Objective: Study the materials required to stop radiation from being transmitted.

State Standard: SCI.CP.7.7 2010

Setup

1) Turn the ST-160 nuclear lab station on, the button is on the back of the unit.
2) Set the voltage on the Geiger tube by pressing the H.V. button and push the up button until the display reads 400.
3) Push the H.V. button again; the red LED should go out.

Measure the background radiation level

1) Obtain a timer from your teacher.
2) Push the count button and start the timer, let the counter run for 30 seconds.
3) Push stop after 30 seconds.
4) Record the counts and repeat 3 times and take the average.
    a. Run 1_____
    b. Run 2_____
    c. Run 3_____
    d. Average_____

Testing Alpha particles

1) Get a set of sources from your teacher. These samples are radioactive but at a very low level and are safe to handle.
2) Keep the sources at least 2 feet from the ST-160.
3) Insert the alpha source (Po-210), label down, into the plastic sample tray and place into the 3rd slot from the top inside the test opening.
4) Conduct three sets of counts of 30 seconds each and average the results.
    a. Run 1_____
    b. Run 2_____
    c. Run 3_____
    d. Average_____
5) Insert the 4 mil poly shield (#1) into the top slot and conduct 3 counts and average as before.
    a. Run 1_____
    b. Run 2_____
    c. Run 3_____
    d. Average_____
6) How much radiation is reaching the detector through the shield?
    a. $\frac{Average\ from\ step\ 5}{Average\ from\ step\ 4} \times 100 =$ _____%

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7) Remove the Poly shield (#1) and replace it with the .04" plastic shield (#4). Conduct another 3 counts and average.
    a. Run 1_____
    b. Run 2_____
    c. Run 3_____
    d. Average_____
8) How much radiation is reaching the detector through the shield?
    a. $\frac{Average\ from\ step\ 7}{Average\ from\ step\ 4} \times 100 =$ _____%
9) Remove the plastic shield and source and return them to their storage locations.

Testing Beta Particles

1. Insert the beta source (Sr-90), label down, into the plastic sample tray and place into the 3rd slot from the top inside the test opening.
2. Conduct three sets of counts of 30 seconds each and average the results.
    a. Run 1_____
    b. Run 2_____
    c. Run 3_____
    d. Average_____
3. Insert the.04 plastic shield (#4) into the top slot and conduct 3 counts and average as before.
    a. Run 1_____
    b. Run 2_____
    c. Run 3_____
    d. Average_____
4. How much radiation is reaching the detector through the shield?
    a. $\frac{Average\ from\ step\ 3}{Average\ from\ step\ 2} \times 100 =$ _____%
5. Remove the .04 plastic shield (#4) and replace it with the .09" aluminum shield (#7). Conduct another 3 counts and average.
    a. Run 1_____
    b. Run 2_____
    c. Run 3_____
    d. Average_____
6. How much radiation is reaching the detector through the shield?
    a. $\frac{Average\ from\ step\ 5}{Average\ from\ step\ 2} \times 100 =$ _____%
7. Remove the .09" aluminum shield (#7) and replace it with the .032" lead shield (#8). Do three counts and average as before.
    e. Run 1_____
    f. Run 2_____
    g. Run 3_____
    h. Average_____
8. How much radiation is reaching the detector through the shield?

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a. $\frac{Average\ from\ step\ 7}{Average\ from\ step\ 2} \times 100 =$ _____%

9. Remove the shield and source and return them to the storage locations.

Testing a Gamma Source

1. Insert the gamma source (Co-60), label down, into the plastic sample tray and place into the 3rd slot from the top inside the test opening.
2. Conduct three sets of counts of 30 seconds each and average the results.
    a. Run 1_____
    b. Run 2_____
    c. Run 3_____
    d. Average_____
3. Insert the.025 aluminum shield (#5) into the top slot and conduct 3 counts and average as before.
    a. Run 1_____
    b. Run 2_____
    c. Run 3_____
    d. Average_____
4. How much radiation is reaching the detector through the shield?
    a. $\frac{Average\ from\ step\ 3}{Average\ from\ step\ 2} \times 100 =$ _____%
5. Remove the .025 aluminum shield (#5) and replace it with the .032" lead shield (#8). Conduct another 3 counts and average.
    a. Run 1_____
    b. Run 2_____
    c. Run 3_____
    d. Average_____
6. How much radiation is reaching the detector through the shield?
    a. $\frac{Average\ from\ step\ 5}{Average\ from\ step\ 2} \times 100 =$ _____%
7. Remove the .032" lead shield (#8) and replace it with the .25" lead shield (#11). Do three counts and average as before.
    a. Run 1_____
    b. Run 2_____
    c. Run 3_____
    d. Average_____
8. How much radiation is reaching the detector through the shield?
    a. $\frac{Average\ from\ step\ 7}{Average\ from\ step\ 2} \times 100 =$ _____%
9. Remove the shield and source and return them to the storage locations.

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Analysis

1) What particle was the easiest to stop?

_____

_____

2) Which source was the most active? How can you tell?

_____

_____

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_____

3) Which source was the hardest to stop?

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4) How would you protect yourself if you had to go into an environment that was contaminated with alpha emitting radiation?

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