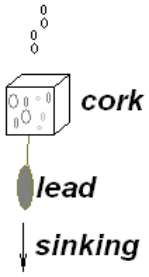
Physics I

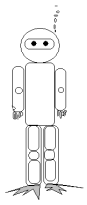
Buoyancy

$F_{buoyancy} = \rho_{fluid}\, g Volume_{under\ surface}$ Buoyancy force

Problem 1.- A piece of cork of volume 0.000015m^3 and density $120 kg/m^3$ is floating on water. How much lead do you need to tie to the cube to sink it?
Density of lead is $11{,}300 kg/m^3$



Problem 2.- You and your diving gear have a total mass of 110kg and a volume of 0.115m^3. How much lead (mass) do you need to carry in your belt to sink in seawater?
Take the density of seawater as 1,025 kg/m^3
Density of lead is 11,300 kg/m^3



Problem 3.- Do ice cubes float higher or lower in an alcoholic drink (compared to pure water)? Why?
[$\rho_{alcohol} = 0.8 g/cm^3$ $\rho_{ice} = 0.9 g/cm^3$ $\rho_{water} = 1 g/cm^3$]

Problem 4.- What fraction of a block of wood (density=800kg/m^3) will be under the surface of mercury (density = 13,600 kg/m^3) when floating?

Problem 5.- The water of a very salty lake has a density of 1,220 kg/m3. Consider a 75-kg person floating in the lake. How much of her volume will be under the surface of the water?

Problem 6.-

a) What is the buoyancy force due to air acting on a ping-pong ball of radius 20mm if the density of air is 1.29kg/m^3?
The volume of a sphere is $\frac{4\pi R^3}{3}$
b) What fraction of its weight is the buoyancy force?
The mass of a ping-pong ball is 0.0027kg