

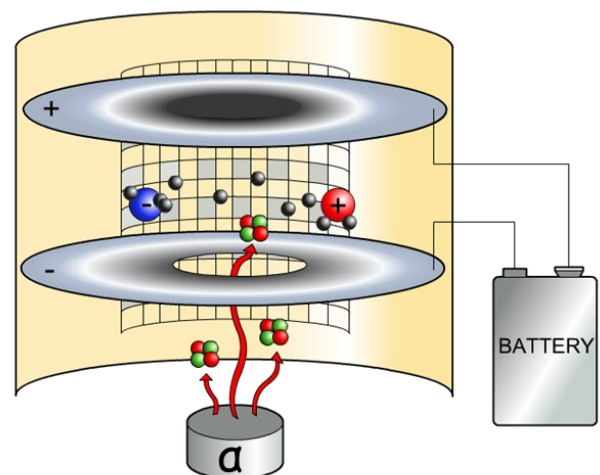
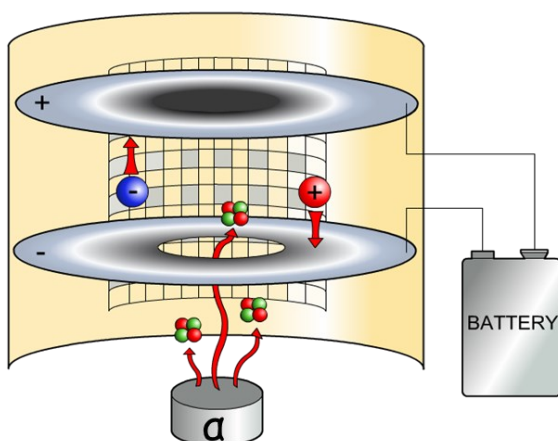
## Smoke alarms

Team Brief: We need a radioactive source to use in household fire alarms. Which one will you chose?

<b>Radioactive source</b>	<b>Radiation Emitted</b>	<b>Half-life</b>
Americurium-241	alpha	458 years
Calerfonium-241	Alpha	4 minutes
Carbon-14	Beta	5730 years
Cobalt-60	Gamma	5 years
Phosphorus-32	Beta	14.3 days
Protactinium-243	Beta	74 seconds
Strontium-90	Beta	28 years
Technetium-99	Gamma	6 hours

This means that less current is flowing through the air, which causes the alarm to sound.

If there is smoke present, it reduces the amount of atoms ionized.



The alpha particles ionize the air creating a current in the smoke alarm. The alarm does not go off.

## Medical Tracers

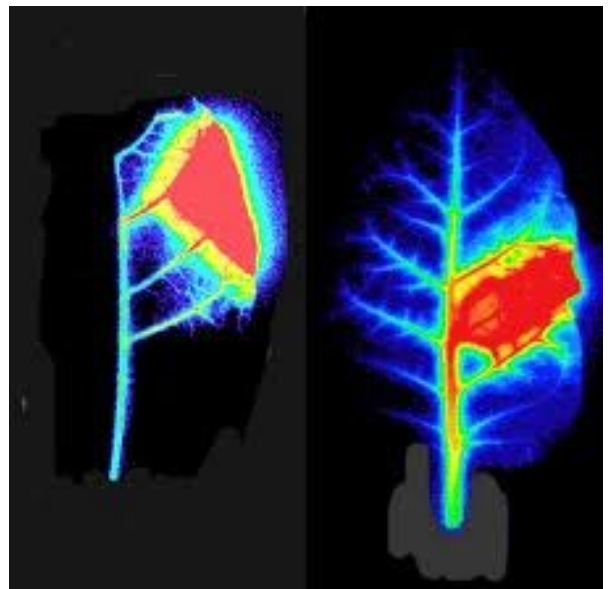
Team Brief: We need a radioactive source to use as a medical tracer. The patient will be scanned within 2 hours of the tracer being injected.

<b>Radioactive source</b>	<b>Radiation Emitted</b>	<b>Half-life</b>
Americurium-241	alpha	458 years
Calerfonium-241	Alpha	4 minutes
Carbon-14	Beta	5730 years
Cobalt-60	Gamma	5 years
Phosphorus-32	Beta	14.3 days
Protactinium-243	Beta	74 seconds
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A radioactive source (tracer) is injected into the body.

Radiation is detected by a scanner which makes a picture of the body.

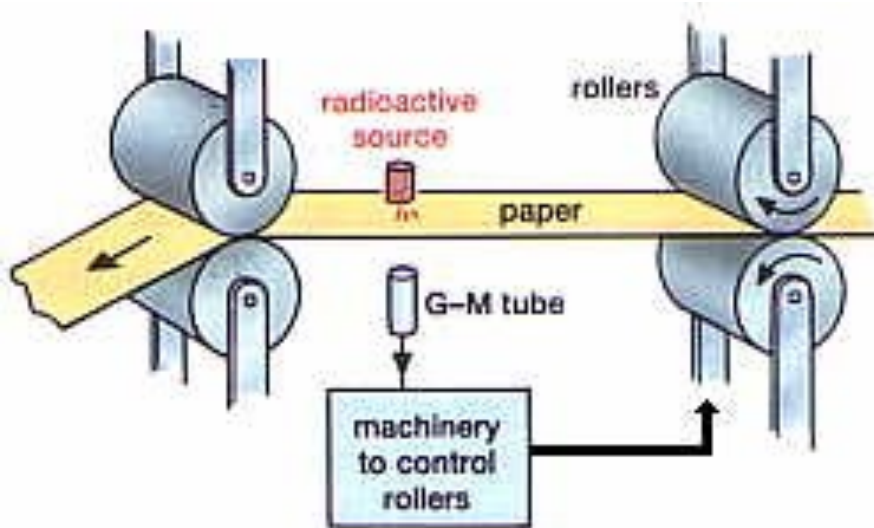
The radioactive tracer concentrates in the area being scanned.



## Paper Milling

Team Brief: You need to select a radioactive source that can be used to monitor the thickness of paper in a paper mill.

<b>Radioactive source</b>	<b>Radiation Emitted</b>	<b>Half-life</b>
Americurium-241	alpha	458 years
Calerfonium-241	Alpha	4 minutes
Carbon-14	Beta	5730 years
Cobalt-60	Gamma	5 years
Phosphorus-32	Beta	14.3 days
Protactinium-243	Beta	74 seconds
Strontium-90	Beta	28 years
Technetium-99	Gamma	6 hours



A radioactive source is on one side of the paper and a detector on the other.

If too much radioactivity is getting through, then the paper is too thin and the rollers open up a bit to make the material thicker.

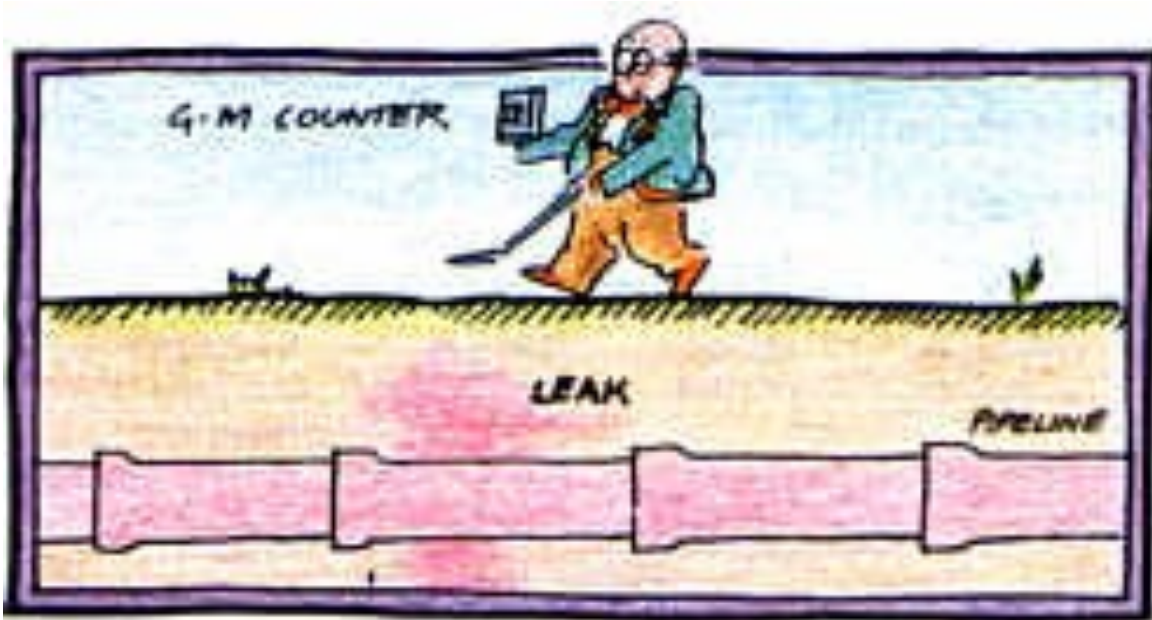
If not enough radioactivity is detected then the rollers compress to make the material thinner

This method is used in the manufacture of lots of sheet materials: plastics, paper, sheet steel.

## Finding leaks in underground water pipes

Team Brief: You need to select a radioactive source that will allow water companies to find a leak in an underground pipe.

<b>Radioactive source</b>	<b>Radiation Emitted</b>	<b>Half-life</b>
Americurium-241	alpha	458 years
Calerfonium-241	Alpha	4 minutes
Carbon-14	Beta	5730 years
Cobalt-60	Gamma	5 years
Phosphorus-32	Beta	14.3 days
Protactinium-243	Beta	74 seconds
Strontium-90	Beta	28 years
Technetium-99	Gamma	6 hours



The radioactive isotope is injected into the water. ,

Areas of high radioactivity is where the leak will be.

Then the ground above the pipe is checked with a Geiger-Muller detector