Jason Cody - Sep 15, 2023, 2:18 PM CDT

Assignment #6 - Lab Report #3

You cannot edit this entry after it is graded.

Description	To be completed by the end of lab.
I worked in a group with	
The work for this assignment is in	My notebook

Grade **8.5 / 10**

Graded on Sep 15, 2023, 2:18 PM CDT

Jason Cody - Sep 15, 2023, 2:18 PM CDT

Chemical Reaction of Copper Oxide and Methane Gas

Reacting copper oxide with methane to produce copper, carbon dioxide gas, and water vapor. The mass of remaining copper after reaction will be used to determine empirical formula of original copper oxide. Start with the most important thing first: empirical formula of an oxide. Then, describe how you'll get there. Finally, how will the results be evaluated?

Monday September 11th

Reference

Kateley, L. J., *Introduction to Chemistry in the Laboratory,* 20th Ed., Lake Forest College, **2019**, Experiment 3, Appendix B. OK

Data & Observations OK, but a full narrative isn't necessary. A Pyrex test tube was measured on an centered analytical balance, the test tube weighed 22.2072g. Red copper oxide powder added to the test tube, the combined weight was 23.1221g. The test tube was placed in clamp and heated, a flame at the mouth of the test tube prevented oxygen from recombining with the copper (see Figure 4). Wooden blocks were added under that Bunsen burner to decrease the distance between the blue cone of flames and the copper oxide. As the compound was heated it quickly changed from brick red to black and then slowly turned dusty pink. Once the color stopped changing the Bunsen burner was turned off but the flame burning off methane was left lit to prevent oxygen undoing the completed reaction. The final product is a highly saturated orangey pink solid with a (combined with the test tube) mass of 23.0041g.

Mass of Test Tube (g)	22.2072
Mass of Test Tube and Copper Oxide (g)	23.1221
Mass of Test Tube and Copper	23.0041

Figure 1. Recorded Data OK, but this is a table and the heading should be at the top.

Mass of Copper Oxide (g)	0.9149
Mass of Copper (g)	0.7969
Moles of Copper	0.01254
% weight of Copper	87.10%
Mass of Oxygen (g)	0.1180
Moles of Oxygen	0.007375

Ratio of Copper to Oxygen	2:1 OK, but actually 1.7:1. you did some serious rounding

Figure 2. Calculated Data

Standard Error deviation?	0.6925
Average	88.17%
Median	88.54%
Range	1.64

Figure 3. Group Data OK, but what data did you use for this? The reader should be able to reproduce your calculations from what you include in the report.

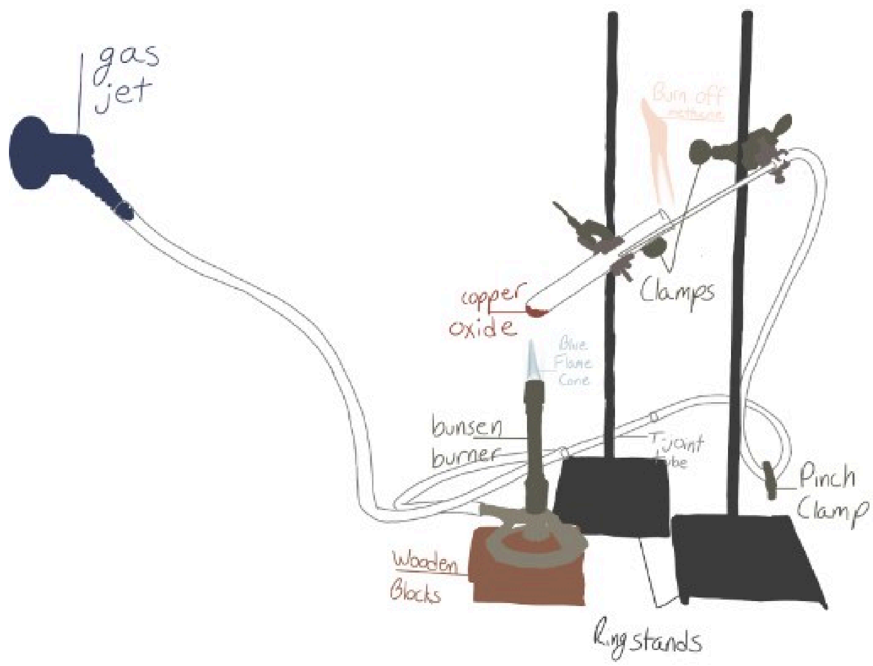

Figure 4. Experiment Set-up OK. So lifelike (amazing what your illustrator skills can accomplish from a photo!)

Calculations

Mass of Test tube and copper oxide - mass of test tube = mass of copper oxide

23.1221g - 22.2072g = 0.9149g of copper oxide

Mass of test tube and copper - mass of test tube = mass of copper

23.0041g - 22.2072g = 0.7969g of copper

mass of copper oxide - mass of copper = mass of oxygen

0.9149g - 0.7969g = 0.1180g of oxygen

(mass of copper/mass of copper oxide) x 100 = % copper

(0.7969g/0.9149g) x 100 = 87.10% = experimental value

0.7969g Cu (1 mol Cu/63.55g of Cu) = 0.01254 mol Cu /0.007375 = 1.700 ~ 2

0.1180g O (1 mol O/16.00g O) = 0.007375 mol O   /0.007375 = 1

Empirical formular = Cu_2O = (127.10g/mol Cu + 16.00g/mol O) = 143.1 g/mol Cu_2O

(127.10g Cu/ 143.10g Cu_2O) x 100 = 88.82% = theoretical value

Percent error = [(87.10-88.82)/88.82] x 100 = 1.937% error OK, but be careful about SF here--subtraction causes you to lose a few.

Group Data:

Standard deviation = 0.6925 OK, but the # of SF here is determined by the number in the range.

Average = (88.57 + 87.10 + 88.54 + 87.88 + 88.74)/5 = 88.17% OK, here's your data!

Range = 88.74 - 87.10 = 1.64

CV = (0.6925/88.17) x 100 = 0.7854%

Conclusions

The reaction $4Cu_2O + CH_4 \rightarrow 8Cu + 2H_2O + CO_2$ and the secondary reaction $CH_4 + 2O_2 \rightarrow 2H_2O + CO_2$ occur in this experiment. OK Accuracy is my personal error, calculated by percent error. A percent error of 1.937% is extremely high and inaccurate. OK, but you're overselling your results. Just state them without evaluation (extremely high). Precision is the group error, how repeatable an accuracy mistake was, and is represented by standard deviation. The standard deviation for this experiment with red copper oxide was 0.6925 which is within the average of standard errors. My accuracy fell outside of the group's precision. My experimental value differed by from the theoretical value by 1.72%. There are places places where operative error may have occurred, including issues with measurement and not heating the copper oxide for long enough. OK, any visual evidence of this?