

Your Name: \_\_\_\_\_ KEY \_\_\_\_\_

TF's name: \_\_\_\_\_

Discussion /dayTime: \_\_\_\_\_

Show your dimensional analysis setup and give your answer to the correct number of significant figures with appropriate units.

Useful information:  $N_A = 6.022140857 \times 10^{23}/\text{mol}$

1. (6 points,) The density of liquid water is 1.0 kg/L. The molar mass of water is 18.01 g/mol. Assume that each water molecule occupies a cubical volume and that in liquid water the cubes are packed together with no empty space between them. Calculate the length of the cube edge. Express your result in m, to the right number of significant figures.

$$V = \frac{18.01 \text{ g}}{1 \text{ mol}} \cdot \frac{1 \text{ mol}}{6.022 \text{ molecules}} \cdot \frac{1 \text{ kg}}{1000 \text{ g}} \cdot \frac{1 \text{ L}}{1 \text{ kg}} \cdot \frac{1000 \text{ ml}}{1 \text{ L}} \cdot \frac{1 \text{ cm}^3}{1 \text{ ml}} \cdot \frac{1 \text{ m}^3}{10^6 \text{ cm}^3} = 2.991 \cdot 10^{-29} \text{ m}^3$$

$$L = \sqrt[3]{2.991 \cdot 10^{-29} \text{ m}^3} = 3.1 \cdot 10^{-10} \text{ m} \quad (2 \text{ points})$$

Edge length = $3.1 \cdot 10^{-10} \text{ m}$
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2. (2 points) Write the molecular formula for sodium carbonate.  
 \_\_\_\_\_  $\text{Na}_2\text{CO}_3$  \_\_\_\_\_

3. (2 points) Write the common name for  $\text{MnO}_4^-$ . **Permanganate**