Chem Lab: Aluminum and copper (II) chloride reaction. *Name:*_____

*p.*_____ *Seat #*_____

Procedure. **(**In addition to the equipment mentioned below, you may use any of the lab instruments in your drawer or on the counter to help with observations/measurements. Think about which quantitative data you might want to record before you begin.)

1. Put on Goggles! Fill a 100 mL beaker about ¼ full of tap water. Add about 1 level spoonful of copper (II) chloride to the water. Allow the system of water and crystals to stand for a few minutes and record any qualitative and quantitative observations.
2. Stir the system until the crystals dissolve. Record observations.
3. Loosely roll up a square of aluminum foil, and add the foil to the beaker/contents. Record observations.
4. Clean up: Pour the contents of the beaker in to the "copper waster beaker" over by the fume hood. Rinse the beaker in the sink. Clean any other glassware you used, and return all glassware to your drawer. Remove goggles, and wash hands!

Qualitative Data:

*1. Observe after adding the $CuCl_2$ to the water:*_____

_____

*2. Observe after stirring the $CuCl_2$/water:*_____

*3. Observe after adding the Al foil:*_____

_____

_____

_____

Quantitative Data: *(record at least 3 pieces of quantitative data during lab.)*

Data Analysis:

1. Classify each substance by circling the correct *italicized description.*

a. copper (II) chloride *metal element* *nonmetal element* *ionic compound* *covalent compound*

b. aluminum *metal element* *nonmetal element* *ionic compound* *covalent compound*

c. water *metal element* *nonmetal element* *ionic compound* *covalent compound*

2. A **mixture** contains two or more substances* that are mixed together, but NOT chemically combined.
* for example it might contain 2 elements, or 3 compounds, or 4 elements and 2 compounds, etc.

homogeneous mixtures (aka "solutions") are well mixed; they are uniform throughout.
heterogeneous mixtures are not well mixed; they are not uniform throughout.
(more info about mixtures can be found on page 15-16 of your book)

Classify each of these as a homogeneous or heterogeneous mixture:

a. The copper chloride and water, when the copper chloride was in a layer at the bottom: _____

b. The copper chloride and water, after the copper chloride had completely dissolved: _____

c. The contents of your beaker any time after adding the aluminum: _____

3a. See pages 253-254 of your textbook. List 3 general signs that a chemical change (chemical reaction) may be occurring. (List general signs that a reaction is occurring; not related to today's lab. The first one is done for you.)

(1) *The reaction may absorb or release heat or light.*

(2)_____

(3) _____

3b. A chemical reaction occurred in lab when you added the Al to the copper (II) chloride solution.
Discuss two observations that you made in lab today that indicated that a chemical reaction was occurring once you added the aluminum. Be specific (refer to your qualitative/quantitative data).

(1)

(2)

4. Fill out:	Formula	Charge	# of protons	# of electrons
Aluminum atom	Al	_____	_____	_____
Aluminum ion	____	+3	_____	_____
Chloride ion	____	_____	_____	18
Chlorine atom	____	_____	_____	_____
Copper (II) ion	Cu^{+2}	_____	_____	_____

5. Oxygen has 3 stable isotopes: O-16 (15.9949 amu), O-17 (16.9991 amu), and O-18 (17.9991 amu).
a. Which of these isotopes is the most common?_____
b. Explain your logic – how can you tell that the isotope in (a) must be the most common?
(hint: refer to the periodic table somehow!)

c. Suppose that 43.00 % of oxygen atoms were O-16 (15.9949 amu), 47.20 % were O-17 (16.9991 amu), and the remainder were O-18 (17.9991 amu). What would be the atomic mass of oxygen, based on a weighted average?
Report your answer to 4 decimal places, even if this may seem like too many.
As with any calculations, show work and include units on your work and on your final answer!

6. Write a chemical equation for the reaction that occurred when the aluminum was added.
(Include phase subscripts and balance the equation.)

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