

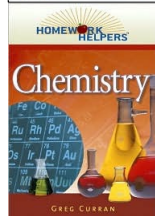
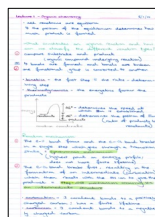
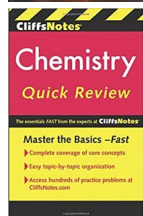
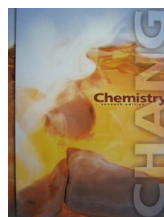
Meeting Students Where They Are:
Using Technology to Make Learning Accessible and Engaging

Tyler DeWitt

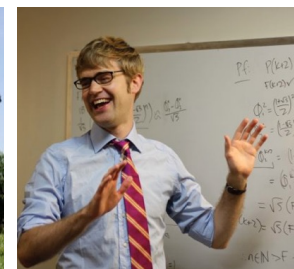
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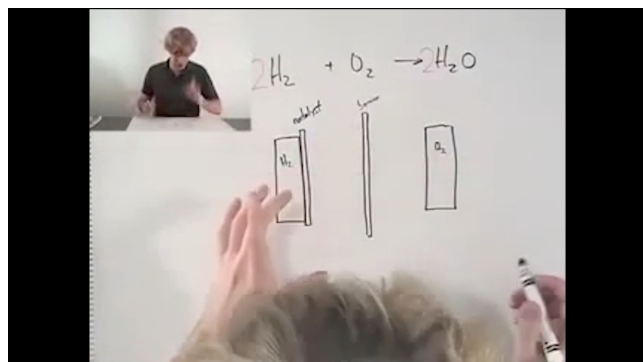
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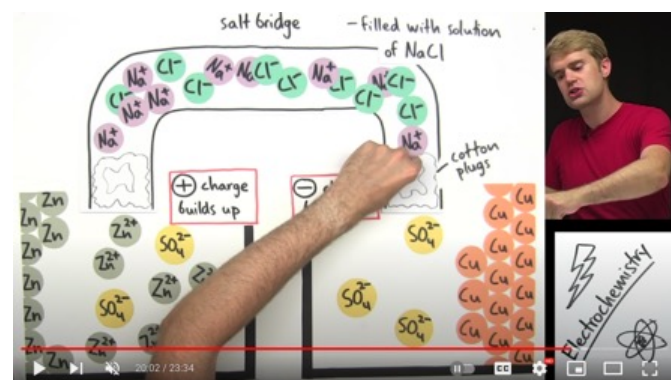
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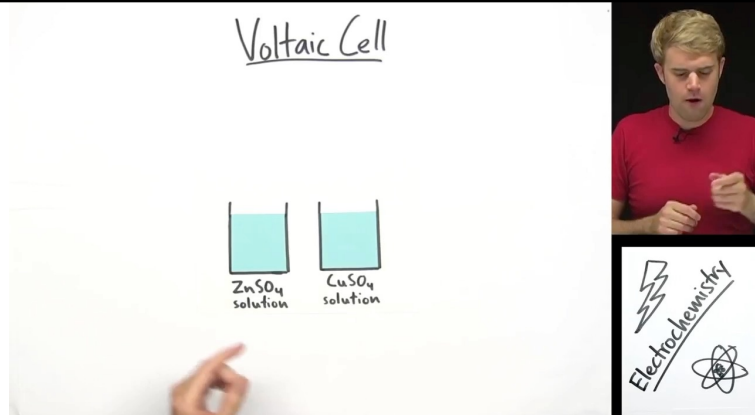
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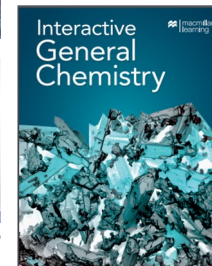
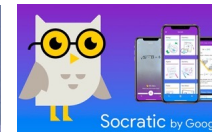
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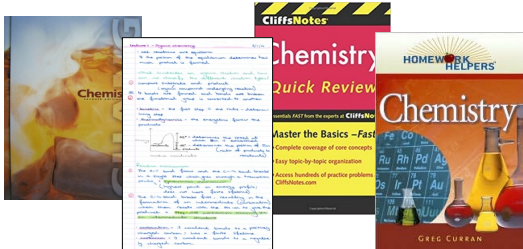
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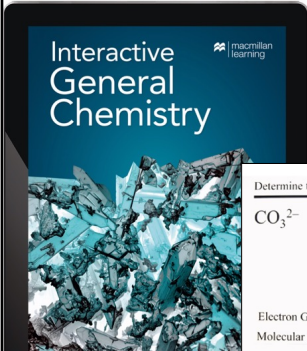
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"I learned this way ; why can't **you**?!?"

"It worked for **me** ; why doesn't it work for **you**?!?"

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Valence Shell Electron Pair Repulsion

Although electrons have very little mass, they occupy the vast majority of the volume of an individual atom (Section 2.3) and likewise take up most of the volume of molecules. Molecules consist of atoms that share valence electrons and may also have lone pairs of electrons on the central atom. Repulsions between these groups of electrons determine the overall shapes of molecules.

The valence shell electron pair repulsion, VSEPR, model provides a way to predict the shape of a molecule based on the number of individual electron domains surrounding the central atom (the domain number). Each of these electron domains is a charge cloud made up of either shared or lone pair electrons. The most stable arrangement of these charge clouds is the one in which there is the least repulsion, where they are as far apart as possible while maintaining their connection to the central atom. This most stable arrangement is known as the **electron geometry** or domain geometry. Electrons, whether they are shared or unshared, do not act like the rigid connectors you may use with a molecular model kit. Rather, electrons are charge clouds capable of shifting their locations with respect to each other. The relative locations of these domains around the central atom of a molecule affect the shape.

Determine the molecular geometry for O_3 , CO_3^{2-} , SOCl_2 , and BrO_3^- :


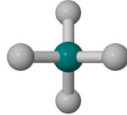
CO_3^{2-}

$$\left[\begin{array}{c} \text{O} \\ \text{O}=\text{C}=\text{O} \\ \text{O} \end{array} \right]^{2-}$$

Electron Geometry: Trigonal Planar
Molecular Geometry: Trigonal Planar

Predict the molecular geometry for the molecule with the Lewis structure shown.

A. trigonal bipyramidal
B. seesaw
C. octahedral
D. square pyramidal
E. square planar

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Determine the molecular geometry for O_3 , CO_3^{2-} , SOCl_2 , and BrO_3^- :

CO_3^{2-}

$$\left[\begin{array}{c} \text{O} \\ \text{O}=\text{C}=\text{O} \\ \text{O} \end{array} \right]^{2-}$$

Electron Geometry: Trigonal Planar
Molecular Geometry: Trigonal Planar

Calculate the pH of a 0.10 M solution of NaClO

reaction: $\text{ClO}^- (\text{aq}) + \text{H}_2\text{O} (\text{l}) \rightleftharpoons \text{HClO} (\text{aq}) + \text{OH}^- (\text{aq})$

initial	0.10	0	0
change	-x	+x	+x
equilibrium	0.10 - x	x	x

$K_b = \frac{[\text{HClO}][\text{OH}^-]}{[\text{ClO}^-]}$

$K_b = 2.5 \times 10^{-8}$

Are these molecules isomers? If so, what type of isomer are they?

$\text{H}_3\text{C}-\text{C}(\text{H})=\text{C}(\text{H})-\text{CH}_3$ and $\text{H}_3\text{C}-\text{C}(\text{H})=\text{C}(\text{H})-\text{CH}_3$

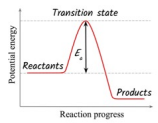
What mass of gold is plated by passing 5.0 A of current through a $\text{Au}(\text{NO}_3)_3$ solution for 4.0 hours?

$\text{Au}^{3+} (\text{aq}) + 3 \text{e}^- \rightarrow \text{Au} (\text{s})$

$4.0 \text{ h} \left(\frac{60 \text{ min}}{1 \text{ h}} \right) \left(\frac{60 \text{ s}}{1 \text{ min}} \right) \left(\frac{5.0 \text{ C}}{1 \text{ s}} \right) \left(\frac{1 \text{ mol e}^-}{96485 \text{ C}} \right) \left(\frac{1 \text{ mol Au}}{3 \text{ mol e}^-} \right) \left(197 \text{ g Au/mol Au} \right)$

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Activation energy (E_a)




Which block is more dense?

Floats: Less dense than liquid


Sinks: More dense than liquid

$B > \text{liquid} > A$

orbit



orbital



IGC 2.0

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The student with the lowest grade on your Chem 101 exam isn't necessarily intellectually incapable. With the right resources, he could go on to earn a Ph.D from MIT, and might even end up being an author of the textbooks you use in your class.

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What does it mean to
"Meet Students Where They Are?"

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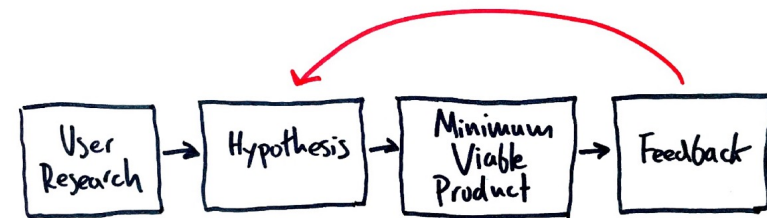
Meeting Students Where They Are:

- Use medium they're fluent in
- Low-tech, high-tech
- Patient, step-by-step
- Casual language
- Lots of visuals
- Metacognitive

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You **almost certainly** do **NOT** know
the best solution for your students.
(They probably **don't know either.**)

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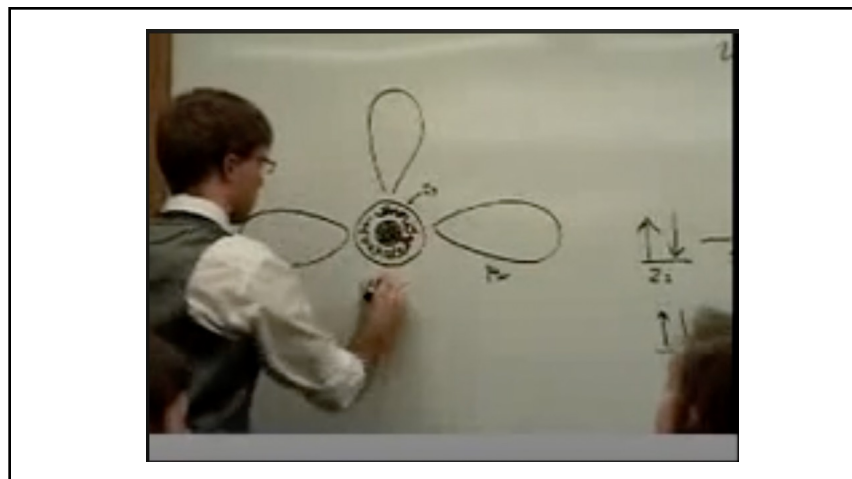
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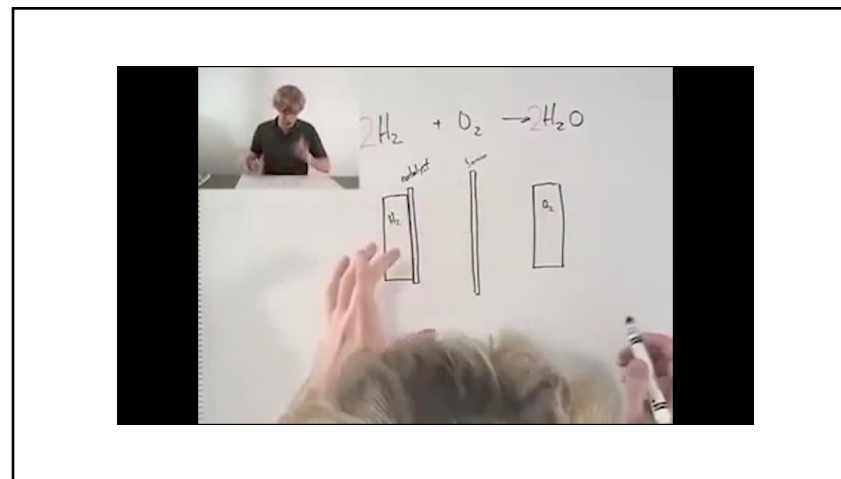
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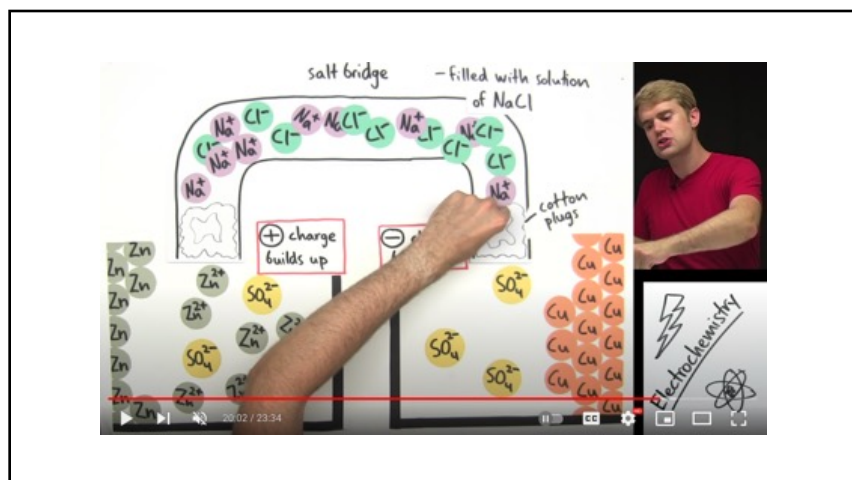
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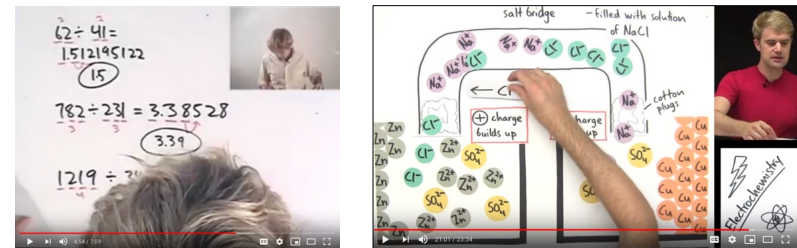


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Minimum Viable Product (Prototype really...)

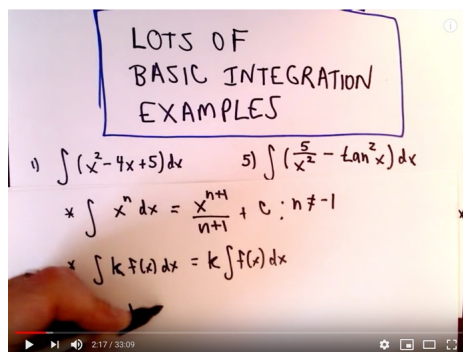
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it's not going to be perfect: get over it



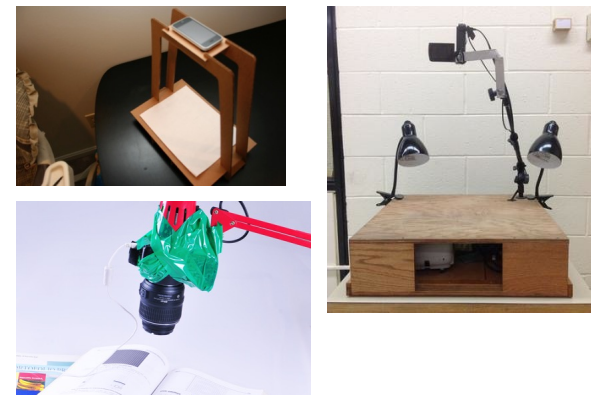
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low-tech is often more effective than high-tech

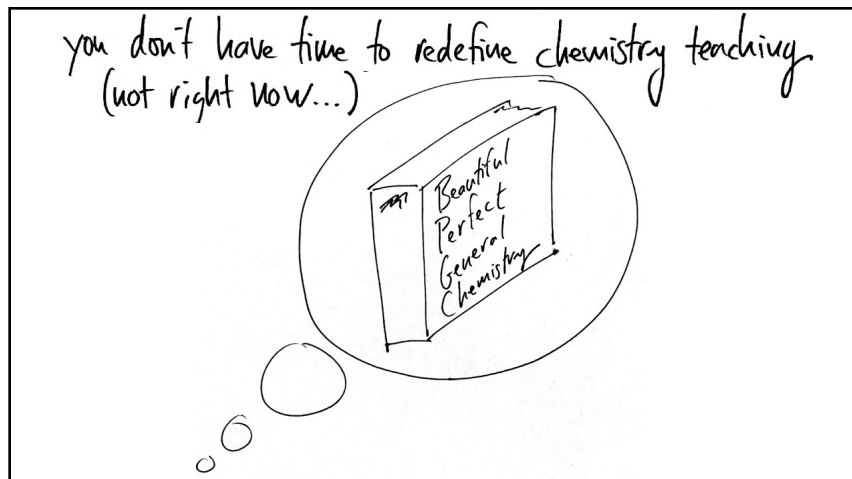


YouTube: PatrickJMT

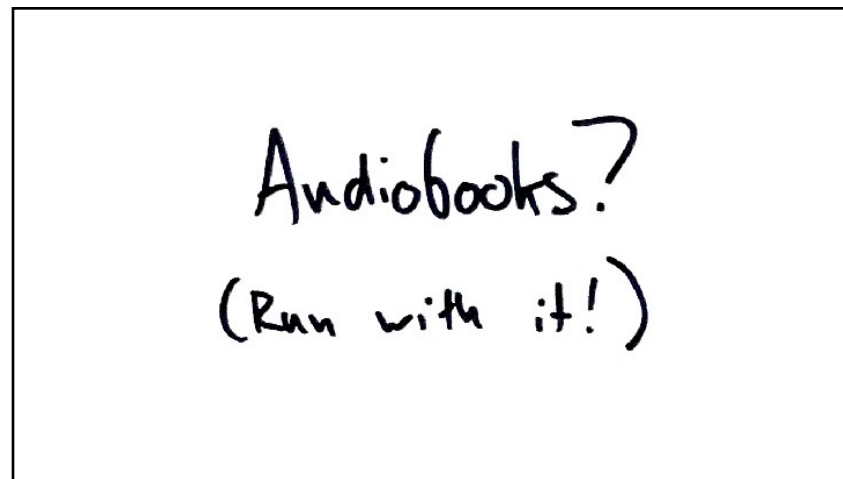
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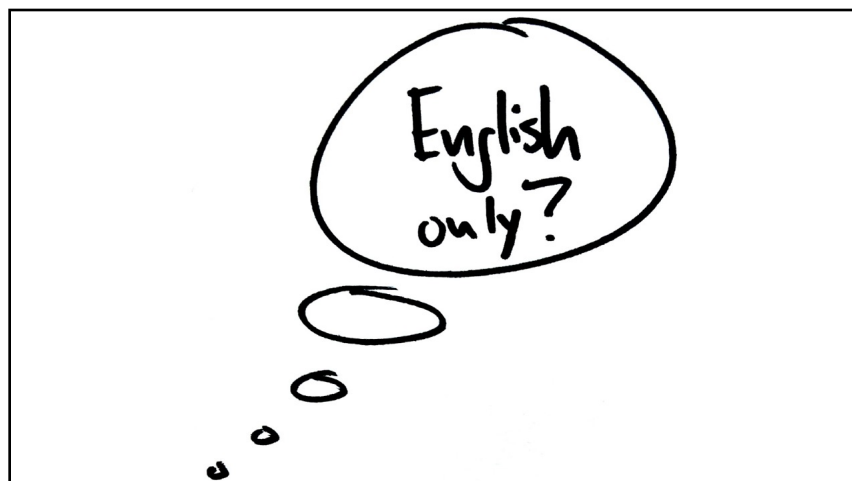
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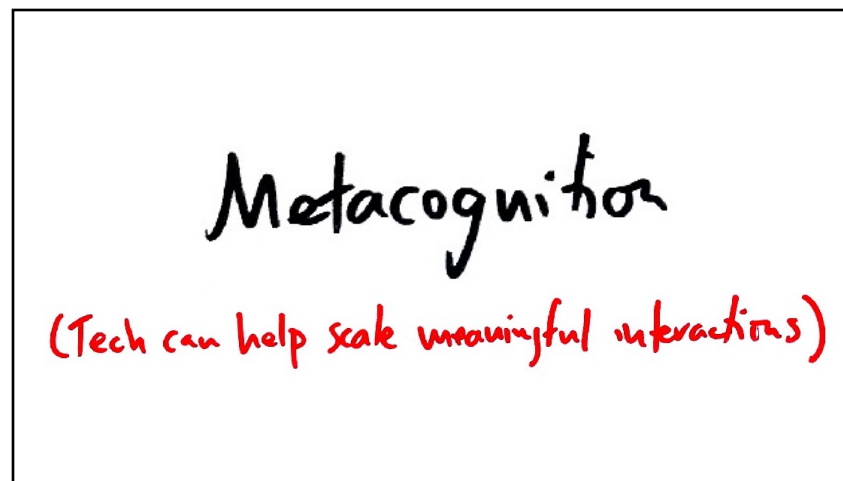
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QUIZ

You're heating a pot of water on the stove. From the point of view of the water (the water is the "system"), is this an endothermic or an exothermic reaction? In order to receive credit, you must explain your reasoning.

When you heat up a pot of water, what happens to the movement of the molecules that make it up?

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Thermo chemistry and Phase changes

Heat is added to break bonds in steam (H₂O break in steam)

Heat is removed to form bonds in steam (H₂O form in steam)

Endothermic (heat goes in)

Heat is moving from the surroundings into the system.

- fire
- stove
- sun

Exothermic (heat comes out of something)

Heat moves from system into surroundings.

- If water is system, this is an endothermic process.
- If burning is the system, this is an exothermic process.
- Depends on point of view

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Hydrogen bond \rightarrow H attached to F, O, N bonding to F, O, N

THERMOCHEMISTRY + PHASE CHANGES

all heat added

ice \rightarrow liquid \rightarrow steam

removes heat

removes heat

Molecules moving faster

Molecules moving slower

adding heat

EXOTHERMIC PROCESS

heat moves from surroundings into water (system)

removes heat

EXOTHERMIC PROCESS

heat moves to surroundings from the system (water)

water is a high specific heat

Boonless heat, exothermic

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Heat is energy.

Temperature is how fast molecules are moving.

Heat movement causes a change in temperature.

Heat and Temp are NOT the SAME thing. More heat lets you increase temp.

water

ice

Some stuff gets a little heat, and its temp goes way up. Others, their temp hardly goes up at all.

high specific heat

low specific heat

* Specific heat, how resistant you are to changing your temp.

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"Walk me through your notes.
Explain this diagram."

37



What is happening in that beaker?

Video report/documentary of laboratory activities

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General Chemistry

Reports Dashboard

Unit Level Activities

Subunit Highlights

There are 2 Assignments in this Subunit

Students Completed 100 % of Assignments

Students Answered 35 % of Questions Correctly On Their First Try

Performance by Assignment

Assignment Title	Average # of Questions Started Per Student	Average Achievement	Questions Correct on First Try
CHAPTER 1 Science and Measurement	—	100%	—
HW 1	41	40%	35%

3D BOOK NOTEBOOK

Path of particle

View

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