. Water also refracts light. Have you ever seen the spectrum in the sky after a rainstorm? The water droplets in the air act as tiny prisms, which produce a rainbow.</td>
<td>Light passes through a window.</td>
<td>Black objects absorb all light while color objects absorb all but that spectrum of light. Something white absorbs very little light. If something absorbs no light, you will not be able to see it because no light is reflected back to your eye.</td>
</tr>
<tr>
<td>Material</td>
<td>Opaque</td>
<td>Transparent</td>
<td>Translucent</td>
<td></td>
</tr>
<tr>
<td>-----------</td>
<td>---------------------------------------------</td>
<td>--------------------------------------------</td>
<td>--------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Definition</td>
<td>The material is completely blocked from light.</td>
<td>The material allows light to pass through with little or no disturbance.</td>
<td>The materials allow only part of the light to pass through will bouncing the rays off in many directions.</td>
<td></td>
</tr>
<tr>
<td>Example</td>
<td>Most things are opaque. A red brick will reflect red light, and absorb the rest.</td>
<td>Clear glass or plastic</td>
<td>Frosted glass</td>
<td></td>
</tr>
</tbody>
</table>

Look at the example of the light wave below. Can you label it? The wave consists of a peak or crest, trough, and wavelength.

*Look on page 15 for the answer to the question above.*
1. Which tool is used to separate white light into the color spectrum?

A.  
B.  
C.  
D.  

2. Which of the above waves has the longest wavelength?

A. Wave 1  
B. Wave 2  
C. Wave 3  
D. Wave 4  

Which of the above waves has the longest wavelength?

A. Wave 1  
B. Wave 2  
C. Wave 3  
D. Wave 4
3. Which label best describes how light interacts with each of these glass objects?

**Answer Key:**
- **Jar of coins** – transparent
- **Cookie jar** – Opaque
- **Stained-Glass window** -- translucent
Answer Key to problems on page 12:

Crest

Wavelength

Trough
Standard 4.1

The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which

a) distinctions are made among observations, conclusions, inferences, and predictions;
b) objects or events are classified and arranged according to characteristics or properties;
c) appropriate instruments are selected and used to measure length, mass, volume, and temperature in metric units;
d) appropriate instruments are selected and used to measure elapsed time;
e) predictions and inferences are made, and conclusions are drawn based on data from a variety of sources;
f) independent and dependent variables are identified;
g) constants in an experimental situation are identified;
h) hypotheses are developed as cause and effect relationships;
i) data are collected, recorded, analyzed, and displayed using bar and basic line graphs;
j) numerical data that are contradictory or unusual in experimental results are recognized;
k) data are communicated with simple graphs, pictures, written statements, and numbers;
l) models are constructed to clarify explanations, demonstrate relationships, and solve needs; and
m) current applications are used to reinforce science concepts.

Overview

The skills described in standard 4.1 are intended to define the “investigate” component of all of the other fourth-grade standards. The intent of standard 4.1 is that students will continue to develop a range of inquiry skills, achieve proficiency with those skills in the context of the concepts developed at the fourth-grade level, and strengthen their understanding of the nature of science. It is also intended that by developing these skills, students will achieve greater understanding of scientific inquiry and the nature of science as well as more fully grasp the content-related concepts.

The nature of science refers to the foundational concepts that govern the way scientists formulate explanations about the natural world. The nature of science includes the following concepts:

a) the natural world is understandable;
b) science is based on evidence, both observational and experimental;
c) science is a blend of logic and innovation;
d) scientific ideas are durable yet subject to change as new data are collected;
e) science is a complex social endeavor

- Science assumes that the natural world is understandable. Scientific inquiry can provide explanations about nature. This expands students’ thinking from just a knowledge of facts to understanding how facts are relevant to everyday life.

- Science demands evidence. Scientists develop their ideas based on evidence and they change their ideas when new evidence becomes available or the old evidence is viewed in a different way.

- An observation is what you see, feel, taste, hear, or smell. Scientists construct knowledge from observations and inferences, not observations alone. To communicate an observation accurately, one must provide a clear description of exactly what is observed and nothing more. Those conducting investigations need to understand the difference between what is seen and what inferences, conclusions, or interpretations can be drawn from the observation.

- Elapsed time is the amount of time that has passed between two given times.

- An experiment is a fair test driven by a hypothesis. A fair test is one in which only one variable is compared.

- In science, it is important that experiments and the observations recorded are repeatable.

- There are two different types of data – qualitative and quantitative. Qualitative data deal with descriptions and data that can be observed, but not measured. Quantitative data are data that can be counted or measured and the results can be recorded using numbers. Quantitative data can be represented visually in graphs and charts. Quantitative data defines whereas qualitative data describes. Quantitative data are more valuable in science because they allow direct comparisons between observations made by different people or at different times.

<table>
<thead>
<tr>
<th>Example of Qualitative vs. Quantitative Data</th>
<th>Main Street Elementary School Science Club</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qualitative</td>
<td>Quantitative</td>
</tr>
<tr>
<td>● Friendly</td>
<td>● 10 fourth-grade students and 12 fifth-grade students</td>
</tr>
<tr>
<td>● Likes science</td>
<td>● 14 girls, 8 boys</td>
</tr>
<tr>
<td>● Positive about school</td>
<td>● 92 percent participated in the division wide science fair last year</td>
</tr>
</tbody>
</table>
Standard 4.7

The student will investigate and understand the organization of the solar system. Key concepts include:

a. the planets in the solar system;
b. the order of the planets in the solar system; and
c. the relative sizes of the planets.

Overview

This standard focuses on providing an introduction to our solar system. This includes the introduction to the planets in the solar system, their order in the solar system in relation to the sun, and the sizes of the planets in relation to the size of Earth.

- Our solar system is ancient. Early astronomers believed that Earth was the center of the universe and all other heavenly bodies orbited around Earth. We now know that our sun is the center of our solar system and eight planets, a handful of dwarf planets, 170 named moons, dust, gas, and thousands of asteroids and comets orbit around the sun.

- Our solar system is made up of eight planets: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune.

- Mercury, Venus, Earth, and Mars are considered terrestrial planets. Jupiter, Saturn, Uranus, and Neptune are called gas giants.
**Planets:** (The pictures of the planets are not to scale)

**Mercury** is closest to the sun and is a small, heavily cratered planet. Mercury looks like our moon. Since Pluto’s reclassification from planet to dwarf planet, Mercury is now the smallest planet in our solar system.

![Mercury](image)

**Venus** is second from the sun. It is similar to Earth in size and mass, and has a permanent blanket of clouds that trap so much heat that the temperatures on the surface of Venus are hot enough to melt lead.

![Venus](image)

**Earth** is third from the sun. Earth’s atmosphere, the liquid water found on Earth, and its distance from the sun, among many other factors, make Earth a haven for life.
**Mars** is fourth from the sun. The atmosphere on Mars is thin and there is a vast network of canyons and riverbeds on the red planet. Scientists hypothesize that Mars once supported a wet, warm Earth-like climate.

**Jupiter** is fifth from the sun. Jupiter is the largest planet in the solar system and is considered a gas giant. Jupiter has no solid surface.
**Saturn** is sixth from the sun. Early scientists thought Saturn was the only planet with rings, but we now know that all four gas giants (Jupiter, Saturn, Uranus, and Neptune) have rings.

![Saturn](image1)

**Uranus** is seventh from the sun. Uranus is a gas giant.

![Uranus](image2)

**Neptune** is eighth from the sun. Neptune appears blue through telescopes and is a gas giant.

![Neptune](image3)
The sequence of the eight planets in the solar system based on their position from the sun is as follows:

Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune

The eight planets sorted by size from largest to smallest are:

Jupiter, Saturn, Uranus, Neptune, Earth, Venus, Mars, and Mercury.

Pluto is no longer included in the list of planets in our solar system due to its small size and irregular orbit. Pluto is smaller than seven of the moons in our solar system and cannot be seen without a telescope.

In 2006, the International Astronomical Union (IAU), the recognized authority in naming heavenly objects, formally reclassified Pluto. On August 24, 2006, Pluto's status was officially changed from planet to dwarf planet.

A new distinct class of objects called "dwarf planets" was identified in 2006. It was agreed that "planets" and "dwarf planets" are two distinct classes of objects.

What differentiates a dwarf planet from a planet?

For the most part, they are identical, but there is one key difference: A dwarf planet has not "cleared the neighborhood" around its orbit, which means it has not become gravitationally dominant and it shares its orbital space with other bodies of a similar size.
A student chose food items from her kitchen to model the size of the planets in our solar system. She chose one food item to represent each planet. She used the walnut to represent Earth. Which statement correctly matches the food items with the planets they represent?

- A  The cantaloupe represents Jupiter, and the grape represents Mercury.
- B  The radish represents Mars, and the head of lettuce represents Saturn.
- C  The lemon represents Uranus, and the lime represents Neptune.
- D  The pea represents Neptune, and the radish represents Venus.
Which set of notes describes Uranus?

A. Mars, Venus, Earth, Mercury, Neptune, Uranus, Saturn, Jupiter
B. Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune
C. Mars, Mercury, Earth, Venus, Saturn, Jupiter, Uranus, Neptune
D. Mercury, Mars, Earth, Venus, Jupiter, Saturn, Neptune, Uranus

Name the planets in sequence using their position from the sun.

A. Mars, Venus, Earth, Mercury, Neptune, Uranus, Saturn, Jupiter
B. Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune
C. Mars, Mercury, Earth, Venus, Saturn, Jupiter, Uranus, Neptune
D. Mercury, Mars, Earth, Venus, Jupiter, Saturn, Neptune, Uranus
Standard 4.8

The student will investigate and understand the relationships among the Earth, moon, and sun. Key concepts include:

a. the motions of Earth, the moon, and the sun;
b. the causes for Earth’s seasons;
c. the causes for the phases of the moon;
d. the relative size, position, age, and makeup of Earth, the moon, and the sun; and
e. historical contributions in understanding the Earth-moon-sun system.

Overview

This standard focuses on the Earth-moon-sun system and includes knowledge related to the motions of this system and the results of our unique position in it. This includes the presence of an atmosphere, liquid water, and life.

Key Terms:

Revolution and rotation are the terms we use to describe the motions of Earth and the moon.

- Revolution is the movement of Earth in an orbit around the sun. Earth completes one revolution around the sun every 365 ¼ days.

- The moon revolves around Earth about once every month.
- **Rotation** is the turning of Earth on its axis, which causes day and night.

![Diagram of Earth's rotation and sunlight]

**Seasons**

- Earth’s **axial tilt** causes Earth to experience **seasons** as it revolves around the sun.
Phases of the Moon

- The phases of the moon are caused by its position relative to Earth and the sun. The phases of the moon include:

**New Moon** - The moon's non-illuminated side is facing the Earth. The moon is not visible (except during a solar eclipse).

**Waxing Crescent** - The moon appears to be partly but less than one-half illuminated by direct sunlight. The fraction of the moon's disk that is illuminated is increasing.

**First Quarter** – ½ of the moon appears to be illuminated by direct sunlight. The fraction of the moon's disk that is illuminated is increasing.

**Waxing Gibbous** - The moon appears to be more than one-half but not fully illuminated by direct sunlight. The fraction of the moon's disk that is illuminated is increasing.

**Full Moon** - The moon's illuminated side is facing the Earth. The moon appears to be completely illuminated by direct sunlight.

**Waning Gibbous** - The moon appears to be more than one-half but not fully illuminated by direct sunlight. The fraction of the moon's disk that is illuminated is decreasing.

**Last (third) Quarter** – 1/2 of the moon appears to be illuminated by direct sunlight. The fraction of the moon's disk that is illuminated is decreasing.

**Waning Crescent** - The moon appears to be partly but less than one-half illuminated by direct sunlight. The fraction of the moon's disk that is illuminated is decreasing.
• **Earth** is one of eight planets that revolve around the sun and make up the solar system. Earth is the third planet from the sun, is one of the four terrestrial inner planets. It is about 150 million kilometers from the sun. Earth is a geologically active planet with a surface that is constantly changing. It has large amounts of life-supporting water and oxygen-rich atmosphere. Earth’s protective atmosphere blocks out most of the sun’s damaging rays.

![Earth](image)

• The **moon** is a small rocky satellite of Earth, having about one-quarter the diameter of Earth and one-eighth its mass. It has extremes of temperature, virtually no atmosphere or life, and very little water.

![Moon](image)

• The **sun** is an average-size yellow star of hydrogen gas that serves as the center of our solar system and as our source of heat and light. It is about 110 times the diameter of Earth and is approximately 4.6 billion years old.

![Sun](image)
Historical Contributions
Try to analyze the differences in what Aristotle, Ptolemy, Copernicus, and Galileo observed and what influenced their conclusions.

<table>
<thead>
<tr>
<th>Aristotle - 370 BC</th>
<th>Earth-centered View</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth is the center of the universe. The earth is inside of a giant ball that turns and the things in the sky are attached to the ball. The earth doesn't move.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ptolemy - 100 AD</th>
<th>Earth-centered View</th>
</tr>
</thead>
<tbody>
<tr>
<td>The earth is spherical (round) and the objects in space orbit the earth. The earth doesn't move.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Copernicus – 1480</th>
<th>Sun-centered View</th>
</tr>
</thead>
<tbody>
<tr>
<td>The earth is spherical (round). The earth spins on its axis. The earth and the other planets revolve around the sun.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Galileo - 1575</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>He proves that Copernicus' theory is correct. Builds a <strong>telescope</strong> to study the moon. Discovers that the moon is not flat – it has mountains and craters.</td>
<td></td>
</tr>
</tbody>
</table>

- The NASA Apollo missions added greatly to our understanding of the moon.
- Our understanding of the sun, moon, and the solar system continues to change with new scientific discoveries.
A student observes the phases of the moon during one month. What phase of the moon belongs in each of these boxes?

Answer:
1. Waning Crescent
2. Full Moon
3. Waxing Gibbous
<table>
<thead>
<tr>
<th><strong>hypothesis</strong></th>
<th>An educated guess/prediction about what will happen based on what you already know and what you have already learned from your research.</th>
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<tr>
<td><strong>inference</strong></td>
<td>A tentative explanation based on background knowledge and available data.</td>
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<tr>
<td><strong>prediction</strong></td>
<td>A forecast about what may happen in some future situation, based on the application of factual information and principles and the recognition of trends and patterns.</td>
</tr>
<tr>
<td><strong>experiment</strong></td>
<td>A fair test driven by a hypothesis.</td>
</tr>
<tr>
<td><strong>conclusion</strong></td>
<td>A summary statement based on the results of an investigation. Scientific conclusions are based on verifiable observations.</td>
</tr>
<tr>
<td><strong>dependent variable</strong></td>
<td>The factor in an experiment that changes as a result of the manipulation of the independent variable.</td>
</tr>
<tr>
<td><strong>independent variable</strong></td>
<td>The factor in an experiment that is altered by the experimenter. The independent variable is purposely changed or manipulated.</td>
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<tr>
<td><strong>constants</strong></td>
<td>Constants are the things that are purposefully kept the same throughout the experiment.</td>
</tr>
<tr>
<td><strong>sound</strong></td>
<td>A sound is a form of energy produced and transmitted by vibrating matter.</td>
</tr>
<tr>
<td><strong>sound wave</strong></td>
<td>A sound wave is a disturbance moving through a medium. (solid, liquid, gas)</td>
</tr>
<tr>
<td><strong>frequency</strong></td>
<td>Frequency is the number of vibrations in a given unit of time.</td>
</tr>
<tr>
<td><strong>wavelength</strong></td>
<td>Wavelength is the distance between two compressions.</td>
</tr>
<tr>
<td><strong>pitch</strong></td>
<td>Pitch is determined by the frequency of a vibrating object. Objects vibrating faster have a higher pitch.</td>
</tr>
<tr>
<td><strong>matter</strong></td>
<td>Matter is material that is a solid, liquid or gas.</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
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</tr>
<tr>
<td>light</td>
<td>Light is the natural agent that stimulates sight and makes things visible.</td>
</tr>
<tr>
<td>rays</td>
<td>Rays are narrow beams of light.</td>
</tr>
<tr>
<td>light waves</td>
<td>Light waves are the only electromagnetic waves we can see. We see these waves as the colors of the rainbow.</td>
</tr>
<tr>
<td>visible light spectrum</td>
<td>The visible light spectrum is the range of light that is visible to the human eye and is responsible for the colors we see.</td>
</tr>
<tr>
<td>prism</td>
<td>A prism is a triangular shaped piece of cut and polished glass.</td>
</tr>
<tr>
<td>reflected</td>
<td>Reflected means light is bounced off an object.</td>
</tr>
<tr>
<td>refracted</td>
<td>Refracted means light is bent when it hits an object.</td>
</tr>
<tr>
<td>transmitted</td>
<td>Transmitted means light passes through an object.</td>
</tr>
<tr>
<td>absorbed</td>
<td>Absorbed means the light is taken in as heat.</td>
</tr>
<tr>
<td>Planet</td>
<td><strong>Mercury</strong></td>
</tr>
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<td>----------</td>
<td>-------------</td>
</tr>
<tr>
<td>4.7</td>
<td>Venus</td>
</tr>
<tr>
<td>4.7</td>
<td>Earth</td>
</tr>
<tr>
<td>4.7</td>
<td>Mars</td>
</tr>
<tr>
<td>4.7</td>
<td>Jupiter</td>
</tr>
<tr>
<td><strong>Saturn</strong></td>
<td>Saturn is the sixth planet from the sun. Early scientists thought Saturn was the only planet with rings, but we now know that all four gas giants (Jupiter, Saturn, Uranus, and Neptune) have rings.</td>
</tr>
<tr>
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<tr>
<td><strong>Uranus</strong></td>
<td>Uranus is the seventh planet from the sun. Uranus is a gas giant.</td>
</tr>
<tr>
<td><strong>Neptune</strong></td>
<td>Neptune is the eighth planet from the sun. Neptune appears blue through telescopes and is a gas giant.</td>
</tr>
<tr>
<td><strong>Revolution</strong></td>
<td>Revolution describes Earth's movement around the sun every 365(\frac{1}{4}) days.</td>
</tr>
<tr>
<td><strong>Rotation</strong></td>
<td>Rotation describes the spinning of Earth on its imaginary axis, which takes about 24 hours to complete and causes day and night to occur.</td>
</tr>
<tr>
<td><strong>Seasons</strong></td>
<td>Seasons are created by the tilt of Earth. Each period of the year has special climate conditions.</td>
</tr>
<tr>
<td><strong>Axial Tilt</strong></td>
<td>Axial tilt describes the invisible axis that is slanted allowing for seasons to occur.</td>
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<tr>
<td>4.8</td>
<td></td>
</tr>
<tr>
<td><strong>Phases of the Moon</strong></td>
<td>Phases of the moon are the different shapes of the moon you see from Earth caused by the position of Earth and the sun.</td>
</tr>
<tr>
<td>4.8</td>
<td></td>
</tr>
<tr>
<td><strong>Moon</strong></td>
<td>The moon is a small rocky satellite that is about one-quarter the diameter of Earth and 1/8 its mass. It has extremes of temperature, virtually no atmosphere or life and very little water.</td>
</tr>
<tr>
<td>4.8</td>
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<tr>
<td><strong>Waxing Gibbous</strong></td>
<td>The waxing gibbous is the phase of the moon where more than ½ of the moon is visible and seems to be growing bigger. It occurs just before the full moon.</td>
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<tr>
<td>4.8</td>
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<tr>
<td><strong>New Moon</strong></td>
<td>The new moon is the moon phase that occurs when the moon is between Earth and the sun, at which point the moon cannot be seen because its lighted half is facing the sun and its dark side faces Earth.</td>
</tr>
<tr>
<td>4.8</td>
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</tr>
<tr>
<td><strong>Waxing Crescent</strong></td>
<td>The waxing crescent is the moon phase that follows the new moon where a small lighted area appears to grow larger.</td>
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<tr>
<td>4.8</td>
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</tr>
<tr>
<td><strong>First Quarter</strong></td>
<td>The first quarter is the phase of the moon in which the right side of the moon is visible. (looks like a &quot;half moon&quot;)</td>
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<tr>
<td><strong>Full Moon</strong></td>
<td>The full moon is the moon phase when the moon is completely visible and perfectly round.</td>
</tr>
<tr>
<td><strong>Last Quarter</strong></td>
<td>The last quarter is the phase right after the full moon. It is when one-half of the moon's face appears to be illuminated by sunlight.</td>
</tr>
<tr>
<td><strong>Waning Crescent</strong></td>
<td>The waning crescent is the phase of the moon when a small lighted area appears to grow smaller. It appears before a new moon.</td>
</tr>
<tr>
<td><strong>Aristotle</strong></td>
<td>Aristotle is a Greek philosopher who believed that planets, the sun, the moon and the stars revolved around Earth.</td>
</tr>
<tr>
<td><strong>Galileo</strong></td>
<td>Galileo thought that the sun was the center of the universe.</td>
</tr>
<tr>
<td><strong>NASA Apollo</strong></td>
<td>The National Aeronautics and Space Administration Apollo missions aim was to land humans on the moon and bring them back safely.</td>
</tr>
</tbody>
</table>