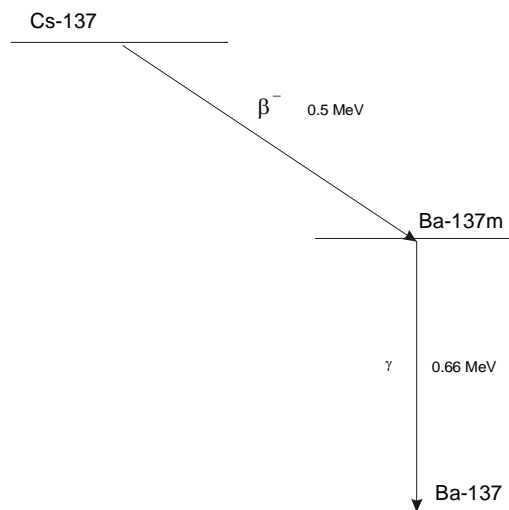


Isotope Generator Cs-137 / Ba-137 m

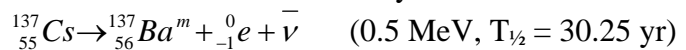
The purpose of this experiment is to investigate the decay of a radioactive material and hence to determine the half-life of the substance.

The Isotope Generator contains Cs-137 as the long-lived parent nuclide which has a half life of 30.25 years. Cs-137 decays, by emission of betaradiation, into the stable isotope Ba-137.



This transition is partly effected (approx 5%) by direct conversion into the stable isotope Ba-137 (the ground state) and partly (approx 95%) via the metastable energy state of Ba-137m.

Hence we have the series of decays



In the experiment Ba is "milked" out of the Isotope Generator by pressing an eluting solution through the generator as described below.

The gammarays from Ba-137 is detected by a GM-tube connected to a Counter (for example Rm400) which can be controlled by FPRO.

Experimental Procedure

Safety rules to be observed:

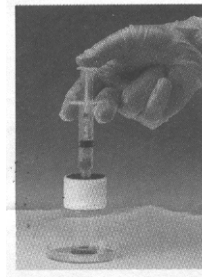
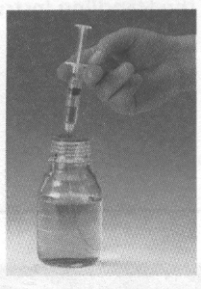
- 1) Keep a distance of at least 25 cm from any radioactive source, except when you must handle it
- 2) Eating, drinking etc. is strictly prohibited during this experiment
- 3) Wash your hands after the experiment.

Connect GM-tube with counter device.

Prepare the counter to count in successive intervals of 10 s.

From 4-5 measurements you can estimate a value for the background radiation. This number should be subtracted from the real measurements.

Now the Ba-137 sample should be prepared (contact the teacher!):



- Connect the plastic tube onto the syringe, draw approx 2 mL of the eluting solution into the syringe and remove the tube.
- remove the protected cap from the generator (blue labelled screw socket) and connect the generator with the syringe tip by tightening it lightly into the screw socket.
- to start the eluting process, pull the protecting cap off the discharging socket (no screw thread!) and hold the generator with its discharging hole facing downwards above the receiving vessel. By carefully pressing the syringe piston the eluting solution is forced through the generator and discharging into the receiving vessel. The piston should not be pressed too strongly! The whole eluting process should take approximately 10 – 20 seconds.
- after the eluting process has been completed, the generator should be sealed with both sealing caps.

Now you should place the GM tube as close to the sample-solution as possible and then start the experiment starting the counter.

Table your counts and create a graph. Investigate the graph by suitable functional fitting to find the decay constant and the half time.