

ARCH-KT Archimedes Bucket & Cylinder

Warning:

•Not a toy; use only
in a laboratory or
educational setting.

•California Proposition 65

Warning: This product can expose you to chemicals
including chromium and lead, which are known to the
State of California to cause cancer, birth defects, or
other reproductive harm. For more information go to
www.P65Warnings.ca.gov.



Introduction

Archimedes' Principle is an important law that has a wide use in physics mainly pertaining to buoyancy and density. This kit demonstrates the principles of buoyancy and displacement. The cylinder fits into the bucket perfectly. The unit can be hung from a spring scale and weighed. It can then be lowered into a container of water and the reduction weight noted. Experiments prove that the weight loss equals the weight of the water displaced.

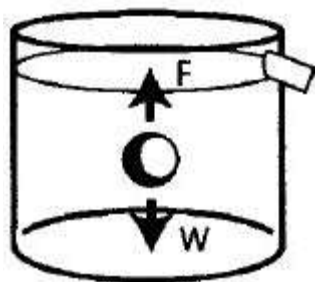
History

Archimedes was challenged to discover a way to identify whether or not a king's crown was made of solid gold or whether or not the metal smith had induced other materials into the crown and thereby keeping some of the gold for himself. The story that has been handed down over centuries was that Archimedes stepped into a bathtub which then overflowed. This was the inspiration that was responsible for him jumping from the tub and running through the streets. From this action he concluded that if an object were completely submersed in water it would displace an amount of water that is equal to the amount of weight lost. This principle is now known as *buoyancy* is the foundation of shipbuilding, body fat measurement and many other uses. It states that if an object is completely immersed in a liquid there will be an upward force equal to the weight of an equivalent volume of the fluid.



Science Behind It

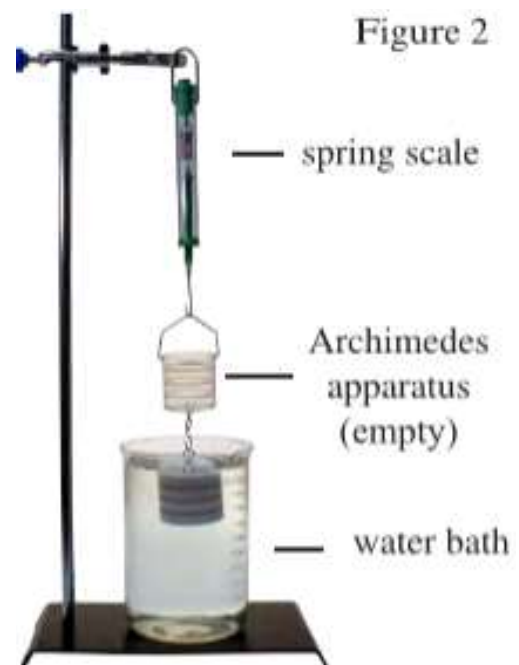
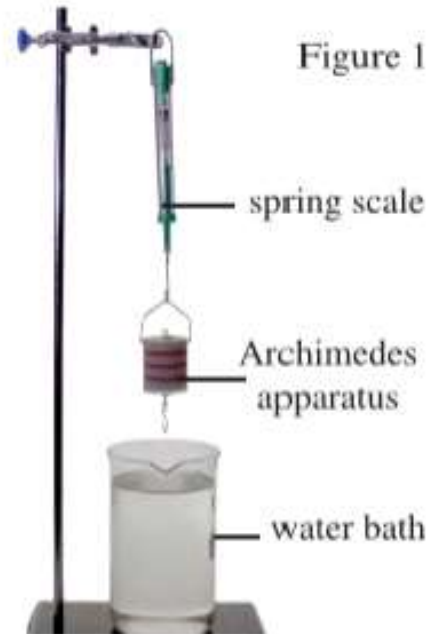
The graphic to the left demonstrates an object with volume V , and a density p , in a liquid. The force on weight W , pulling down on the object is $W = -pVg$. The force F , of buoyancy pushing up on the object is $F = p_0Vg$. If the object's density is greater than the liquid then the object will sink. If the object's density is less than that of the liquid then the object will float.



How to Use

This experiment can be performed using a spring scale.

1. Begin by setting up a water bath and ring stand.
2. Hang the cylinder and bucket from a spring scale.
3. Record the weight of both pieces shown on the spring scale.
4. Separate the cylinder and bucket and hang the cylinder from the bottom of the bucket. Lower the spring scale until the top surface of the cylinder is just below the surface of the water.
5. Measure the weight of the apparatus. It will appear that the cylinder and bucket weight less in water.
6. Keeping the cylinder submerged, fill the bucket with water. Measure the weight on the spring scale.
7. Note that the addition of the weight equal to the buoyant force of the water will return the spring scale to the original value.
8. **The Archimedes experiment demonstrates the buoyance principle: The weight of the water in the bucket is equal to the weight of the water displaced by the cylinder.**



Additional Supplies
You will need the following supplies (not included).
Support stand
Spring scale
Beaker