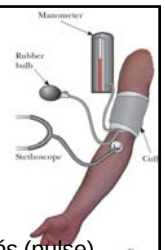
Measuring Blood Pressure

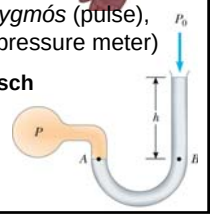


- Blood pressure is measured with a special type of manometer called a *sphygmomano-meter*

The word comes from the Greek *sphygmós* (pulse), plus the scientific term manometer (pressure meter)

Samuel Siegfried Karl von Basch

- Pressure is measured in mm of mercury



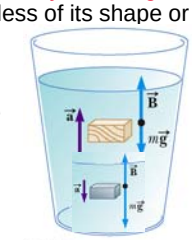
Systolic + diastolic

Buoyant Force

- The magnitude of the buoyant force always equals the weight of the displaced fluid

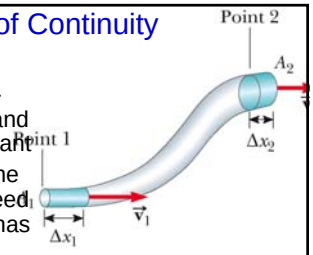
$$B = \rho_{fluid} V_{fluid} g = w_{fluid}$$

- The buoyant force is the same for a totally submerged object of a given volume, regardless of its shape or density--i.e. its weight
- Buoyant force is up-against gravity
- Mass of object determines if net force is up or down
- Since fluid density depends on depth, objects float at different heights



Equation of Continuity

- $A_1v_1 = A_2v_2$
- The product of the cross-sectional area of a pipe and the fluid speed is a constant
  - Speed is high where the pipe is narrow and speed is low where the pipe has a large diameter
- Av is called the *flow rate*

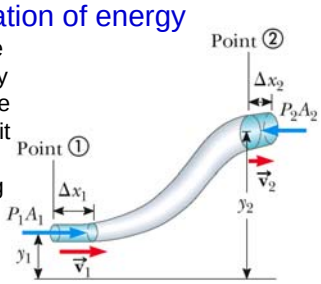


Streamlines

Connect packets of fluid connected in flow pattern

Bernoulli's Equation = conservation of energy

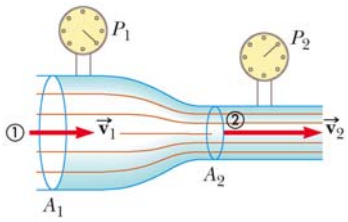
States that the sum of the pressure, kinetic energy per unit volume, and the potential energy per unit volume has the same value at all points along a streamline



$$P + \frac{1}{2}\rho v^2 + \rho g y = \text{constant}$$

Applications of Bernoulli's Principle: Venturi Tube

- Shows fluid flowing through a horizontal constricted pipe
- Speed changes as diameter changes
- Can be used to measure the speed of the fluid flow
- Swiftly moving fluids exert less pressure than do slowly moving fluids

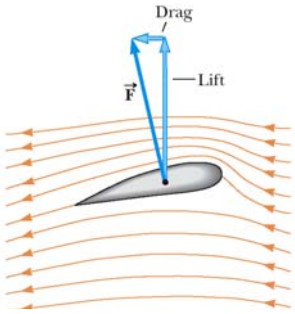


$$P + \frac{1}{2}\rho v^2 + \cancel{\rho g y} = \text{constant}$$

0 since horizontal flow

Application – Airplane Wing

- The air speed above the wing is greater than the speed below
- The air pressure above the wing is less than the air pressure below
- There is a net upward force
  - Called *lift*
- Other factors are also involved



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