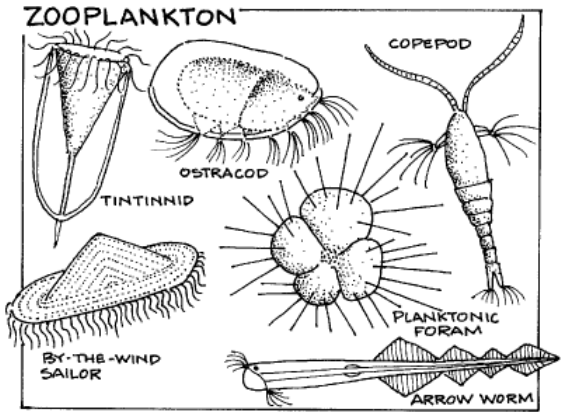
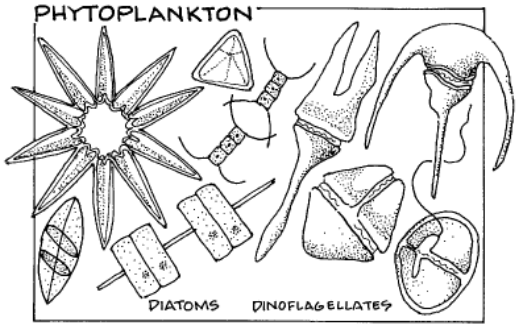
STE June REVIEW Part 2

Total mercury was determined in samples of phytoplankton and zooplankton collected from 14 sampling stations in Lake Michigan. The results of mercury analyses were 0.079 ppm for organism X and 0.108 ppm for organism Y.





a) Give an estimate for what you think is the concentration of mercury in Lake Michigan waters. Assume a bioconcentration factor of 40.
b) Which of the tested organisms is an algae? Which is a zooplankton, an organism that eats algae. Why?
c) According to FDA studies, shark often has mercury concentrations exceeding 3 ppm. Assuming one does not excrete any of the mercury ingested, how much shark in kg does a 60 kg person have to eat in a year to raise the toxic level of mercury in one's body by 2 mg/kg. Express your answer in kg of shark eaten on average per week.
d) How did the shark end up with such a high level of mercury?

Read more: http://www.lenntech.com/periodic/water/aluminium/aluminum-and-water.htm#ixzz0osT7fiEm

Answers

a) [toxin in Algae] / [toxin in water]= 40
0.079 /x = 40
40 x = 0.079
x =0.079/40=0.001975 = 0.0020 ppm
Why did we choose the 0.079? see(b)

b) Because of bioaccumulation, the organism that's higher on the food chain should have more of the toxin. So the zooplankton has 0.108 ppm and the algae has 0.079 ppm. Usually the bioconcentration factor compares the organism at the bottom of the food chain to that of the water (environment), which is why we selected 0.079 in (a).

c) In a year, the person has to eat 60 kg*(2mg/kg) = 120 mg, assuming it all gets stuck in his body. The shark has 3mg/kg, so 120 mg(kg/3mg) = 40 kg , so that mass of shark will have this amount of mercury. But they want a weekly avg, so 40kg/52weeks = 0.77 kg/week is what the person would have to ingest.

d) Bioaccumulation. The shark is high on the food chain, so it keeps eating “living filters”of the pollutant who in turn filtered and concentrated mercury from what they ate.