1-1-2016

15.0.B Discussion Nature of Heat Rumford Joule

Christopher F. Bauer
University of New Hampshire, chris.bauer@unh.edu

Keep the same role structure today as you had last class (manager, recorder, spokesperson, encourager – if you are in 5-person group, let the encourager be the person who did not have a role last time)

Task 1:

Tie up loose ends. Some groups have data to graph. Some groups have experiments to finish. Please get this done as efficiently as you can. Your folder has your recorder reports from Tuesday, with a few comments.

HOLD OFF on discussing Question #8 (below) from Task 2 (Mar 10). We will do this all together.

8) Try to write a little mathematical equation that expresses this energy idea in terms of the information on the graph. [It may be easier to figure this out by using the direct mixing experimental data. And to look at the equal-volume condition first. Then consider the non-equal volume condition.] Your equation should make sense in terms of your model that you described in #5.

Task 2 Discussion of Count Rumford and Joule readings

Manager should inform me when you start this. Allow up to 12 minutes to address all the questions. Notes onto a fresh recorder report.

Once everyone has completed Tasks 1 and 2, we will have a research conference on our past several days of experiments. Your spokesperson should be prepared to describe what it is you have done and your interpretations of your data.

Task 3 If you complete Task 2 and are waiting, I have something for you.

Rumford and Joule, Chem 444A, Fire and Ice, CB

Guiding Questions for reading.

Rumford on "Source of Heat Excited by Friction"

1. What in general was B Thompson (Count Rumford) attempting to figure out?
2. He did several experiments, and uses several arguments to make his case. What are the arguments and where are they in the document?
3. What is he saying on page 98 and 99 top and why?
4. What does Rumford claim heat is? What does he suggest he doesn't know?

Joule "On the Mechanical Equivalent of Heat"

1. Joule cites several studies of his own. What seems to be the conceptual thrust of these experiments?
2. What seems to be his procedural approach to experimentation to support the claims regarding #1?

Others observations or insights

Christopher F. Bauer, Principal Investigator.
This material is based upon work supported by the National Science Foundation under Grant No. 1245730.
Any opinions, finding and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

RECORDER REPORT, Chem 444A "Fire & Ice"

Group Member Name	Role	Date: 3/12/15
Taylor	Recorder	
Marisa	Manager	
Charles	Encourager	Nicely expressed.
Emily	Spokesperson	

Rumford on "Source of Heat Excited by Friction"

① He was attempting to figure out where the heat produced in the mechanical operation of boring a cannon actually came from.

② His arguments were that the heat was either being released by the broken up pieces of metal or it was a result of the metal rubbing up against each other. His experiments showed motion was cause of heat.

③ In the metal cylinder experiment Rumford is saying "the heat excited by the process was not at the expense of latent heat or the combined caloric of the metal."

Rumford claims that heat must be caused by motion. The heat was not coming from anywhere else and did not just exist as a material substance. He said that anything any insulated body can continue to furnish w/o limitation cannot be a material substance.

RECORDER REPORT, Chem 444A "Fire & Ice"

Group Member Name	Role	Date: 3/12/15
Tim Closson	Recorder	
Emma Addison	Manager	
Kaleigh Z.	Spokesperson	
Mandy Graves	Encourager	

decent attempt at making sense of the article

Rumford

. Count Rumford was observing frictional heat by boring into a cannon. He was attempting to figure out if heat was a product of motion or if it was another substance.

. One experiment he did was he put his cannon contraption into water and he was able to make the water boil. He made the claim that frictional heat was inexhaustible.

. Rumford claims heat is a product of motion. He doesn't know how bodies are able to generate the motion necessary to generate heat like he was able to do with the bore and cannon.

. On page 98 and 99, Rumford is trying to reason and conclude where the heat is coming from. He knows he can feel heat from the friction, but he still doesn't know where it is actually coming from or if it is its own substance. He was trying to prove that heat came from motion, that it was the product of a physical phenomena.

Christopher F. Bauer, Principal Investigator.
This material is based upon work supported by the National Science Foundation under Grant No. 1245730.
Any opinions, finding and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

RECORDER REPORT, Chem 444A "Fire & Ice"

Group Member Name	Role	Date: 3/12/15
Heather Price	Manager	
Jacob Sidney	Recorder	
Emily Dwyer	Spokesperson	Nicely done
Jan Tamposi	Encourager	

Rumford

1. He was exploring the relationship between motion/friction and the production of heat.
2. Arg 1: Chips were no different from slices of metal in heating capacity.
   Arg 2: Chips transferred latent heat to the rest of metal
   Arg 3: Latent heat doesn't run out
3. On page 98/99 he his ruling out the possibilities of heat coming from anywhere other than friction, such as air, water, and metal ✓
4. He claims that heat is motion. He doesn't know by what means motion produces heat ✓

Joule

1. Joule wanted to understand the mechanical/mathematical reasoning for why friction causes heat. He discovered that the quantity of heat produced is proportional to the amount of force applied ✓
2. His design set up allowed for quantitative measurements of force and heat change

Christopher F. Bauer, Principal Investigator.
This material is based upon work supported by the National Science Foundation under Grant No. 1245730.
Any opinions, finding and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.