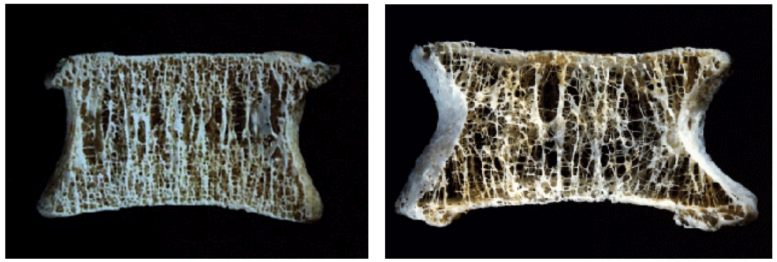
# NASA Spotlite
# Interactive Lesson

## Density
## Grades 5-8



Source: Mosekilde, L. Z rheumatol 2000;59:Suppl 1:1-9

*Figure 1: Normal bone on left compared to osteoporotic bone.*

## Student Packet

# NASA Spotlite Interactive Lesson Guide

## What are NASA Spotlites?

NASA Spotlites are 90-120 second student-produced video segments that address common science misconceptions.

NASA Spotlites are designed to increase scientific literacy in a standards-based classroom. By producing Spotlite videos, students gain production experience, as well as deepen their understanding of science content. Approved NASA Spotlites can be found at the NASA eClips™ website.
https:nasaeclips.arc.nasa.gov


A misconception is a view or opinion that is incorrect because it is based on faulty thinking or understanding.

This is an Interactive PDF. Features in this packet may include:

- fillable boxes
- quick checks
- multiple choice questions
- interactive GIFs (graphics interchange format)
- links to videos and online interactives

The hyperlinks included in this document open PDFs or webpages and may perform differently based on the device being used. Links may have to be cut and pasted into a web browser to open. PDFs and other documents may need to be downloaded to view.

*Try using Adobe Acrobat Reader and Flash Player for optimal performance of all interactive features included in this guide.*


Remember to save your responses.
Under "file" choose "save as." Type your name in front of the document name. Choose "save."

# Pretest

## Density Pretest
## NASA Spotlite Interactive Lesson

Read each question and select the best choice.

1. If the amount of a material (that is consistent throughout) changes, its density will:

Select the best answer.
A. increase dramatically
B. decrease slightly
C. remain the same
D. increase slightly

2. The _____ of an object is a ratio of the object's mass to its volume.

Select the best answer.
A. density
B. matter
C. weight
D. velocity

3. If an object's mass, relative to its _____, is unchanged, then its density remains constant.

Select the best answer.
A. velocity
B. weight
C. speed
D. volume

4. Students in a lab determined the density of 45 ml of water to be 1g/cm$^3$. Exactly 15 ml of water is removed.

What will be the density of the water?

Select the best answer.
A. 30 g/cm3
B. 15 g/cm3
C. 1 g/cm3
D. 45 g/cm3

5. Identify the correct formula for determining the density of a substance.

Select the best answer.
A. volume/mass
B. volume/weight
C. weight/mass
D. mass/volume

# Engage

### Today's Lesson

In today's lesson you will learn about density. Using interactive Frayer Models, you will learn key vocabulary that will help you form a clearer understanding of the characteristics of density and how density is calculated.

What do you already know about density?

**True or False:** The density of a sample material is dependent on the amount of the material present.

| Select the best answer. |
| --- |
| True |
| False |

### Spotlite Video

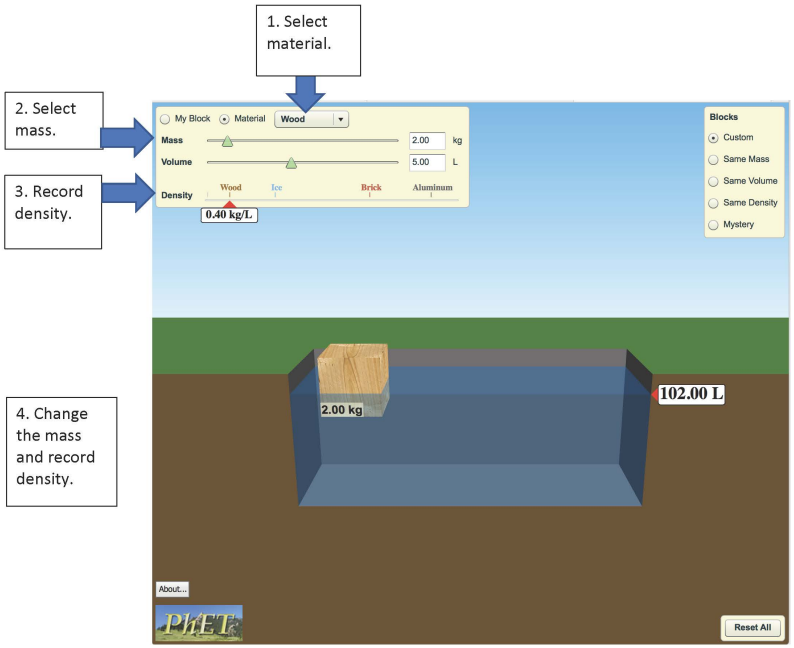
Next, you will watch a short video about density. As you watch the video, pay close attention to any new vocabulary.


**Video Link- NASA Spotlite: Are You Dense?**
NASA eClips™ Website - https://nasaeclips.arc.gov
NASA eClips™ YouTube - https://youtu.be/JfYWe9q0hck

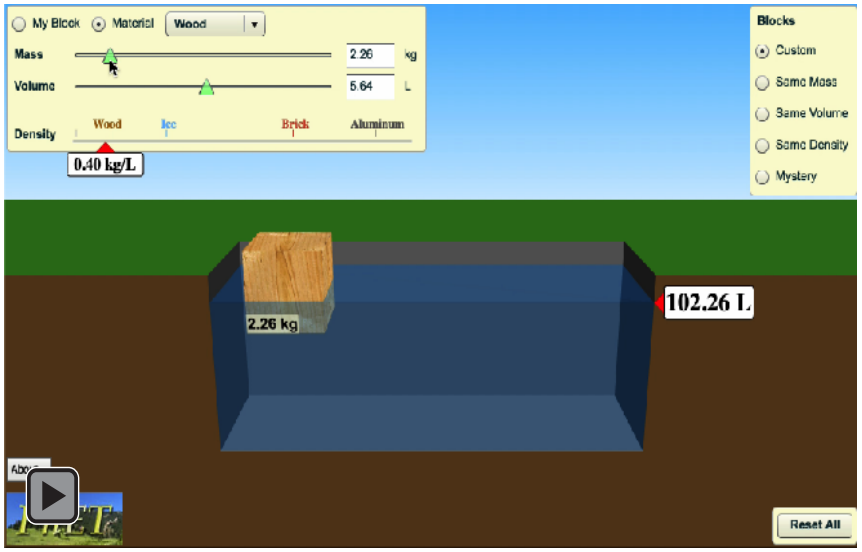
# Explore

## Explore Activity

In this PhET simulation you can see the buoyancy of objects made with different materials. When you change the mass of an object does the density of that object change?




Link to simulation- https://phet.colorado.edu/sims/density-and-buoyancy/density_en.html




Press play to see a screen capture of the simulation.

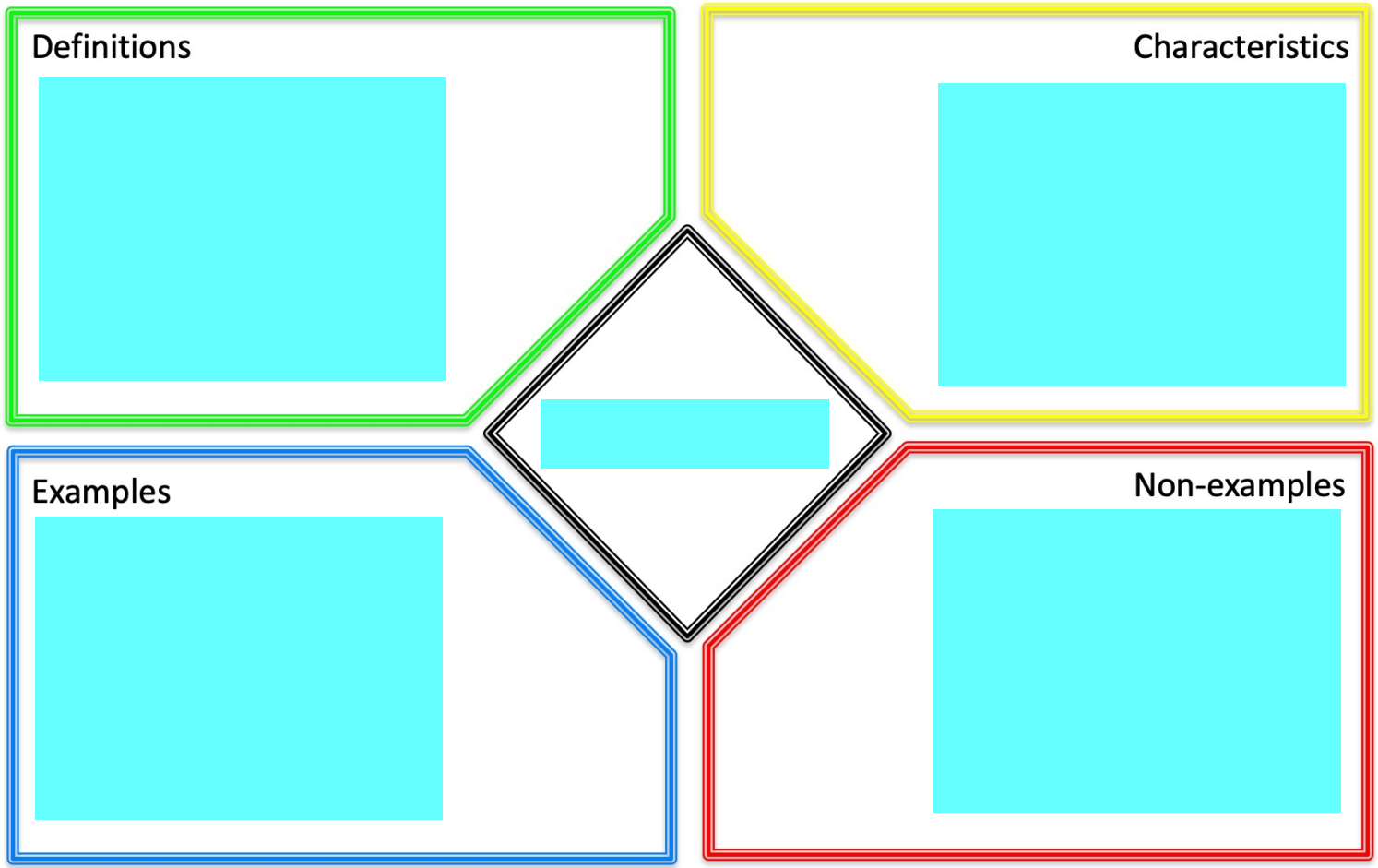
**Think-Pair-Share**

What did you learn about how mass affects the density of an object? Give some examples to support your statement.

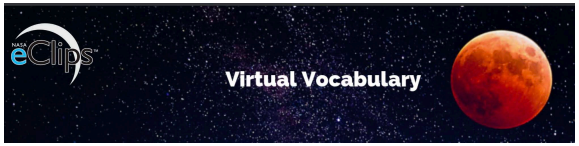
# Explain

**Frayer Model for Vocabulary Development**

Use the graphic organizer to write definitions, characteristics, examples and non-examples for a vocabulary word. You can include drawings, graphics, and diagrams.




**Visit the NASA eClips™ Virtual Vocabulary for more definitions.**



# Elaborate/Extend

## NASA Connection

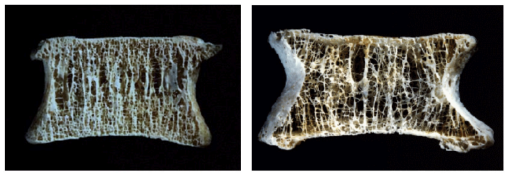
### Bone Density

When traveling in space, one specific area of concern is bone density, which is a measure of how strong the bone is. Bone density is measured by the amount of mineral in a skeletal area, and this measurement is called Bone Mineral Density (BMD).

Bone loss increases when the human body is in a reduced gravity environment. Astronauts on the ISS, or on a future long-duration mission, may lose an average of 1% BMD per month while in space. An astronaut's bones may weaken in a way similar to osteoporosis. Osteoporosis is a condition in which bones have lost minerals, especially calcium, making them weaker, more brittle, and susceptible to fractures.

Use the definition of density to explain why the normal bone and the osteoporotic bone pictured above would have different densities.

normal bone



osteoporotic bone

Source: Mosekilde, L. Z rheumatol 2000;59:Suppl 1:1-9

*Figure 1: Normal bone on left compared to osteoporotic bone.*

You have a heterogeneous block of cheese (it has the same materials throughout). You slice off and eat a section of the cheese. How does that affect the density of the remaining cheese?

# Evaluate

### Identify Misconception

What is a common misconception about the density of materials and how can you correct it?

Carefully rewatch the NASA Spotlite video to assess your understanding of the density of materials.


**Video Link- NASA Spotlite: Are You Dense?**
NASA eClips™ Website - https://nasaeclips.arc.gov
NASA eClips™ YouTube - https://youtu.be/JfYWe9q0hck

### Vocabulary Review

Fill-in-the-blanks activity using vocabulary about density. Some words may be used more than once.

1)____ is the amount of matter for a given volume. mass

Density is calculated by dividing the amount of matter, or 2)___ , by the amount of space, or 3)___ , it occupies. mass mass

If a material is the same throughout, a change in the size of the material will not change its 4) ___. mass

# Posttest

## Density Posttest
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C. speed
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# Product Information

Image Credits:

**Cover**
bone density - https://www.nasa.gov/audience/foreducators/microgravity/lessons/index.html

**Vocabulary**
atom - https://commons.wikimedia.org/wiki/File:Atom-1472657.png
Law of Conservation of Matter - https://pixabay.com/vectors/chemical-reaction-experiment-flask-24562/ and https://www.ck12.org/chemistry/law-of-conservation-of-mass/lesson/Conservation-of-Mass-MS-PS/
ratio - https://commons.wikimedia.org/wiki/File:P_fraction.svg
mass - https://commons.wikimedia.org/wiki/File:Simple_balance_scales-02.jpg
density - https://www.losangeles.af.mil/News/Photos/igphoto/2001500817/
volume - https://www.nasa.gov/image-feature/vitamin-d-analysis

**Elaborate/Extend**
cheeses - https://goo.gl/images/BjfMxV

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