CHEM 304
SPRING 2012
HW/Learning Goals #10: Toxic Organics & Heavy Metals

1. Toxic organics (pesticides, PCB's etc.):

a) What chemical (and *bio*chemical) properties of organo-chlorine compounds (pesticides and/or PCB's) lead to their persistence in the environment?

b) Explain the term "bioaccumulation" – what does it mean or refer to?

c) K_{ow} (the octanol/water partition coefficient): i) Define this quantity. ii) State this quantity's relationship to the degree to which a compound will bio-accumulate - i.e. Do compounds that do bio-accumulate have high values of K_{ow} or low values of K_{ow}, and iii) Why do K_{ow} values parallel the propensity to bio-accumulate?

d) Explain the mechanism by which the "organismal concentration" of a compound like a PCB or an organo-chlorine pesticide will increase upon proceeding up the food chain in an ecosystem that has been contaminated.

2. a) What 4 metals are of most concern in the context of environmental chemistry, and why?

b) What are the main sources of environmental Hg?

c) What is the formula for "dimethyl mercury", how is it formed, and why is this form of mercury rather problematic?

d) How does acidification lead to increased solubility of heavy metal compounds, such as: PbS, $PbCO_3$, or HgS?