

Re: Large Water Barometer

Source: <http://sci.tech-archive.net/Archive/sci.physics/2005-03/11997.html>

From: bz (bz+sp_at_ch100-5.chem.lsu.edu)

Date: 03/23/05

Date: Wed, 23 Mar 2005 17:43:59 +0000 (UTC)

galt_57@hotmail.com wrote in
news:1111598013.148447.161460@z14g2000cwz.googlegroups.com:

> bz wrote:
>> galt_57@hotmail.com wrote in news:1111503789.832511.136530
>> @z14g2000cwz.googlegroups.com:
>>
>>> A large, tall vertical tube is filled with water with the
>>> top of the tube being sealed and the base of the tube
>>> immersed in an open tank. Air pressure supports the column
>>> of water. What is the water pressure inside the tube? May
>>> a diver safely swim up the column of water?
>>>
>>>
>>> 15 lb/in², at the bottom (atmospheric pressure)
>>
>> close to zero at the top (the vapor pressure of water at the
>> temperature of the water)
>>
>> Is it safe? I wouldn't want to do it, but one could probably
>> survive it IF one did not hold ones breath while assending
>> and one assended slowly.
>
> What about the risk of something similar to the "Bends?"

hence my next paragraph:

>
>> It would be similar to assending from a depth where the pressure
>> was 2 atmospheres.
>>
>> By the time you get to the top, the air you have expelled during
>> your assent will have raised the pressure considerably, and there
>> would be a significant air-space at the top of the column.
>
> If the tube was, say, a meter in diameter, I wonder how far that amount
> of expelled air would cause the water level to drop?

sci.physics: Re: Large Water Barometer

Measure your lung capacity. It might be 2 to 4 liters.

Use $PV=nRT$ to calculate the number of moles of gas at atmospheric pressure. Then calculate the volume of that number of moles at the vapor pressure of the water in the column.

You could even use $P_1 V_1 T_2 = P_2 V_2 T_1$ as n and R are constants in this case.

Solving for $V_2 = P_1 V_1 T_2 / (P_2 T_1)$

--

bz

please pardon my infinite ignorance, the set-of-things-I-do-not-know is an infinite set.

bz+sp@ch100-5.chem.lsu.edu remove ch100-5 to avoid spam trap