Project 1. Due Monday August 31—Turn in through eCampus. Contact your teaching assistant if you have problems.

This project aims to familiarize you with www.webelements.com making use of its information about isotopomers of elements, both the **stable**, naturally occurring isotopes as well as the **radioactive**, or radioisotopes. This project will be discussed in your PLTL session.

You are assigned to work with only **one** element according to your last name.

Last name initials:	Element	Compound
A through D	Br	PBr_3
E through H	Ga	$GaCl_3$
J through M	Se	$SeCl_2$
N through S	B	BBr_3
T through Z	Fe	$(C_5H_5)_2Fe$

The assignment is as follows for your specific element and compound:

1) For your element, list the percentages (natural abundances) of the stable, naturally occurring isotopes, and show how they average to the atomic mass given for that element in most periodic tables.

2) For each representative **compound** of that element, give (reproduce or sketch the bar graph) the isotopic bundle/pattern for the parent peak in its mass spectrum.
[Note: here you may use the Isotope Distribution Calculator found on the Scientific Instruments site: http://www.sisweb.com/mstools/isotope.htm Suggest an isotopomer composition that could give rise to each peak of the bundle.

3) In the following chart are some radioisotopes used in medical applications: Co-60, I-131, C-14, etc. For each give the nuclear equation that describes the mode of decay and calculate the time required to reduce the radioactivity from that isotope to 6.25% of the original. Here you should use Webelements.

Radioactive Isotope	Applications in Medicine
Cobalt-60	Radiation therapy to prevent cancer
Iodine-131	Locate brain tumors, monitor cardiac, liver and thyroid activity
Carbon-14	Study metabolism changes for patients with diabetes, gout and anemia
Carbon-11	Tagged onto glucose to monitor organs during a PET scan
Sodium-24	Study blood circulation
Thallium-201	Determine damage in heart tissue, detection of tumors
Technetium-99m	Locate brain tumors and damaged heart cells, radiotracer in medical diagnostics (imaging of organs and blood flow studies)

Here is a primer for balancing Nuclear Equations—taken from the web

There are two types of nuclear reactions: Fission, where a nucleus breaks into two or more pieces, and fusion where two or more nuclei combine to form a new element. In nuclear reactions, only the nucleus is involved. Electrons are ignored. Some atomic nuclei are inherently unstable and spontaneously change or "decay". There are four types of decay:

Type	Symbol	Charge of particle	Mass(AMU)	Effect on Atomic #	Effect on Atomic Mass	Strength
Alpha	α	+2 (He nucleus)	4	decrease by 2	decrease by 4	Stopped by paper
Beta- e- emission	β- electron	-1	0	increase by 1	0	Aluminum Foil
Beta+ e- capture	β+ Positron	+1	0	decrease by 1	0	Aluminum Foil
Gamma	γ	none	none	none	none	Lead

The net result of α, β- or β+ decay is a new element. In b- decay, a neutron decays into a p+ and an e- which is then ejected. In β+ decay a p+ captures an e- and transforms into a neutron. But despite the nature of the reaction the law of conservation of matter still applies and the equations are balanced the same way. Note α particle is a helium nucleus!

Another type of reaction occurs when something impacts a nucleus. These reactions result either in the nucleus splitting (fission) or the combination of two or more nuclei to form a third, different nucleus (fusion).

Balancing Nuclear Equations: Matter must be conserved including all p+ & n°. Example:

Decay reaction (α decay) $^{219}_{86}Rn \rightarrow ^{4}_{2}He + ^{215}_{84}Po$

Fission Reaction $^{1}_{0}n + ^{235}_{92}U \rightarrow ^{92}_{36}Kr + ^{141}_{56}Ba + 3^{1}_{0}n$

Fusion Reaction: $^{35}_{17}Cl + ^{1}_{1}H \rightarrow ^{36}_{18}Ar$ another example $^{2}_{1}H + ^{3}_{1}H \rightarrow ^{4}_{2}He + n^{\circ}$