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From the SelectedWorks of Natasha Yates, MA

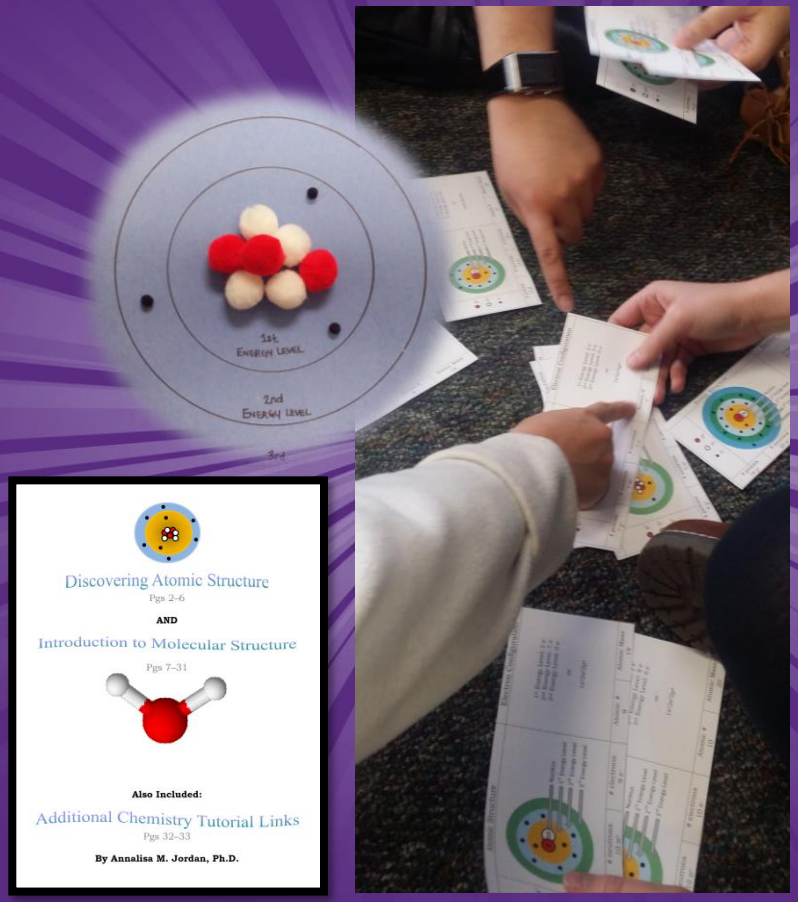
March 14, 2016

Jordan and Yates ACS 2016 V2.pdf

Natasha L Yates

Available at: https://works.bepress.com/natasha-yates/4/

A discovery learning approach to atomic structure and the periodic table:



Training current and future teachers what really *matters* in NGSS

Annalisa Jordan Ph.D., Chemistry
Natasha Yates M.A., Education
St. Catherine University

Structure and Properties of Matter

Elementary, Middle and High school

Particles too small to be seen

NEXT GENERATION SCIENCE STANDARDS

Density

Chemical reactivity

Submicroscopic events

with macroscopic assessments

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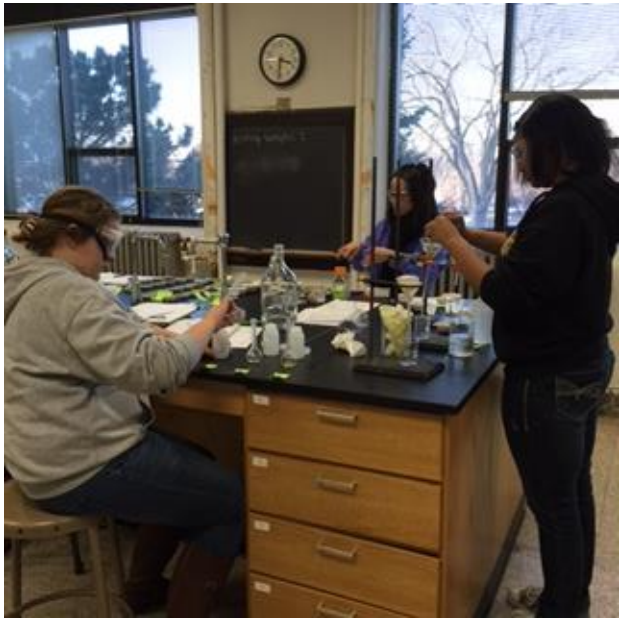
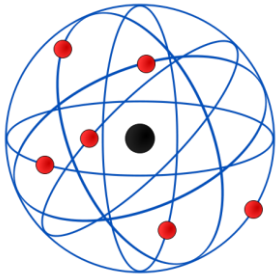
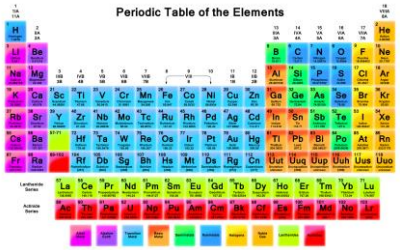
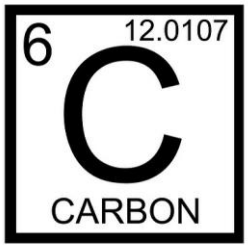


Foundations in Chemistry Concepts: How we do it



1. Define basic chemistry terms
2. Discovery Learning: *Atomic Structure*
3. Discovery Learning: *Periodic Table*
4. Relating to material: *Elements in Our Pockets*



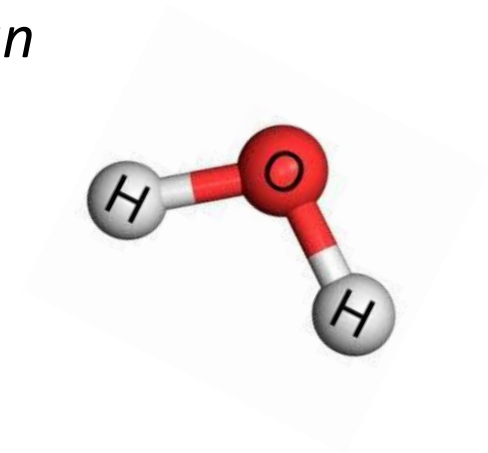


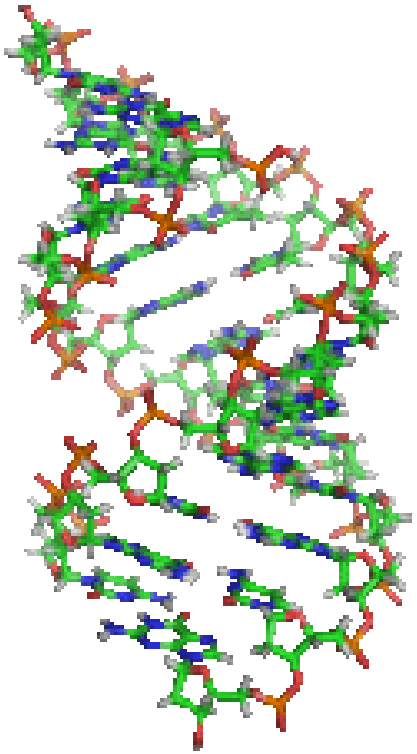
Make the students active learners in studying the foundational concepts.

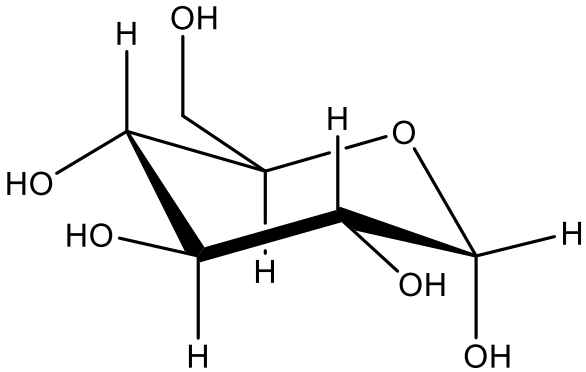
1. Intro to chemistry with questions

Inquiry

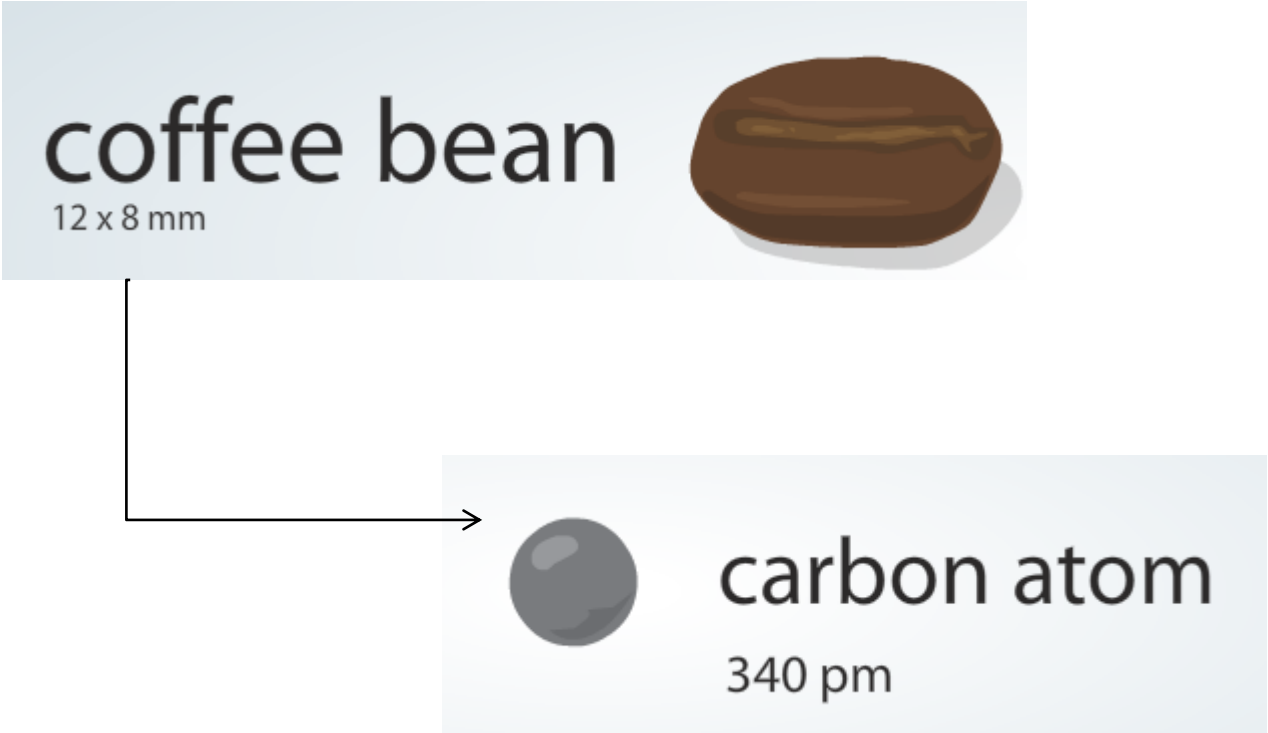
- *List as many chemicals as you can in 60 seconds…*
  - ***What is chemistry?***
  - ***What are examples of chemicals?***
  - ***Where is chemistry in your personal life?***





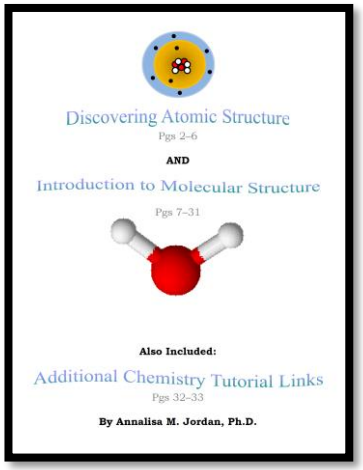


- *EDIT SLIDE PICTURES AND TEXT*



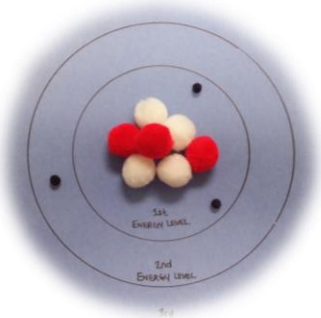
http://learn.genetics.utah.edu/content/begin/cells/scale/

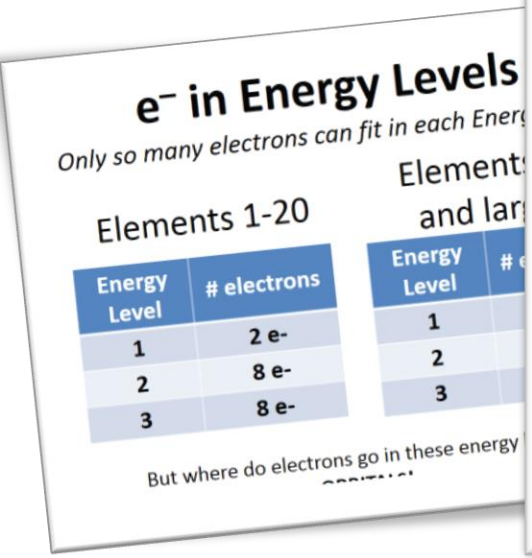
How small is an atom?

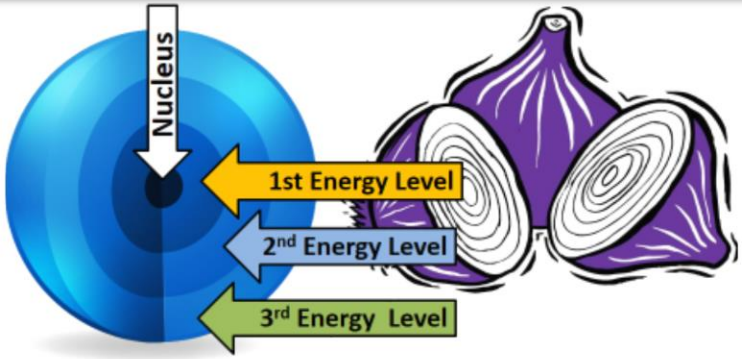


Subatomic Particles

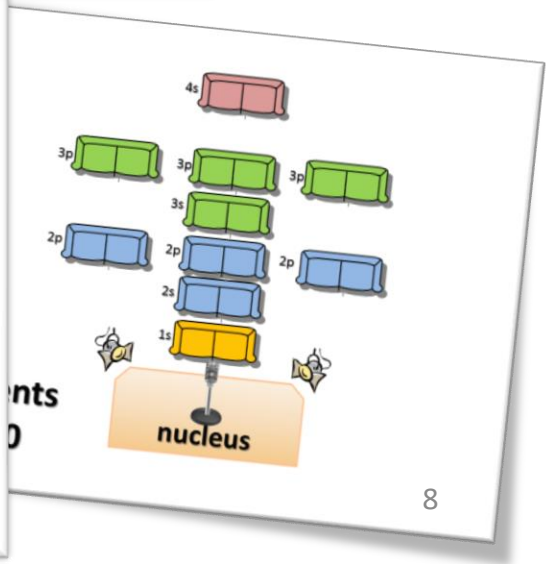
	Proton	Neutron	Electron
Symbol	+ or p^+	○ or n^0	− or e^-
Charge	+1	0	–1
Location	Nucleus	Nucleus	Orbitals in *energy levels* around the nucleus
Mass	1 amu	1 amu	~0 amu



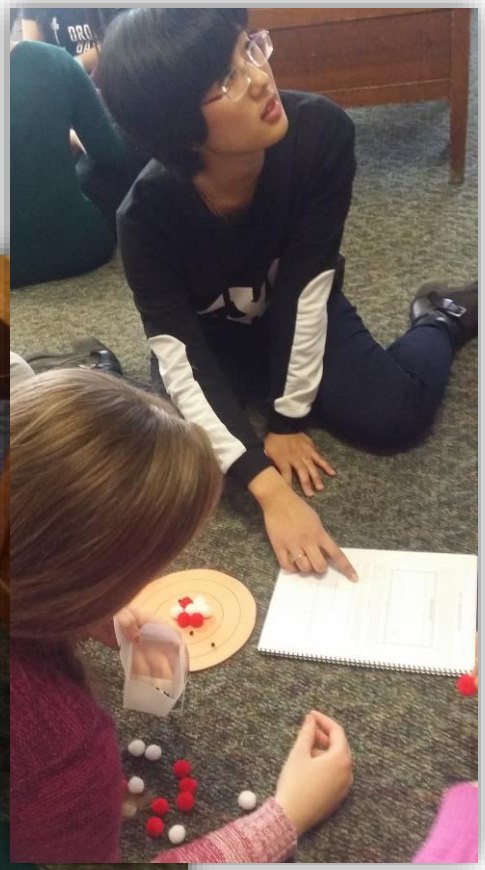


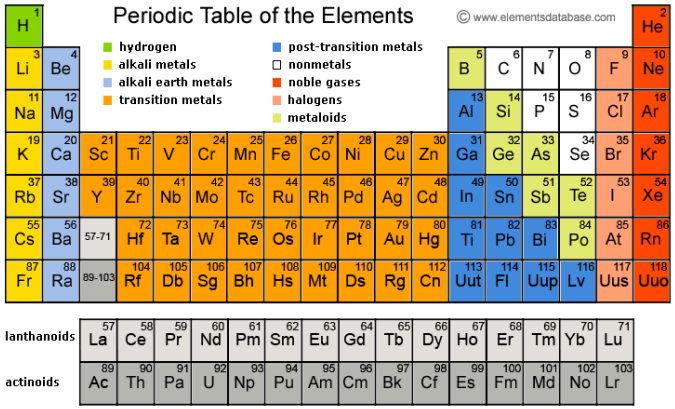


Atoms are like onions… they have layers



DROP





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4. Relating to Material: *Elements in Our Pockets*

Inquiry to Engage: 1st engage the students by asking…

Anyone have any elements in your pocket?

A
v
r
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V
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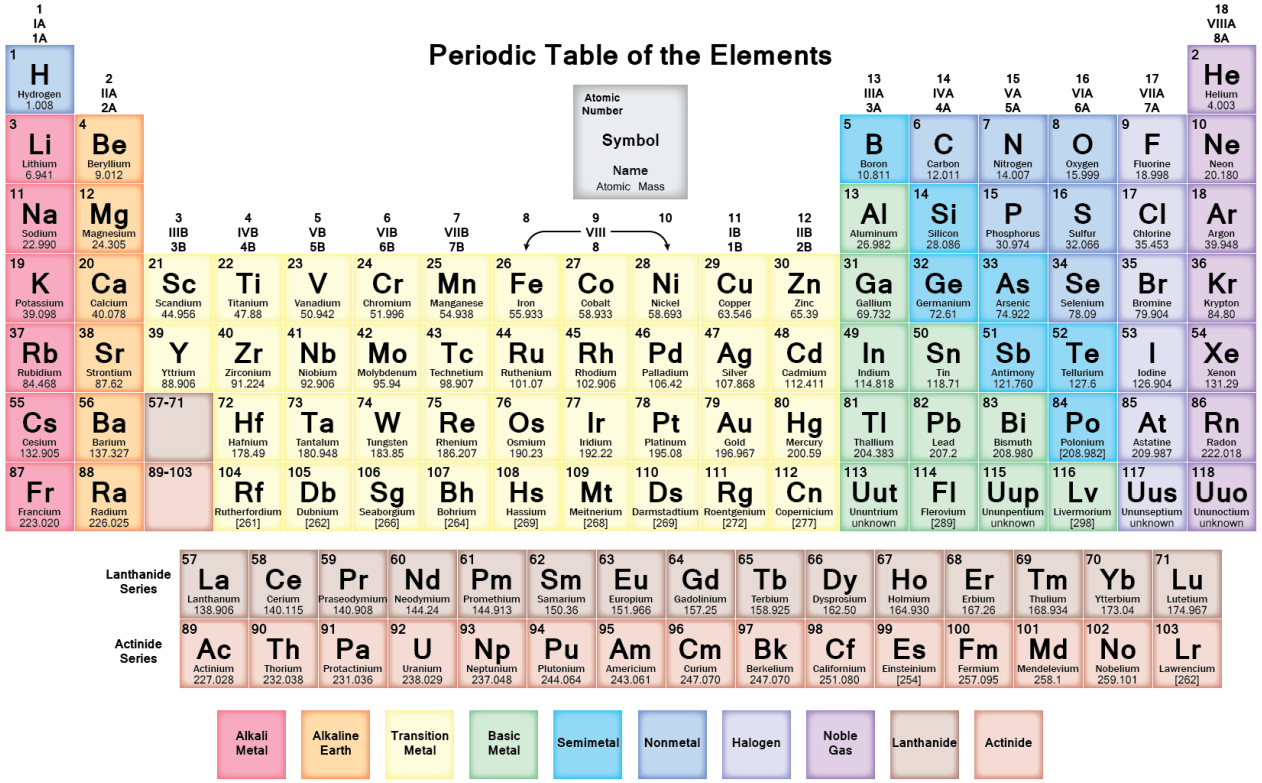
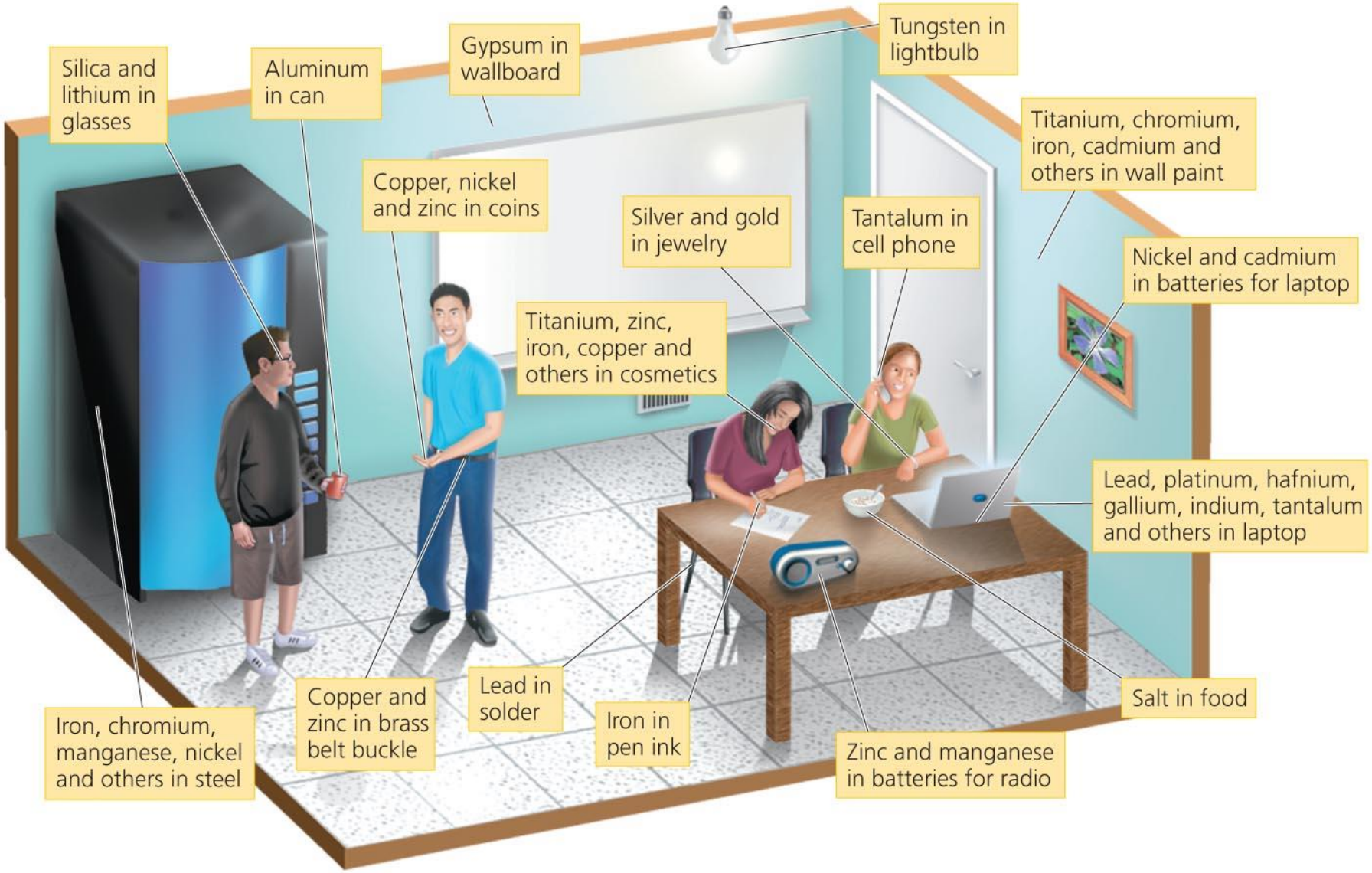
ey



Minerals are everywhere in our products



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Economically useful mineral resources

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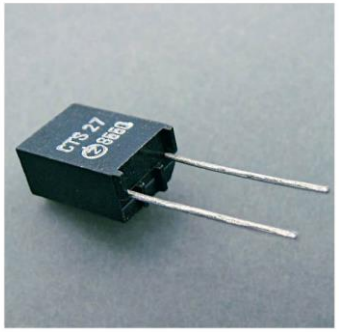
Let’s look at Tantalum

- **Atomic Number:** 73
- **Atomic Weight:** 180.94788
- **Melting Point:** 3290 K (3017°C or 5463°F)
- **Boiling Point:** 5731 K (5458°C or 9856°F)
- **Density:** 16.4 grams per cubic centimeter
- **Phase at Room Temperature:** Solid
- **Element Classification:** Metal
- **Period Number:** 6 **Group Number:** 5

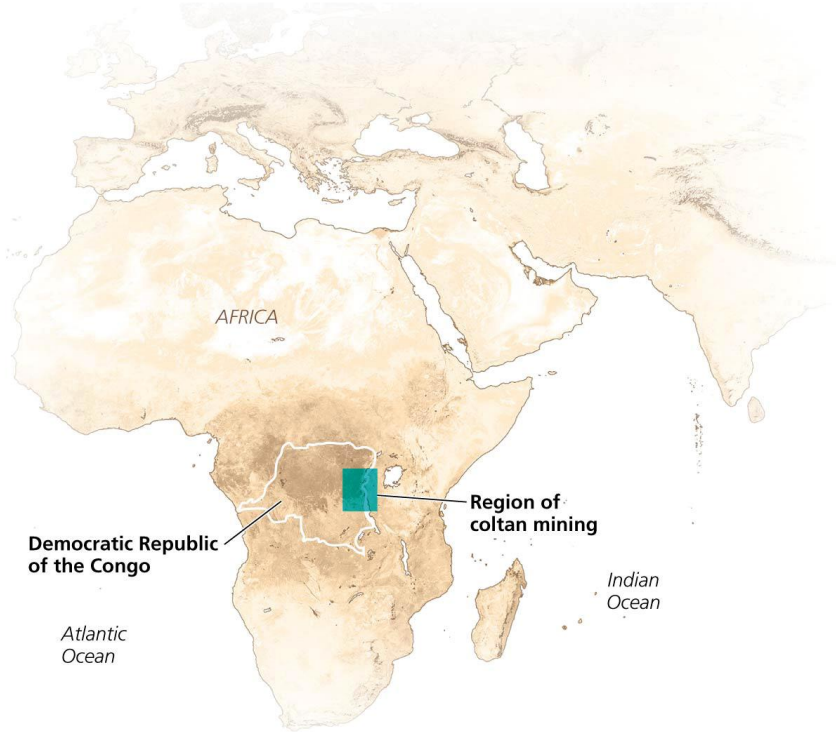
(a) Coltan ore

(b) Capacitor containing tantalum



http://images-of-elements.com/tantalum.php
http://education.jlab.org/itselemental/ele073.html

Central Case: Mining for … cell phones?



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Foundations in Chemistry Concepts: How we do it

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3. Discovery Learning: *Periodic Table*
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Make the students active learners in studying the foundational concepts.

Edit slide so that it is a summary of pictures from our work (Atomic Structure Activty, PT, and Coltan)

Questions?

2. Atomic Structure Activity

Activity:

- build atoms in pairs
  tives

Formative Assessments:

- Worksheets, Answering questions verbally.
- Add picture of cards

SAMPLE NOTECARD:

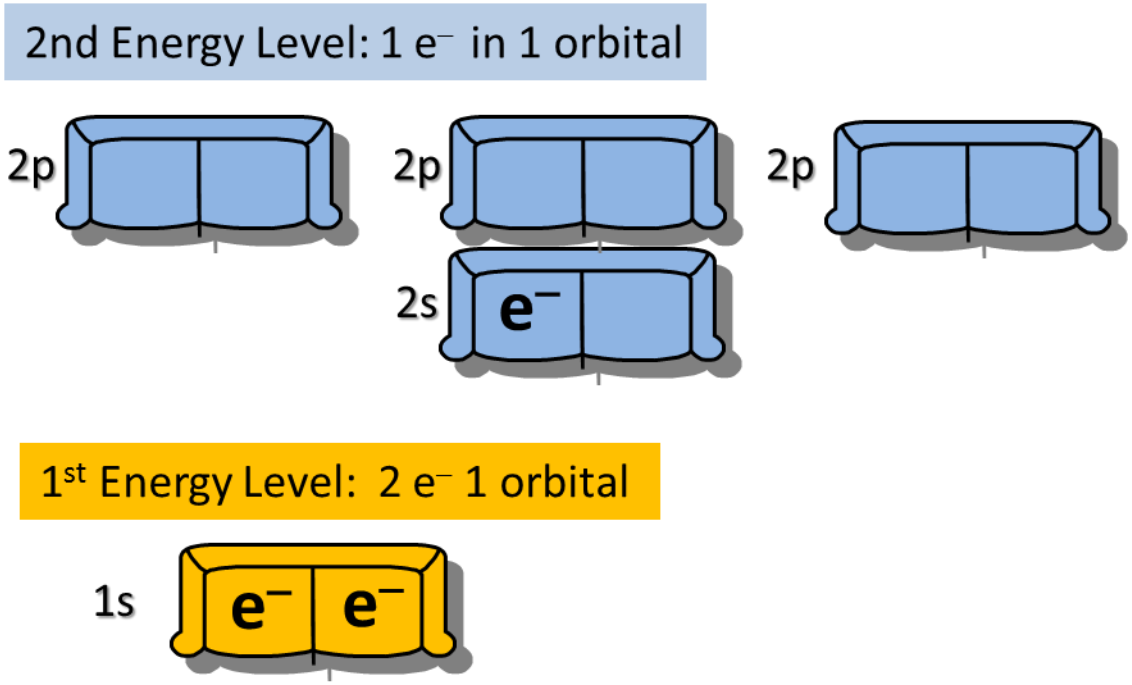
ATOMIC STRUCTURE: ELECTRON CONFIGURATION:

# p^+	# n^o	# e^-	Atomic #	Atomic Mass

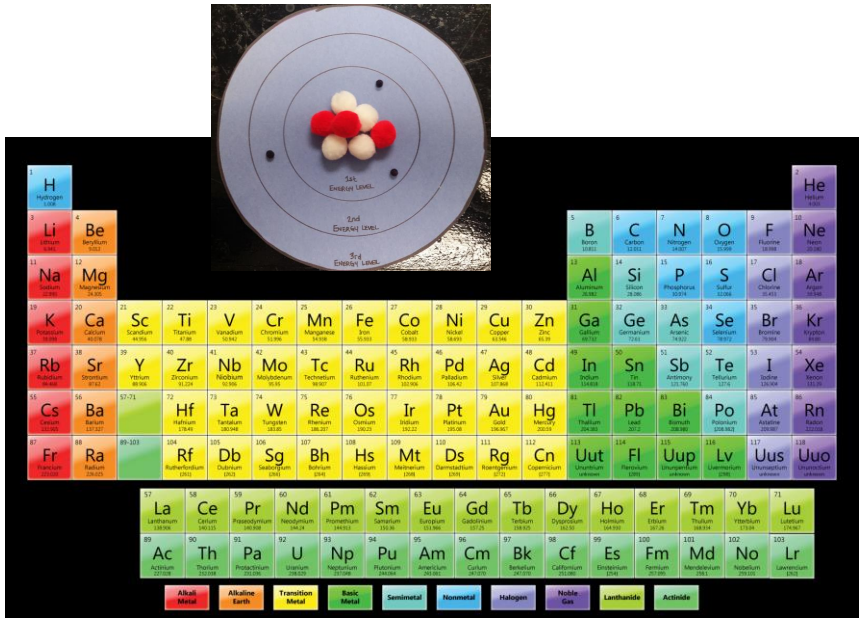
Now organize what you have done

Objective:

- Organize the 20 simplest atoms *THREE* different ways.
  -



3. Discovery Learning: *Periodic Table*

Objective:

- Organize the 20 simplest atoms *THREE* different ways.
  - By atomic #
  - By # of energy levels of e^-
  - By # of e^- in the outermost energy level