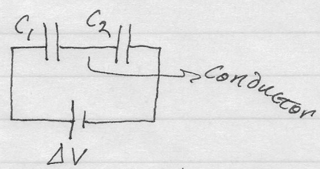
In Series

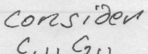


In this configuration,

$\Delta V = \Delta V_1 + \Delta V_2$

while $Q_1 = Q_2$ since charge in a conductor between C_1 + C_2

Let's consider some "equivalent" capacitor to



$$\Delta V = Q/C_{equiv.} = \Delta V_1 + \Delta V_2$$

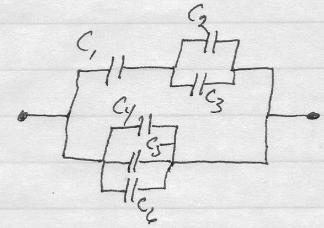
$$\frac{\cancel{Q}}{C_{eq.}} = \frac{\cancel{Q}}{C_1} + \frac{\cancel{Q}}{C_2}$$

$$\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2}$$

When in series, sum the inverses of each capacitance to get the equivalent capacitance.

NOTE: $C_{eq} < C_1, C_2$ always

Example:



What is Equivalent Capacitance?

$$C_{23} = C_2 + C_3 \; ; \; C_{456} = C_4 + C_5 + C_6$$

$$\frac{1}{C_{123}} = \frac{1}{C_1} + \frac{1}{C_{23}}$$

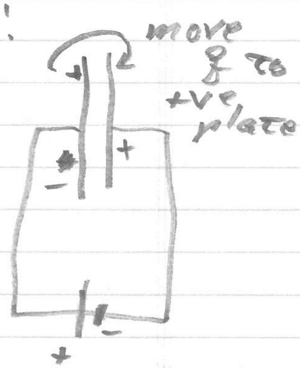
$$\underline{C_{TOT}} = C_{123} + C_{456}$$

$$\underline{= \left[\frac{1}{C_1} + \frac{1}{C_2 + C_3}\right]^{-1} + C_4 + C_5 + C_6}$$

1304 / 1404 L6, ~~p8~~ p11

Energy stored in charged cap.

Consider 2 plates:

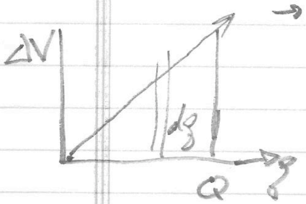


→ move +ve charge, dq, to + plate

(m=c) → initially, no work to move it

→ once some charge moved, work required

→ more + more as charge deposited



→ work required to move dq to +v plate (higher potential)

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

Total work, is

$$W = \int_0^Q \frac{q}{C}\,dq = \frac{1}{C}\int_0^Q q\,dq = \underline{\frac{Q^2}{2C}}$$

→ appears electric potential energy U

Energy stored in ch. cap.

$$\boxed{U = \frac{Q^2}{2C} = \frac{1}{2}Q\Delta V = \frac{1}{2}C(\Delta V)^2}$$