LHS Physics I

Force and Pressure
Pascal's Principle

Review: (not on test)

Properties of Static Fluids

The properties useful for describing a static fluid at a point are:

Density: Mass of a given volume of the substance divided by its volume, given by

ρ = Density

$$\rho = \frac{m}{V}$$

Unit: metric unit is kg/m^3, often expressed in g/cm^3.

Be able to do the conversions from g/cm^3 to kg/m^3.

Review: (not on test)

Properties of Static Fluids (cont.)

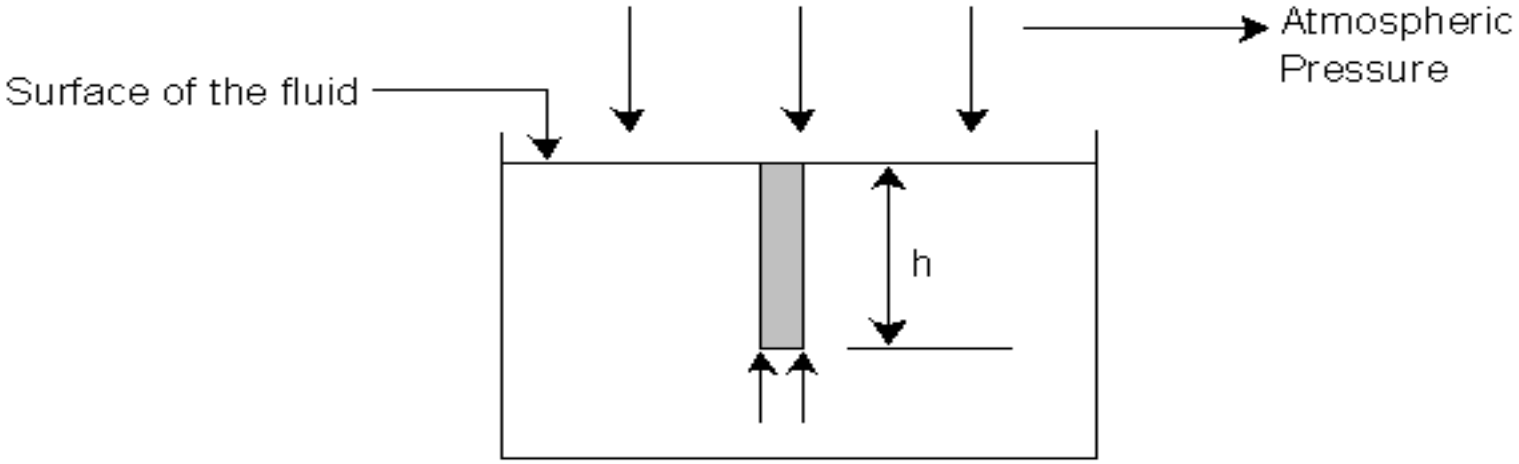
- The following table lists the densities of some common substances in kg/m^3.

Material	Density (kg/m^3)
Water	1000
Iron	7900
Mercury	13600
Ice	917

Pressure formula is: P = F/A

Pressure, **P**:

- Definition: Force, **F**, exerted by a fluid at a point divided by the area, **A**, of the surface, given by **P = F/A**
- Unit: The metric unit is Pa = N/m^2, given the name **Pa**scal.
- The following figure depicts the calculation of pressure in the case of a small vertical cylinder filled with a fluid and with its base at the point.



Pressure formula is: P = F/A or F = PA

Pressure and Force relationship:

- Using P = F/A
  - Pressure is directly related to Force for a constant Area
  - Meaning more pressure then more force
- Using P = F/A
  - Pressure is inversely related to Area for a constant Force
  - Meaning the pressure will increase for a smaller Area

Pascal's Principle

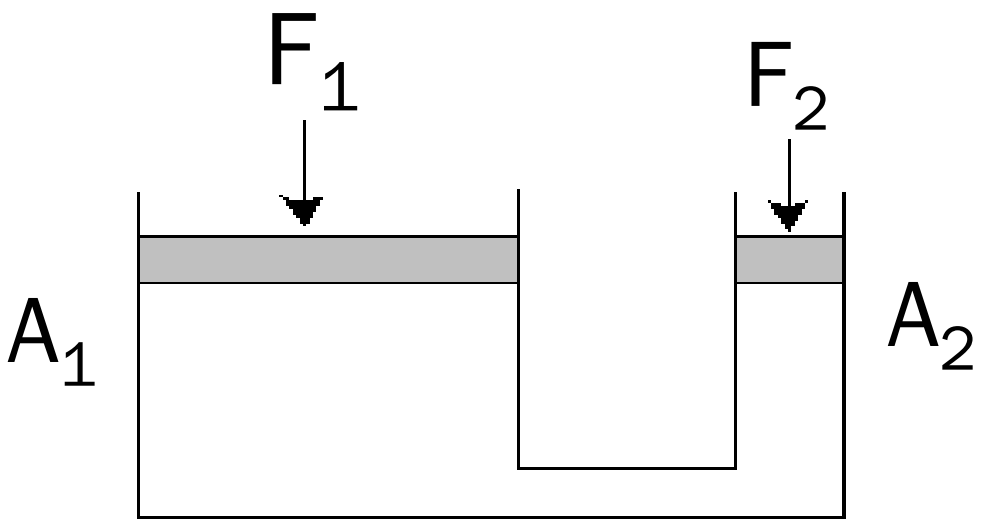
$$P_1 = P_2$$

Statement: When pressure is applied to an enclosed static fluid, the pressure is transmitted undiminished to every part of the fluid. This means the pressure is constant at all points.

Example: A device called the hydraulic press or lever works on Pascal's principle, as shown in the following figure:

$$P_1 = P_2$$

$$F_1/A_1 = F_2/A_2$$

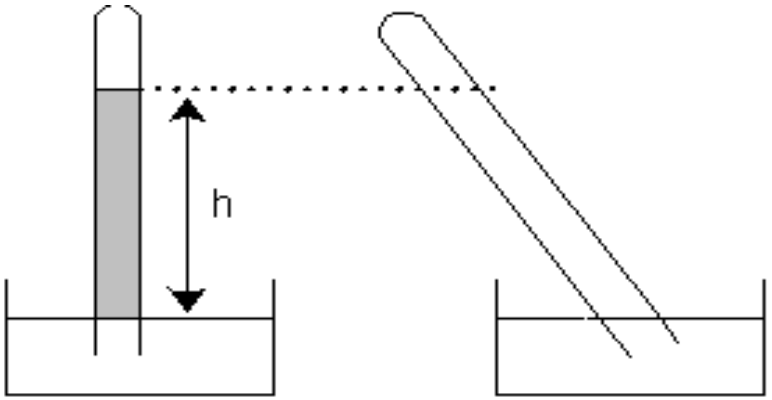


Additional Notes: Measurement of Atmospheric Pressure as an FYI

The atmospheric pressure at any point can be measured using a simple device called a mercury barometer that works on the basis of

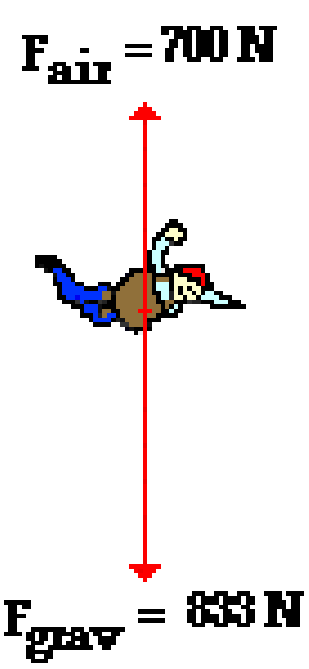
$$P = h \rho g$$

where, P is the pressure, h is the depth of the fluid, ρ is the density of the fluid, and g is the acceleration due to gravity. The following figure depicts a mercury barometer.

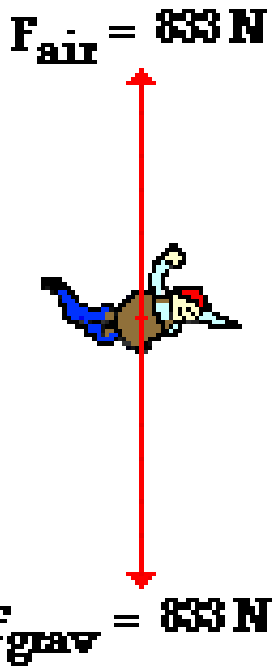


Terminal Velocity = V_T

- Maximum velocity at which an object will fall.
- An object achieves terminal velocity when the net force is zero.
- An object achieves terminal velocity when the net acceleration is zero.



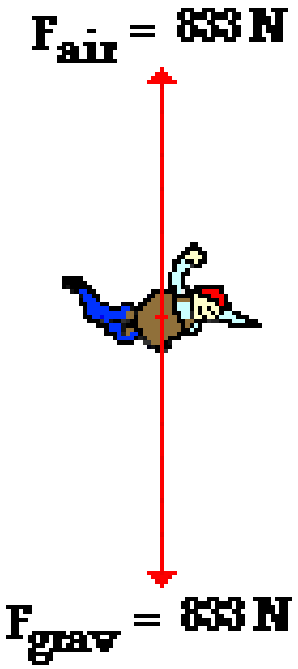
A



B

Which FDB or image shows terminal velocity?
What is the acceleration of the man in each FBD?

Terminal Velocity = V_T



Terminal Velocity = V_T