Investigating nuclear radiation 1

Purpose

To compare the penetrative power of alpha, beta and gamma radiations.

Prediction

Predict the order of penetration, from least to most, for the three types of radiation.

Materials

Geiger tube and counter	alpha, beta and gamma sources
ruler (1 m)	sheets of paper, aluminium and lead

Variables

List controls that need to be put in place to make this experiment a fair trial.

Record dependent variable/s.

Record independent variable/s.

Procedure

1. Set up Geiger tube and counter.
2. With all sources stored well away from the Geiger tube, take background radiation count for one minute. Repeat twice more and record results.
3. Place alpha source two centimetres beneath Geiger tube and take a one-minute count. Repeat twice more and record results.
4. Place a sheet of paper between alpha source and Geiger tube and repeat step 3.
5. Replace alpha source with a beta source and repeat steps 3 and 4.
6. Replace beta source with a gamma source and repeat steps 3 and 4.
7. You have now tested the three sources' ability to penetrate paper.
8. Repeat experiment, this time using a sheet of aluminium between Geiger tube and source.
9. You have now tested the three sources' ability to penetrate aluminium.
10. Repeat experiment, this time using lead.
11. Subtract background count measured in step 2 from actual count to arrive at corrected count.

Results

trial	background count for 1 min
1	
2	
3	
average for 1 min	

	actual count				background radiation count	corrected radiation count
	1	2	3	average		
alpha source:						
alpha source with paper barrier						
alpha source with aluminium barrier						
alpha source with lead barrier						
beta source:						
beta source with paper barrier						
beta source with aluminium barrier						
beta source with lead barrier						
gamma source:						
gamma source with paper barrier						
gamma source with aluminium barrier						
gamma source with lead barrier						

Questions

1. What is background radiation?

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2. Why is the background radiation count subtracted from the actual count?

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3. Study the results columns above and list sources (alpha, beta, gamma) in order of their penetrative ability, from highest to lowest.

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4. If you want to achieve maximum protection from radiation using a barrier, what material would be the most effective? Explain your answer.

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5. Examine the container used to store radioactive sources in your school. Describe the container and explain why it is constructed that way.

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6. Why is it important not to accidentally ingest materials that emit alpha radiation?

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