Honors Level Stoichiometry Challenge: Name _____ Block____

1 ng/ml = 1ppb	ppb = part per billion	nano = 1×10^9	1 ng = 1×10^9 g
1 cm^3 = 1 ml	1000 ml = 1 L	1000 g = 1 kg	1000 m = 1 km

Suppose a group of volunteers is planning to build a park near a local lake. The lake is known to contain low levels of arsenic (As). Therefore, prior to starting construction, the group decides to measure the current level of arsenic in the lake.

If a15.9 cm^3 sample of lake water is found to have 163.5 ng As, what is the concentration of arsenic in the sample in parts per billion (ppb), assuming that the density of the lake water is 1.00 g/cm^3?

One of the volunteers suggests hiring an on-site water treatment company to remove the arsenic from the lake. Calculate the total mass, in kilograms, of arsenic in the lake that the company will have to remove if the total volume of water in the lake is 0.730 km^3.

The company claims their process takes 2.09 days to remove 31.60 kg of arsenic from a water source. Based on the company's claim and the concentration of arsenic in the lake, how many years will it take to remove all of the arsenic from the lake, assuming that there are always 365 days in a year?

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$$\frac{163.5\ \text{ng}}{15.9\ \text{cm}^3} = 10.28\frac{\text{ng}}{\text{cm}^3} = 10.28\frac{\text{ng}}{\text{ml}} = \mathbf{10.28\ ppb}$$

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$$\frac{0.730\ \text{km}^3}{1}\left|\frac{(1000)^3\ (\text{m})^3}{(1)^3\ (\text{km})^3}\right|\frac{(100)^3\ (\text{cm})^3}{(1)^3\ (\text{m})^3}\left|\frac{1\ \text{ml}}{1\ \text{cm}^3}\right|\frac{10.28\ \text{ng}}{1\ \text{ml}}\left|\frac{1\ \text{g}}{1\times10^9\ \text{ng}}\right|\frac{1\ \text{kg}}{1000\ \text{g}} = \mathbf{7504.4\ kg}$$

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$$\frac{7504\ \text{kg}}{1}\left|\frac{2.09\ \text{days}}{31.60\ \text{kg}}\right|\frac{1\ \text{year}}{365\ \text{days}} = \mathbf{1.36\ years}$$