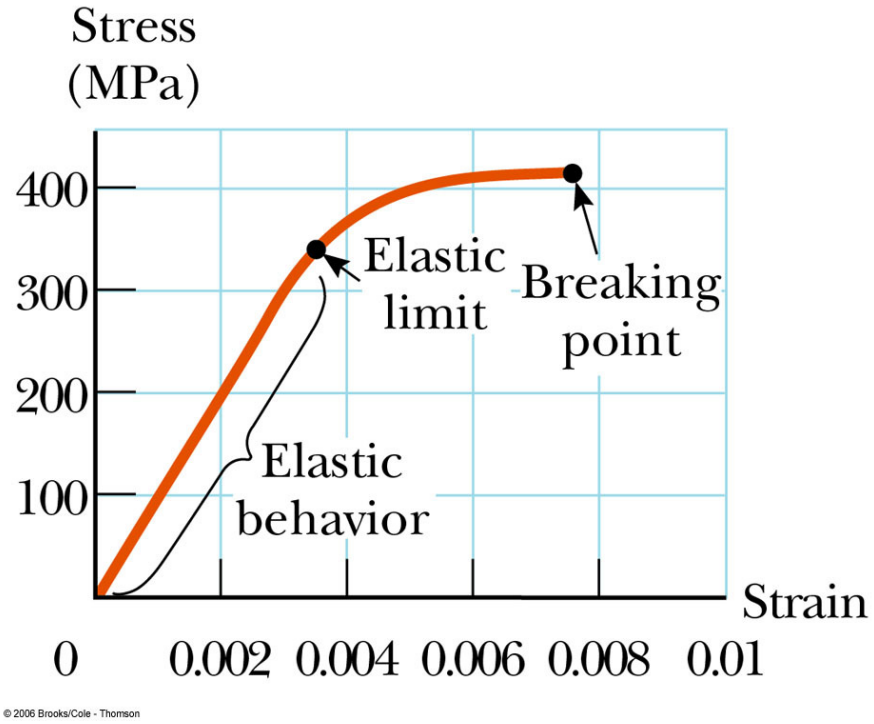
Physics 105 Class 16
SOLIDS, FLUIDS, & PRESSURE

Stress vs. Strain

Elastic Limit

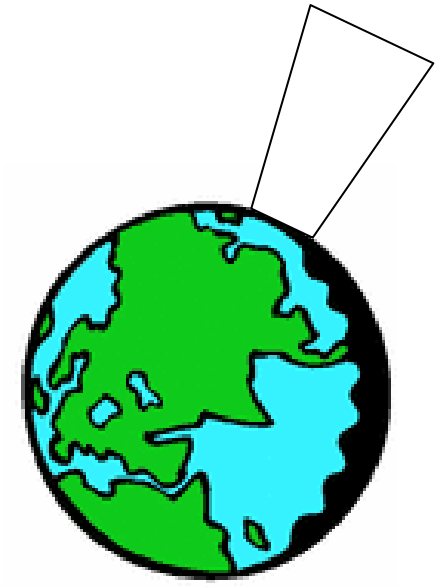


Pressure $$P = \frac{Force}{Area}$$

Why do they never show anyone *standing* on a bed of nails?

Atmospheric pressure: 14.7 lbs/in^2= 1.01x10^{5}N/m^2

Comes from…..



Density $$\rho = \frac{mass}{volume}$$

ρ_{water} = 1000 kg/m^3

ρ_{air} = 1.29 kg/m^3

Specific Gravity

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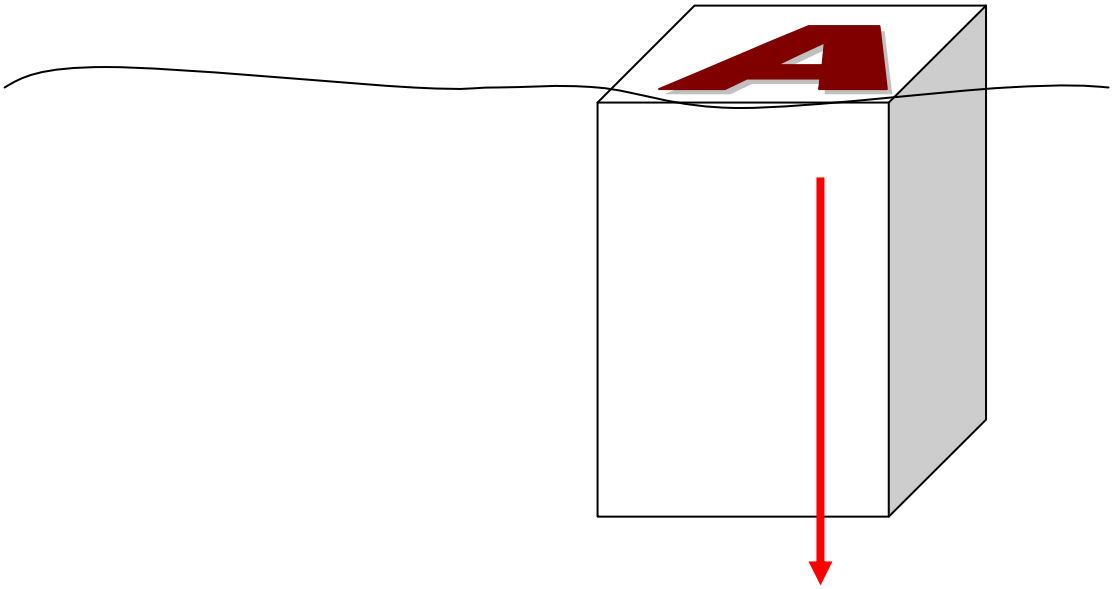
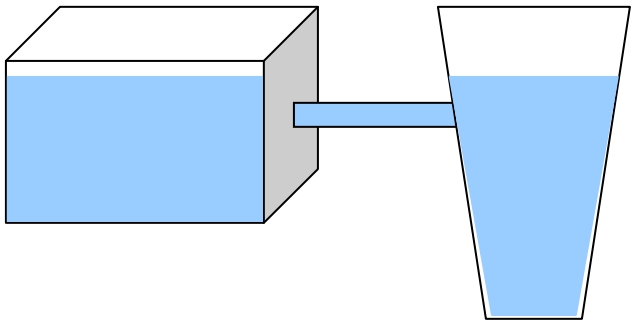
Pressure vs. depth in a fluid



Weight of water above some area A at a depth of *h*.

Pressure at h: (Include the pressure on the top of the fluid).

Pascal's principle: For a fluid at rest, the pressure in the fluid depends only on the depth, not the shape of the container.



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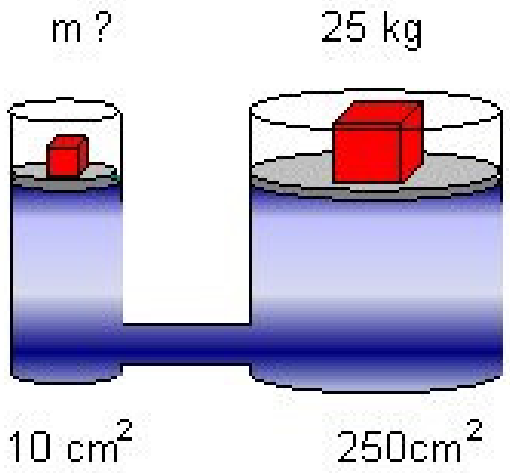
Pascal's principle and hydraulics



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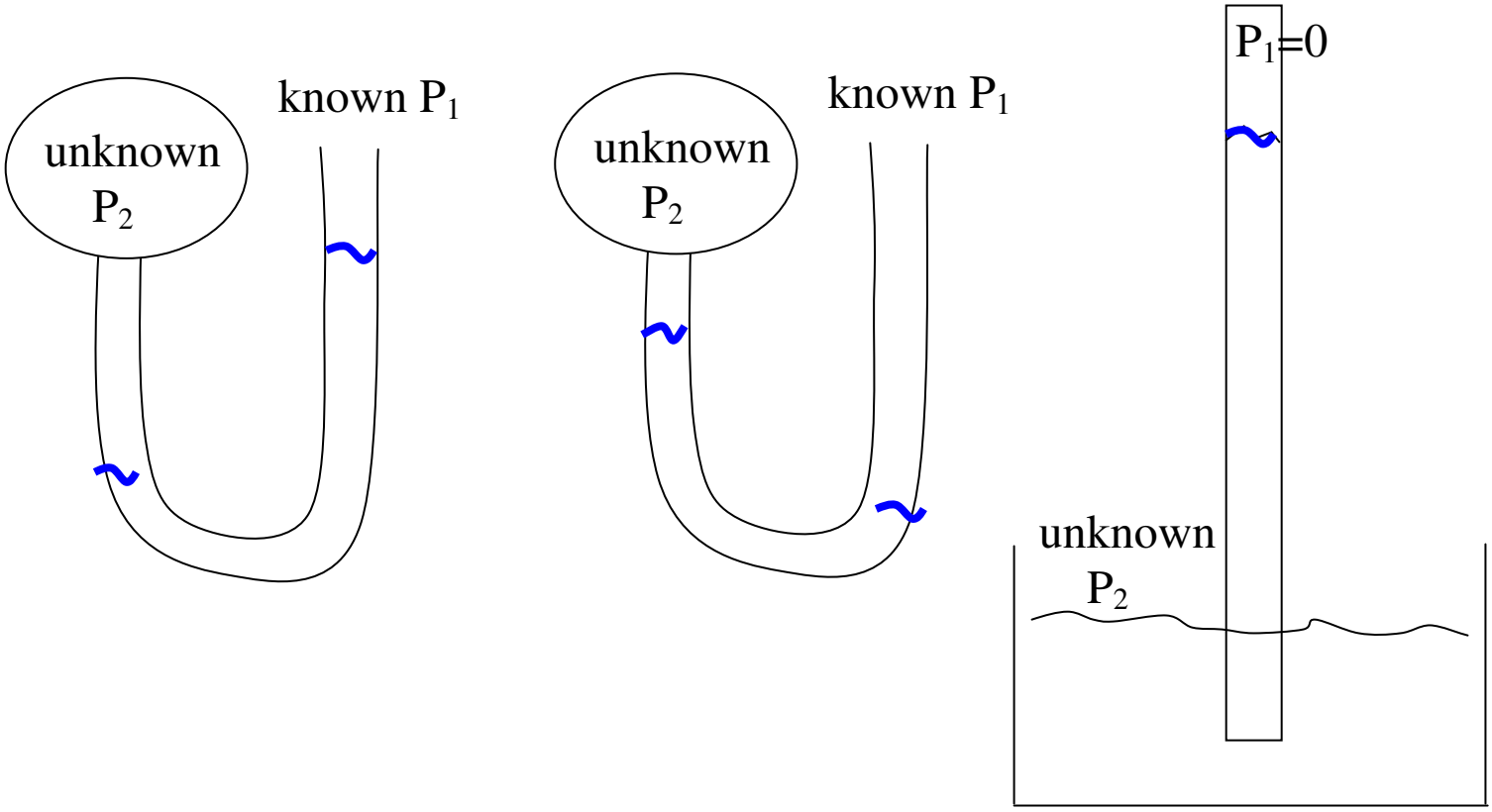
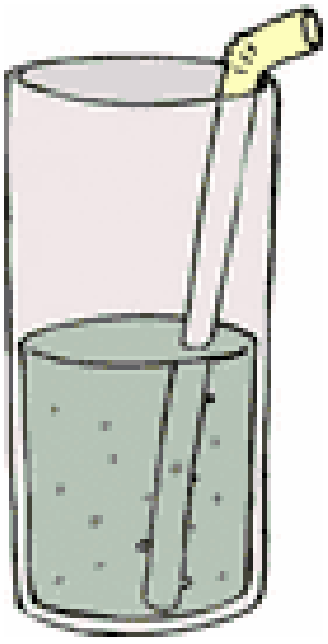
Manometers and Barometers

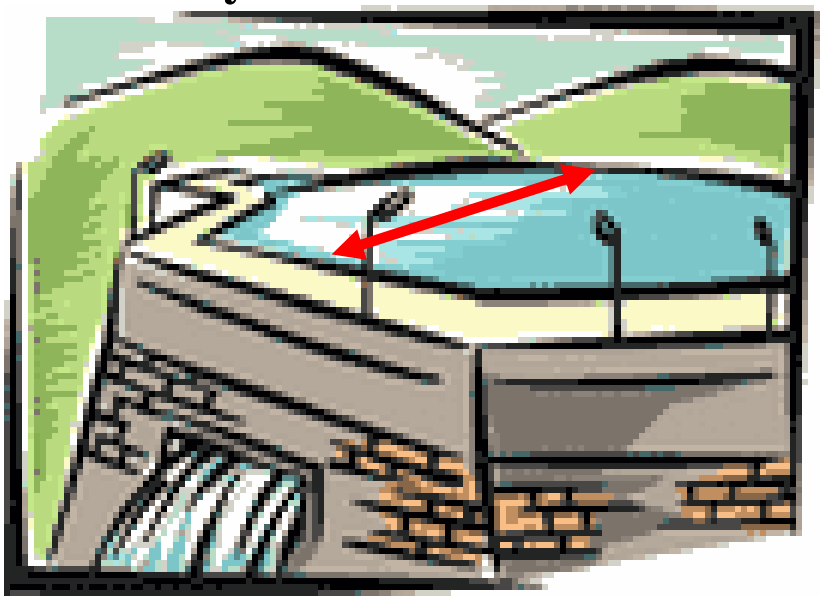


Absolute vs gauge pressure



How high can we lift a fluid with a vacuum?

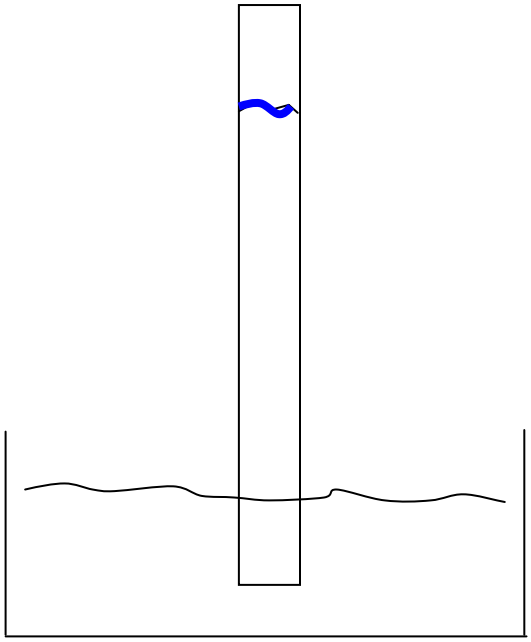
How do you lift water over mountains?



P1. For a longer canyon behind the dam (red arrow length), the dam _____

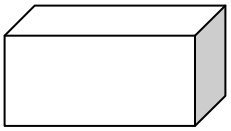
1. can be weaker
2. must be stronger
3. can be the same.

P2. On the moon, where gravity is less, but there is no atmosphere, if you pumped out the top of a barometer, the mercury would rise _____ compared to on earth.



1. higher
2. less high
3. the same
4. not at all

Buoyancy

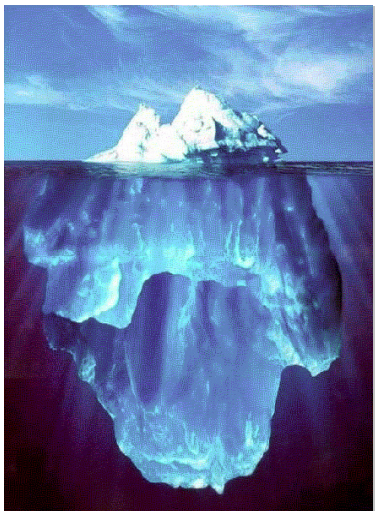


Where does it come from?

Force:

Potential energy:

Archimedes principle: The buoyant force is *always* the weight of the fluid that the object is displacing at the moment.



Objects will want to **sink** if

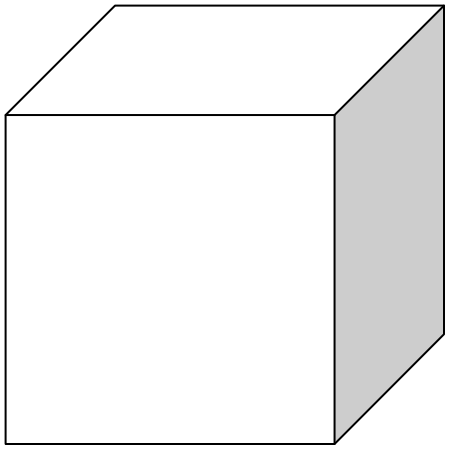
Objects will want to **float** if

They will rise out of the water until

Three cubes of the same size are **completely submerged** under water: lead, steel and wood.

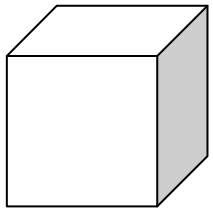
P3. The bouyant force is greatest on the _____ cube

1. lead
2. steel
3. wood
4. none…same



A cube of wood of size 2 m x 2m x 2m weighs 30,000 N. It is held all the way under the water with a chain.

Draw a FBD of the block



P4. What is the buoyant force on the wood?

P5. What tension is in the chain?

How much of the block will be submerged if the chain is removed?

How many men, of weight 1200 N each, could it hold before sinking (assuming it were stable)?

P8. A cannon is placed in a boat. The boat sinks more to displace more water. The amount of new water displaced is

1. a volume of water that weighs **more than** the cannon
2. a volume of water that weighs **as much as** the cannon
3. a volume of water that weighs **less than** the cannon

P9. If the cannon now falls from the boat into the water and sits on the bottom of the lake, the amount of water displaced by the cannon is

1. a volume of water that weighs **more than** the cannon
2. a volume of water that weighs **as much as** the cannon
3. a volume of water that weighs **less than** the cannon

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HOMEWORK HINTS: