

Chapter 1 Notes:

Introduction to Earth Science

1.1 What is Earth Science?

- **earth science** – the study of the _____ and of the _____ around it
 - Earth science is based on the belief that the causes of _____ phenomena, like earthquakes and volcanic eruptions, can be discovered through careful _____ and experimentation.
 - There are four main areas of study:
 1. _____ – the study of the origin, history, and structure of the solid earth and the processes that shape it
 - Includes exploring the earth’s crust in search of new deposits of _____, _____, and _____, as well as other valuable resources
 - Includes seismology (the study of _____) and volcanology (the study of _____)
 - Includes archaeology (the study of history through physical remains, like _____, and artifacts)
 2. _____ – the study of the earth’s oceans (including tides, waves, and ocean currents)
 - Oceans cover nearly _____ of the earth’s surface
 - Includes studying the ocean floor for clues to earth’s _____ and to locate mineral deposits
 - Includes the study of marine _____ (the study of marine plant and animal life)
 3. _____ – the study of the earth’s atmosphere
 - Scientists in this field are often called “_____.” They measure atmospheric conditions like wind speed, temperature, and rainfall and then use that data to prepare detailed weather _____, satellite images, and weather _____.
 4. _____ – the study of the universe beyond the earth (including the moon, planets, sun, and stars)
 - Includes the use of _____ and space probes

- What is the Importance of Earth Science?
 - To _____ and _____ for potential disasters, like earthquakes and volcanic eruptions, and to _____ their effect on human life and property
 - To _____ more about the world around us
 - To access the earth's natural _____ and learn how to use those _____ wisely

- The Study of Ecology:
 - **ecology** – the study of the complex relationships between _____ things and their _____
 - This combines the studies of _____ and earth science
 - _____ – a community of organisms and the environment that they inhabit

- Environmental Pollution
 - **pollution** – the _____ of the environment with waste products or impurities
 - This can be anything that upsets the natural _____ of an ecosystem
 - Some waste products are biodegradable and do not pose much of a threat to the environment
 - **biodegradable** – the ability to be _____ by microorganisms into harmless substances that can then be used by other organisms

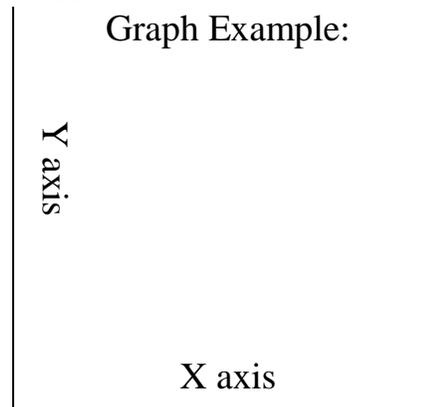
1.2 Paths to Discovery: Scientific Methods

- Steps of the Scientific Method:

- State the _____
 - observation** – using the 5 senses to gather information about the world
 - Observations → _____
- _____ Information
 - Take measurements, if needed
- Form a _____ (a possible explanation or solution to the problem)
- _____ - Test the Hypothesis
 - variable** – a factor in an experiment that can be changed
 - _____ **variable** – the factor in an experiment that is changed or manipulated, x axis
 - _____ **variable** – the factor in an experiment that responds, y axis
 - Mnemonic to help learn the two types of variables:

I'M a DR				
Independent	Manipulated		Dependent	Responding
X axis			Y axis	

Graph Example:

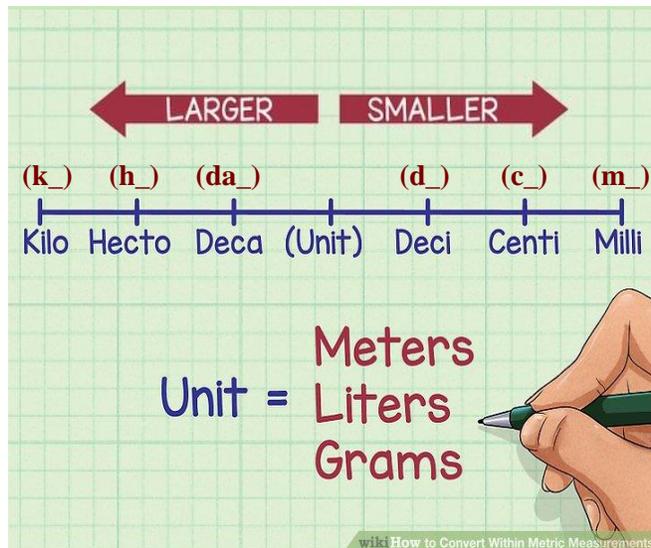


- A control receives no treatment during the experiment and is a good way to make sure additional factors haven't come into play.
- _____ (with graphs, tables, etc.)
 - State a _____

- Mnemonic to help learn the steps of the scientific method:

P_____ a **G**_____ **H**_____ to **E**_____ **A**_____ the **C**_____

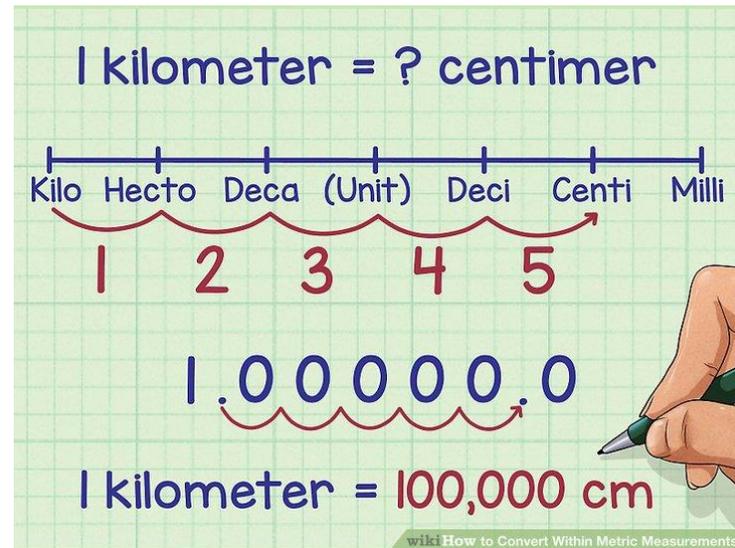
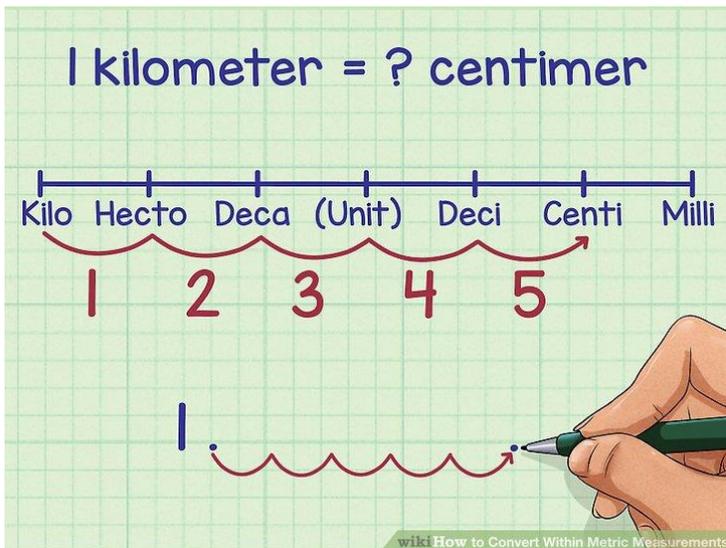
Metric Conversion Guide:



Mnemonic for Metric Conversion Guide:

King **H**enry **D**oesn't Usually **D**rink **C**hocolate **M**ilk

Metric Conversion Example:



Let's Practice:

Example #1: Convert 45 hectameters (hm) to meters (m)

Example #2: Convert .08 meters (m) to centimeters (cm)

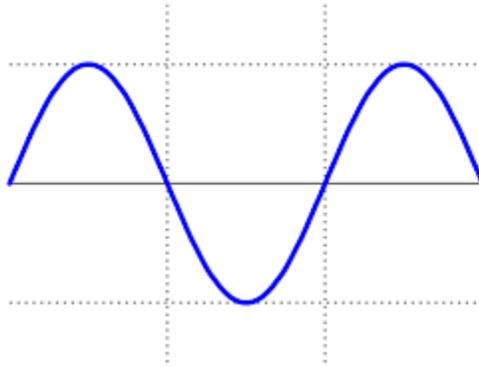
Example #3: Convert 5,187 millimeters (mm) to kilometers (km)

Example #4: Convert 50 centiliters (cL) to Liters (L)

Example #5: Convert .5 kilograms (kg) to grams (g)

1.3 The Birth of a Theory: The Big Bang

- Once a hypothesis has been tested and generally accepted, it may lead to the development of a theory
 - **theory** – a _____ that is supported by the results of experimentation and observation
- Once a theory is well established through research and experimentation, it may become a scientific law
 - **scientific law** – a _____ that correctly describes a natural phenomenon
- Light and the Doppler Effect
 - Scientist Isaac Newton observed that sunlight passing through a glass prism produced a _____ of colors. He named this display the _____.
 - We know now that light travels in _____
 - The distance from the crest of one wave to the crest of the next is a _____. *Indicate one below.*



- Each color in the spectrum has a different wavelength – _____ with the longest and _____ with the shortest.
 - _____ is a good way to remember the order of colors in the spectrum of light
 - As light passes through a prism, each wavelength is bent at a different angle and the band of colors results.
 - Chemical elements also produce spectra (when heated).
 - _____ – a substance that has a characteristic set of physical and chemical properties
 - When heated, these elements produce their own _____ - _____ spectrum of emitted light. These can be used to identify the element, like a unique set of _____.
 - When a light source is moving toward an observer, the wavelengths of the light produced appear _____ (blue). When moving away, the wavelengths appear _____ (red). This shift is called the **Doppler effect**.

- Evidence: Red Shift
 - **spectroscope** – an instrument with a prism that splits _____ into a spectrum
 - Scientists used the spectroscope to determine what elements were present in the _____
 - For example, the sun is about 92% hydrogen and almost 8% helium
 - The spectra of most galaxies (or large systems of stars) were shifted toward the _____ end of the spectrum. This red shift indicates that almost all of the galaxies in the universe are moving away from the _____.
 - Why is this observation important?
 - They determined the universe is _____.

- A Theory Emerges
 - What caused the universe to expand in the first place?
 - Hypothesis: Billions of years ago, all the matter and energy in the universe was compressed into an extremely small volume. About 15 billion years ago, a sudden event called the _____ sent all matter and energy hurtling outward in a giant cloud. As the cloud expanded, some of the matter gathered into clumps that evolved into _____.
 - But if this was the case, wouldn't the energy left from the explosion be evenly distributed throughout the expanding universe?
 - In the 1960s, researchers detected low levels of energy, called **background** _____, evenly distributed throughout the universe.
 - Because of the abundant evidence and widespread acceptance of the big bang hypothesis, this explanation of the origin of the universe became known as the **big bang** _____.