INVESTIGATION OF RADIOACTIVE DECAY – A DICE ANALOGY

Specification reference: **A level Component 3.8 – Nuclear decay**

Theory:

Radioactive decay is based on the assumption that the disintegrations are entirely at random. This can be modelled using dice to represent the atoms of a radioactive isotope.

Apparatus:

1 000 dice

10 × cups to hold 100 dice each

Further guidance for technicians:

Cubes with only one side coloured and cups can be purchased as a kit from Philip Harris catalogue number B8G85951.
http://www.philipharris.co.uk/product/Half-Life-Analogue-B8G85951

Experimental Method:

Each student should have an equal share of the 1 000 dice (or cubes) and a cup. Throw the dice onto the table. Suppose all the dice with the number 1 uppermost have disintegrated. Remove these dice and count the number remaining. Repeat this for a further 9 throws (making 10 in all) and note down the number of throws and the number of dice remaining each time.

When complete combine the results of the class so you have data for 1 000 dice rolled 10 times. Plot a graph of number of dice remaining (y-axis) against number of throws (x-axis). This should give an exponential curve with a half-life of about 3.8 throws.

Practical Techniques:

Use ICT such as computer modelling, or data logger with a variety of sensors to collect data, or use of software to process data.