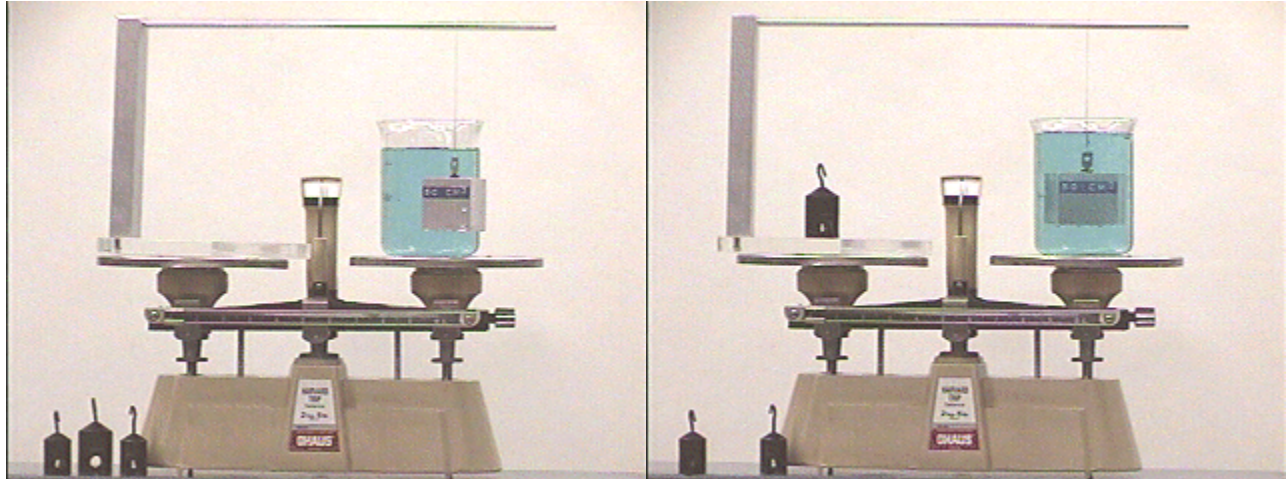


## Answer #40

The answer is (c): the pan balance will become unbalanced, and it will be necessary to place 100 grams on the pan at the left, as seen in the photograph at the right below.



Note that when the 50cc mass is placed into the water it displaces 50cc of water, and feels an upward buoyant force equal to 50 grams, the weight of 50cc of water. The pan at the right feels an equal downward reaction force to the buoyant force also equal to 50 grams.

At the same time, the force on the beam is reduced by that same 50 grams, because the aluminum mass is being partially supported by the buoyant force of the water.

Adding these forces together: there is 50 grams less on the pan at the left and 50 grams more on the pan at the right, therefore you must put 100 grams onto the pan at the left to restore equilibrium.

Now, before I am deluged by hundreds of angry e-mails, let me state that I am aware of the use of the word "gram" in a sort of hybrid way: the "force" involved is equal to the mass multiplied by the acceleration of gravity, in units of Newtons (or perhaps dynes if you are old enough). This formalism, if followed through in detail, nets the same result. If you take issue with this use, then explain why cans of food at the grocery store use two units: the pound (or ounce) and the gram.

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