PRAYAS

JEE 2025

Lecture - 06

Physics

(Mini Lecture)

Capacitor

By- Saleem Ahmed Sir

Topics *to be covered*

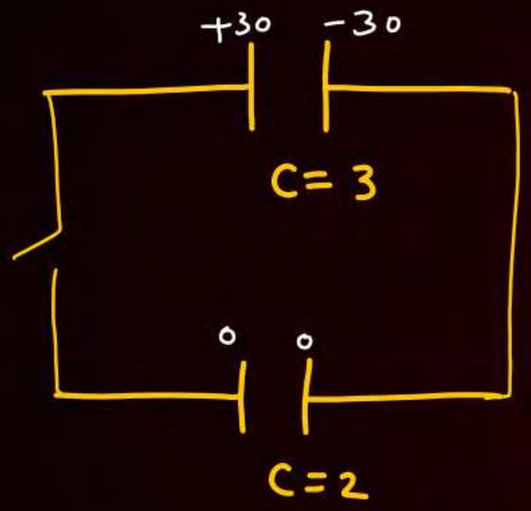
1. Two Capacitor Connection

ATDB.uno

2.

3.

4.



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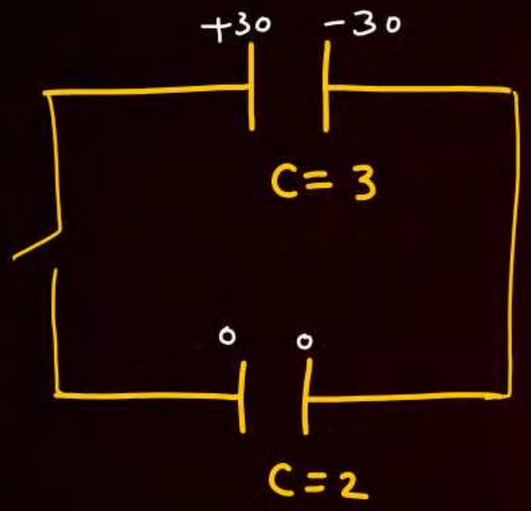
V ⟶ Same

$$V = \frac{x}{3} = \frac{30-x}{2}$$

$$2x = 90 - 3x$$

$$\boxed{x = 18}$$



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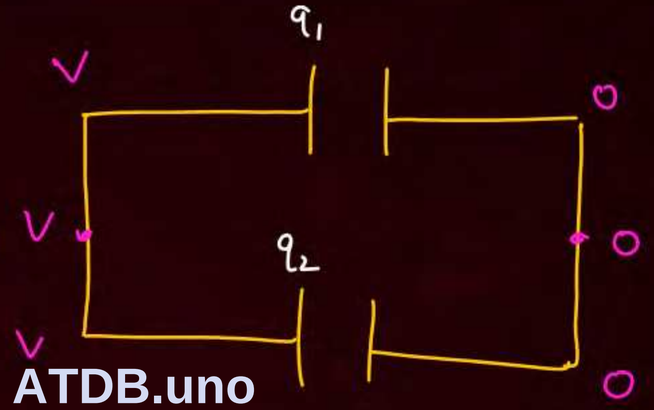


$V = V_{\text{common potential}}$

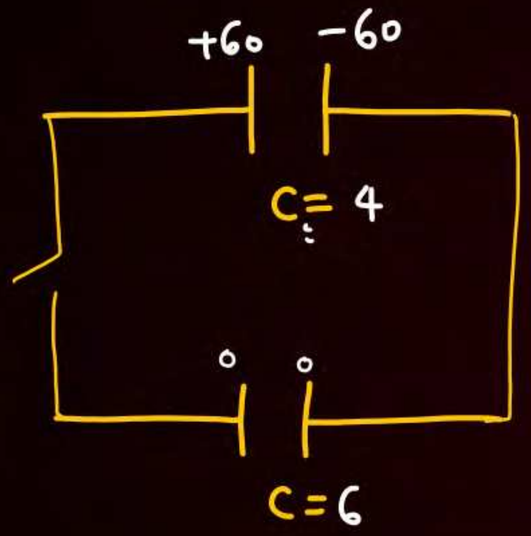
$$q_1 + q_2 = 30$$

$$3V + 2V = 30$$

$$\boxed{V = 6}$$

$$q_1 = 3 \times 6 = 18$$

$$q_2 = 2 \times 6 = 12$$



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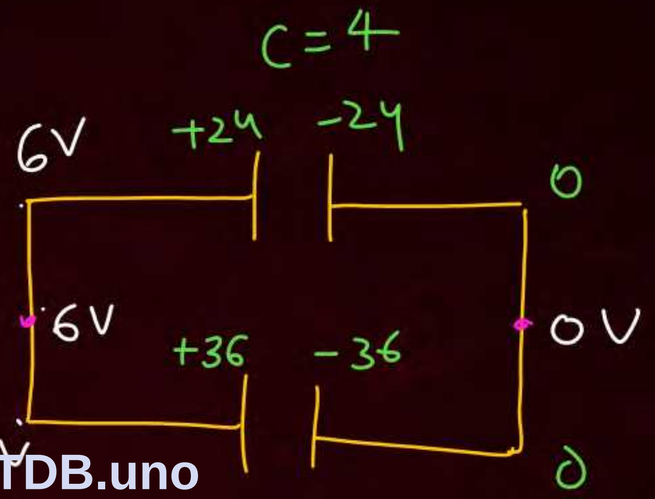
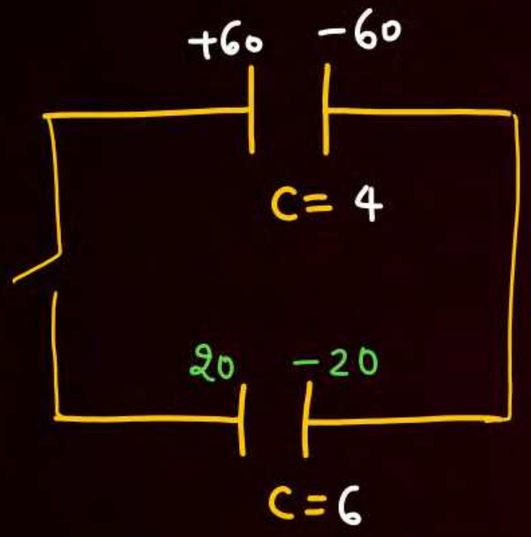


$60 = 10 \times V_c$

$V_c = 6$



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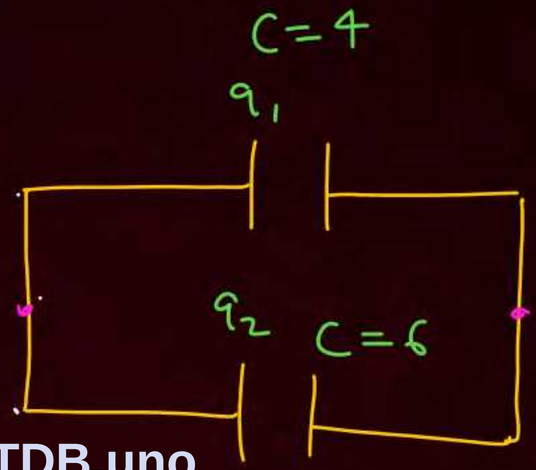
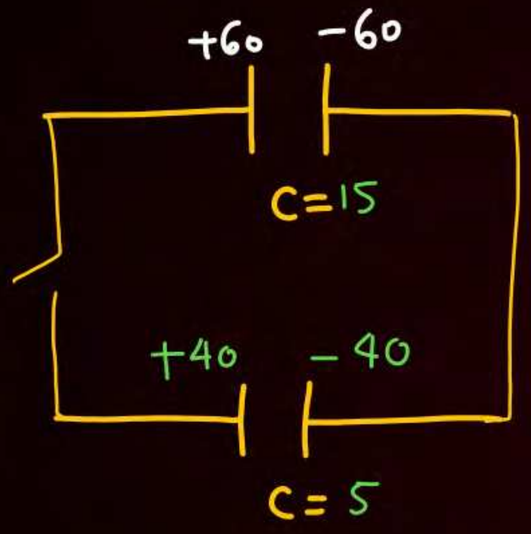


$60 + 20 = (6+4)\,V$

$V = 8$

$q_1 = 32$

$q_2 = 48$



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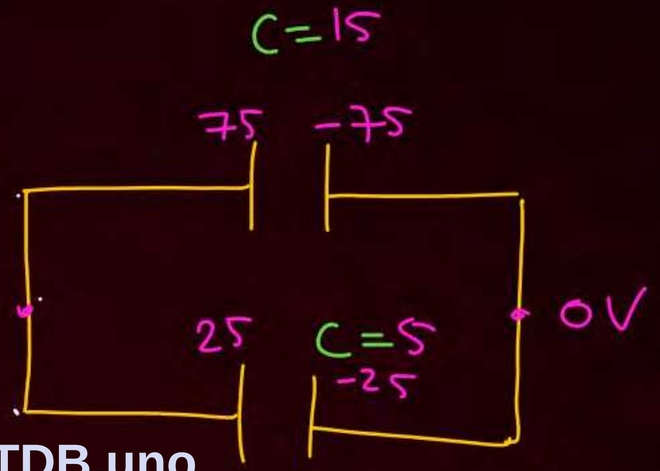
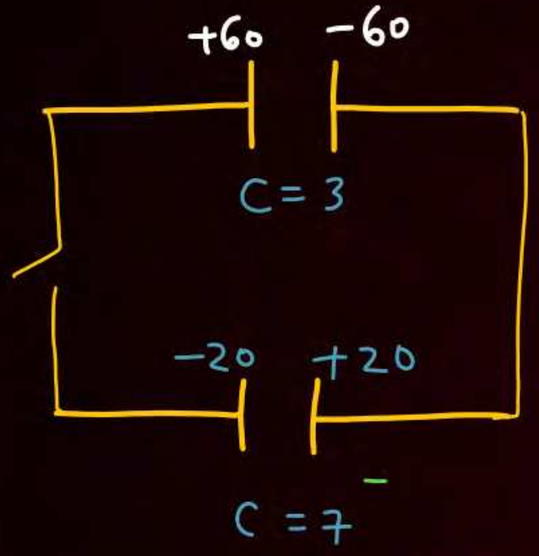


$60 + 40 = 100 = (15+5)\,V$

$V = 5$



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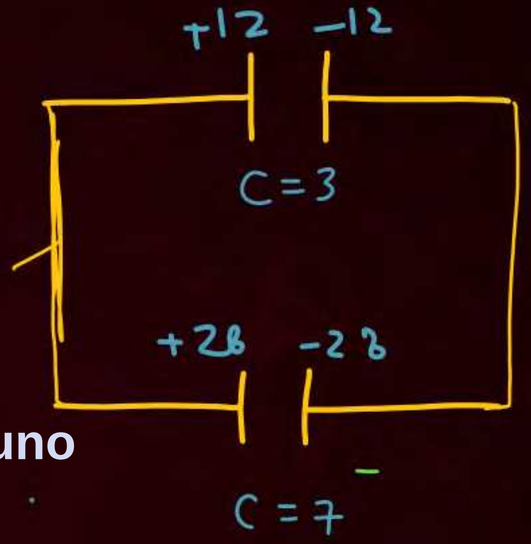
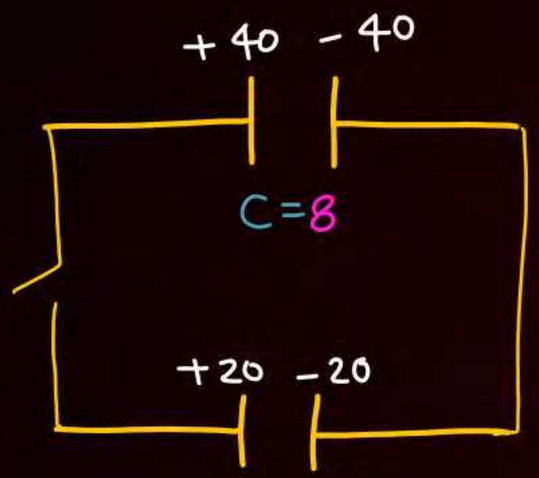


$$Q_{net} = C_{eq} \cdot V$$

$$40 = 10\,V$$

$$V = 4$$



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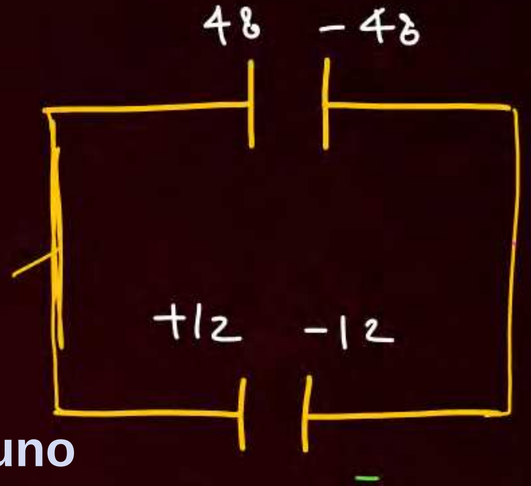


$V_{comm} = 6$ Volt

$$U_i = \frac{1}{2}\frac{(40)^2}{8} + \frac{1}{2}\frac{(20)^2}{2}$$

$$= 100 + 100 = 200$$

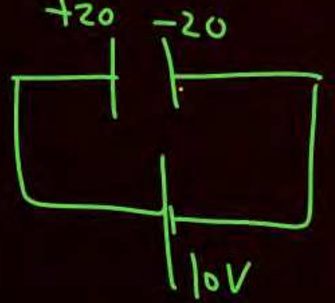
$$U_f = \frac{1}{2} \times 8 \times 6^2 + \frac{1}{2} \times 2 \times 6^2$$

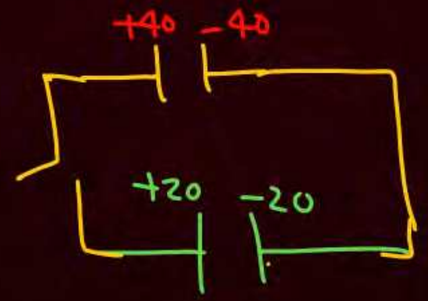
$$= 144 + 36 = 180$$

$$\text{heat loss} = 200 - 180$$

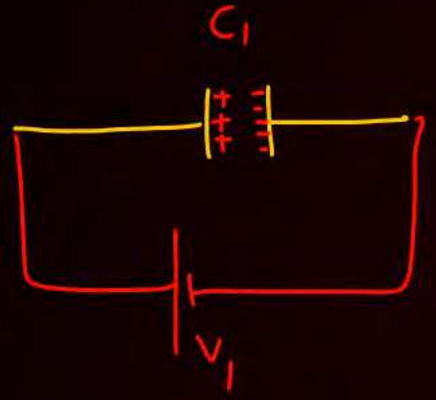
Q A capacitor $C_1 = 8\,F$ is fully charge from a battery of 5 volt. and an another capacitor of $C_2 = 2\,F$ is also fully charge with battery of emf 10 Volt. Now both capacitor are disconnected from their battery & connect each other such that positive plate of one plate is connected to positive plate of another capacitor. find ① common potential ② heat loss

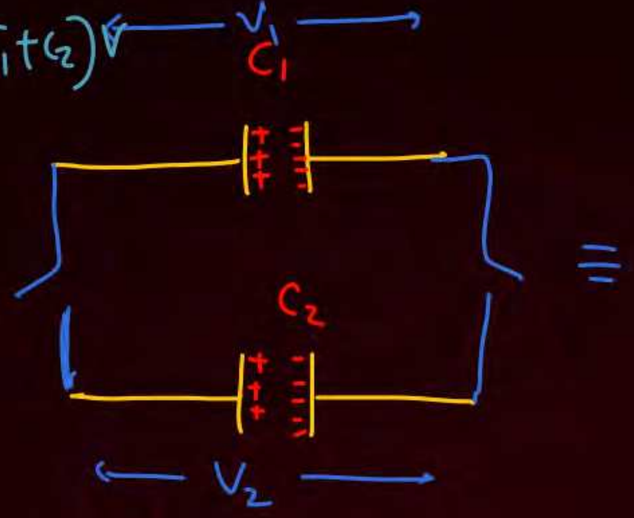
Soln





$C_1V_1 + C_2V_2 = (C_1+C_2)V$





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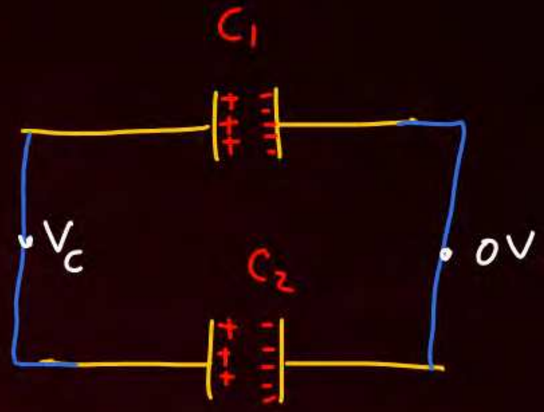
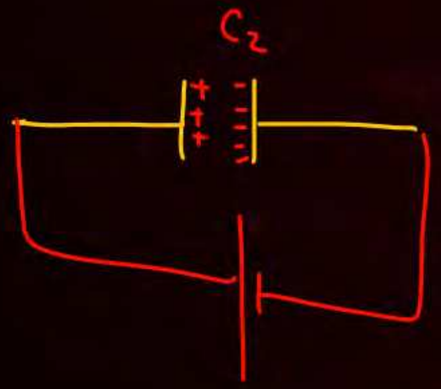


$$V_C = \frac{C_1V_1 + C_2V_2}{C_1+C_2}$$

$$\text{heat loss} = \frac{1}{2}\left(\frac{C_1C_2}{C_1+C_2}\right)(V_1-V_2)^2$$



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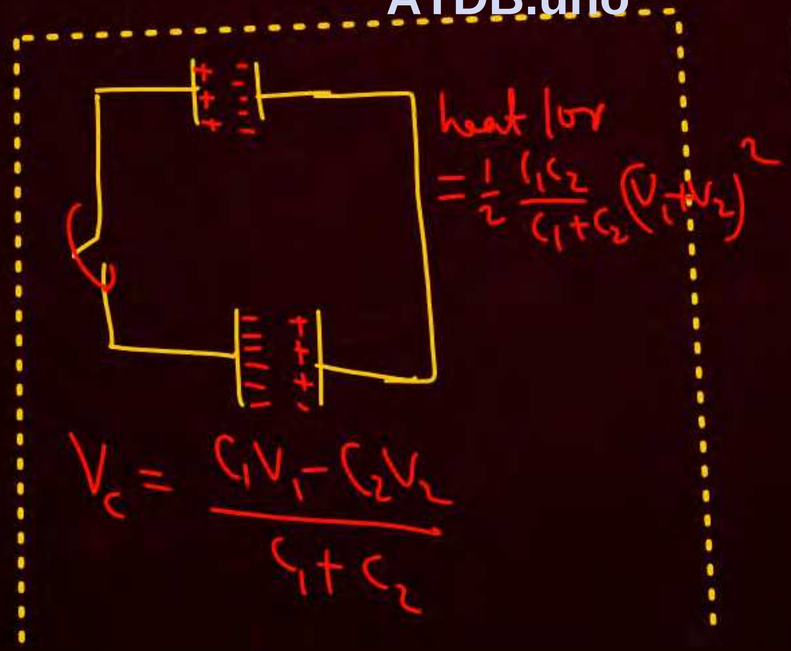

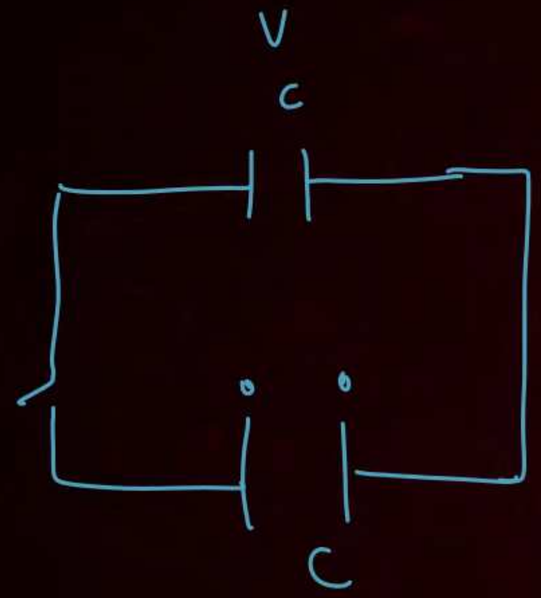

$$\text{heat loss} = \frac{1}{2}\left(\frac{C \times C}{C + C}\right)(V - 0)^2$$

ATDB.uno

$$\left(\frac{1}{2}C_1V_1^2+\frac{1}{2}C_2V_2^2\right)-\left(\frac{1}{2}C_1(V_C)^2+\frac{1}{2}C_2(V_C)^2\right)$$

$$=\frac{1}{2}C_1V_1^2+\frac{1}{2}C_2V_2^2-\frac{1}{2}(C_1+C_2)\left(\frac{C_1V_1+C_2V_2}{C_1+C_2}\right)^2=$$

$$\frac{1}{2}\left[\frac{C_1C_2\cdot\left[(V_1-V_2)^2\right]^2}{(C_1+C_2)}\right]$$