You step onto your bathroom scale one morning and are somewhat pleased to find that last night's pizza binge didn't do as much harm as you'd feared. But how is it that the scale measured "zero" before you stepped on it, despite the weight of the atmosphere pushing down on it? With its settings adjusted as they are currently, what numerical value would the scale read if it were placed in a vacuum chamber (still on Earth) with nothing on it? Explain.

Is the scale adjusted ("tared") to account for the atmosphere?

Though the settings would remain the same, when the scale is placed in a vacuum chamber the force due to the atmosphere would no longer act on the scale. When it did act on the scale, it measured "zero". Therefore upon removing the atmosphere force, the scale would now read a negative number.

Another similar response

When there is no weight on the scale in a normal environment, there is a feature to zero the scale that accounts for the atmospheric pressure and "zeroes" it out, or just subtracting that part off of the scale.

When the scale is in a vacuum, the number would be negative. This is because the force due to atmosphere is being sucked out or removed.

The density of water is 1 g/cm^3, by definition of the gram. With careful attention to units, show that descending 10 meters under water increases pressure by approximately one atmosphere, 10^5 Pa. Show your work.

Not a thorough inclusion of units

density of water = 1 g/cm^3

1x10^-3 / 1x10^-6 = 10^3 kg/m^3

Pa= 10^3 * 10 * 10 = 10^5 Pa

Modest attempt at accounting for units

density=mass/volume

the density of water: 1g/cm^3(1000)=1000kg/m^3

atmospheric pressure: 10^5 Pa

pressure=initial pressure + density(gravity)(depth)

Therefore, 10^5Pa+ 1000kg/m^3(9.8m/s^2)(10m) ~10^5Pa+1x10^5kg/s^2 ~2x10^5atm

Another

P= Po + Pgh

Po= 1 g/cm^3= 1x10^-3/10^-6 kg/m^3

P= 10^3 kg/m^3

h= 10m

g= 10 m/s ^2

Now the pressure increase = Pgh

= 10^3 kg/m^3 x 10 mx 10m/s^2

= 10^5 Pa.

How is it that ships made of metal float?

a. The metal used is a special alloy that is lighter than water

b. Most of their volume is air

c. Their motion gives an upward thrust, just like an airplane's wings

d. Trick question: metal ships can't float, they're actually made of fiberglass and only look metallic