

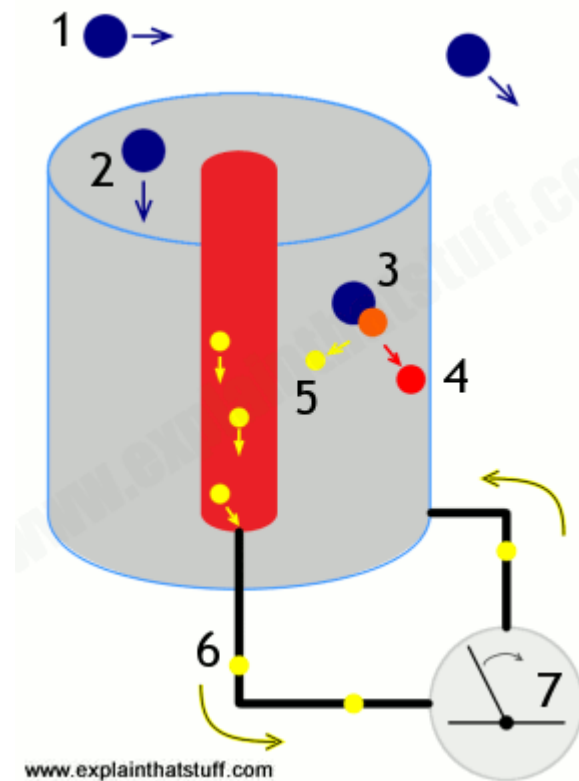
**PHYSICS
FORM 5
DETECTING RADIATION**

What is a Geiger Counter?

A Geiger counter is a metal cylinder filled with low-pressure gas sealed in by a [plastic](#) or [ceramic](#) window at one end. Running down the center of the tube there's a thin metal wire made of [tungsten](#). The wire is connected to a high, positive voltage so there's a strong [electric field](#) between it and the outside tube.

When radiation enters the tube, it causes ionization, splitting gas molecules into ions and electrons. The electrons, being negatively charged, are instantly attracted by the high-voltage positive wire and as they zoom through the tube collide with more gas molecules and produce further ionization. The result is that lots of electrons suddenly arrive at the wire, producing a pulse of electricity that can be measured on a meter and (if the counter is connected to an [amplifier](#) and [loudspeaker](#)) heard as a "click." The ions and electrons are quickly absorbed among the billions of gas molecules in the tube so the counter effectively resets itself in a fraction of a second, ready to detect more radiation. Geiger counters can detect alpha, beta, and gamma radiation.

How a Geiger counter works



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In summary then, here's what happens when a Geiger counter detects some radiation:

1. Radiation (dark blue) is moving about randomly outside the detector tube.
2. Some of the radiation enters the window (gray) at the end of the tube.
3. When radiation (dark blue) collides with gas molecules in the tube (orange), it causes ionization: some of the gas molecules are turned into positive ions (red) and electrons (yellow).
4. The positive ions are attracted to the outside of the tube (light blue).
5. The electrons are attracted to a metal wire (red) running down the inside of the tube maintained at a high positive voltage.
6. Many electrons travel down the wire making a burst of current in a circuit connected to it.
7. The electrons make a meter needle deflect and, if a loudspeaker is connected, you can hear a loud click every time particles are detected. The number of clicks you hear gives a rough indication of how much radiation is present (the meter gives you a much more accurate idea).

Who invented the Geiger counter?

Geiger counters are the most familiar of various ionizing radiation detectors that work in broadly the same way. German physicist Hans Geiger (1882–1945) developed the idea in 1912 while working with Ernest Rutherford, the New-Zealand-born physicist who "split the atom" (proved experimentally that atoms consisted of other, smaller particles). Back in Germany, sixteen years later, Geiger greatly improved the instrument with the help of a colleague named Walter Müller, which is why Geiger counters are often called Geiger-Müller counters (or Geiger-Müller tubes).