

Shipwrecked!

Will a ship sink faster if you increase the amount of salt dissolved in the water?

Notes

This is an investigation to see how adding salt to water affects the buoyancy of objects. You can show the students the Dead Sea after the investigation. They make a 'ship' and time how long it takes to sink in a beaker of water. They add salt to the water can see how this changes the time it takes the ship to sink.

An alternative is to measure the amount of time it takes a rubber ball to sink down a large measuring cylinder.

Resources needed

Salt. You will need a lot of salt. Have it measured out into 50g amounts in beakers/cups for each group

Stopwatches

Plasticine (this sinks very quickly), plastic boat, tin foil

Large beakers/tray/bowl

or

Rubber balls

Large measuring cylinders/jugs/cups

Salt

Stopwatches

Identifying variables

Independent: The amount of salt

Dependent: The time it takes the 'ship' to sink

Control: The ship used

The volume of water

The amount of salt in each spoon/spatula

Method

Students make a 'ship' out of something and make a hole in the bottom. They place the ship in a large beaker of water and time how long it takes the ship to sink. They add spoons/spatulas of salt, then repeat the experiment.

You can use plasticine for this, but my experience of this has been negative. The plasticine sinks far too quickly to measure accurately. It needs to be spread out very thinly and it is easily deformed when retrieved from the water. An alternative is to get a plastic weigh boat, Sellotape on a 10g mass and make a hole in the bottom. Or they could be pre-prepared by super gluing a small piece of plastic or something to them.

You also need to use a large beaker, preferably at least a 1l beaker. This means you have to add a substantial amount of salt to make an appreciable difference.

An alternative is to measure the amount of time it takes a rubber ball to sink down a large measuring cylinder/jug. I've not tried this, but I expect it would work much better. The only problem is retrieving the ball. You could have the ball on a string, or they could pour the water and the ball into a large beaker n between runs.

Risk assessment

A risk assessment is not necessary for this investigation.

Collecting results

The experiment should be done three times for each quantity of salt.

Presenting results

These results can be presented as a line graph of the amount of salt added against time.

Interpreting data

The students should be able to see that increasing the amount of salt decreases the time it takes the ships to sink. They can use their results to make a prediction on how long it would take to sink for a quantity of salt that you set for them. They could then test this prediction.

Conclusion

You may not want the students to write a conclusion for this, but here is a nice explanation of buoyancy taken from a website.

An object floats in a liquid if the object weighs less than the liquid it displaces. So the denser the liquid (the more mass for a given volume) the more objects will float in it. Adding table salt (NaCl) to water increases the mass of the water and also increases the volume. However, the volume increase is by a smaller fraction than the mass increase. So the density (mass/volume) increases.