WJEC England Physics A Level

SP C3 06 : Nuclear Decay
Practical notes

1. Investigation of Radioactive Decay: A Dice Analogy

Equipment:
- 50 cubes, with one coloured face
- A large tub
- A tray large enough for all the cubes to lie flat

Method:
1. Place the 50 cubes in the tub and shake gently.
2. Throw the cubes out into the tray.
3. Remove any cubes which landed coloured-side-up and record the number remaining.
4. Put the remaining cubes into the tub and repeat.
5. Repeat 10 times, or until all cubes have been removed.
6. Plot a graph of the number of cubes remaining against the number of throws.

Theory:
The graph should produce an exponential decay curve, which is the model for radioactive decay. This can be used to investigate half life; read off the number of throws needed to halve the number of cubes remaining, then read off the number of throws between half and a quarter of cubes remaining. The half life should remain constant.

2. Investigation of the Variation of Intensity of Gamma Radiation With Distance

Equipment:
- Gamma source
- Geiger counter
- Stopwatch
- Metre ruler

Method:
1. First, measure the background radiation using the geiger counter (without the gamma source).
   a. Record the count rate for 10 minutes and divide by 600 for the counts per second.
2. Set the geiger counter 1m away from the source. Take the number of counts over 5 minutes and find the count rate.
3. Repeat for 0.9m, 0.8m etc.
4. Plot a graph of count rate against distance.
5. Count rate should decrease exponentially as distance increases.
6. Plot a graph of count rate against distance². This should produce a straight line.

Theory:
This experiment and results should confirm the inverse square law. The intensity of gamma radiation decreases with the square of distance.