Name _____

Density: $\rho = \frac{m}{Vol}$, measured in kg/m^3, where $Vol = l * w * h = A * h$

Pressure: $P = \frac{F}{A}$, Force/Area, measured in $N/m^2 = Pa$ (Pascal: SI Unit)

Atmospheric pressure $=1$atm$=1.013 \times 10^5 Pa = 760 mmHg = 14.7psi(lb/in^2)$

$\Delta P = \rho g h$: $\Delta P =$ change in pressure (in Pa), $\rho=$ density of fluid, $h=$depth in fluid

Absolute Pressure = Gauge Pressure + 1 atm

1. What is the mass of air in a room that is 15m x 20m x 6m? The density of air is $1.293 kg/m^3$.

2. A vacuum pump used to preserve wine uses a rubber stopper and a plunger, which takes air out of the bottle each time it is pulled up and down. Why does it get harder and harder to pull the stopper off the bottle with each pump?

3. Could you use a straw to sip a drink on the moon? **A**:Yes, **B**:No

4. What is the maximum pressure a 65kg woman wearing high heels exerts on the ground if the total area of one shoe is $1cm^2$.

5. What is the purpose of water towers in cities (other than storing water)?

6. Blood plasma flows from a bag through a tube into a patient's vein, where the blood pressure is 12 mmHg (1600 Pa). The density of blood plasma is about $1025 kg/m^3$. What is the minimum elevation the bag must be placed so that the plasma flows into the veins?

7. Humans can withstand about 4 atmospheres of pressure above normal atmospheric pressure. How deep can humans dive, unassisted, in freshwater, which has a density of $1000 kg/m^3$?

Can a person dive even deeper in seawater, which has a density of $1025 kg/m^3$? **A**:Yes, **B**:No, **C**:Same as freshwater

8. If the tire pressure gauge for a bike tire reads 120psi, what is the actual pressure inside the tires, in atm?

$\Delta P = \rho gh$: $\Delta P =$ change in pressure (in Pa), $\rho=$ density of fluid, $h=$depth below reference pt

Area of circe: $A = \pi r^2$

Pascal's Principle: Pressure in a fluid only depends on depth.

If input and output are at same depth then $P_{in} = P_{out}$, so $\frac{F_{in}}{A_{in}} = \frac{F_{out}}{A_{out}}$

9. The Mariana trench is located on the floor of the Pacific Ocean at a depth of 11km . The density of seawater is $1025kg/m^3$. What is the absolute pressure in Pascals at that depth?

How many atmospheres is that?

What force would the water exert on a circular window with a radius of 0.1m?

Compare that force to the weight of an airplane with a mass of 1.2×10^5kg.

10. Rank the points A,B,C,D,E from the lowest pressure to the highest.
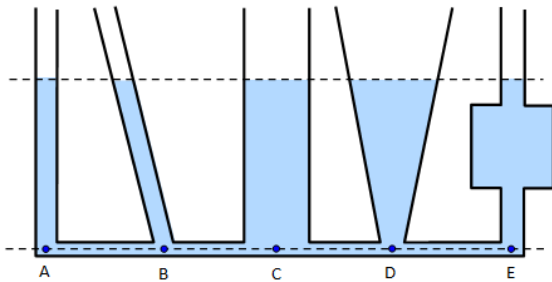
11. How much input force would you need to apply to lift a car of mass $2000kg$ if the radius of the input piston is $0.01m$ and the radius of the piston lifting the car is $0.2m$, and the input and output pistons are at the same height?