

Density Column

Purpose

To illustrate the concept of density by making a density column that can be used to determine the relative densities of several solid objects.

Materials

- Syrup (brown) or light corn syrup
- Dishwashing detergent (green)
- Water (colored red with food coloring)
- Vegetable oil (yellow)
- Ethanol (colored blue with food coloring)
- 250-mL glass graduated cylinder
- Small ice cube
- Small cork
- Small piece of chalk

Safety

- Read the SDS sheet for ethanol.
- Ethanol is highly volatile and flammable. Ensure no open flames are present (candle, Bunsen burner).
- Wear safety glasses and gloves.
- Avoid inhalation of ethanol vapors.

Procedure

1. Pour 50 mL of syrup in a 250-mL glass graduated cylinder and let the liquid settle.
2. Tilt the graduated cylinder and pour 50 mL of dishwashing detergent slowly down the side of the cylinder. Then, let the liquid settle in the upright position. The detergent should form a layer on top of the syrup.
3. Repeat step 2 for the other liquids: red colored water, vegetable oil, and blue colored alcohol.
4. Drop in various items (ice, cork, chalk, ...) and observe the level at which the object sinks or floats.
5. Cover the cylinder in plastic wrap and leave undisturbed for several days before re-examining.
6. Shake the graduated cylinder and re-examine after several minutes.

Results

- The colored liquids layer in the column (from bottom to top: brown, green, red, yellow, blue).

Follow-up Teaching Notes

- The liquids, with the exception of the oil, are miscible so care must be taken when layering them.

Connections

- Density, separation methods, solubility, diffusion.

Extension

- Students could determine the densities of the liquids to generate order of pouring the liquids.
- The actual densities of the solids can be determined and compared to their position in the density column.

Disposal/Clean-up

- Contents of the cylinder can be safely poured down the drain but ensure that solids are strained out or removed from the sink trap and placed in the garbage.