

CHEMDU · COMMUNITY CHEMISTRY · LEVEL 1

LECTURE 1

Atomic Structure

The Case of the Glowing Watch: What's Really Inside Matter?

■ Duration: 50 minutes

Lecture script · with hooks, segments, demos, and key takeaways

Hook (opening 2 minutes)

Teacher holds up (or shows a photo of) an old, glowing wristwatch.

“You find this watch at a garage sale for \$5. It glows in the dark. The seller says, ‘It’s old, but it still works.’ You buy it.

One week later, a friend says: ‘You know that watch might be radioactive, right?’

By the end of today, you will be able to answer three questions:

Is the watch dangerous?

What would you do with it?

What’s actually inside an atom that makes some things glow — or hurt you?”

SEGMENT 1: Can You Cut Forever? (6 minutes)

Teacher says: “I want you to close your eyes and imagine this...”

Guided visualization (teacher speaks slowly): “Imagine you have a gold ring. You cut it in half. Then you cut one half in half. Then you cut that piece in half. Keep going, smaller and smaller, inside your mind.”

Teacher asks (show of hands / chat response if online): “Raise your hand if you think you could keep cutting FOREVER and never reach a smallest piece.” Then: “Raise your hand if you think there IS a smallest piece — and after that, you can’t cut anymore.”

Teacher reveals: “About 2,500 years ago, a guy named Democritus said: ‘There IS a smallest piece.’ He called it atomos — Greek for ‘cannot be cut.’ That’s where we get the word atom.

The amazing thing? He was basically right — but it took 2,000 years to prove it. No microscope, no lab, just thinking. That’s the power of asking questions.”

Quick physical action: “Pretend your hands are scissors. Cut an invisible piece of paper. Then cut it again. Now pretend your fingers can’t cut anymore — that’s an atom.”

SEGMENT 2: The Atom’s Three Rooms (10 minutes)

Teacher says: “An atom is like a very small house with three rooms. Each room has something different.”

Draw or show this simple diagram as you speak:

text

~ ~ ~ (electrons buzzing around)

~ NUCLEUS ~

~ (protons + neutrons) ~

~ ~ ~ ~ ~

Teacher says: “Room 1 (the center) is the NUCLEUS — tiny but heavy. Inside the nucleus are:

Protons — they have a positive (+) charge.

Neutrons — they have no charge (neutral).

- Room 2 is OUTSIDE the nucleus. That’s where electrons live. Electrons are negative (-), super light, and they zoom around like crazy fast moons.”*

Interactive table (show on screen or say aloud, students repeat the key point after you):

Particle	Where?	Charge	ONE thing to remember
Proton	Nucleus	+	“P” for positive
Neutron	Nucleus	0	“N” for neutral
Electron	Outside	-	Moves, makes electricity

Partner talk (1 minute): “Turn to the person next to you. One of you say: ‘Proton — where and what charge?’ The other say: ‘Electron — where and what charge?’ Then switch.”

Real-world connection (1 minute): “Electrons are why your phone screen lights up. Fireworks get their colors because electrons jump and fall. Red firework? Strontium electrons. Green? Copper electrons. You’ve seen chemistry your whole life.”

SEGMENT 3: What Makes an Atom Dangerous? (10 minutes)

Teacher says: “Most atoms are happy — they stay the same forever. But some atoms are unstable. Imagine a chair with one missing leg. It wobbles and eventually falls apart. An unstable atom ‘falls apart’ by shooting out tiny pieces or energy. That’s radioactive decay.”

Kinesthetic activity (stand up / sit down):

“Stand up if you think an atom with the ‘right’ number of neutrons is stable.” (Students stand)

“Sit down if you think an atom with way too many neutrons is unstable.” (Sit)

“Jump once if you think an unstable atom can hurt you.” (Jump)

Teacher says: “Three types of radiation come out of unstable atoms. I’m going to show you a quick table — then we’ll do a hand sign for each.”

Show table (read aloud):

Type	What is it?	Stopped by...	Danger if outside your body?
Alpha	Big, slow particle	Paper	No (skin stops it)
Beta	Fast electron	Aluminum foil	Maybe (skin burn)
Gamma	Super energy wave	Thick lead/concrete	Yes (goes through you)

Hand signs (teacher leads, students copy):

Alpha: Make a big fist (the “big, slow particle”), then put a piece of paper in front of it (flat hand).

Beta: Flick your fingers like a fast electron, then show a piece of foil (flat hand).

Gamma: Wave both hands like energy waves, then put your hands far apart (thick shield).

Safety rule (repeat together as a class): “Distance is your friend. Time is the enemy. Shielding works.”

Teacher: “If you see the radioactive trefoil symbol (☢), do NOT touch. Move away. Don’t eat or drink near it.”

SEGMENT 4: Mystery Activity — Is the Watch Safe? (8 minutes)

Teacher says: “Let’s go back to our glowing watch. You now know about unstable atoms and radiation. I’m going to give you four clues. Your job is to decide: Would you keep the watch?”

Clue 1 (show on screen or say): “The glow comes from radium paint. Radium is unstable and gives off gamma rays (which can pass through skin) and alpha particles (which are dangerous if inhaled).”

Clue 2: “The watch is from 1965. The paint is old and might be flaking into dust.”

Clue 3: “If you wear the watch 24/7 for a year, you get about as much radiation as two dental X-rays.”*

Clue 4: “If you open the watch and breathe in the dust, those alpha particles will sit in your lungs for years.”

Breakout / Think-Pair-Share (3 minutes):

“Think alone: Would you buy the watch for \$5? Keep it? Wear it? Throw it away?”

“Share with a partner.”

“Volunteers share what you and your partner decided.”

Teacher gives the real-world answer (1 minute): “Most safety experts say: It’s probably safe to wear occasionally, but — never open the case — and don’t wear it every day for years. If the paint is flaking, seal it in a plastic bag or take it to a hazardous waste collection. Don’t let kids play with it. And definitely don’t eat it.”

SEGMENT 5: Radon — The Invisible Danger in Your Home (5 minutes)

Teacher says: “You can see a glowing watch. But the most dangerous radioactive thing in most homes is invisible.”

Quick poll (show hands / chat): “Who has heard of radon? Raise your hand.”

Teacher: “Radon is a gas from uranium in the soil. It seeps into basements. You breathe it. It releases alpha particles inside your lungs. Radon is the #1 cause of lung cancer in people who have never smoked.”

What to do (simple, actionable):

“Test your home. A kit costs \$15–30 at a hardware store.”

“If levels are high, a contractor installs a vent pipe — \$800–\$1,500.”

“If you rent, ask your landlord: ‘Has this place been tested for radon?’”

Call to action: “Before next session, if you live in a house with a basement, just LOOK online for ‘radon test kit.’ No need to buy — just see what it looks like. That’s all.”

CLOSING — The 30-Second Challenge (4 minutes)

Teacher says: “Before we go, let’s see what stuck with you. This is not a test. It’s a challenge to see how much you can remember in 30 seconds — with a partner.”

Instructions:

“Pair up. Person A talks for 30 seconds. Say everything you remember from today about atoms or safety.”

“Then Person B gets 30 seconds. Go!”

(Teacher times 30 seconds per person — light and fun, no pressure.)

Final takeaway table (show on screen / read aloud):

You learned...	So you can...
Atoms have protons, neutrons, electrons	Understand what radiation is
Unstable atoms decay → alpha, beta, gamma	Recognize danger levels
Alpha is dangerous if inhaled	Never open old glowing watches; test for radon
Old radium watch = handle with care	Keep it sealed, don’t wear daily
Radon gas = test your basement	Save money and possibly a life

Final line (closing the loop on the hook): “So — that \$5 glowing watch? You can buy it. But now you know: keep it in a box, don’t wear it every day, never open it, and definitely don’t lick it. Next week: The Periodic Table — and why you should never put pure sodium in water.”

SUMMARY OF ENGAGEMENT IMPROVEMENTS

Original Feature	More Engaging Version
Starts with a definition	Starts with a mystery ("Is this watch safe?")
Lecture only	Mix of talk, hand signs, partner discussion, stand/sit activity
No physical actions	Hand signs for alpha/beta/gamma; "scissors" for cutting atoms
Passive listening	Students predict (show of hands), then discover answers
Safety as a separate segment	Safety woven into the watch mystery and radon action
Ends with summary	Ends with 30-second partner challenge (retrieval practice, low stress)
No call to action	Call to action: "Just look up a radon test kit this week"