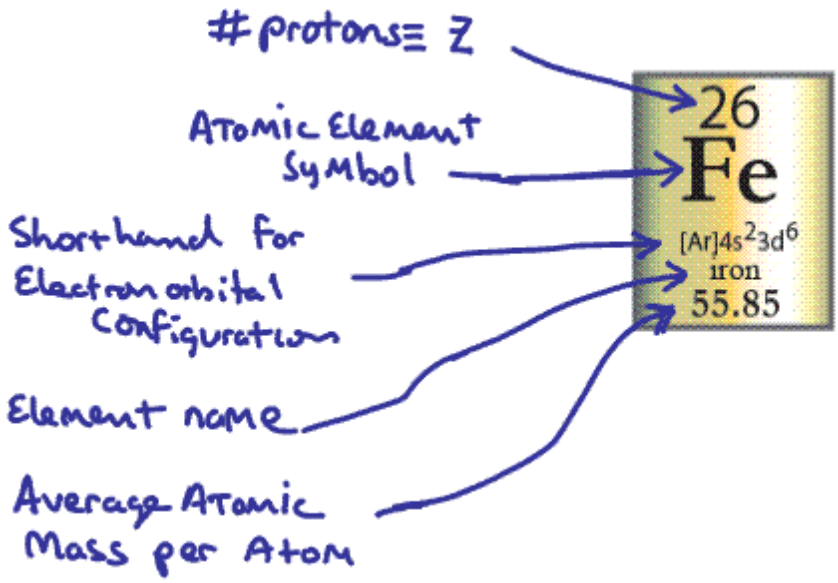
Physics 102 – Spring 2011 – Recitation module 7

Consider the periodic chart on the next page. This chart provides information about each of the known atomic elements. Below is a guide for the iron entry in the periodic chart. The other element entries are similar.



^{56}Fe has how many protons and how many neutrons?

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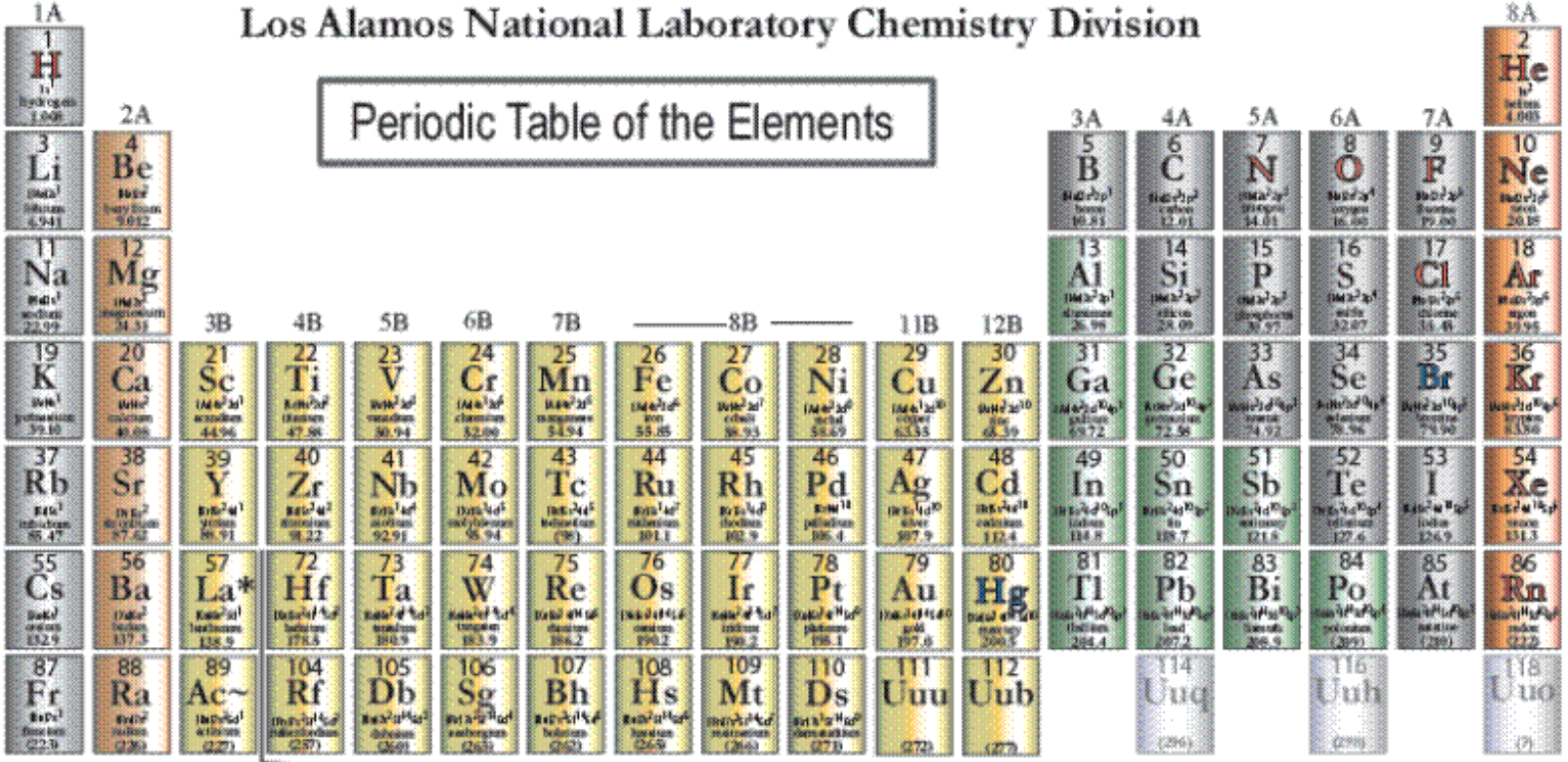
Why is the mass listed on the iron entry in the periodic charge 55.85 instead of a whole number like 56 or 57?

Using the periodic chart on the next page, determine the nuclear product remaining after

1) β^- decay of ^{211}Pb (lead-211)
2) α decay of ^{247}Cm (californium-247)
3) γ decay of ^{131}I (iodine-131)

Los Alamos National Laboratory Chemistry Division

Periodic Table of the Elements



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CHEMISTRY

element names in **blue** are liquids at room temperature
element names in red are gases at room temperature
element names in black are solids at room temperature

Which do you think is safer overall for the public – a coal power plant or a nuclear power plant?

What are all the factors you should consider in evaluating this?

When the atomic (fission) bomb was being developed, one of the scientists on the Manhattan project suggested that the detonation of the bomb might trigger fusion reactions in the atmosphere, causing a fusion chain reaction that could burn up the entire atmosphere of the Earth. Other sceintist calculated that under worst-case scenario assumptions the temperature needed to ignite fusion reactions int eh atmosphere was a factor of 100 higher than that expected to occur in themidst of the fission explosion. So, these scientists were confident that the atmosphere would not be destroyed. This issue and the potential risk was not made public at the time.

Discuss fission and fusion and make sure you understand the difference between the two processes.

What do you think about this story?

Was the risk justified in this instance?

How certain should the science be to make you comfortable with such a risk?

What would you have done if you were the President at the time (considering only this question)?

Sadly, it is possible that you might see one or more instances of "nuclear terrorism" in your lifetime. What kinds of events of this nature might happen?

What type of nuclear terrorism event is the most likely to happen?

Whay type of nuclear terrorism event would cause the most damage? Which would cause the least damage?

You measure the carbon radioactivity (number of decays observed per second) of an old wooden axe is only 20% of its original value. Estimate the age of the ax handle.

Can scientists carbon date an ordinary rock? Why or why not?

What are the two characteristics that make uranium a good substance to use for fueling a nuclear reactor? Why?