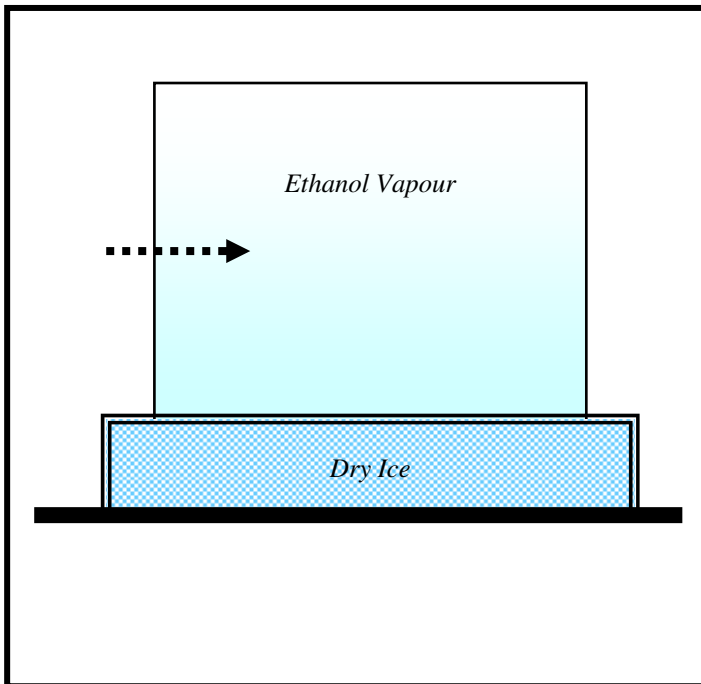
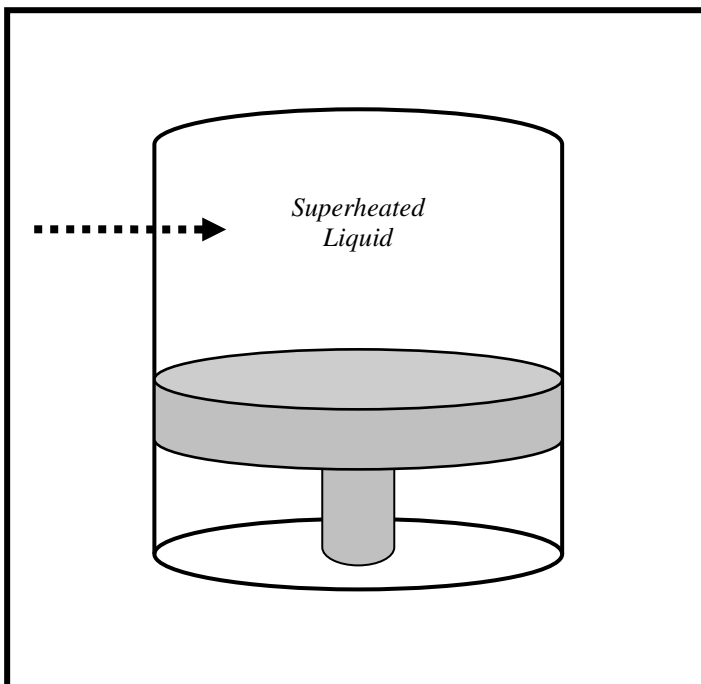


Cloud Chambers



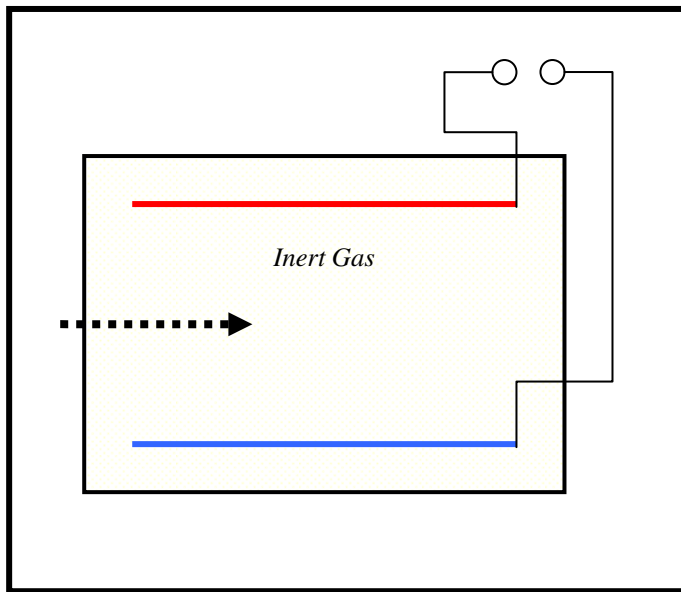
- In a cloud chamber a vapour is kept in a supercooled state, which means it's still a gas but below its normal condensation temperature.
- As the particle passes through it leaves a trail of ions, these make the vapour condense. However, only charged particles show up.
- The vaporised ethanol shows up as "vapour trails" – like clouds. By applying a magnetic field and observing which way the particles are deflected we can work out what charge they have by the left hand rule.

Bubble Chambers



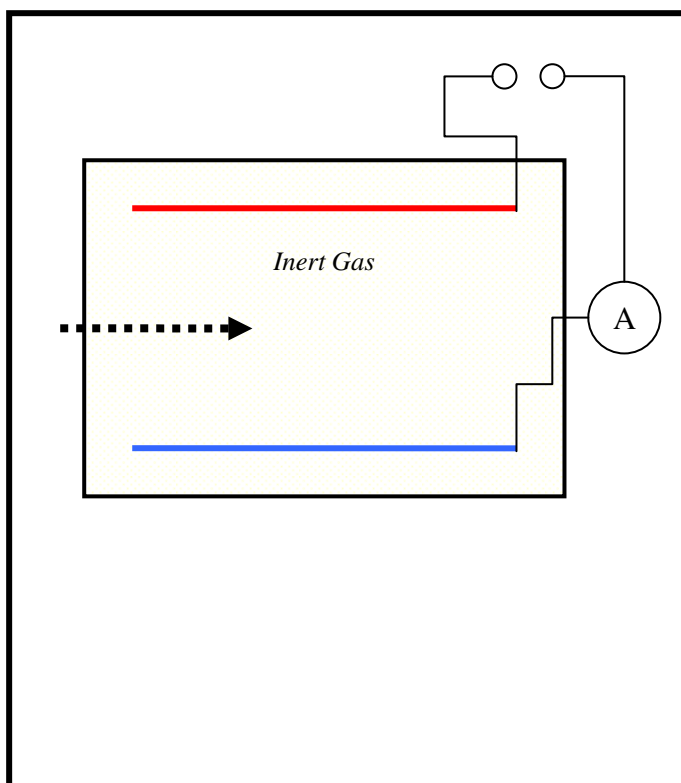
- A bubble chamber is filled with liquid just below its boiling point.
- As particles enter the system the piston decreases the pressure in the system, making the liquid superheated.
- The trail of ions left by the particles causes nearby liquid to vaporise, forming a trail of bubbles in the chamber.
- The system is subject to a magnetic field which can identify by the direction of the trail whether a particle was negatively or positively charged (using the left hand rule).

Spark Chambers



- In a spark chamber when a charged particle is released into the system a high voltage is turned on across two electrodes.
- The ion trail left by the particle allows the current to spark across the gap – showing its path.

Drift Chambers



- The drift chamber works on the same principles as a spark chamber – but without the sparks.
- Again a voltage is turned on but this time not high enough to spark. Instead, ions will drift to the charged plates caused a current to be recorded on the ammeter.
- Hundreds of these set ups can be combined together to gain a digital record which a computer can use to calculate the path taken by the particle through the system.
- The key advantage here is that the data is *digital* not a photograph requiring human processing. It also has a much quicker “refresh time” and can cope with a stream of particles.