Uranium Problem Setup:

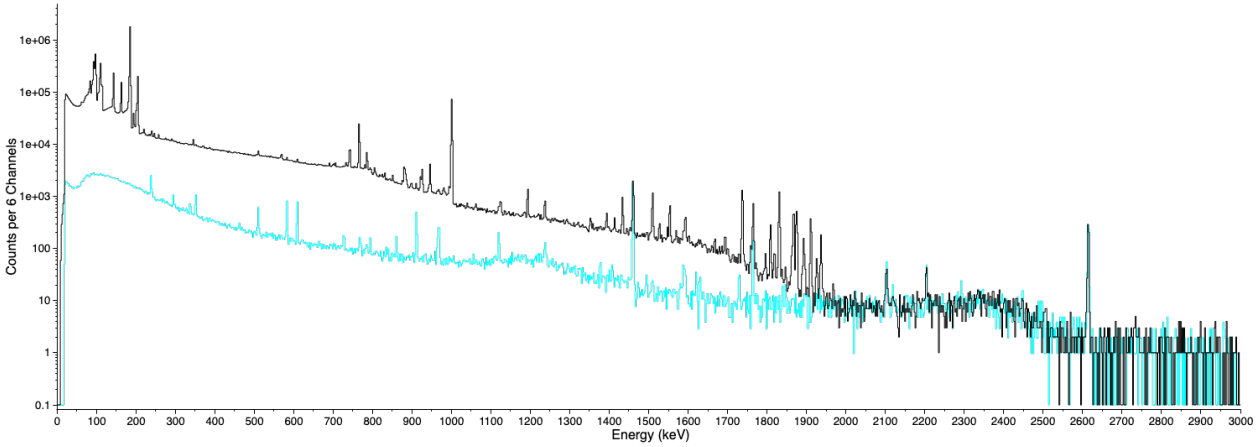

Figure 1 uranium_40%_HPGe_15cm.n42

A radiation portal monitor alarmed, with the source of the alarm being a 10cm×10cm×10cm plastic container weighing a little over 1 kg.
A HPGe detector was used for secondary inspection. A 1-hour spectrum was taken at 15 cm from box center to detector face and is shown in Figure 1. The onboard RIID indicated uranium.

Information you will need:
The file "uranium_40%_HPGe_15cm.n42" contains both an item of interest spectrum, and a 1-hour background spectrum.

You can assume the source is pure uranium with an age of 20 years, and spherically shaped.

If opened in InterSpec the N42 file will have the appropriate detector response function (DRF) included. The "HPGe 40%" DRF included with InterSpec is also close-enough to use for this problem.

For other programs, you can assume the detector has a face diameter of 6.6 cm, and an *intrinsic efficiency* equation of:

$$exp(-2.0333 - 0.657987 * ln(x) + 0.0331352 * \ln(x)^2 - 0.176174 * ln(x)^3 - 0.077921 * ln(x)^4 + 0.010443 * ln(x)^5 + 0.00134222 * ln(x)^6)$$

Where *x* is energy in MeV. This equation was derived from data available from https://github.com/sandialabs/InterSpec/tree/master/tutorials/make_drf/cal_data_HPGe.

Questions:

a) From just looking at the spectrum, is the uranium shielded?
b) What is the approximate uranium enrichment?
c) What is the approximate uranium mass?