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Day 08 Feb 17 Latent heat of phase change

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### 8.0.A Daily Outline

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Purpose:

- Using experimental data for macroscopic observations, and PhET simulations for particulate level, push students to develop an integrative picture for how heat relates to the temperature of substances and to phase change. [lays groundwork for latent heat and intermolecular forces]
- Conduct this as a research conference: one person from each of the different experimental groups meets to build a model (jigsaw structure – provide individual accountability)
- This provides a nice opportunity for the grad students to facilitate the discussion through Socratic questioning (and to be observed doing it) – leading to public presentation and discussion of model
- Conduct simple experiments on direct evidence for evaporative cooling and for intermolecular forces

Board

Sit at any of the 3 tables. BUT, split up from expt group from Thursday.

Make stick-on name tag.

I'll check you in.

Materials

Name tags (7 per table)

White board markers

Post their data posters around the room

Returns

Distributions

Starting Comments \_\_\_\_\_ 2 minutes max

- Thanks for standing weekly assignments
- I provided some feedback regarding in-class notes (not said)

### Task 1 Experimental Discussion and Synthesis

The goal is at your table to create a visual poster that provides a general description and summary of the phenomenon of phase change, and how heat, temperature, and molecular structure are related to it. In other words, this is your best collective idea about what's going on.

What you are doing is exactly what a group of scientists do when trying to make sense of some phenomenon – they get together and compare experiments and ideas.

The first step is to synthesize all the experimental results. Your pre-class assignment and notes will help with this. You may consult any of your prior notes or readings, but don't go fishing on the internet.

Each group will have one of the graduate interns as a facilitator. It's not their job to help you get to a right answer. His/her job is to help you think through the ideas so that they are consistent and scientifically sensible (and consistent with data).

You have 40 minutes to discuss, design, and create this poster.

Didn't get to this.

Task 2 Simple Experimental Tasks to Emphasize Heat associate with phase change

(See handout of procedures).

Drop water on thermochromic paper; drop methanol (Beral pipets, well plates as a holder)

Spray can of computer cleaner -- one can, everyone hold it first before spraying and sense the temperature (or have two cans and spray from only one)

Wax paper, toothpicks, water, oil (Beral pipets; well plates as a holder) Need magnifier also.

Balloon charged and show bending of stream of water; non bend of stream of oil – two stations

Task 2 Those past challenge questions

Challenge Questions (attempt without consulting other sources of info):

- 1) Things we did apply to the deflate-gate controversy. What and explain how it applies? Does this confirm or dispute the claim that the Patriots let air out of the balls?
- 2) What are the major components of air? Predict (graph) their relative average speeds. (dinitrogen, dioxygen, carbon dioxide, water, argon) – how to calculate mass of a substance
- 3) Apply any relationship we've discussed to explaining why the inner planets are devoid of H<sub>2</sub> and He, whereas the outer planets are rich in them. [name the inner and outer planets]  
You can use the PhET to test this.

We will be discussing the experimental results in three groups, one person from each of the experimental groups from Thursday.

I would like three of you to be discussion facilitators, one per group. And the fourth is to be an observer of the facilitators.

As facilitators, your job is to find places of agreement or disagreement, encourage discussion that includes arguments with stronger warrants (explanations and backings), and language that visualizes the molecular level. If they say something is so, that goes without challenge, you could ask how they know that. If someone comments on an observation, you could ask whether anyone else can confirm that.

The observer should watch each facilitator for a time, and the frequency and nature of the interactions and discussion within each group, Be prepared to share your observations with that person later. You are not evaluating a performance; you are just another set of eyes.