Investigating nuclear radiation 3

This worksheet should be used instead of the embedded **'Your task'** screen in the learning object.

Your task is to use the learning object to investigate the penetrating abilities of three types of radiation (alpha, beta and gamma).

- Locate and open the learning object, *The alpha, beta and gamma of radiation*.
- After viewing the apparatus set up, select **Skip** to go to the next screen.
- Instead of following the instructions on this screen, select **Close panel**.
- This will open the screen you will use to produce data for this investigation.

For the purposes of this investigation the following isotopes will be used:

- americium–241 (alpha source),
- strontium–90 (beta source), and
- cobalt–60 (gamma source, also emits beta radiation).

Procedure

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

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2. Measure the background radiation count by selecting:
   - no isotope
   - air barrier
   - 10 mm distance
   - start count (time is pre-set for five seconds)

   Enter results for three trials in the table on the next page.

3. Now make the following selections
   - americium–241 (alpha source)
   - paper barrier
   - 10 mm distance
   - start count (time is pre-set for five seconds)

   Enter results for three trials in the table on the next page.

4. Repeat step 3 above for the aluminium barrier.

5. Repeat step 3 above for the lead barrier.

6. Repeat steps 3, 4, and 5, but this time select the beta source, strontium–90.

7. Repeat steps 3, 4, and 5, but this time select the gamma source, cobalt–60.

Results

trial	background count 5 seconds
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						

Processing the data

Complete the table of results by calculating averages and subtracting background radiation count.

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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