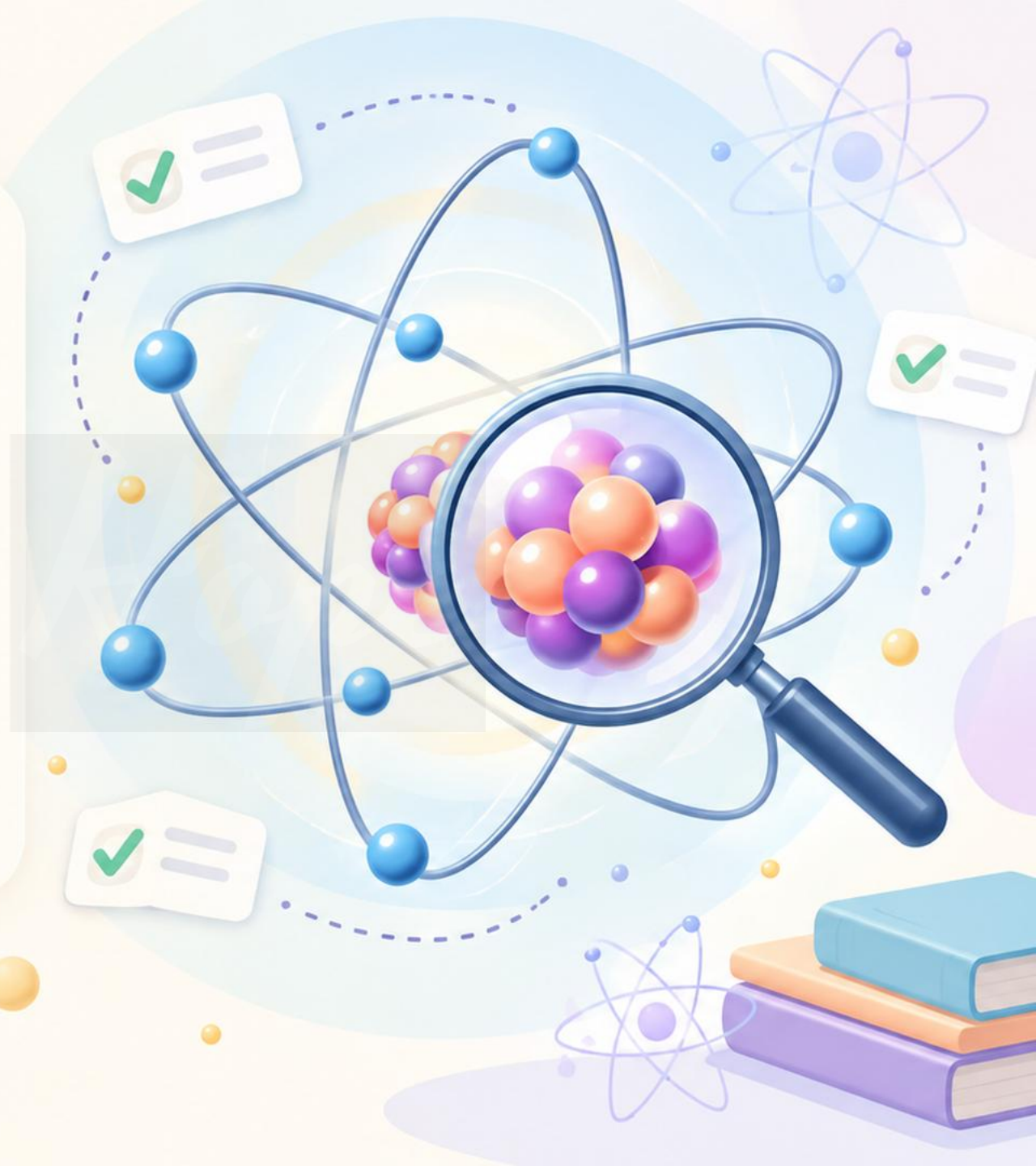


SCIENCE • CLASS 9

CHAPTER 8

Journey Inside the Atom

NCERT SOLUTIONS



THOMSON'S ATOM: CHARGE BALANCE

Pause and Ponder — Question 1

Question: Make Thomson's atom using positive clay and electron beads. What happens if:

- (i) the clay's positive charge is less than the beads' total negative charge?
- (ii) the clay itself carries some negative charge? Is the model still neutral?

Solution (i): Negative charge is greater than positive charge, so the model has a net negative charge.

Solution (ii): Negative clay cannot provide the required positive background. If extra negative charge is added to an initially balanced model, it also becomes negatively charged. A neutral model needs equal amounts of positive and negative charge.

$$Q_{\text{net}} = Q_{\text{positive}} - |Q_{\text{negative}}| \quad \Bigg| \quad \text{For neutrality: } Q_{\text{net}} = 0$$

THOMSON'S MODEL & ELECTRONS

Pause and Ponder – Questions 2-3

Question 2:

Is an orange or lemon with seeds in soft pulp a good comparison for Thomson's atom? Where does it match and fail?

Matches:

The pulp represents a spread-out positive background; the seeds represent electrons embedded in it.

Limits:

Real pulp and seeds do not have these electric charges. Seeds may be grouped in segments, so their arrangement is only a rough comparison. Thomson's model has no central nucleus.

Question 3:

Why did Thomson conclude that electrons are present in all atoms?

Solution:

Cathode rays had the same properties even when the electrode material or gas was changed. This showed that electrons are common particles found in all atoms.

NEGATIVE PARTICLES IN GOLD FOIL

Pause and Ponder – Question 4

Question: What would happen if negatively charged particles replaced α -particles in Rutherford's gold foil experiment?

Solution:

- A nucleus is positively charged.
- Positive α -particles are repelled by it.
- Negative particles would be attracted towards it, so nearby paths would bend towards the nucleus.
- Many particles passing far from nuclei could still pass almost straight through: atoms are mostly empty space.

positive particle	negative particle
↓ repulsion (pushed away from nucleus)	↓ attraction (pulled towards nucleus)

The pattern would not be exactly the same. It would also depend on the negative particles' mass and energy; electrons are much lighter than α -particles.

Answer: Attraction replaces repulsion near the nucleus.

WHAT BACKSCATTERING REVEALED

Pause and Ponder — Questions 5–6

Question 5: A few α -particles bounced back sharply.

Why did this rule out Thomson's plum pudding model?

Solution:

Energetic positive α -particles need a very strong repulsive force to turn back.

This requires positive charge to be concentrated in a tiny, dense region.

Thomson's spread-out positive charge could not explain such large deflections.

Conclusion: The atom has a small, dense, positively charged nucleus.

Question 6: If you could ask Rutherford one question about his work, what would it be?

One possible response: "Why do orbiting electrons not lose energy and fall into the nucleus?"

Why ask this? It points to the problem of atomic stability that his model could not explain.

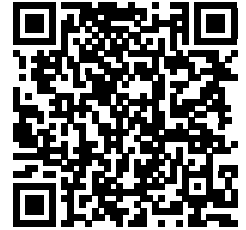


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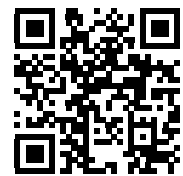


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