

Quiz 1

Assigned 5 Sep 12, Due 17 Sep 12

Chart of the nuclides (up to and including page 1-13 of the lecture notes)

Use the chart of the nuclides, the readings on the chart of the nuclides, table of the isotopes, and web links from lecture 1 to answer the following questions.

1. (10 Points) Using the chart of the nuclides find 4 isotopes where the metastable state is longer lived than the ground state.

Isotope	Metastable half life	Ground state half life

2. (10 Points) The cross section data generally have two values. As an example the cross section data the absorption of a neutron and emission of a photon for ^{147}Nd is $\sigma_{\gamma} = 4\text{E}2, 2\text{E}2$
Why are there two values and what is the cross section unit. Define the different types of cross sections presented by the data.

3. (5 Points) Name 5 elements lighter than uranium that were found during the discovery of fission.

4. (10 Points) Provide 5 elements that have at least 5 metastable isotopes? Are there any trends in the population of isotopes with metastable states? (consider the number of neutrons and protons)

5. (10 Points) Provide the cumulative fission yields for the A isobars listed below.

A	^{233}U	^{235}U	^{239}Pu
116			
95			
72			
160			

6. (15 Points) Plot the ratio of ^{235}U cumulative fission yield to ^{239}Pu cumulative fission yield for $90 \leq A \leq 105$ and $135 \leq A \leq 150$. (Use plotting software, provide on separate page).

What are the differences between the higher ($135 \leq A \leq 150$) and lower ($90 \leq A \leq 105$) A set? What accounts for this difference?

7. (15 Points) Describe the cross section data presented for ^{197}Au .

8. (10 Points) Provide the main gamma decay energy and the gamma decay intensity for the following isotopes

Isotope	Main gamma decay energy (keV)	Gamma Intensity (%)
^{56}Ni		
^{60}Co		
^{127}Sb		
^{137}Cs		
^{183}Re		
^{241}Am		

9. (5 Points) Where was the location of the first man-made reactor?

10. (10 Points) Provide the spin, parity, and half-life for the isotopes below

Isotope	Spin	Parity	Half-life
^{208}Pb			
^{107}Rh			
^{99}Tc			
$^{148\text{m}}\text{Pm}$			
^{162}Dy			
^{255}Fm			