

HCC 11 Physics

Range of Alpha and Beta Particles in Air

Investigation 2 2014/15



TIME ALLOWED FOR THIS TEST

Preparation:	One class period
Working time:	Double period
Write up time:	One week after conducting

MATERIAL REQUIRED OR RECOMMENDED FOR THIS TEST

Year 11 ATAR Physics Formula & Constants Sheet

Pens, pencils, eraser, rule, Mathaid or Math-o-Mat

Scientific calculator

INSTRUCTIONS

Numerical answers should be evaluated to the appropriate number of significant figures unless otherwise stated and given in scientific notation.

All recorded measurements should be shown in both graphs and tables with the associated error.

One of the safety principles that radiation industry workers observe is to maintain a safe distance between any radioactive source and themselves. What is a reasonable safe distance - 10 cm, 50 cm, 1 m or 10 m?

Aim: To determine how far alpha and beta particles penetrate through air.

First you must write what you know of alpha and beta radiation, and the properties and characteristics commonly associated with each of these that would affect the distance they travel through air, with appropriate referencing (in-text and end-text) and use this information to develop a hypothesis of what you will find.

Define your variables for this investigation: dependent (what variable you will be measuring), independent (what variable you will be changing to see the relationship between it and the dependent variable) and state several variables you are controlling to ensure a fair test and how and why you are controlling them. Remember your hypothesis should be a statement involving your dependent and independent variables.

Materials provided:

- Americium-241 source
- Strontium-90 source
- Geiger-Muller tube and counter
- Meter ruler
- Retort stand and clamp

You will need to construct a method for determining 'g' using these materials. When you write out your procedure and apparatus list, make sure you only mention the materials you have chosen to utilise, and have written out the steps in full detail, so that if someone were to follow your method, they would achieve the exact same results. Carefully consider safety precautions: **you should always use tongs and heavy duty rubber gloves when handling radioactive sources.** Prepare your tables to record your data.

At this stage, check in with your teacher and ask if you can begin conducting your experiment.

You will need to produce data tables and graphs to help draw your conclusions. Data tables and graphs should both indicate the uncertainty of the data.

When you discuss your findings, you must explain trends in the data and any calculations you have made from your data and what they mean. You should identify any sources of error (consider the Geiger-Muller tube design!) and discuss how you reduced error, or how you recognise you could have

performed the experiment better to reduce error next time. Identify any outliers that do not fit with the trend.

Finally, state your conclusion. This should be a direct, brief response to the aim and should refer to your hypothesis - whether or not it was supported.

Refer to the investigation rubric for marks available in your write-up.