pH and Logarithms

1. Find the pH of the following substances with the given hydronium ion concentrations. The pH is the negative of the logarithm to the base 10 of the hydrogen ion concentration in moles per liter.

$$pH = - \log [H_3O^+]$$

Substance	Hydrogen ion concentration	pH
Milk	.0000004	
Limes	.016	
Sodium hydroxide (lye)	3.2×10^{-14}	
Crackers	3.9×10^{-9}	
Water	.0000001	

2. Find the hydrogen ion concentration of the following substances.

Substance	pH	Hydrogen ion concentration
Vinegar	2.8	
Shampoo	5.5	
Beer	4.8	
Soda Pop	2.7	
Tomato	4.2	
Wine	3.4	

3. Make a chart with a vertical logarithmic scale (powers of 10), and position the substances along the chart according to their hydrogen ion concentrations.

4. Write the pH number of the substance beside each entry on your chart.