

Density Bottle

Observe:

Shake the bottle. The beads will mix up. Now set it down and watch. The beads will separate at opposite ends of the bottle. Keep watching, and they will slowly come back together in the middle.

What do you think just happened?

The Science:

This bottle contains salt water and isopropyl alcohol. Water and isopropyl are miscible (they mix in all proportions). The salt particles bond more easily to the water particles, forcing the alcohol out of the mix. This creates 2 layers, the salt water on the bottom and the less dense alcohol on top. Salt water and alcohol will NOT mix in all proportions, this is why it layers. When you shake the bottle the liquids temporarily mix, causing the density to temporarily fall between what the separate layers are. This forces the beads apart, the regular beads (colored) are more dense than the mix, and sink to the bottom. The UV beads (clear) are less dense than the mix, and rise to the top. As the liquids begin to separate again, the pure isopropyl layer rises to the top, since by itself isopropyl is the least dense of all the items in the bottle. This causes the layer of UV beads to begin to sink, as they hover between the layer of pure isopropyl, and the still mixed portion of the liquids. The regular beads do the same thing at the bottom of the bottle, as the salt water begins to separate out, the colored beads begin to rise, staying between the most dense layer of pure salt water and the liquid mix.

Additional activity: The clear beads are UV sensitive. Take them in the sun to watch them change colors. Spray the outside of the bottle with sunscreen to test how well it works. You can also test your sunglasses or car windows.

Make Your Own:

To make your own density bottle, you will need:

- 16 oz bottle
- 35 mL pure salt (NOT iodized, NOT Sea salt)
- 250 mL 70% isopropyl alcohol
- 140 mL distilled water
- Some UV sensitive pony beads (craft store item)
- Some regular pony beads (craft store item), any color

Pour the salt and water into the bottle, shake until dissolved. Add the beads. If the beads sink to the bottom, you need slightly more salt. Pour in the alcohol. You will see a layer form between the salt water and the alcohol, this is because of the impurities in the salt. You may choose to suck this out with an eyedropper, or let the beads disguise it. Add the beads next. They should float between the layers.

Due to variations and impurities in store brands of salt, this exact mix may not work. If the beads float on the top, you need slightly less salt. You will need to redo the mixtures from the beginning. This may take several tries.