POTENTIAL DAY 2: THE ELECTRIC POTENTIAL

WARMUP Day 1 Bridge

Yesterday: $U = kq_1q_2/r$ needs TWO charges. Divide out one of them (the "visitor"): U/q_visitor = ________ — which belongs to the source charge and the location alone. What Unit-8 move is this twin of?

ELECTRIC POTENTIAL: ENERGY PER COULOMB

$V = U/q$ → point charge: **$V = kq/r$** (volts = J/C)

V is a SCALAR — superposition is plain signed addition, no components ever. Falls off as $1/r$ (one power). Once V is mapped: **$U = qV$** and **$W = q\Delta V$** for any visitor.

μC arithmetic: $k(\mu C)/m = 9\times10^3$ V — the same 9000 as fields, but per single power of r.

WE DO Exercise 1: One Charge's Map

For a +6.0 μC charge, tabulate V at r = 1.0, 2.0, 3.0 m. Then, right column: |E| at the same three r. Circle which column halves ($1/r$) and which quarters ($1/r^2$) as r doubles.

SCALAR SUPERPOSITION

WE DO **Exercise 2: The Dipole Midpoint, Revisited**

+4.0 μC at x = 0, −4.0 μC at x = 2.0 m. At the midpoint: **(a)** V = _________ (two signed terms). **(b)** But from Unit 8, E there = 72,000 N/C. One sentence: how can V be zero where E is huge?

YOU DO **Exercise 3: Both Positive**

Two +3.0 μC charges sit 2.0 m apart. Find V at their midpoint — and recall E there is ZERO. (The mirror image of Exercise 2!)

WE DO **Exercise 4: Work From the Map**

V at point A is 27,000 V; at point B it is 9,000 V. How much work does the FIELD do on a +2.0 μC charge moving A → B? ($W_{field} = q(V_A - V_B)$.) Would you or the field do the pushing?

PAPER PRACTICE

PRACTICE PROBLEMS

P1 Straight V

V at 3.0 m from a −9.0 μC charge (sign matters).

P2 Superposition, Signed

+2.0 μC at x = 0 and −6.0 μC at x = 4.0 m. Find V at x = 1.0 m.

P3 Where Is V Zero?

Same pair (+2 at 0, −6 at 4.0 m): find the point BETWEEN them where V = 0. ($k \cdot 2/x = k \cdot 6/(4-x)$ — linear, not quadratic.)

P4 Energy via the Map

A +2.0 μC charge moves from r = 1.0 m to r = 3.0 m away from a +6.0 μC source. Compute V at both spots, then the field's work $W = q(V_i - V_f)$, then check the sign against your intuition (like charges separating).