

Figure 9

	0 (Not yet meeting proficiency)	1 (Approaching proficiency)	2 (Meeting or exceeding proficiency)
Claim: <i>A statement that answers the guiding question</i>	Does not make a claim or makes an inaccurate claim. E.g. "The red/brown stuff is rust"	Makes an accurate but vague or incomplete claim. E.g. "The red/brown stuff is copper."	Makes an accurate and complete claim. E.g. "The red/brown stuff is copper, which is the product of a single replacement reaction."
Evidence: <i>Scientific data that supports the claim.</i>	Does not provide evidence or only provides inappropriate evidence that does not support the claim.	Provides appropriate but insufficient data. E.g. "All the reactions that resulted in the red/brown stuff contained copper in the solution" (student did not provide sufficient/complete evidence)	Provides appropriate and sufficient data. (Lists and describes observations for the 6 possible reactions and identifies which ones resulted in red/brown stuff and which did not react, includes information about the blue color disappearing in the copper solutions, explains how they figured out that the red/brown stuff is copper)
Reasoning: <i>A justification that connects the claim and evidence using appropriate and sufficient scientific concepts</i>	Does not provide reasoning or only inappropriate reasoning. E.g. summarizes the procedure	Repeats evidence and connects it to the claim, but does not include a complete description of the scientific concepts. Identifies the products for some of the single replacement reactions and describes how copper is produced in each, does not explain that atoms are conserved in chemical reactions or that the red/brown stuff cannot be rust	Provides accurate and complete reasoning that connects the claim and evidence. Includes a complete description of the scientific concepts. Identifies the products of each single replacement reaction that occurred, uses the idea that atoms are rearranged in chemical reactions to explain why copper must be present on the product side, describes what happens in single replacement reactions and how for each reaction investigated the solid produced is copper, explains that as the blue copper ions in solution react, solid copper forms, explains that the red/brown stuff cannot be rust because Fe was not present in any of the reactions that produced red/brown stuff,

Claim, Evidence, Reasoning (CER) rubric with examples/expectations of student responses, modified from McNeil and Krajcik (2012).