Swim Blater

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hi!!

I. INTRODUCTION

Intro...

II. PHENOMENOLOGY

When an object is dropped in a swimming pool, there are three possibilities :

1. The object floats in the pool surface.
2. The object dips into the water and stops at some point without reaching the bottom.
3. The object dips until reaching the pool's bottom.

When the object is dropped, it gains kinetic energy before dipping into the pool. In the first case, the motion stops and the object begins to float until reaching the surface; then because of Newton's second law: **there is a force** pulling up the object which is greater than the force of gravity and is balanced when the object is partially inmersed. In the second case when the energy is dissipated because of water friction forces, the object stops and gets stuck at the reached depth; then according to Newton's second law, **there is a force** with the same magnitude and opposed to the force of gravity. Finally, in case three, when the object dips into the water it begins to slow its motion (until it is stopped by the bottom), then again because of Newton's second law : **there is a force** which partially balances the force of gravity.

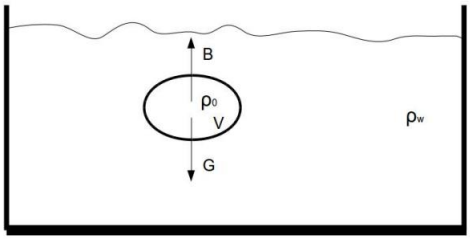
The unknown force is the buoyancy force which was first described by Archimedes of Syracuse about 200 B.C. Archimedes captured this phenomena in the well known Archimedes' principle which is described in the next section.

III. ARCHIMEDES' PRINCIPLE

Archimedes' principle can be found in several general physics textbooks, like [1] and it states:

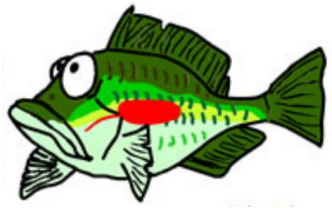
"A body wholly or partially immersed in a fluid will be buoyed up by a force equal to the weight of the fluid that the body displaces"

make a discussion about the principle and how it matches the phenomenology explained in the previous section linking it with newton's second law...for this purposes considere next pic,



IV. FISHES AND THEIR SWIM BLADDER

Talk about the fhish and its swim bladder, then considere a model ilustrated in the picture:



Define the model of the fish to considere, ie, it doesn't have cavities and and its mass in average is unifomly distributed before and after the bladder changes so $m = \rho V$

[1] J Walker D. Halliday, R. Resnick.