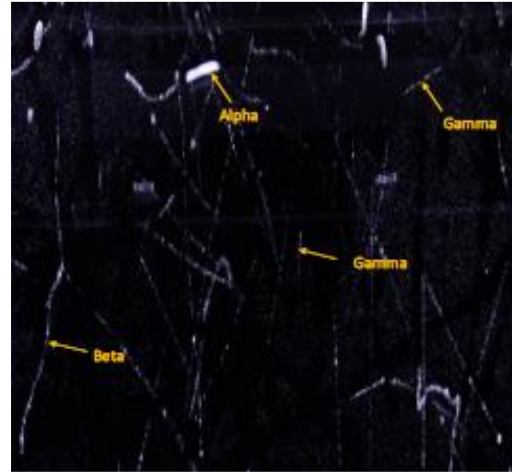


Can you build a cloud chamber?

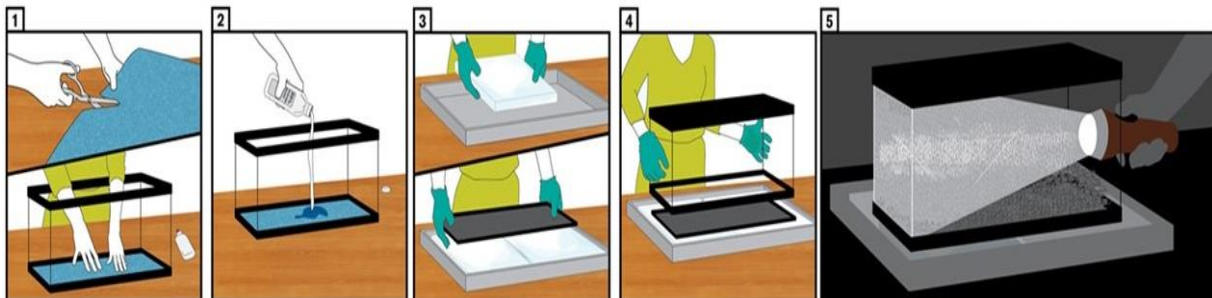
In order to study subatomic particles, you need a method of detecting them. Over the years, physicists have developed devices that can show the presence of particles and reveal their properties. Cloud chamber is an enclosed box filled with an alcohol vapor. When an electrically charged particle comes along, it collides with alcohol vapor molecules, ionizing the vapor by ripping away the electrons on some of the gas atoms along its path; this leaves behind positively charged atoms and initiate the condensation process creating visible liquid droplets - “tracks”. Different types of particles will leave different tracks based on their mass, charge and energy.



Materials: Clear plastic or glass tub (such as a fish tank) with a solid lid (plastic or metal), felt, isopropyl alcohol (90% or more. You can find this at a pharmacy or special order from a chemical supply company. Wear safety goggles when handling the alcohol), dry ice (frozen carbon dioxide. Often used at fish markets and grocery stores to keep products cool. Wear thick gloves when handling the dry ice).

Activity: Adapted from this Symmetry article: <https://www.symmetrymagazine.org/article/january-2015/how-to-build-your-own-particle-detector>

Cut the felt so that it is the size of the bottom of the fish tank. Glue it down inside the tank (on the bottom where the sand and fake treasure chests would normally go). Once the felt is secured, soak it in the isopropyl alcohol until it is saturated. Drain off any excess alcohol. Place the lid on top of dry ice so that it lies flat. You might want to have the dry ice in a container or box so that it is more stable. Flip the tank upside down, so that the felt-covered bottom of the tank is on top and place the mouth of the tank on top of the lid. Wait about 10 minutes... then turn off the lights, shine a flashlight into your tank and observe clouds created by cosmic ray particles.



Questions to ask: Which particles leave short, fat tracks? Which particles leave long, straight tracks?

Useful links: https://ed.fnal.gov/lsc_exhibits/list.html