Keep your "ion" the Reaction!

Electrolytes (Reference: pp. 438-452, *Conceptual Physical Science*, 4th edition)

1. Electrolytes break apart into + and - ions when they dissolve in water to make solutions. These + and - ions can move in the solution and transport electric charge through the solution. Thus electrolyte solutions conduct electricity. For each of the following substances test the conductivity by immersing the electrodes of the conductivity tester into the liquid solutions. BE CAREFUL! (If the solutions are not made then dissolve a spoonful of solid into 50 mL of water or if a liquid pour 50 mL into a small beaker.) The more the solution is conductive, the brighter the light. Describe the relative conductivity of each solution.

Substance	Conductivity
deionized water	
salt water	
sugar water	
vinegar	
ammonia	
soda pop	
baking soda	
hydrochloric acid	
sodium hydroxide	
orange juice	
soap (dissolve a few chips in deionized water)	

2. The substances that do conduct electricity are called electrolytes and can be broken down into the classes of acids, bases, and salts. Use your textbook (pages 438-441) to answer the following questions.

According to Arrhenius acid solutions conduct electricity because of the movement of some anion and what specific cation?

According to Arrhenius basic solutions conduct electricity because of the movement of some cation and what specific anion?

The Bronsted-Lowry theory of acid base behavior focuses on what the acid and base do and not what ions they produce in water. What is the B/L theory of acids and bases?

What is a hydronium ion?

3. There are always hydronium and hydroxide ions in any water solution. When we multiply their concentrations (in moles/Liter) we always get the number 1.0×10^{-14}. The pH scale measures the amount of H^+ ions in solution. Since the concentration varies so much the pH scale was define to be logarithmic, that is it is related to the exponent of ten of the concentration. See page 447 in your text and define pH. _____
Fill in the following chart.

$[H_3O]^+$	$[H_3O]^+$ (in power of ten)	pH	$[OH]^-$
1			
.1	10^{-1}	1	10^{-13}
.01			
.001			
.0001			
.00001			
.000001			
.0000001			
.00000001			
.000000001			
.0000000001			
.00000000001			
.000000000001			
.0000000000001			

In an acid solution $[H_3O]^+ > [OH]$. This means the pH would be < _____.
In a basic solution $[H_3O]^+ < [OH]$. This means the pH would be > _____.
In a neutral solution $[H_3O]^+ = [OH]$ and the pH is _____.

4. Some compounds change color at different pH values. They are called <u>indicators</u>. If these indicators are soaked into pieces of paper it is possible to correlate the color to a pH value. For the substances below, use a piece of pH paper to determine the approximate pH of each solution. Dip a glass rod into the solution and touch the rod to the end of the paper. Then compare this value to using a pH meter.

Substance	pH paper	pH meter
deionized water		
salt		
sugar		
vinegar		
ammonia		
soda pop		
baking soda		
hydrochloric acid		
sodium hydroxide		
orange juice		
soap (dissolve a few chips in deionized water)		

Oxidation-Reduction (Reference: pages 452-463, *Conceptual Physical Science*, 4th edition)

1. Clean the surface of a Zn strip with sandpaper. Place the strip in a small beaker. Transfer enough 0.1 M $CuSO_4$ solution into the beaker to cover part of the Zn strip. After 5 minutes, record your observations.

Write the reaction.

2. Measure 20 mL of 0.1 M zinc sulfate solution and transfer it to a clean small beaker. Measure out 20 mL of 0.1 M cupric sulfate solution and transfer it to a clean small beaker. Fold a thin piece of filter paper and soak in KNO_3 solution. Position the soaked filter paper so that one end of the paper is in the cupric sulfate solution and the other end is in the zinc sulfate solution. Place a copper strip in the cupric sulfate solution and a zinc strip in the zinc sulfate solution. These are the electrodes of the galvanic cell. Use the voltmeter and measure the voltage by attaching the leads of the voltmeter to each strip. _____ If you get a negative voltage, reverse the leads. Identify the polarity of the electrodes of the galvanic cell.
_____
_____

Draw a diagram of the cell showing the electron flow.

Write reactions for what is happening at each electrode.

Identify the anode and cathode.

What is being oxidized? _____
What is being reduced? _____
What is the oxidizing agent? _____
What is the reducing agent? _____

What is the purpose of the strip of paper with KNO_3?

Compare part 1 and part 2. What is similar about these reactions; what is different?