
समस्त बिहार, भरेगा हुंकार
HUNKAR
2025
में आपका स्वागत हैं

HUNKAR 2025

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PHYSICS

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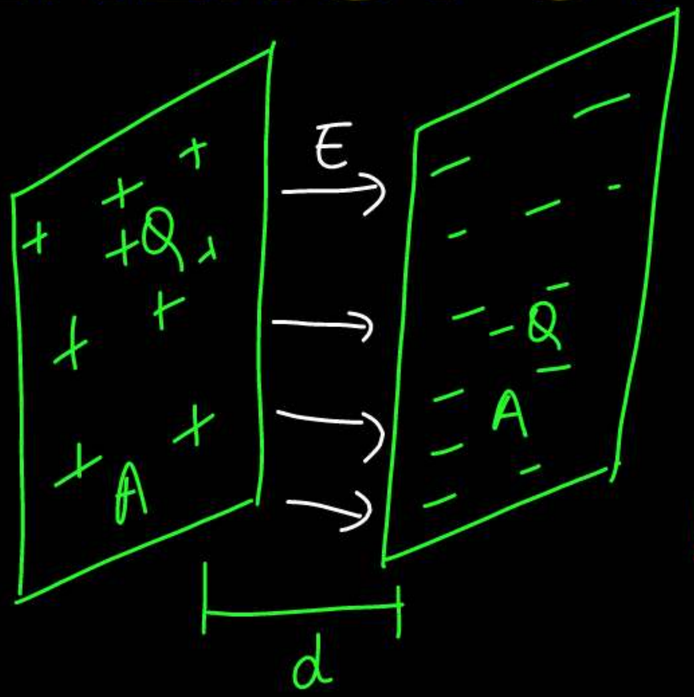
अध्याय 02

Combination of capacitor
संधारित्रों का संयोजन

आज का टॉपिक

ENERGY STORED IN CAPACITOR



$\therefore \sigma = \frac{Q}{A}$ $E = \frac{\sigma}{2\varepsilon_0} = \frac{Q}{2A\varepsilon_0}$

$F = Q \cdot \frac{Q}{2A\varepsilon_0}$

$$\boxed{F = \frac{Q^2}{2A\varepsilon_0}}$$

$\text{Work} = F \cdot d$

$W = \frac{Q^2 d}{2A\varepsilon_0}$

$U = \frac{1}{2}\frac{Q^2 d}{A\varepsilon_0}$

$\therefore C = \frac{\varepsilon_0 A}{d}$

$U = \frac{1}{2}\frac{Q^2}{\left(\frac{A\varepsilon_0}{d}\right)}$

$\therefore C = \frac{Q}{V}$

$Q = CV$

$$\boxed{U = \frac{1}{2}\frac{Q^2}{C}}$$

$U = \frac{1}{2}\frac{C^2V^2}{C}$

$$\boxed{U = \tfrac{1}{2}CV^2}$$

$U = \frac{1}{2}Q \cdot V^2$

$$\boxed{U = \tfrac{1}{2}QV}$$

ENERGY STORED IN CAPACITOR

INTEGRATION METHOD

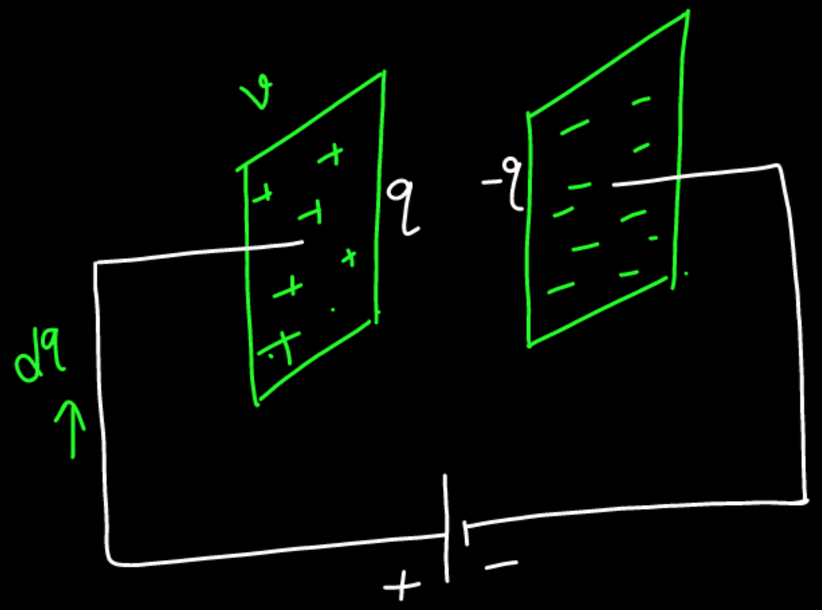
$$V = \frac{dW}{dq}$$

$$dW = V \cdot dq$$

$$C = \frac{Q}{V}$$

$$C = \frac{q}{v}$$

$$V = \frac{q}{C}$$



$$dW = v \cdot dq$$

$$dW = \frac{q\,dq}{C}$$

$$W = \frac{1}{C}\int_0^Q q\,dq$$

$$W = \frac{1}{C}\left(\frac{q^2}{2}\right]_0^Q$$

$$W = \frac{1}{C}\left(\frac{Q^2}{2} - 0\right)$$

$$W = \frac{1}{2}\frac{Q^2}{C}$$

$$U = \frac{1}{2}\frac{Q^2}{C}$$

$$U = \frac{1}{2}CV^2$$

$$U = \frac{1}{2}QV$$

⊛

$$\int x^n \, dx = \frac{x^{n+1}}{n+1} \qquad \int x^5 \, dx = \frac{x^6}{6}$$

$$\int x \, dx = \frac{x^2}{2}$$

$$\int q \cdot dq = \frac{q^2}{2}$$

ENERGY DENSITY

ऊर्जा घनत्व

Energy stored per unit volume of a parallel plate capacitor is called energy density of parallel plate capacitor.

किसी समानांतर पट संधारित्र के इकाई आयतन में जमा ऊर्जा उस संधारित्र का ऊर्जा घनत्व कहलाता है।

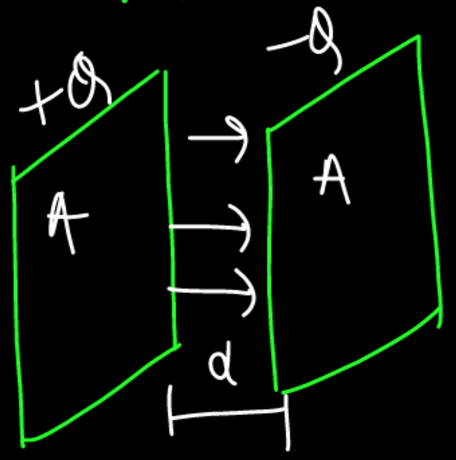
$$u = \frac{U}{\text{Volume}} = \frac{\text{Total Energy}}{\text{Volume}}$$

Energy density

आयतन

$$\sigma = \frac{Q}{A}$$

$$E = \frac{\sigma}{\varepsilon_0}$$



$$U = \frac{1}{2}\frac{Q^2 d}{A\varepsilon_0}$$

$$\text{Volume} = Ad$$

$$u = \frac{1}{2}\frac{Q^2 d}{A\varepsilon_0 A d}$$

$$u = \frac{1}{2}\frac{Q^2}{A^2\varepsilon_0}$$

$$u = \frac{1}{2}\frac{\sigma^2}{\varepsilon_0}\frac{\varepsilon_0}{\varepsilon_0}$$

$$u = \frac{1}{2}\frac{\sigma^2}{\varepsilon_0^2}\cdot\varepsilon_0$$

$$\boxed{u = \frac{1}{2}E^2\varepsilon_0}$$ V.V.G

⊛ Capacitor

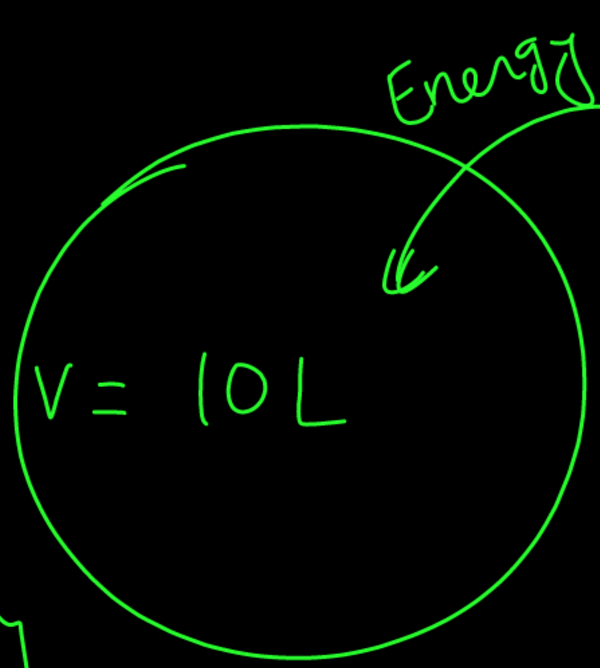
$$C = \frac{\varepsilon_0}{Ad}$$

$$F = \frac{Q^2}{2A\varepsilon_0}$$

$$W = \frac{Q^2 d}{2A\varepsilon_0}$$

$$U = \frac{1}{2} C V^2$$

$$U = \frac{1}{2} \varepsilon_0 E^2$$



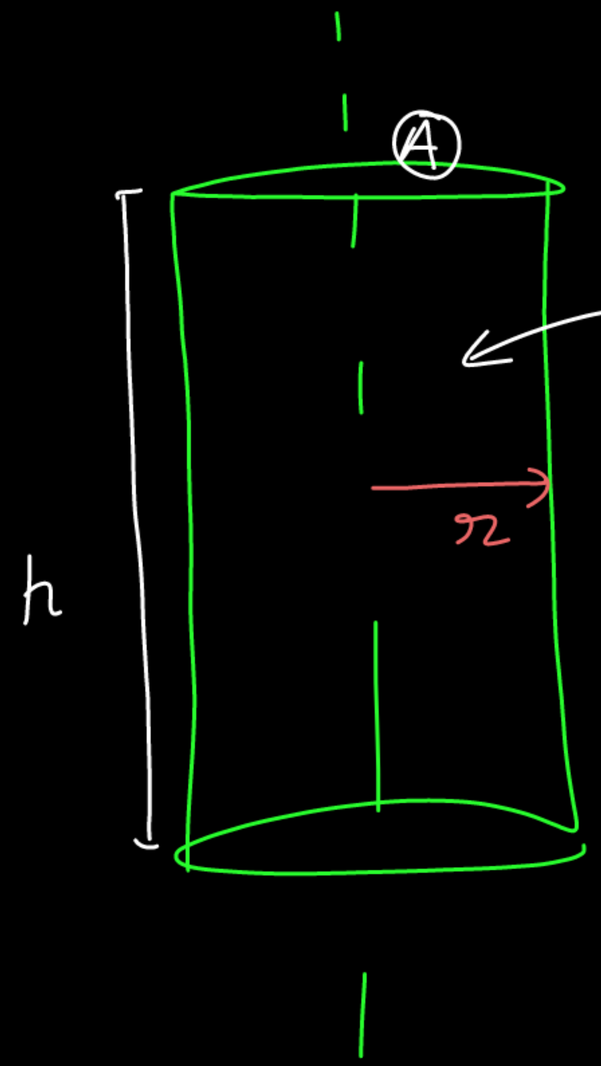
$$\text{Energy density} = \frac{E}{\text{Volume}}$$

$U \rightarrow$ Energy

$V =$ Volume

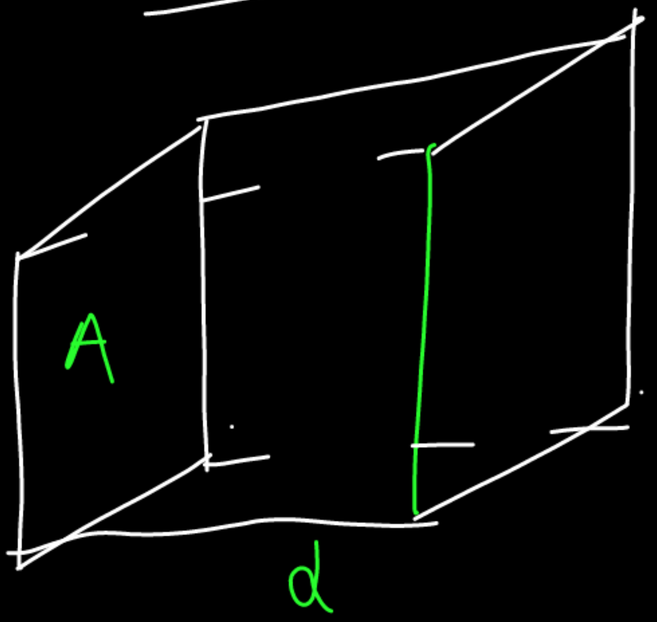
$u =$ ऊर्जा घनत्व
Energy density

ऊर्जा घनत्व $= \boxed{\frac{U}{\text{Volume}} = u}$



आयतन
Volume $= \boxed{\pi r^2 h}$

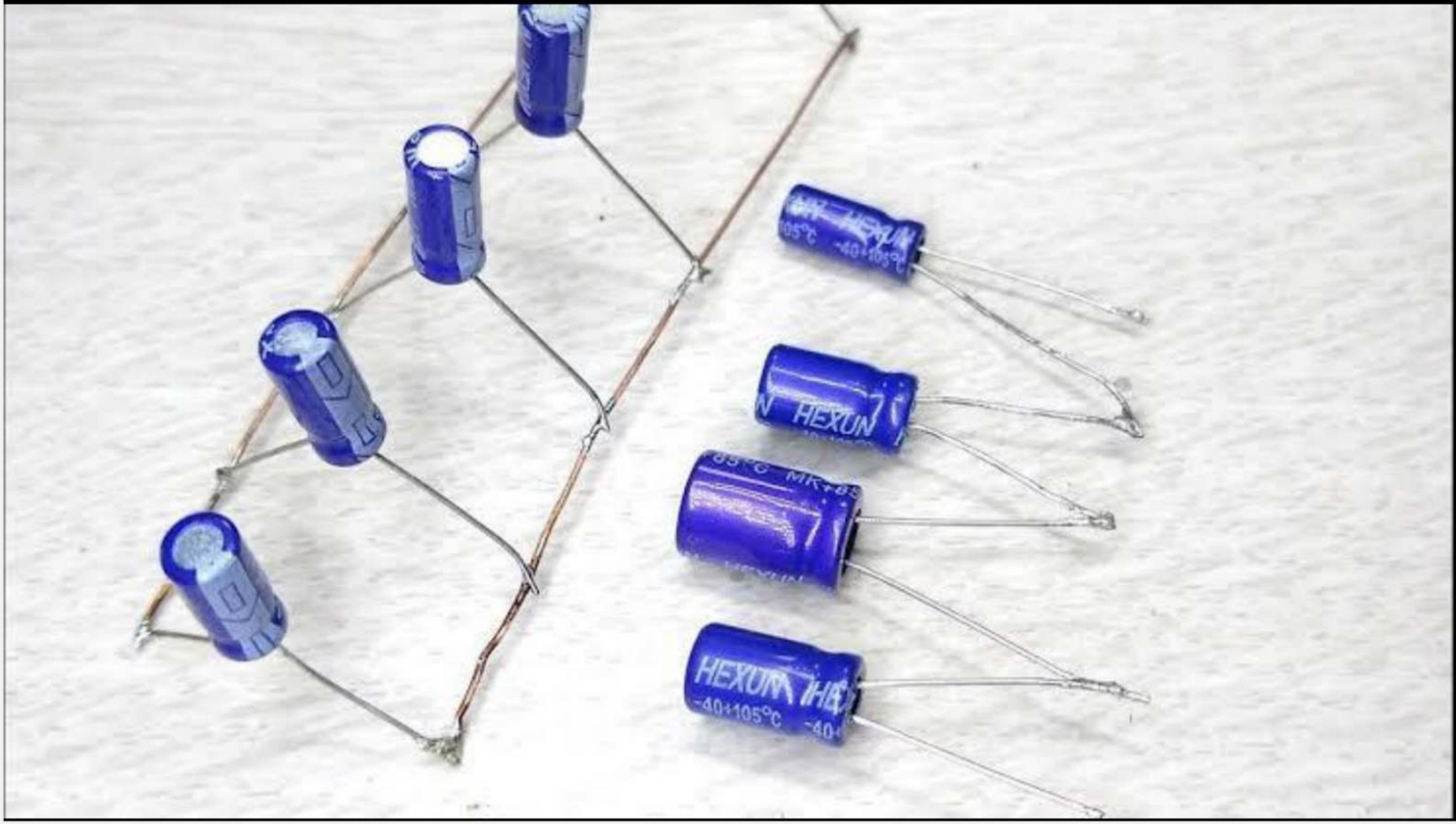
$= \underline{A h}$

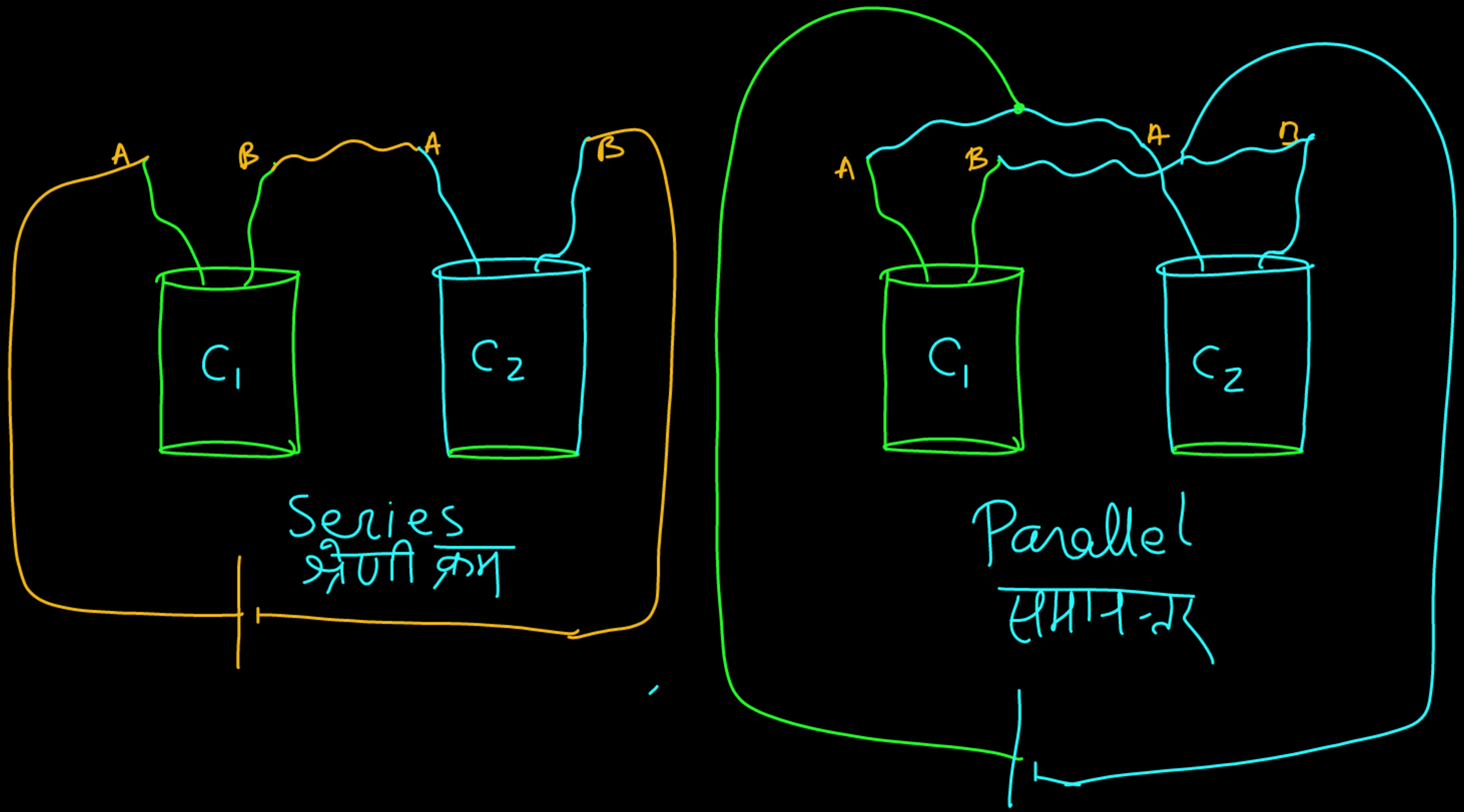


Volume $= \underline{8 m^3}$

Volume $= \boxed{Ad}$

COMBINATION OF CAPACITORS




A
B
A
B
C1
C2
Series
श्रेणी क्रम
A
B
A
B
C1
C2
Parallel
समान्तर

EQUIVALENT CAPACITANCE

समतुल्य धारिता

If number of capacitors are replaced by one capacitor which can store same amount of charge that all the capacitors can store then the capacitance of that capacitor is called equivalent capacitance.

यदि किसी परिपथ में बहुत सारे संधारित्र जुड़े हो तो उन सभी संधारित्र को एक संधारित्र से स्थानांतरित किया जाए और वह उतना ही आवेश जमा कर पाए जितना सभी मिलकर जमा करते हैं तो उस संधारित्र की धारिता समतुल्य धारिता कहलाती है