Answer #144

Before giveing the answers to the questions, click your mouse here to see the counter with the alpha source. Moving the alpha source back a few centimeters away from the counter stops the alphas from reaching the counter, as you hear. The "range" of alpha particles is only a few centimeters of air. Does this help with your answer?

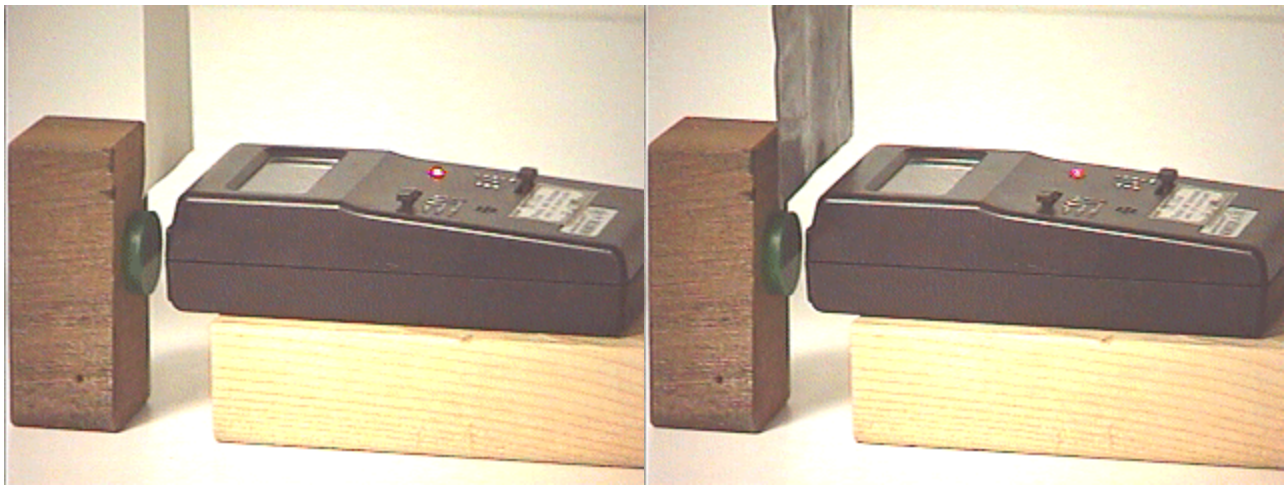
Alphas:

There are a few answers to this one, so let's start with the simplest case: the alpha particles, set up in the photograph below. Click on the picture to see an mpeg video of the action.

The ^{237}Am (americium) source produces alphas with about 5.5 MeV of kinetic energy. It only takes a sheet of paper to stop alpha particles from any naturally occurring radioactive material.

Betas:

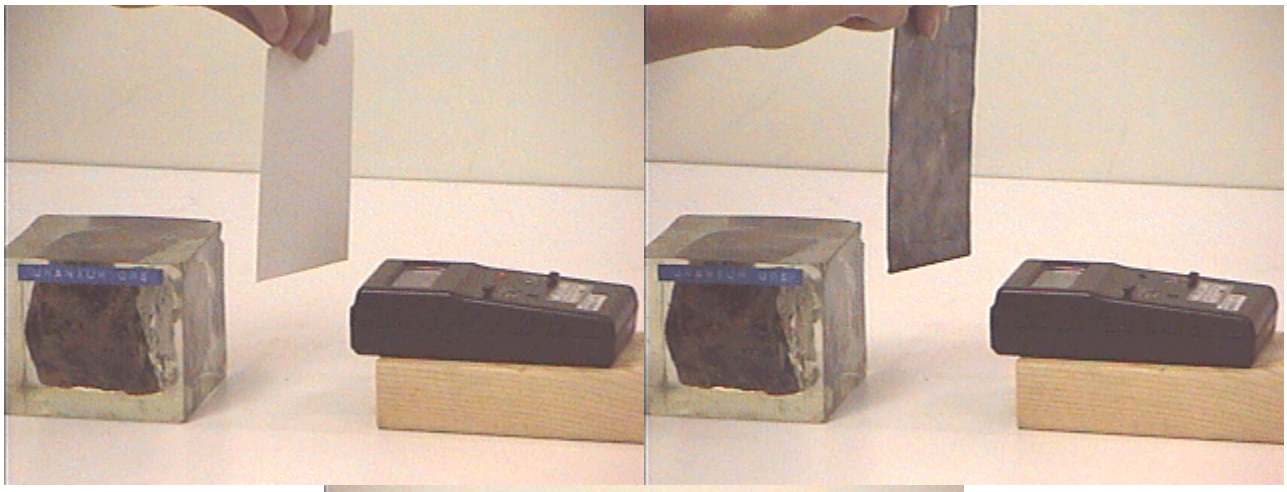
Let's look at the betas next. Which "stopper" is necessary to stop beta particles? Click your mouse on either the paper (left) or the lead sheet (right) photographed below to see mpeg videos yielding the answer.

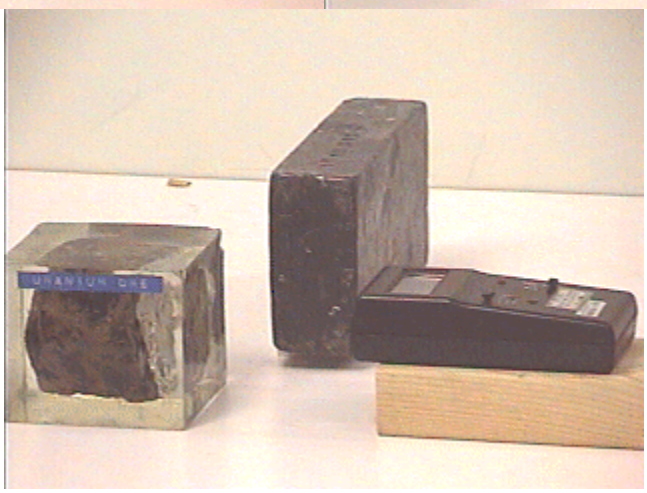


The ^{90}Sr (strontium) source produces betas with a maximum kinetic energy of about 1.5 MeV. It takes a few millimeters of lead sheet to stop betas from most naturally radioactive materials.

Gammas:

Lastly, we have the gammas. Click your mouse on each "stopper" to find the answer.





This source produces gammas with kinetic energy mostly less than 2 MeV, but surprisingly they have much more range, or penetrating ability, than the same energy of betas or much higher alphas. It may take the thickness of more than one lead brick to stop gamma rays from some naturally radioactive materials or from radioactive waste.

Alphas interact with the electrons in matter very srongly and lose their energy rapidly. Betas interact much more weakly with the electrons and have a relatively longer range. Gammas interact even more weakly and therefore have an even greater range. The fact that alphas, betas, and gammas all interact with electrons results in their being able to remove electrons from atoms and molecules, so they are called "ionizing radiation." Ionizing radiation is able to do lots of damage to anything with which it interacts, which may be either good or bad.

Archive 8

Question of the Week

Outreach Index Page

Lecture-Demonstration Home Page

For questions and comments regarding the *Question of the Week* contact
Dr. Richard E. Berg by e-mail or using phone number or regular mail address
given on the Lecture-Demonstration Home Page.