

# Lesson Plans for Chemistry Unit

## Lesson 1: Intro to Atom: What's Inside?

Objective: Students will be able to understand the relative size of an atom, examine properties that are used to identify objects, test for those properties, and form a hypothesis about the identity of an unknown object.

Learning Goal: Atoms are the tiny particles that make up all matter. Students conclude different materials have different properties because they are made of different atoms.

Vocabulary: matter, atom, physical property, chemical property, volume, mass, density

### Engage:

1. Students are asked about the smallest object they have ever seen, and then share in their groups. Students are then asked, what is the object they chose made of? (i.e. paper, dirt, etc.) And then what is that object made of? And so on...until the class comes to the idea that objects must be made of smaller particles that we cannot see. So how small is this particle? (The ATOM)
2. Ask students, "If I gave you one atom of gold for every second that has elapsed since The Big Bang, how much or many atoms would you have? What would the pile look like or compare to?"
3. Ask students, "What are you thinking? A teaspoon of gold? A bucketful of gold? A truckful?" One atom for every second since the beginning of time, don't underestimate it! Second by second, we pass through the radiation dominated moments after the big bang, the era in which matter started to collapse into stars, the time that planets like our earth formed around the Sun; we pass the earliest periods of life on earth, and on and on. And with each second of these epochs an atom gets added to the offer.

Here is a gold coin weighing one ounce. How many of these would you have?



Not even one of these coins would be given.



At right is a fragment that is 1.5% of the original coin. It is about the smallest fragment that is easy to show.

The astonishing result is that even this fragment is too big. It is 3,000 times too big!

My offer turns out to be very far from generous. As many atoms of gold as seconds since the big bang amounts to a speck of gold weighing 0.14 milligrams and worth 0.21 cents.

- Teacher note: 1 milligram = the brain of a small worker bee or a very, very small snowflake, brand new dollar bill cut into 1000 pieces.

**Explore:** How can scientists gather information about a particle that is so small they cannot see it? Scientists must perform tests on the particle (or object).

4. Students are asked to brainstorm information that they need to know in order to identify an object? As a class, students develop a list of properties that can help identify an object.

- Teacher note: A class T-chart can be developed listing physical and chemical properties and ones that can be tested for in class.

5. Students are then presented with covered boxes that have objects with the same volume but different masses (density cubes made of different atoms), and asked to design and perform tests to eventually hypothesize about the identity of the object and what is made out of.

- Teacher note: a variety of different objects made of different materials can be used also

**Explain:**

6. Students record their observations on the handout and conclude about the identity of object.

7. Teacher leads class discussion on how properties can identify an object and how other tests may need to be performed to come to a conclusion (magnetism, conductivity, etc).

- Teacher note: Discussion can be extended to specifically talk about the experiments performed to gain information about the atom (Rutherford, Thomson, etc.)

8. Students record their observations on the handout and conclude about the identity of object.

- Teacher note: Pictures of how atoms are arranged differently in different materials can be shown <http://www.middleschoolchemistry.com/multimedia/chapter3/lesson1#metal>

**Elaborate:**

9. Students compare their methods and findings with other groups, revise any tests, identify any errors and revise their hypothesis

10. Students share their conclusions and find out what was inside the box.

**Evaluate:**

11. Students complete handout and answer questions:

- a) What are the smallest particles that make up all matter? How small are they?
- b) Why do different objects have different properties?

Students should make the connection that different objects are made of different atoms, and thus have different properties.