ESS 460 – ESS 560 Cosmogenic Nuclides

Homework Week 1 – basic chemistry and physics revision

Web resources for cosmogenic nuclides – beyond Wikipedia

(1) Go to: http://pdg.lbl.gov/2008/reviews/contents_sports.html (bookmark it for later). This is the most authoritative set of pages I know of for current chemistry and physics information.

(a) What is the currently accepted value of *Avogaddro's Number* and its current uncertainty?

(b) What are the currently accepted values of the *proton mass* and *neutron mass* and their uncertainties?

(c) How many grams in 1 *atomic mass unit (amu)*?

(2) Find a good-quality periodic table (there are many online, but there are also a lot of lousy ones. Again, I'd recommend:
http://pdg.lbl.gov/2008/reviews/periodicrpp.pdf
as an authoritative one)

(a) Find precise *atomic weights* of the following elements:

Be Al Si Cl Mn

(b) List the *stable isotopes* of each of these elements, and its precise atomic mass. For this you will need a Chart of the Nuclides. e.g. http://atom.kaeri.re.kr/ or http://www.nndc.bnl.gov/chart/

(c) How many atoms are there in 1 mg of Be? Al? Cl?

(d) How many atoms of ^{35}Cl are there in 1 mg of isotopically normal Cl?

(3) Go to either: http://atom.kaeri.re.kr/ or http://www.nndc.bnl.gov/chart/

(a) List the radioactive isotopes of Be with half-lives > 1 day.

(b) What are the *decay mode* and *decay products* of each radioisotope?

(c) List all the radioactive isotopes of the following elements with half-lives greater than 100 years: C, Al, Si, Cl, Ar, Ca, Mn, Fe, Ni, Kr