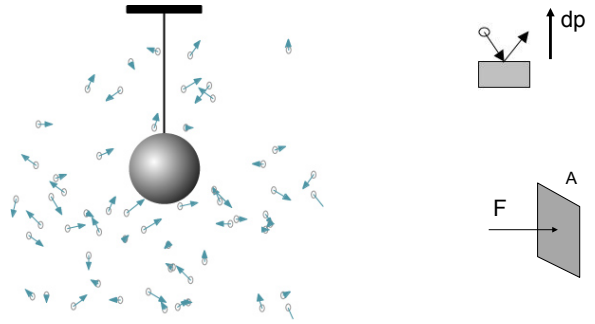
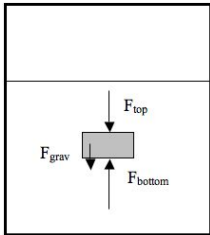


Contact forces due to a fluid



[Animation](#)

Pressure as a function of depth



Atmospheric pressure at sea level at 20 C is

$$1.01 \times 10^5 \text{ Pa}$$

The pressure relative to atmospheric pressure is called gauge pressure.

Example

The atmospheric pressure at the surface of Venus is about 90 times the Earth's atmospheric pressure at its surface. How far below the sea level in the ocean would you have to go in order to find the same pressure as on the surface of Venus? Assume that seawater is incompressible (i.e. its density is uniform) and is a static fluid. The density of seawater at 20 C and a pressure of 1 atm is $1.024 \times 10^3 \text{ kg/m}^3$.



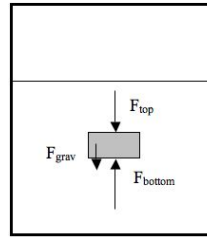
Poll

How far below the surface of water is the absolute pressure two times the pressure at the surface?

1. 1 m
2. 2 m
3. 10 m
4. 20 m
5. 100 m



Buoyant force



Poll

What variables does the buoyant force of a fluid on an object depend on?

1. Depth in the fluid
2. Density of the fluid
3. Mass of the object
4. How much of the object is submerged
5. All of the above
6. 1 and 2
7. 3 and 4
8. 1 and 4



Poll

An object is held at rest under water. It is completely immersed. If it is moved to a greater depth, does the buoyant force on the object increase, decrease, or remain constant?

1. Increase
2. Decrease
3. Remain constant



Poll

A piece of Styrofoam is held under water. When it is released, it travels upwards until it floats. As it is rising upward, but still completely immersed in the water, is the buoyant force greater than, less than, or equal to the weight of the object?

1. Greater than
2. Less than
3. Equal to



Poll

A piece of Styrofoam is held under water. When it is released, it travels upwards until it floats. As it is rising above the surface, does the buoyant force on the Styrofoam increase, decrease, or remain constant.

1. increase
2. Decrease
3. Remain constant



Poll

An object immersed in water falls to the bottom at constant speed. There is fluid resistance (drag) acting on the object of course. Is the buoyant force less than, greater than, or equal to the weight of the object?

1. Less than
2. Greater than
3. Equal to



Example

What percentage of the volume of an ice cube floats above water? The density of ice is $0.97 \times 10^3 \text{ kg/m}^3$.



Poll

The water level in a cup with ice is exactly at the edge of the top of the cup. After the ice melts, does the water level rise, fall, or remain the same?

1. Rises
2. Falls
3. Remains the same



Example

What is the buoyant force of air on a helium balloon? Assume that the balloon is a sphere of radius 10 cm. What mass of string should you hang on the balloon in the previous question so that the balloon floats in air at equilibrium?



Example

Suppose a 10-kg buoy has a volume of 1 m^3 . If the buoy is submerged and rises upward at a constant speed, what is the drag force on the buoy?



Example

Suppose that you want the buoy in the previous question to be suspended in water so that it neither rises to the top nor sinks to the bottom. How much water must be let into the buoy?