Complete the following problems. You must show your work to receive full credit. Show your answers to the correct number of significant figures with the correct units.

1. The volume of seawater on earth is about 330,000,000 mi³. If seawater is 3.5% sodium chloride by mass and has a density of 1.03 g/mL, what is the approximate mass of sodium chloride, in metric tons, dissolved in the seawater on earth? (10 points) (1 mi = 1.609 km, 1 metric ton = 1000 kg).

It will be useful to get volume in terms of mL (or cm³) to use the density:

$$1 \text{ mi} \quad x \quad \underline{1.609 \text{ km}} \quad x \quad \underline{1000 \text{ m}} \quad x \quad \underline{1 \text{ cm}} \quad = \quad 1.609 \text{ x } 10^5 \text{ cm}$$

$$3.3 \text{ x } 10^8 \text{ mi}^3 \quad x \quad \underline{(1.609 \text{ x } 10^5 \text{ cm})^3} \quad = \quad 1.375 \text{ x } 10^{24} \text{ cm}^3 = 1.375 \text{ x } 10^{24} \text{ mL}$$

$$1.375 \text{ x } 10^{24} \text{ mL} \text{ x } \underline{1.03 \text{ g seawater}} \text{ x } \underline{3.5 \text{ g NaCl}} \quad \text{x } \underline{1 \text{ metric ton}} = 4.956 \text{ x } 10^{16} \text{ Ton}$$

$$1 \text{ mL} \qquad 100 \text{ g seawater} \qquad 10^6 \text{ g}$$

So, 5.0×10^{16} metric tons of sodium chloride are required.

2. A graduated cylinder is partially filled with 8.00 grams of diatomaceous earth, a porous material that is often used as a filtering medium. If diatomaceous earth is insoluble in water and has a density of 2.20 g/cm³, what volume of water must be added to bring the total volume in the cylinder to 100.0 mL? (8 points):

We need to find the volume occupied by the diatomaceous earth:

$$8.00 \text{ g} \times 1 \text{ cm}^3 = 3.636_4 \text{ cm}^3 = 3.636_4 \text{ mL}$$

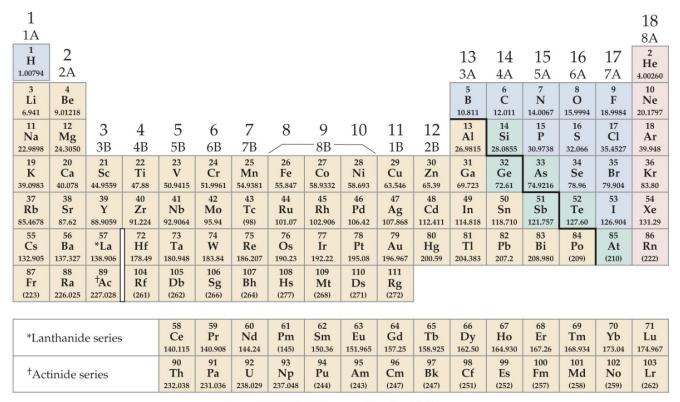
Therefore, we need to add 100.0 mL - 3.636 mL = 96.4 mL

3. Complete the table below (8 points):

Name	Symbol	# Protons	# Neutrons	# Electrons
chlorine - 37	³⁷ CI	17	CI	17
phosphorous – 31	³¹ P	15	16	15
manganese – 55 ion	⁵⁵ Mn ²⁺	25	30	23

Possibly Useful Information

% by mass = $\frac{\text{g component}}{100 \text{ g sample}}$	d = m/v	
Don't walk between parked carsor moving ones!	$1 \text{ cm}^3 = 1 \text{ mL}$ $1000 \text{ cm}^3 = 1 \text{ L}$	



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