

10.3 Cartesian diver – Boyle's Law

Subjects: Behavior of gases, Boyle's Law

Description: A large soft drink bottle contains water and a small medicine dropper at the top. As the sides of the bottle are pushed, the dropper sinks to the bottom. When the pressure is released, the dropper rises to the top again.

Materials:

Cartesian diver bottle (2 L soda bottle)

Stopper

Medicine dropper

Water

Pre-Class Preparation:

1. Fill the bottle to the top with water.
2. Fill the medicine dropper with water and place in the bottle. It should bob at the top.
3. Stopper the bottle.

Procedure:

1. Gently press the sides of the bottle. The water level will rise in the dropper and it will sink.
2. Release the pressure. The water in the dropper will lower and the dropper will rise back to the surface.
3. The diver can be passed around the class.

Discussion:

Boyle's Law describes the relationship between pressure and volume. Increasing pressure on a gas will decrease its volume. When the sides of the diver are pressed, the water is forced into the dropper, decreasing the volume of air in the dropper. This makes it more massive and dense, causing it to sink. When the pressure is released the opposite effect occurs and the dropper rises.

References:

1. L. Summerlin, C. Borgford. J. Ealy. *Chemistry Demonstrations: A Sourcebook for Teachers*. 1987. Volume 2. Page 22