CEE490 / ENVH461 HW#1 Name: _____

Due Tuesday Oct. 6, 2009 at class time.

Cancer Risk from Exposure to Air Pollutant Emissions from Medical Waste Incinerator

Given: Medical Waste Incinerator (1000 lb waste/hr) proposed to be constructed
Maximum downwind air pollutant concentrations in table below
(annual average pollutant concentrations from TSCREEN dispersion calculations)
Unit cancer risk factors are shown in the table below,
obtained from EPA's Integrated Risk Information System IRIS at http://www.epa.gov/iris

Note: The medical waste incinerators at Seattle's Swedish Hospital, Veterans Administration Hospital, and Northwest Hospital (incinerator built in 1991, shut down Aug 1998 after failing a emission source test for HCl) were shut down. The Seattle VA Hospital on Beacon Hill abandoned its incinerator in Sept 1998 after continued protests from community and environmental groups.

Dioxins: Air sampled in: 1) Sweden had dioxin concentrations ranging from 0.003 to 5 picograms/m^3; 2) Bermuda had dioxin concentrations ranging from .035 to 0.105 picograms/m^3; 3) Felicity Ohio had dioxin concentrations of 1.8 picograms/m^3. There are many measurements of dioxin concentrations in stack gas emissions from incinerators, pulp mills, power plants, etc. but very few in ambient air. Why do the EPA and State Air Pollution Agencies not measure the dioxin concentration in the ambient air?
Picogram = (10^{-12})(gram) http://www.epa.gov/wtc/trendcharts/dioxintrendsweb.htm

Equations:

$$\text{Cancer Risk to 1 Person Breathing 1 Pollutant for 70 Years} = \left(\text{Annual Av Pollutant Conc}, \frac{\mu g}{m^3}\right)\left[\text{Pollutant Cancer Unit Risk Factor}, \frac{\text{Cancer Risk}}{(\mu g / m^3)}\right]$$

$$\text{Total Max 70 Year 1 Person Cancer Risk Breathing Multiple Pollutants} = \sum \left[\text{Single Pollutant Max Cancer Risks to 1 Person}\right]$$

Find:

a. Maximum Cancer Risk (70 year exposure) for 1 person breathing each individual air pollutant (put answers in table below)

Air Pollutant	Annual Average Pollutant Conc. ($\mu g/m^3$)	Cancer Unit Risk Factor [Risk/($\mu g/m^3$)]	Max Cancer Risk to 1 Person Breathing Pollutant for 70 Years
Arsenic	.0000160	.0043	
Beryllium	.0000006	.0024	
Cadmium	.0000280	.0018	
Chromium	.0000026	.012	
Nickel	.0000300	.00048	
Dioxin/Furans	.0000020	33.33	

b. Total Max. 70 year cancer risk to 1 person breathing 6 hazardous air pollutants shown in the table. _____ Cancer Risk/1 person

c. Total Max 70 year cancer risk to 10^6 people breathing the 6 hazardous air pollutants shown in the table. _____ Cancer Risk/10^6 Persons