

The scenario

Subject	Nuclear physics / Ionising radiation
Length	6:02
Main goals	become familiar with radiation
Detailed goals	show that there are three basic types of nuclear radiation and show their properties regarding range and penetration
Structure and description of experiments:	
1. Introduction	Ionising radiation is everywhere and we cannot escape from it, so we should learn about it as much as we can.
2. Main subject	Ionising radiation
Experiments	<p>This is a radiation detector with a Geiger tube. When it is turned on, it always shows some value of counts per seconds (cps). This is because everything is radioactive: the air we breathe, the desk on which radiometer stands, also we are slightly radioactive.</p> <p>The rate of counts increases when radiation source is placed in front of the detector. We will try to charge a conducting sphere, giving it a charge from a rod to its outer surface. But when we place paper between source and detector, cps value decreases. This source, americium-241 emits alpha particles, which are stopped by paper. Now we use beta particles emitter: potassium-40. Now paper is not enough for stopping this type of radiation, aluminium sheet is enough.</p> <p>The last source is thorium-232 with its radioactive daughters. It emits many types of radiation but there is huge amount of gamma rays coming out from it. Now paper does no change in cps, aluminium shows slight reduce in cps but lead stops radiation almost totally.</p> <p>Conclusion: indeed, there are different types of nuclear radiation with different penetration abilities: alpha particles are easily stopped by paper, beta particles needs more dense material, such as aluminium and gamma rays, the most penetrable, need very dense lead.</p> <p>Application: now we know, how to protect ourselves from different kind of radiation, what kind of shield is needed for sufficient protection.</p>
3. Summary, evaluation and remarks	Americium-241 emits alpha particles but also weak gamma radiation (60 keV). This is the reason why count rate does not fall to zero when blocked with paper.

	<p>Potassium-40 emits beta particles but also strong gamma radiation (1461 keV). This is the reason why count rate does not fall to zero when blocked with thin aluminium sheet.</p>
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Level: secondary school