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ARJUN BATCH

CLASS 11th | PHYSICS

समतल में गति

MOTION IN A PLANE

Chapter-3 | Part-5



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आज क्या पढेंगे ?



1. सदिशों का वियोजन
2. समतल में गति

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सदिशों का वियोजन

(i) 2 D द्विविमीय (कल Last Class)

$\vec{A} = \vec{A_x} + \vec{A_y}$

या $\vec{A} = A_x\hat{i} + A_y\hat{j}$

$|A| = \sqrt{A_x^2 + A_y^2}$

$\tan\theta = \frac{A_y}{A_x}$

$\theta = \tan^{-1}\left(\frac{A_y}{A_x}\right)$

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(ii) 3D त्रिविमीय



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यदि $\vec{A} = 3\hat{i} + 4\hat{j}$ है तो इनका परिणामी ज्ञात कीजिए।

$$|\vec{A}| = \sqrt{A_x^2 + A_y^2} = \sqrt{(3)^2 + (4)^2} = \sqrt{9+16}$$

$$= \sqrt{25} = 5$$

$$\tan\theta = \frac{A_y}{A_x} = \frac{4}{3} = 1.33$$

$$\theta = \tan^{-1}(1.33)$$

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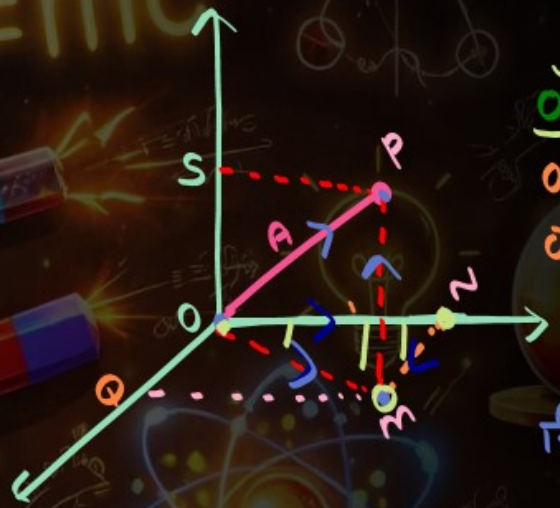
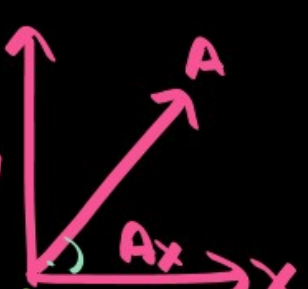
त्रिविमीय गति में सदिशों का वियोजन



$\overrightarrow{ON} = A_x$ = x-अक्ष

$OS = MP = A_y$ = y-अक्ष

$OQ = MN = A_z$ = z-अक्ष



$\triangle OMP$ में,

त्रिभुज के नियम

$\overrightarrow{OP} = \overrightarrow{OM} + \overrightarrow{MP}$

$\triangle OMN$ में,

$\overrightarrow{OM} = \overrightarrow{ON} + \overrightarrow{NM}$

$\overrightarrow{OP} = \overrightarrow{ON} + \overrightarrow{NM} + \overrightarrow{MP}$

$\vec{A} = \vec{A_x} + \vec{A_z} + \vec{A_y}$

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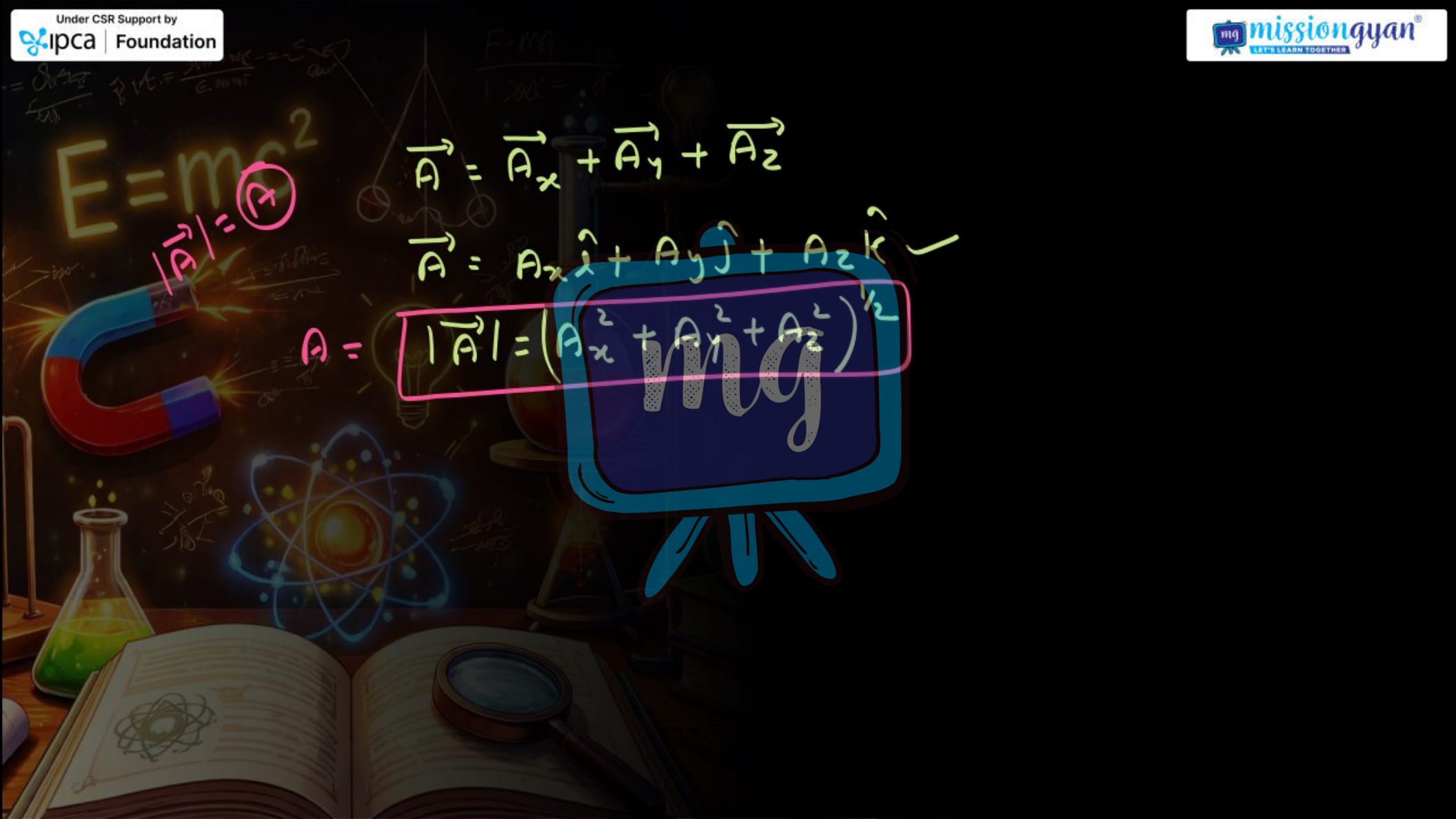

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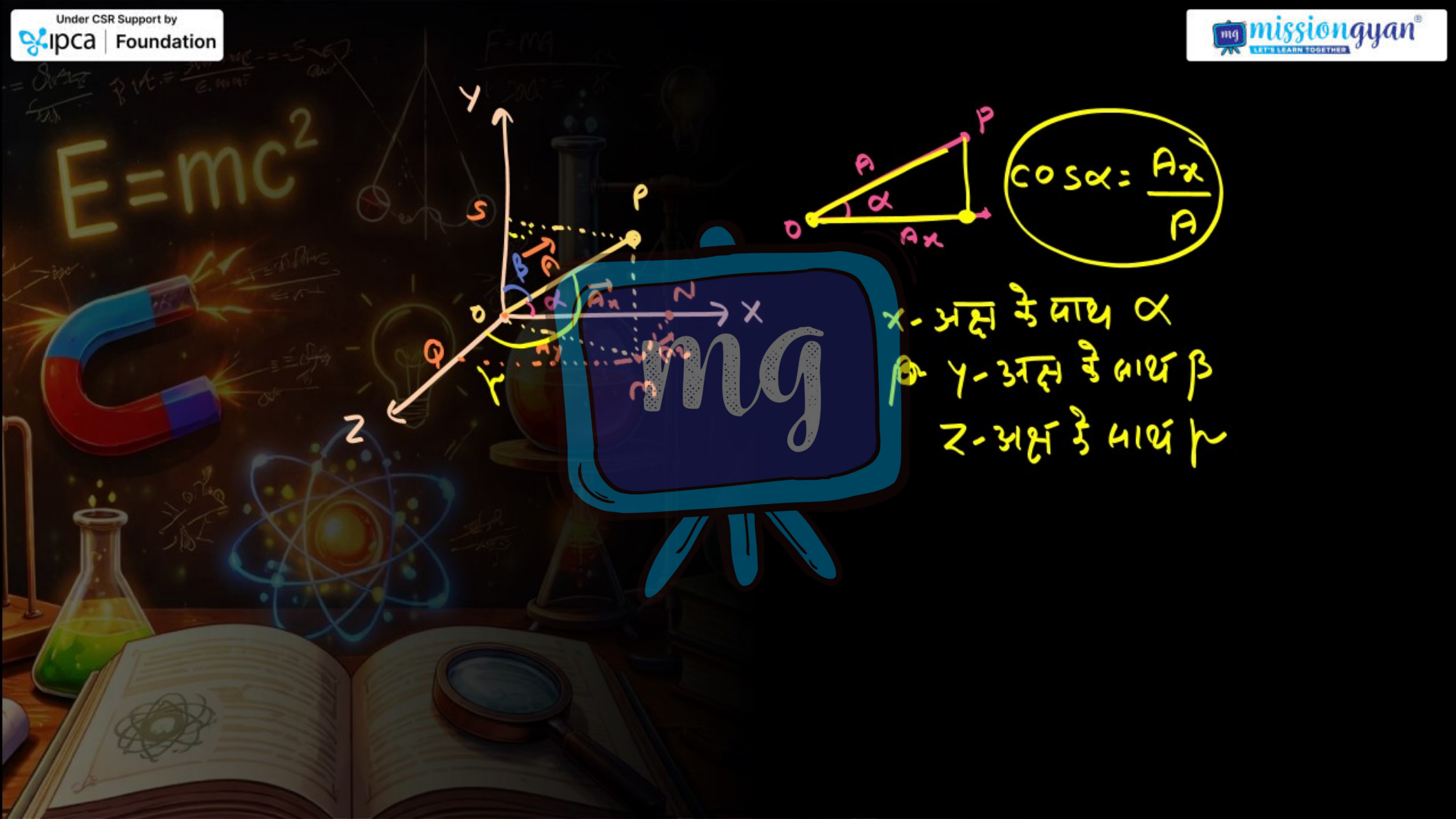

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$E=mc^2$

$\cos\alpha = \frac{A_x}{A} \rightarrow A_x = A\cos\alpha$ ——— (i)

इसी प्रकार $\cos\beta = \frac{A_y}{A} \rightarrow A_y = A\cos\beta$ ——— (ii)

$\cos\gamma = \frac{A_z}{A} \rightarrow A_z = A\cos\gamma$ ——— (iii)

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समी (i), (ii) व (iii) का वर्ग करके जोड़ने पर

$$A_x^2 + A_y^2 + A_z^2 = A^2\cos^2\alpha + A^2\cos^2\beta + A^2\cos^2\gamma$$

$$A_x^2 + A_y^2 + A_z^2 = A^2(\cos^2\alpha + \cos^2\beta + \cos^2\gamma)$$

$$\because A = (A_x^2 + A_y^2 + A_z^2)^{1/2}$$

$$A^2 = A_x^2 + A_y^2 + A_z^2$$

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→ सभी कोज्याओं का वर्ग 'यूनिट वेक्टर' के बराबर होता है।



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समतल में गति

सामान्य गति जैसे चींटी का रेंगना

खिलाड़ियों की खेल के मैदान में गति

→ Zig-Zag (टेढ़ा-मेढ़ा) गति —

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सदिश निरूपण

$E=mc^2$

$\Delta\gamma + \gamma_1 = \gamma_2$

$\Delta\gamma = \gamma_2 - \gamma_1$



(i) विस्थापन

$\Delta\gamma = \gamma_2 - \gamma_1$

स्थिति सदिश

$\gamma_1 = x_1\hat{i} + y_1\hat{j}$

$\gamma_2 = x_2\hat{i} + y_2\hat{j}$

$\Delta\gamma = \gamma_2 - \gamma_1 = (x_2 - x_1)\hat{i} + (y_2 - y_1)\hat{j}$

(यदि) = स्थिति सदिशों में अन्तर

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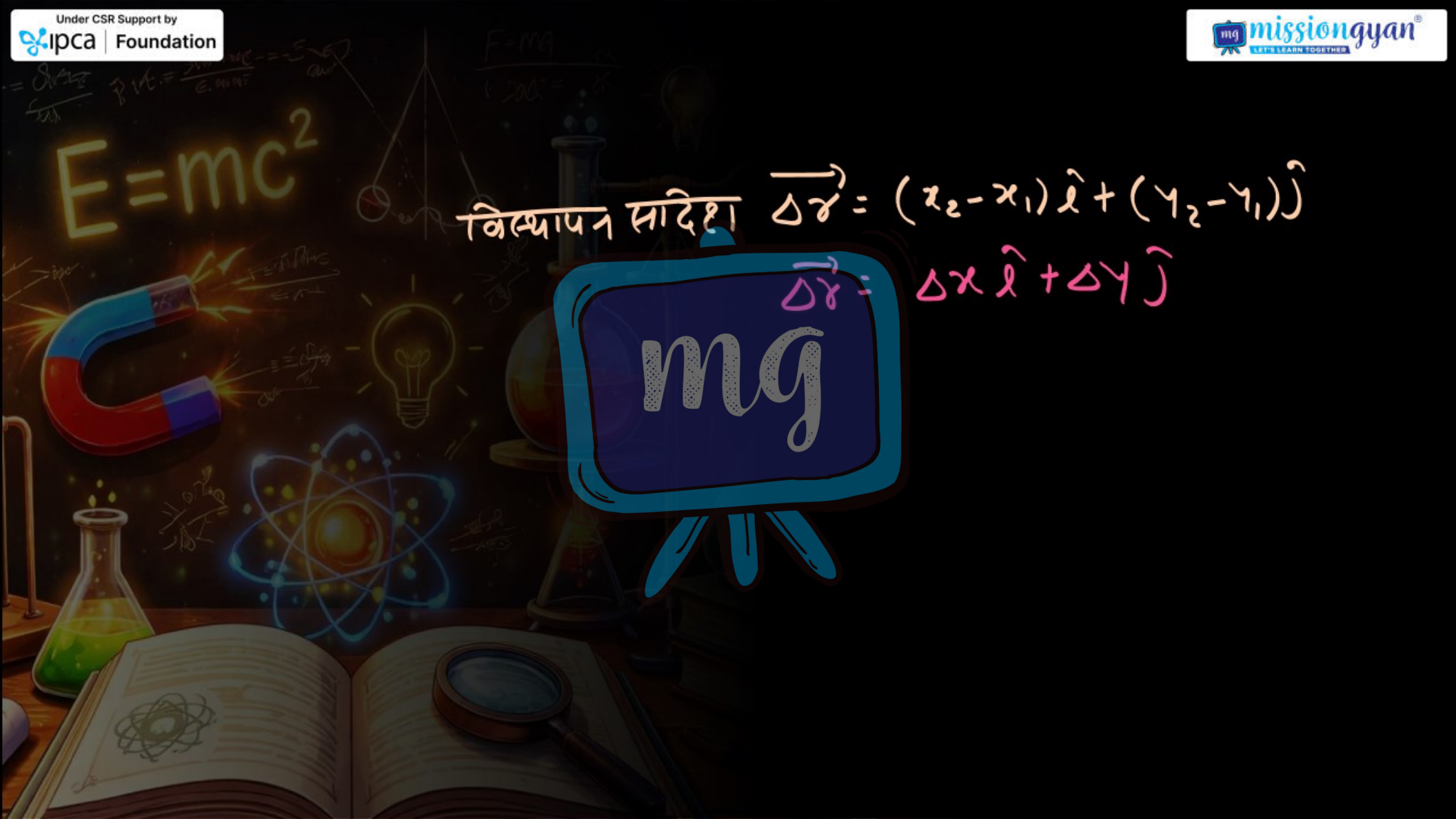

विस्थापन सदिश $\overrightarrow{\Delta r} = (x_2 - x_1)\hat{i} + (y_2 - y_1)\hat{j}$

$\overrightarrow{\Delta r} = \Delta x\,\hat{i} + \Delta y\,\hat{j}$

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विस्थापन वेग = स्थिति सदिशों में अन्तर

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सदिश निरूपण

(ii) वेग



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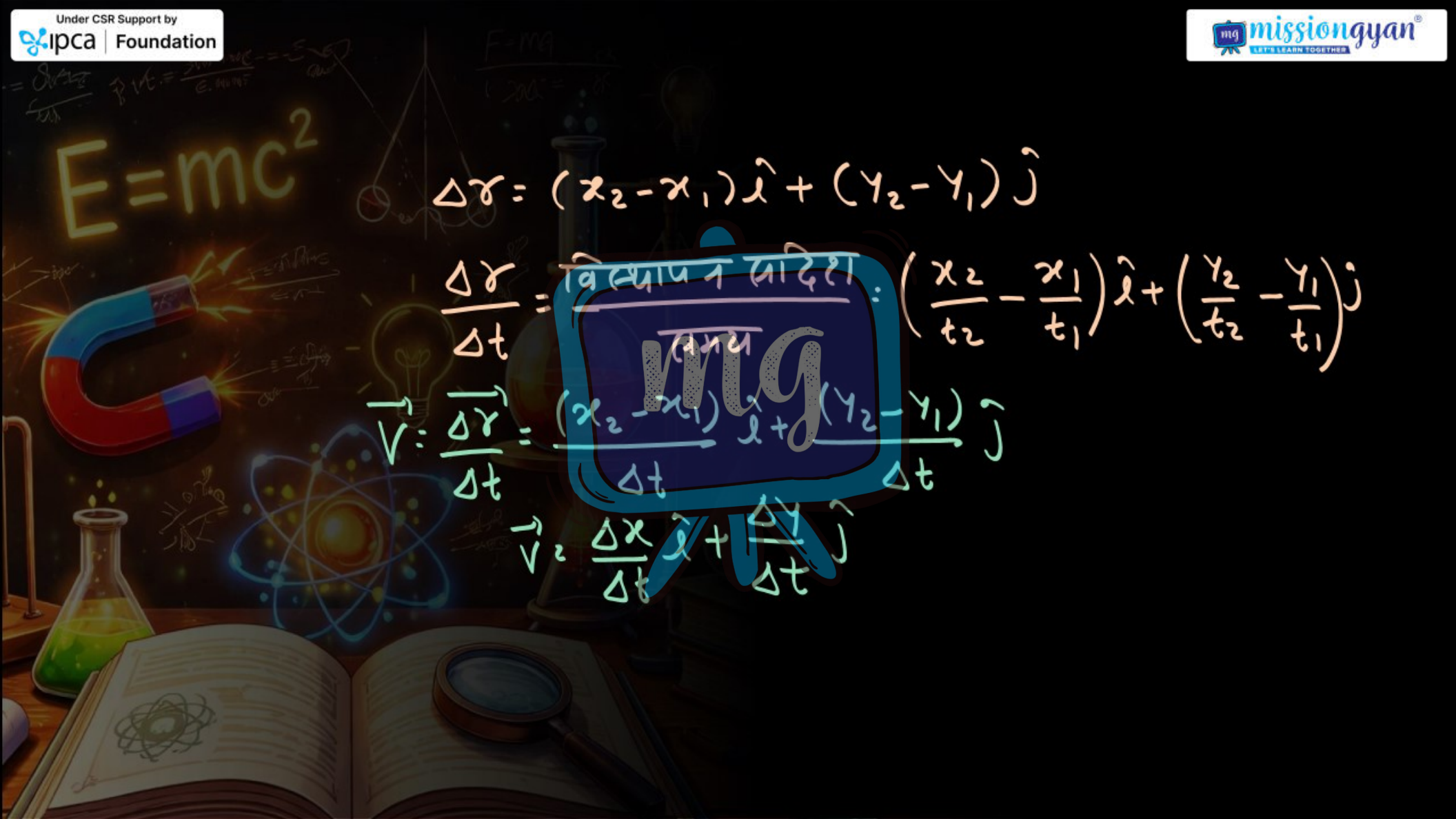

$$\Delta \vec{r} = (x_2 - x_1)\hat{i} + (y_2 - y_1)\hat{j}$$

$$\frac{\Delta \vec{r}}{\Delta t} = \frac{\text{विस्थापन का सदिश}}{\text{समय}} : \left(\frac{x_2}{t_2} - \frac{x_1}{t_1}\right)\hat{i} + \left(\frac{y_2}{t_2} - \frac{y_1}{t_1}\right)\hat{j}$$

$$\vec{V} : \frac{\Delta \vec{r}}{\Delta t} = \frac{(x_2 - x_1)}{\Delta t}\hat{i} + \frac{(y_2 - y_1)}{\Delta t}\hat{j}$$

$$\vec{V} : \frac{\Delta x}{\Delta t}\hat{i} + \frac{\Delta y}{\Delta t}\hat{j}$$

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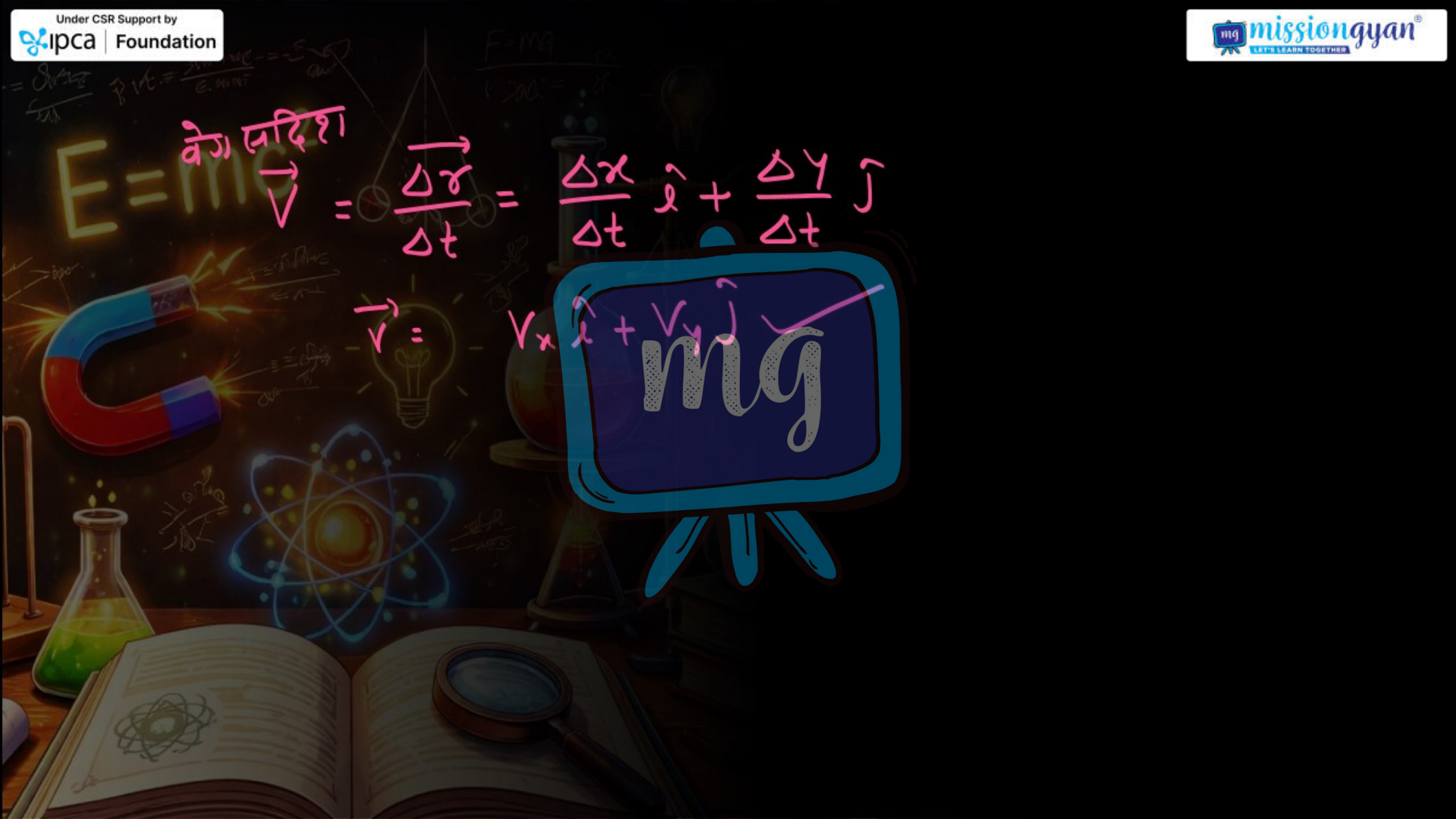

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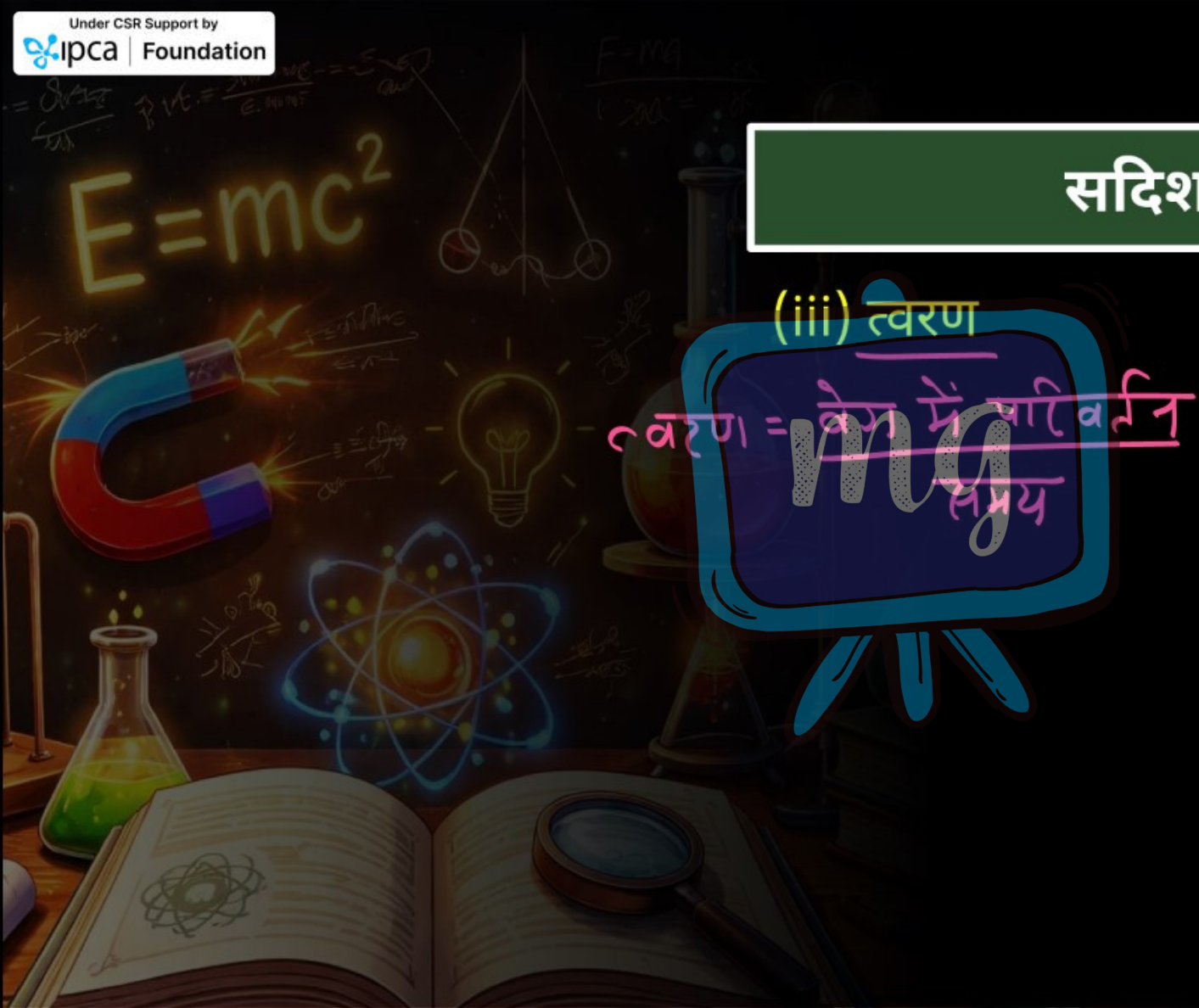

(iii) त्वरण

त्वरण = वेग में परिवर्तन / समय

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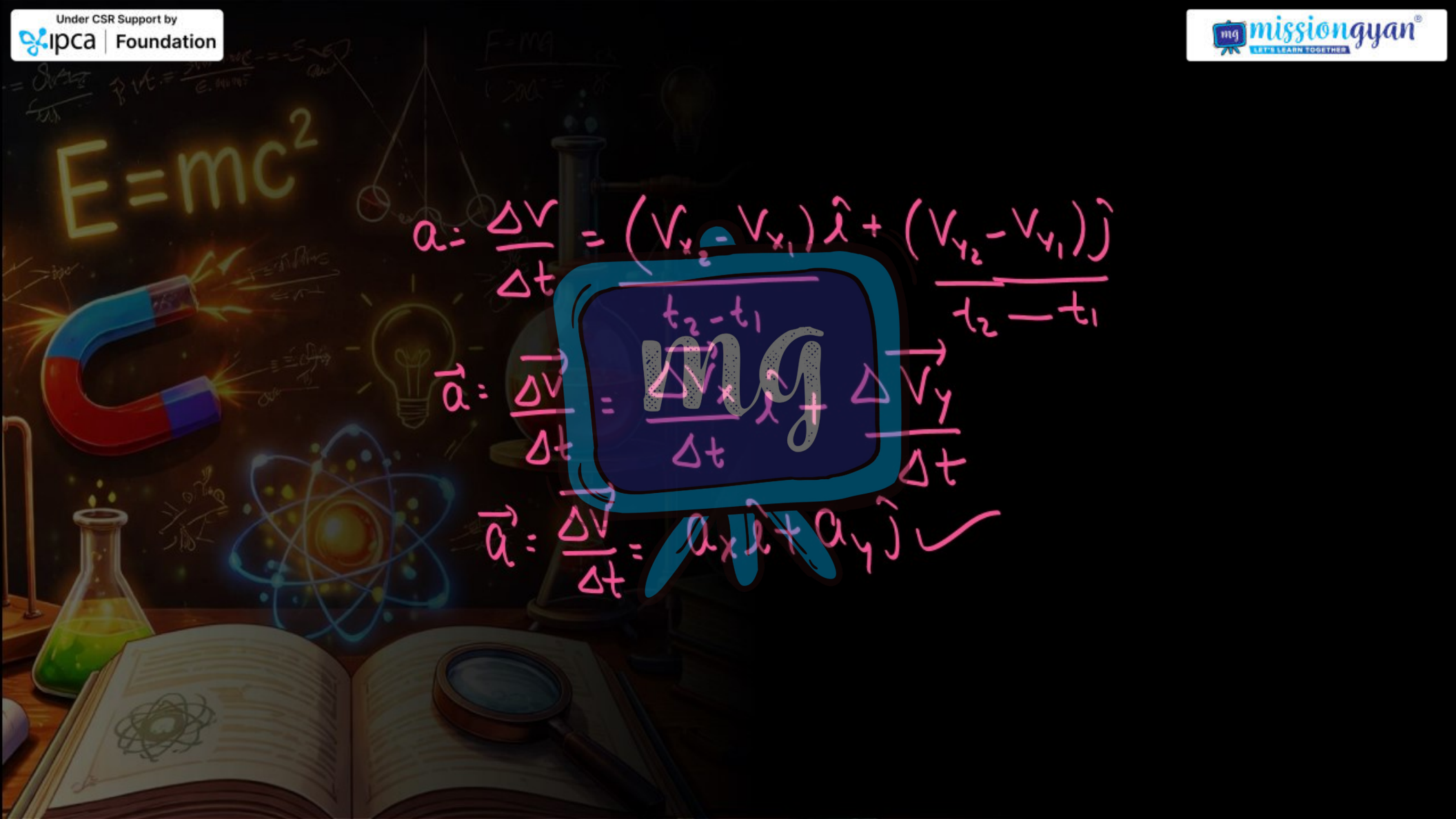

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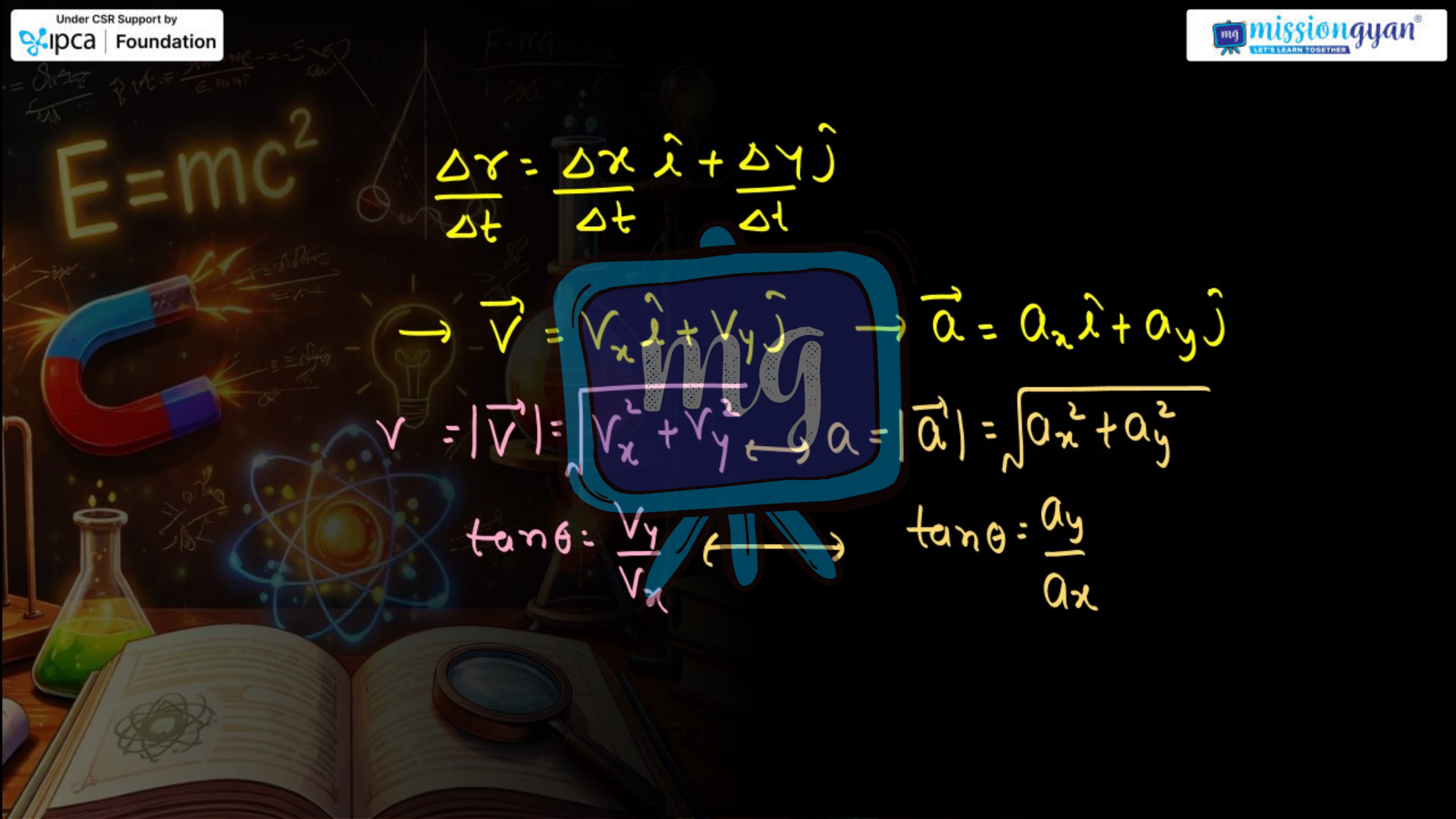

$$\frac{\Delta \vec{r}}{\Delta t} = \frac{\Delta x}{\Delta t}\hat{i} + \frac{\Delta y}{\Delta t}\hat{j}$$

$$\vec{v} = v_x\hat{i} + v_y\hat{j} \qquad \vec{a} = a_x\hat{i} + a_y\hat{j}$$

$$v = |\vec{v}| = \sqrt{v_x^2 + v_y^2} \qquad a = |\vec{a}| = \sqrt{a_x^2 + a_y^2}$$

$$\tan\theta = \frac{v_y}{v_x} \qquad \tan\theta = \frac{a_y}{a_x}$$

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