

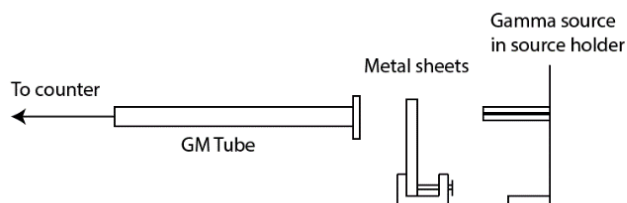
# Edexcel Physics A Level

## Core Practical 15

Investigate the Absorption of Gamma Radiation by Lead



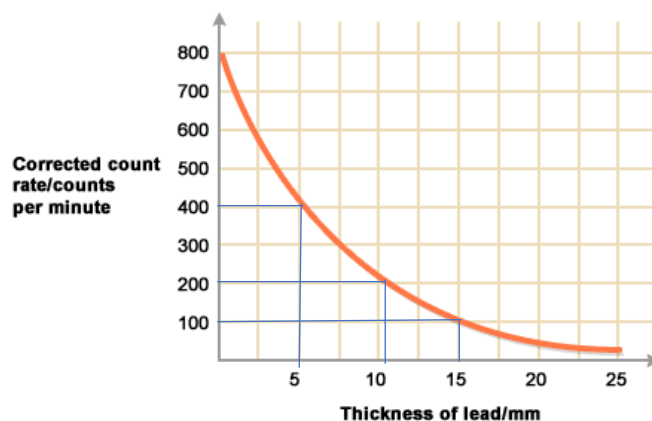
## Method



- Set up a **Geiger counter** and radioactive source, with a **clamp** and **sheet of lead** between them
- Before the radioactive source is removed from the box, record the **background radiation** count on the GM tube over a long period of time (5-10 minutes)
- Place the source in the source holder and point at the GM Tube
- Measure the **thickness of each lead sheet** at various points around the lead sheet using a **micrometer**, and find an **average thickness** of one sheet
- Add each sheet one by one, recording the count over a much shorter amount of time than for the background count
- Repeat process three times, and find the average count for each thickness
- Calculate the count rate as;

$$\text{Count rate} = \frac{\text{Number of Counts}}{\text{Time elapsed}}$$

- Calculate the corrected count rate by subtracting background radiation count from each reading
- Plot corrected count rate (y axis) against thickness, and use to find several **half thickness values** and calculate the mean half thickness



### Safety

- Gamma source: reduce exposure time by keeping in lead lined box when not in use, handle with tongs, do not point at anyone else and keep distance (as activity reduces by an inverse square law)
- Wash hands after handling lead

### Evaluation

- **Aluminium** removes  $\alpha$  and  $\beta$  radiation from the counts, so only gamma is recorded on the 0 count
- Repeats required as decay is **random**
- Less time required for counts with a source as the activity is so much higher than **background**
- For more clear results, plot  **$\ln A$  (y axis) against thickness** for a straight-line graph, straight line with gradient of  $\lambda$  (the decay constant),  $A$  being the activity or corrected count rate

