DAY 43 Compare Atoms & Molecules, Part 1

This is the first lesson of chapter 4, Introduction to Atoms. It includes the first half of contrasting case activity 4.1.

Big Ideas

- Atoms and molecules are the particles that make up matter.
- Atoms can combine to form molecules, and molecules are made up of atoms.

Materials

Teacher:

1. slides – day43.ppt

Students:

1. example cards – worksheets 24-29
2. data tables – worksheets 30-31

Activities & Allotted Time (40 minutes total)

5 minutes – warm-up activity
35 minutes – cc activity – Compare Atoms & Molecules, part 1

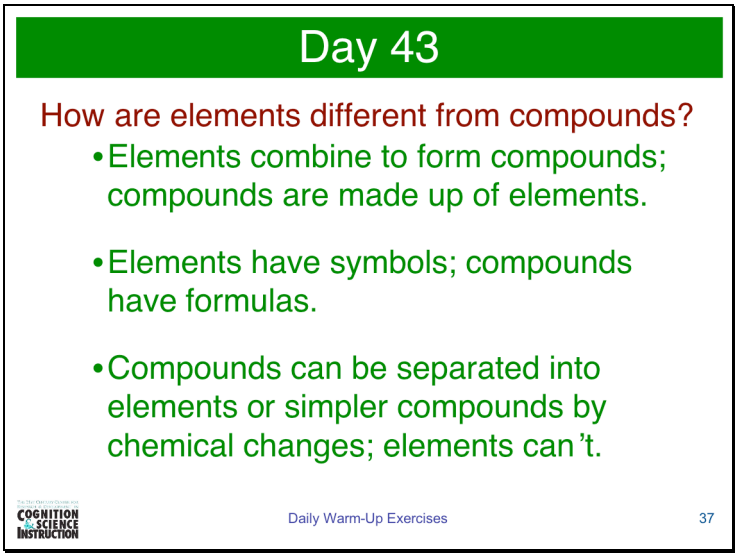
Compare Atoms & Molecules, part 1

In part 1, students examine cards that depict atoms and molecules, and they complete a table designed to help them focus on key features. In part 2, they use a Venn diagram to depict similarities and differences between atoms and molecules. The concluding discussion focuses on connections to previous contrasting case activities.

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Day 43 – Compare Atoms & Molecules 1

Warm-Up Activity



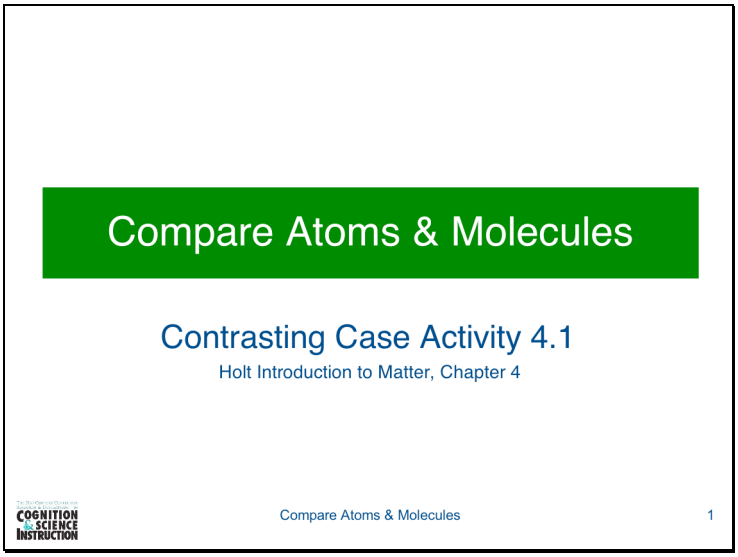
Why do compounds have formulas?
Compounds always have the same composition, and the formula shows the composition.

What do elements and compounds have in common?
both are pure substances

What's a pure substance?
a substance that contains only one type of particle

Day 43 – Compare Atoms & Molecules 1

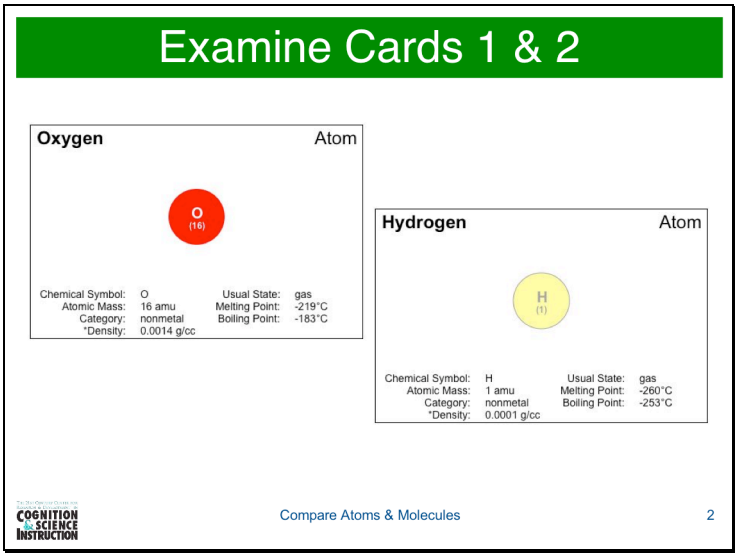
Compare Atoms & Molecules, part 1 (cont.)



In this activity, students compare six cards that depict atoms as labeled circles and six cards that show molecules as combinations of those circles. The atoms are oxygen, hydrogen, sodium, chlorine, nitrogen, and carbon. The molecules are oxygen (O^2), hydrogen (H^2), water, carbon dioxide, baking soda, and acetic acid.

Day 43 – Compare Atoms & Molecules 1

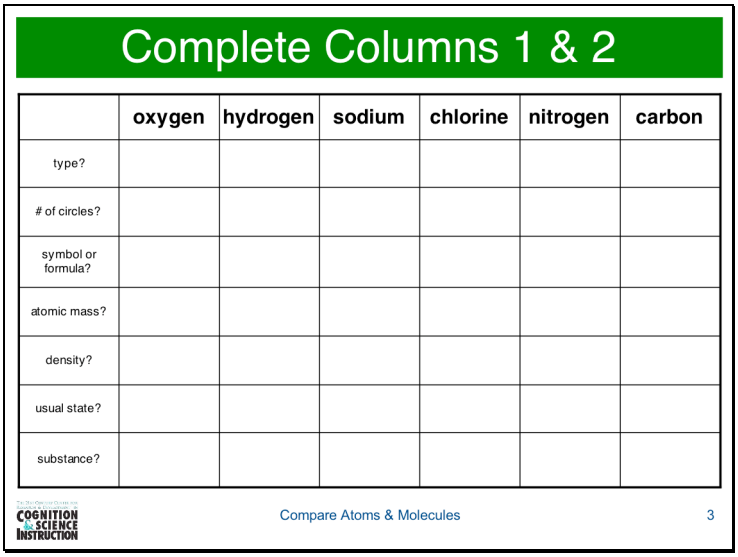
Compare Atoms & Molecules, part 1 (cont.)



Distribute the atom cards (worksheets 24-26) and ask students to examine the first two (oxygen & hydrogen). They should recognize the information at the bottom of each card, because it is identical to the element cards for these two substances. By this point in the chapter, they should also be able to explain the meaning of each category except atomic mass. That topic will be covered in section 4.2.

Day 43 – Compare Atoms & Molecules 1

Compare Atoms & Molecules, part 1 (cont.)

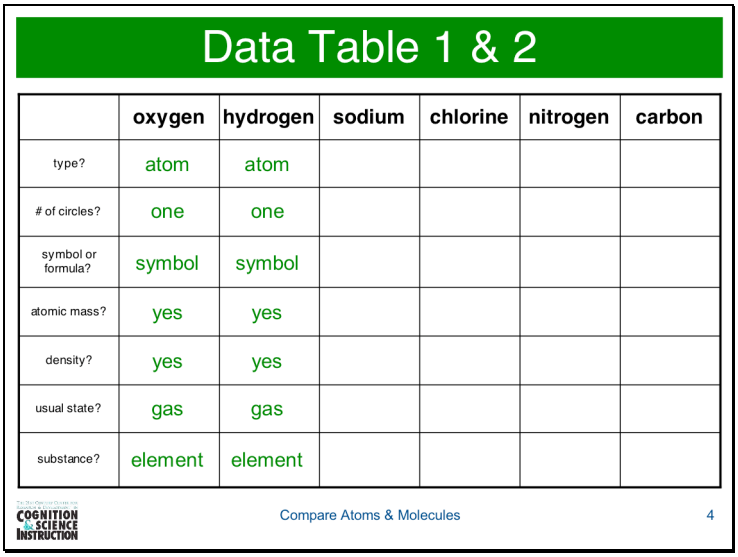


Distribute the first data table (worksheet 30) and have students work in pairs to complete the first two columns. [The abridged questions in the first column are for your use when going over the answers with your students. See the student worksheets for the complete questions.]

The next slide shows the completed columns.

Day 43 – Compare Atoms & Molecules 1

Compare Atoms & Molecules, part 1 (cont.)



Data Table 1 & 2

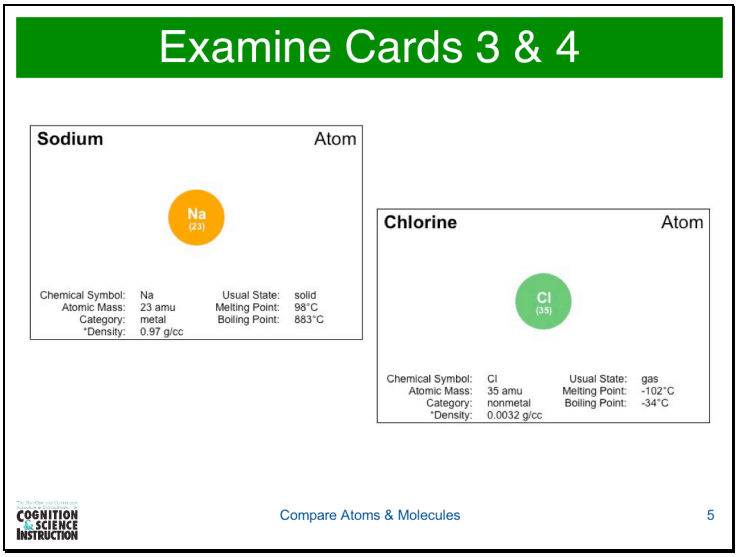
	oxygen	hydrogen	sodium	chlorine	nitrogen	carbon
type?	atom	atom				
# of circles?	one	one				
symbol or formula?	symbol	symbol				
atomic mass?	yes	yes				
density?	yes	yes				
usual state?	gas	gas				
substance?	element	element				

Answers will appear on keypress.

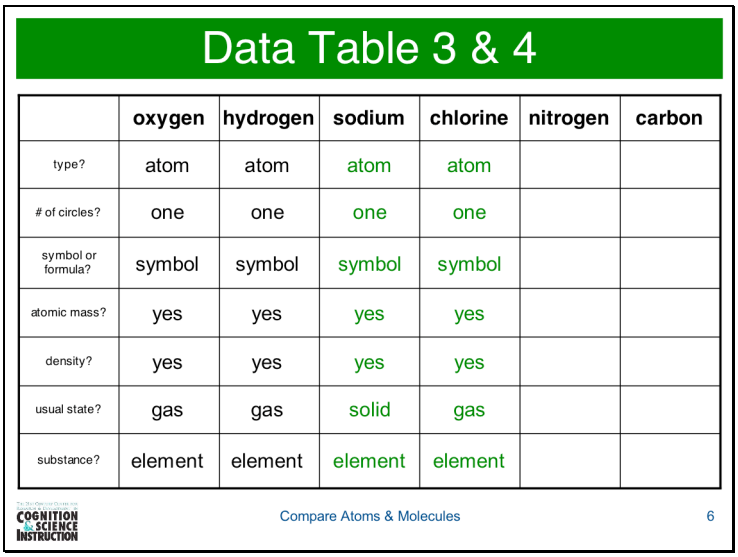
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Day 43 – Compare Atoms & Molecules 1

Compare Atoms & Molecules, part 1 (cont.)



Ask students to examine the next two cards (sodium & chlorine) and complete the next two columns of the data table.



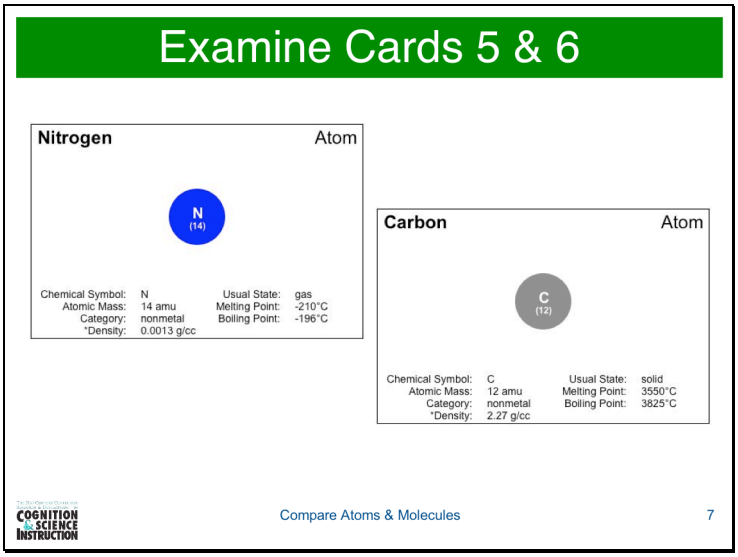
	oxygen	hydrogen	sodium	chlorine	nitrogen	carbon
type?	atom	atom	atom	atom		
# of circles?	one	one	one	one		
symbol or formula?	symbol	symbol	symbol	symbol		
atomic mass?	yes	yes	yes	yes		
density?	yes	yes	yes	yes		
usual state?	gas	gas	solid	gas		
substance?	element	element	element	element		

Answers will appear on keypress.

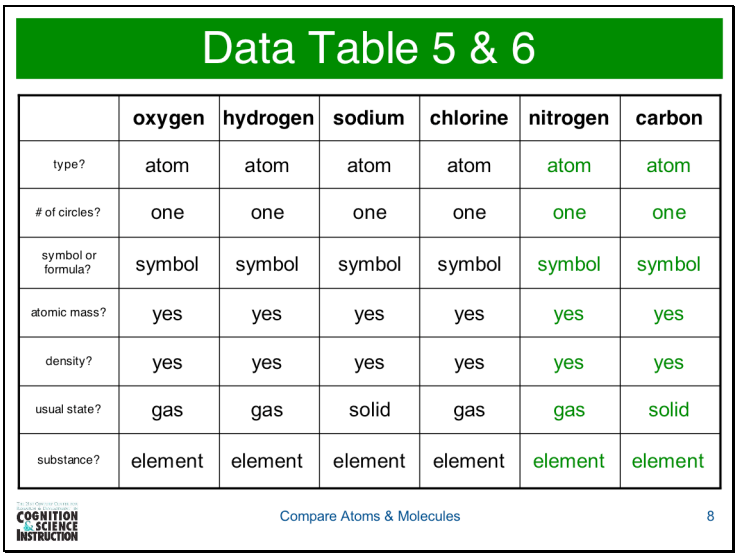
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Day 43 – Compare Atoms & Molecules 1

Compare Atoms & Molecules, part 1 (cont.)



Ask students to examine the last two cards (nitrogen & carbon) and complete the last two columns of the data table.

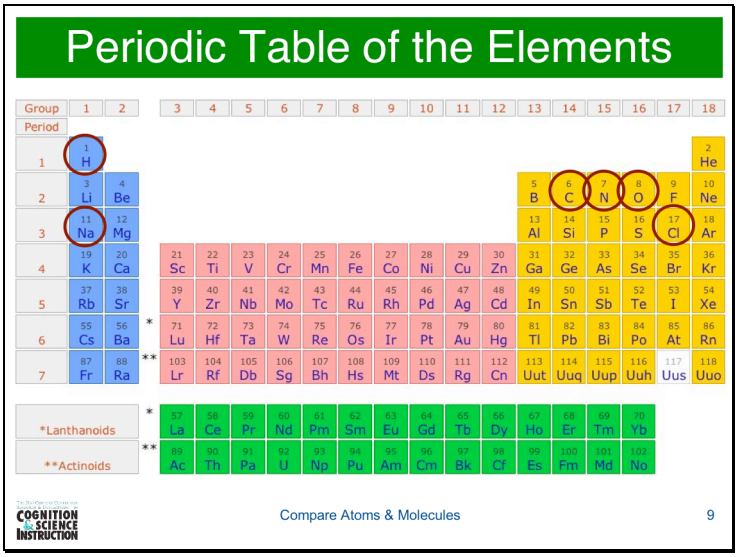


	oxygen	hydrogen	sodium	chlorine	nitrogen	carbon
type?	atom	atom	atom	atom	atom	atom
# of circles?	one	one	one	one	one	one
symbol or formula?	symbol	symbol	symbol	symbol	symbol	symbol
atomic mass?	yes	yes	yes	yes	yes	yes
density?	yes	yes	yes	yes	yes	yes
usual state?	gas	gas	solid	gas	gas	solid
substance?	element	element	element	element	element	element

Answers will appear on keypress.

Day 43 – Compare Atoms & Molecules 1

Compare Atoms & Molecules, part 1 (cont.)

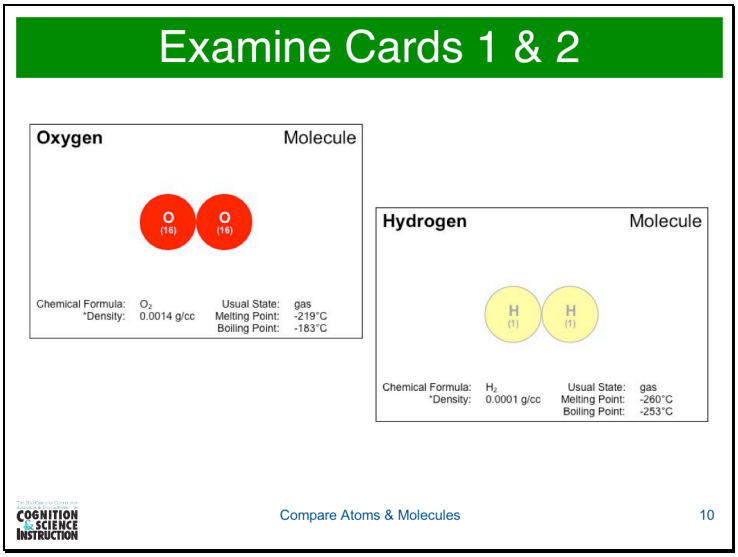


Tell your students that this table lists all the known elements. Have them compare it with the table on pages 154 & 155 of their textbook. Their table also shows the name and atomic mass of each element. Encourage students to find the elements they worked with today, and to identify any other elements they recognize. Circles will appear in the following order:

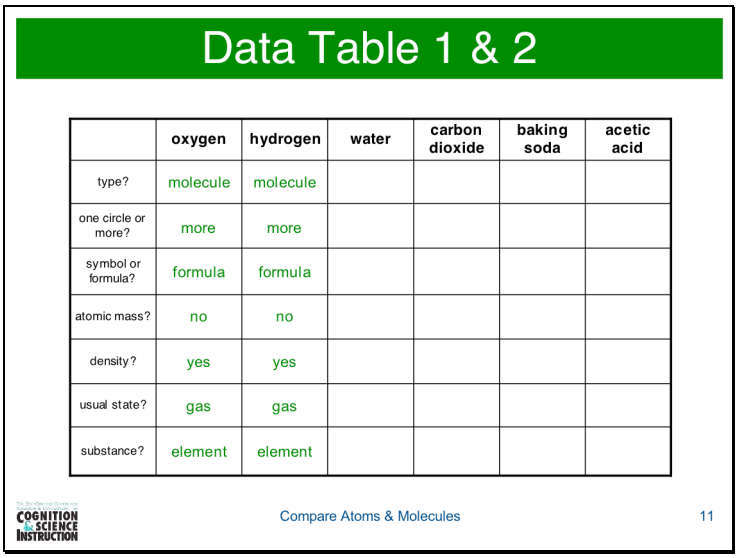
- oxygen
- hydrogen
- sodium
- chlorine
- nitrogen
- carbon

Day 43 – Compare Atoms & Molecules 1

Compare Atoms & Molecules, part 1 (cont.)



Distribute the molecule cards (worksheets 27-29) and data table 2 (worksheet 31). Have students work in groups to complete the first two columns of the new data table.

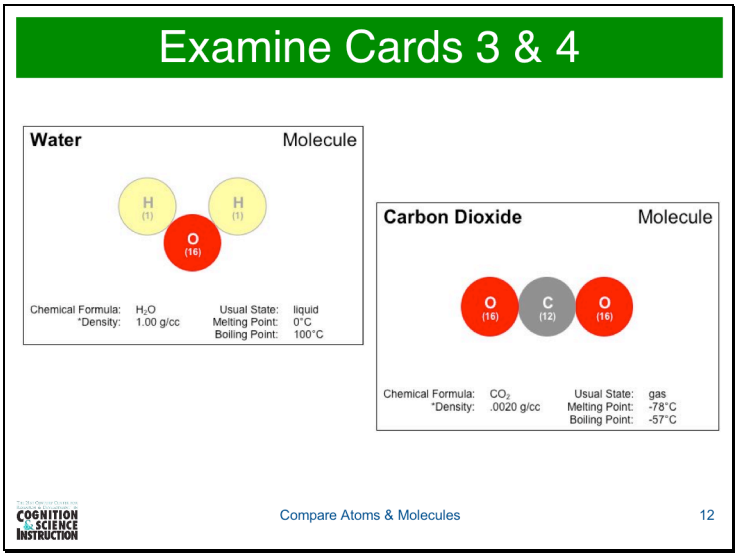


	oxygen	hydrogen	water	carbon dioxide	baking soda	acetic acid
type?	molecule	molecule				
one circle or more?	more	more				
symbol or formula?	formula	formula				
atomic mass?	no	no				
density?	yes	yes				
usual state?	gas	gas				
substance?	element	element				

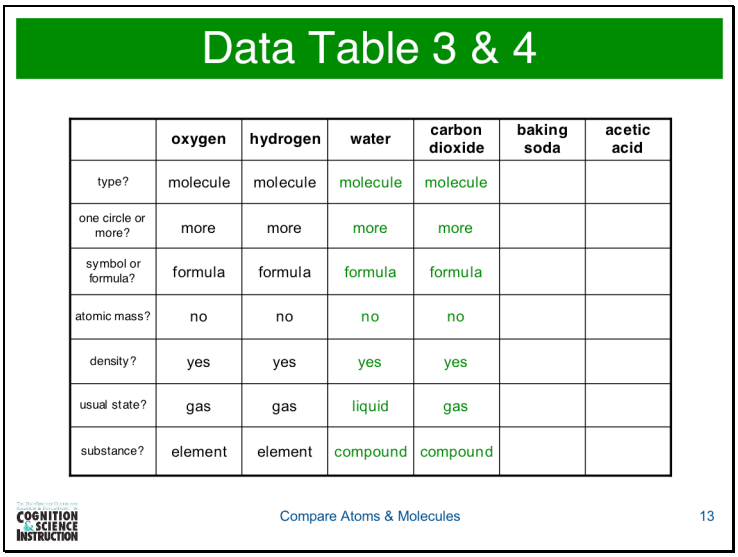
Answers will appear on keypress.

Day 43 – Compare Atoms & Molecules 1

Compare Atoms & Molecules, part 1 (cont.)



Have students work in groups to complete the next two columns of the data table.

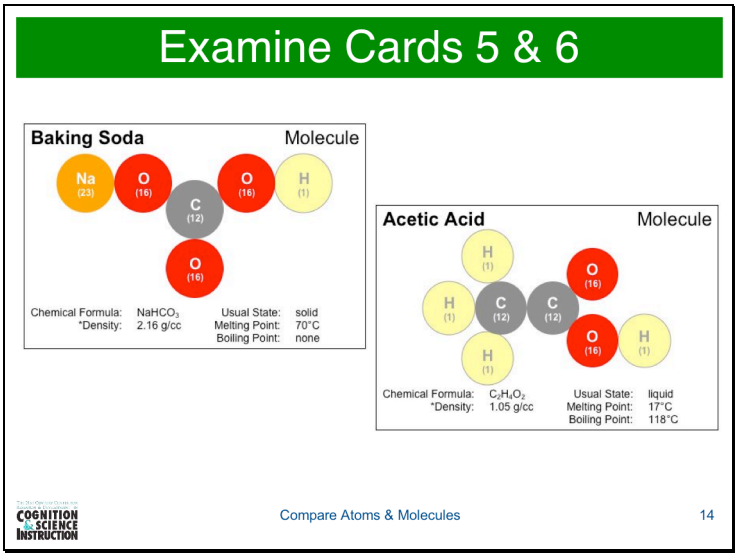


	oxygen	hydrogen	water	carbon dioxide	baking soda	acetic acid
type?	molecule	molecule	molecule	molecule		
one circle or more?	more	more	more	more		
symbol or formula?	formula	formula	formula	formula		
atomic mass?	no	no	no	no		
density?	yes	yes	yes	yes		
usual state?	gas	gas	liquid	gas		
substance?	element	element	compound	compound		

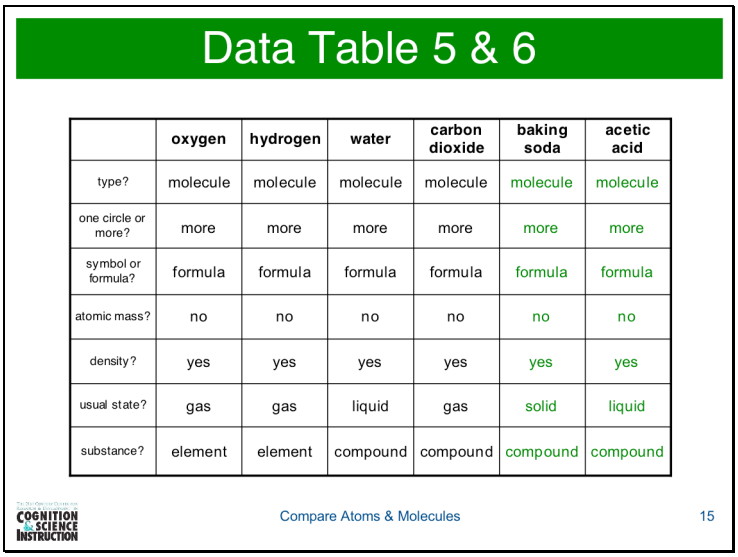
Answers will appear on keypress.

Day 43 – Compare Atoms & Molecules 1

Compare Atoms & Molecules, part 1 (cont.)



Have students work in groups to complete the next two columns of the data table.



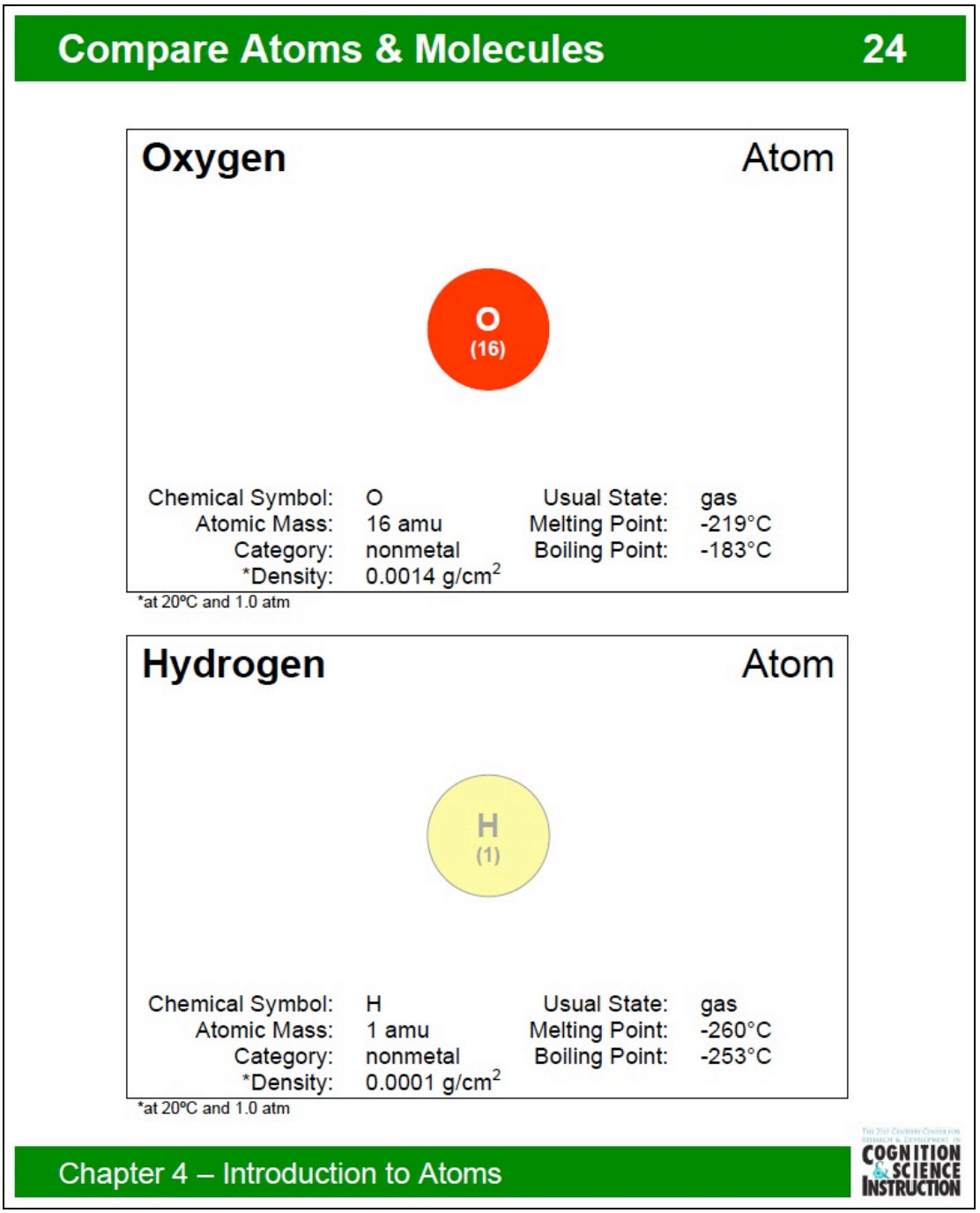
	oxygen	hydrogen	water	carbon dioxide	baking soda	acetic acid
type?	molecule	molecule	molecule	molecule	molecule	molecule
one circle or more?	more	more	more	more	more	more
symbol or formula?	formula	formula	formula	formula	formula	formula
atomic mass?	no	no	no	no	no	no
density?	yes	yes	yes	yes	yes	yes
usual state?	gas	gas	liquid	gas	solid	liquid
substance?	element	element	compound	compound	compound	compound

Answers will appear on keypress.

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Day 43 – Compare Atoms & Molecules 1

Worksheet 24



Compare Atoms & Molecules 24

Oxygen Atom

Chemical Symbol:	O	Usual State:	gas
Atomic Mass:	16 amu	Melting Point:	-219°C
Category:	nonmetal	Boiling Point:	-183°C
*Density:	0.0014 g/cm^2		

*at 20ºC and 1.0 atm

Hydrogen Atom

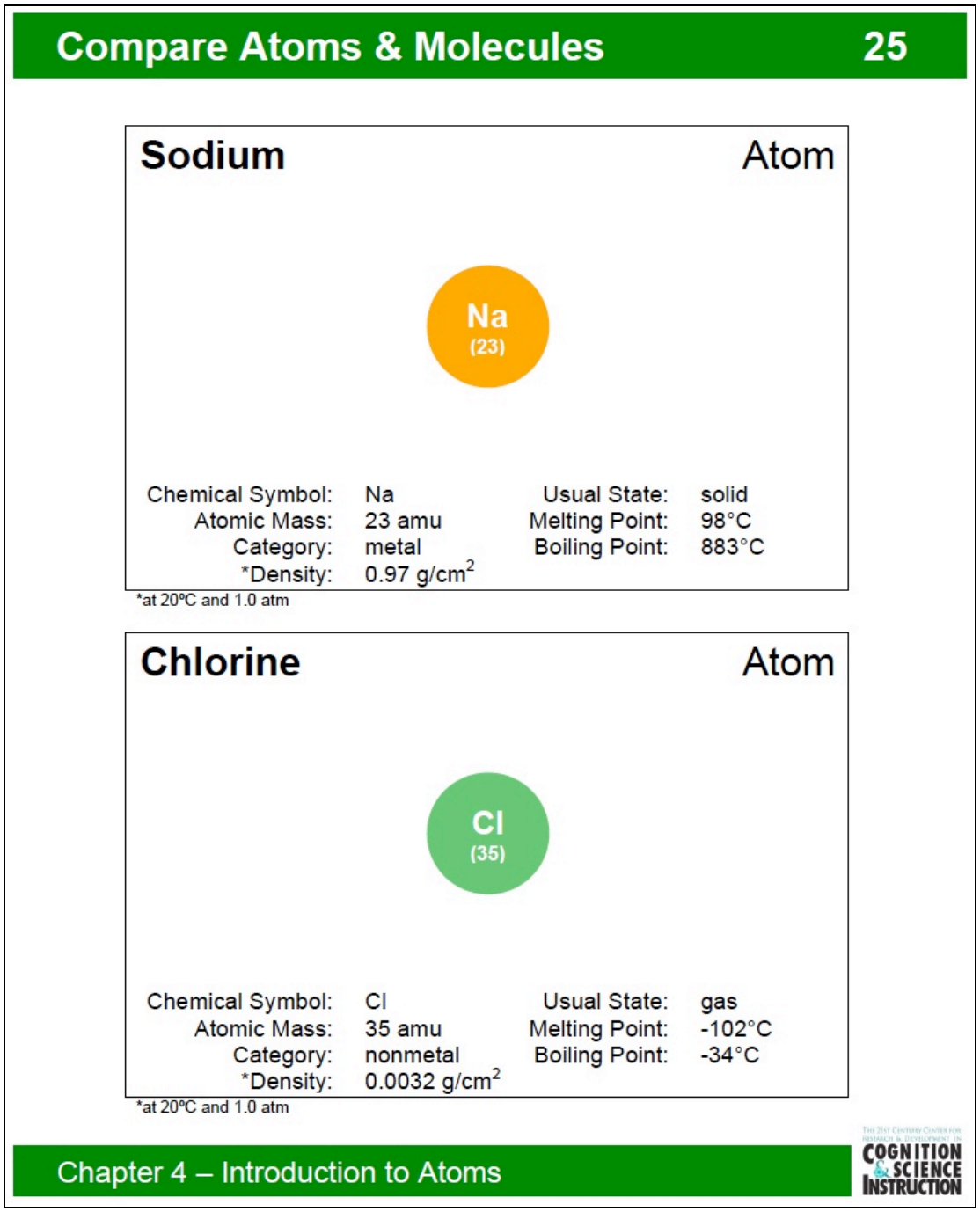
Chemical Symbol:	H	Usual State:	gas
Atomic Mass:	1 amu	Melting Point:	-260°C
Category:	nonmetal	Boiling Point:	-253°C
*Density:	0.0001 g/cm^2		

*at 20ºC and 1.0 atm

Chapter 4 – Introduction to Atoms

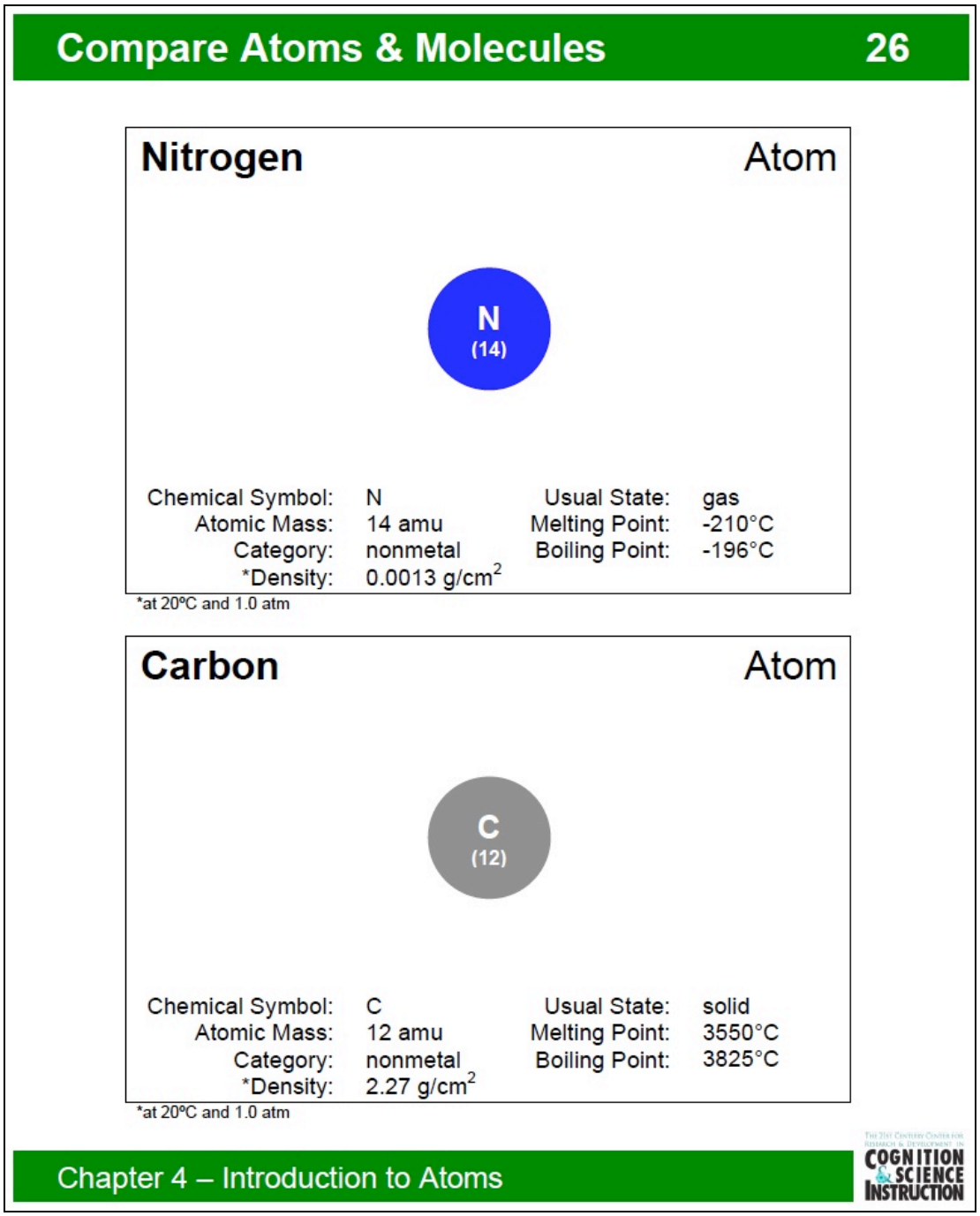
Day 43 – Compare Atoms & Molecules 1

Worksheet 25



Day 43 – Compare Atoms & Molecules 1

Worksheet 26



Compare Atoms & Molecules 26

Nitrogen — Atom

N
(14)

Chemical Symbol:	N	Usual State:	gas
Atomic Mass:	14 amu	Melting Point:	-210°C
Category:	nonmetal	Boiling Point:	-196°C
*Density:	0.0013 g/cm^2		

*at 20°C and 1.0 atm

Carbon — Atom

C
(12)

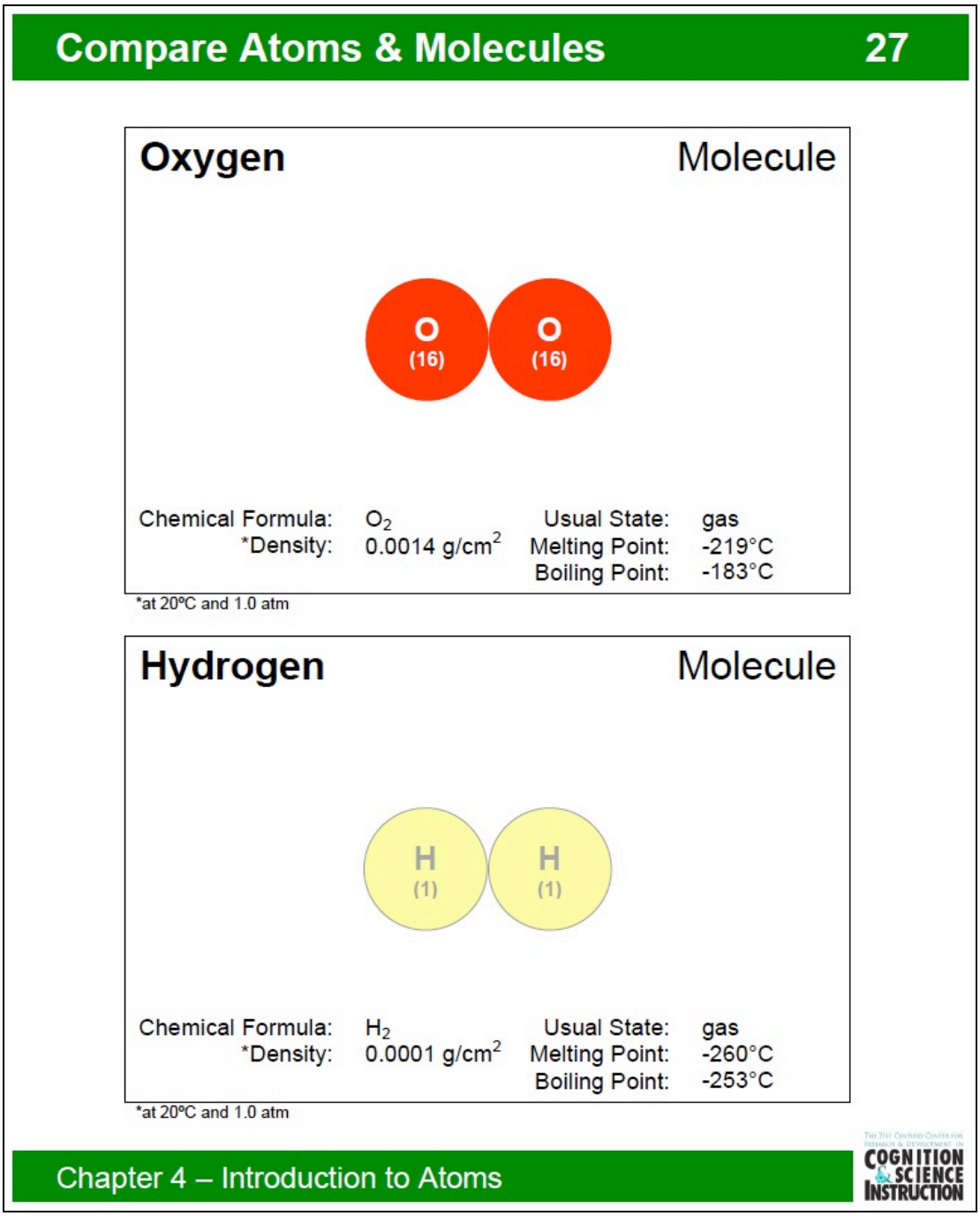
Chemical Symbol:	C	Usual State:	solid
Atomic Mass:	12 amu	Melting Point:	3550°C
Category:	nonmetal	Boiling Point:	3825°C
*Density:	2.27 g/cm^2		

*at 20°C and 1.0 atm

Chapter 4 – Introduction to Atoms

Day 43 – Compare Atoms & Molecules 1

Worksheet 27

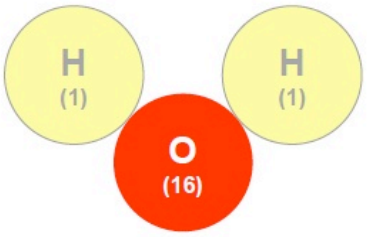


Day 43 – Compare Atoms & Molecules 1

Worksheet 28

Compare Atoms & Molecules 28

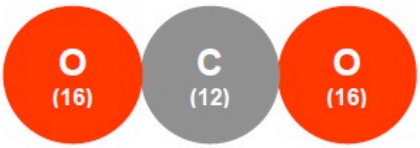
Water Molecule



Chemical Formula:	H_2O	Usual State:	liquid
*Density:	1.00 g/cm^2	Melting Point:	0°C
		Boiling Point:	100°C

*at 20°C and 1.0 atm

Carbon Dioxide Molecule



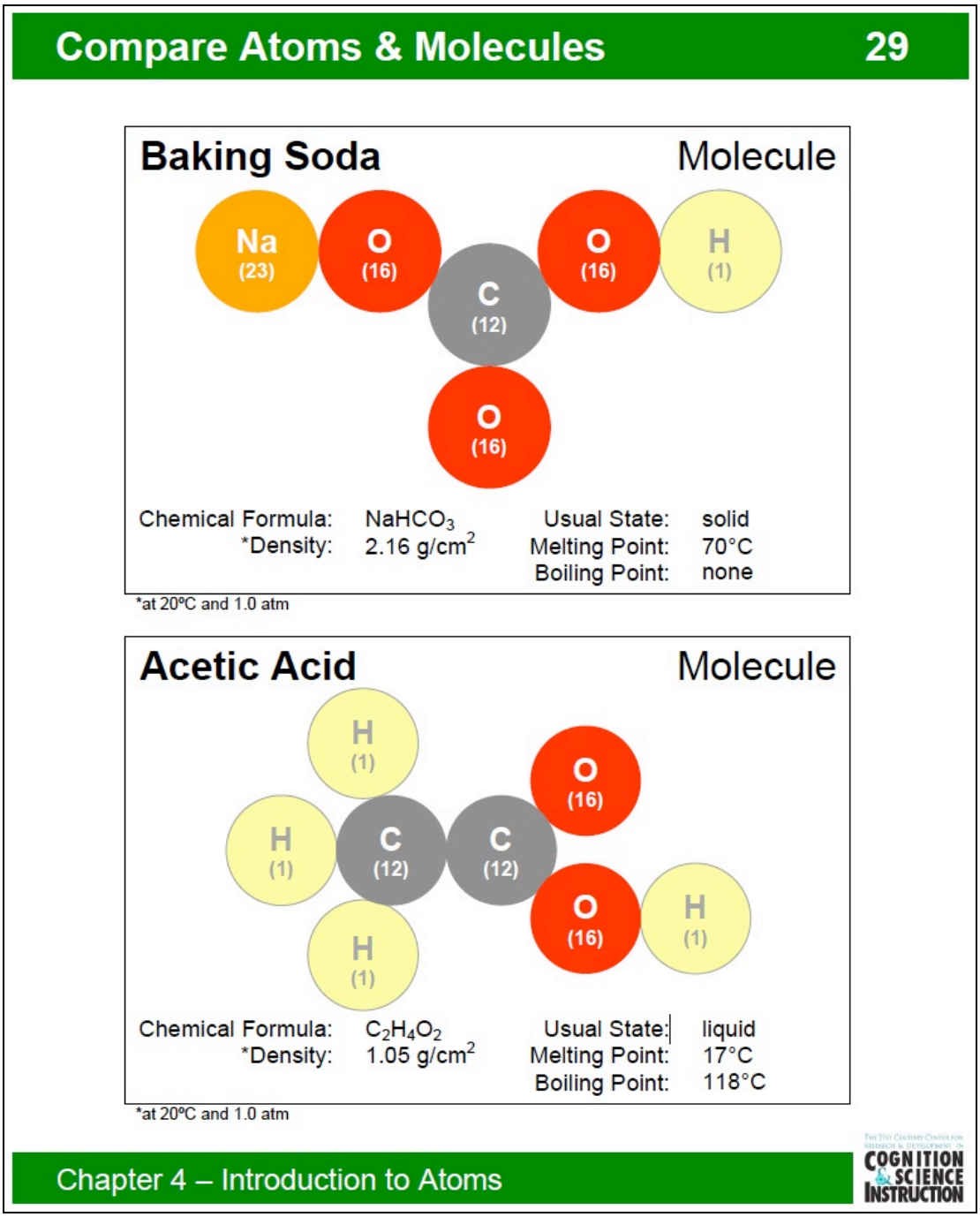
Chemical Formula:	CO_2	Usual State:	gas
*Density:	.0020 g/cm^2	Melting Point:	-78°C
		Boiling Point:	-57°C

*at 20°C and 1.0 atm

Chapter 4 – Introduction to Atoms

Day 43 – Compare Atoms & Molecules 1

Worksheet 29



Day 43 – Compare Atoms & Molecules 1

Worksheet 30

Compare Atoms & Molecules – Data Table 1 30

	oxygen	hydrogen	sodium	chlorine	nitrogen	carbon
Is it an atom or molecule?						
Is there one circle or more than one?						
Does it have a symbol or formula?						
Does it have atomic mass?						
Does it have density?						
What is its usual state?						
Is it an element, compound, or mixture?						

Chapter 4 – Introduction to Atoms

Day 43 – Compare Atoms & Molecules 1

Worksheet 31

Compare Atoms & Molecules – Data Table 2 31

	oxygen	hydrogen	water	carbon dioxide	baking soda	acetic acid
Is it an atom or molecule?						
Is there one circle or more than one?						
Does it have a symbol or formula?						
Does it have atomic mass?						
Does it have density?						
What is its usual state?						
Is it an element, compound, or mixture?						

Chapter 4 – Introduction to Atoms

DAY 44

Compare Atoms & Molecules, Part 2

This is the second half of contrasting case activity 4.1.

Big Ideas

- Atoms and molecules are the particles that make up matter.
- Atoms can combine to form molecules, and molecules are made up of atoms.

Materials

Teacher:

1. slides – day44.ppt

Students:

1. example cards – worksheets 24-29
2. data tables & Venn diagram – worksheets 30-32

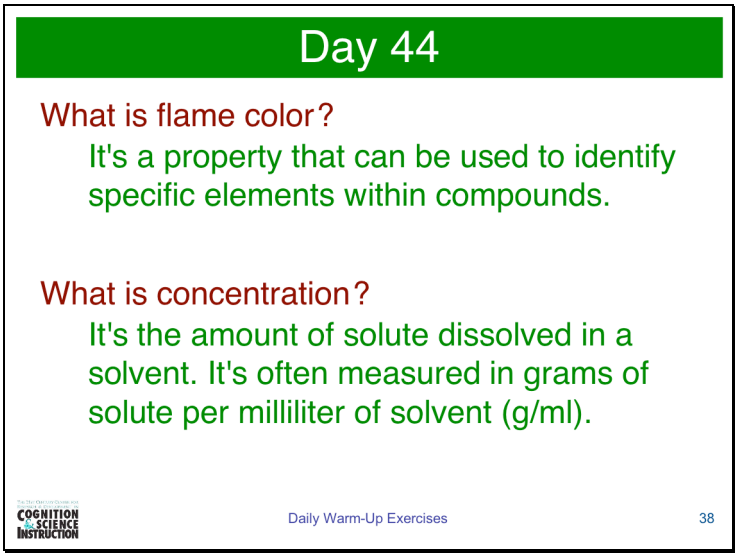
Activities & Allotted Time (40 minutes total)

5 minutes – warm-up activity
35 minutes – cc activity – Compare Atoms & Molecules, part 2

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Day 44 – Compare Atoms & Molecules 2

Warm-Up Activity

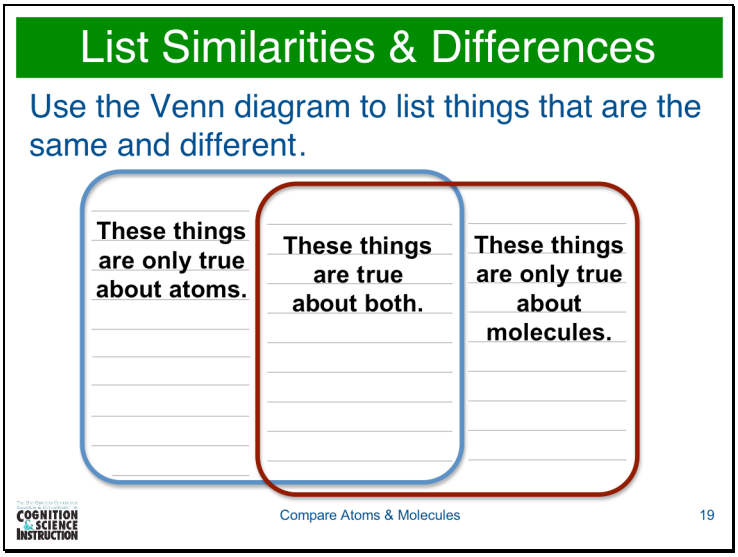


What do we call the particles that make up matter?
atoms and molecules

What's the difference between atoms and molecules?
atoms can combine to form molecules;
molecules are made up of atoms

Day 44 – Compare Atoms & Molecules 2

Compare Atoms & Molecules, part 2



Distribute the Venn diagram (worksheet 32) and have students work in pairs or groups, then share their ideas with the class. As in activities 3.1 & 3.3, use questions to help them identify similarities.

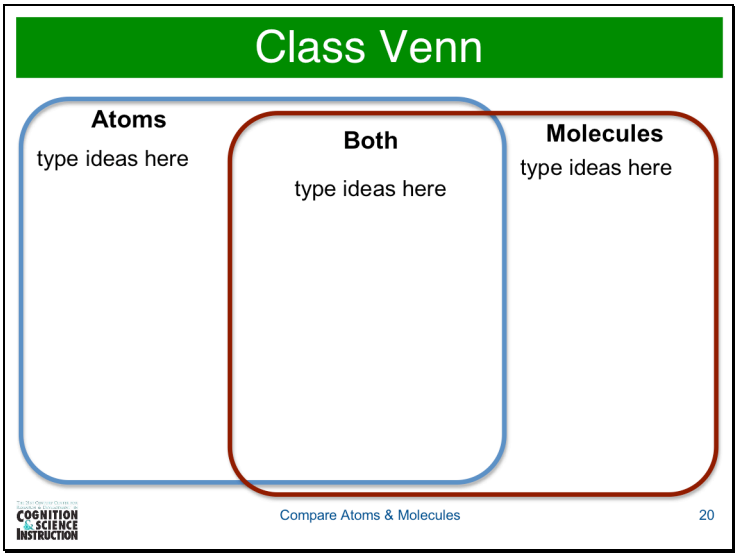
Point out that most of today's examples match elements and compounds students worked with in 3.1 & 3.3. If each drawing shows one particle of that element or compound, what does that tell you about atoms & molecules?

They are the particles that make up elements and compounds, or the particles that make up matter.

The next slide contains a blank Venn Diagram you can use to display your students' ideas.

Day 44 – Compare Atoms & Molecules 2

Compare Atoms & Molecules, part 2



(Click Escape to stop the slide show. After entering students' ideas, click the slide show icon at the bottom of the window to display the diagram.)
Some ideas your students may come up with:

Same

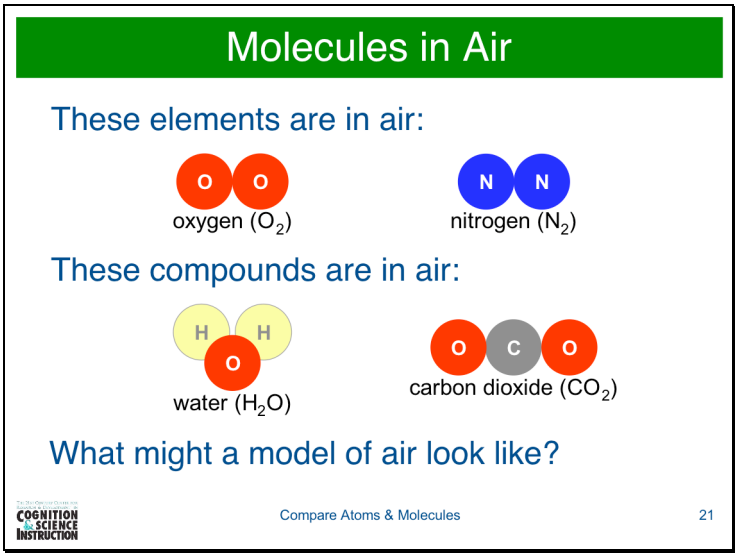
- both have mass and volume
- both are matter
- both can change state
- both are particles that make up elements & compounds

Different

- atoms are pictured as one circle; molecules are pictured as two or more
- atoms can combine to form molecules; molecules are made up of atoms,
- atoms are elements; molecules can be elements or compounds
- atoms are represented by symbols; molecules are represented by formulas

Day 44 – Compare Atoms & Molecules 2

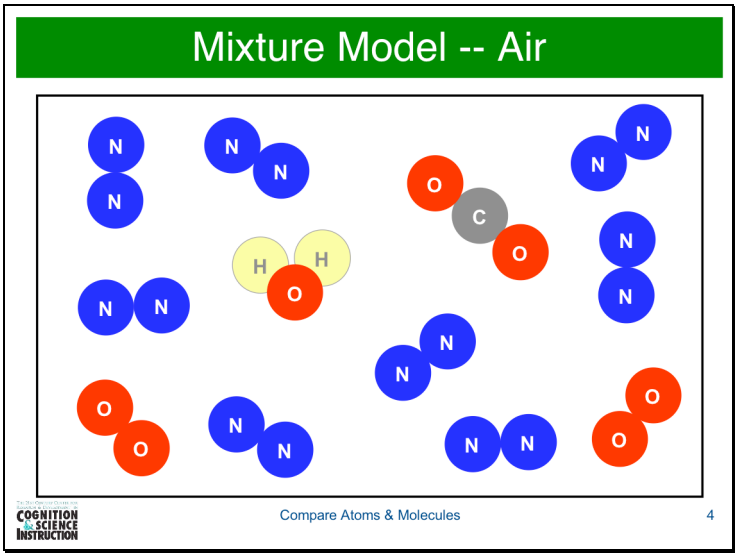
Compare Atoms & Molecules, part 2



Have one or two students share their ideas, then show the sample model on the next slide.

Day 44 – Compare Atoms & Molecules 2

Compare Atoms & Molecules, part 2

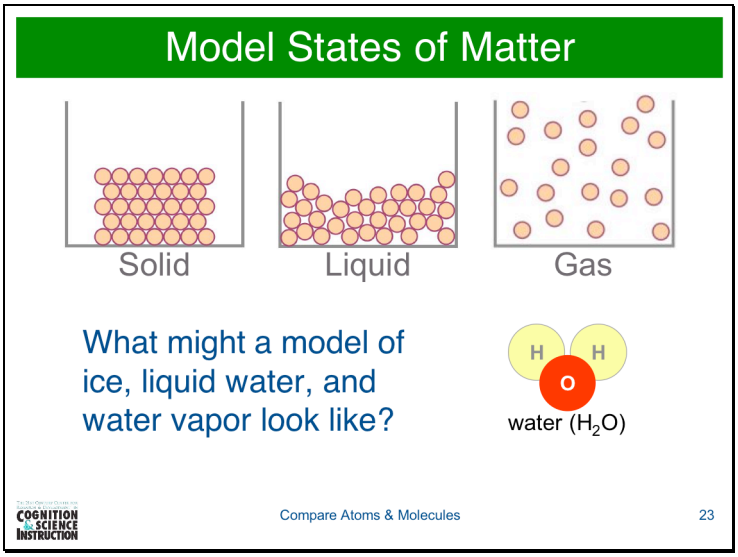


This model shows the molecules that make up air. Air is a mixture that contains mostly nitrogen, with a little oxygen and a tiny bit of carbon dioxide, water vapor, and other gases. Students should recall that the composition of air changes from place to place and time to time. In other words, there is no single "recipe" for air, which is one of the features that makes mixtures different from compounds.

Ask about the spaces between particles. Is there anything in there? Some students may think the spaces contain air, and that all these gas molecules are floating around in air. Try to help them understand that these molecules <u>are</u> the air, and that the spaces between particles are empty. As they learned from the particle models, gases contain a lot of empty space.

Day 44 – Compare Atoms & Molecules 2

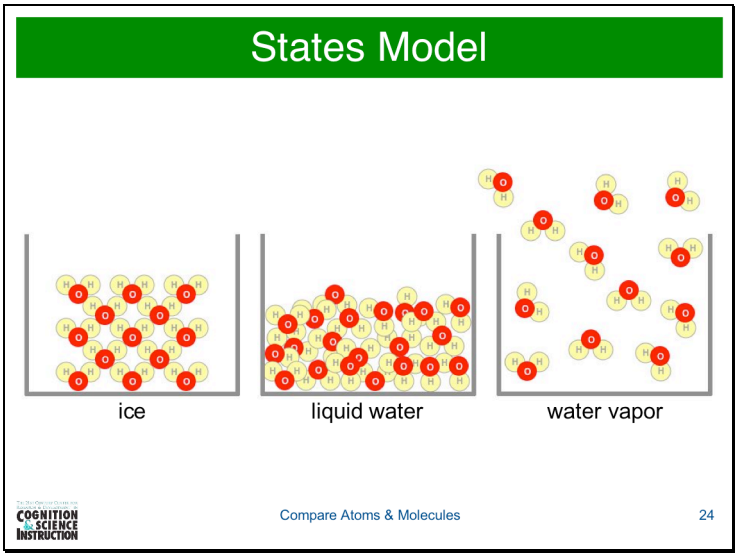
Compare Atoms & Molecules, part 2



Have one or two students share their ideas, then show the sample model on the next slide.

Day 44 – Compare Atoms & Molecules 2

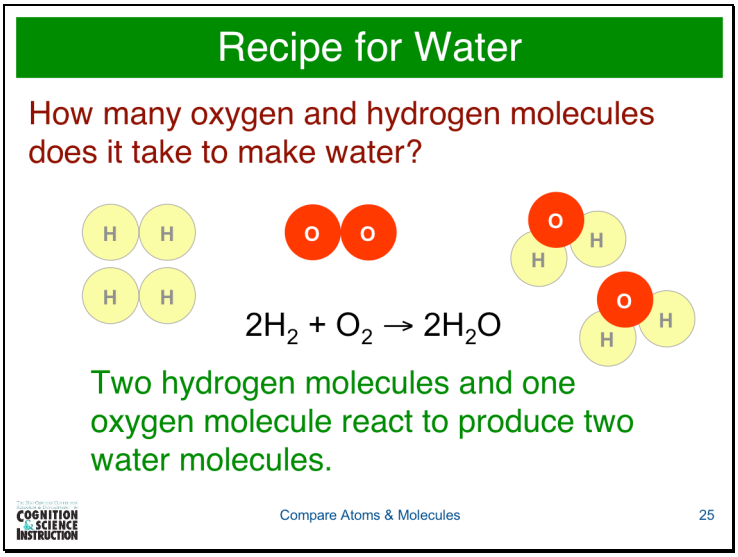
Compare Atoms & Molecules, part 2



Explain that the attractions between water molecules cause them to arrange themselves in a pattern when they change from liquid to solid. The pattern creates a lot of spaces between molecules, which is why solid ice is less dense than liquid water.

Day 44 – Compare Atoms & Molecules 2

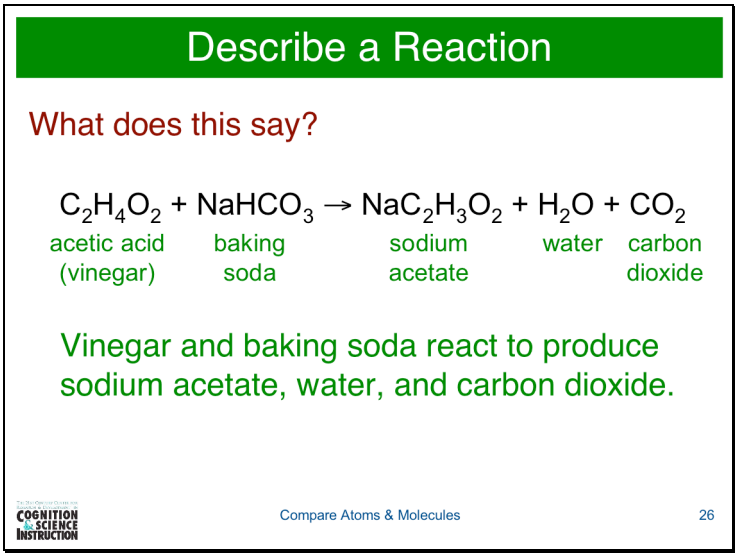
Compare Atoms & Molecules, part 2



At first, the screen shows only the question and the hydrogen and oxygen molecules. Most students will initially say it takes one molecule of each to make a molecule of water. When you press a key, a water molecule and an oxygen atom appear, showing that , with one molecule of each, you'd have one oxygen atom left over. Ask if they can think of a "recipe" that would use all the atoms, with no leftovers. Students should recognize that a second hydrogen molecule is needed to combine with the extra oxygen atom.

Day 44 – Compare Atoms & Molecules 2

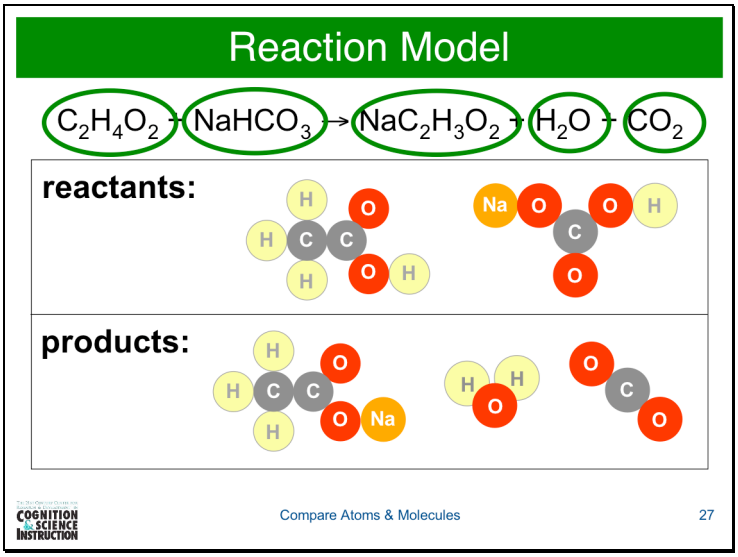
Compare Atoms & Molecules, part 2



Students may remember this formula from the "Crack the Code" slide in Compare Compounds & Mixture (day37.ppt, slide 2), but the labels will appear to provide hints in this order: water, carbon dioxide, vinegar, baking soda, sodium acetate

Day 44 – Compare Atoms & Molecules 2

Compare Atoms & Molecules, part 2



At first, only the formula and empty table are displayed. Circles will appear on keypress for each of the following questions:

What does the model for acetic acid look like? [models will appear on keypress when you're ready to show the answer]

What does the model for baking soda look like?

What atoms do we need for a molecule of water?

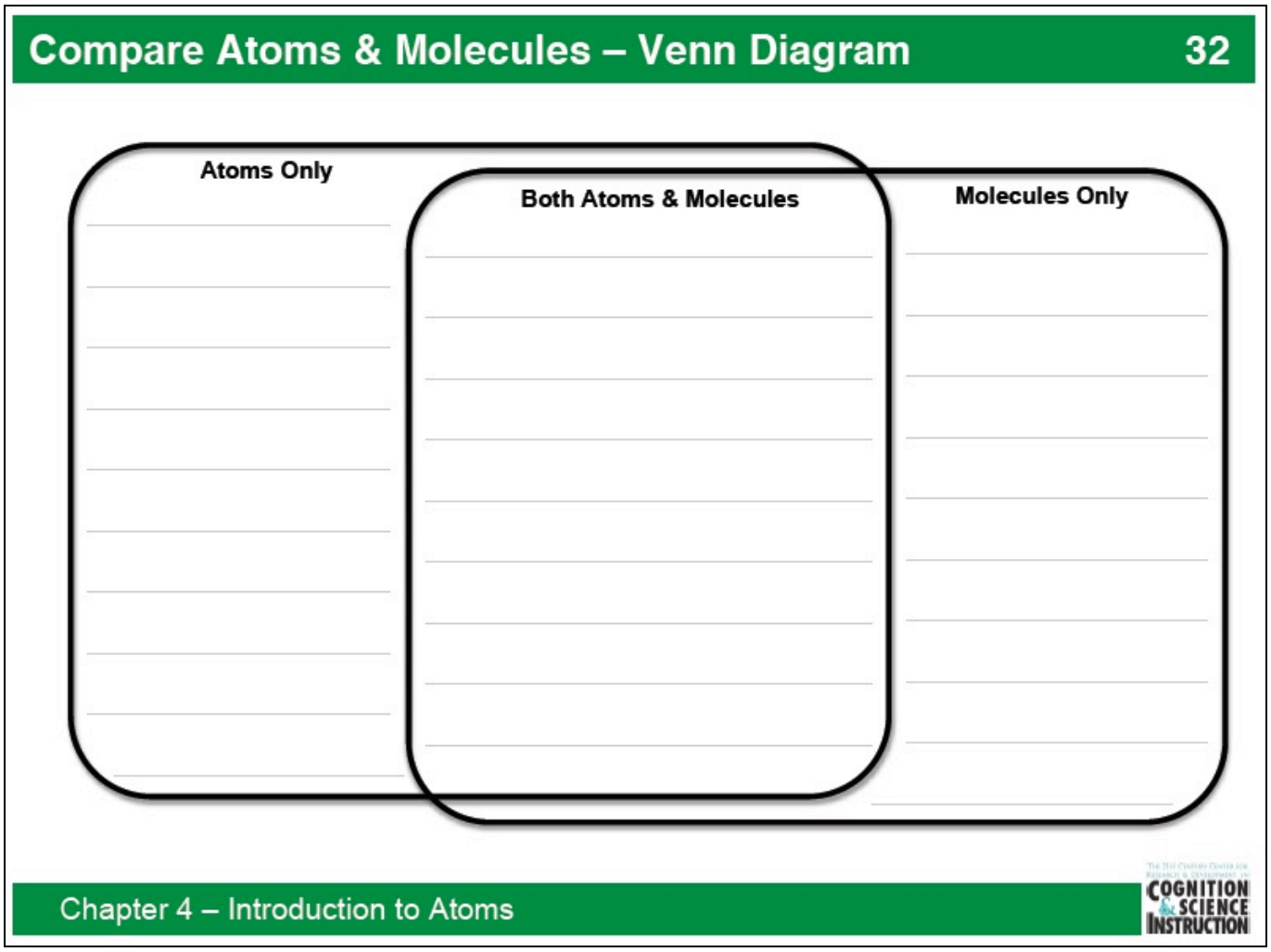
What atoms do we need for a molecule of carbon dioxide?

What atoms do we need for sodium acetate?

These slides illustrate that, when molecules react (or undergo a chemical change), the atoms that make up the molecules rearrange themselves to make different molecules. The atoms are the same before and after the change, but the molecules are different.

Day 44 – Compare Atoms & Molecules 2

Worksheet 32



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DAY 45

Where is It?

This lesson includes two visualization exercises and the start-up activity for chapter 4 (page 81).

Big Idea

- It is possible to gather information about something without actually seeing it.

Materials

Teacher:

1. visualization exercises – day45.ppt

Students:

1. cardboard screen
2. plain paper (large enough to cover screen)
3. blocks or books (for raising screen above table)
4. marble
5. unknown object (e.g., wooden blocks of different shapes)

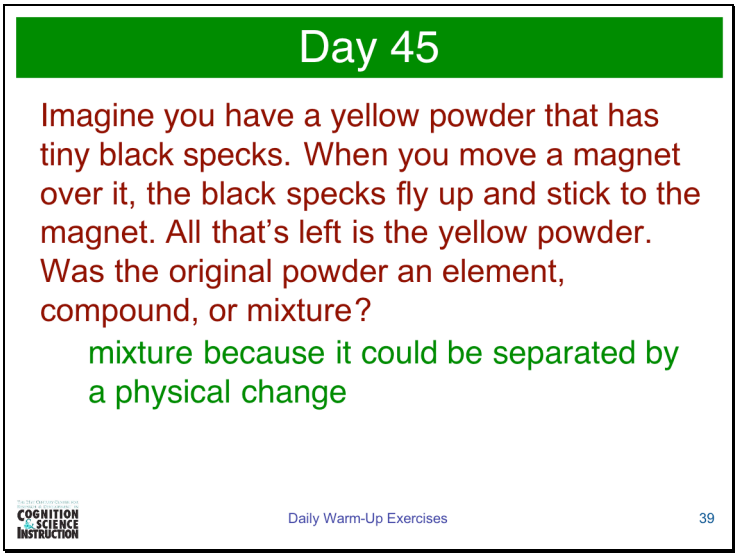
Activities & Allotted Time (40 minutes total)

5 minutes – warm-up activity
5 minutes – visualization 4.1a – Zoom
5 minutes – visualization 4.1b – Labeling
25 minutes – start-up activity – *Where is It?* – page 81

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Day 45 – Where is It?

Warm-Up Activity

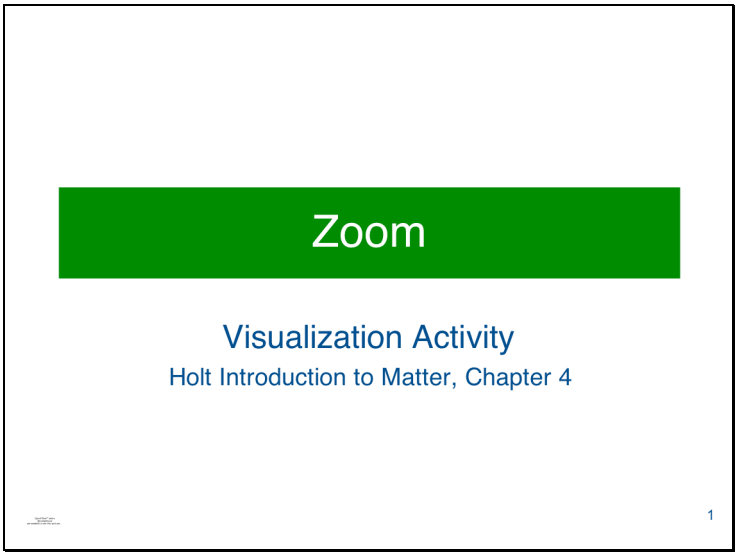


What property did you use to separate the mixture?
magnetism

Is magnetism a chemical or physical property?
physical

Day 45 – Where is It?

Visualization Exercise 4.1a – Zoom



Goal: Expand students' understanding of a zoom convention by illustrating additional visual clues that indicate a zoom is being used.

Type of Activity: Teacher comment

Overview: This activity is designed to help the students develop a better understanding of the zoom convention by looking at two diagrams with the zoom convention used in the same way, that is, magnifying something that is invisible to the naked eye in the original image.

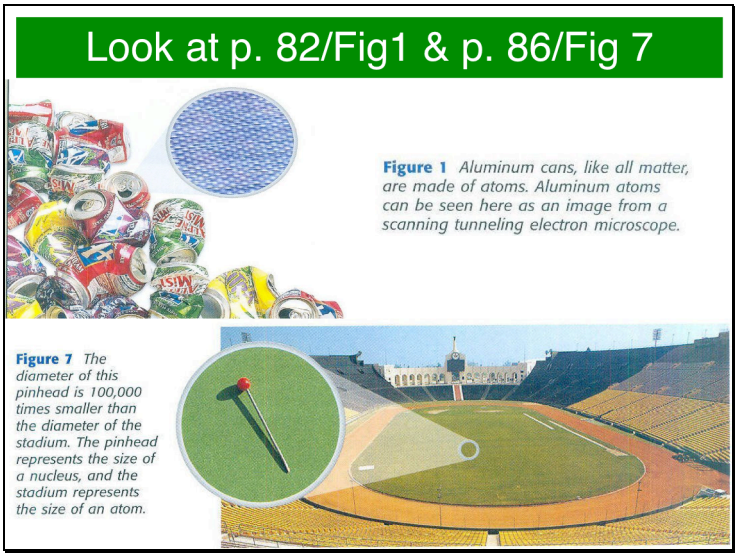
Procedure: The teacher should ask the students to review the visual clues they learned in chapter one that indicate that a zoom convention was in the diagram. [One visual clue was an arrow pointing from one part of the object to a larger version of that part (see page 5, figure 2). The other was a small circle connected to a big circle by the use of a shadow where the big circle had a magnified version of the small circle (see page 35, figure 5).]

(proceed to the next slide)

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Day 45 – Where is It?

Visualization Exercise 4.1a – Zoom (cont.)



Teacher comment: Explain that sometimes specific parts of an image are unable to be seen without magnification. Both images above use the zoom convention to facilitate the visualization of a part of the image. The zoom bubble can be used to make something that is NOT visible in the original image (the cans) visible in the zoom bubble (the aluminum atoms in Fig 1). The case is the same on p. 86/Fig 7 where the pin head is not visible in the original image and needs magnification to be visible in the zoom bubble.

(End of Activity)

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Day 45 – Where is It?

Visualization Exercise 4.1b – Labeling

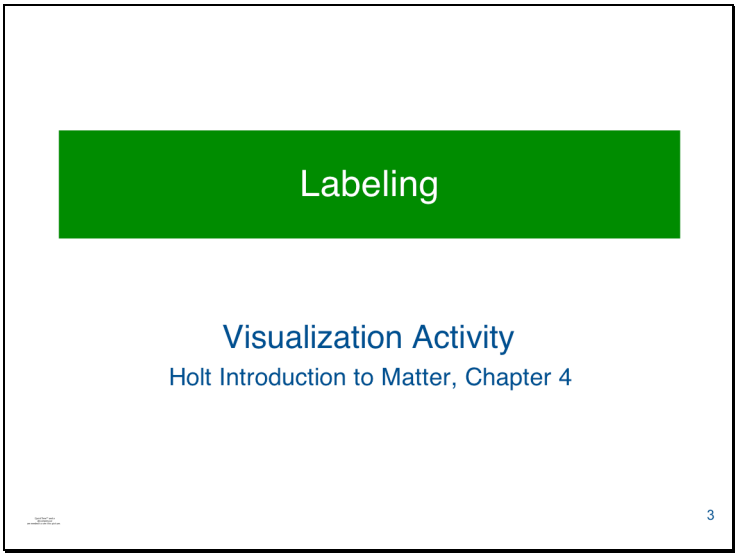


Image Comprehension Focus: Labeling

Goal: Reinforce the importance of labels in diagram comprehension

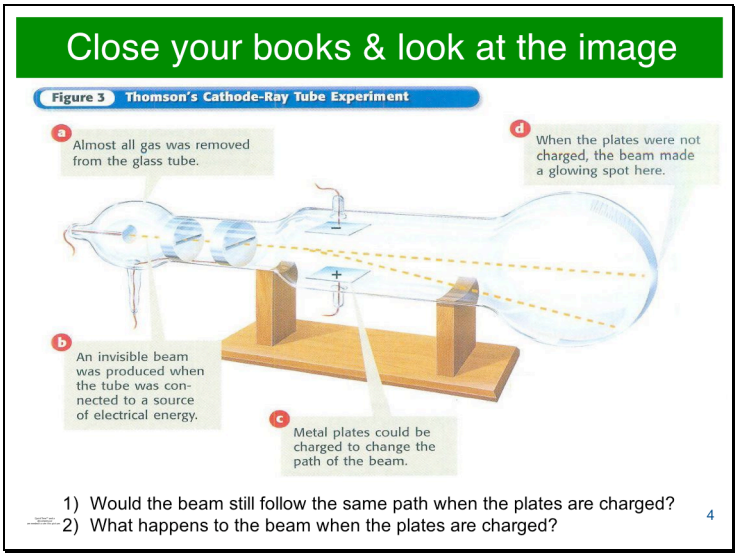
Type of Activity: Student activity

Overview: This activity is designed to provide an experience for students to realize the importance of (explanatory) labels.

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Day 45 – Where is It?

Visualization Exercise 4.1b – Labeling (cont.)



Student Activity (in pairs or in groups): The teacher presents the modified image and gives the students a minute to read (or reads to them) the questions. Asks if there is enough information in the diagram to answer the questions. (The students should have difficulty answering them because the information in the labels is incomplete.)

1) Would the beam still follow the same path when the plates are charged? Explain. (or Would the glowing spot be in the same place when the plates were charged? Explain.) ---- No. It would go through a different path which is pulled towards the positively charged plate. (No. It would be lower and closer to the positively charged plate.)

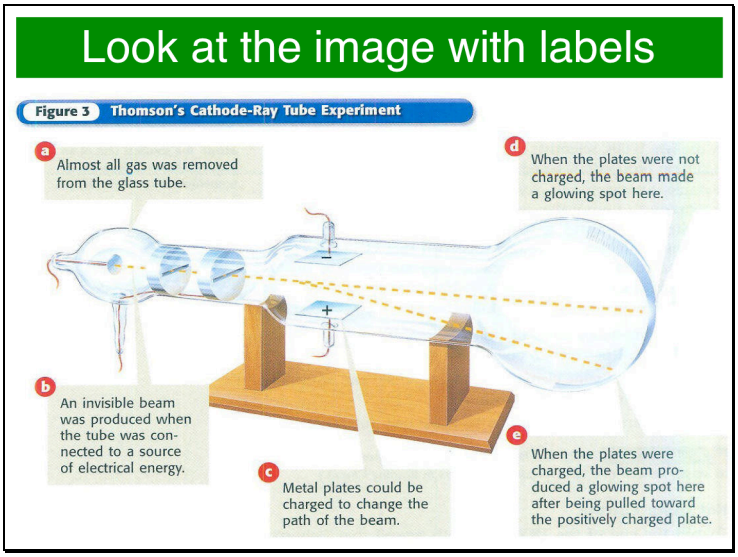
2) What happens to the beam when the plates are charged? ---- The beam would get pulled towards the positively charged plates.

(Proceed to the next slide)

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Day 45 – Where is It?

Visualization Exercise 4.1b – Labeling (cont.)



The teacher gives answers and explains where the answers can be found.

The teacher concludes that labeling is an important convention in an image that can provide useful information about different parts and processes shown in an image. To comprehend an image thoroughly, reading the labels is necessary.

(End of activity)

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DAY 46

Development of Atomic Theory

This lesson covers section 4.1 (pages 82-87) and includes three visualization exercises.

Big Ideas

- An atom is the smallest particle into which an element can be divided and still be the same substance.

Materials

Teacher:

1. visualization exercises – day46.ppt

Students:

none

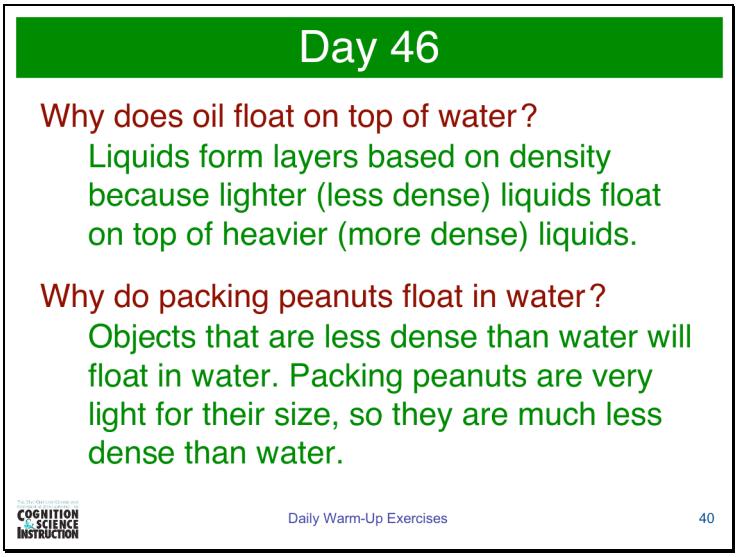
Activities & Allotted Time (40 minutes total)

5 minutes – warm-up activity
5 minutes – visualization 4.1c – Captions
5 minutes – visualization 4.1d – Labeling
5 minutes – visualization 4.1e – Relative Scale
20 minutes – chapter 4.1 – *Development of Atomic Theory*

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Day 46 – Development of Atomic Theory

Warm-Up Activity



What is mass?

the amount of matter in an object or sample;
depends on how big it is and what it's made of

What is weight?

a measure of the force of gravity acting on an object
depends on the mass of the object and the strength of gravity

Day 46 – Development of Atomic Theory

Visualization Exercise 4.1c – Captions

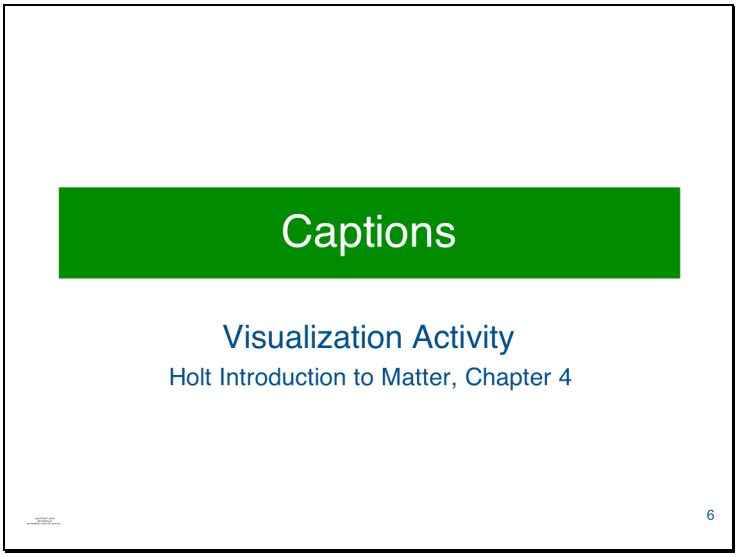


Image Comprehension Focus: Captions

Goal: Reinforce the role of captions in image comprehension.

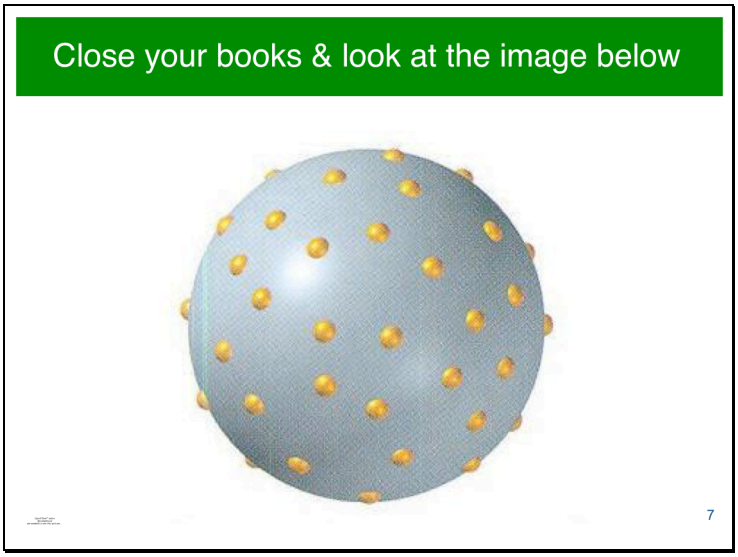
Type of Activity: Student activity

Overview: This activity is designed to provide an additional experience which illustrates the importance of reading captions.

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Day 46 – Development of Atomic Theory

Visualization Exercise 4.1c – Captions (cont.)



Student Activity: Teacher has students look at the image (p.84/Fig 4) without the caption. Teacher asks students to answer these questions (they should have difficulty answering them because of the lack of information):

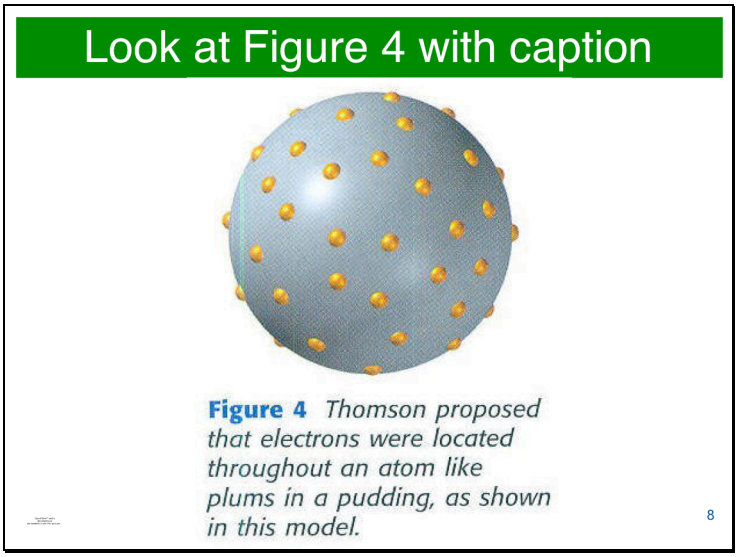
1) What does the image represent? (a model of an atom)
2) Who proposed this model of an atom? (Thomson)
3) What does the grey ball-shaped object represent? (an atom)
4) What are the yellow bumps in the grey ball-shaped object? (electrons)

(Proceed to the next slide)

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Day 46 – Development of Atomic Theory

Visualization Exercise 4.1c – Captions (cont.)



Teacher presents the image with the caption and concludes that the caption is the key to understanding the image.

(End of Activity)

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Day 46 – Development of Atomic Theory

Visualization Exercise 4.1d – Labeling

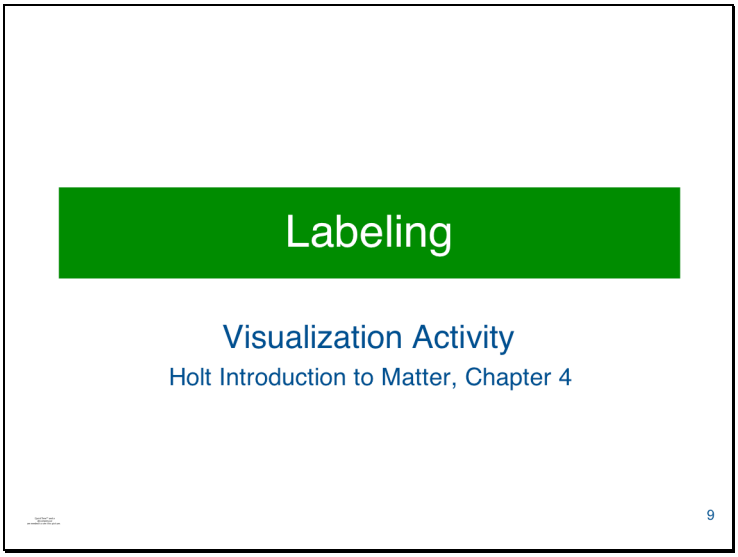


Image Comprehension Focus: Labeling

Goal: Reinforce the importance of labels in diagram comprehension

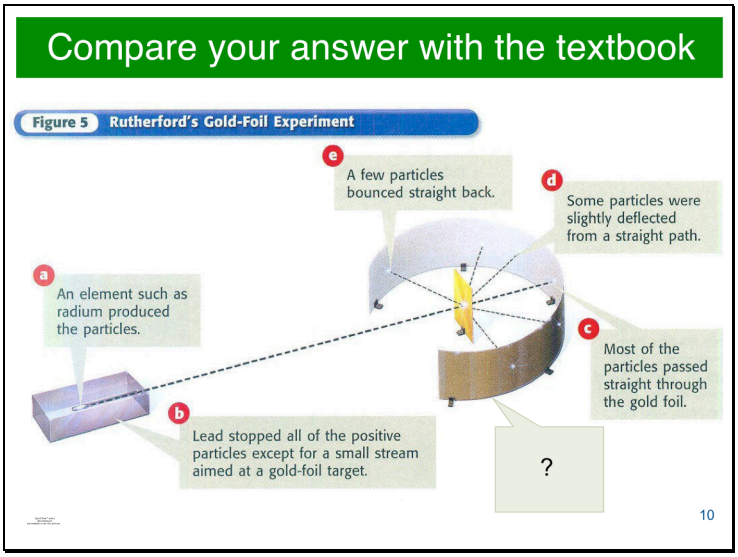
Type of Activity: Teacher comment and student activity

Overview: This activity is designed to teach students how to utilize (explanatory) labels in an image to gain better comprehension.

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Day 46 – Development of Atomic Theory

Visualization Exercise 4.1d – Labeling (cont.)



The teacher leads a discussion about the source of information for the explanatory labels for figure 5.

The teacher asks students what sections of the text on page 85 give the information for labels 'a' and 'b' (Answer: the paragraph under the heading 'Rutherford's Atomic "Shooting Gallery).

Teacher then asks students what section of the text on page 85 gives the information for labels 'c,' 'd' and 'e.' (Answer: the paragraph under 'Surprising Results')

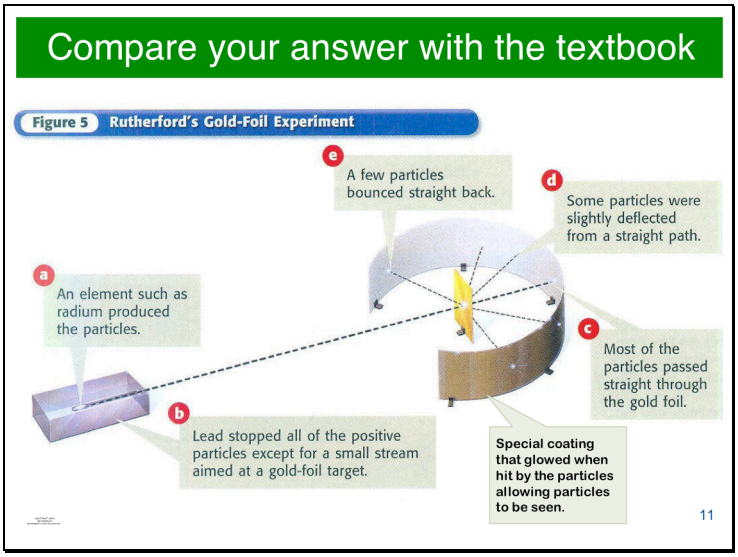
The teacher then points out that, while most of the image is explained by the text, there is one part of the image that does not have a label, as indicated by the question mark. The teacher asks students (individually or in groups) to review the text and come up with their own explanatory label for the box with the question mark.

(Proceed to next slide)

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Day 46 – Development of Atomic Theory

Visualization Exercise 4.1d – Labeling (cont.)



Teacher asks individual students (or groups) to share their explanatory labels and shows the above slide with one possible answer.

(End of Activity)

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Day 46 – Development of Atomic Theory

Visualization Exercise 4.1e – Relative Scale

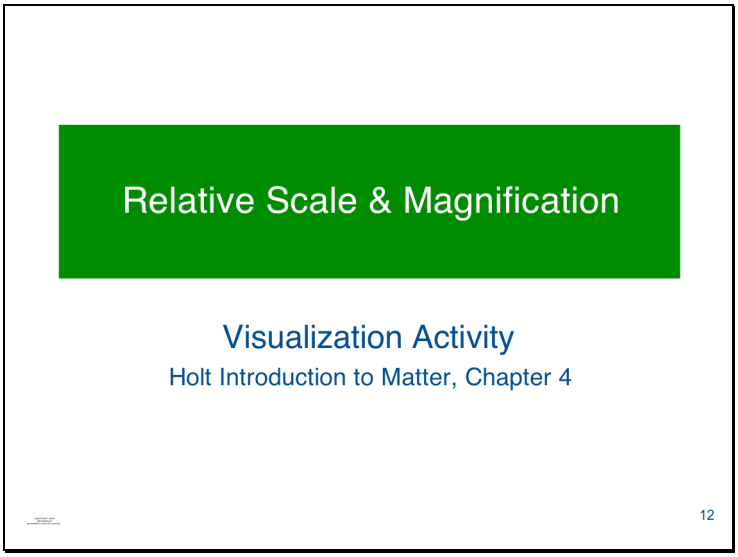


Image Comprehension Focus: Relative scale/Magnification

Goal: Maintenance of the concept that the size of images may not reflect actual sizes of objects.

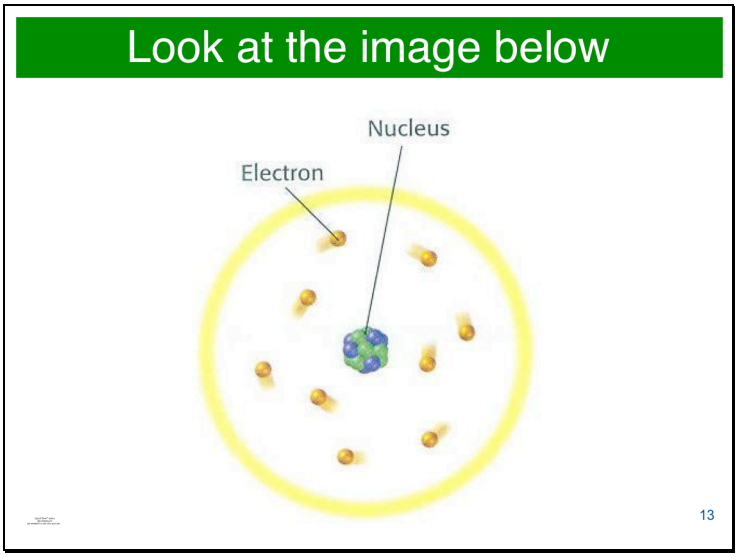
Type of Activity: Teacher comment

Overview: The purpose of this activity is to remind students that they need to consider the scale of images shown, as sometimes the size of the image shown is not an accurate representation of an object's actual size.

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Day 46 – Development of Atomic Theory

Visualization Exercise 4.1e – Relative Scale (cont.)



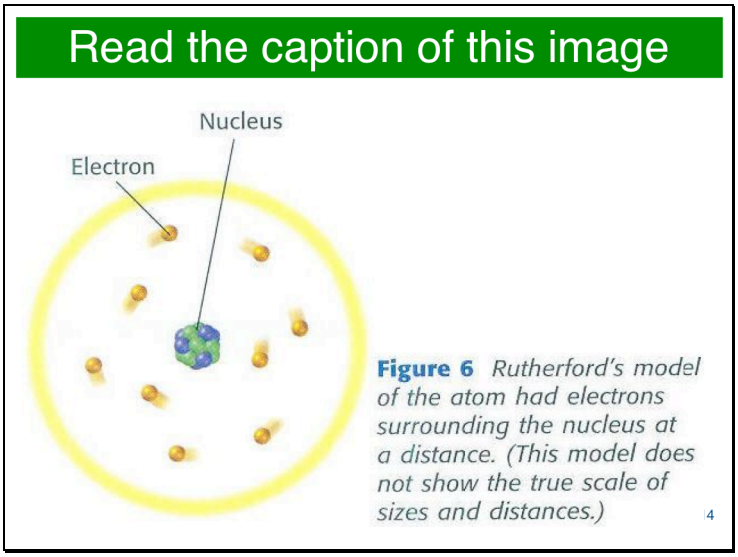
Student Activity: Teacher has the students look at this image (p.86/Fig 6 without a caption), and has them pay attention to the sizes of the nucleus and the atom in this image

(Proceed to the next slide)

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Day 46 – Development of Atomic Theory

Visualization Exercise 4.1e – Relative Scale (cont.)



Teacher has students read the caption of this figure and pay attention to the content in parentheses.

Teacher asks students to draw their own picture of an atom, encouraging them to try to draw their model 'to scale.'

(Proceed to the next slide)

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Day 46 – Development of Atomic Theory

Visualization Exercise 4.1e – Relative Scale (cont.)

Look at the image below

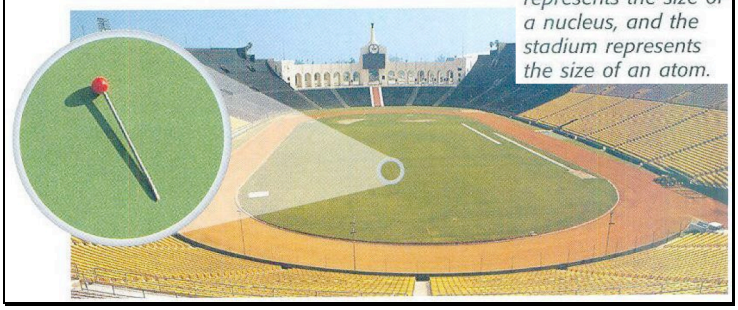


Figure 7 *The diameter of this pinhead is 100,000 times smaller than the diameter of the stadium. The pinhead represents the size of a nucleus, and the stadium represents the size of an atom.*

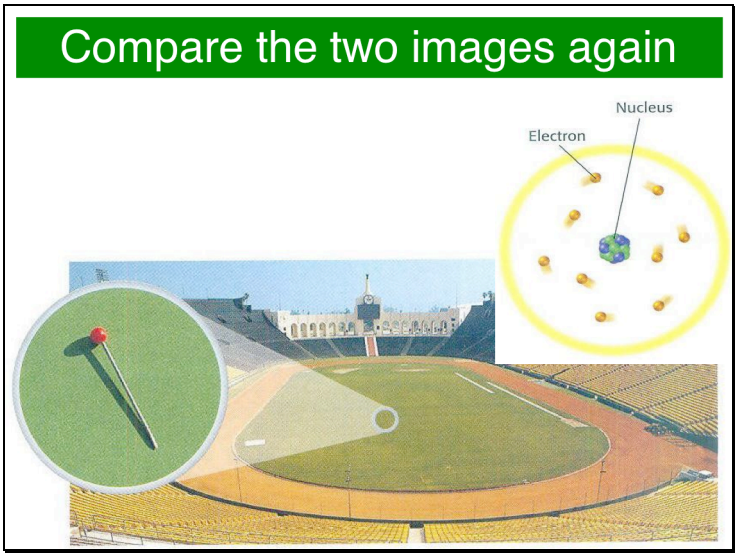
Teacher has students read the caption of p.86/Fig 7 and emphasizes that the actual size of a nucleus compared to an atom in reality is the size of the pinhead compared to the whole stadium.

(Proceed to the next slide)

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Day 46 – Development of Atomic Theory

Visualization Exercise 4.1e – Relative Scale (cont.)



The teacher has students look at p. 86/Fig 6, Fig 7, and their own drawings in order to see the differences.

The teacher points out that this image (and many of the images of an atom with a nucleus and electrons) do not show the real relative scales. In the images in this chapter*, the nucleus and the electrons are magnified on a much larger scale than the atom.

The teacher emphasizes again that the images of atoms with a nucleus and electrons are drawn with different relative scales in order to clearly show the structures inside of an atom, NOT to reflect the actual sizes of the electrons and nucleus compared to an atom.

* The caption of p. 86/Fig. 7 is crucial to understand the image and further to help build the concept of the relative sizes of an atom and a nucleus. A sentence or two to mention this at the end of the activity would be useful.

(End of Activity)

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DAY 47

Atomic Size & Structure

This lesson covers the first three parts of section 4.2 (pages 88-91) and includes two visualization exercises.

Big Ideas

- All atoms have mass.
- Atomic number is the number of protons an atom contains.
- All atoms of the same element have the same atomic number.

Materials

Teacher:

1. visualization exercises – day47.ppt

Students:

none

Activities & Allotted Time (40 minutes total)

5 minutes – warm-up activity
5 minutes – visualization 4.2a – Labeling
5 minutes – visualization 4.2b – Colors
25 minutes – chapter 4.2, parts 1-3

Chapter 4.2, parts 1-3

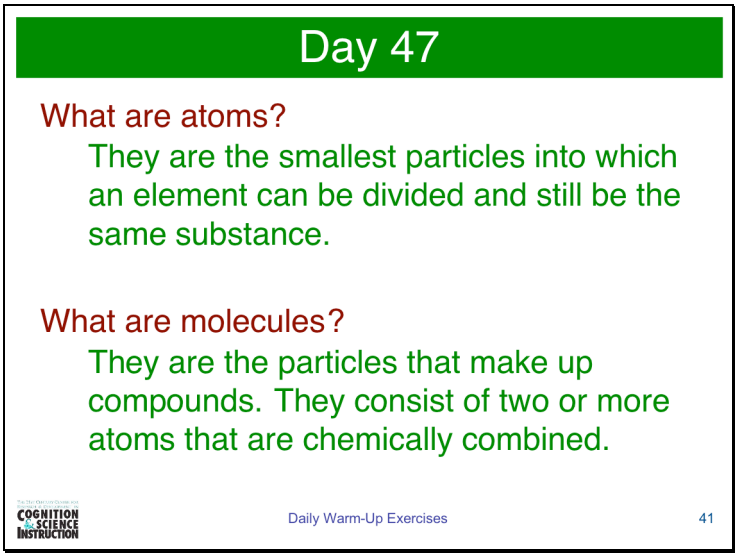
It's hard for many students to comprehend just how small atoms are. You might begin the lesson by asking students to name the smallest thing they can imagine. As the misconception alert on page 89 points out, even a dust particle (or a single grain of flour, baby powder, etc.) is made of millions of atoms.

Emphasize that cells are made up of atoms, so atoms are smaller than cells. In fact, molecules like water, oxygen, and carbon dioxide are continuously moving in and out of cells. You might have students use molecule drawings to show these three molecules moving through openings in a cell membrane.

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Day 47 – Atomic Size & Structure

Warm-Up Activity



How did scientists learn about atoms without actually seeing them?
They did experiments in which they could observe how particles reacted in certain situations.

Day 47 – Atomic Size & Structure

Visualization Exercise 4.2a – Labeling

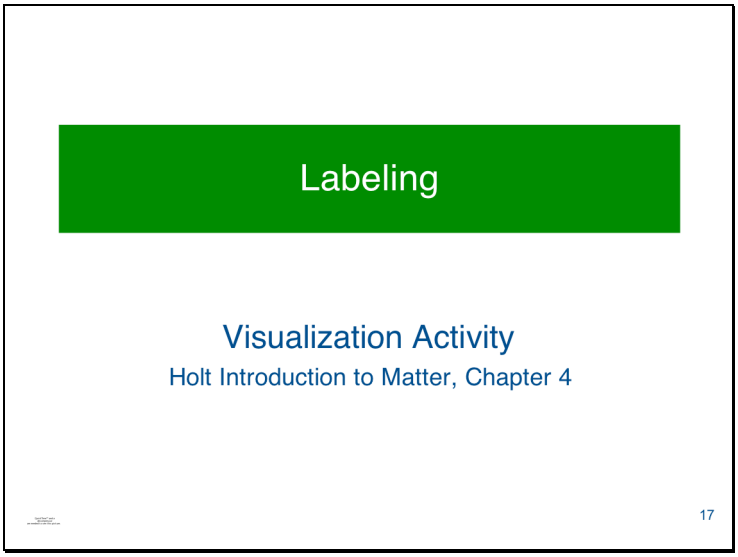


Image Comprehension Focus: Labeling

Goal: Reinforce the importance of the labels in diagram comprehension

Type of Activity: Student activity

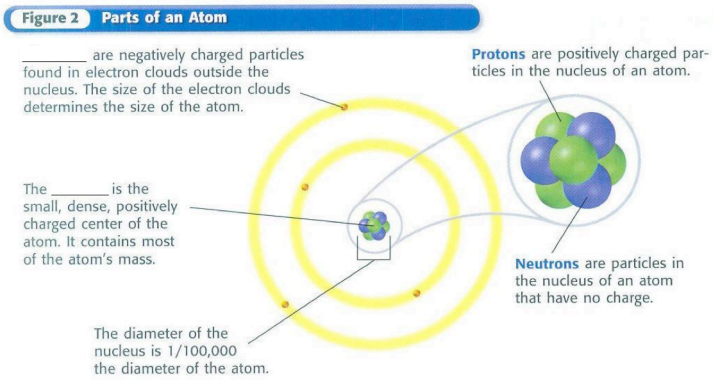
Overview: This activity is designed to teach students how to utilize labels in an image to gain better comprehension and get more information.

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Day 47 – Atomic Size & Structure

Visualization Exercise 4.2a – Labeling (cont.)

Close your books & look at the image below

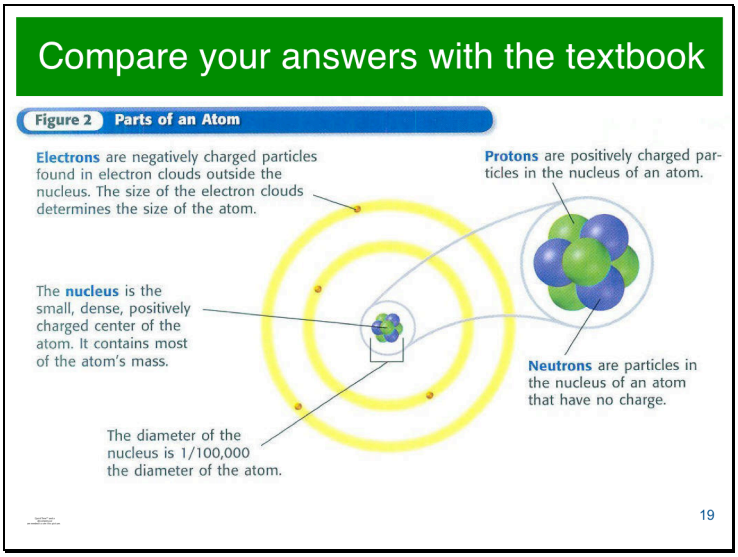


Student Activity: The teacher has students read the modified image and asks them to try filling in the blanks "_____ are negatively charged particles…" (Answer: Electrons) and "The _____ is the small, dense, …" (Answer: nucleus). Students should be able to fill in the blanks with the assistance of the rest of the labels, because they will have learned about these two concepts earlier in this chapter.

(Proceed to the next slide)

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Visualization Exercise 4.2a – Labeling (cont.)



Teacher presents the original image with complete labels and concludes that labeling is an important convention to convey useful information for different parts and processes shown in an image. Without reading all of the given information, one might not understand the image completely or even correctly.

(End of Activity)

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Day 47 – Atomic Size & Structure

Visualization Exercise 4.2b – Colors

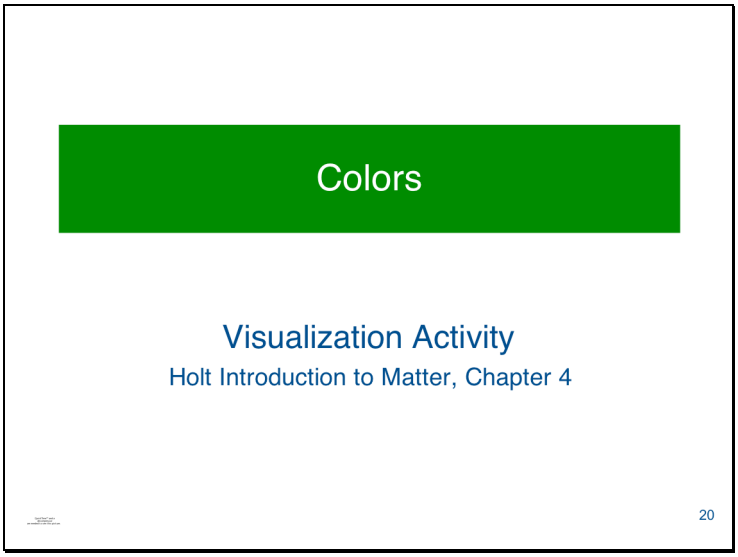


Image Comprehension Focus: Colors

Goal: Maintenance with the concept that colors are used to identify similar or identical structures but still may not be realistic in terms of reflecting the real color of an object or a structure.

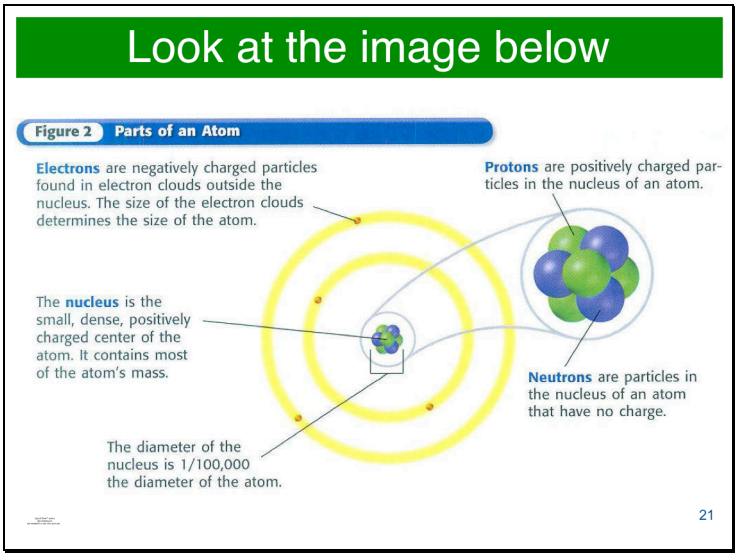
Type of Activity: Student activity

Overview: The purpose of this activity is to provide the students with an additional opportunity to practice interpreting the use of color as a mechanism to identify similar structures in a diagram.

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Day 47 – Atomic Size & Structure

Visualization Exercise 4.2b – Colors (cont.)



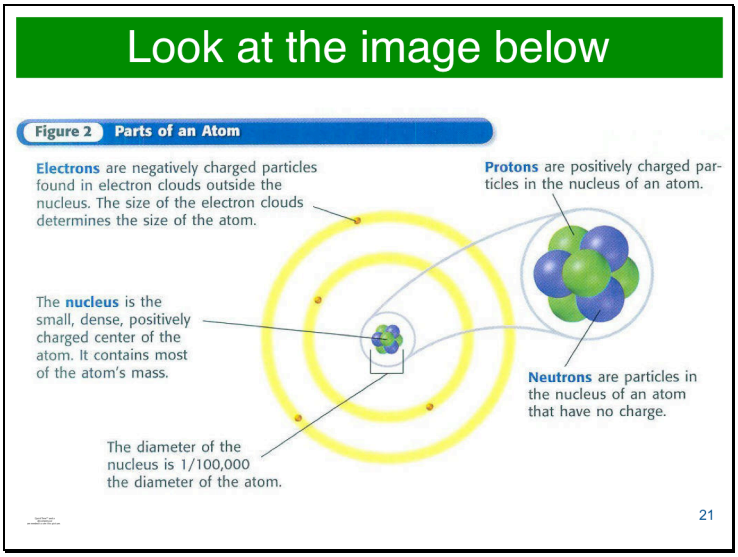
Student Activity: Teacher asks students to write down their answers:

1) How many colors are used in the diagram to represent electrons, protons and neutrons? (Answer: three)
2) What color is used to represent electrons? (gold) What colors are used to represent protons and neutrons? (green and purple)
3) Why are different colors used? (Because the three colors differentiate three different parts of an atom—electrons, protons and neutrons.)

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Day 47 – Atomic Size & Structure

Visualization Exercise 4.2b – Colors (cont.)



Teacher gives the answers and emphasizes that the function of colors in a diagram is to identify as well as differentiate parts of an object (an atom in this case).

Teacher then points out that, through the whole chapter (p.86/Fig 6; p.87/Fig 8; p.89/Fig 2; p.90/Fig 3; p.91/Fig 4; p. 92/Fig 5; p.94/Fig 7), electrons, protons and neutrons are consistently represented with gold, green and purple, respectively, but these three colors do NOT reflect the real color of electrons, protons and neutrons.

(End of Activity)

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DAY 48

Isotopes & Forces

This lesson covers the rest of section 4.2 (pages 91-94) and includes one visualization exercise.

Big Ideas

- Isotopes are atoms of the same element that have different numbers of neutrons.

Materials

Teacher:

1. visualization exercises – day48.ppt

Students:

none

Activities & Allotted Time (40 minutes total)

5 minutes – warm-up activity
10 minutes – visualization 4.2c – Arrows
25 minutes – chapter 4.2, parts 4-5

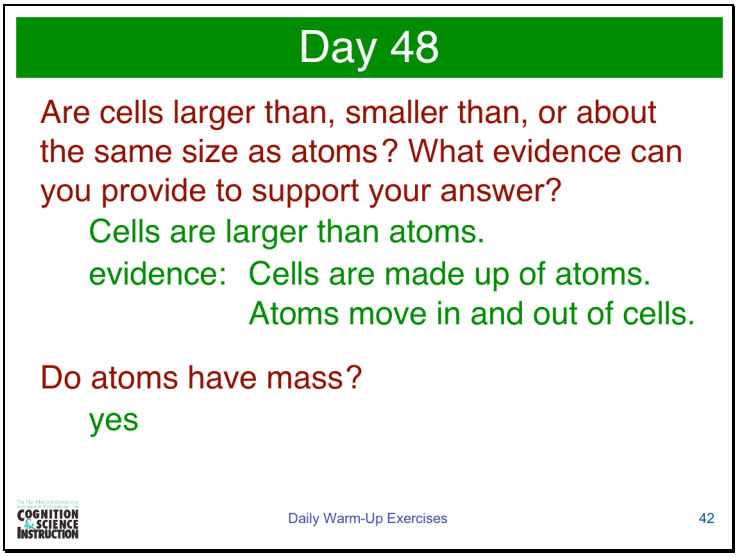
Chapter 4.2, parts 4-5

The book says gravitational force acts between all objects all the time. In other words, every object is constantly pulling on and being pulled toward every other object. Tell your students that the strength of this force depends on the mass of the objects and the distance between them. Because the masses of protons, neutrons, and electrons are so small, the gravitational forces between them are very weak. Students will learn more about gravitational and electromagnetic forces in the Forces, Motion & Energy module.

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Day 48 – Isotopes & Forces

Warm-Up Activity



What unit is used to measure the mass of atoms and molecules?
atomic mass unit (amu)

What is atomic number?
the number of protons an atom contains

What is true about all atoms of the same element?
they all have the same atomic number

Day 48 – Isotopes & Forces

Visualization Exercise 4.2c – Arrows

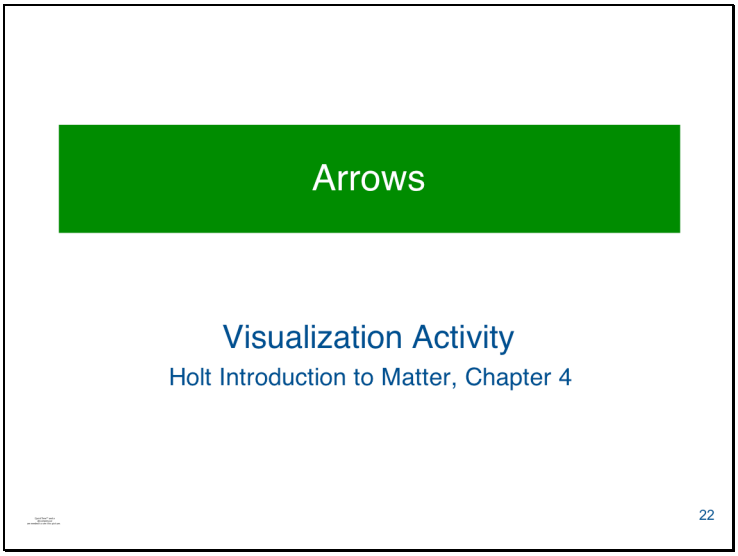


Image comprehension focus: Arrows

Goal: Expand understanding of how arrows can indicate forces

Module Activity: Teacher Comment & Student Activity

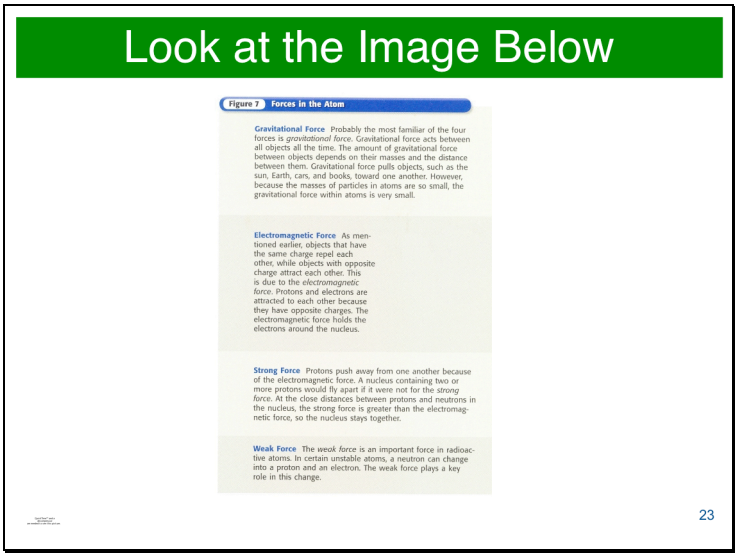
Overview: This activity is intended to extend students' understanding of the use of arrows in diagrams to include showing forces.

Procedure: The teacher should introduce the new function of arrows: indicating forces (direction and strength; primarily direction in this case)

(Proceed to the next slide)

Day 48 – Isotopes & Forces

Visualization Exercise 4.2c – Arrows (cont.)



Student Activity: The teacher instructs students to look at the above* modified image from page 94 and read the explanatory labels.

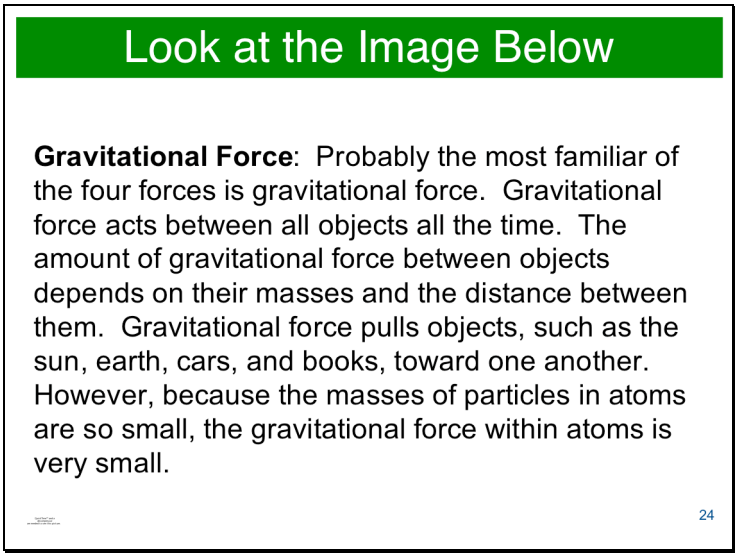
*Note: Please note that students must not view their textbooks before attempting this exercise as the textbook page contains the answers to the exercise. As the above image may be difficult for students to view when projected, the following slides show segments of the above text, enlarged for easier student viewing. In addition to the following slides, a sheet with the above text is available in the teacher materials, in the event that the teacher would prefer to make copies of the above image for distribution to the class. In this way, if the above image is difficult to read, the teacher has the option of projecting the following four slides, and/or making paper copies to be distributed to the class.

(Proceed to next slide)

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Day 48 – Isotopes & Forces

Visualization Exercise 4.2c – Arrows (cont.)



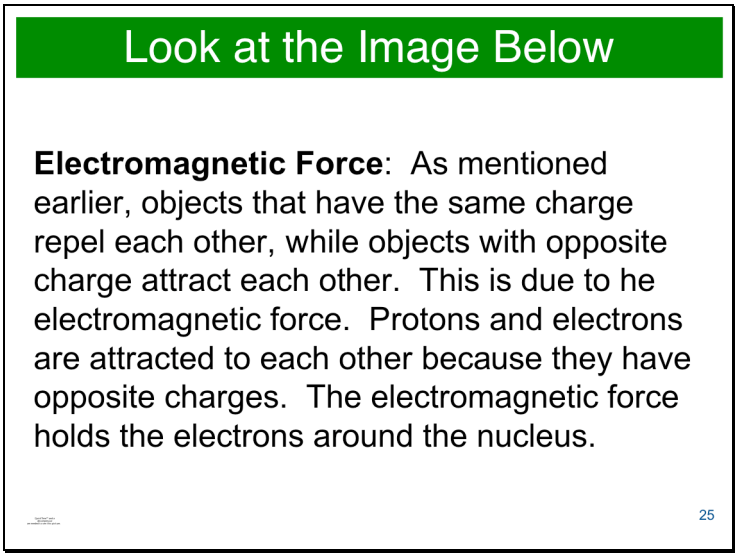
Project image of Part 1 of Figure 7 for easier viewing

(Proceed to next slide)

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Day 48 – Isotopes & Forces

Visualization Exercise 4.2c – Arrows (cont.)



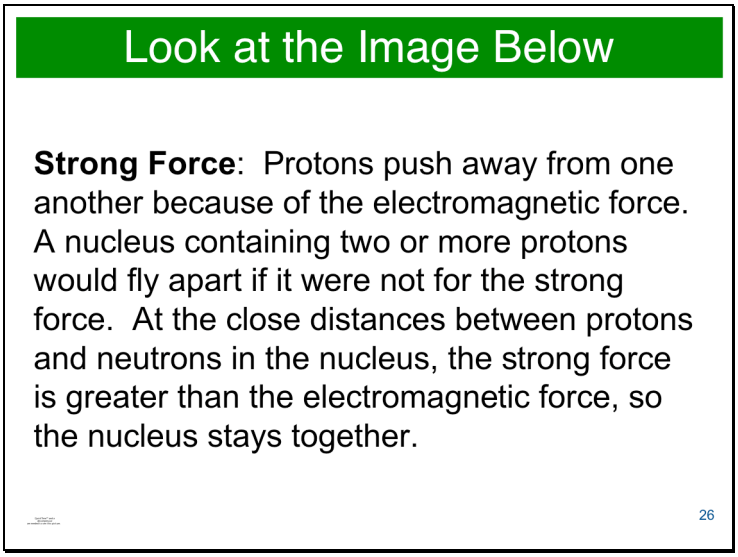
Project image of Part 2 of Figure 7 for easier viewing

(Proceed to next slide)

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Day 48 – Isotopes & Forces

Visualization Exercise 4.2c – Arrows (cont.)



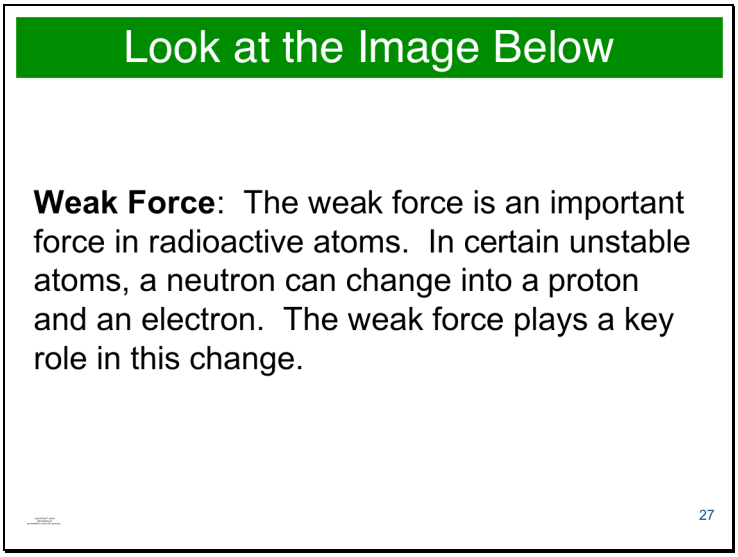
Project image of Part 3 of Figure 7 for easier viewing

(Proceed to next slide)

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Day 48 – Isotopes & Forces

Visualization Exercise 4.2c – Arrows (cont.)



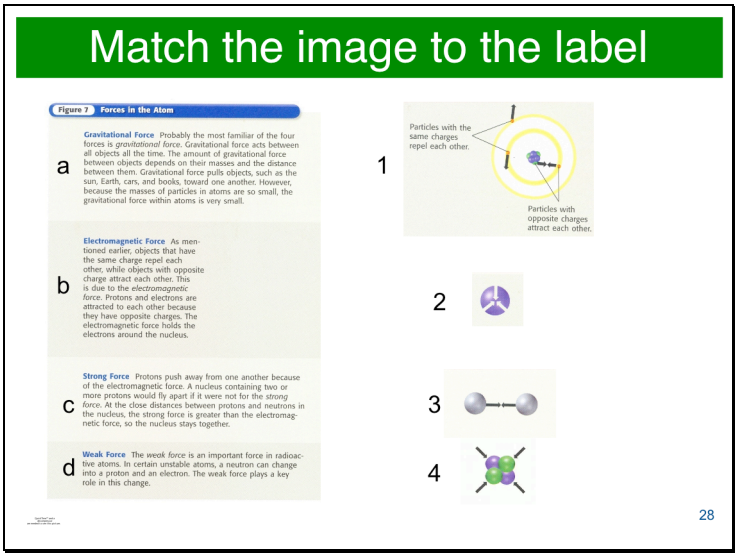
Project image of Part 4 of Figure 7 for easier viewing

(Proceed to next slide)

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Day 48 – Isotopes & Forces

Visualization Exercise 4.2c – Arrows (cont.)



The teacher then instructs students to look at the image to the right of each label advising them that the images are not correctly matched next to each label.

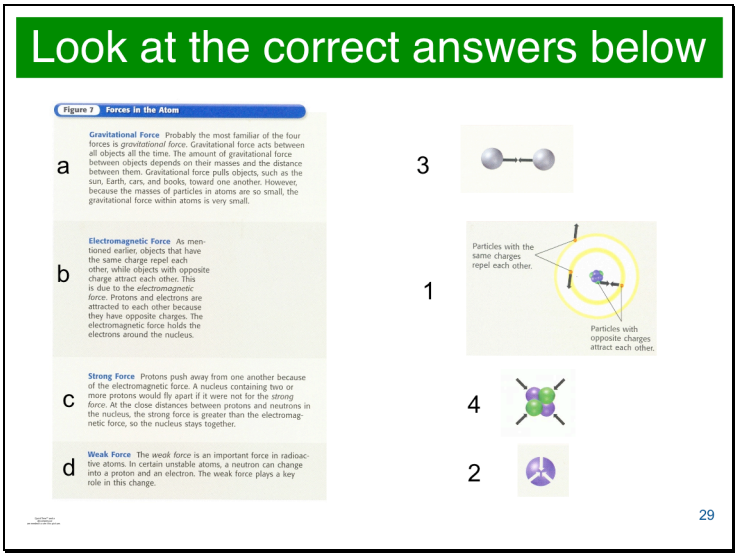
Teacher asks students (individually or in groups) to correctly match each lettered label with its correctly numbered image.

(Proceed to next slide)

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Day 48 – Isotopes & Forces

Visualization Exercise 4.2c – Arrows (cont.)



The teacher shows students the correct answers, emphasizing the description of the forces and the arrows that represent those forces. The teacher also emphasizes the point that labels often contain critical information when trying to understand an image.

Additional Teacher Comment: In the original image, the correct image is located directly to the right of each label, which helps the reader see the way in which they are related. In this particular image, the authors have further emphasized these relationships by using alternating light and dark bands in the background color.

The teacher should point this out to the students. It might also be useful to remind students of the earlier activity in which bullet points were color coded to make a side-by-side relationship more obvious (Chapter 3, page 57).

(End of Activity)

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DAY 49

Made to Order

This lesson is the model-making lab described on pages 96-97.

Big Ideas

- Isotopes of the same element have the same atomic number but different atomic masses.

Materials

Teacher:

none

Students:

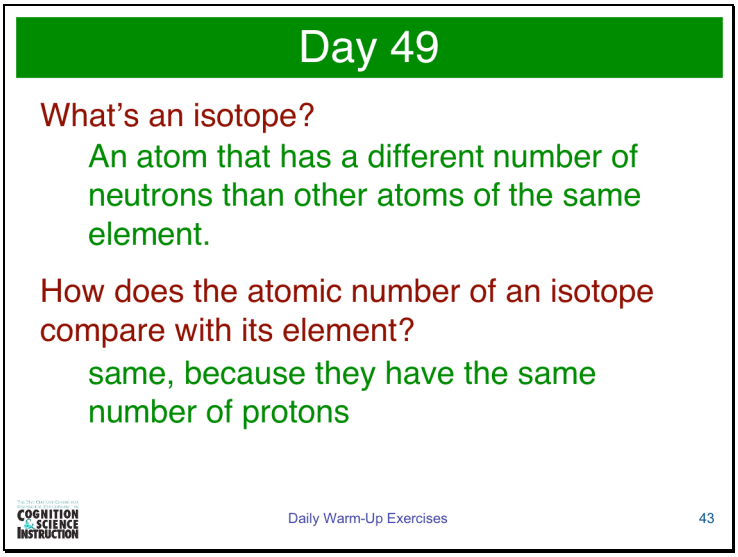
1. periodic table
2. Styrofoam balls – blue & white
3. toothpicks

Activities & Allotted Time (40 minutes total)

5 minutes – warm-up activity
35 minutes – modeling lab – *Made to Order* – pages 96-97

Day 49 – Made to Order

Warm-Up Activity



How does the atomic mass of an isotope compare with that of its element?

different, because they have different numbers of neutrons

DAY 50

Quiz 8/Reteach/Review

This lesson provides an opportunity for you to address areas that need attention and for students to review what they've learned about matter.

Big Ideas
See list of big ideas, all days.

Materials

Teacher:

1. vocabulary list – IM word list.doc
2. list of big ideas – IM big ideas.pdf

Students:

1. Quiz 8

Activities & Allotted Time (40 minutes total)

10 minutes – quiz
10 minutes – go over quiz
20 minutes – reteach/review chapter 4

Reteach/Review Chapter 4
After going over the quiz and reviewing the vocabulary words and big ideas, use the section review questions on pages 87 and 95 and the chapter review questions on pages 98-99 to identify areas that need additional attention.

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Day 50 – Quiz 8/Reteach/Review

Quiz 8 – Page 1

1. In a solution, the substance that dissolves is called the _____.
   a. solvent
   (b.) solute
   c. colloid

2. If you could remove all the atoms from a wooden chair, what would be left?
   a. The chair would still look very much the same.
   b. Only the cells that made up the tree the wood came from would remain.
   (c.) There would be nothing left of the chair.

3. Flame color is a property that can be used to identify _____.
   (a.) specific elements within a compound
   b. the concentration of a solution
   c. isotopes of the same element

4. Which statement correctly explains why the development of atomic theory was possible?
   a. Scientists developed powerful microscopes that enabled them to see protons, neutrons, and electrons.
   b. Modern imaging techniques enabled scientists to see electron clouds surrounding the nucleus of an atom.
   (c.) It is possible to gather information about something without actually seeing it.

5. Isotopes of the same element have the same _____ but a different _____.
   a. atomic mass; atomic number
   (b.) number of protons; atomic mass
   c. atomic mass; number of neutrons

6. All atoms of the same element have the same _____.
   (a.) atomic number
   b. number of neutrons
   c. atomic mass

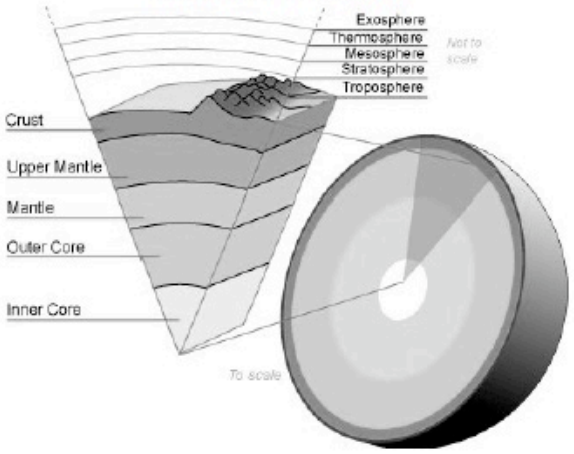
Introduction to Matter

Day 50 – Quiz 8/Reteach/Review

Quiz 8 – Page 2

7. **Note to student:** We know you didn't learn this, but we want you to try to answer the question based on the information in the diagram.

The Earth and its Layers



According to the above figure, if one were to start in the center of the earth and then drill towards the surface, one would have to start in the _____.

a. outer core
b. mantle
c. inner core
d. crust

Introduction to Matter

Day 50 – Quiz 8/Reteach/Review

Quiz 8 – Page 3

8. What are atoms?

An atom is the smallest particle into which an element can be divided and still be the same substance. Atoms can combine to form molecules, and molecules are made up of atoms. Atoms and molecules are the particles that make up matter. Atoms are very small, but they all have mass, measured in atomic mass units.

Introduction to Matter