

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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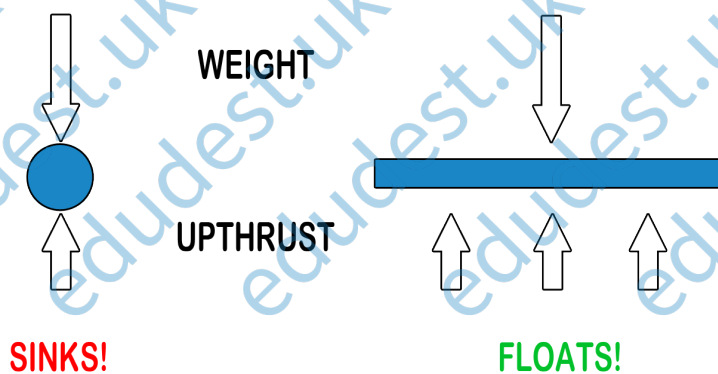
EXPERIMENT 1

- **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?

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**.

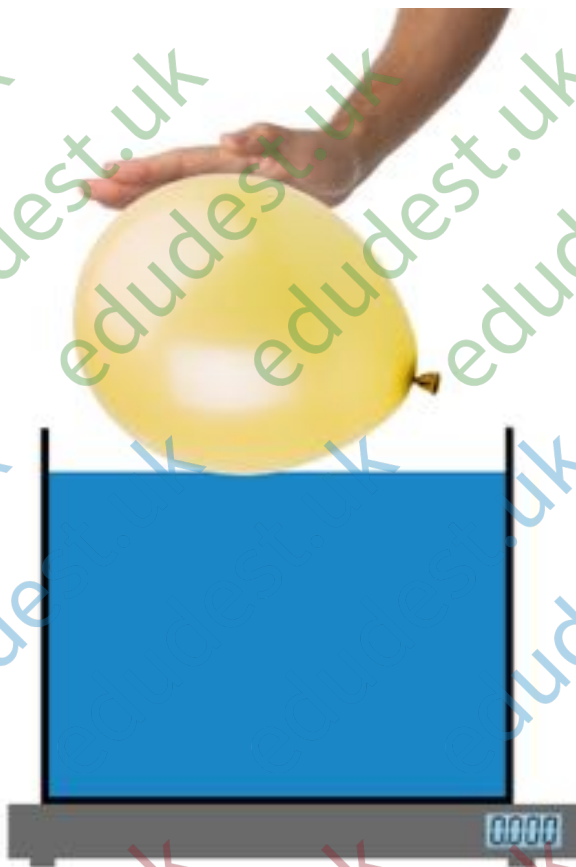


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EXPERIMENT 3

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.

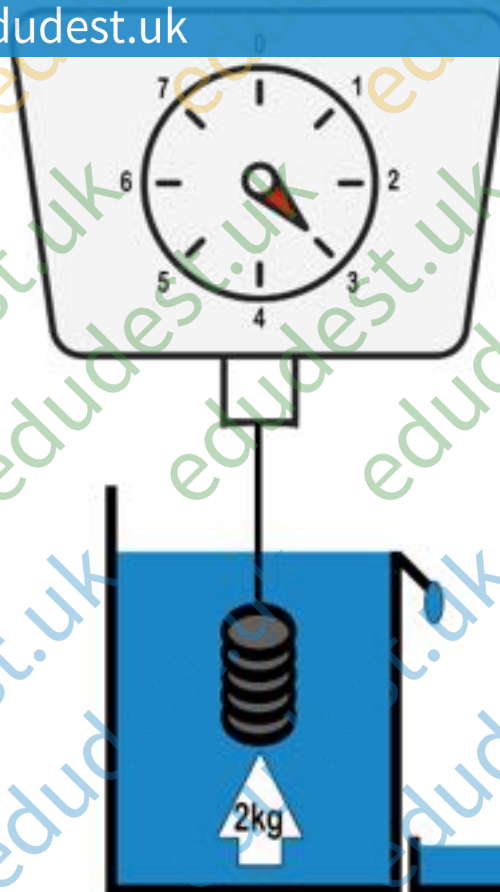
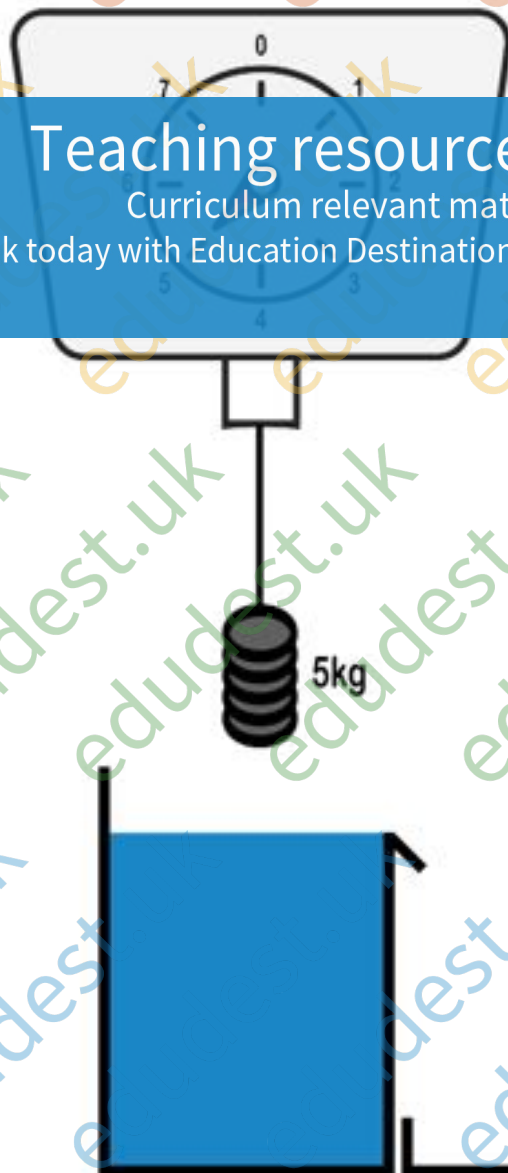


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This is **Archimedes' Principle**

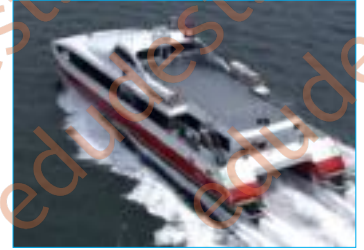
RESEARCH TASK

- 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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✓ Draw some of the different types of hull below:



Type of vessel: _____



Type of vessel: _____



Type of vessel: _____



Type of vessel: _____

- ▶ The Red Funnel vehicle ferry has a **flatter** hull than the Red Jet passenger ferry.
- ▶ The vehicle ferry carries a greater load and travels at a lower speed. The shape of the hull allows a greater upthrust to support the heavy ferry.
- ▶ The smaller twin-hull Red Jet is able to move through the water more quickly.

Try to think about how the shape of the hull is related to the function of the vessel.

Shape of Hull	Function of the Vessel

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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



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STEP 2

1. Now place your boat in a container of **fresh** water.
2. Add the **same number** of marbles to the boat as in the previous test.
3. **What happens?.**
4. Fresh water is less dense than salty water, so there is less upthrust on the model.

STEP 3

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



STEP 4

1. Add a Plimsoll line to your model boat or draw one suitable for your model in the space below.

