Chemistry 140 Name(s):

Exercise 6: Electrolytes, conductivity, oxidxation and reduction

1. Fill in the tables below; use "**bright**", "**dim**" or "**none**" to characterize brightness. For type of electrolyte, write "**strong**" "**weak**" or "**non**".

Water and solutions

Liquid or Solution	Bulb brightness	Type of electrolyte
Distilled water		
Tap water		
Salt (NaCl) solution		
Sugar ($C_{12}H_{22}O_{11}$) solution		
Baking soda ($NaHCO_3$) solution		
Boric acid (H_3BO_3) solution		

Liquids of Your Choice

Liquid tested	Bulb brightness	Type of electrolyte

Foods of Your Choice

Food Tested	Bulb brightness	Type of electrolyte

2. What did the **brightness** of the bulb have to do with the **conductivity** of the tested material?

3. What **chemical property** did the liquids/solutions in the first table that conducted electricity have in common? Hint: look at their **chemical formulae**.

4. What type of **chemical species** does the chemical property in question 3 lead to?

5. To confirm your suspicions in question 4, read the labels on the containers of the liquids and foods you tested in the last two tables and determine which **substances** were responsible for the conductivity of the liquids/solids.

6. To what **chemical property** could the difference in the brightness of the light from material to material be attributed? Hint: consider the conductivity of two acids: 0.1 M HCl (aq) and 0.1 M H_3BO_3 (aq).

7. Pure water does not conduct electrical current; however, there is a great danger of electrocution when a person comes in contact with an electrical appliance when taking a bath. Why is this the case?

Oxidation and reduction

8. Assign oxidation numbers to each atom in the following species:

a. NO_3^- (nitrate anion)

b. $SbCl_5$ (antimony chloride)

c. $CaHAsO_4$

d. I_3^- (triiodide anion)

9. Determine whether the following changes are an oxidation, a reduction or neither. Show the oxidation number change that proves your point:

a. SO_3^{2-} to SO_4^{2-}

b. Cl_2 to ClO_3^-

c. N_2O_4 to NH_3

d. PbO to $PbCl_4^{2-}$

10. Balance the following half-reactions in an **acidic** solution:

a. $NO \rightarrow NO_3^-$

b. $P_4 \rightarrow HPO_3^{2-}$

11. Balance the following half-reactions in a **basic** solution:

a. $Cl_2 \rightarrow OCl^-$

b. $S_2O_4^{2-} \rightarrow SO_4^{2-}$

12. Balance the following reaction in an **acidic** solution:

$H_2SeO_3 + I^- \rightarrow I_2 + Se$

13. Balance the following reaction in a **basic** solution:

$SeO_3^{2-} + I^- \rightarrow I_2 + Se$