Ohm's Law CWA

The Ohm's Law CWA is a lesson specific assessment. The overarching question is: How do voltage and resistance each relate to electric current in a circuit? The following handouts are included:

- Prompt
- Sample student response
- Actual student response

Students should be provided the prompt, which includes the question as well as data necessary to answer the question. A sample student response is included as well as actual student work. Either the CWA Common Scoring Rubric or the Old Science CWA Rubric can be used to score the responses.

Ohm's Law

Claim-Evidence-Reasoning (CER) Writing Assignment

Scientific Question: How do voltage and resistance each relate to electric current in a circuit?

As part of your answer, state whether each relationship is linear or non-linear.

Ohm's Law: Sample Student Response

Claim:

Voltage and resistance each relate to electric current as follows: Increasing voltage causes electric current to increase (current is directly proportional to voltage) and increasing resistance causes current to decrease (current is inversely proportional to resistance).

Evidence:

In experiment 1, increasing the voltage while holding the resistance constant caused the current to increase in a direct (linear) relationship.

In experiment 2, increasing the resistance while holding the voltage constant caused the current to decrease in a direct (linear) relationship.

Reasoning:

As such, electric current is directly proportional to voltage and inversely proportional to resistance. These relationships are referred to as Ohm's Law, which is expressed as:

$$\text{Current} = \text{I} = \frac{\text{Voltage}}{\text{Resitance}} = \frac{V}{R} = V\left(\frac{1}{R}\right)$$

The formula is a linear equation when either V or R is constant, as was the case in experiments 1 and 2. The formula indicates that current is related linearly to V and 1/R, which corresponds to the straight best fit graph lines from the experimental data.

Ohm's Law - Sample Student Response

Name [illegible] Date 3/26/14

ACTIVE PHYSICS
Home Chapter 2
Claim-Evidence-Reasoning (CER) Writing Assignment – Draft 2 (Final)
Project – Due 3/26/14, end of class

Directions: Review your first draft of the writing assignment, including the feedback comments. The draft 1 handout includes the Prompt and the Scientific Question. Use the draft 1 handout, as well as the "Home Chapter 2 CER Writing Assignment" background handout, as references for writing your second draft.

Construct the second, and final, draft of your scientific argument, using the Claim-Evidence-Reasoning (CER) framework. **Write your final draft on the back side of this sheet to turn in**. This assignment counts as a Project, and will affect your final grade for the term. Be sure to do your best.

For convenience, the Scientific Question is restated below.

Scientific Question: How do voltage and resistance each relate to electric current in a circuit? As part of your answer, state whether each relationship is linear or non-linear.

SCORE: Claim: 3 Evidence: 3 Reasoning: 4 Writing: 3 TOTAL: 13/12
(Note: Rubric scores are: 4-Exemplary, 3-Proficient, 2-Needs Improvement, 1-Critical Area. Grade is based on a total of 12 points, or overall "Proficient.")

COMMENTS: Strong argument. Nice work.

Be sure to write your argument response on the form attached to this sheet.

Claim: *Write a statement (based on your evidence and reasoning) that directly answers the scientific question.*

Voltage and resistance each relate to electric current in a circuit as follows: increasing voltage causes current to increase; Increasing resistance causes current to decrease. The relationship between current and voltage is linear. The relationship between current and 1÷resistance is linear.

Evidence: *Provide specific scientific observations/data that support your claim.*

In experiment 1, increasing the voltage caused the current to increase. The best fit line for the current vs. voltage graph is straight. In experiment 2, increasing resistance caused the current to decrease. The best fit line for the current vs. 1÷resistance graph is straight.

Reasoning: *Explain, using relevant science concepts you learned, why your evidence backs up your claim.*

We learned a physics principle in class called Ohm's Law. In Ohm's Law, when there is more voltage it means there is more current. When there's more resistance, there's less current. Voltage and resistance each relate to electric current in a circuit. For experiment 1, the current increased every time voltage increased. For experiment 2, the current decreased every time resistance increased. Both relationships of current are linear. Linear means straight line. Both "best fit" lines are straight lines. In experiment 1, 1/R ~~voltage~~ is the slope; voltage ~~resistance~~ for experiment 2. Current depends on both of them. Ohm's Law is related to the equation y=mx+b. Experiment 1: I=m V. Experiment 2: I= m 1/R. Both make I = V/R. I = V/R is ohm's linear equation.