

HOW DO SHIPS FLOAT?

BUOYANCY, DENSITY, & FLOATING OBJECTS

6TH, 7TH, 8TH GRADE READING

Improve students'
literacy skills

Sub Plan

Science Applicability



Reading Comment



★★★★★ Extremely satisfied - Great resource to work on student reading comprehension and it tied into the topic I was teaching. My students have been struggling with reading and I've been incorporating more reading into my lessons. Thank you for the resource.



SCROLL
to take a look inside!

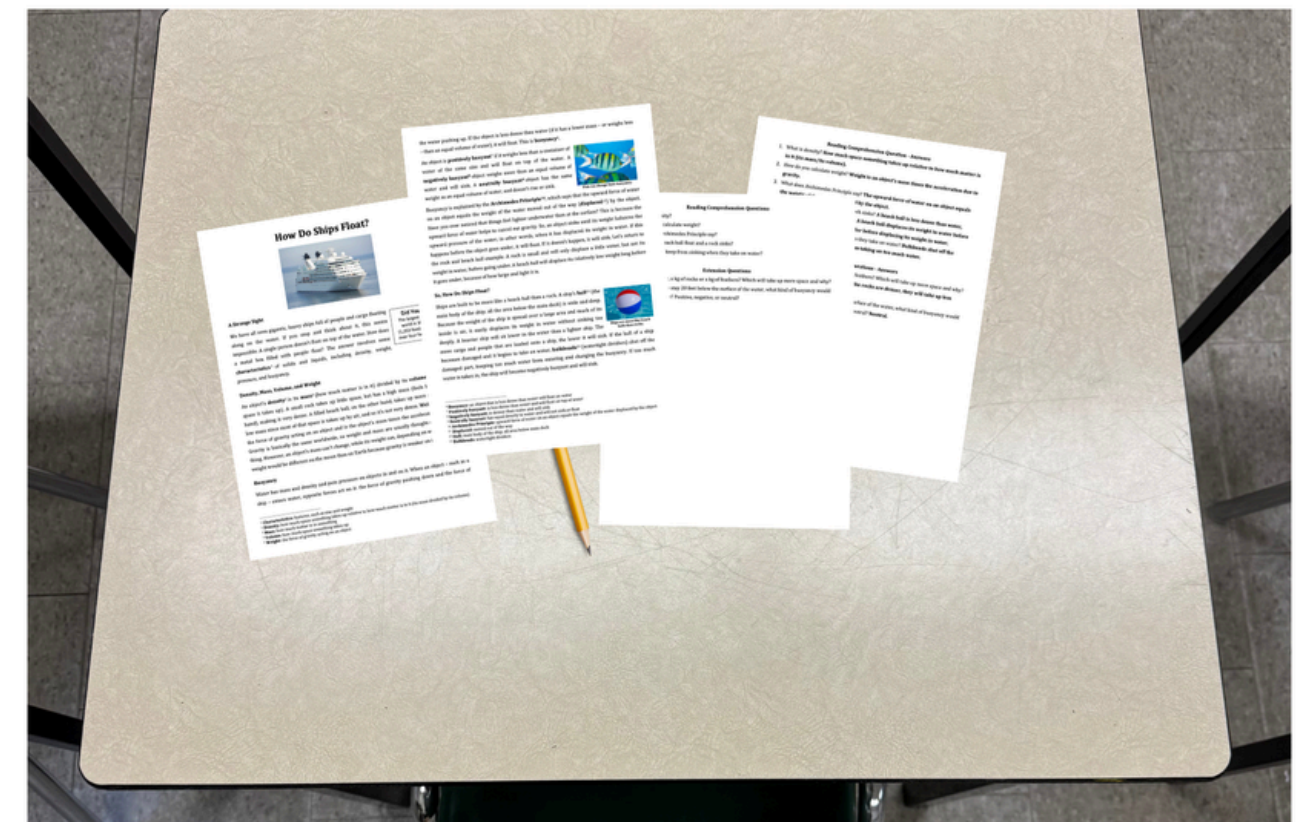


THE PROBLEMS YOU FACE

- Limited time to teach scientific literacy and strengthen students' reading and analysis skills.
- Need meaningful extension activities to engage fast-moving learners.
- Difficulty creating effective last-minute sub plans that still support student learning.

NO-PREP - PRINT/UPLOAD

- Questions and Answer Key
- **No Prep, Ready-to-Use:** Print or assign digitally with Google Docs, Microsoft Word, and PDF formats for flexible classroom use
- **Includes Varied Question Types:** Knowledge, thinking, connecting, application, and open-ended questions.



What Will Your Students Learn?

READING COMPREHENSION ARTICLE & QUESTIONS

- Density vs mass vs volume vs weight
- Buoyancy
- Positive, Negative, and Neutral Buoyancy
- Archimedes Principle
- So, how do ships float?

Reading Comprehension Questions

1. What is density?
2. How do...
3. What do...
4. Why do...
5. How do...

How Do Ships Float?



A Strange Sight

We have all seen gigantic, heavy ships full of people and cargo floating along on the water. If you stop and think about it, this seems impossible. A single person doesn't float on top of the water. How does a metal box filled with people float? The answer involves some characteristics of solids and liquids, including density, weight, pressure, and buoyancy.

Did You Know?
The largest ship in the world is 382 meters (1,253 feet) long! That's over four football fields!

Density, Mass, Volume, and Weight

An object's **density**² is its **mass**³ (how much matter is in it) divided by its **volume**⁴ (how much space it takes up). A small rock takes up little space, but has a high mass (feels heavy in your hand), making it very dense. A filled beach ball, on the other hand, takes up more space but has low mass since most of that space is taken up by air, and so it's not very dense. **Weight**⁵ is simply the force of gravity acting on an object and is the object's mass times the acceleration of gravity. Gravity is basically the same worldwide, so weight and mass are usually thought of as the same thing. However, an object's mass can't change, while its weight can, depending on where it is. Your weight would be different on the moon than on Earth because gravity is weaker on the moon.

Buoyancy

Water has mass and density and puts pressure on objects in and on it. When a ship enters water, opposite forces act on it. The water's buoyancy pushing d...

Article with
Comprehension
Questions

6th, 7th, 8th Grade

Print & Digital

PDF



Your Reading

How Do Ships Float?



A Strange Sight

We have all seen gigantic, heavy ships full of people and cargo floating along on the water. If you stop and think about it, this seems impossible. A single person doesn't float on top of the water. How does a metal box filled with people float? The answer involves some **characteristics**¹ of solids and liquids, including density, weight, pressure, and buoyancy.

Density, Mass, Volume, and Weight

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Buoyancy

Water has mass and density and puts pressure on objects in and on it. When an object enters water, opposite forces act on it: the force of gravity pushing down and the force of buoyancy pushing up.

¹ **Characteristics:** features, such as size and weight

² **Density:** how much space something takes up relative to how much matter is in it (its mass divided by volume)

³ **Mass:** how much matter is in something

⁴ **Volume:** how much space something takes up

⁵ **Weight:** the force of gravity acting on an object

the water pushing up. If the object is less dense than water (if it has a lower mass – or a lower density – than an equal volume of water), it will float. This is **buoyancy**⁶.

An object is **positively buoyant**⁷ if it weighs less than an equal volume of water of the same size and will float on top of the water. A **negatively buoyant**⁸ object weighs more than an equal volume of water and will sink. A **neutrally buoyant**⁹ object has the same weight as an equal volume of water, and doesn't rise or sink.



Fish can change their density.

Buoyancy is explained by the **Archimedes Principle**¹⁰, which says that the upward force on an object equals the weight of the water moved out of the way (**displaced**¹¹) by the object. Have you ever noticed that things feel lighter underwater than at the surface? This is because the upward force of water helps to cancel out gravity. So, an object sinks until its weight equals the upward pressure of the water; in other words, when it has displaced its weight in water. If it happens before the object goes under, it will float. If it doesn't happen, it will sink. Like the rock and beach ball example. A rock is small and will only displace a little water. A beach ball will displace its relatively low weight in water, before going under. A beach ball will displace its relatively low weight in water, before going under, because of how large and light it is.

So, How Do Ships Float?

Ships are built to be more like a beach ball than a rock. A ship's **hull**¹² (the main body of the ship; all the area below the main deck) is wide and deep. Because the weight of the ship is spread over a large area and much of its inside is air, it easily displaces its weight in water without sinking too deeply. A heavier ship will sit lower in the water than a lighter ship. The more cargo and people that are loaded onto a ship, the lower it will sink. If the hull becomes damaged and it begins to take on water, **bulkheads**¹³ (watertight dividers) can help keep the ship from sinking. A damaged part, keeping too much water from entering and changing the buoyancy. If water is taken in, the ship will become negatively buoyant and will sink.



Ships are like beach balls.

⁶ **Buoyancy:** an object that is less dense than water will float on water

⁷ **Positively buoyant:** is less dense than water and will float on top of water

⁸ **Negatively buoyant:** is denser than water and will sink

⁹ **Neutrally buoyant:** has equal density to water and will not sink or float

¹⁰ **Archimedes Principle:** upward force of water on an object equals the weight of the water displaced

¹¹ **Displaced:** moved out of the way

¹² **Hull:** main body of the ship; all area below main deck

¹³ **Bulkheads:** watertight dividers

Reading Comprehension Questions

1. What is density?
2. How do you calculate weight?
3. What does Archimedes Principle say?
4. Why does a beach ball float and a rock sink?
5. How do ships keep from sinking when they take on water?

Extension Questions

6. What is heavier, a kg of rocks or a kg of feathers? Which will take up more space and why?
7. If you wanted to stay 20 feet below the surface of the water, what kind of buoyancy would you need to have? Positive, negative, or neutral?

Reading Comprehension Question - Answers

1. **Density** is how much space something takes up relative to how much matter is in it (its mass divided by volume).

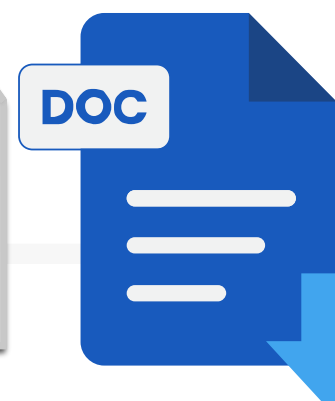
2. **Weight** is an object's mass times the acceleration due to gravity.

3. Archimedes Principle says: **The upward force of water on an object equals the weight of the water displaced by the object.**

4. A beach ball floats because it is **less dense than water**, so it displaces its weight in water before going under. A rock sinks because it is **more dense than water**. A beach ball displaces its weight in water before going under. A rock goes under before displacing its weight in water.

5. Ships keep from sinking when they take on water. **Bulkheads** shut off the water from taking on too much water.

Answer Key Included Office, Google, and PDF Versions

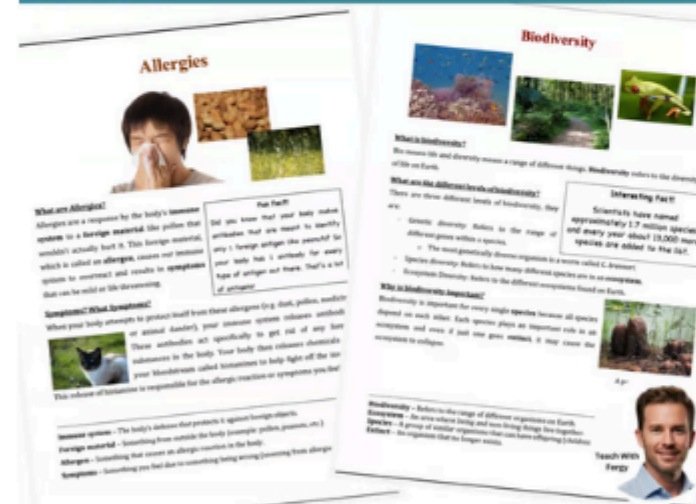


Comprehension and Extension Questions

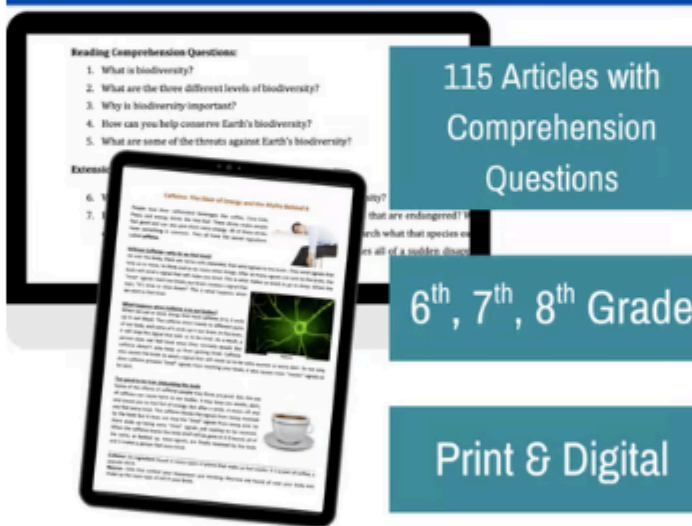
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115 Articles with
Comprehension
Questions

6th, 7th, 8th Grade

Print & Digital



★★★★★ Extremely satisfied - So many comprehensive readings for all science fields. PDF and DOCX versions included so they can be edited if needed. Each one includes short answer questions at the end, the first set are easy to find the answers to in the readings, the second set require a bit more critical thinking. Includes an answer key. Great to use to fill in time or for sub plans.

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