

KEY

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

- a) What chemical (and biochemical) 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?

As } VERY TOXIC  
 Hg }  
 Cd }  
 Pb - TOXIC + USE WIDE SPREAD

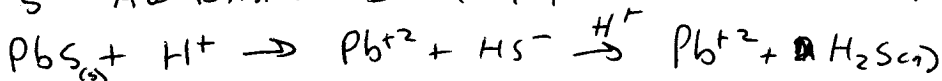
b) what are the main sources of environmental Hg?

→ COAL, WASTE INCINERATORS, → LANDFILLS

c) What is the formula for "dimethyl mercury", how is it formed, and why is the form of mercury rather problematic? →  $Hg^0 \rightarrow Hg^{2+} \rightarrow Hg(CH_3)_2$  OR  $CH_3-Hg-CH_3$

↳ THIS CROSSES BIOLOGICAL MEMBRANES EASILY

d) How does acidification lead to increased solubility of heavy metal compounds, such as:  $PbS$ ,  $PbCO_3$ , or  $HgS$ ?  $CO_3^{2-} + S^{2-}$  ARE BASIC - REACTION w/  $H^+$  INCREASES SOLUBILITY



a) THEY ARE VERY INSOLUBLE IN  $H_2O$  - BUT SOLUBLE IN FATS (OILS, ETC.)

b) IT REFERS TO THE TENDENCY OF SUCH COMPOUNDS TO ~~linger~~ LINGER IN ORGANISMS + INCREASE IN CONCENTRATION ~~or~~ UP THE FOOD CHAIN.

c) i) IT IS THE RATIO OF SOLUBILITY IN OCTANOL / SOLUBILITY IN  $H_2O$   $K_{ow} = \frac{S_{OCT}}{S_{H_2O}}$   
 ii) LARGER  $K_{ow}$  MEANS MORE TENDENCY TO BIO ACCUMULATE  
 iii) OCTANOL SOLUBILITY MIMICS FAT SOLUBILITY.

d) THE ORGANOCHLORINES LINGER IN FAT TISSUE - DO NOT GET ELIMINATED SINCE URINE IS A "WATER SOLUBILITY" BUSINESS. EACH ORGANISM EATS MORE THAN ITS BODY WEIGHT IN A LIFETIME, AND THUS "FILTERS OUT" FAT SOLUBLE SUBSTANCES.