**Stoichiometry Recycling Challenge to Make Some $$$**

**Assessment:** Many students cannot relate stoichiometry to real life. Therefore, this assessment is developed based on what students can encounter everyday. Students will calculate whether it is financially wise try to make money from iron dust or not.

Scenario: You and your friends want to make a quick buck or two. Instead of doing actual labor to earn some money, you and your friends decide to use your chemistry knowledge to earn money (and not in a Breaking Bad sort of way). You’ve heard that selling scrap iron is a nice way to earn a little dough. You and your friends scrounge up a nice pile of old metal from stuff lying around your homes. Unfortunately, the large majority of it now exists in the form of rust.

You remove the rust and sell the good iron that remains. You have 83.33kg of it and sell it for $0.24 per kg for a profit of $20.

While $20 is nice, the fact that so much iron is “wasted” as rust really annoys you and your collaborators. Since you and your crew are chemistry experts, you know that you can create a reaction where the rust in converted back into metallic iron, which you can then sell. However, that requires another metal to react with the rust.

You have following metals available:

2.5kg of Aluminum cans swiped from someone’s uncle’s “collection” of cans from adult beverages

3.0kg of Zinc from disassembling the zinc anode in someone’s hot water heater

2.4kg of Copper from stripping the wiring out of your older brother’s piece of crap car with a $2000 audio system

The reactions of the metals above with rust are as follows:

\_\_Al + \_\_Fe2O3 🡪 \_\_Al2O3 + \_\_Fe

\_\_Zn + \_\_Fe2O3 🡪 \_\_ZnO + \_\_Fe

\_\_Cu + \_\_Fe2O3 🡪 \_\_CuO + \_\_Fe



First choose the metal that you think best fit your purpose and explain why it is so. (Don’t forget the balance the equation for the reaction that you chose).

Assuming you have more than enough rust, how much iron would you be able to recover using the metal that you chose? (Remember, 1 kg = 1000 g) (Show your work)

Using the current market value of iron as $.24/kg, how much money would the metal that you chose yield from the iron it produced? (Remember 1 kg=1000 g)

Below is the current value for the 3 metals you used to produce the iron:

 Cu = $6.60/kg Al = $1.43/kg Zn = $1.54/kg

Taking into consideration how much metal that you need and its current market value, does taking the iron out of the rust and then selling it financially make sense? Why or why not? Justify your answer.

Are you happy with your selection of the type of metal for getting the rust out of the iron? If so explain why? If not, what would be your other selection? Please explain

**Reflection/Teaching Tips:**

**Purpose for the assessment:**

The purpose of this assessment ismaking students to adapt stoichiometry practices to something a little more "real-life". This assessment will provide an unusual stoichiometry assignment to break up the normal flow of the unit. This assessment supports peer learning since students will be in groups.

**Additional advice for using the assessment:**

This assessment can be used after mass-mass stoichiometry, before limiting reactants. This assessment was used as a two-person group assignment after teacher had progressed through mass-mass stoichiometry. It could be also design as a formative assessment for limiting reactants as well.

**Student understanding:**

This assessment used things they encounter everyday. Since the types of questions were unusual, some students were a little unsure of how to precede them.They struggled the most with the question regarding financial sense, once students were given clues. It made sense for them, they just were not used to those types of questions. They had a decent grasp on mass-mass stoichiometry. Students could do the math aspect fine. They had a hard time putting into words why it wasn't cost effective. Since it was a group work, some students relied on their partner too much.