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Day 09 Feb 19 Phase change, intermolecular forces, and heat

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### 9.0.A Daily Outline

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Purpose:

- Conduct simple experiments on direct evidence for evaporative cooling and for intermolecular forces
- Discuss challenge questions (about gas behavior and KMT)
- Set up assignment and heads up about test.

Board

New groups: please find your name tag.

Make a stick-on name tag with first name.

Introduce yourself to your new working group.

Identify something all have in common (that is not UNH related)

Your brought questions: transfer most pressing one for you to the poster at your table.

Turn in your homework to table -- this is the check-in

Return blank schedules to Dr. Chan – setting up first set of focus groups.

Materials

Name tags (4 per table)

Premade name cards (set on tables)

White board markers

Post their composite posters and heating/cooling posters around the room

Returns

Distributions

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

- When each person has put one question on poster, stick it up on wall. See what we can review today.
- Do your introductions, then find instructions in the blue folder and start set of 4 short experiments. Instructions there will get you organized. Working in pairs or table groups.

[40 minutes, including debriefing]

Task 1 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

Debriefing:

Going to have spokesperson from each group read their response to the last question for each experiment (if not sure which one, ask me). Do AB first. Then CD.

? Are expts A and B about the same phenomenon? There is a name for that “evaporative cooling”.

? Are expts C and D about the same phenomenon? Molecules can be “sticky” – “intermolecular forces” between molecules. One source is “polarity” of molecule – explain what that is.

Handout information about the substances they tested: structure, mp, bp, heat of fusion and vaporization.

- Look at property data vs your experimental evidence – consistent?
- What structural features might affect “stickiness”

Minilecture as needed.

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.

Who thinks they have a good handle on a response to ....

See where the discussion goes.

Assignment:

Read: "Making Ice in East Indies" two articles.

- 1) Write a coherent paragraph on why this ice-making process works, using your understanding of phenomena and descriptions in the article.
- 2) The article also provides insights regarding sociology, economics, and culture. Write a comment about some aspect that struck you, citing evidence for your observation.

Read: The other linked websites are about various areas of application of the ideas we've been addressing. Choose two different topics from among the websites, read them, then write a paragraph that explains how the concepts we've been working with pertain to the applications you chose.

Each of these counts as a "reflection assignment" – see syllabus. Obviously, you can consult your notes.

You do not have to do a standing weekly writing assignment this week.

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Heads up: we will have a "test" on Tuesday about the material up to and including this assignment. The test will ask you to apply your understanding or extend your understanding to something novel.

I'm not expecting it to take the entire period. It will be "closed book" – so you will not have access to notes or other resources.

Your folder has copies of what each group has.

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Based on your experience from facilitating on Tuesday, I will send you the weekly standing assignments for the students you had in your group. Based on working with them, and their standing assignments, I want you to make a prediction regarding how well they might do on the test I plan to give on Monday.

In making your prediction, cite what your evidence is.

Sara: Samantha, Eliza, Kaleigh, Amanda J, Jake, Cale', Kyle

Ben: Tim, Nick, Marisa, Heather, Miriam, Jon, Mandy

Tiffany: Becky, Taylor, Emma, Charles, Emily K., Emily D.

Patches: Pick 7 people of your choice: Becky, Taylor, Emma, Cale', Kyle, Jon, Sean

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Today, pick a group. Sit with them to observe. It is critical that they all have the opportunity to get their hands on the materials. Do they jump in or are they tentative? How good are they at noticing things? Do they miss important or valuable observations? Do they try something once, or show curiosity in repeating the observation? In other words, how do students handle themselves when faced with a task where observation and management and persistence might be important to getting to the heart of an idea.

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When we do the discussion about challenge questions, I might put them together according to which one they want to talk about. Then put one or two of you with them with a particular role – I want you to casually say things that suggest they might have it wrong to see whether they will demonstrate conviction of understanding.