MLT / FPT / CSWT | SEMESTER 1

BS105 Applied Chemistry

# Unit 1
## What is inside an atom?

Today we walk from Dalton to Rutherford model.
Simple pictures. No heavy maths.

Class 1 | Group A topic

WHY LEARN THIS?

# Atoms sit behind your daily work.

## MLT

- Blood, salts, medicines: all made of atoms and ions.

## FPT

- Water, oil, sugar, acid: chemistry of food starts here.

## CSWT

- Chips, wires, batteries: materials are atomic arrangements.

UNIT 1 MAP

# We take Unit 1 in three parts

## Today

- Dalton (brief)
- Thomson
- Rutherford

## Next

- Bohr model
- Quantum numbers
- Electron configuration

## Later

- Bonding
- Hybridisation
- Solutions

START HERE

# An atom is a tiny building brick.

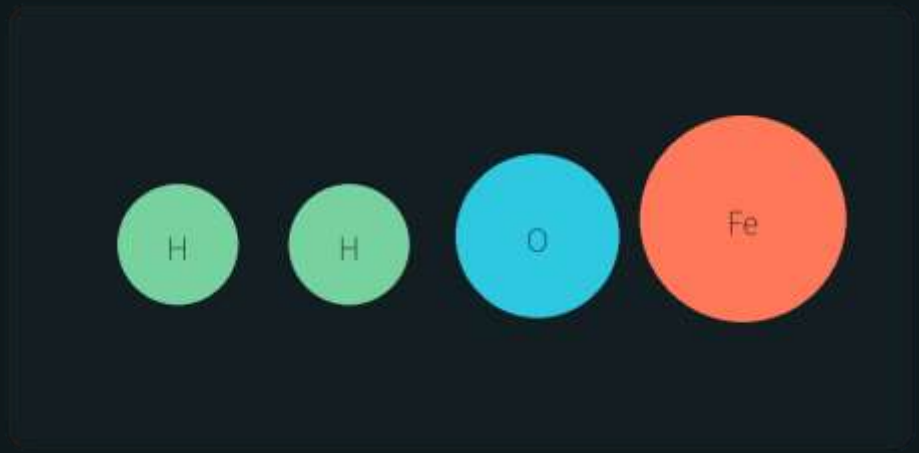
> Everything around you is made of atoms : air, water, iron, plastic.

> Atoms are extremely small. You cannot see one atom with your eyes.

> Different elements have different atoms (H, O, Fe, C...).

> First people thought atoms were solid balls. Then we looked inside.

# First clear idea: atoms are solid balls




## Dalton said

- Matter is made of tiny solid atoms.
- Same element = same atoms.
- Different elements = different atoms.
- Atoms join in fixed ratios to form molecules.
- He thought atom is the smallest part of anything.

# What he got right -- and what he missed

## Still useful

- Atoms are real building blocks.
- Each element has its own kind of atom.
- Compounds form in fixed ratios.

## He did not know

- Atoms are not actually “solid”.
- They have smaller parts inside.

THREE PARTICLES

# Later Scientists found three pieces inside


Proton

Positive

In the nucleus


Neutron

No charge

In the nucleus

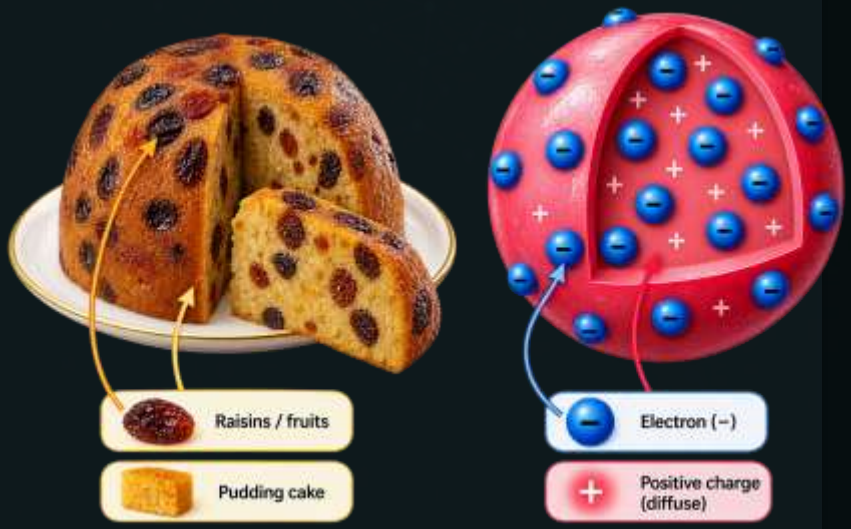

Electron

Negative

Moves outside

Short form: proton = p+, neutron = n, electron = e-
Nucleus = protons + neutrons (centre). Electrons stay outside.

# The “Palm Pudding” model of atom




## Thomson's idea

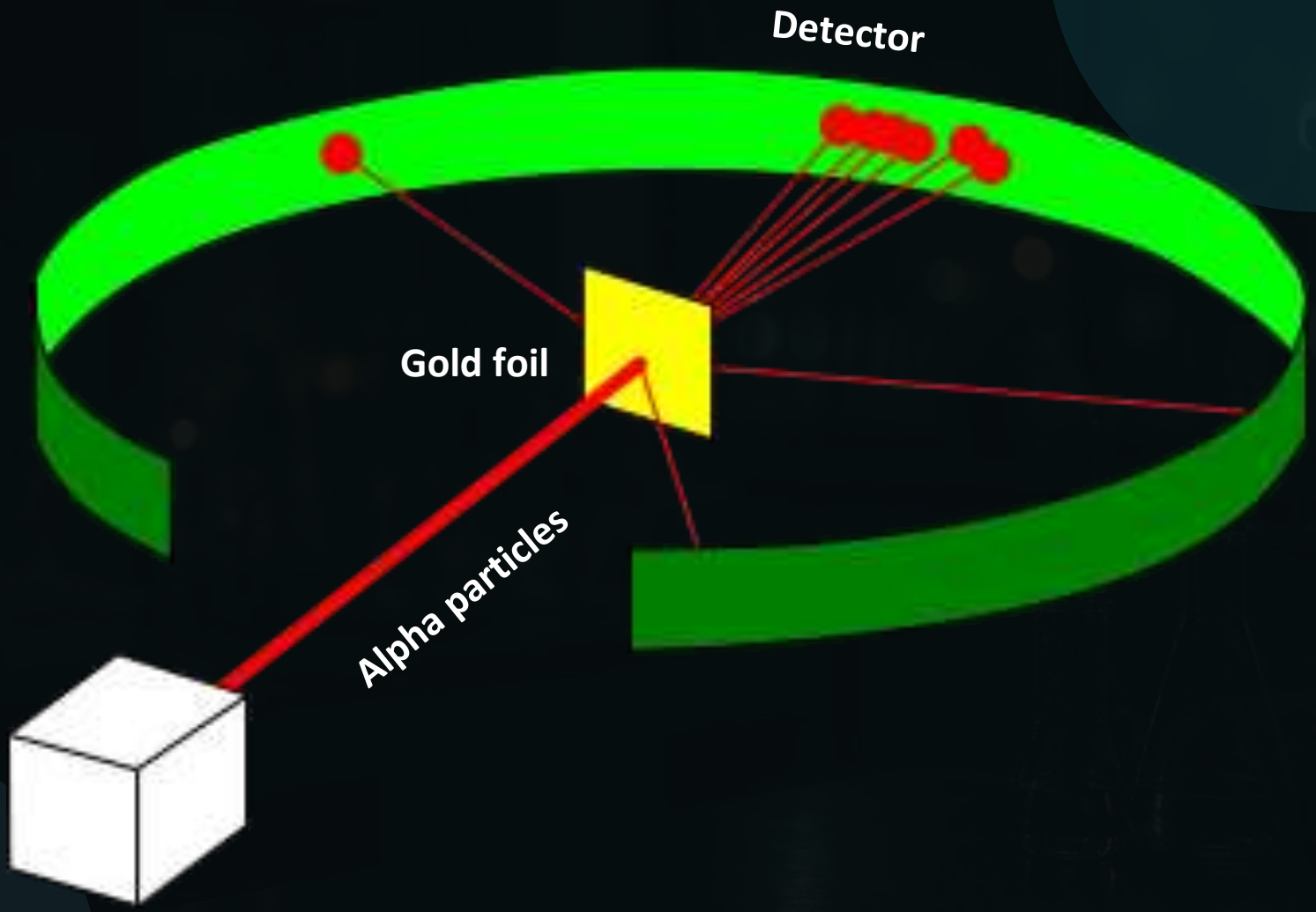
- Positive charge spread out like soft dough.
- Electrons sit in it like raisins in bread.
- Better than a “solid ball” concept but still not the full story.

RUTHERFORD ASKED

# If we shoot tiny particles at a thin gold foil, what happens?

He used alpha particles ($He^{2+}$): heavy, positive bits from radioactive decay.
The foil was extremely thin, like a few thousand atoms thick.
If Thomson was right, the particles should pass with only small bends.

# Gold foil (watch the paths)






Source: Wikimedia Commons

WHAT HE SAW

# Three results: three meanings.

### Most alpha particles (+) went straight

Atom is mostly empty space.

### A few alpha particles (+) bent sideways

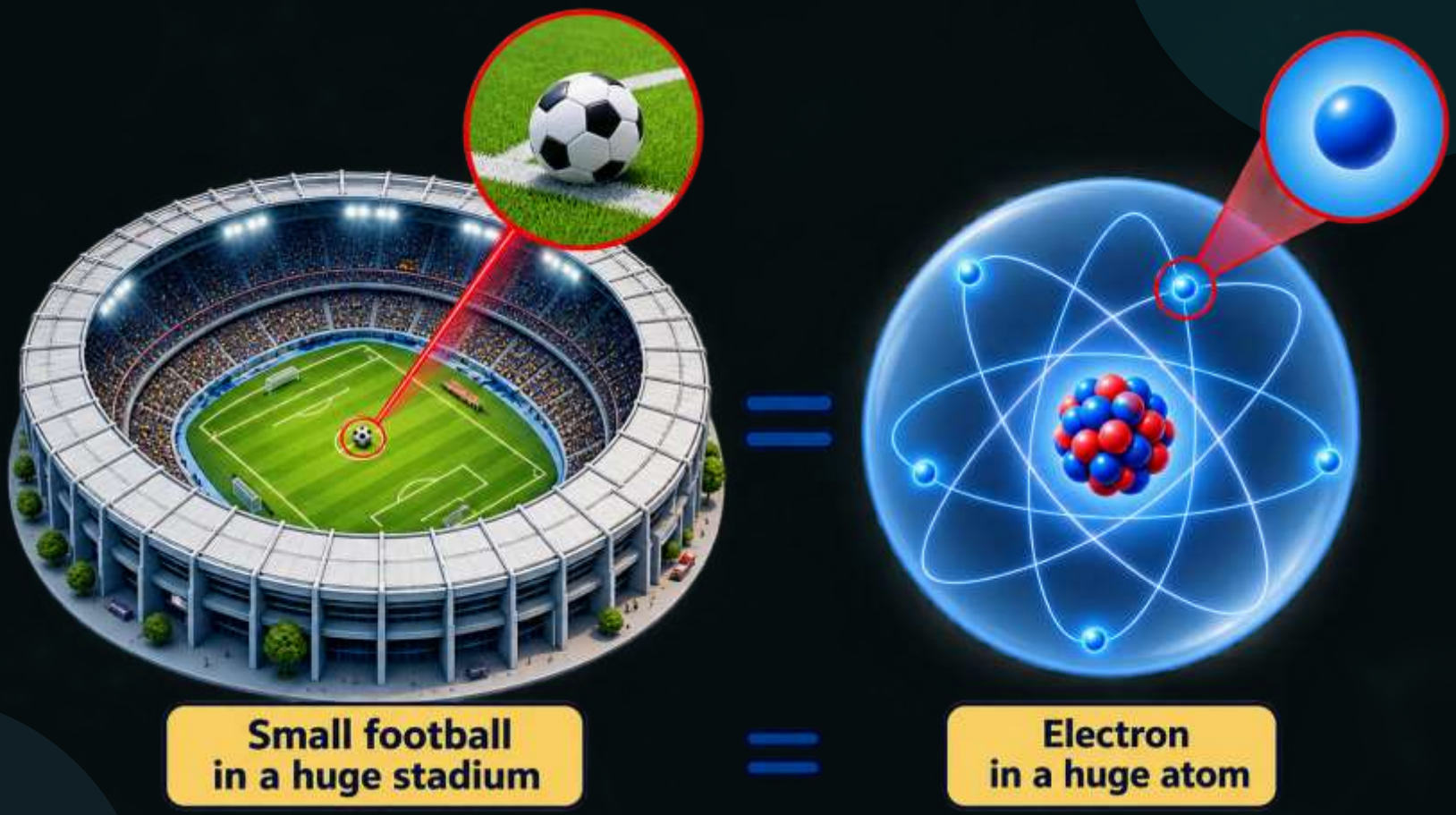
Something positive and heavy is inside.

### Very few alpha particles (+) bounced back

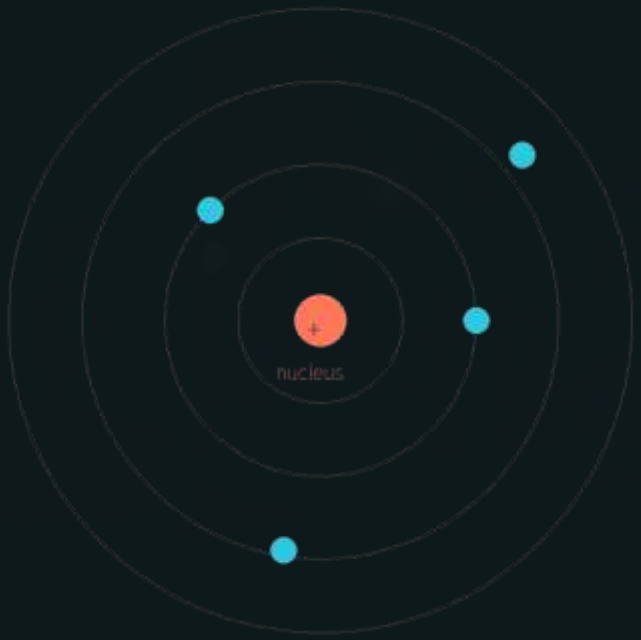
That heavy positive part is tiny -- the nucleus.

A HELPFUL PICTURE

# Nucleus is tiny compared to the atom



# This is the picture for your notes

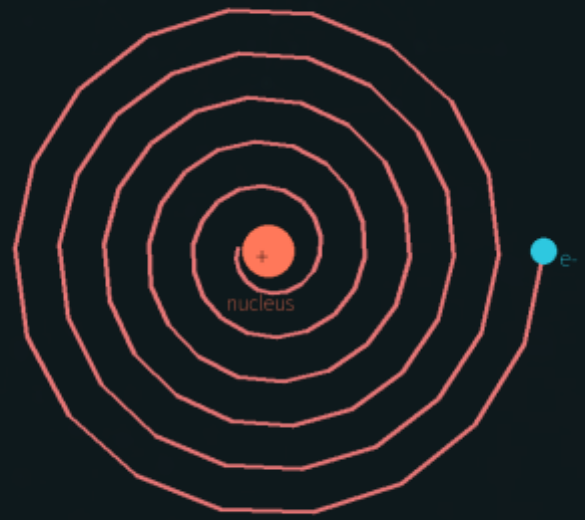



## Points from his model

- Centre = nucleus (protons + neutrons).
- Nucleus is positive and heavy.
- Electrons move outside the nucleus.
- Most of the atom is empty space.
- This replaced the old Thomson picture.

ONE PROBLEM

# But, Rutherford could not explain the stability




## In simple words

- A charged particle going round should lose energy.
- Then the electron would fall into the nucleus.
- But real atoms do not collapse.
- Also hydrogen line spectrum needs a better model.
- So next class we meet Dr. Bohr.

BEFORE YOU GO

# Today’s summary

- Dalton said atoms are like solid balls.
- Later we found protons, neutrons and electrons.
- Thomson put electrons in a positive dough.
- Rutherford's gold foil showed a tiny nucleus.
- Most of the atom is empty space.
- Rutherford still has a problem: Can’t explain the stability of atom.

NEXT CLASS

# Bohr model and hydrogen spectrum

- We will not derive energy or radius formulae.
- We will learn Bohr's main points and how hydrogen shows colored lines.
- Bring a notebook sketch of the Rutherford atom.

# Any question?