📘 PHYSICS FORMULA + CONCEPT NOTEBOOK

Day 4 — Electrostatics (Electric Field & Field Lines)

🔵 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**

🔵 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).

🔵 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)

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

Electric fields add using **vector law**:

$$E = \sum E_i$$

$\sum_i$

🔵 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**

🔵 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)

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

Stronger on **axial line** than **equatorial line**.

(No formula today — will come later)

🔵 8. Zero Electric Field

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

🔵 9. Relation Between Force & Field

$$F = qE$$

If q is negative → direction opposite to field.

🔵 10. Important Board Definitions

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