



# PHYSICS FORMULA + CONCEPT NOTEBOOK

## Day 4 — Electrostatics (Electric Field & Field Lines)

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### 1. Electric Field (E)

#### Definition:

Electric field at a point is the *force per unit positive test charge* placed at that point.

$$E = \frac{F}{q}$$

Unit: N/C or V/m

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### 2. Electric Field Due to a Point Charge

For a point charge  $Q$ :

$$E = \frac{1}{4\pi\epsilon_0} \frac{Q}{r^2}$$

Direction: **Radially outward** (for +Q), **inward** (for -Q).

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### 3. Electric Field as a Vector

Electric field is a **vector**.

If two charges produce fields  $E_1$  and  $E_2$ :

$$E_{net} = E_1 + E_2$$

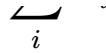
(Use vector addition)

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### 4. Electric Field Due to Multiple Charges (Superposition)

Electric fields add using **vector law**:

$$E = \sum E_i$$



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## ● 5. Electric Field Lines

Properties:

1. Do not intersect
  2. Start on **positive** charges, end on **negative** charges
  3. Density of lines = **strength of field**
  4. Perpendicular to conductor surface
  5. Tangent to field line = **direction of electric field**
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## ● 6. Electric Field Lines — Patterns

- Isolated + charge → lines go outward
- Isolated – charge → lines come inward
- Dipole → from + to –

(You must draw this in notebook for boards)

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## ● 7. Electric Field of a Dipole (Concept Only Today)

Stronger on axial line than equatorial line.

(No formula today — will come later)

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## ● 8. Zero Electric Field

Electric field becomes zero when **vector sum cancels**, not because charge is absent.

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## ● 9. Relation Between Force & Field

$$F = qE$$

If  $q$  is negative  $\rightarrow$  direction opposite to field.

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## ● 10. Important Board Definitions

1. Electric field
2. Electric field intensity
3. Electric field lines
4. Superposition principle