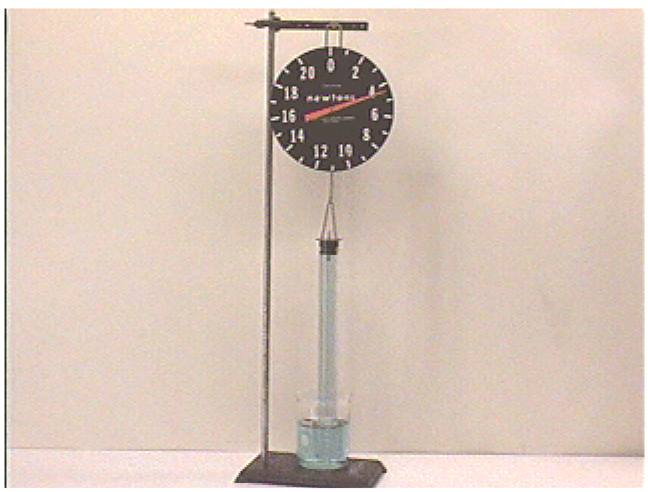
Question #16

Before launching into the question, let us review how a standard mercury barometer works.

First a tube, over 76 cm in length and sealed on one end, is filled completely with mercury (the heavy liquid) and it is then positioned vertically with the open end in a pool of mercury. Atmospheric pressure will then hold the mercury up in the tube at a height such that the downward pressure exerted by the mercury in the tube on surface of the mercury pool is equal to the atmospheric air pressure, also exerted downward on the surface of the mercury pool. As the atmospheric pressure rises and falls, the level of the mercury in the tube rises and falls, so that the numerical value of the air pressure at any given time is equal to the height of the mercury column.

We have made a sort of barometer using a short water column with a beaker of water as the pool, only the tube of our barometer is supported by a spring scale, as seen in the photograph below. Blue water taken from the azure seas of the Caribbean is used because it is easier to see. Notice the "weight" of the tube as shown by the scale; this is equal to the upward force required to hold the tube up.



Now suppose that we remove a small seal at the top of the tube, allowing outside atmospheric air to enter the tube and displace the water, so there will be air rather than water in the tube. The question involves the force necessary to hold up the tube after the water in the tube has drained out.

Which of the following statements most accurately describes the situation after the water in the tube has drained out into the beaker?

- (a) The reading of the spring scale will be greater.
- (b) The reading of the spring scale will be less.
- (c) The reading of the spring scale will remain the same.

Click here for Answer #16 after June 12, 2000.

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For questions and comments regarding the *Question of the Week* contact Dr. Richard E. Berg by e-mail or using phone number or regular mail address given on the Lecture-Demonstration Home Page.