Physics 161

Lecture 11, Summ

Hydrostatics

October 10, 2017

Lecture 11: learning objectives

This lecture

You will be able to define the four states of matter.

You will be able to apply the concepts of density and pressure to solids, liquids, and gases.

You will be able to apply the equation for hydrostatic equilibrium to fluid columns. Principle of Pascal.

You will be able to state Archimedes' principle and apply it to floating and submerged objects.

Density and pressure

Density:
Mass per unit volume.

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

Pressure:
Magnitude of force per unit area.

$$P = \frac{F}{A}$$

Pressure in fluid:
The pressure at a depth h below the surface of a liquid open to the atmosphere is greater than atmospheric pressure by an amount proportional to the depth.

$$P = P_0 + \rho g h$$

Principles

Pascal's principle:
A change in pressure applied to an enclosed fluid is transmitted uniformly to every point of the fluid and to the walls of the container.

Archimedes' principle:
Any object completely or partially submerged in a fluid is buoyed up by a force with magnitude equal to the weight of the fluid displaced by the object.

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