# Edexcel Physics IGCSE

## Chapter 7: Radioactivity and Particles Practical Notes

# Investigate the Penetration Powers of Different Types of Radiation Using Either Radioactive Sources or Simulations

## Equipment

- Radioactive sources:
  - Alpha source
  - Beta source
  - Gamma source
- Geiger counter
- Stopwatch
- Ruler
- Absorbers such as:
  - Plastic
  - Aluminium
  - Steel
  - Lead
  - Paper

## Method

1. Set up the Geiger counter without any of the radioactive sources nearby and record the background activity over a period of about 15 minutes and calculate the count rate in counts per minute (divide the total counts by the number of minutes).
2. Set up a clamp stand directly in front of where the source will be - this will be used to attach your absorbers to.
3. Place the Geiger counter around 5cm from where the source will be, pointing towards the clamp stand.
4. Move the first radioactive source into position and with no absorbers in place, record the number counts over a 5 minute period and calculate the count rate.
5. Attach different absorbers to the clamp stand, one at a time, and repeat.
6. Correct all count-rate readings for background radiation by subtracting the background reading measured in step 1.
7. Repeat for the other two sources and then compare the count rates for each source with each different absorber.
8. A higher count rate for a given material means that more radiation has passed through the absorber and so the radiation type is more penetrating.

**Tips**

- To develop this experiment further, you could experiment with different thicknesses of absorbers to see how the penetration varies for each type of radiation.
- Repeat readings are beneficial in this experiment since it is not unusual to get anomalous results due to miscounting or random variation.
- If readings for all combinations seem particularly low, the radioactive source may be too old and may have become too inactive to get easily observable readings - a new source may be required or count rates should be taken over a longer period of time.
- Consider the best way to display your results - you could construct bar charts for each material or you could construct them for each radiation type.

**Safety Precautions**

- Ensure radiation in use signs are clearly displayed, and that all those in the laboratory are aware that radiation is in use.
- When not in use, ensure that the radioactive emitters are stored in their containers to reduce unnecessary exposure.
- Use radioactive sources that have a half-life of a few years and have been approved for school use.
- Never handle the sources directly, always use long-armed tongs with an extended arm to maximise the distance you are from the source.
- A teacher/technician should always be present when working with radioactive sources in the lab.