

# Boyle's Law

## AND THE DIVE ENVIRONMENT

Boyle's Law states that for a given gas, such as air in the scuba diver's buoyancy compensator device (BCD), if you multiply the pressure (P) surrounding the gas by the volume (V) of gas, you will always end up with the same number (c).

$$PV=c$$

Increase the pressure surrounding the gas, the volume of the gas gets smaller.

Decrease the pressure surrounding the gas, the volume of the gas becomes greater.

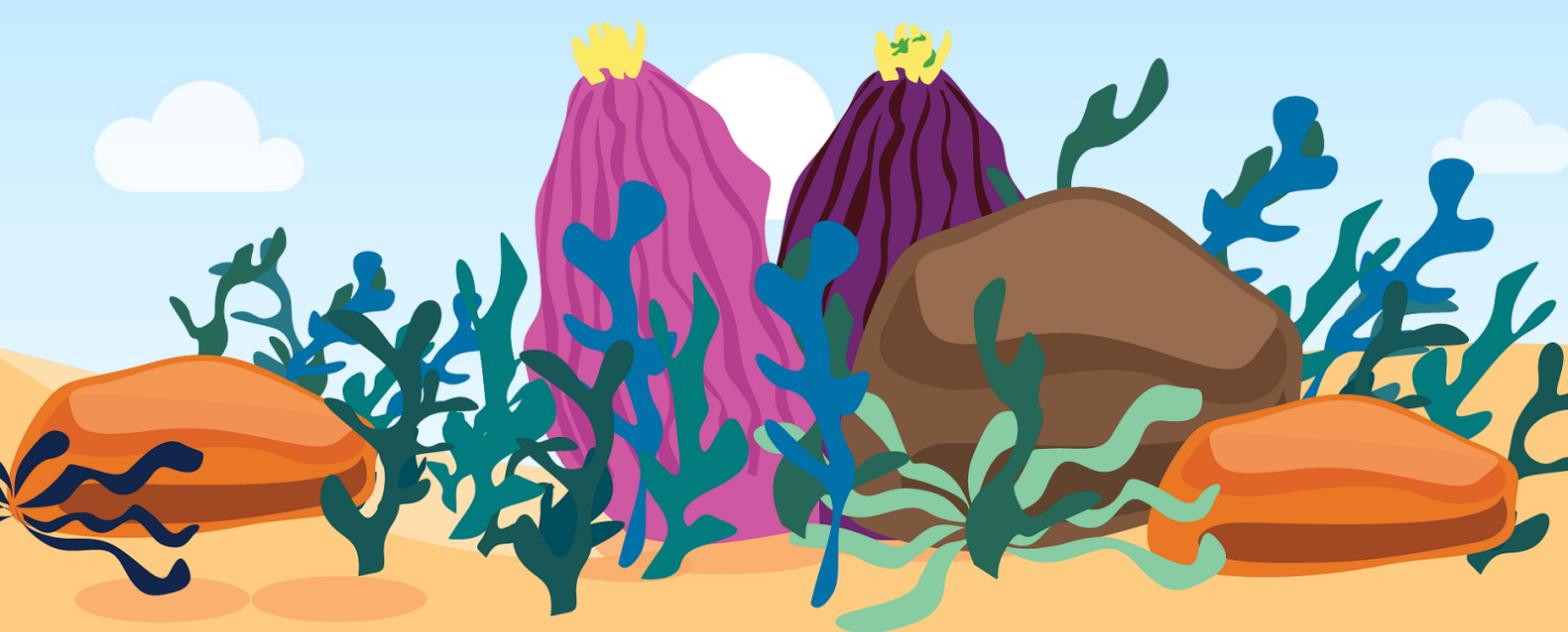
Note: the temperature of the gas must remain constant for Boyle's Law to apply.



## Examples when diving:

**Descent:** as a diver descends, the water pressure around her increases, **compressing** the air in her ears. She must equalize the pressure in her ears to avoid pain.

**Ascent:** as a diver ascends, she has to release excess air from her BCD so that the **expanding** air won't cause her to lose control of her buoyancy.





## Try the Cartesian Diver Experiment!

Materials needed:

- a transparent water bottle
- a glass eyedropper
- water

Follow these instructions:

- Fill the water bottle until it is full.
- Put enough water in your eyedropper so that it is just buoyant enough to float on top of the water in the bottle.
- Put the water bottle lid on so it is tight.
- Squeeze the bottle and observe what happens.



If you follow the instructions successfully, your eyedropper "diver" should descend to the bottom when you squeeze on the bottle.

According to Boyle's Law, you are reducing the volume of the bottle, which increases the pressure, causing the diver's air to compress.

When you release your pressure on the bottle, the diver should ascend. According to Boyle's Law, the water pressure decreases, causing the diver's air to expand.

