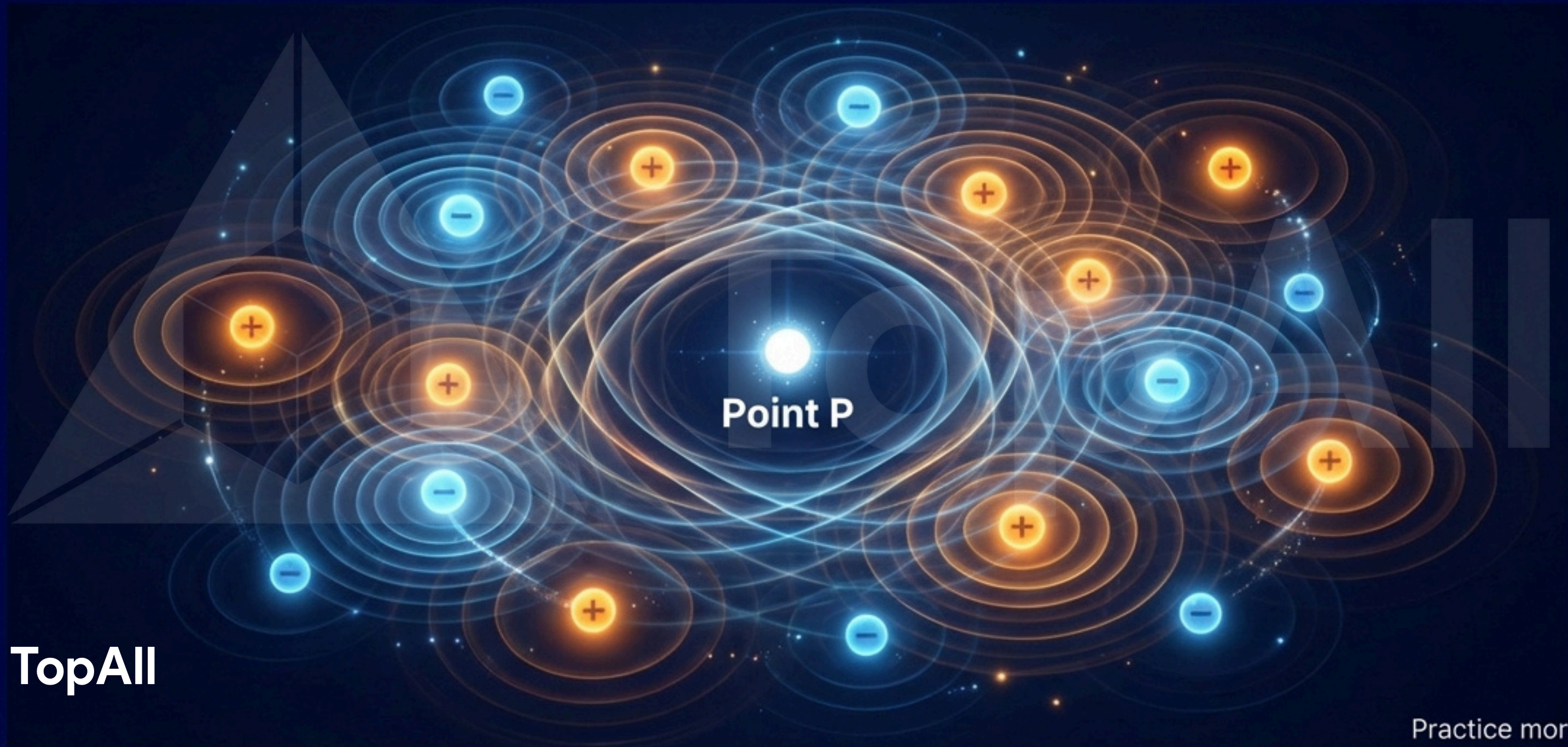
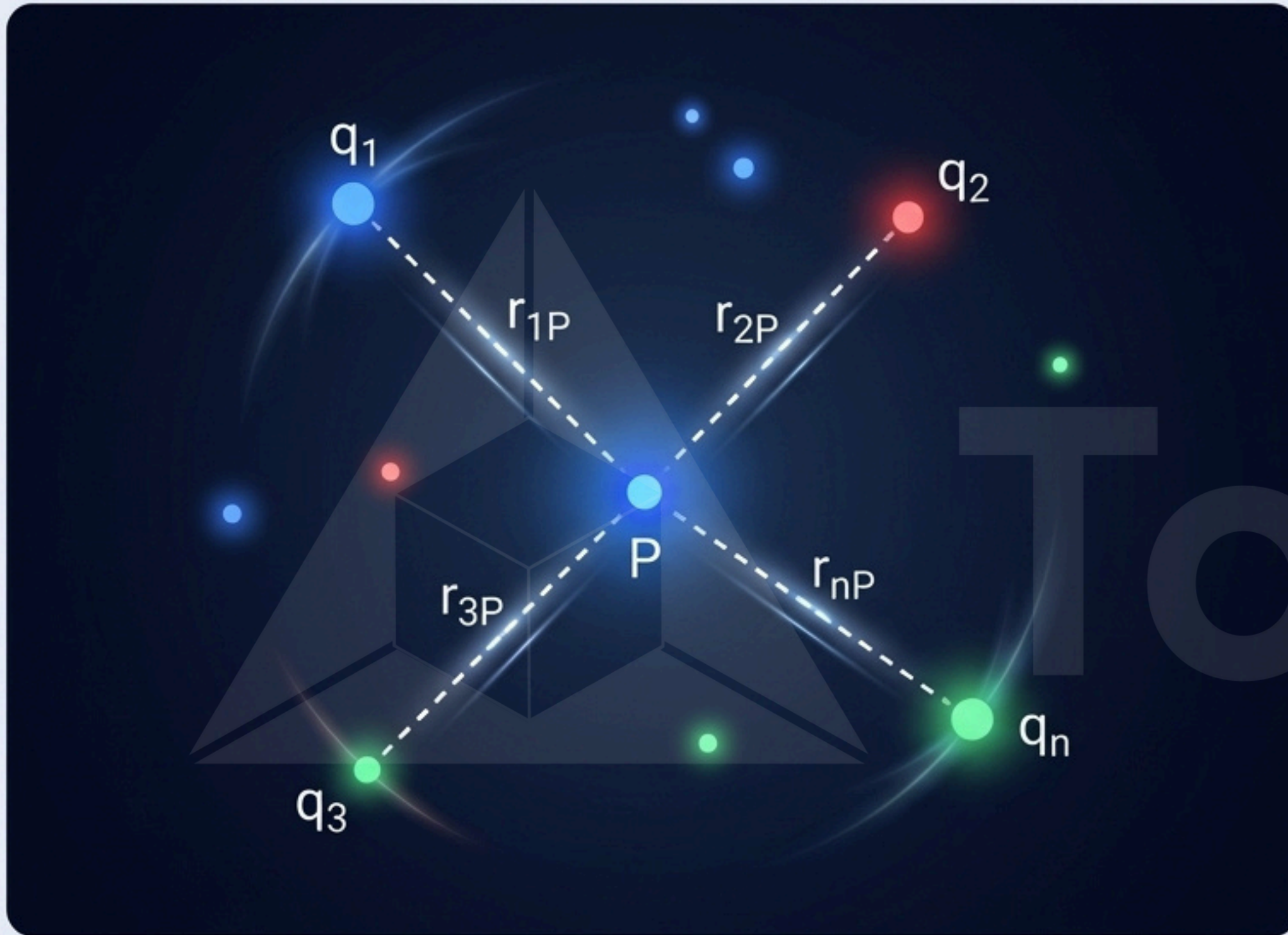


Many Charges, One Potential

Mastering the Superposition Principle for Discrete and Continuous Charge Systems.



Visualizing A System Of Charges



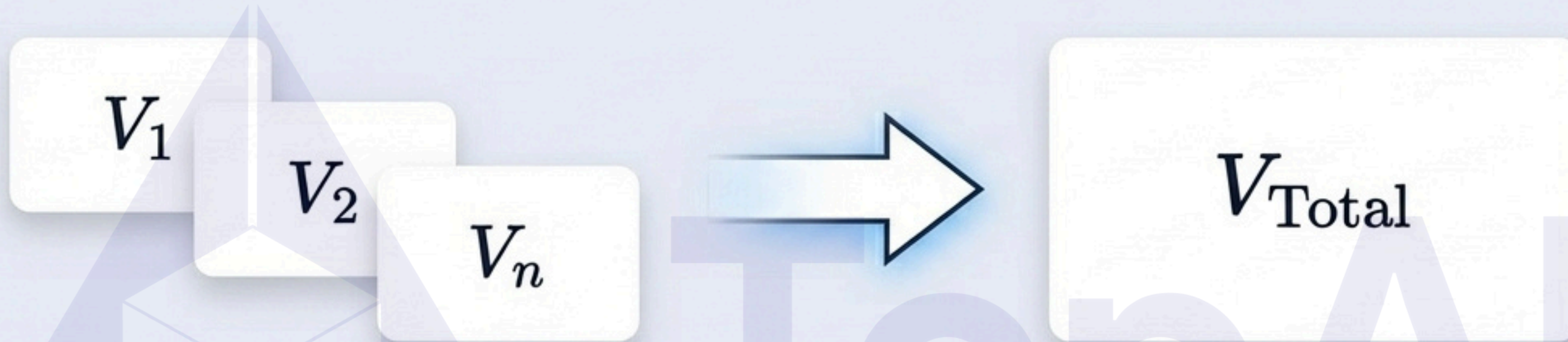
Individual Contributions

Every single charge in the space creates its own potential at point P, completely ignoring the presence of the others.

$$V_1 = \frac{1}{4\pi\epsilon_0} \frac{q_1}{r_{1P}}$$

The Superposition Principle

The **total potential** at P is the **algebraic** sum of the potentials due to individual charges.



$$\text{Eq (2.17): } V = V_1 + V_2 + \dots + V_n$$

$$\text{Eq (2.18): } V = \frac{1}{4\pi\epsilon_0} \sum_{i=1}^n \frac{q_i}{r_{iP}}$$

EXAM TRAP: Unlike Electric Fields, Potential is a SCALAR. Do not use vectors or resolve components. Just keep the +/- signs of the charges!



You've Learned the Theory. Let's Test Them Now.

$$E=mc^2$$



Turn theory into marks with **unlimited MCQs, smart analysis, and focused revision.**

Practice Now



At prep.topall.app

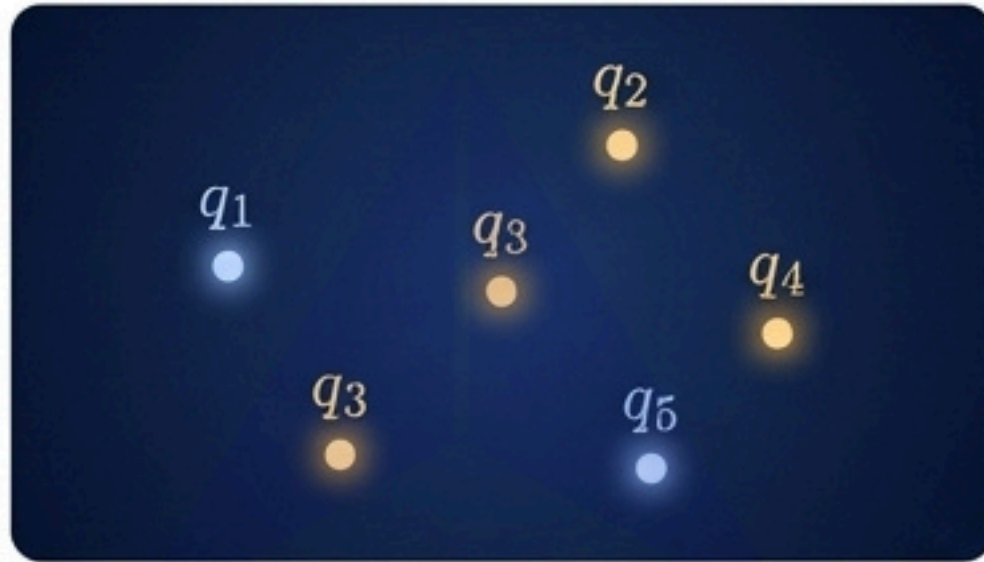
Key Highlights

- » Free Study Material, Videos & Infographics
- » Push Your Limits with Level-Based Challenges
- » Climb the Leaderboard Among Fellow Aspirants
- » Practice Unlimited MCQs for NEET & JEE
- » Get Clear Explanations, Not Just Marks
- » Track Your Performance Smarter



Scaling Up: Continuous Charge Distributions

Discrete Points

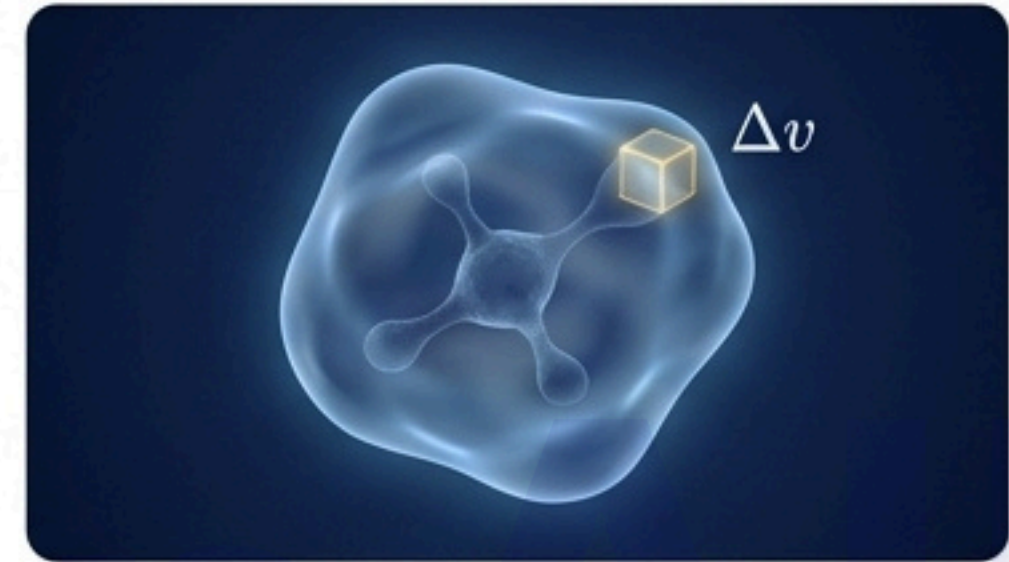


Countable charges ($q_1, q_2, \dots$)



Uses **Summation**

Continuous Body



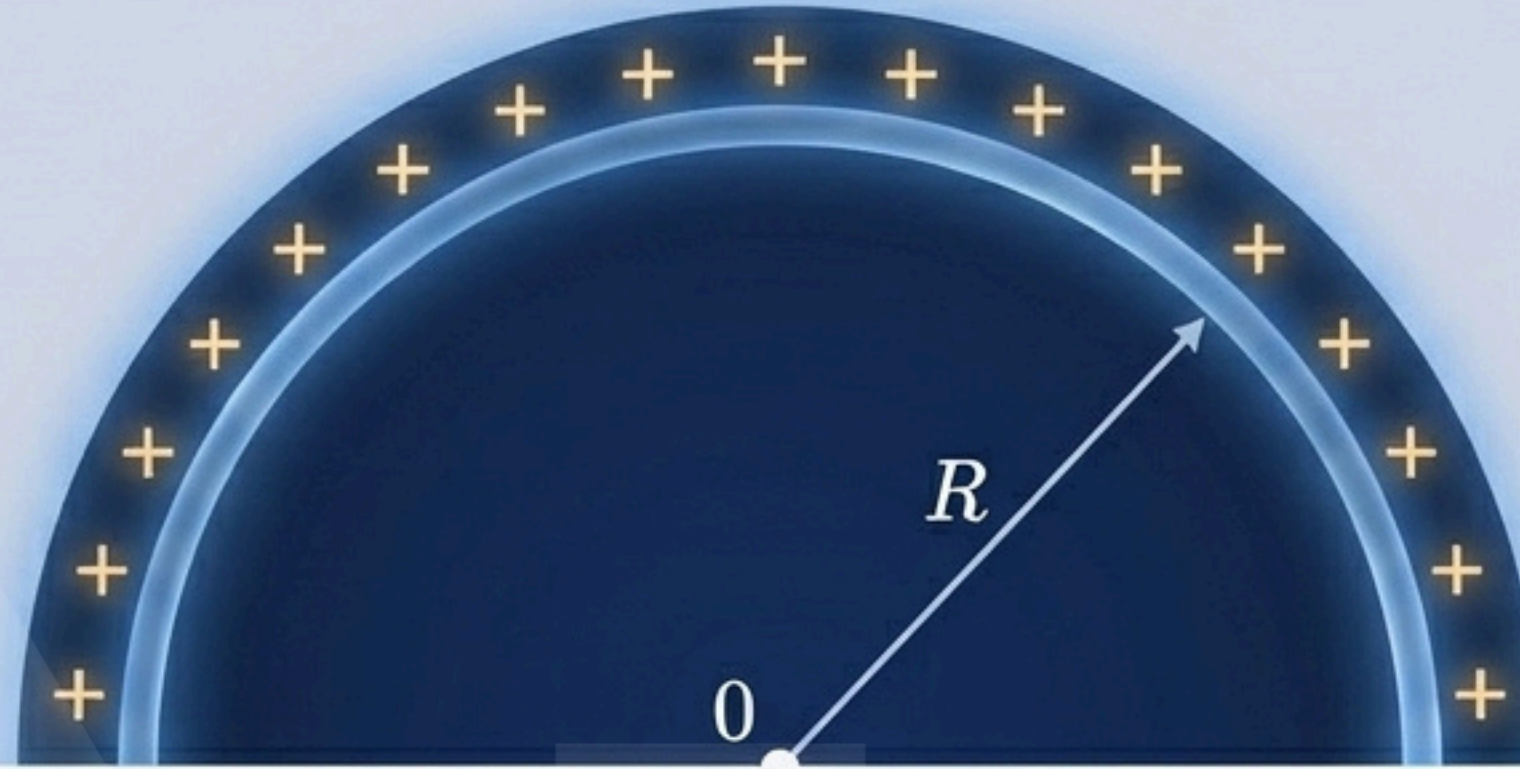
Infinite, smeared charge (ρ)



Uses **Integration**

The principle remains exactly the same: break the object into tiny pieces, find V for each piece, and add them all up.

Special Case: Uniformly Charged Spherical Shell



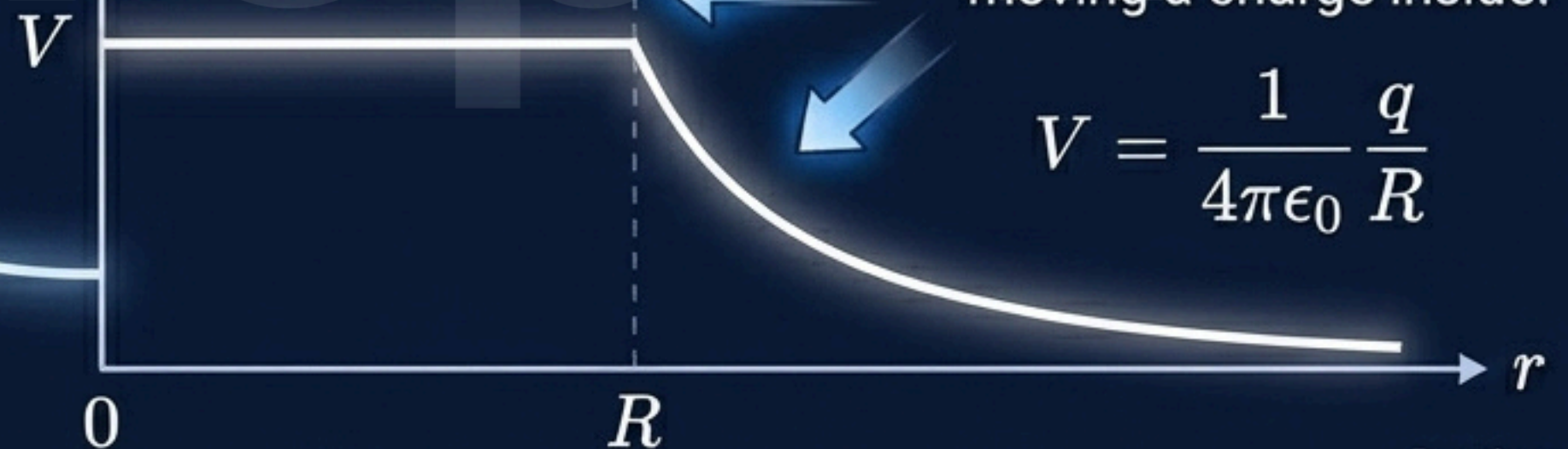
Potential inside equals potential on the surface! (Constant)

Outside ($r \geq R$): Acts like all charge is at the center.

$$V = \frac{1}{4\pi\epsilon_0} \frac{q}{r}$$

Inside ($r < R$): Electric field is zero, so no work is done moving a charge inside.

$$V = \frac{1}{4\pi\epsilon_0} \frac{q}{R}$$



Recap & Problem-Solving Shortcuts



The Scalar Advantage

- **ADD** potentials algebraically. No vectors!
- **INCLUDE** the sign of the charge in your calculation ($-q$ gives $-V$).



The Shell Trick

- **REMEMBER:** $V_{\text{inside}} = V_{\text{surface}} = \text{Constant}$.
- **SHORTCUT:** If asked for potential difference between two points inside a shell, the answer is always ZERO.



The Zero Point

- **VERIFY** that potential is taken as zero at infinity for standard formulas to work.



You've Learned the Theory.

Now Let's Test It.

Reading notes gets you knowledge.

Practicing MCQs gets you marks.

That's exactly what TopAll Pro is built for.

Try TopAll Pro Now

What TopAll Pro Does Differently

-  **Stuck? Snap it. Solve it. — Doubts AI**
Photo → step-by-step solution in seconds, 24/7
-  **Your AI Coach finds your blind spots**
Concept-level weakness detection — not just chapter-level
-  **4.5 Lakh+ questions. Never run out.**
13× more content than any other prep app in India
-  **Build your own test in 60 seconds**
Pick a chapter, set difficulty — AI does the rest instantly.
-  **AI Recommendation that helps you improve**
AI Recommendation Analysis your Tests and tell you where you need to improve.



Practice the moment you finish studying
Jump in while the concept is still fresh in your head

4.5L+
MCQs

1.5L+
Students

AI Powered
In-Depth Analysis