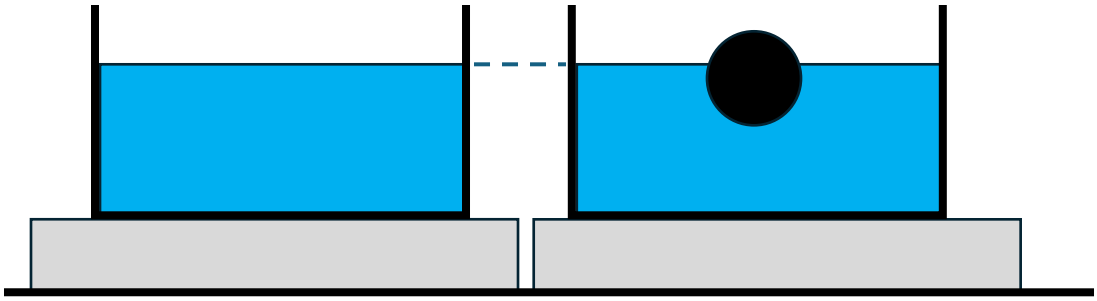
Teacher notes
Topic A

Two classic questions on buoyancy forces – great class discussion questions

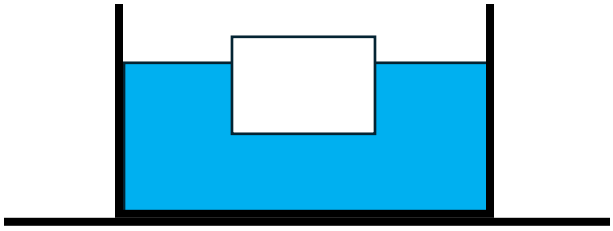
1. The diagram shows two identical containers filled with water. In the second container a ball floats in the water. The level of the water is exactly the same.



The containers are put on weighing scales.

Which weighs more?

2. A piece of ice floats in a container of water.



What happens to the level of the water when the ice melts?

Answer

1. The left weighing scale will show the weight of the container and the weight of the water.

   The one on the right will show the weight of the container, the weight of the water and the weight of the ball. But there is less water in the container on the right. It is less by the volume displaced by the floating ball. Since the ball floats, the weight of the ball is equal to the upthrust force which in turn equals the weight of the displaced water.

   Hence, we have a tie, they both weigh the same.

   In a class discussion the following is bound to come up: why does the scale record the weight of the ball since the ball is not touching the scale?

   The liquid exerts the upthrust force on the ball and so the ball exerts the same magnitude force downwards on the liquid. Since the upthrust force is equal to the weight of the ball the scale will read the weight of the ball as well.

2. Since the ice floats the weight of the ice is equal to the upthrust i.e. the weight of the displaced water. When the ice melts its weight stays the same. Hence the volume of the melted ice (now water) is equal to the volume of the displaced water. Hence the level of the water in the container stays the same.