Pressure: \( P = \frac{F}{A} \)

- Perpendicular force \( F \), per unit area, \( A \).
- \( P \) increases with depth
  \( P_h = P_{atm} + \rho \cdot g \cdot h \)

Over to you …
Imagine holding two identical bricks under water. Brick \( A \) is partly submerged, while brick \( B \) is entirely underwater. The force needed to hold brick \( B \) in place is:
  - larger
  - the same as
  - smaller
  than the force required to hold brick \( A \) in place.

Over to you …
Imagine holding two identical bricks under water. Brick \( A \) is just beneath the surface of the water, while brick \( B \) is at greater depth. The force needed to hold brick \( B \) in place is:
  - larger
  - the same as
  - smaller
  than the force required to hold brick \( A \) in place.
Measuring pressure

Barometer
- What weight of fluid can the pressure support?

\[ P_A = P_{\text{atm}} + \rho gh \]

Gauge pressure
- We often measure the excess pressure above atmospheric pressure
  - Tyre pressure is about 3 atmospheres above atmospheric pressure
  - Blood pressure is 120:80 mm of Hg above atmospheric pressure

Blood Pressure measurement
- Diastolic phase
  - Heart expands
  - Low pressure
  - Blood to ventricles

- Systolic phase
  - Heart, ventricles contract
  - High pressure
  - Blood to arteries
Blood pressure measurement

120 mm Hg
80 mm Hg

Open to atmosphere

Archimedes' Principle

Upward buoyant force on an object immersed in a fluid is equal to the weight of the fluid displaced by the object.

FB = W_{fluid}

W_{object}

1.68 m of H₂O ~ 125 mm Hg
**Archimedes’ Principle**

- The two weigh the same.
- The glass with ice cubes weighs more.
- The glass without ice cubes weighs more.

Which weighs more?

- Two identical glasses are filled to the same level with water. One of the glasses has ice cubes floating in it. One of the glasses are filled to the same level with water.

**Over to you...**

---

**Buoyancy & the brain**

- Brain: average density = 1040 kg/m³
- Cerebrospinal fluid: average density = 1007 kg/m³

---

**Hot air balloons**

- (Buoyancy) Weight of air displaced by balloon when weight of air displaced by balloon.

---

**Two identical glasses are filled to the same level with water. One of the glasses has ice cubes floating in it. Which weighs more?**

- The glass without ice cubes weighs more.
- The glass with ice cubes weighs more.
- The two weigh the same.

Over to you...
Two identical glasses are filled to the same level with water. One of the glasses has ice cubes floating in it. When the ice cubes melt, in which glass is the level of water higher?

- The glass without ice cubes
- The glass with ice cubes
- It is the same in both.

Over to you...

A boat carrying a large boulder is floating on a lake. The boulder is thrown overboard and sinks. The water level in the lake (with respect to the shore) rises, drops, or remains the same. Explain why.

- It remains the same.
- It rises.
- It drops.

Over to you...

A boat carrying a large boulder is floating on a lake. The boulder is thrown overboard and sinks. The water level in the lake (with respect to the shore) rises, drops, or remains the same. Explain why.

- It remains the same.
- It rises.
- It drops.

Over to you...