2.813/2.83 Homework #2
Material Flows

Please bear in mind that with material flows all calculations are approximate.

Problem 1
With the project of Yucca mountain the US is hoping to store nuclear waste that is currently stored onsite at the nuclear facilities. What if all this waste was thrown into the ocean. How would the concentration of uranium in the ocean change if we assume 100% of the waste is Uranium. Go online and find the US nuclear waste from 1968 onwards (hint: EIA). Calculate the increase in the concentration of Uranium (in percentage) if all the US waste is dumped into the ocean.

Problem 2
Lets assume there is a proposal to open a mega-factory or conglomerate of factories that emits 8 Gtonnes of carbon (C) as carbon dioxide into the atmosphere in a given year. In that year how much will the CO_2 concentration change? There are several ways of doing it. Hint: Think about residence time! (visit your class slides)

Problem 3
Assume you smoke 20 cigarettes/day for a year. How much lead are you exposed to? Hint: If you can't find the concentration of lead in tobacco, assume the whole cigarette is average biomass.

Problem 4
Estimate the global amount of copper mobilization <u>in</u> human beings today.

Problem 5
If we expect population to increase to 9 billion in 50 years from now, and GDP per capita to increase by a factor of 7, how much will we need to reduce our environmental impact per GDP just to stay even?

Problem 6
If the future value F of an asset with a present value P is increased at the (interest) rate i per time period, then over n time periods, show that $F \cong P(1+in)$ for $i^2 << 1$.

Problem 7
Using the TRI (it is okay to report the answers in pounds):

A) In 1998 in Louisiana, how much chromium has emitted to air?

B) In 2001, in the U.S. what was the total on and off site disposal (and other releases) of HAP's?

C) In 2002, in Middlesex, NJ which chemical had the largest emitted quantities on and off site (disposal + other releases)? Hint: you can either find it or export it (fancy) into excel and use the sort tool.

HUMAN BODY COMPOSITION

Element	Percent	Pounds	Kilograms
Oxygen	65	97.5	44.2
Carbon	18	27.0	12.2
Hydrogen	10	15.0	6.8
Nitrogen	3	4.5	2.0
Calcium	1.5	2.25	1.0
Phosphorus	1.0	1.50	0.68
Sulfur	0.25	0.375	0.170
Potasssium	0.20	0.300	0.136
Chlorine	0.15	0.225	0.102
Sodium	0.15	0.225	0.102
Magnesium	0.05	0.075	0.034
Iron	0.006	0.009	0.004
Fluorine	0.0037	0.00555	0.00252
Zinc	0.0032	0.00480	0.00218
Silicon	0.0020	0.00300	0.00136
Zirconium	0.0006	0.00090	0.00041
Rubidium	0.00046	0.00069	0.00031
Strontium	0.00046	0.00069	0.00031
Bromine	0.00029	0.000435	0.000197
Lead	0.00017	0.000255	0.000116
Niobium	0.00016	0.000240	0.000109
Copper	0.00010	0.000150	0.000068
Aluminum	0.000087	0.0001305	0.0000592
Cadmium	0.000072	0.0001080	0.0000490
Boron	0.000069	0.0001035	0.0000469
Barium	0.000031	0.0000465	0.0000211
Arsenic	0.000026	0.0000390	0.0000177
Vanadium	0.000026	0.0000390	0.0000177
Tin	0.000024	0.0000360	0.0000163
Mercury	0.000019	0.0000285	0.0000129
Selenium	0.000019	0.0000285	0.0000129
Manganese	0.000017	0.0000255	0.0000116
Iodine	0.000016	0.0000240	0.0000109
Gold	0.000014	0.0000210	0.0000095
Nickel	0.000014	0.0000210	0.0000095
Molybdenum	0.000013	0.0000195	0.0000088
Titanium	0.000013	0.0000195	0.0000088
Tellurium	0.000012	0.0000180	0.0000082
Antimony	0.000011	0.0000165	0.0000075
Lithium	0.0000031	0.00000465	0.00000211
Chromium	0.0000024	0.00000360	0.00000163
Cesium	0.0000021	0.00000315	0.00000143
Cobalt	0.0000021	0.00000315	0.00000143
Silver	0.0000010	0.00000150	0.00000068
Uranium	0.00000013	0.000000195	0.000000088
Beryllium	0.00000005	0.000000075	0.000000034
Radium	0.0000000000001	0.00000000000021	0.0000000000001

Mass of the element assumes an average body mass of 150 pounds (68.04 kilograms). Source: Geigy Scientific Tables, Ciba-Geigy Limited, Basle, Switzerland, 1984