



Chapter 7

Forces in Fluids

Section 2

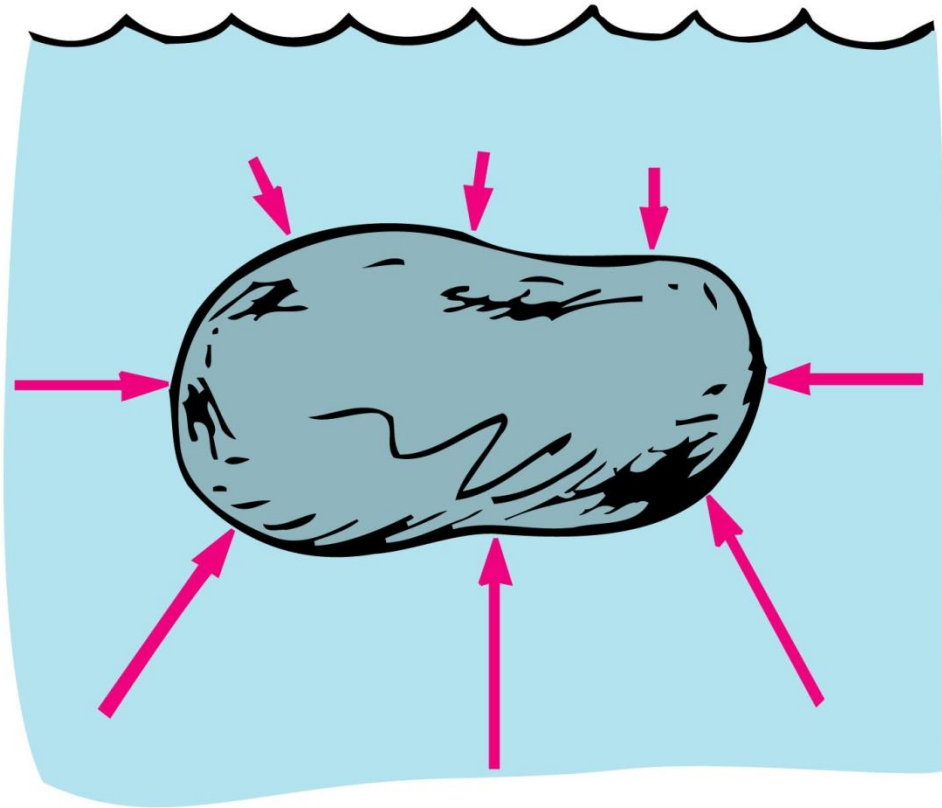
Buoyant Force



Essential Questions 7-2

- What is the relationship between fluid pressure and buoyant force?
- How can you predict whether an object will sink or float in a liquid?
- What role does density play in an object's ability to float?
- How can the overall density of an object be changed?

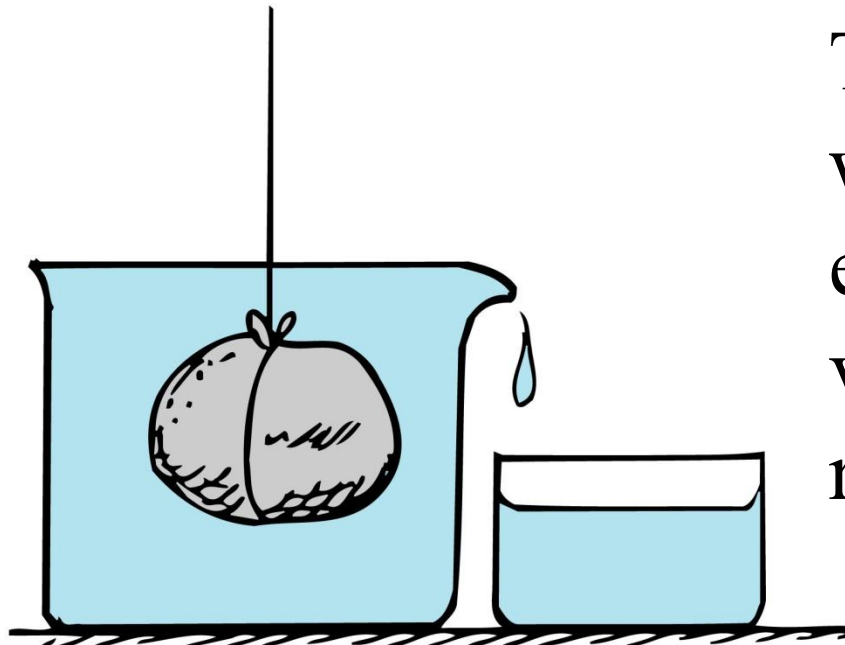
Buoyancy



Net upward
force is
called the
buoyant
force

Easier to
lift a rock
in water

Displacement of Water



The amount of water displaced is equal to the volume of the rock.



Archimedes' Principle

- *An immersed body is buoyed up by a force equal to the weight of the fluid it displaces.*
- The apparent weight of an object in a liquid is gravitational force (weight) minus the buoyant force

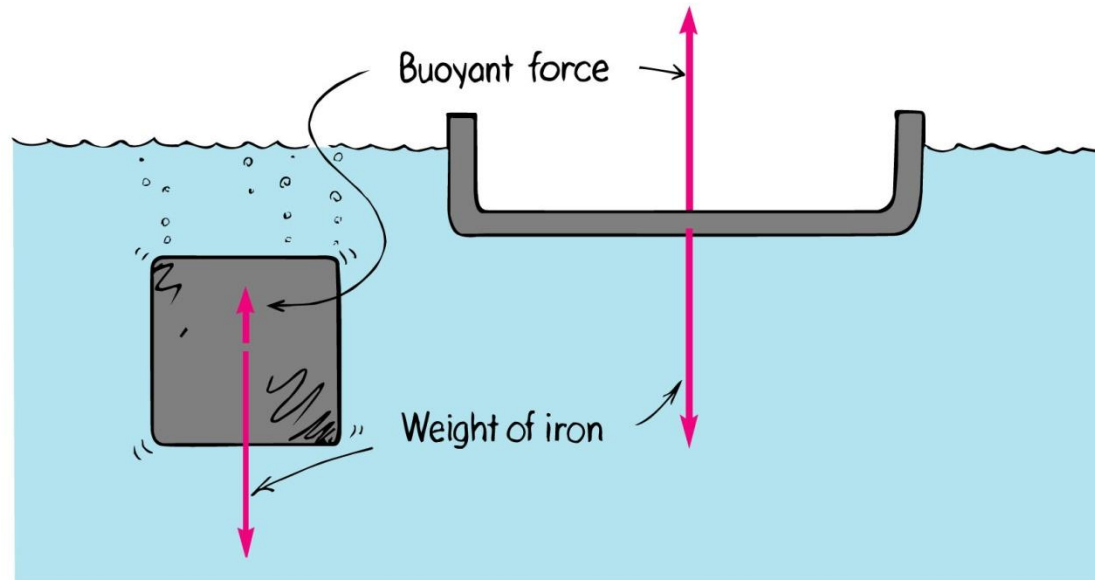
Sinking

If the buoyant force $<$ the force of gravity, then the object will sink

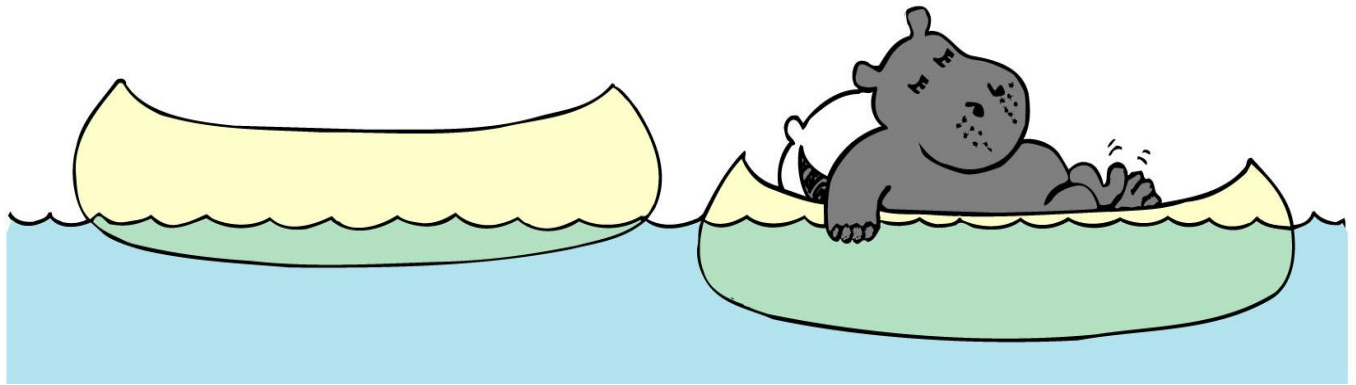


Flotation

- *A floating object displaces a weight of fluid equal to its own weight.*



Flotation



If the buoyant force = the force of gravity, then the object will float



Buoying Up

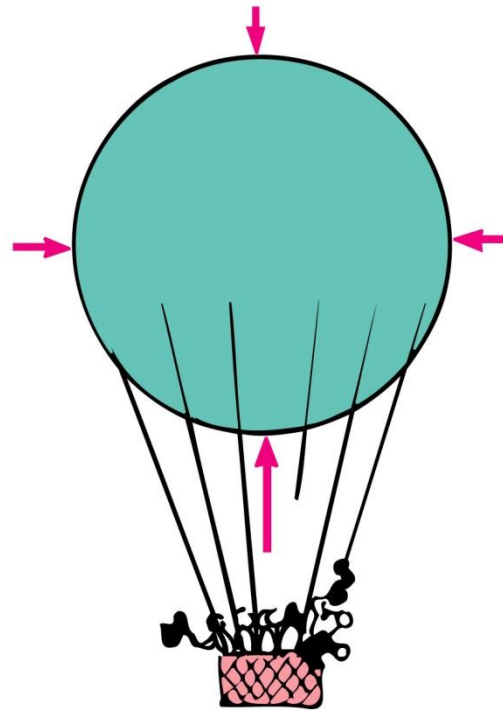
If the buoyant force $>$ the force of gravity, then the object will be buoyed up (pushed to the surface)



Buoyancy in a Gas

- *An object surrounded by air is buoyed up by a force equal to the weight of the air displaced.*
- Exactly the same concept as buoyancy in water. Just substitute air for water in the statement
- If the buoyant force is greater than the weight of the object, it will rise in the air

Buoyancy in a Gas



Since air gets less dense with altitude, the buoyant force decreases with altitude. So helium balloons don't rise forever!!!



Changing Overall Density

- A ship floats because of its' shape
- Submarines have ballast tanks to fill with water, this allows the sub to increase its' density to sink under the surface
- Fish use a swim bladder to change their density so they can go up and down in the water