FLINN SCIENTIFIC

Name_____

Characteristics of Nuclear Radiation

Data Table A

Number of Counts per Minute													
Radiation	**No Shielding**			**Shielding**									
				Paper			**Aluminum**			**Lead**			
Background													
Alpha													
Beta													
Gamma													

Data Table B

Source												
Distance from radiation detector	2 cm			5 cm			10 cm			20 cm		
Activity (Counts per minute)												

Post-Lab Questions *(Use a separate sheet of paper to answer the following questions.)*

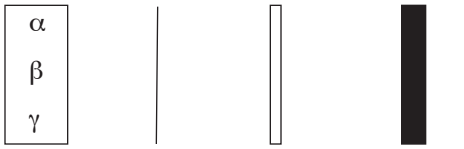
1. Compare the background activity (number of counts per minute of background radiation) versus that of the alpha, beta, and gamma sources in Part A. Is it necessary to "correct" the activity of the α, β, and γ sources to take into account the level of background radiation? Explain.

2. What type(s) of shielding material can be used to absorb (a) alpha, (b) beta, and (c) gamma radiation?

3. Which metal, aluminum or lead, is more effective in shielding against beta radiation? What is the reason for the difference in shielding ability of aluminum versus lead?

4. Is it possible to completely stop gamma radiation using a sheet of metal? Would increasing the thickness of the metal stop more gamma radiation? Why or why not?

5. Use arrows in the following diagram to show the ability of alpha, beta, and gamma radiation to "penetrate" different types of shielding materials.



6. Prepare a graph of radiation activity (counts per minute) on the *y*-axis versus the distance of the beta or gamma source from the detector on the *x*-axis.

7. Describe in words how the level of radiation from a radioactive source changes as the distance of the source from the detector increases.

8. Calculate the activity ratios for each of the following distances. Does the activity change by a constant amount when the distance from the source is doubled?

   (a) $\frac{1\text{ cm}}{2\text{ cm}}$ (b) $\frac{5\text{ cm}}{10\text{ cm}}$ (c) $\frac{10\text{ cm}}{20\text{ cm}}$

9. Based on the results obtained in Question #8, predict how the amount of radiation detected should change when the distance between the source and the detector is increased by a factor of four (e.g., from 5 cm to 20 cm). What was the actual activity ratio at 5 cm versus 20 cm?

10. Explain how distance and shielding can be used together to protect workers from the harmful effects of gamma radiation.

11. *(Optional)* How could shielding be used to decide what type of radiation is emitted by an "unknown" radioactive source?