

Ferries: Pressure, Floating & Sinking

Why do some objects float and other sink?

Student Introduction

- ▶ This activity is all about understanding why some objects float on water whilst others sink.
- ▶ Can you find out why a heavy metal ferry doesn't sink?



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EXPERIMENT 1

- **Collect** some random objects.
- **Predict** which will float and which will sink.
- **Test** your predictions.
- **Why** do some objects float and others sink?

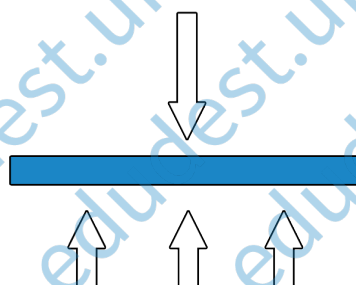
Do metal objects sink?



SINKS!

WEIGHT

UPTHRUST



FLOATS!

When you travel to the Isle of Wight you will cross the Solent on a Red Funnel ferry.

The ferry is made of metal, but it does not sink.

When it is full of cars, buses, trucks and people, it still does not sink. **WHY NOT?**



- » The ferry floats on the surface because it displaces a larger weight of water than its own weight.
- » To do this, the ferry needs a large surface area pushing down onto the water.
- » Other factors such as the material and shape of the vessel will affect its buoyancy.

EXPERIMENT 2

Experiencing Upthrust

- Use a **large container** half full of water, such as a bucket.
- Blow up and tie off a **balloon**.
- **Push** the balloon down below the surface of the water.
- The force you can feel pushing the balloon back up again is **upthrust**.

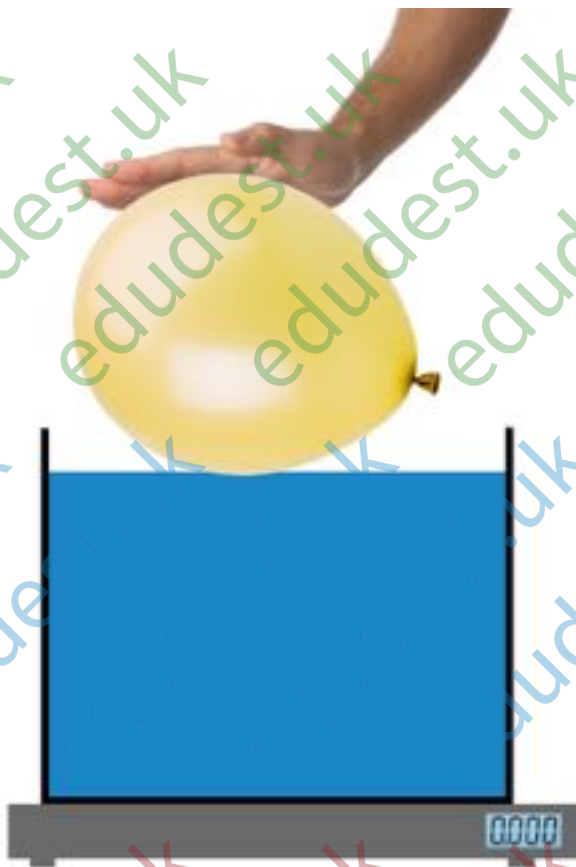


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EXPERIMENT 3

Measuring Upthrust

- **Stand** your container on a set of bathroom scales.
- **Take a reading**, or zero the display if this is a feature of the scales.
- As you push the balloon into the water **what happens** to the reading?

EXPERIMENT 4

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Displacement

- In the last experiment, did you notice how the level of water moved **upwards** as you pushed the balloon **down**?
- This is called **displacement**.
- The upwards force exerted on an object immersed in fluid is **equal to** the weight of the fluid displaced by the object.
- Look at the following diagrams. If you have the right equipment available, **try to reproduce it** using different masses.
- If not, study the diagrams carefully to understand what is happening here.

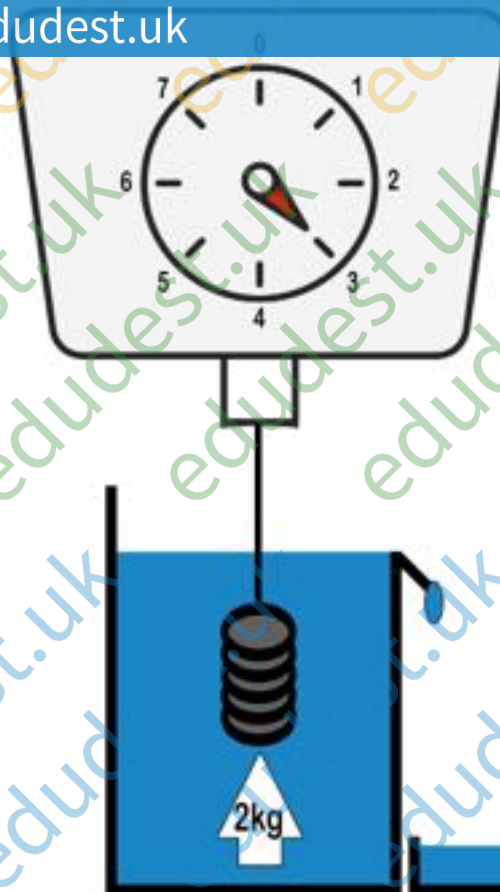
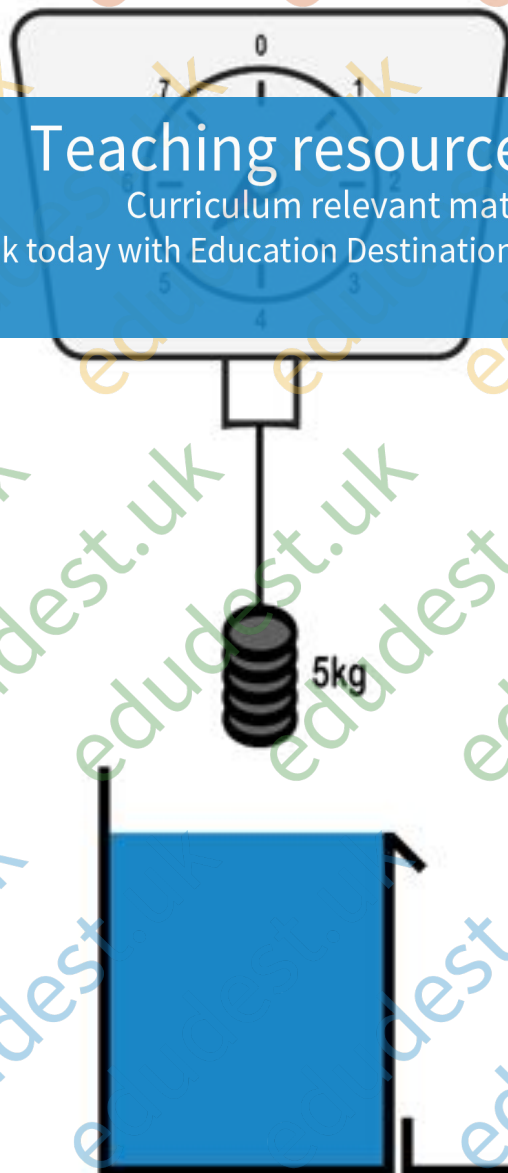


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This is **Archimedes' Principle**

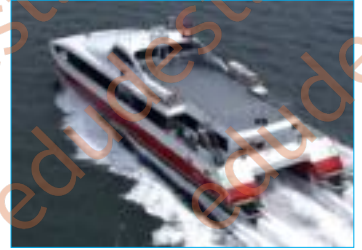
RESEARCH TASK

- Research the problem that Archimedes solved about the king's crown.



ON THE FERRY

The following exercises should be undertaken whilst on board the Red Funnel ferry.



► Different vessels have different shaped hulls.

► The hull of the boat needs to move through the water with as little friction as possible.

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Study the shape of their hull. You will be able to work out the shape of the hull by looking carefully at what you can see above the water line.

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✓ Draw some of the different types of hull below:



Type of vessel: _____



Type of vessel: _____



Type of vessel: _____



Type of vessel: _____



BACK AT SCHOOL

Does the type of liquid affect upthrust and buoyancy?

In this experiment we will compare a boat floating in salty water against the same boat floating in fresh water.

STEP 1

1. Make a **simple model boat** hull out of modelling clay.
2. Float it in a container of **very salty** water.
3. **Add** as many marbles as you can without your boat



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6. Add the **same number** of marbles to the boat as in the previous test.

What happens?

Fresh water is less dense than salty water, so there is less upthrust on the model boat.

STEP 2

1. Research: What did Samuel Plimsoll (1824 - 1898) do that made shipping safer?

