

PHYSICS • CLASS 12

CHAPTER 12

Atoms

CHAPTER NOTES



ATOMS — STRUCTURE, SCATTERING & QUANTA

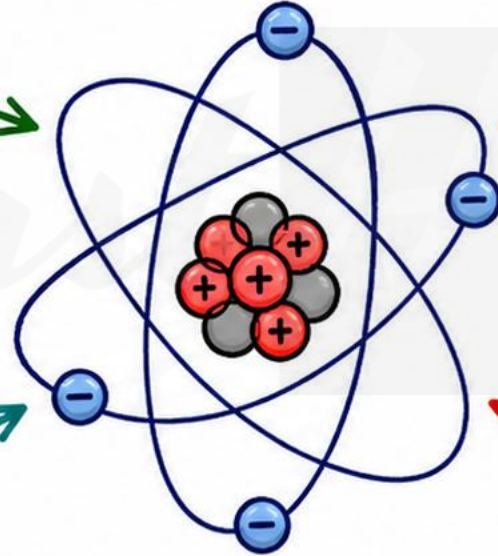
An atom is electrically neutral, yet it contains electrons and positive charge.
Its structure is revealed by scattering and spectra.

① EARLY MODEL

Thomson: positive charge spread through the atom; electrons embedded within it.

③ CLASSICAL PROBLEM

A revolving charge should radiate, lose energy and make the atom unstable.



② SCATTERING

Rare large-angle alpha deflections reveal a tiny, massive, positive nucleus.

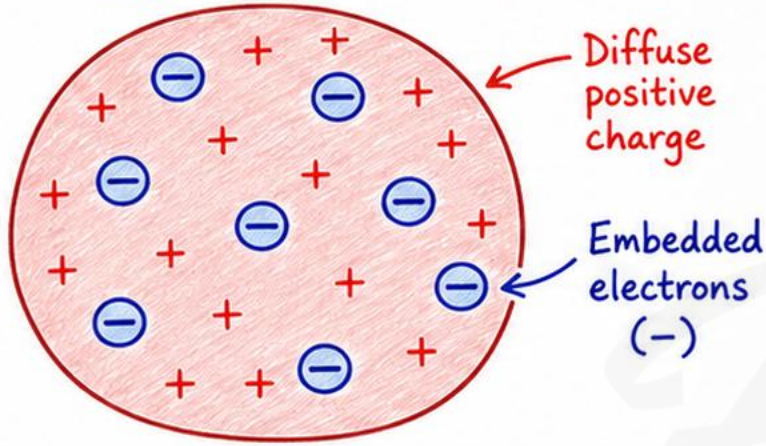
④ QUANTUM RESOLUTION

Bohr energy levels and de Broglie standing waves explain discrete hydrogen spectra.

KEY THREAD: STRUCTURE → ENERGY LEVELS → SPECTRAL LINES

THOMSON MODEL & THE SPECTRAL CLUE

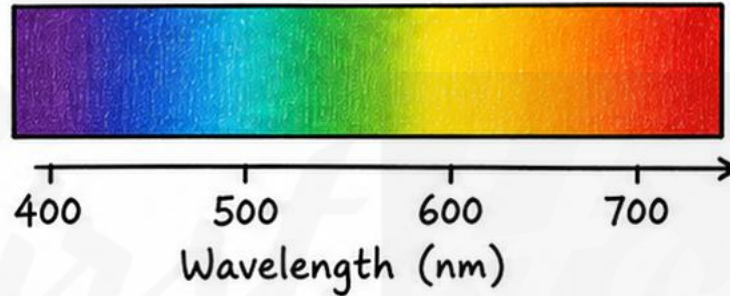
THOMSON'S MODEL



- Positive charge is uniformly distributed through the atomic volume.
- Electrons are embedded like seeds in a watermelon.
- Total positive and negative charge balance: the atom is neutral.

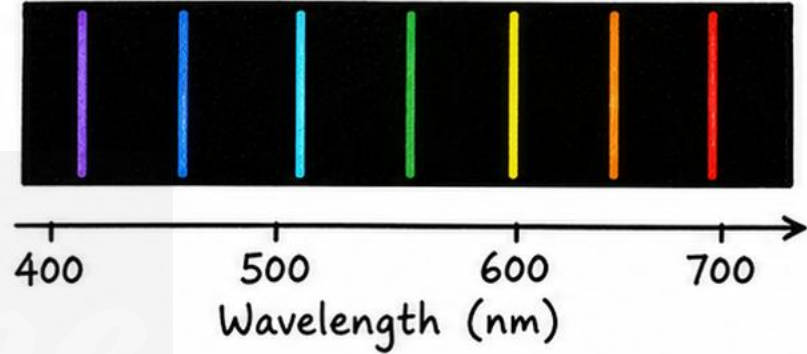
CONTINUOUS SPECTRUM

many neighbouring atoms/molecules interact



Solids, liquids and dense gases emit a continuous range of wavelengths.

LINE SPECTRUM



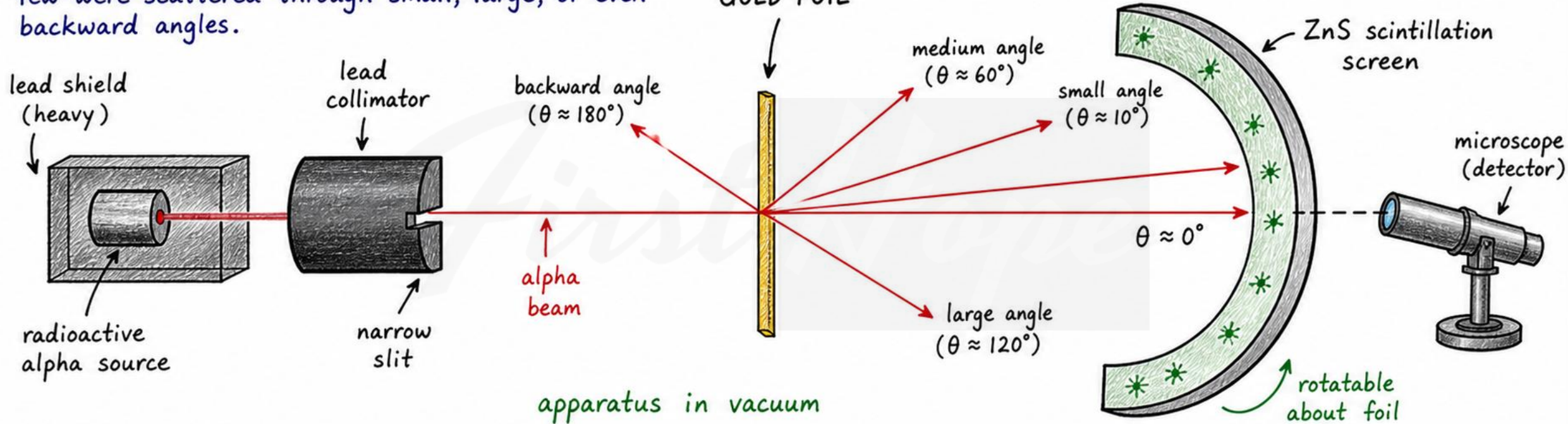
- Excited rarefied gases emit only certain discrete wavelengths.
- Every element has a characteristic spectral fingerprint.

THE CLUE: discrete spectra must reflect discrete internal atomic structure — a feature Thomson's model could not explain.

GEIGER-MARSDEN SCATTERING EXPERIMENT

- A narrow beam of alpha particles was directed at an ultrathin gold foil.
- Most particles passed straight through, while a few were scattered through small, large, or even backward angles.

Alpha energy $\approx 5.5 \text{ MeV}$
gold-foil thickness = $2.1 \times 10^{-7} \text{ m}$



AIM

Probe how positive charge and mass are arranged inside an atom.

DETECTION

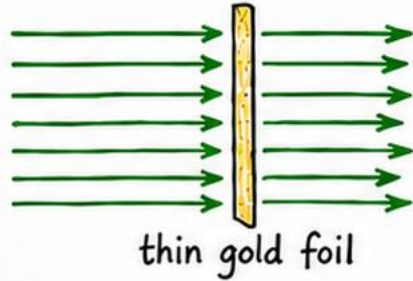
Each alpha particle striking ZnS produces a tiny scintillation counted through the microscope.

MEASUREMENT

Rotate the detector and record number scattered versus angle θ .

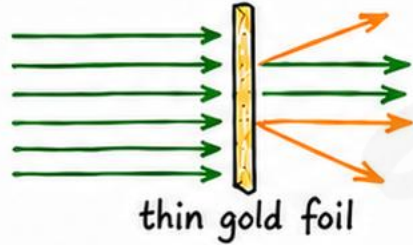
RUTHERFORD SCATTERING — OBSERVATIONS

MOST:



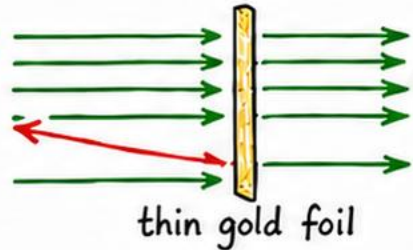
Most alpha particles pass through the foil without any deflection or with a very small deflection.

FEW:



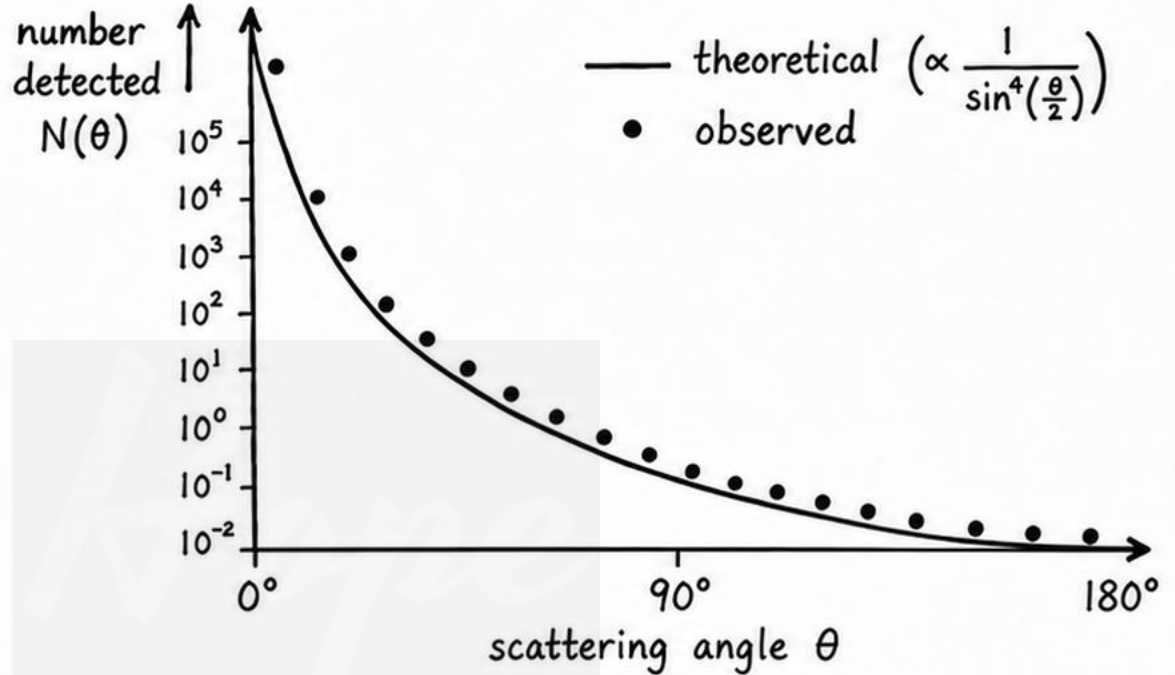
A few alpha particles are deflected through modest angles.

EXTREMELY RARE:



An extremely rare alpha particle is deflected by more than 90 degrees.

- about 0.14% scatter by more than 1°
- about 1 in 8000 scatter by more than 90°



- Atom is mostly empty space.
- Positive charge and almost all mass occupy a tiny central region.
- Only a close encounter with that concentrated positive charge can reverse a positive alpha particle.

RARE LARGE-ANGLE EVENTS DISCLOSE THE NUCLEUS.

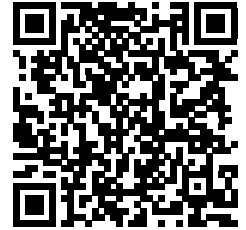


FREE PREVIEW

[Click here to visit our website](#)

SCHOOL NOTES & NCERT SOLUTIONS

Complete notes and
NCERT solutions are
available on
FirstHope app only.



[Scan or click here](#)

Click here to get the app



Available on Google Play

JOIN THE FIRSTHOPE COMMUNITY

Join our Telegram channel

Click here to join Telegram



[Scan or click here](#)

@FirstHope_CBSE_Notes

Instagram

@firsthope.school

[Click here to follow >](#)

YouTube channel

@firsthope.school

[Click here to watch >](#)

FirstHope website

firsthope.co.in

[Click here to visit our website >](#)

CBSE / Class 9 / Class 10 / Class 11 / Class 12

Preview notes and NCERT solutions. Full PDFs in the FirstHope app.