



समस्त बिहार, भरेगा हुंकार

HUNKAR 2025

में आपका स्वागत है

HUNKAR 2025



VIDYAKUL



PHYSICS

JP UJALA Sir

अध्याय 06

आज का टॉपिक

EXPRESSION FOR INDUCED EMF AND CURRENT

→ EMF $\rightarrow \mathcal{E} = -\frac{d\phi}{dt}$

$$\mathcal{E} = -\frac{\Delta\phi}{\Delta t}$$

→ Current $i = \frac{\mathcal{E}}{R} = -\frac{1}{R} \frac{d\phi}{dt}$

$$i_{av} = \frac{\mathcal{E}}{R} = -\frac{1}{R} \frac{\Delta\phi}{\Delta t}$$

→ Charge $\frac{dq}{dt} = -\frac{1}{R} \frac{d\phi}{dt}$

$$\frac{\Delta Q}{\Delta t} = -\frac{1}{R} \frac{\Delta\phi}{\Delta t}$$

$$\boxed{dq = -\frac{d\phi}{R}}$$

$$\boxed{\Delta Q = -\frac{\Delta\phi}{R}}$$

INDUCED EMF BY CHANGING MAGNETIC FIELD

चुम्बकीय क्षेत्र में परिवर्तन के कारण उत्पन्न वि.दा.बल

$$\xi = -\frac{d\phi}{dt}$$

$$\xi = -A \cdot \frac{dB}{dt}$$

$$A \rightarrow A \cos \theta$$

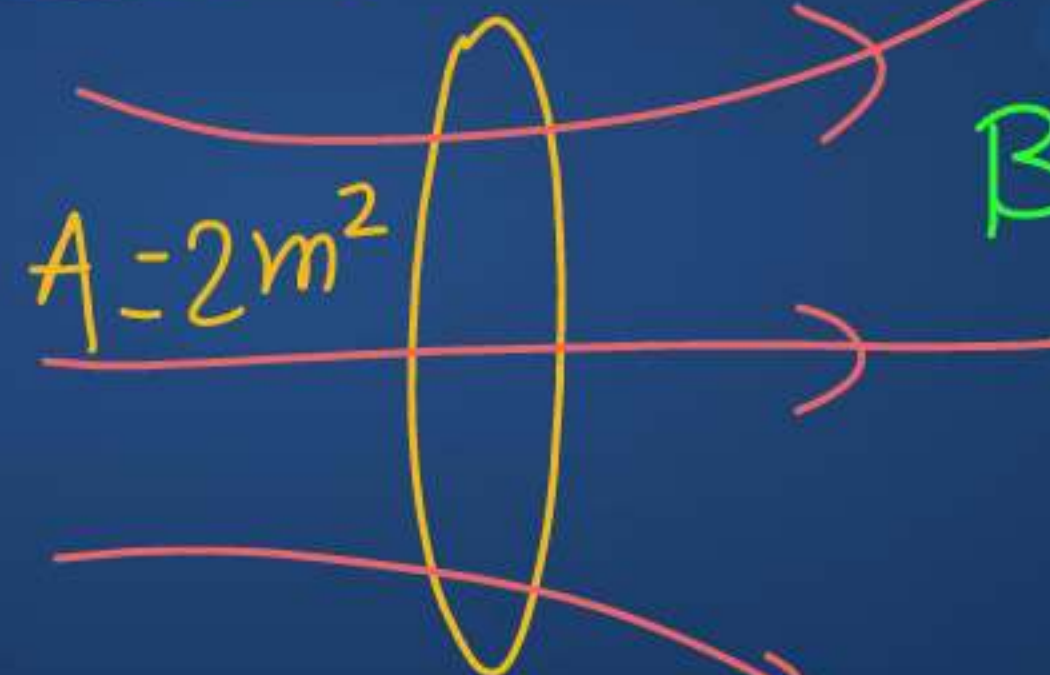
$$\phi = B A \cos \theta$$

if $\theta = 0^\circ$

$$\phi = BA$$

$$\xi = -\frac{dBA}{dt}$$

* Example Find ξ_{mf} at $t = 2 \text{ sec}$.



$$B = 2t^2 + 3t$$

$$\xi = -2 \times (4t + 3)$$

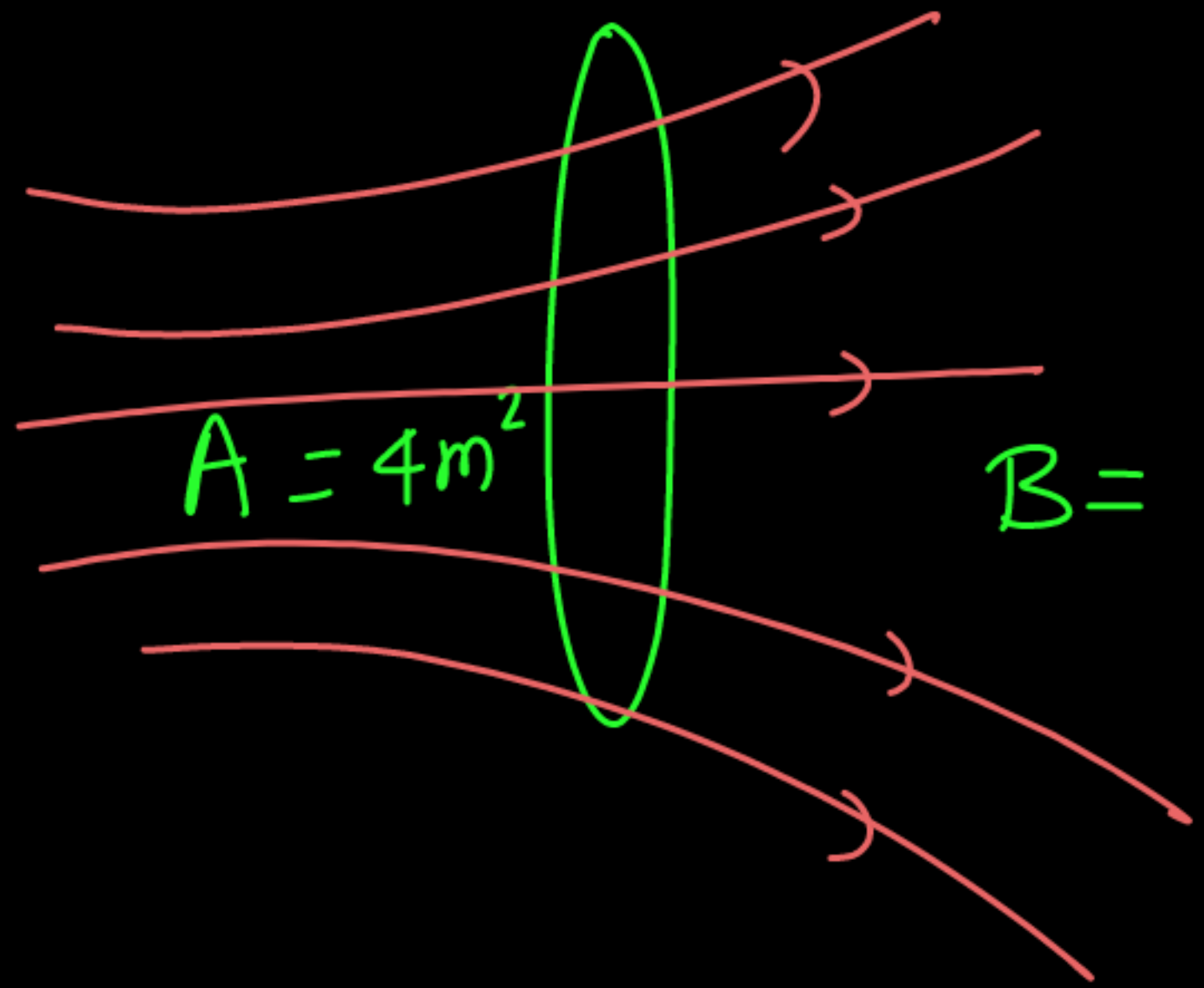
$$\xi = -2 \times 11$$

$$\xi = -22 \text{ Volts}$$

$$\xi = -A \frac{dB}{dt}$$

$$\xi = -2 \times \frac{d(2t^2 + 3t)}{dt}$$

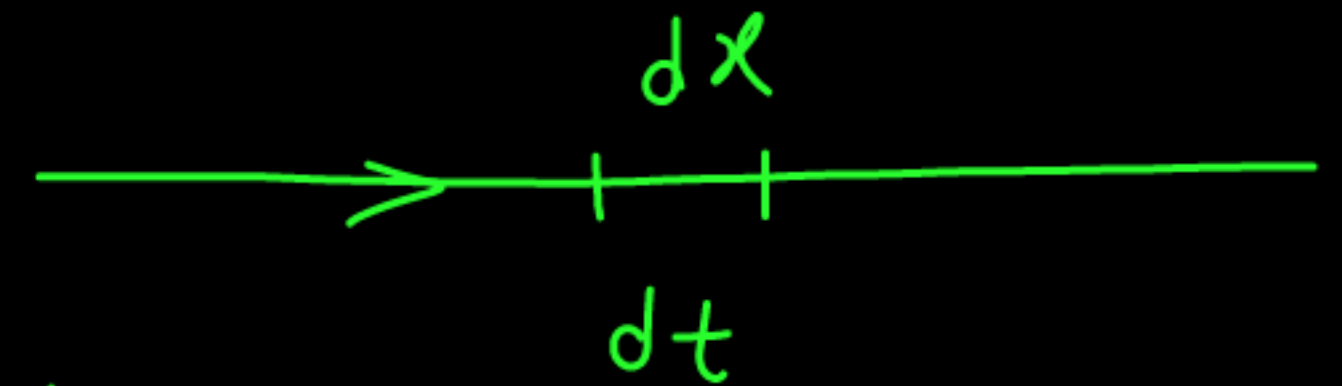
HW Q. Find the ϵ mf at $t = 2\text{sec}$ * Class 11th



$$B = 4t^3 + 2t$$

$$\begin{aligned} \text{Speed} &= \frac{\text{Distance}}{\text{time}} \\ \text{वेग} &= \frac{\text{दूरी}}{\text{समय}} \end{aligned}$$

*



$$V = \frac{dx}{dt}$$

$$* \quad \phi = B A \cos \theta$$

$$B = 20 \text{ T}$$

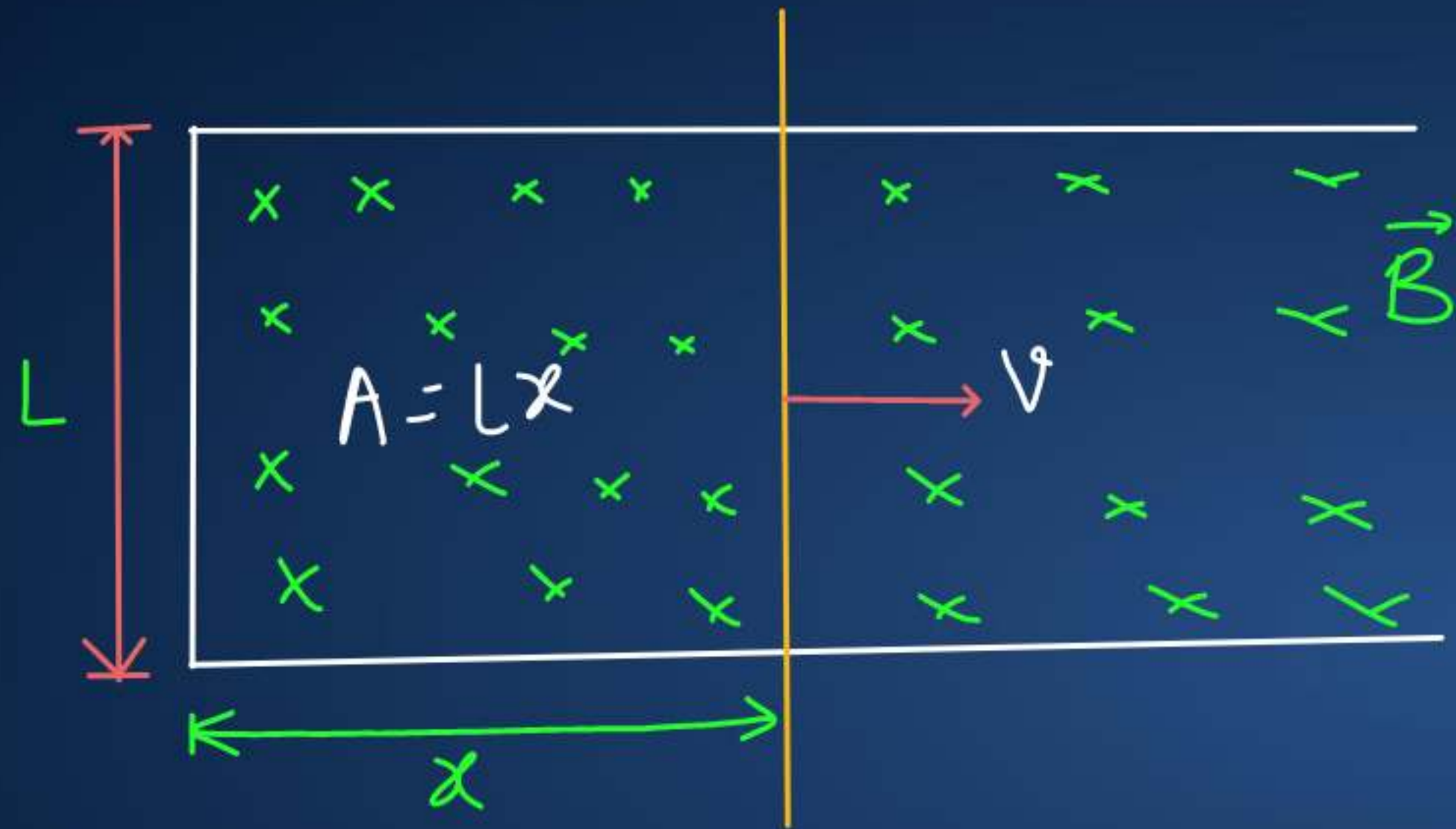
$$A = 4 \text{ m}^2$$

$$\theta = 60^\circ$$

$$\phi = \overset{10}{\cancel{20}} \times 4 \times \underline{1}$$
$$= \underline{40 \text{ weber}}$$

INDUCED EMF BY CHANGING AREA

क्षेत्रफल में परिवर्तन के कारण प्रेरित विद्युत वाहक बल



$$\phi = BA \cos \theta$$

$$\theta = 180^\circ$$

$$\phi = -BA$$

$$\therefore A = Lx$$

$$\mathcal{E} = -\frac{d\phi}{dt}$$

$$\mathcal{E} = -\frac{d(-BA)}{dt}$$

$$\mathcal{E} = B \cdot \frac{dA}{dt}$$

$$\mathcal{E} = B \cdot \frac{dLx}{dt}$$

$$\mathcal{E} = BL \left(\frac{dx}{dt} \right)$$

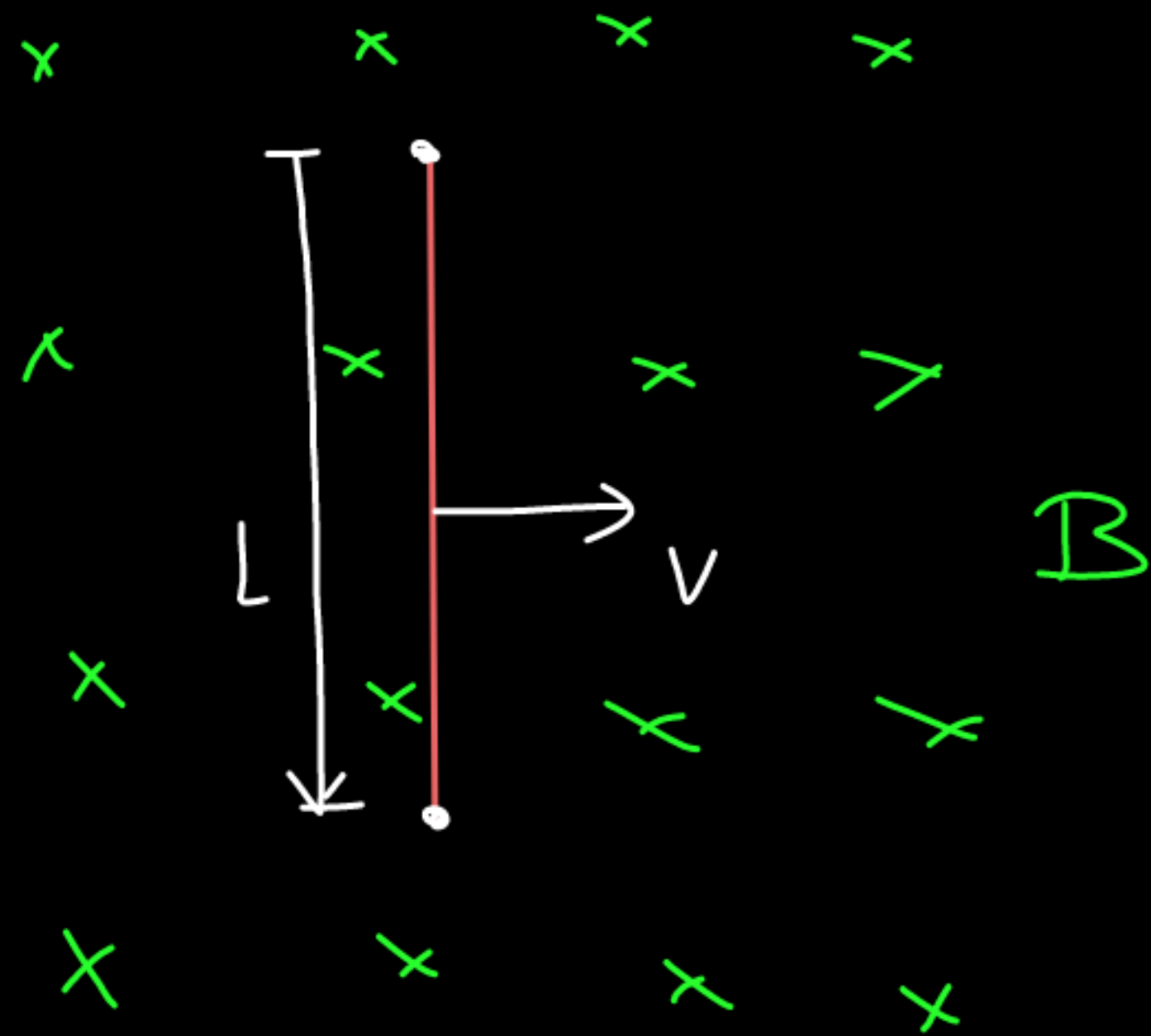
$$\boxed{\mathcal{E} = BLV}$$

$$\frac{V \cdot V \cdot g}{}$$

Q. Find the emf.



⊗ motional \mathcal{E} mf
 गतिक विद्युत वाहक बल

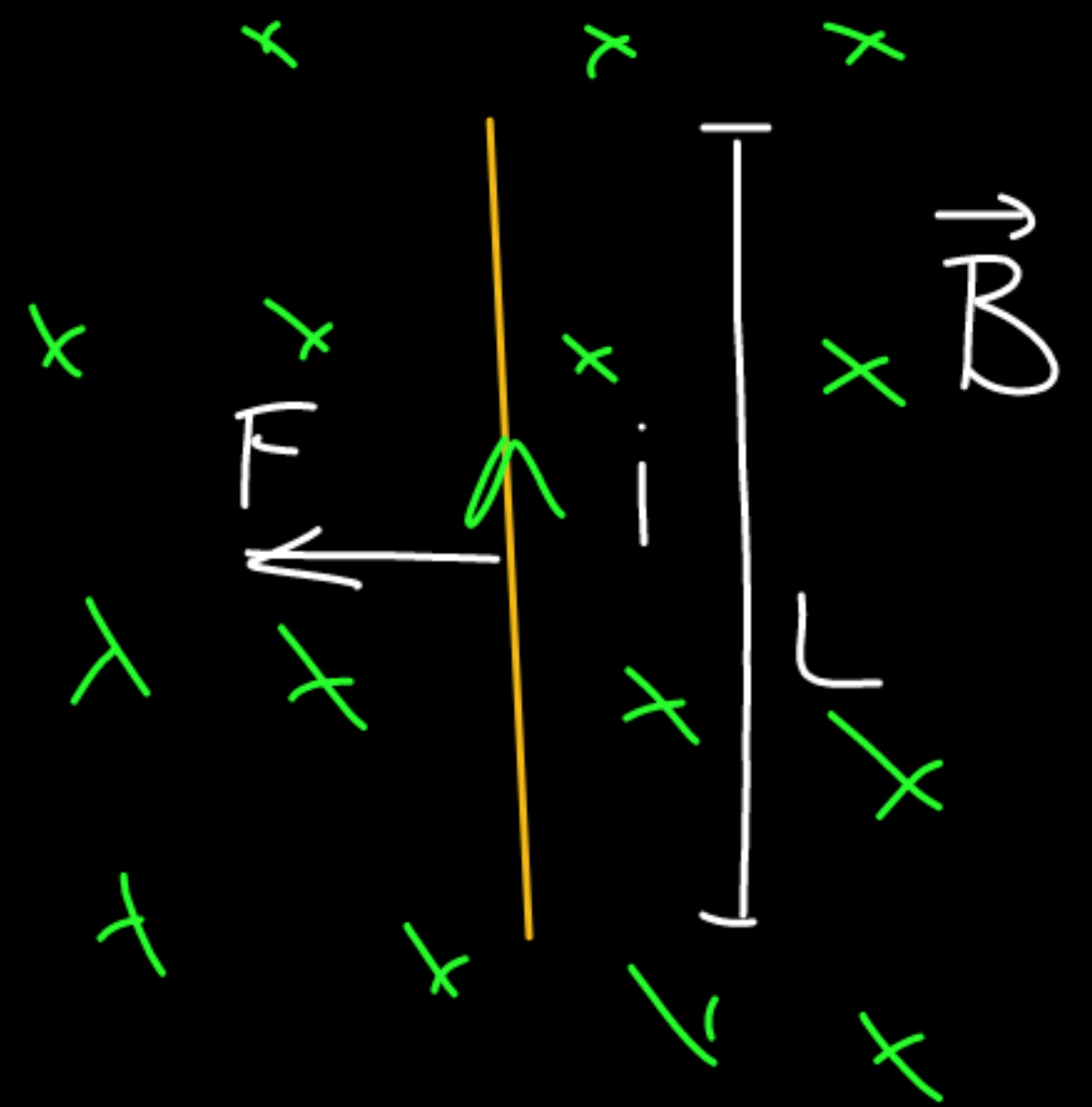


$$V_A - V_B = \mathcal{E} = BLV$$

$$\begin{aligned} \mathcal{E} &= iR \\ i &= \mathcal{E}/R \\ V &= iR \\ i &= V/R \end{aligned}$$

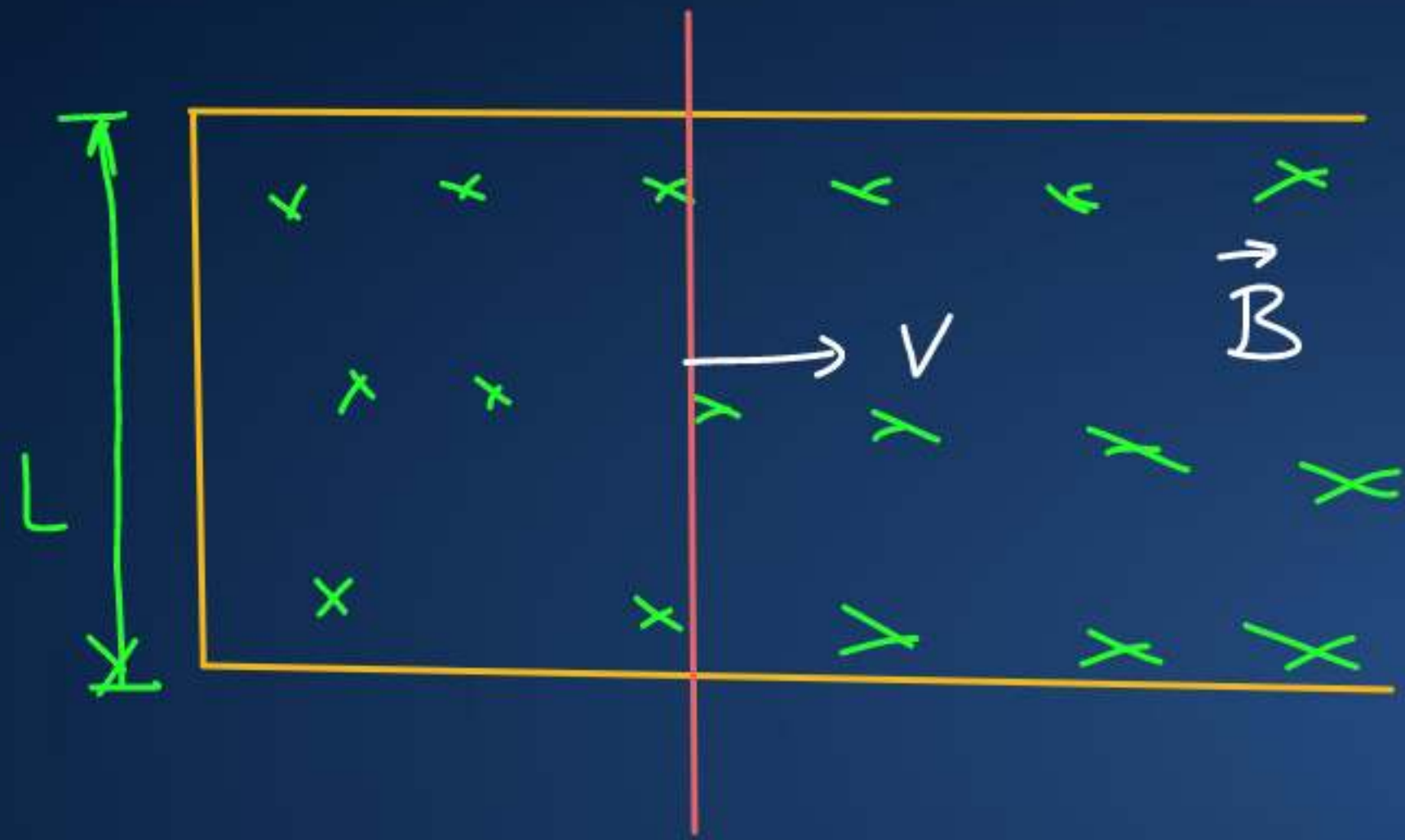
$$F = qVB$$

$$F = iLB$$



FORCE AND POWER REQUIRED TO PULL THE LOOP

लूप को खींचने में लगा बल तथा शक्ति



$$i = \frac{BLV}{R}$$

$$F = iLB$$

$$F = \left(\frac{BLV}{R}\right) \cdot LB$$

$$F = \frac{B^2 L^2 V}{R}$$

$$\mathcal{E} = BLV$$

If Resistance of loop is R .

Then

$$i = \frac{\mathcal{E}}{R} = \frac{BLV}{R}$$

⑩ $\text{Power} = \frac{dW}{dt}$
 $= \frac{d(Fdx)}{dt}$
 $= F \left(\frac{dx}{dt}\right)$
 $\text{Power} = F \cdot v$

$$\text{Power} = \frac{B^2 L^2 V^2}{R}$$