

Separation Techniques

Name - _____

- 1.) A red-brown solution of bromine in water ($density = 1.01 \frac{g}{mL}$) is poured into a separatory funnel. Trichloroethane ($density = 1.34 \frac{g}{mL}$) is added and the mixture is shaken thoroughly. Afterwards, two liquid layers are seen in the funnel: a clear layer of water and a reddish-orange layer of bromine in trichloroethane. Which layer will be on the top? Why?

Answer - The water will be on top as it has a lower density.

- 2.) If you wished to completely remove the liquid from the solid/liquid solution, which separation method(s) could be used? If you did want to save the liquid, which method(s) could be used?

Answer - Distillation, would work in separating and saving both the solid and liquid.

If the liquid doesn't matter evaporation, solvent extraction, or recrystallization will work.

- 3.) Why shouldn't the solvent completely evaporate in the recrystallization method of purification?

Answer - If the solvent completely evaporates all dissolved crystals will come out of the solvent. The idea is to separate each substance and so just one is recrystallized by allowing some of the solvent to remain with the other crystals still dissolved.

- 4.) How can you separate all the components in a mixture containing sand, iron filings, water and gasoline?

Answer - Filter the liquids from the solids. Use a magnet to remove the iron filings from the sand, pour off the gasoline or use a sep funnel to remove the gasoline, distil the water at $100^{\circ}C$.

5.) How can you separate a mixture of white sand (density = 2.2 g/mL), black sand (density = 5.2 g/mL), liquid methanol (m.p. -94°C , b.p. 65°C) and liquid hexanol (m.p. -47°C , b.p. 158°C)? Methanol and hexanol are miscible.

Answer - Filter to separate the solids from liquids. Use gravity filtration (put sands in shaker and the more dense black sand will settle to the bottom) to separate the sand types. Distil to separate the alcohols (methanol will boil off first).

6.) How can you separate a mixture of three solids: potassium sulphate (m.p. 1069°C , soluble in water, insoluble in alcohol), calcium carbonate (m.p. greater than 1000°C , insoluble in water, insoluble in alcohol) and naphthalene (m.p. 81°C , insoluble in water, soluble in alcohol)?

Answer - Put mixture in sep funnel to solvent extract with alcohol to dissolve only naphthalene. Distil off alcohol later. Put remaining mixture in sep funnel again to solvent extract using water to dissolve only potassium sulphate. Later distil off water to have potassium sulphate remain.