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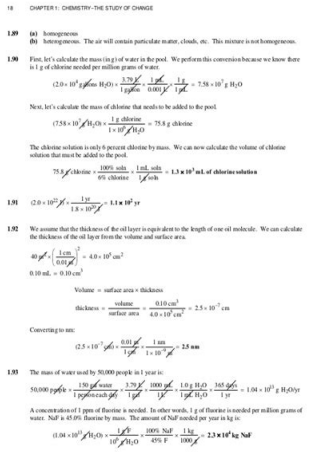
so many fake sites. this is the first one which worked! Many thanks



18 CHAPTER 1: CHEMISTRY–THE STUDY OF CHANGE

1.89 **(a)** homogeneous
(b) heterogeneous. The air will contain particulate matter, clouds, etc. This mixture is not homogeneous.

1.90 First, let's calculate the mass (in g) of water in the pool. We perform this conversion because we know there is 1 g of chlorine needed per million grams of water.

$$(2.0 \times 10^5\ \text{gal}) \times \frac{3.79\ \text{L}}{1\ \text{gal}} \times \frac{1\ \mu\text{L}}{0.001\ \text{L}} \times \frac{1\ \text{g}}{1\ \mu\text{L}} = 7.58 \times 10^5\ \text{g H}_2\text{O}$$

Next, let's calculate the mass of chlorine that needs to be added to the pool.

$$(7.58 \times 10^5\ \text{g H}_2\text{O}) \times \frac{1\ \text{g chlorine}}{1 \times 10^6\ \text{g H}_2\text{O}} = 75.8\ \text{g chlorine}$$

The chlorine solution is only 6 percent chlorine by mass. We can now calculate the volume of chlorine solution that must be added to the pool.

$$75.8\ \text{g chlorine} \times \frac{100\%\ \text{soln}}{6\%\ \text{chlorine}} \times \frac{1\ \text{mL soln}}{1\ \text{g soln}} = \mathbf{1.3 \times 10^3\ mL\ of\ chlorine\ solution}$$

1.91 $(2.0 \times 10^{22})\ \text{yr} \times \frac{1\ \text{yr}}{1.8 \times 10^{22}\ \text{yr}} = \mathbf{1.1 \times 10^2\ yr}$

1.92 We assume that the thickness of the oil layer is equivalent to the length of one oil molecule. We can calculate the thickness of the oil layer from the volume and surface area.

$$40\ \text{yd}^2 \times \left(\frac{1\ \text{cm}}{0.01\ \text{yd}}\right)^2 = 4.0 \times 10^5\ \text{cm}^2$$

$$0.10\ \text{mL} = 0.10\ \text{cm}^3$$

$$\text{Volume} = \text{surface area} \times \text{thickness}$$

$$\text{thickness} = \frac{\text{volume}}{\text{surface area}} = \frac{0.10\ \text{cm}^3}{4.0 \times 10^5\ \text{cm}^2} = 2.5 \times 10^{-7}\ \text{cm}$$

Converting to nm:

$$(2.5 \times 10^{-7}\ \text{yd}) \times \frac{0.01\ \text{yd}}{1\ \text{yd}} \times \frac{1\ \text{nm}}{1 \times 10^{-9}\ \text{yd}} = \mathbf{2.5\ nm}$$

1.93 The mass of water used by 50,000 people in 1 year is:

$$50{,}000\ \text{people} \times \frac{150\ \text{gal water}}{1\ \text{person each day}} \times \frac{3.79\ \text{L}}{1\ \text{gal}} \times \frac{1000\ \mu\text{L}}{1\ \text{L}} \times \frac{1.0\ \text{g H}_2\text{O}}{1\ \mu\text{L H}_2\text{O}} \times \frac{365\ \text{day}}{1\ \text{yr}} = 1.04 \times 10^{15}\ \text{g H}_2\text{O/yr}$$

A concentration of 1 ppm of fluorine is needed. In other words, 1 g of fluorine is needed per million grams of water. NaF is 45.0% fluorine by mass. The amount of NaF needed per year in kg is:

$$(1.04 \times 10^{15}\ \text{g H}_2\text{O}) \times \frac{1\ \text{g F}}{10^6\ \text{g H}_2\text{O}} \times \frac{100\%\ \text{NaF}}{45\%\ \text{F}} \times \frac{1\ \text{kg}}{1000\ \text{g}} = \mathbf{2.3 \times 10^9\ kg\ NaF}$$

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