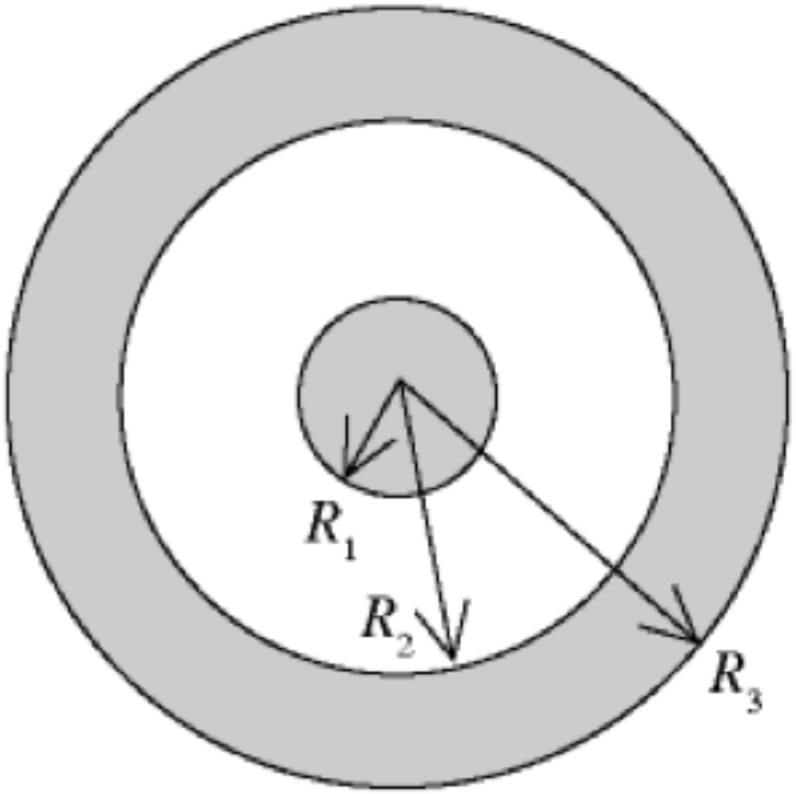
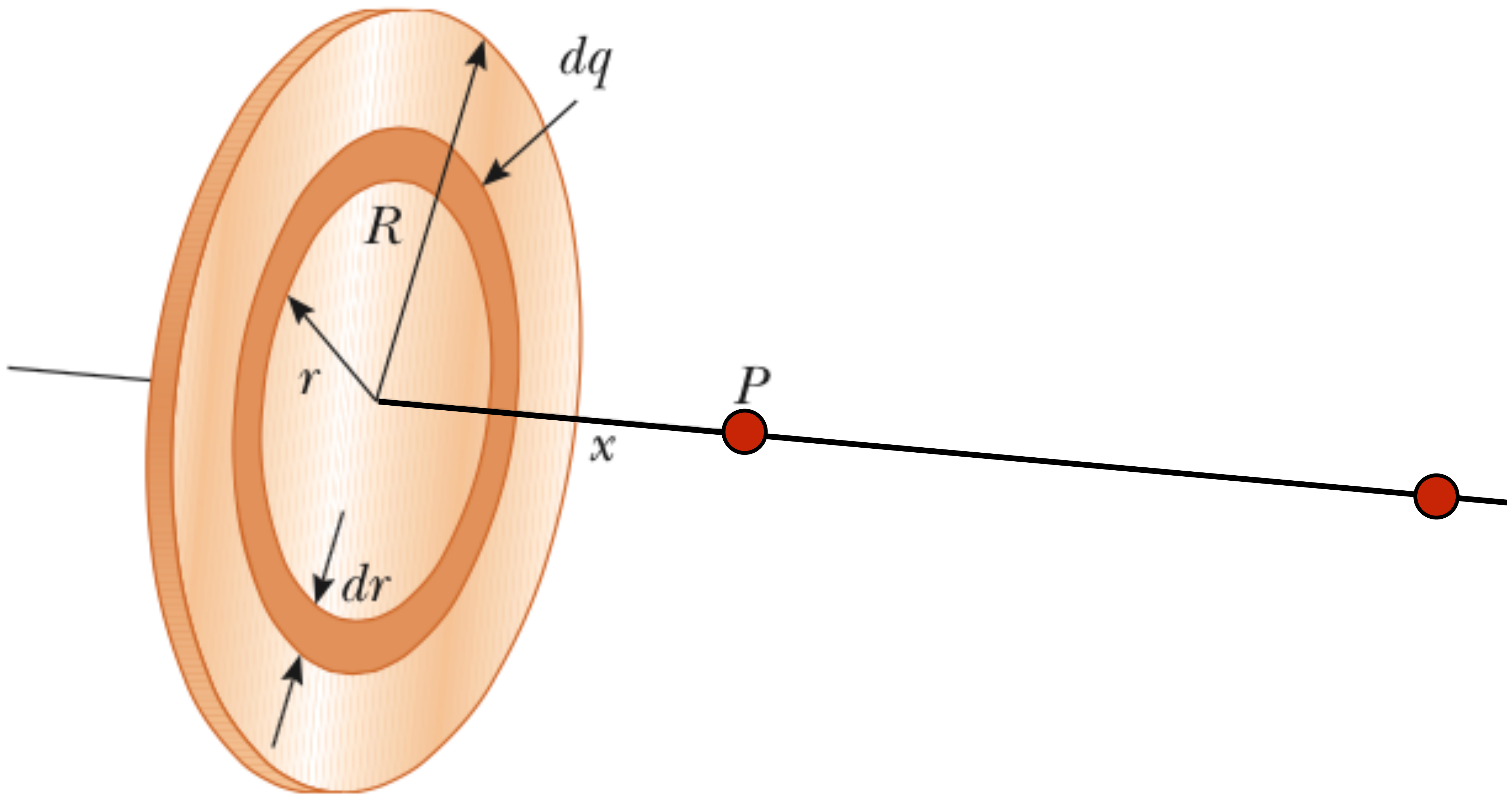
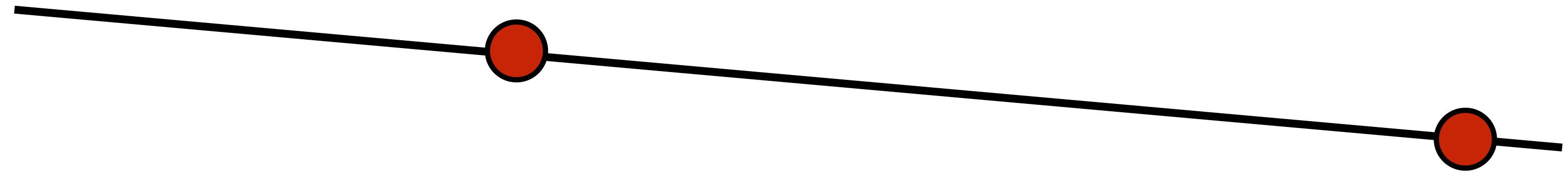

PH 220
Lance Nelson


R_1
R_2
R_3



dq
R
r
P
x
dr



Which set of equipotential surfaces matches this electric field?

A.

B.

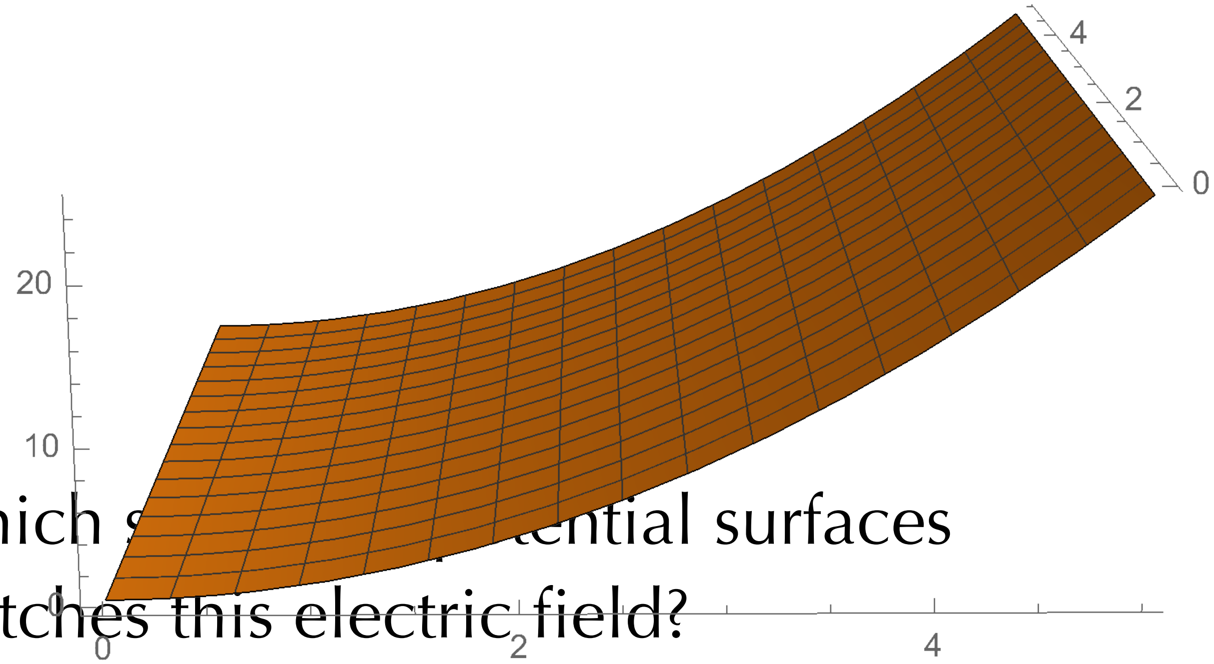
C.

D.

E.

F.

Question #2



Which s … tential surfaces matches this electric field?

A.

B.

C.

D.

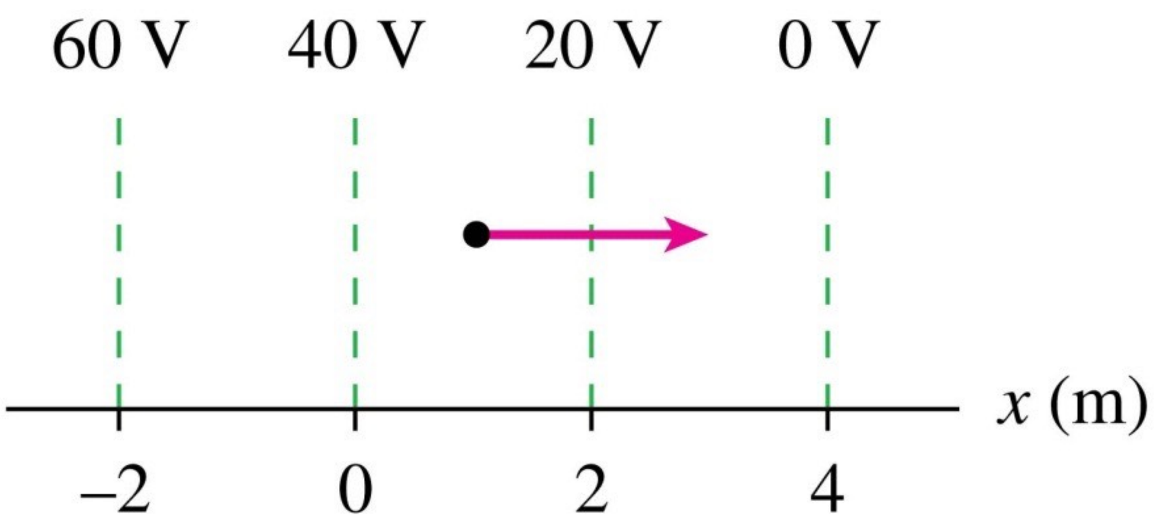
E.

F.

Question #3

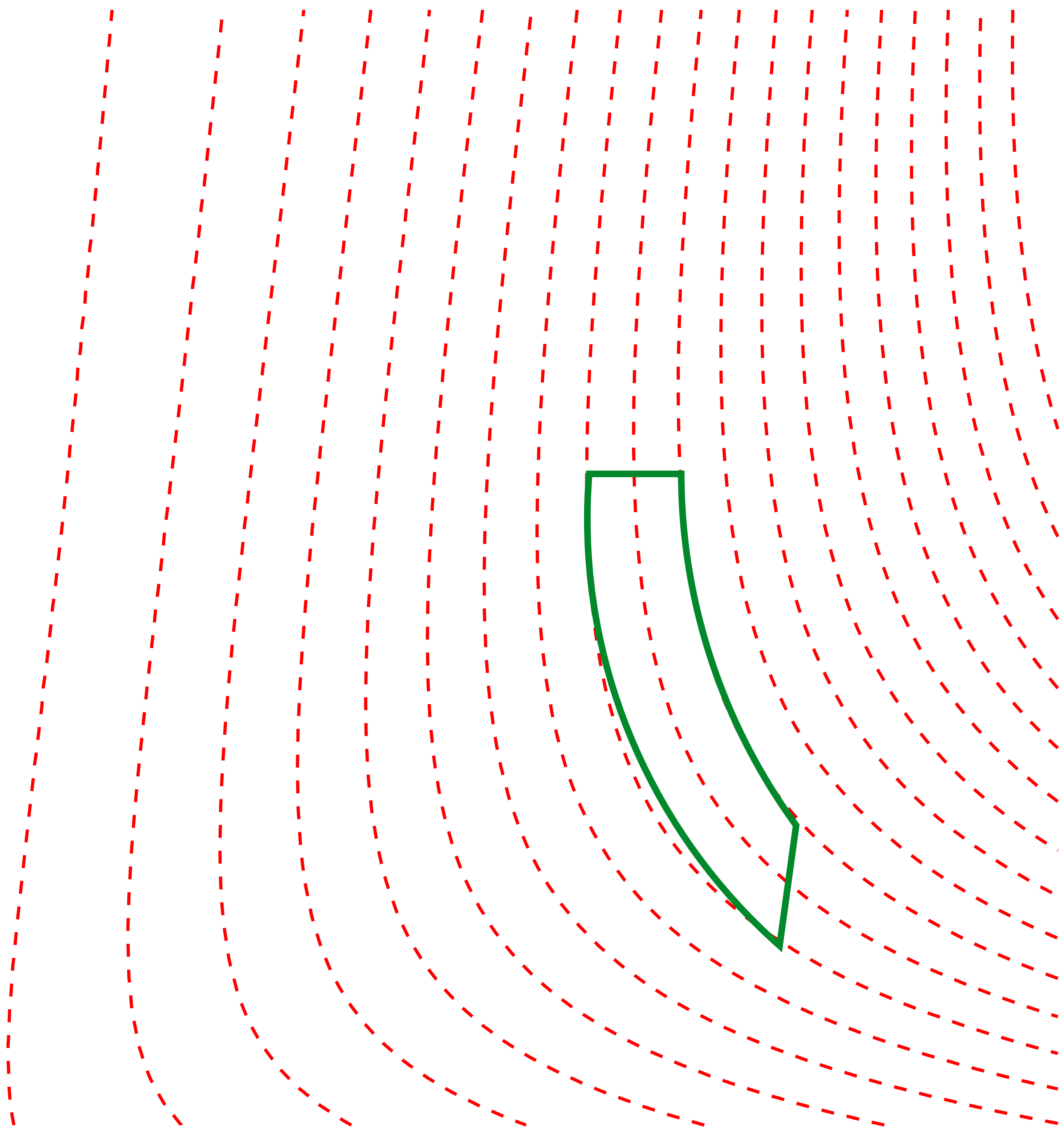
The electric field at the dot is

A. $30\hat{\imath}$ V/m.
B. $-10\hat{\imath}$ V/m.
C. $20\hat{\imath}$ V/m.
D. $10\hat{\imath}$ V/m.
E. $-30\hat{\imath}$ V/m.



Kirchoff's Loop

What is the potential difference for this closed path?



Kirchoff's Loop

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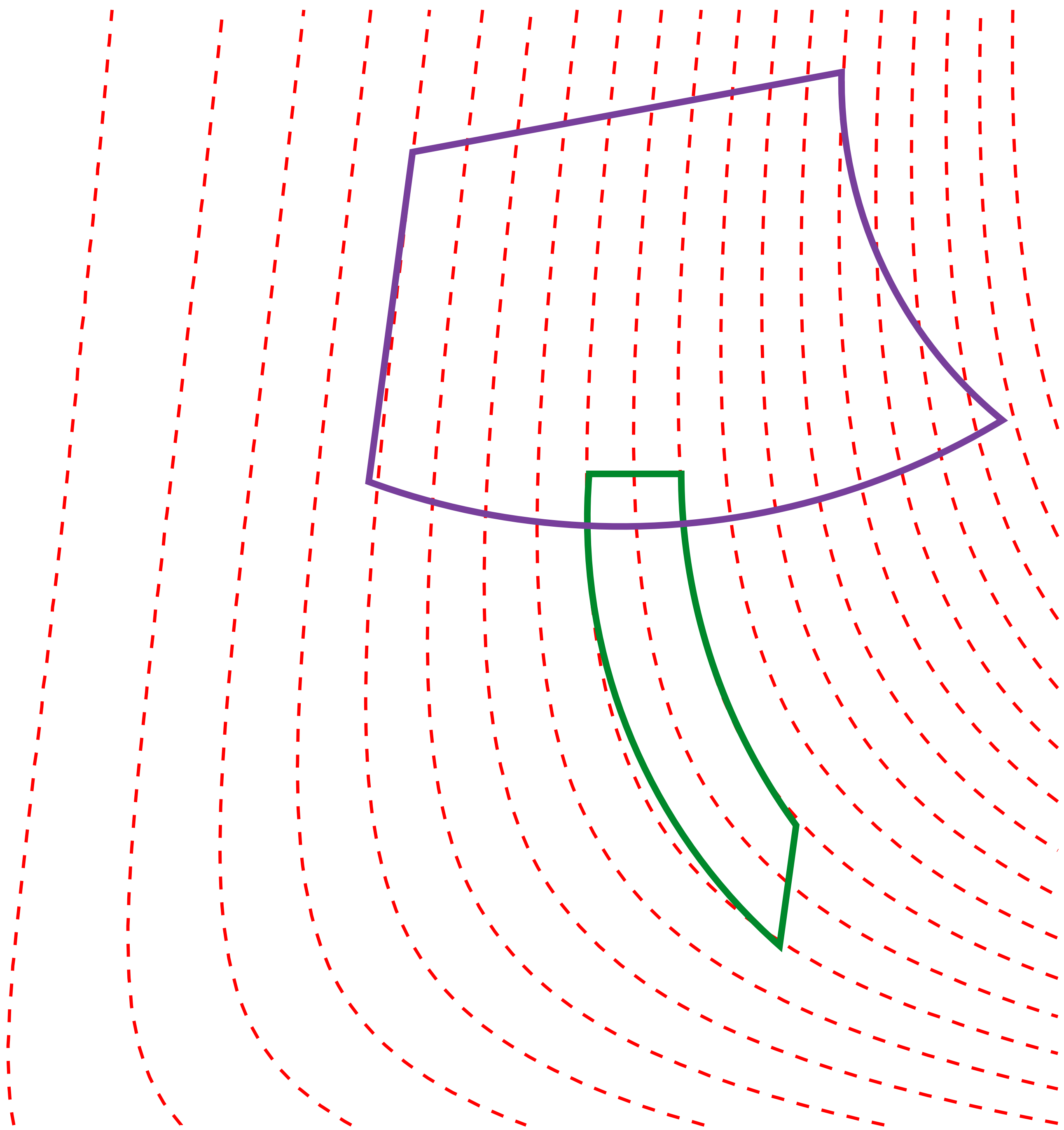
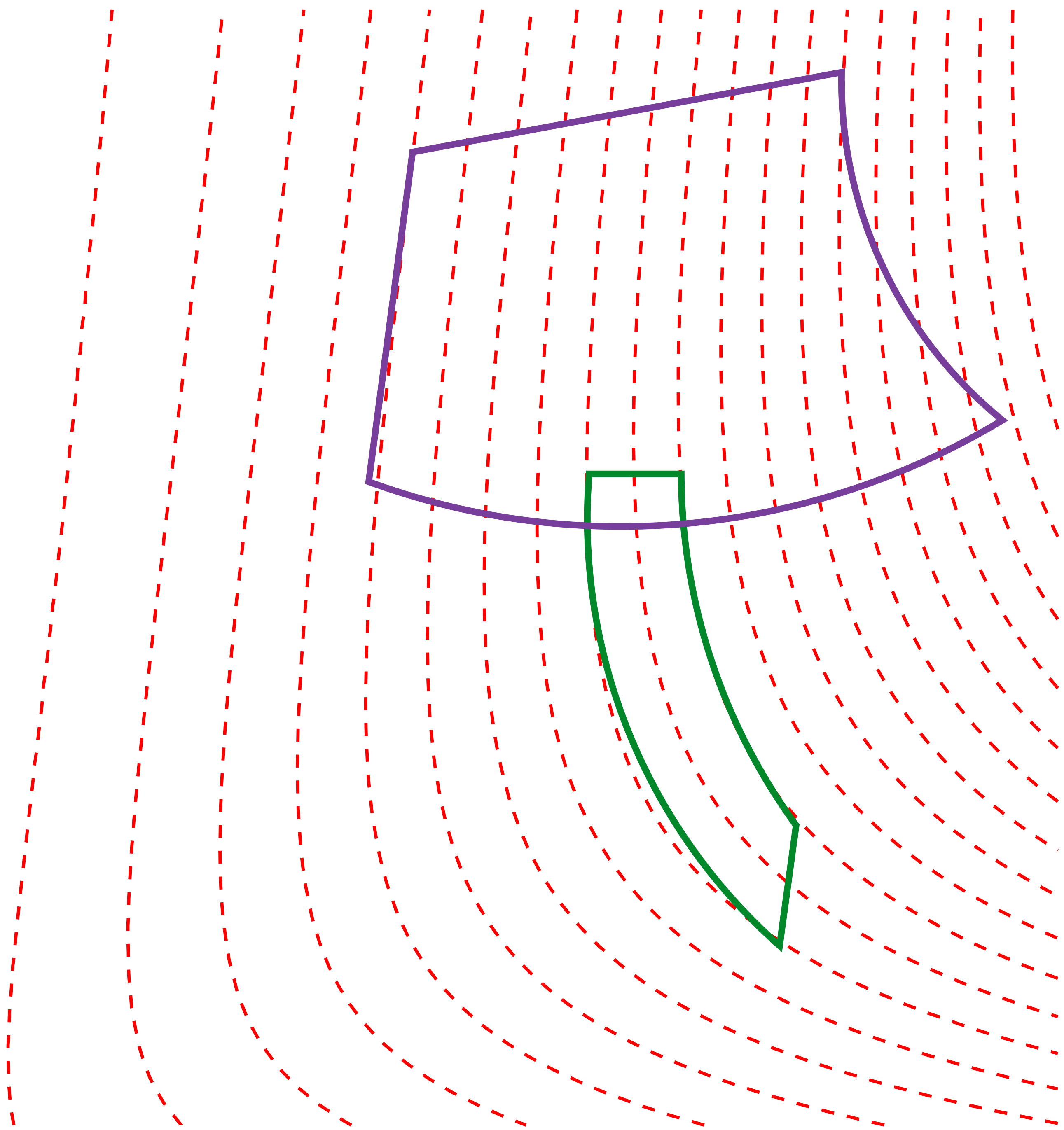


Kirchoff's Loop

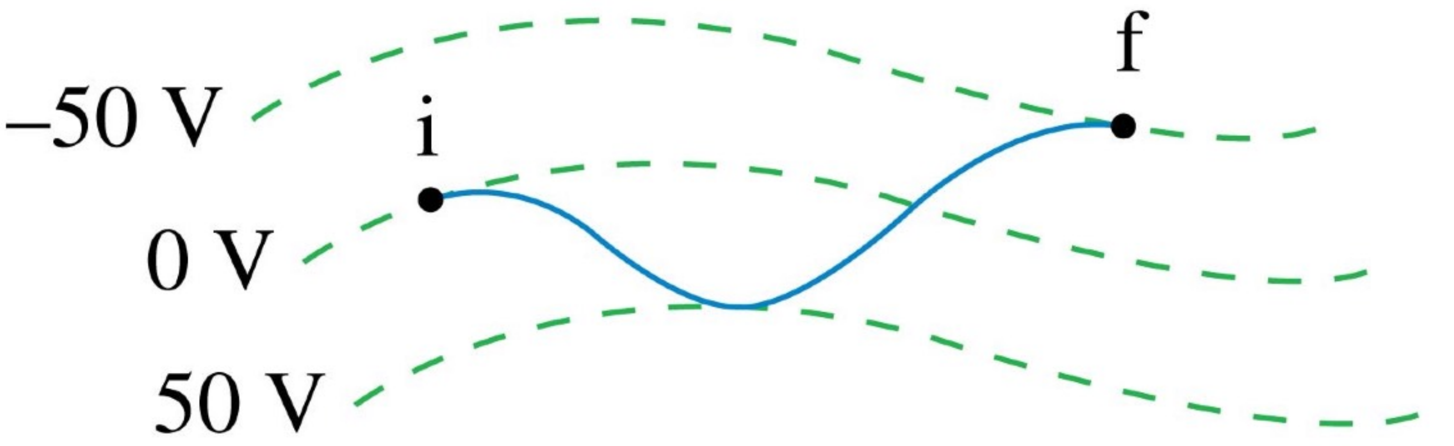
What is the potential difference for this closed path?

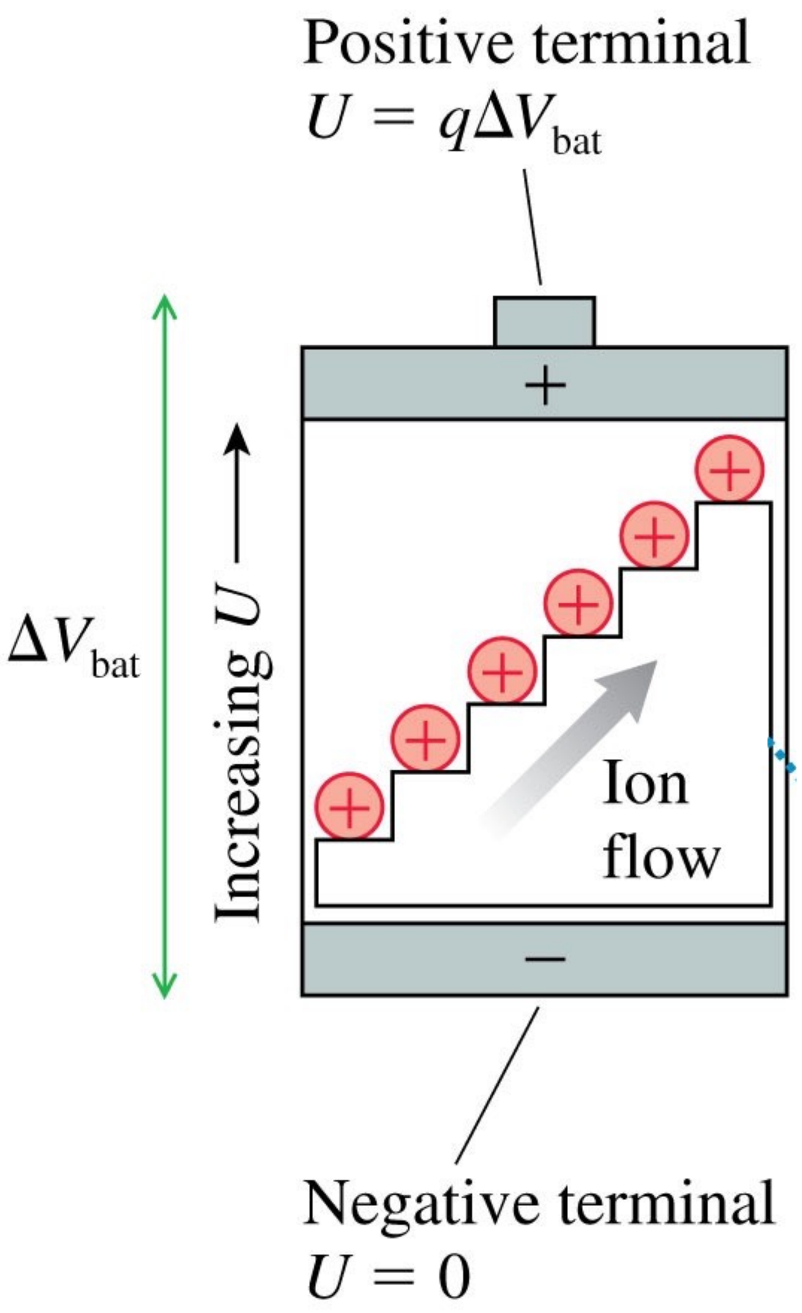
$$\Delta V_{\mathrm{loop}} = 0$$

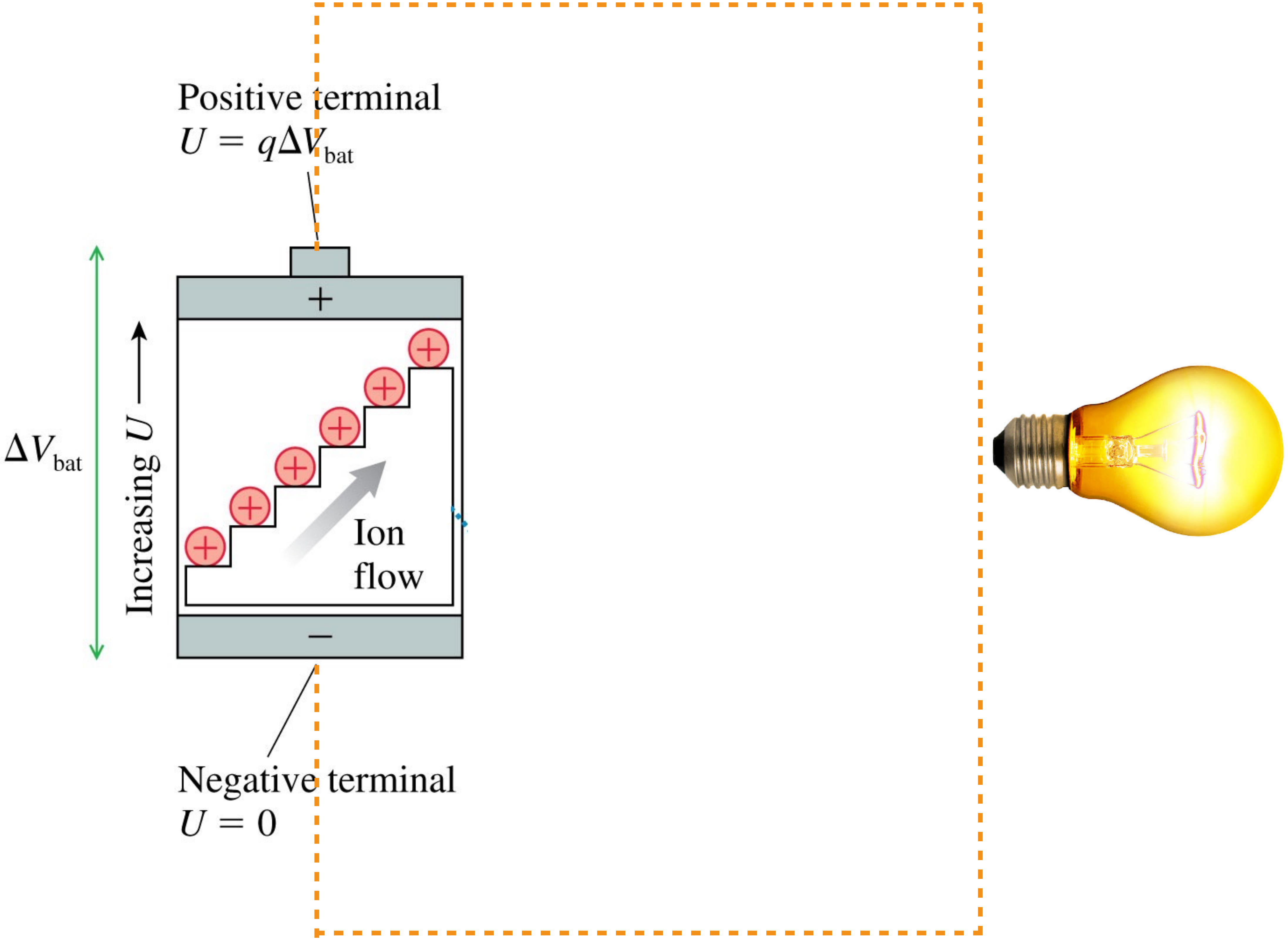


A particle follows the trajectory shown from initial position i to final position f. The potential difference ΔV *is*

A. 100 V.
B. 50 V.
C. 0 V.
D. –100 V.
E. –50 V.



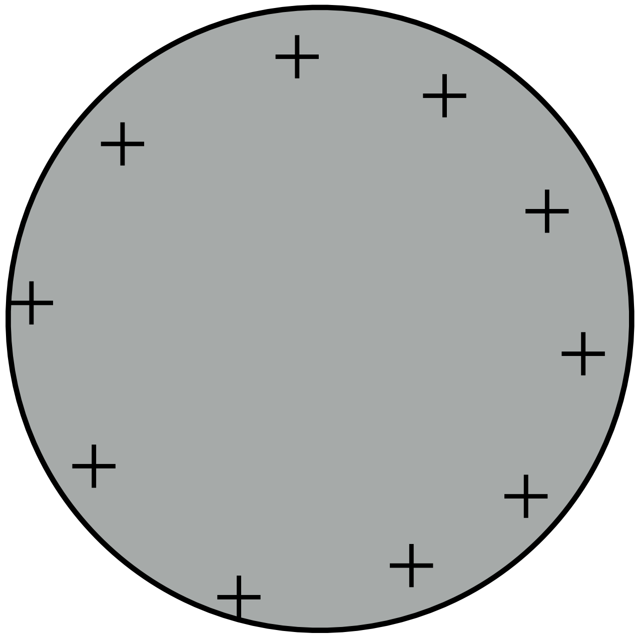

Positive terminal
$U = q\Delta V_{bat}$
ΔV_{bat}
Increasing U
+
Ion
flow
−
Negative terminal
$U = 0$


Positive terminal
$U = q\Delta V_{bat}$
ΔV_{bat}
Increasing U
Ion
flow
Negative terminal
$U = 0$

Conductors in equilibrium Question #5

If the amount of charge remains unchanged, what will happen to the electric field at the surface of this sphere if I shrink it down?

a) stay the same b) decrease c) increase



Conductors in equilibrium

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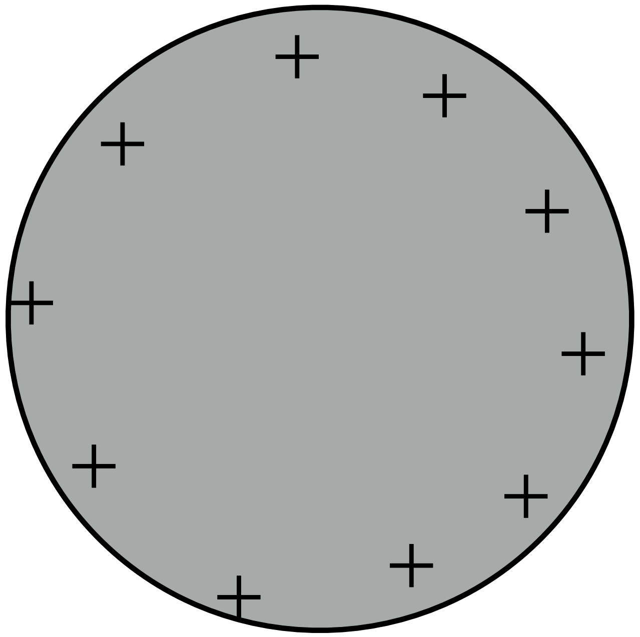
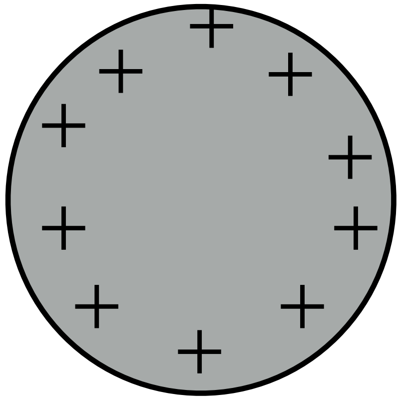




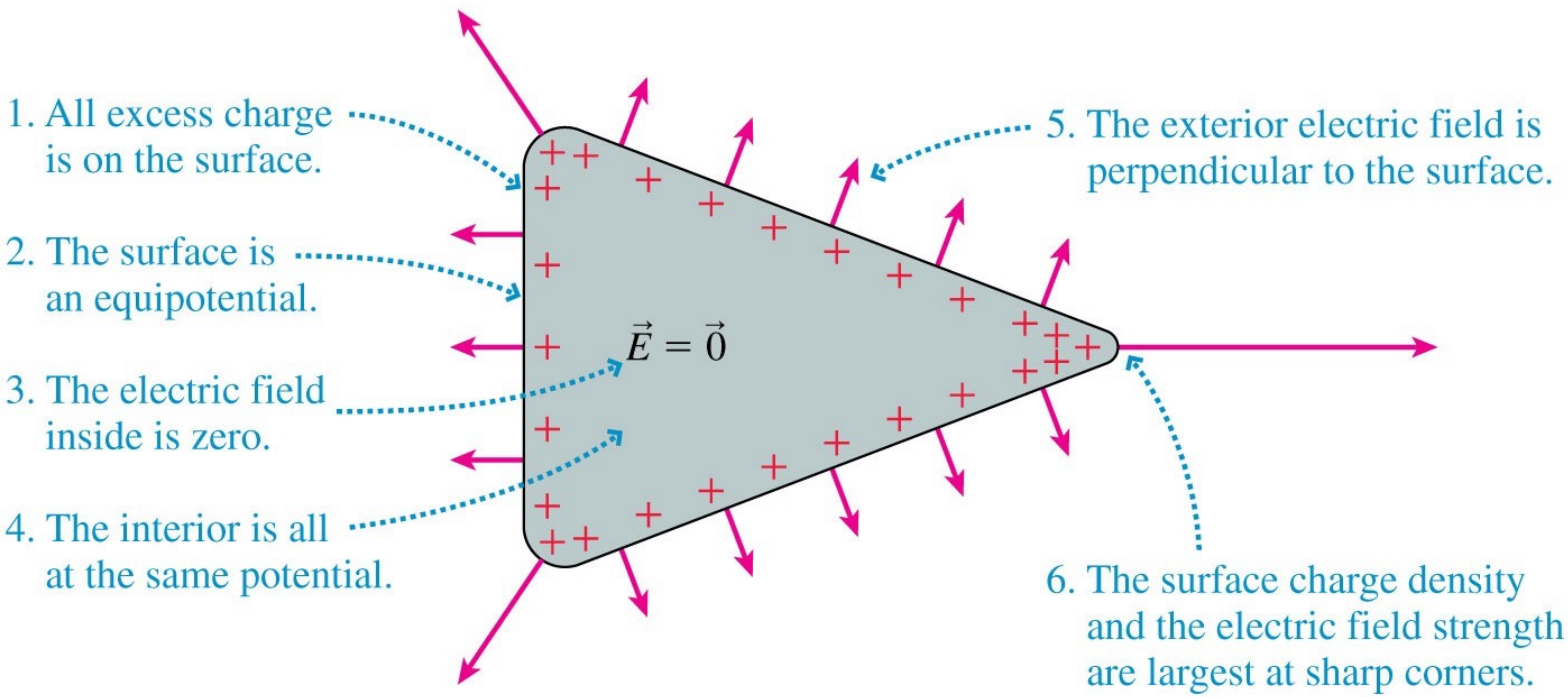
Conductors in equilibrium Question #5

If the amount of charge remains unchanged, what will happen to the electric field at the surface of this sphere if I shrink it down?

a) stay the same

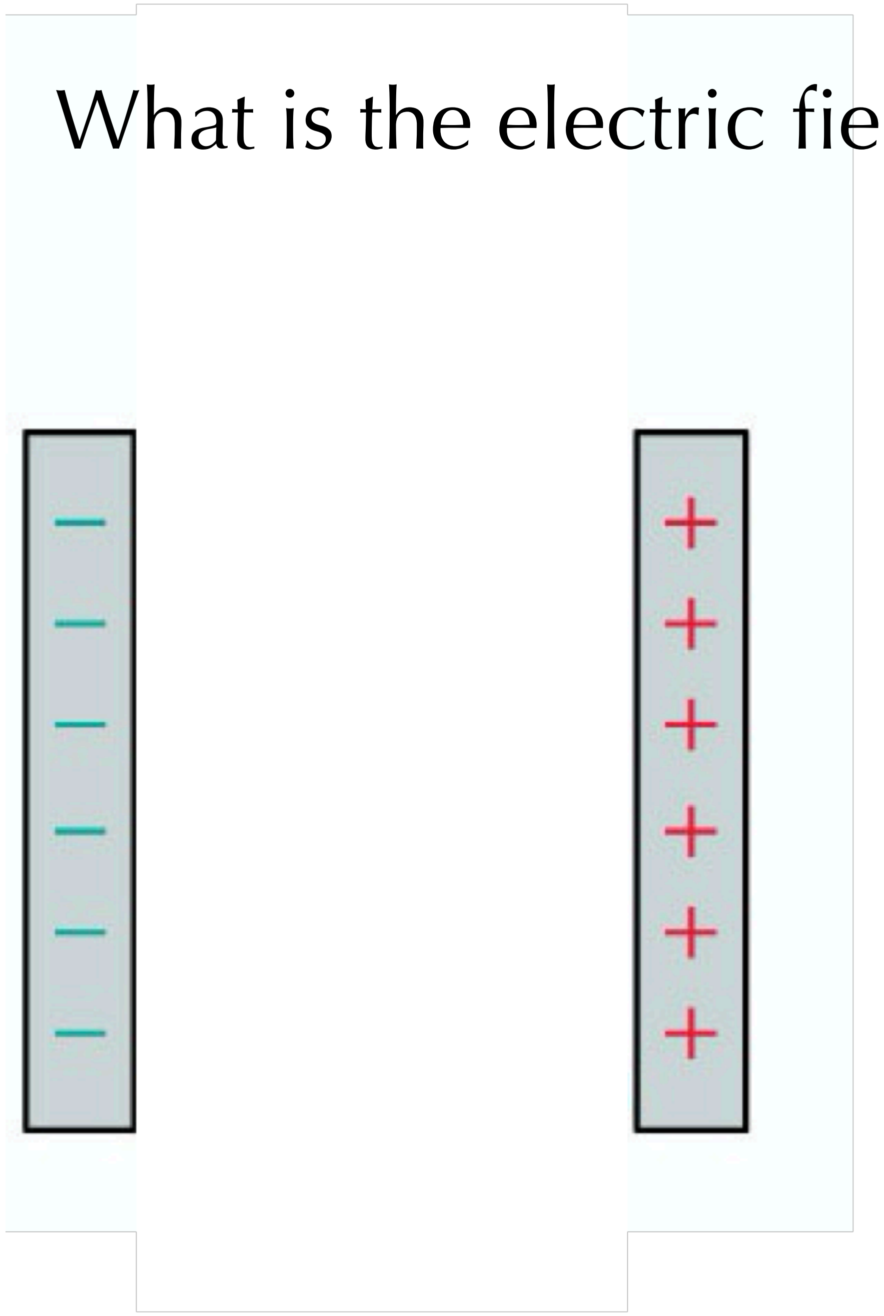
b) decrease

c) increase



(Review): Planes of Charge Question #6

What is the electric field in between the two planes of charge?



E $\quad \dfrac{\eta}{\epsilon_0}$ to the left

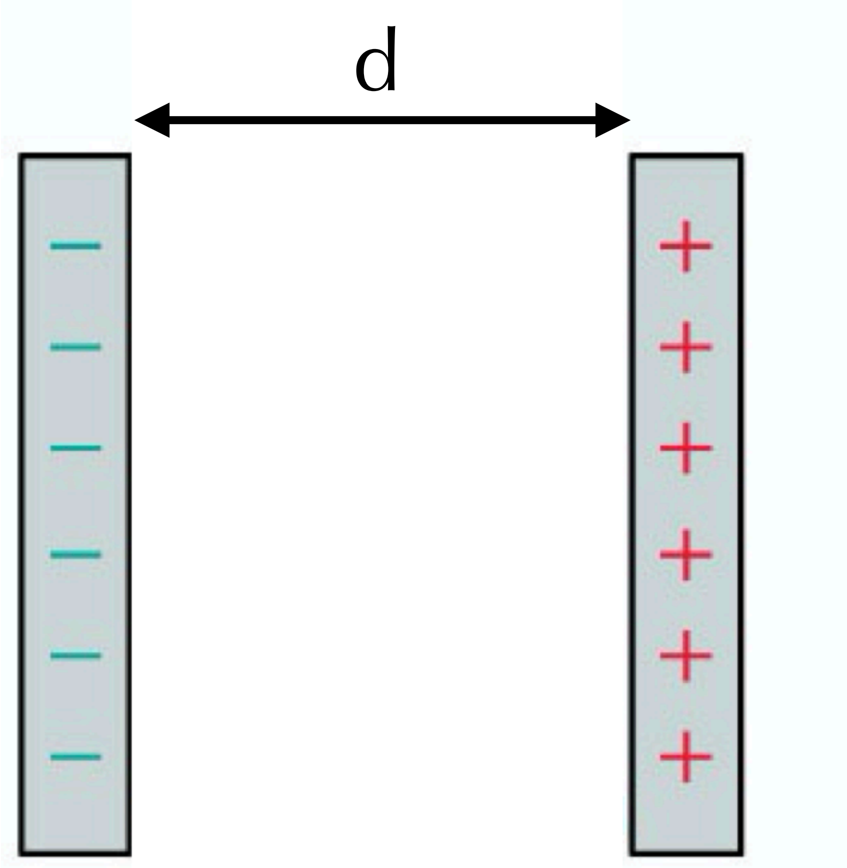
A $\quad \dfrac{\eta}{\epsilon_0}$ to the right

D $\quad \dfrac{\eta}{2\epsilon_0}$ to the left

B $\quad \dfrac{\eta}{2\epsilon_0}$ to the right

(Review): Planes of Charge Question #7

What is the potential difference between the two planes of charge?



D $\Delta V = +\frac{\eta}{2\epsilon_0}d$

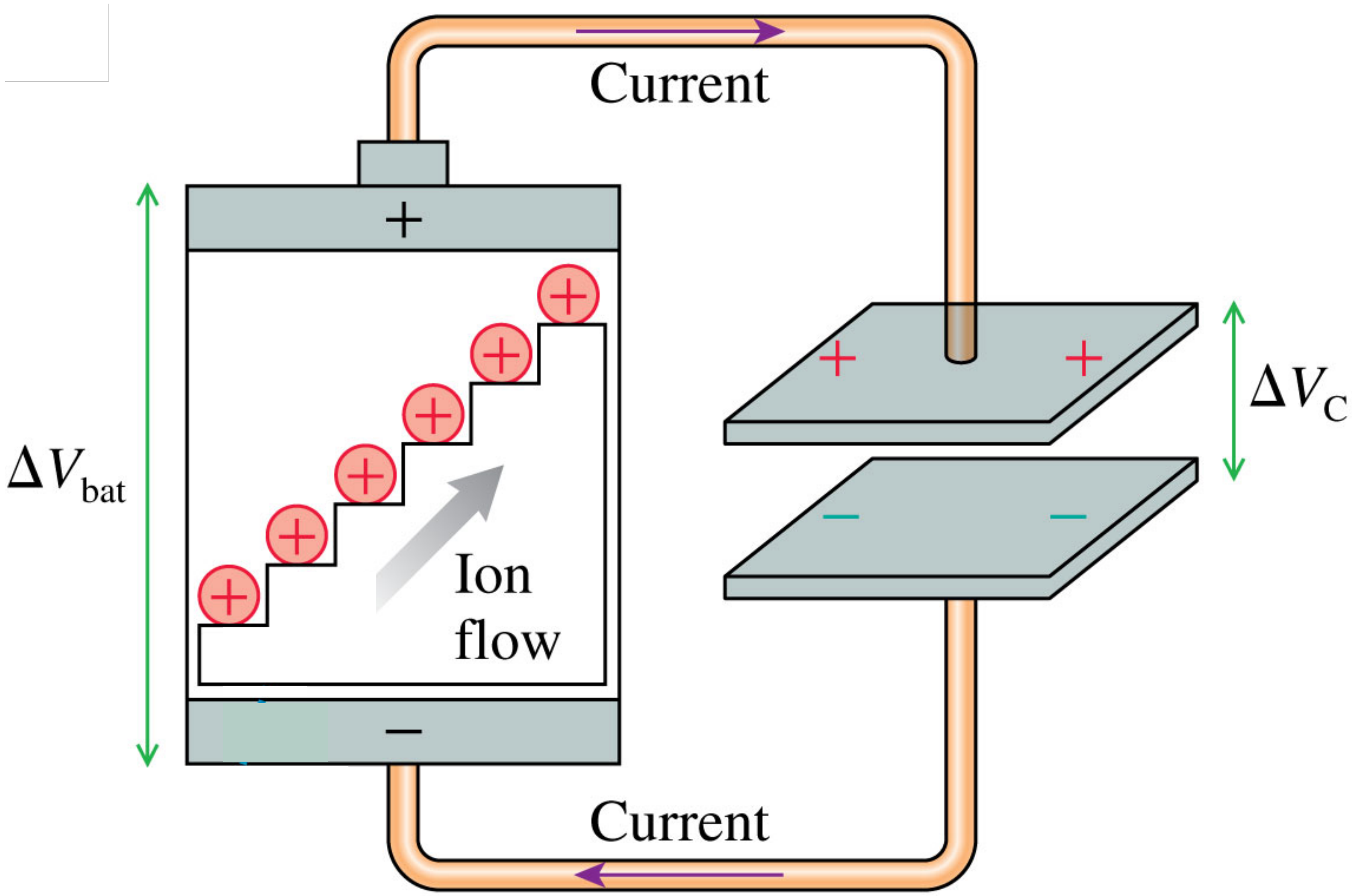
B $\Delta V = -\frac{\eta}{\epsilon_0}d$

A $\Delta V = -\frac{\eta}{2\epsilon_0}d$

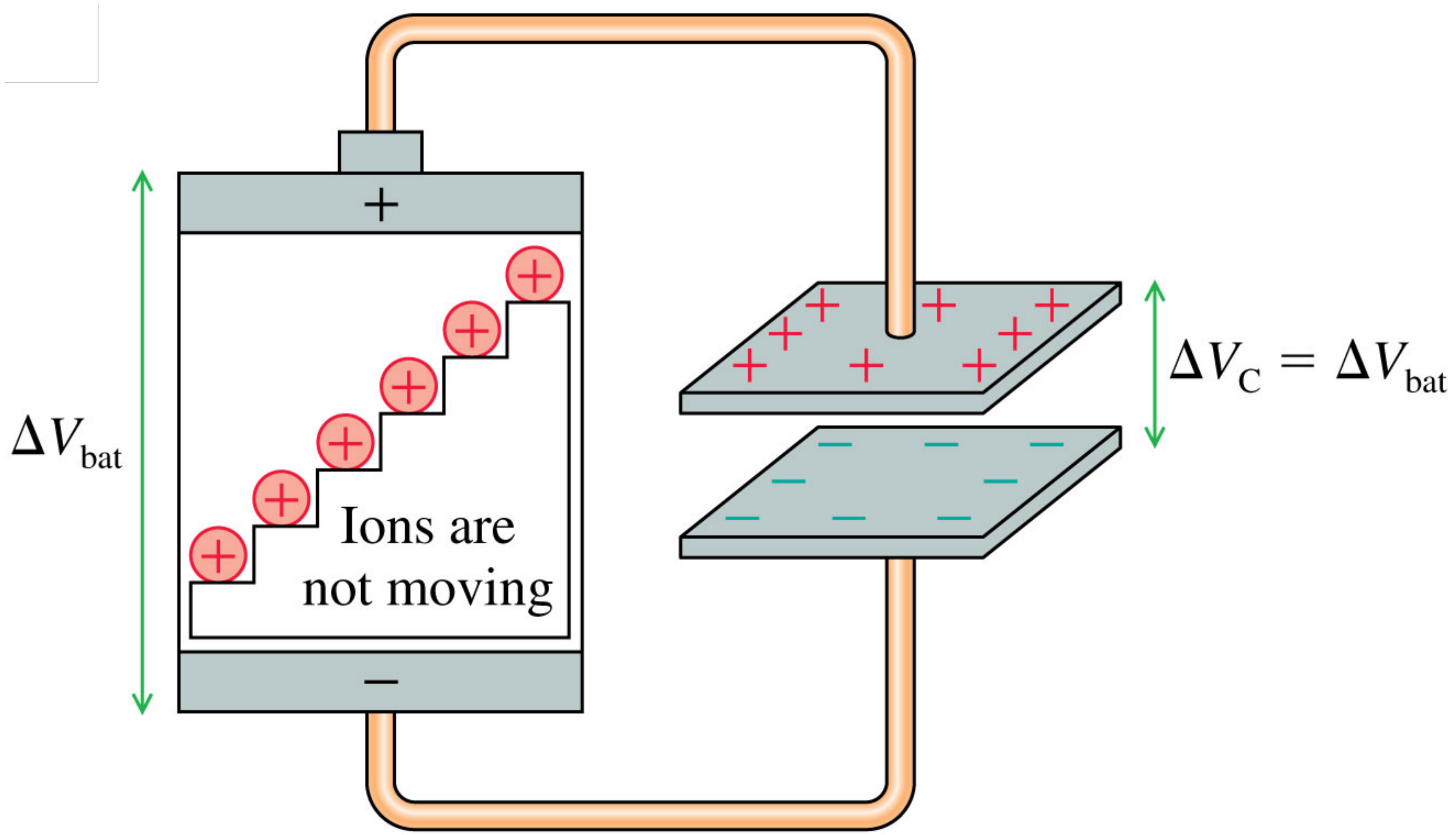
E $\Delta V = +\frac{\eta}{\epsilon_0}d$

$$\Delta V = V_{\text{right}} - V_{\text{left}}$$

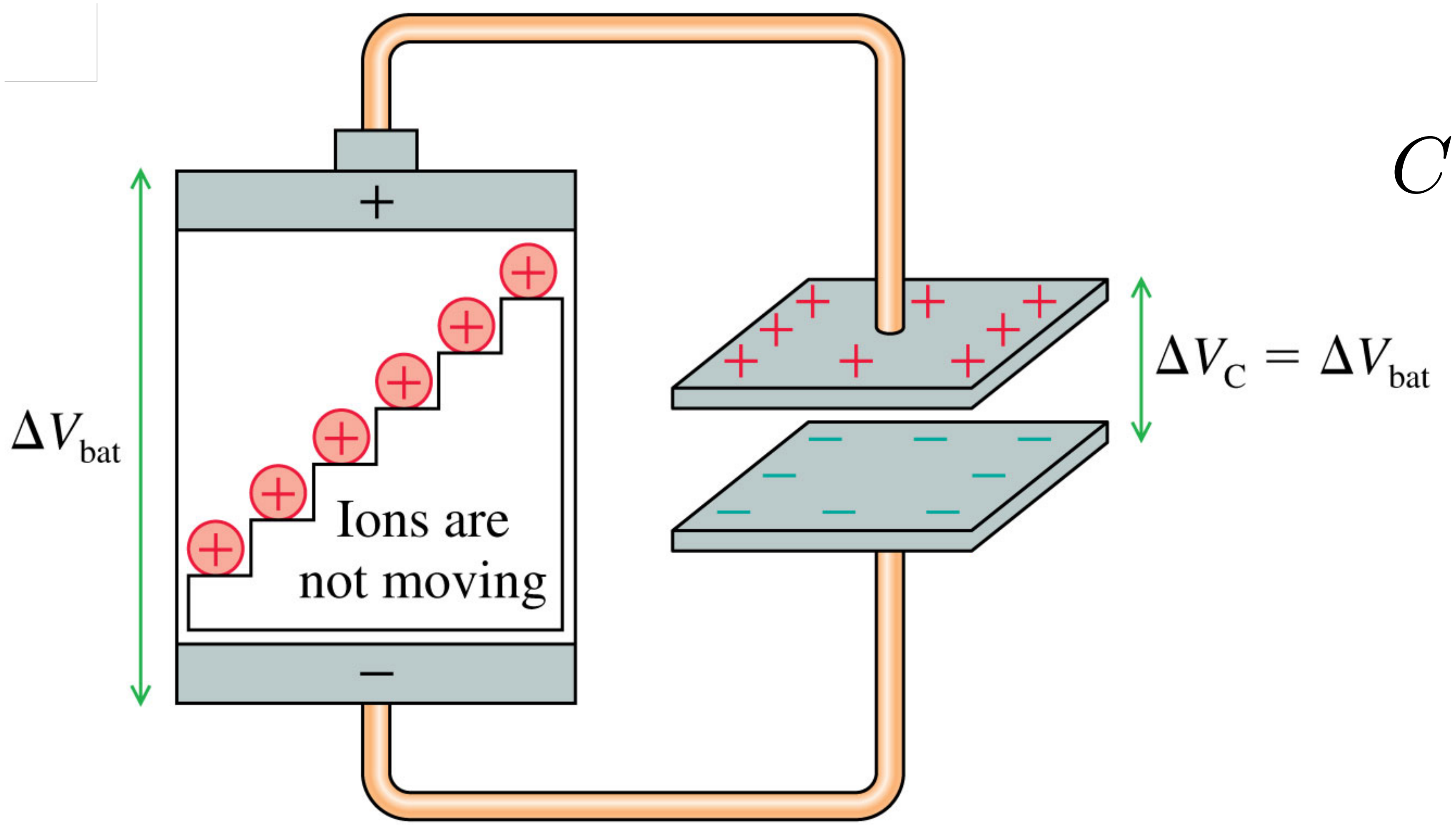
Capacitance



Capacitance

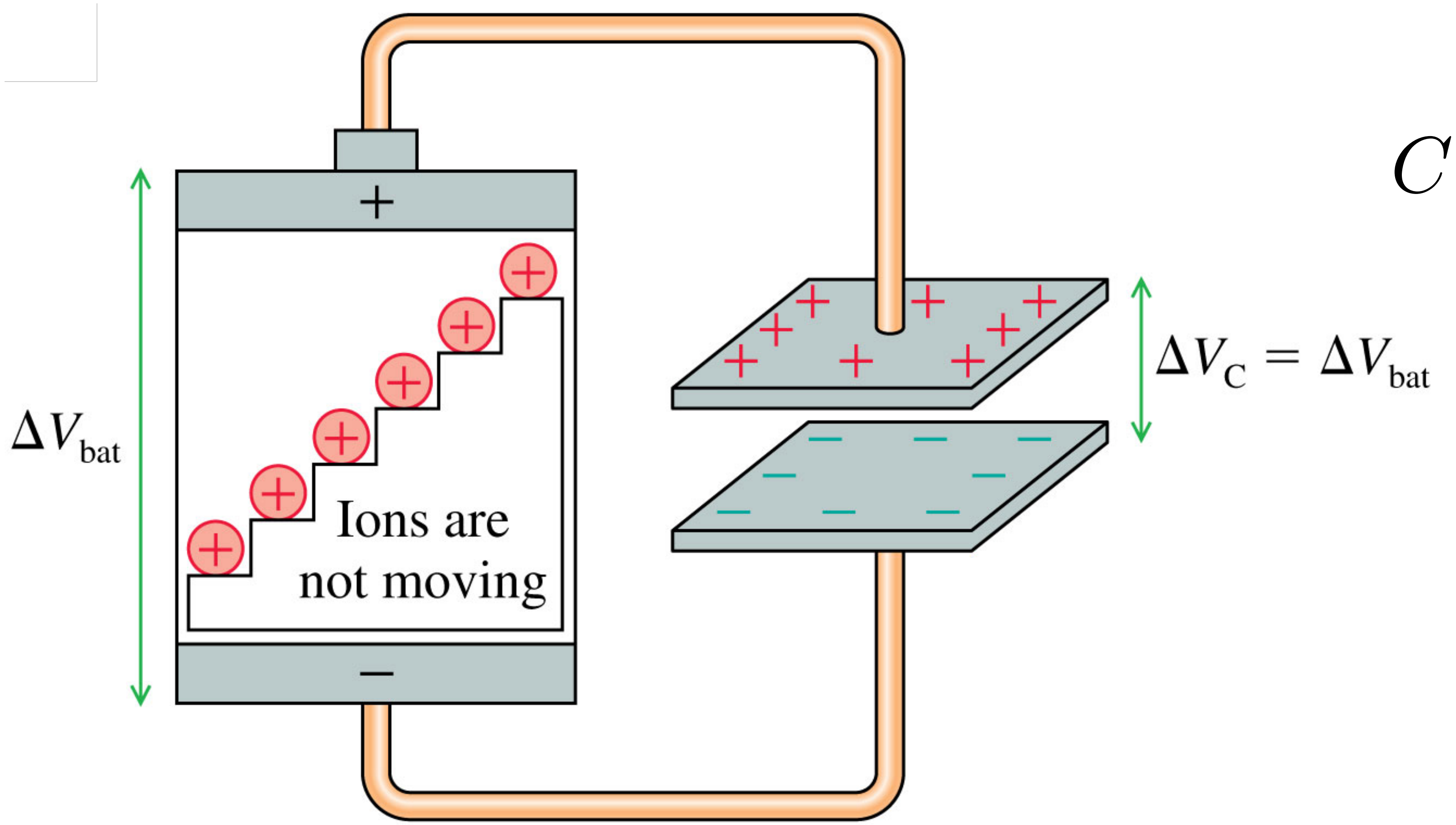


Capacitance



$$C = \frac{Q}{\Delta V_C}$$

Capacitance



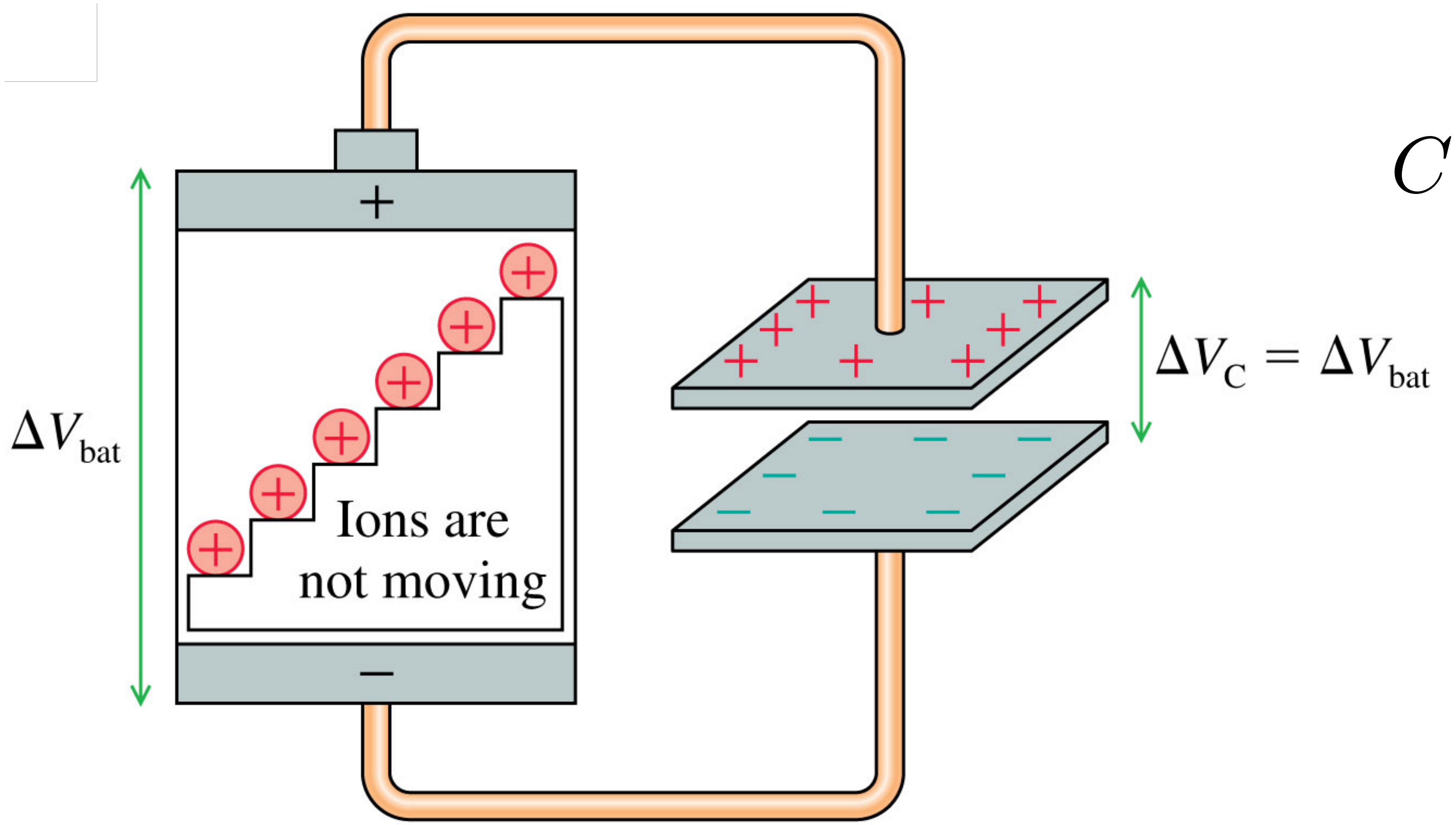
$$C = \frac{Q}{\Delta V_C}$$

Question #8

If the area of the plates got larger, could the capacitor store more charge or less charge?

A - Same B- Less. C- More

Capacitance



$$C = \frac{Q}{\Delta V_C}$$

Question #9

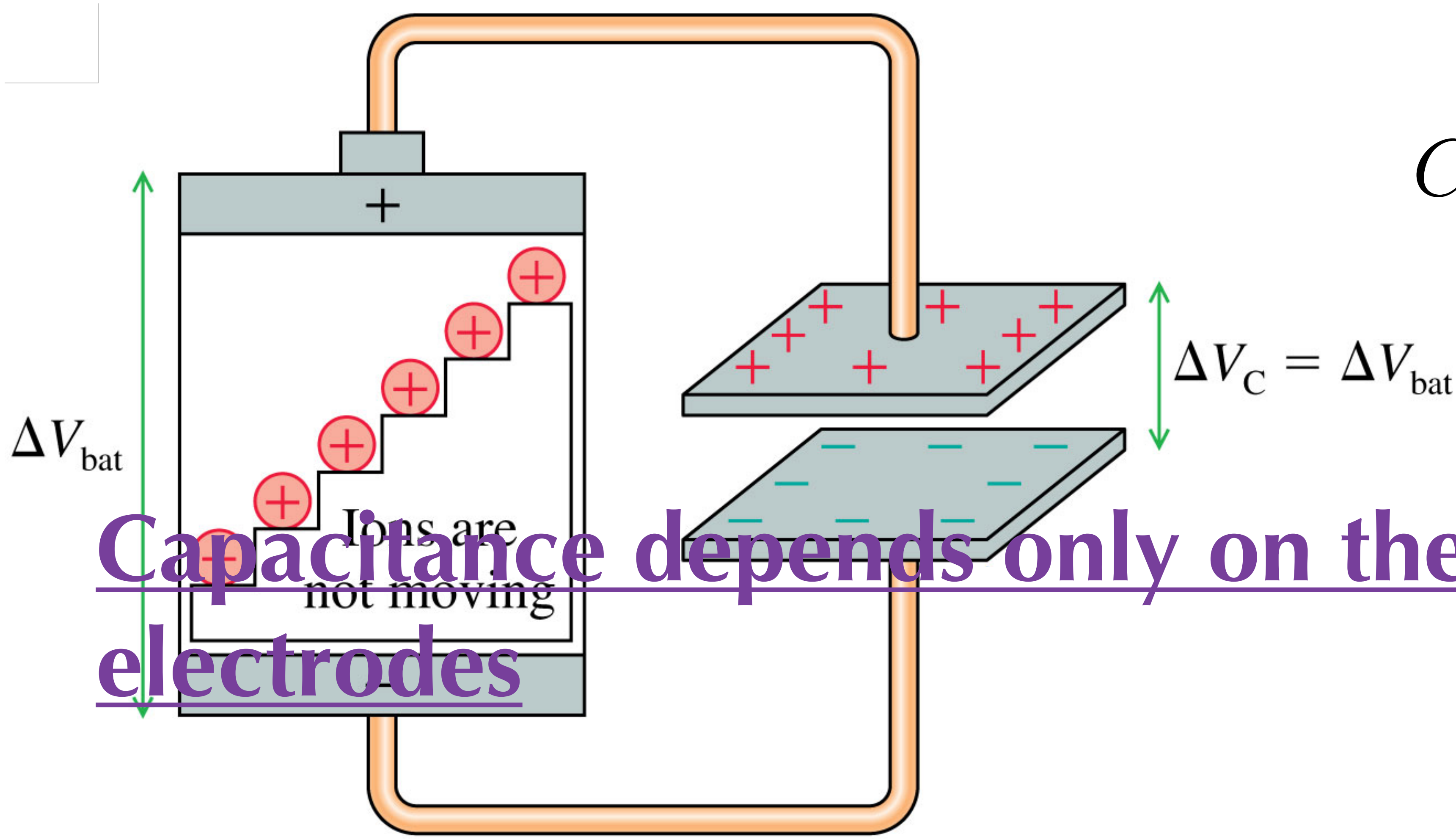
If the plate separation got larger, could the capacitor store more charge or less charge?

A - Same

B- Less.

C- More

Capacitance



$$C = \frac{Q}{\Delta V_C}$$

Capacitance depends only on the geometry of the electrodes

Question #9

If the **plate separation** got larger, could the capacitor store more charge or less charge?

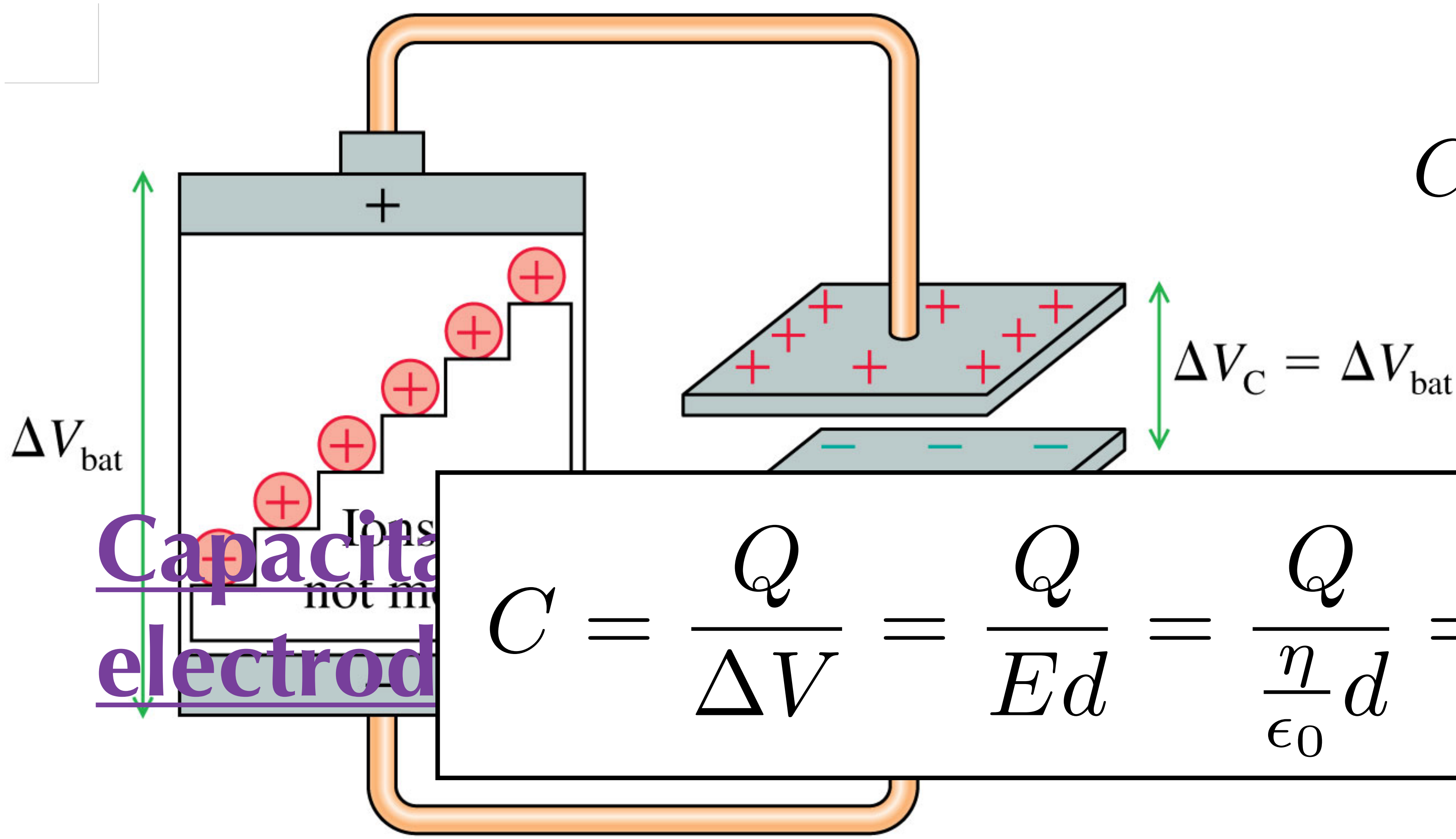
A - Same

B- Less.

C- More

Capacitance

$$C = \frac{Q}{\Delta V_C}$$



Capacita… the
electrod…

$$C = \frac{Q}{\Delta V} = \frac{Q}{Ed} = \frac{Q}{\frac{\eta}{\epsilon_0}d} = \frac{Q}{\frac{Q}{A\epsilon_0}d} = \frac{A\epsilon_0}{d}$$

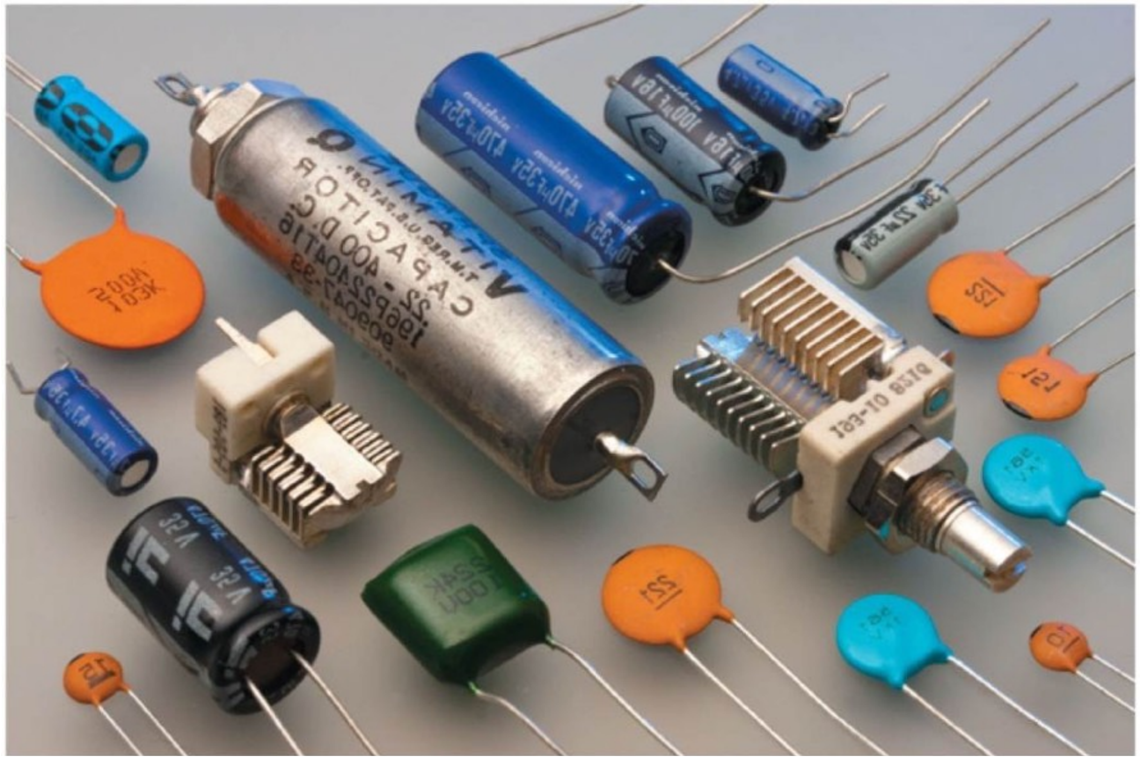
Question #9

If the plate separation got larger, could the capacitor store more charge or less charge?

A - Same

B- Less.

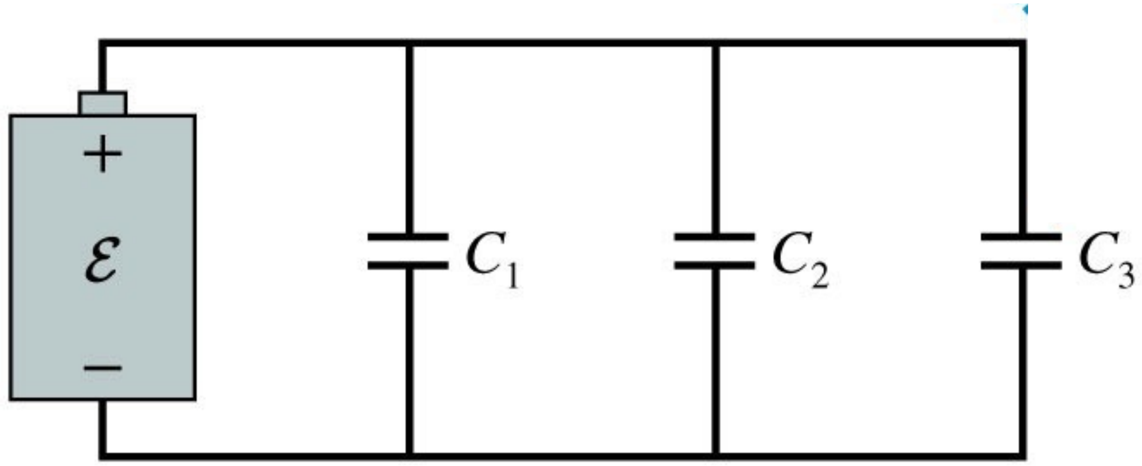
C- More



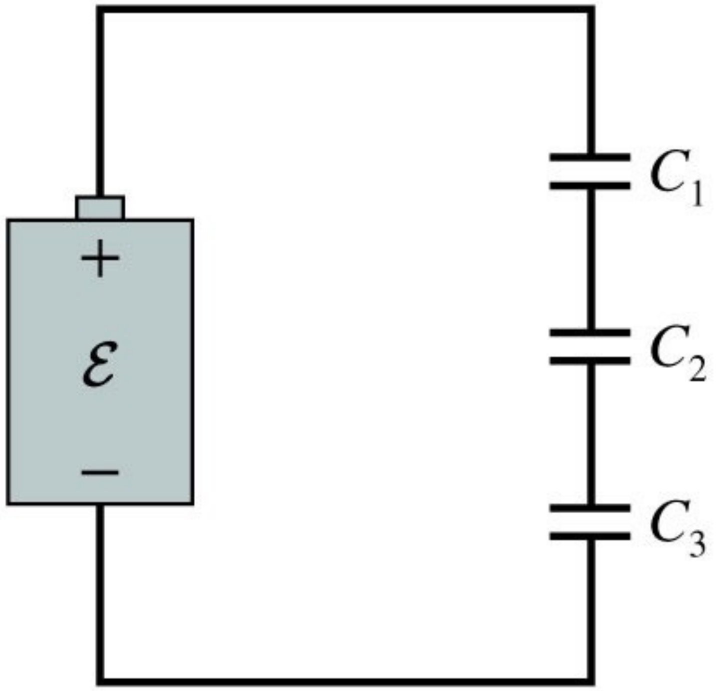

Shift
Enter

Beginning of Circuits

parallel

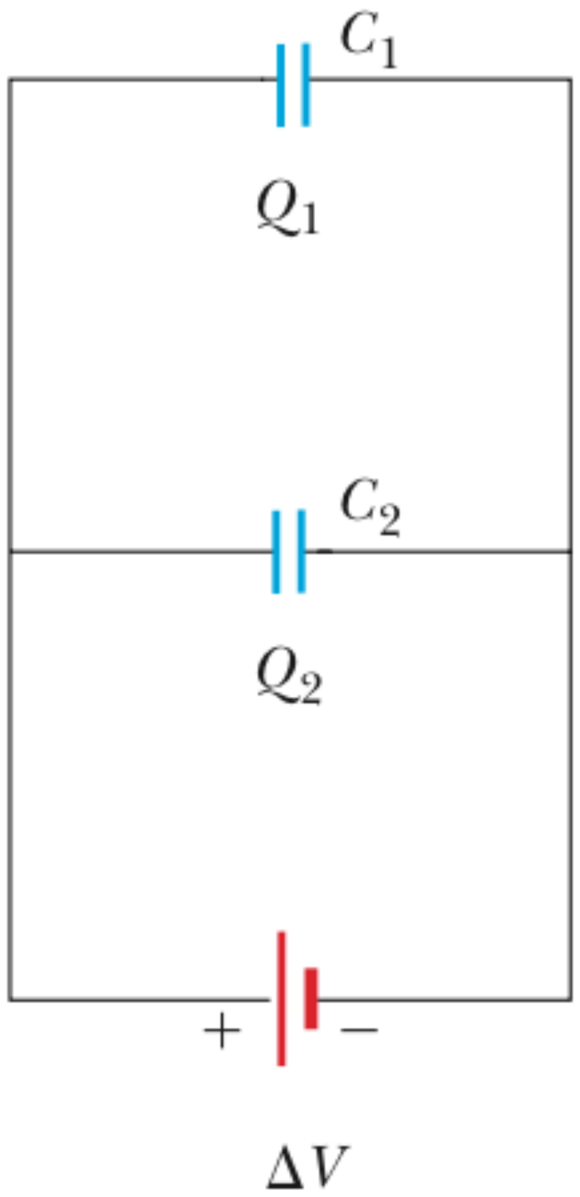


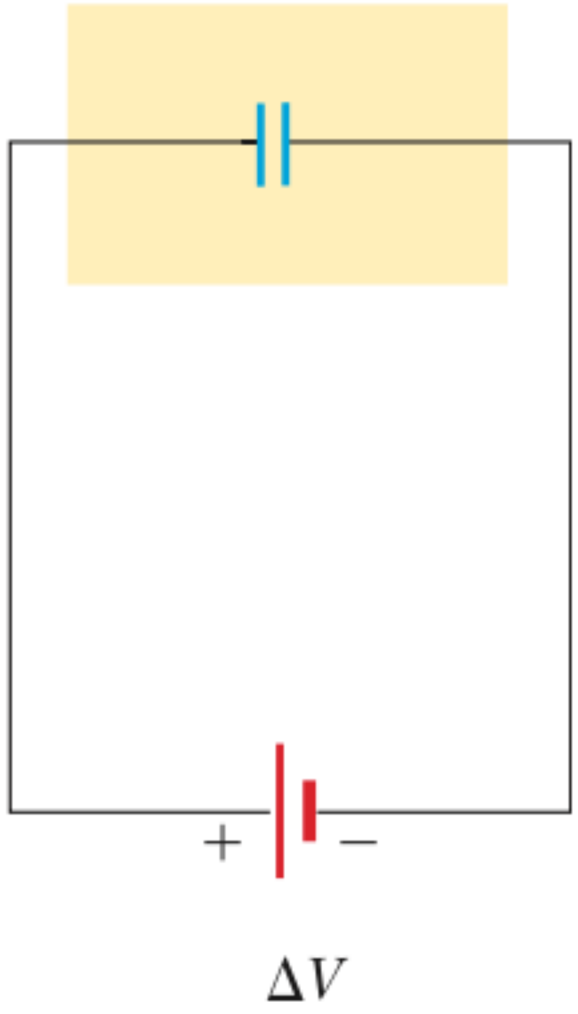
series



Parallel

Is the potential difference across capacitor 1 greater than, less than or equal to the potential difference across capacitor 2?





a) greater
b) equal
c) less

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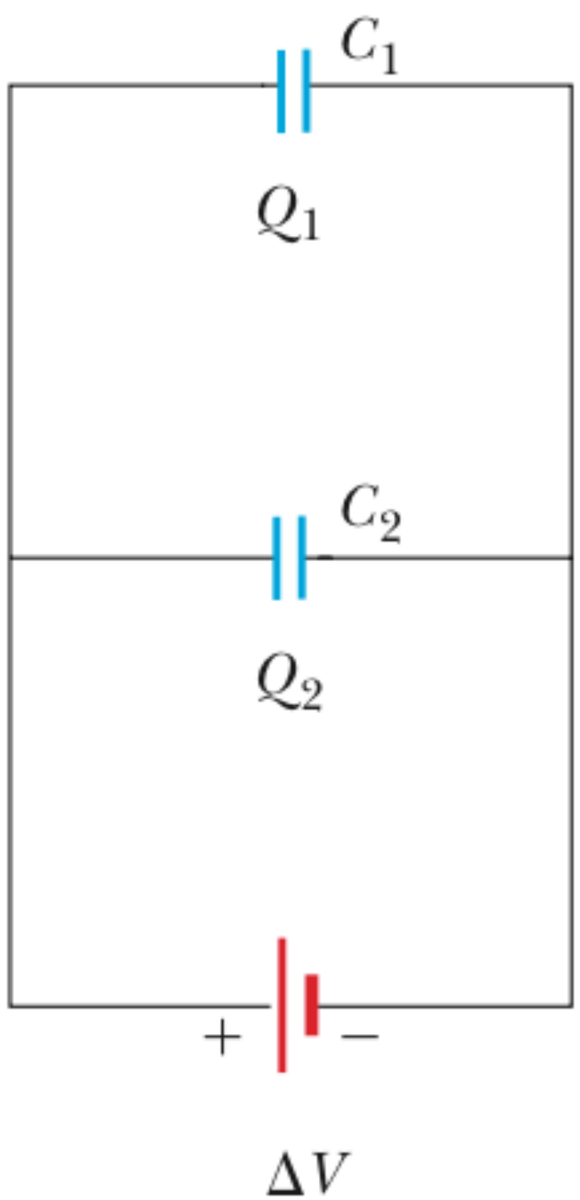
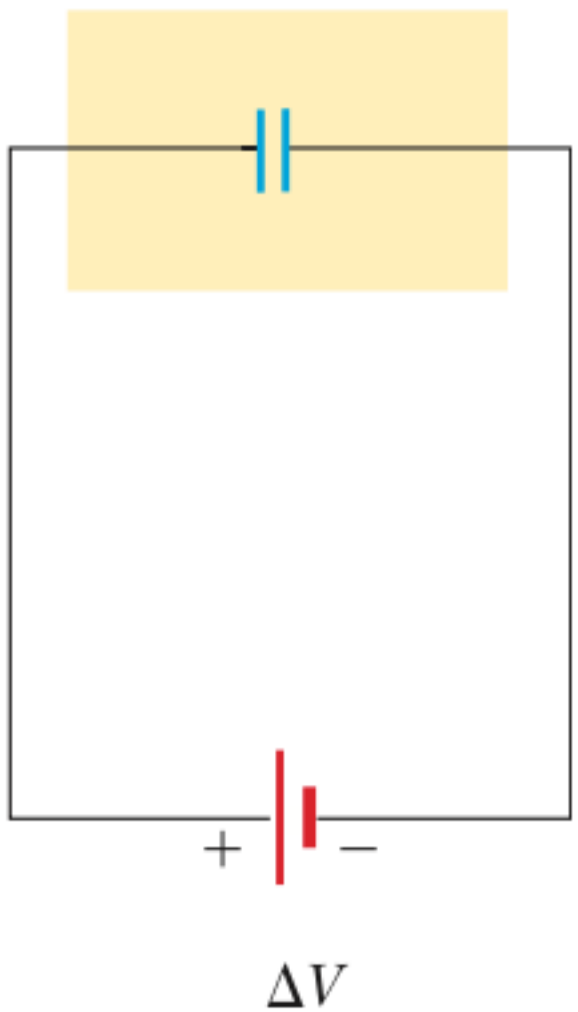


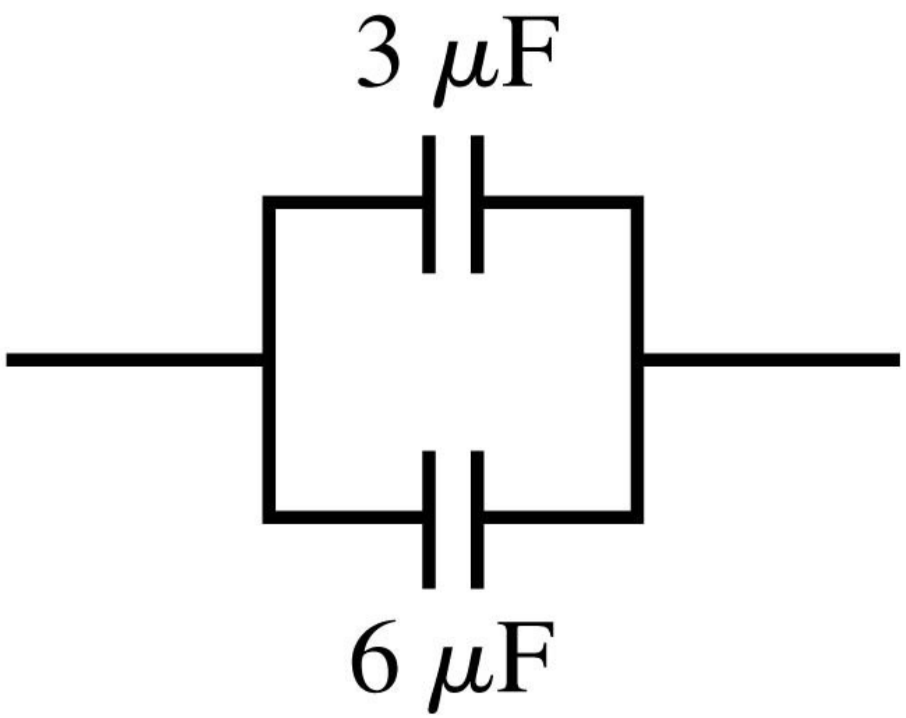


a) greater
b) equal
c) less

$$C_{\mathrm{eq}} = C_1 + C_2 + C_3 + \ldots$$

The equivalent capacitance is

A. 9 μF.
B. 6 μF.
C. 3 μF.
D. 2 μF.
E. 1 μF.



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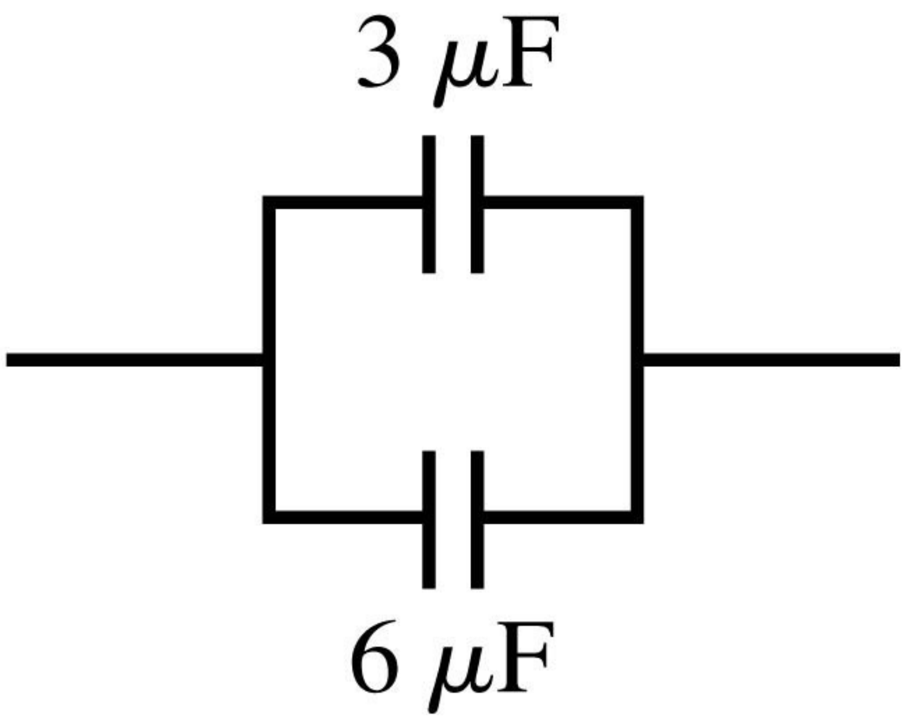
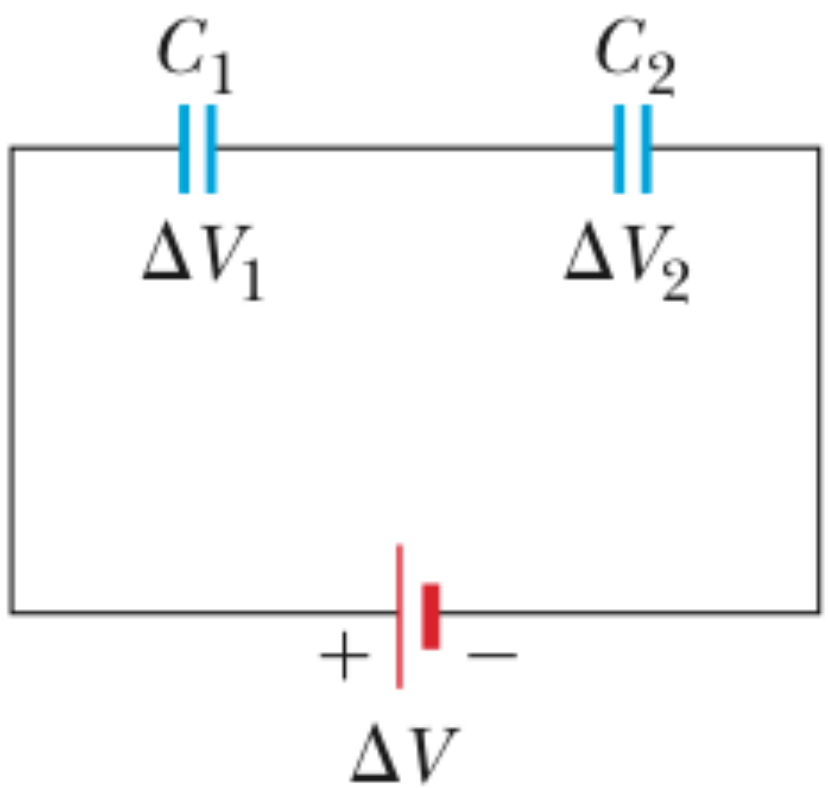
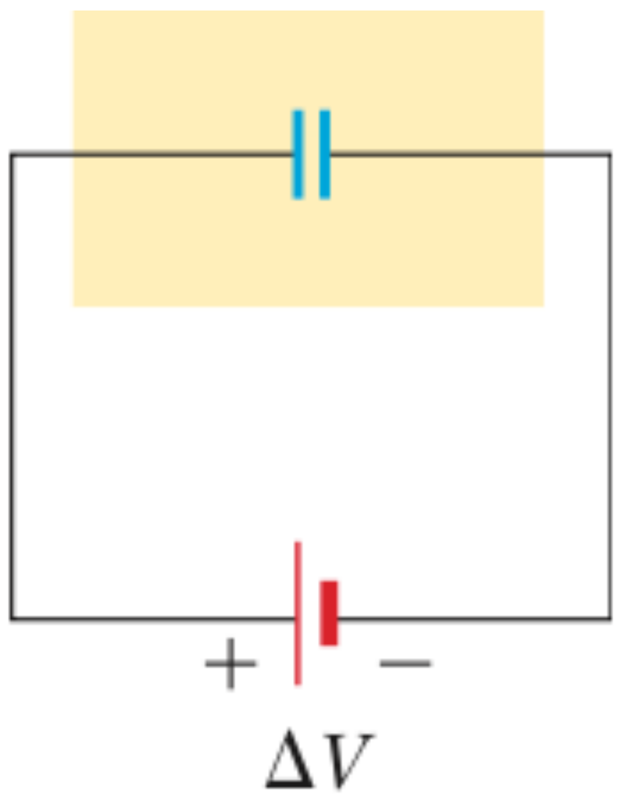


Series

Is the charge on capacitor 1 greater than, less than or equal to the charge on capacitor 2?

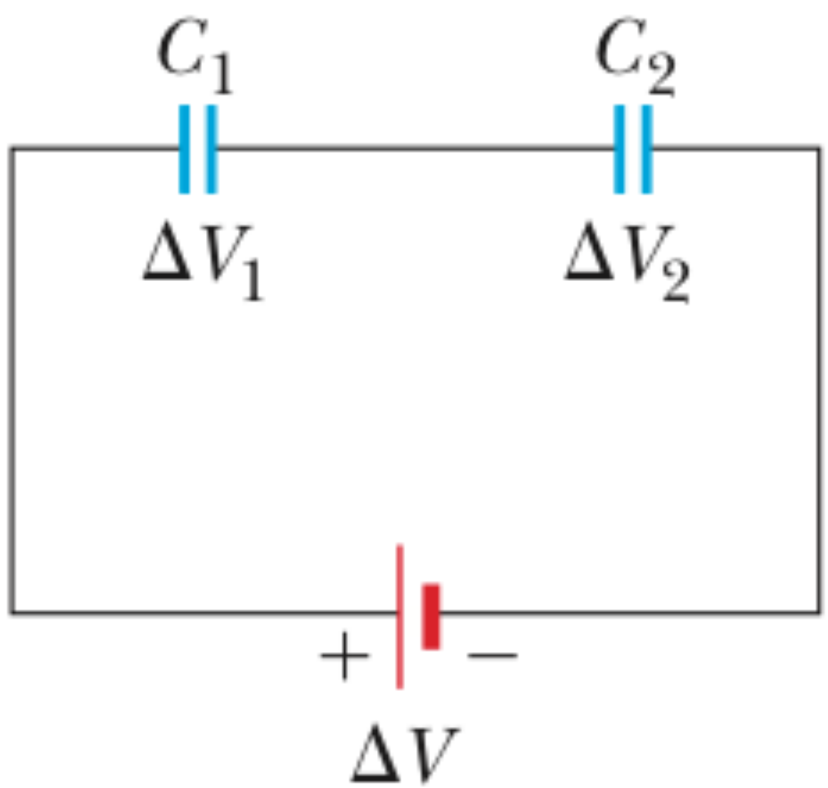


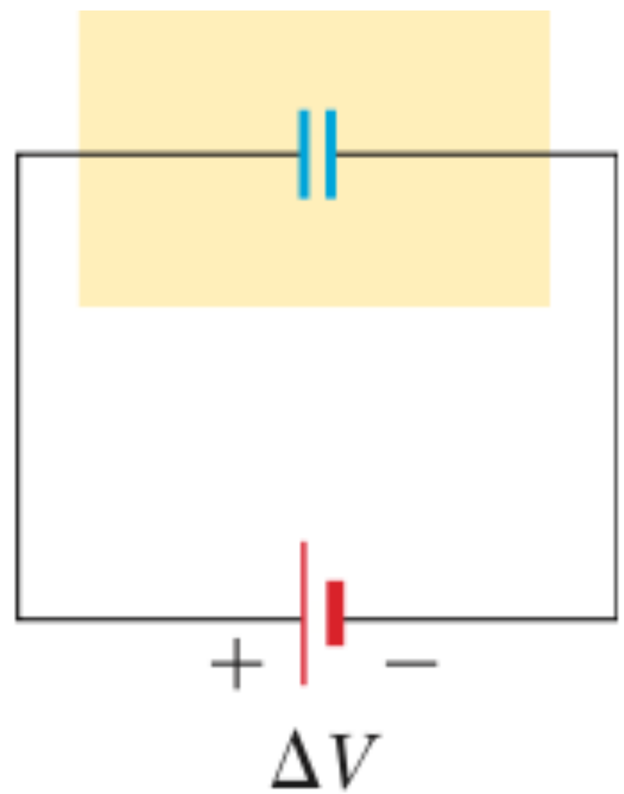


b) greater
c) less
d) equal

Series

Is the charge on capacitor 1 greater than, less than or equal to the charge on capacitor 2?



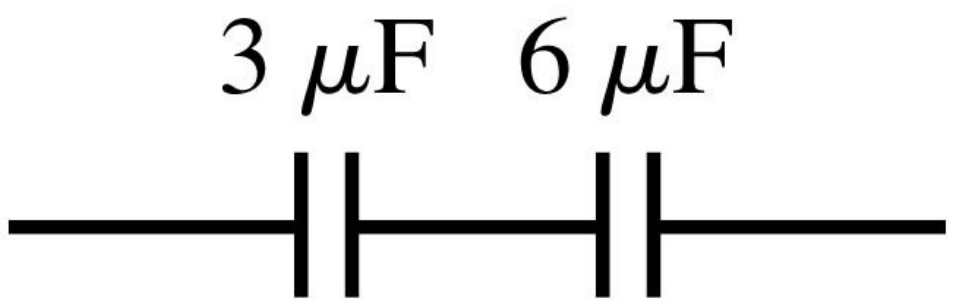


b) greater
c) less
d) equal

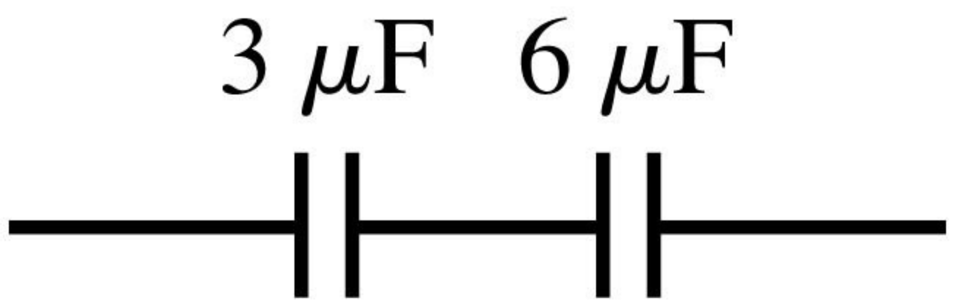
$$\frac{1}{C_{\rm eq}} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + \dots$$

The equivalent capacitance is

A. 9 μF.
B. 2 μF.
C. 3 μF.
D. 6 μF.
E. 1 μF.



The equivalent capacitance is



A. 9 μF.

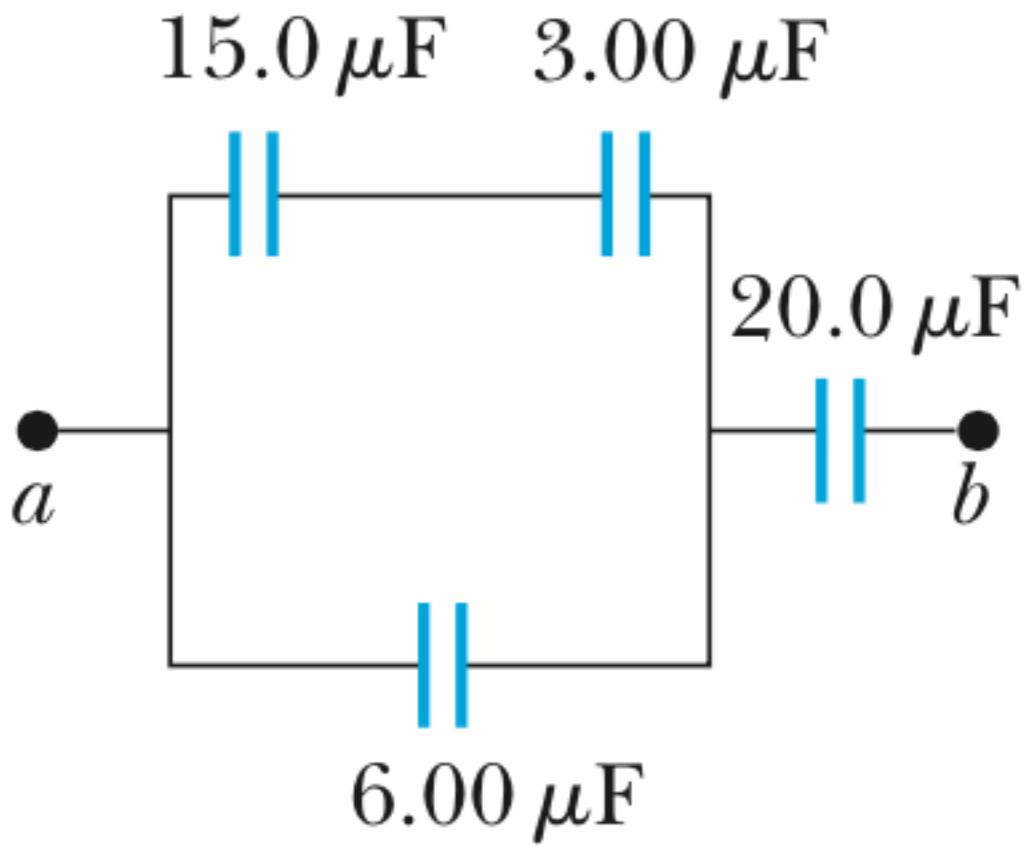
B. 2 μF.

C. 3 μF.

D. 6 μF.

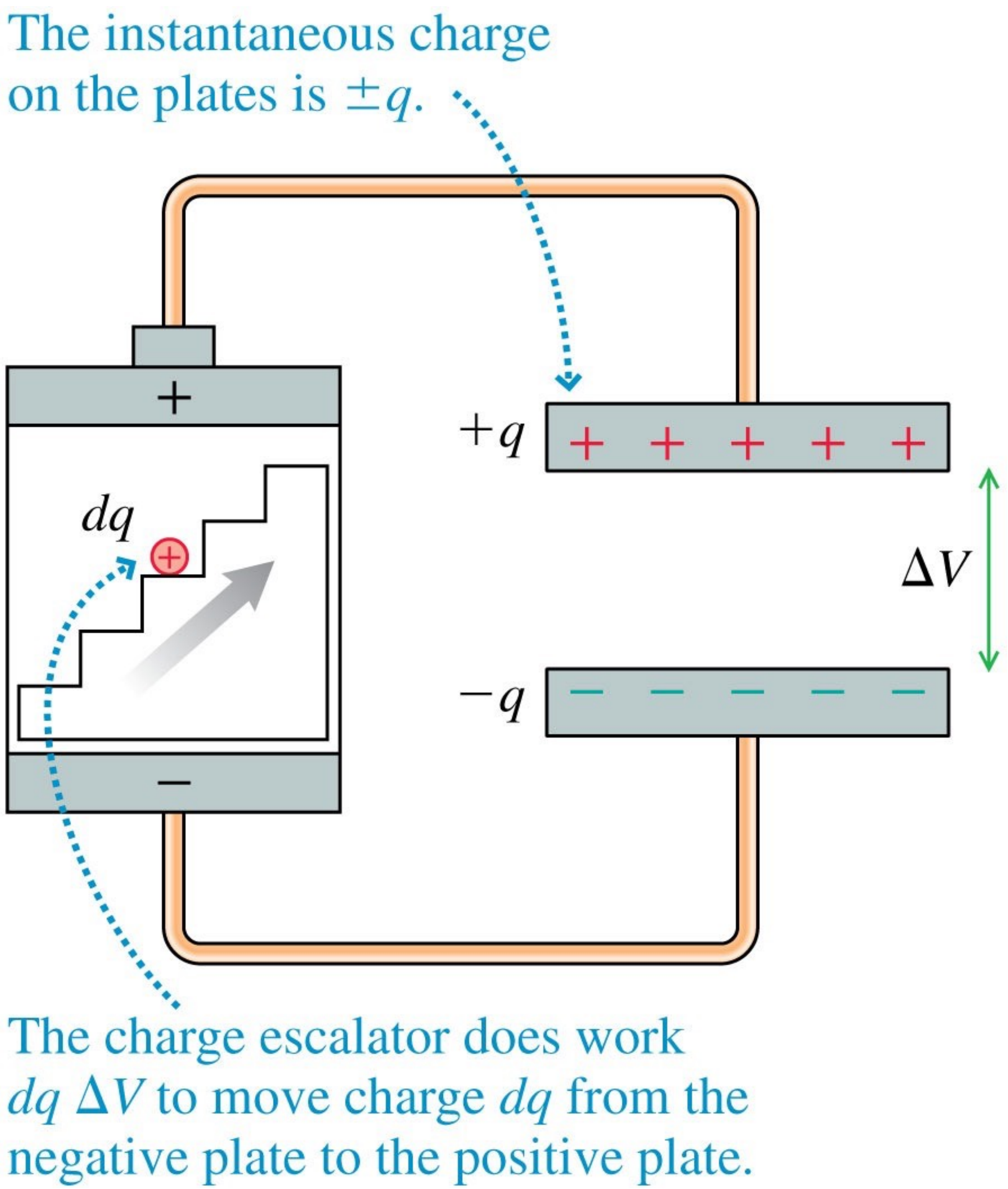
E. 1 μF.

Find the equivalent capacitance between points a and b



Energy stored in a capacitor

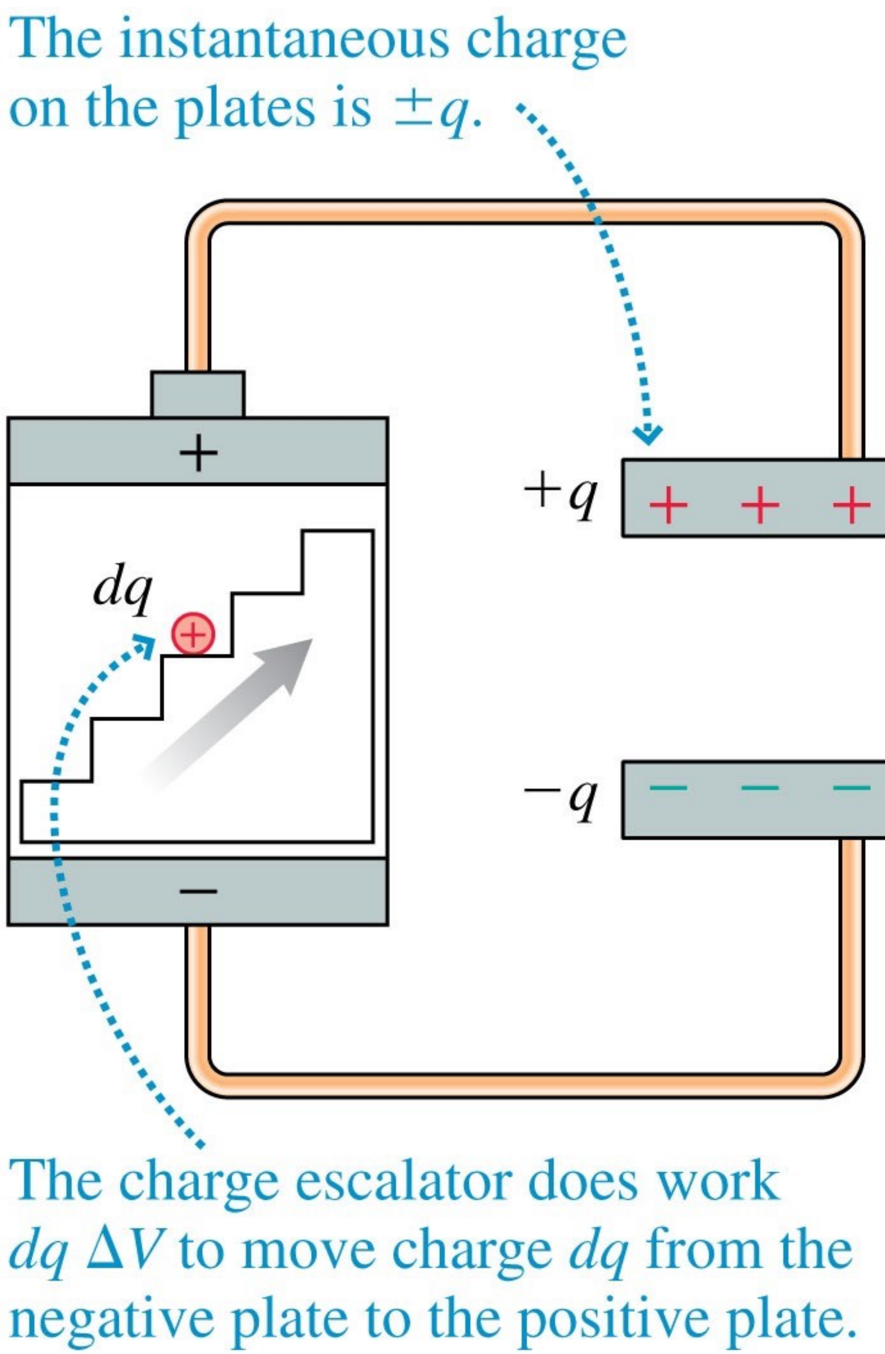
$$dU = dq\,\Delta V = \frac{q\,dq}{C}$$



Energy stored in a capacitor

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

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

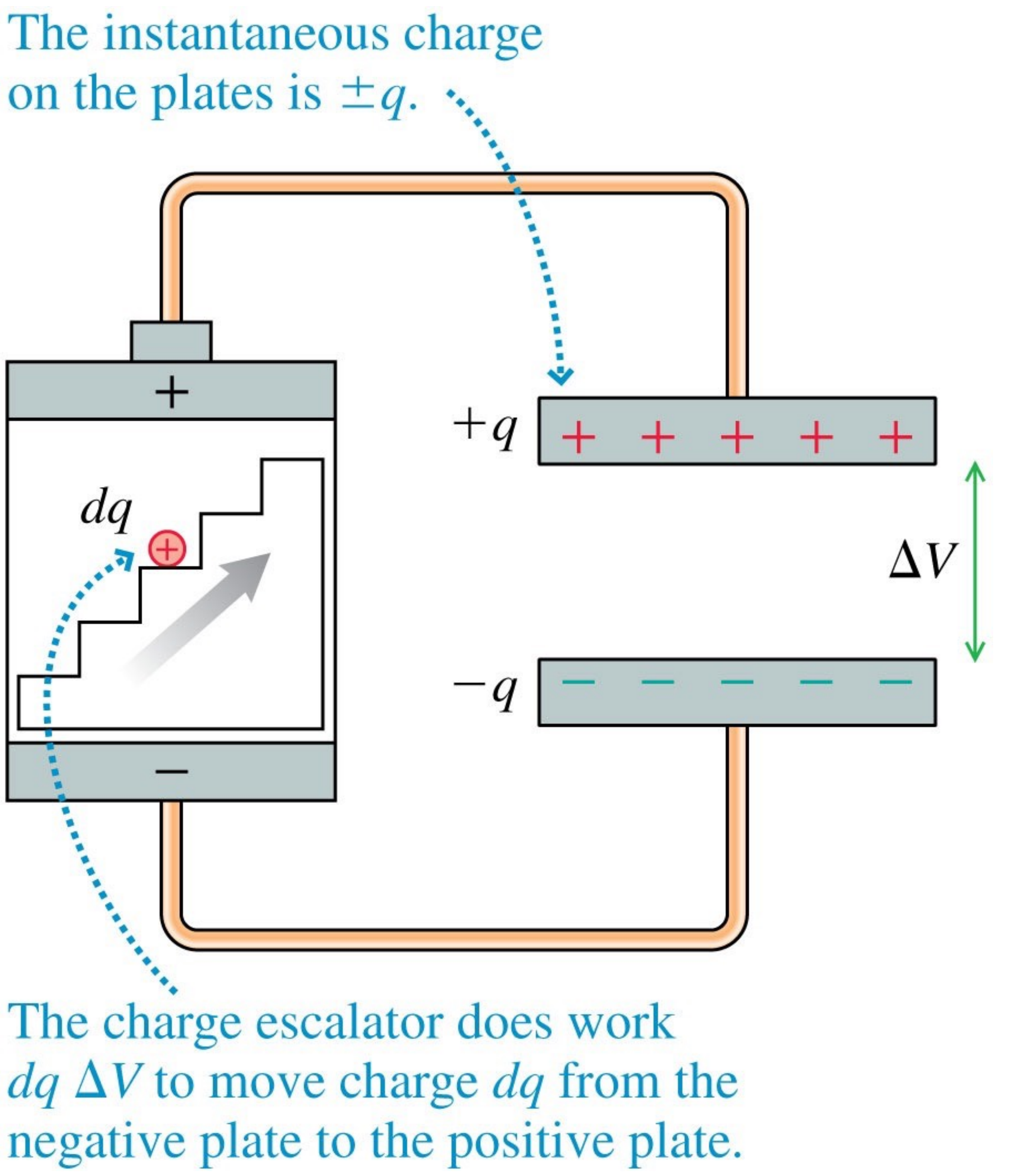


Energy stored in a capacitor

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

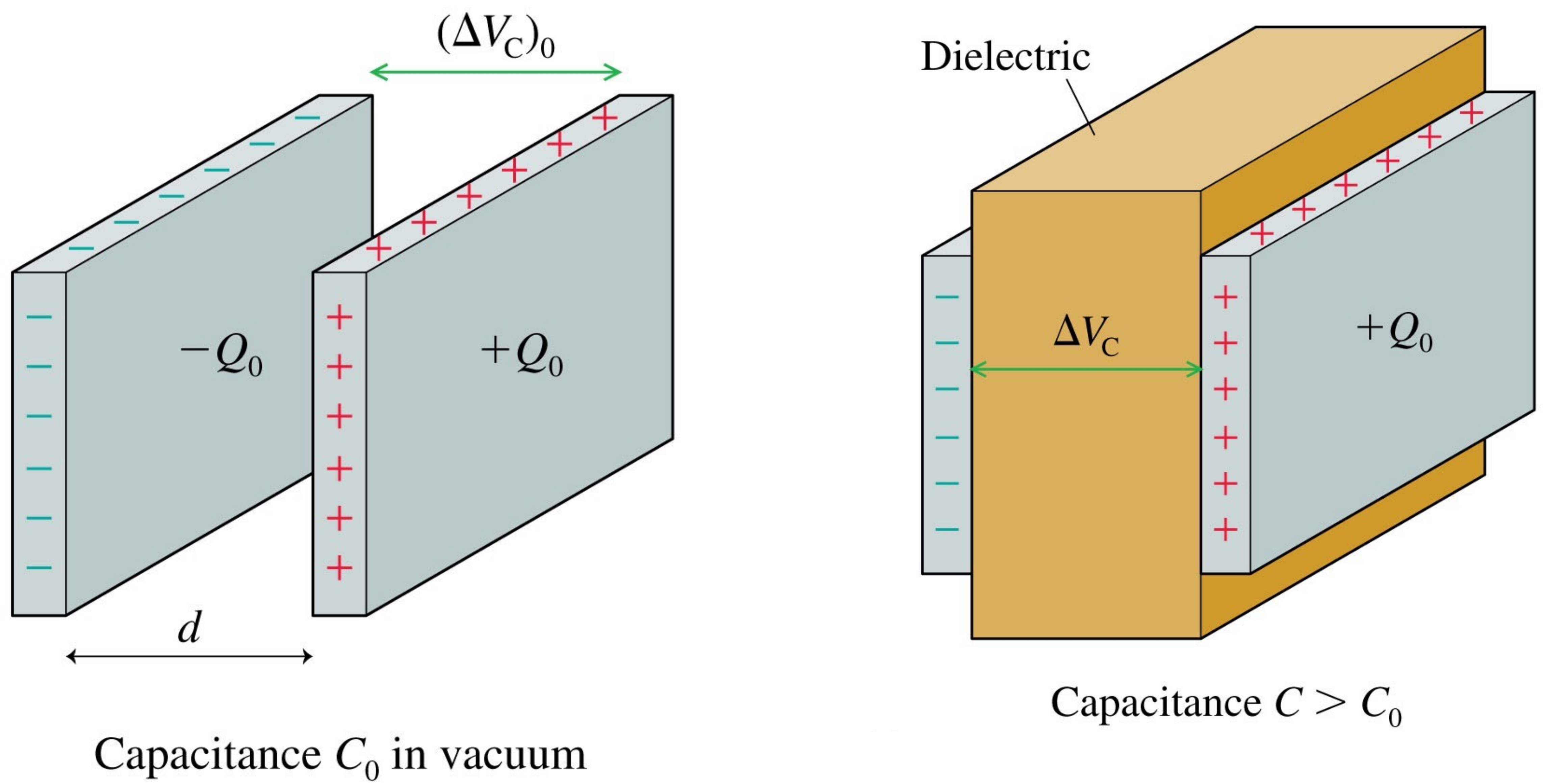
$$U_C = \frac{1}{C}\int_0^Q q\,dq = \frac{Q^2}{2C}$$

$$= \frac{1}{2}C(\Delta V_C)^2$$



Dielectrics

What will happen to the E field in between the plates if I insert a dielectric material?



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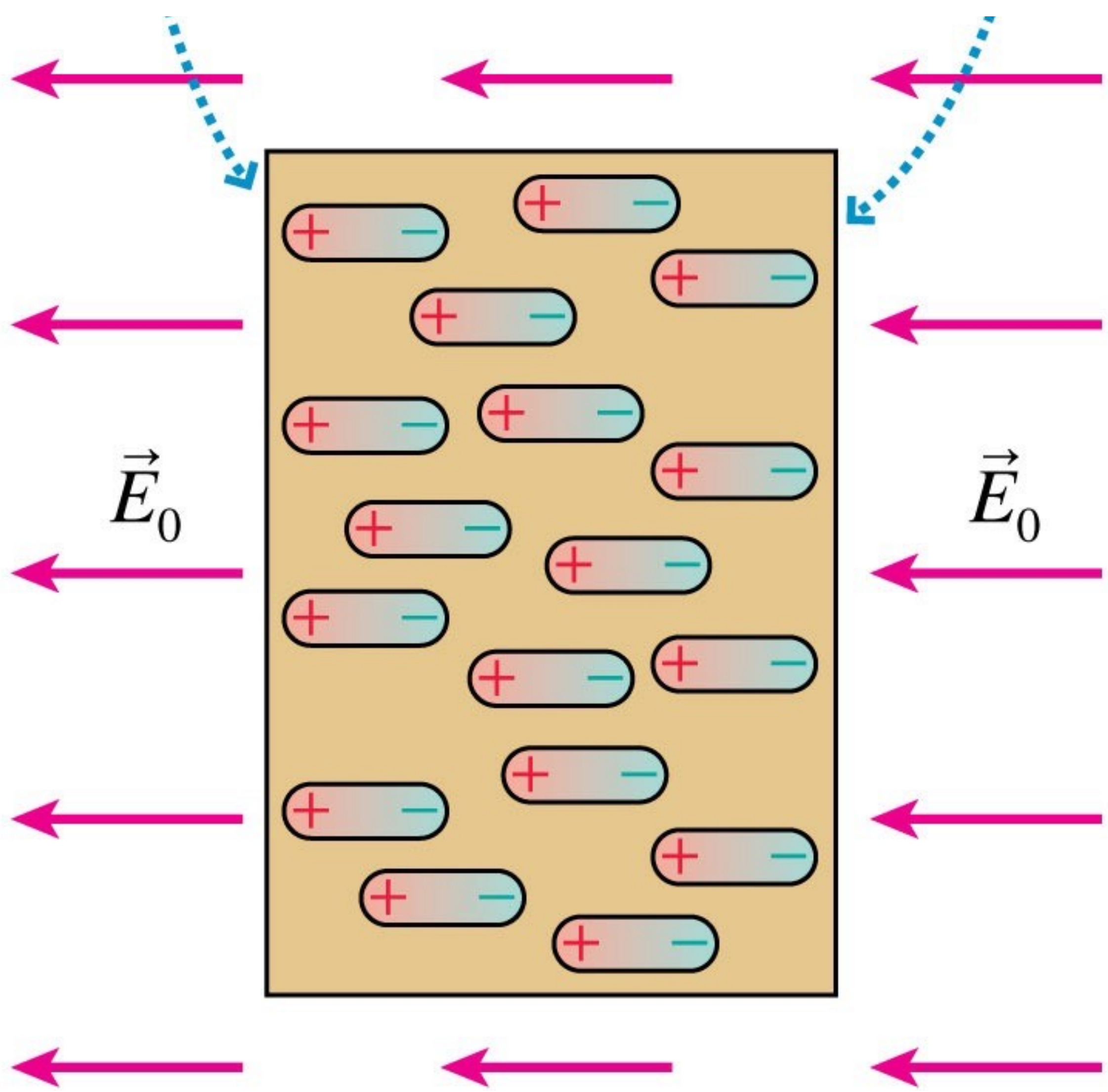
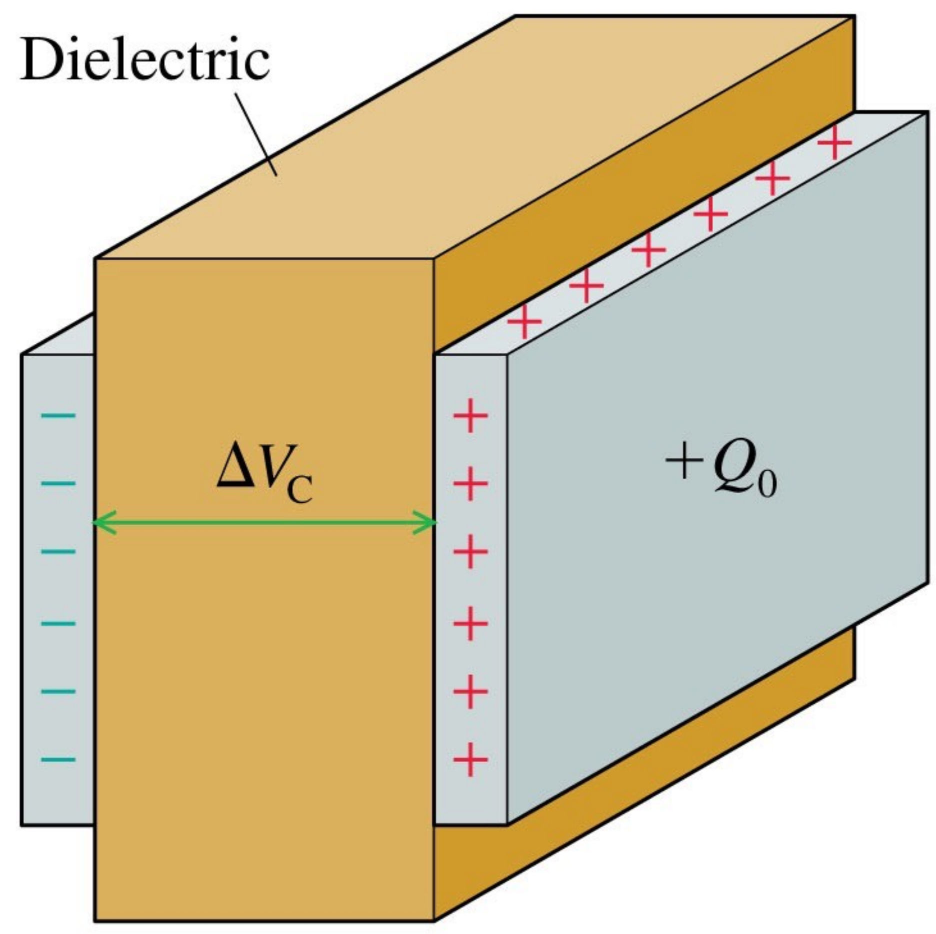


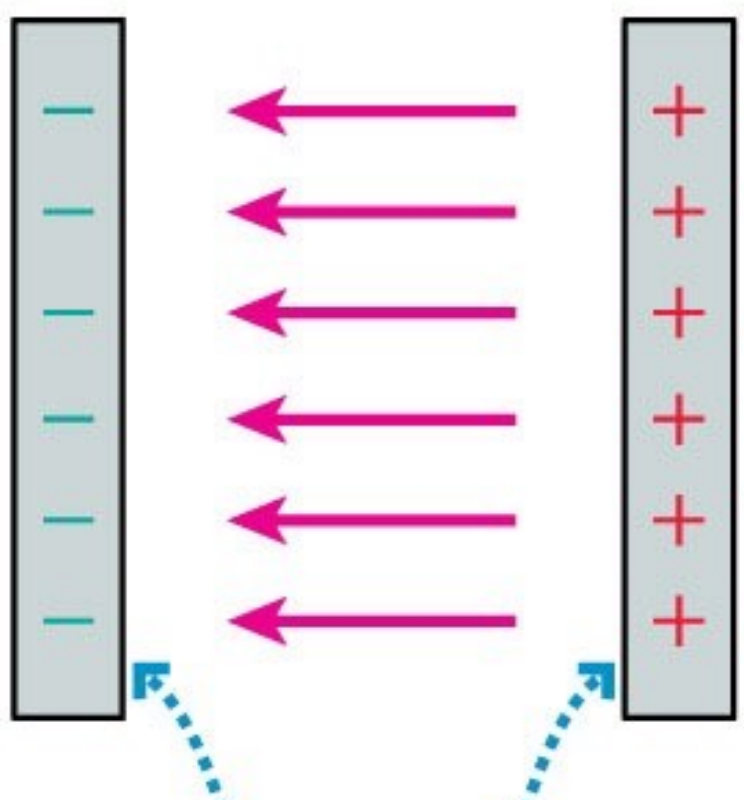


Capacitance $C > C_0$

Dielectrics

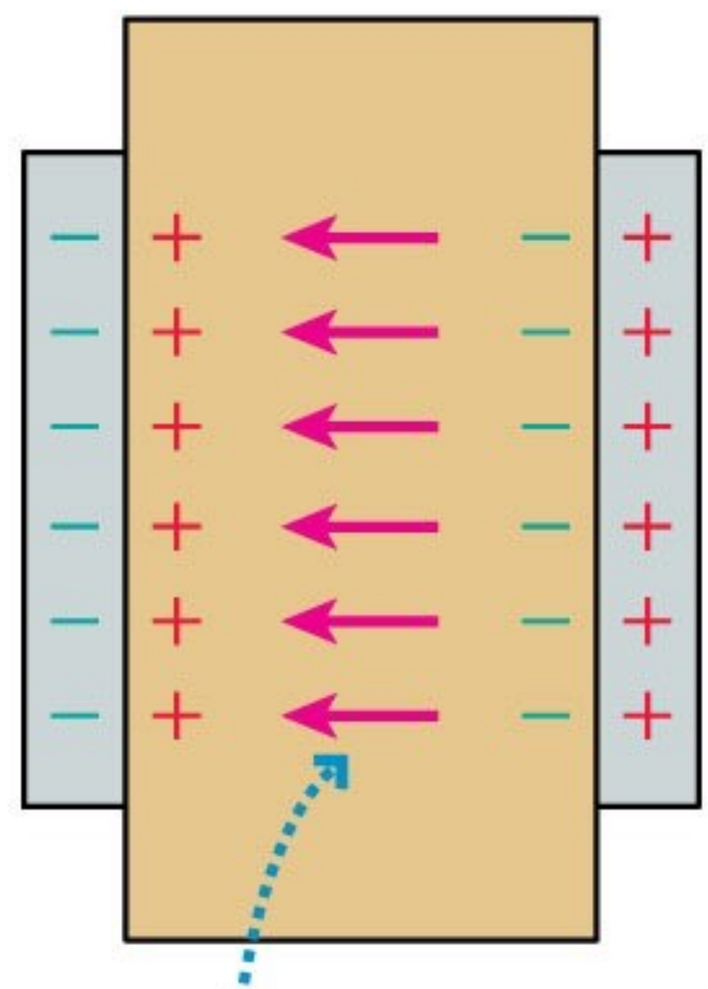
What will happen to the E field in between the plates if I insert a dielectric material?

$$E_0 = \frac{\eta_0}{\epsilon_0}$$



Before

E



After

Fill in the logic chain

E-field $\longrightarrow$ Voltage $\longrightarrow$ Charge on plates

"If the E field goes down, then the voltage… and the charge on the plates….."

Fill in the logic chain

E-field $\longrightarrow$ Voltage $\longrightarrow$ Charge on plates

"If the E field goes down, then the voltage… and the charge on the plates….."

$$\kappa \equiv \frac{E_0}{E}$$

Fill in the logic chain

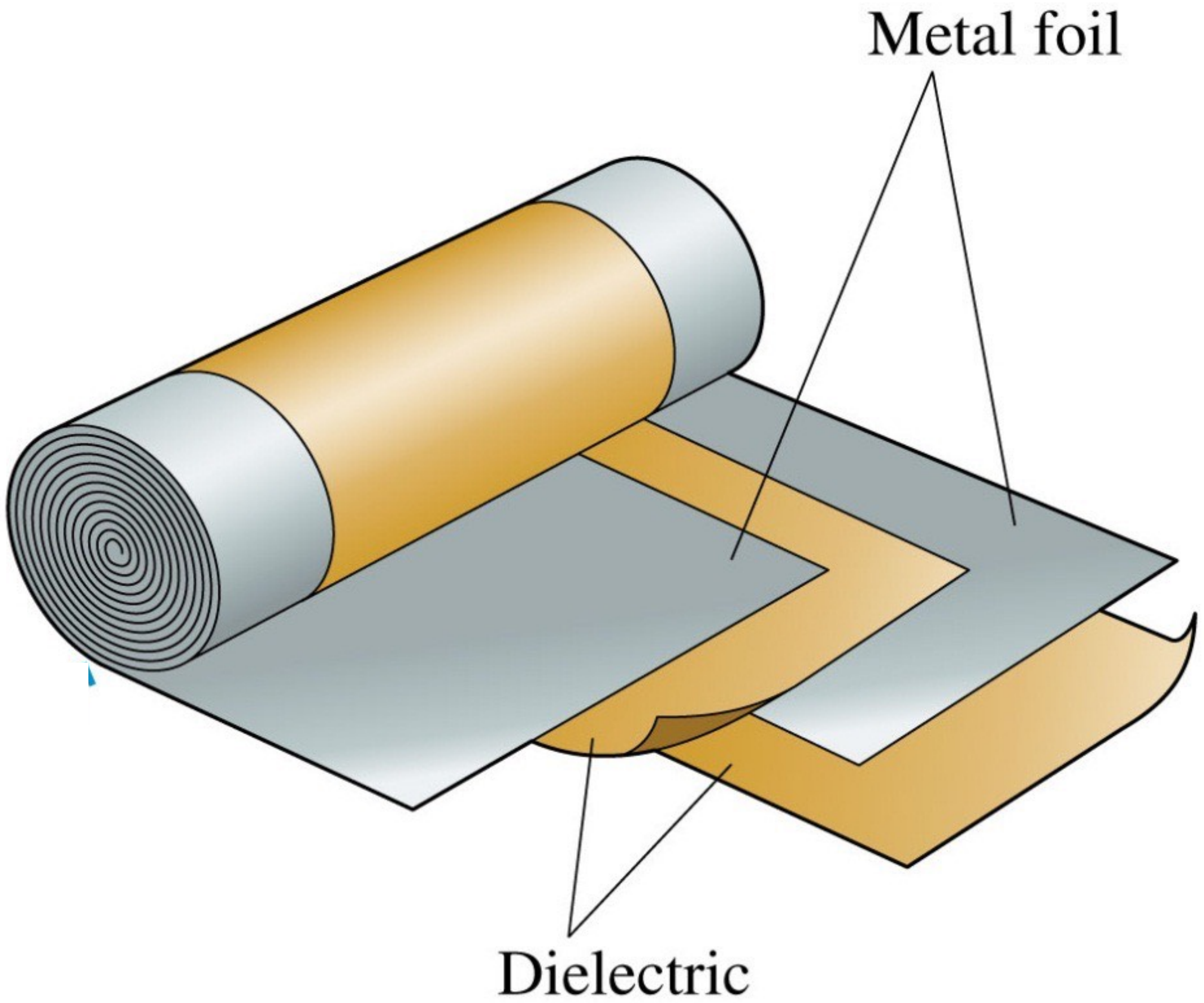
E-field $\longrightarrow$ Voltage $\longrightarrow$ Charge on plates

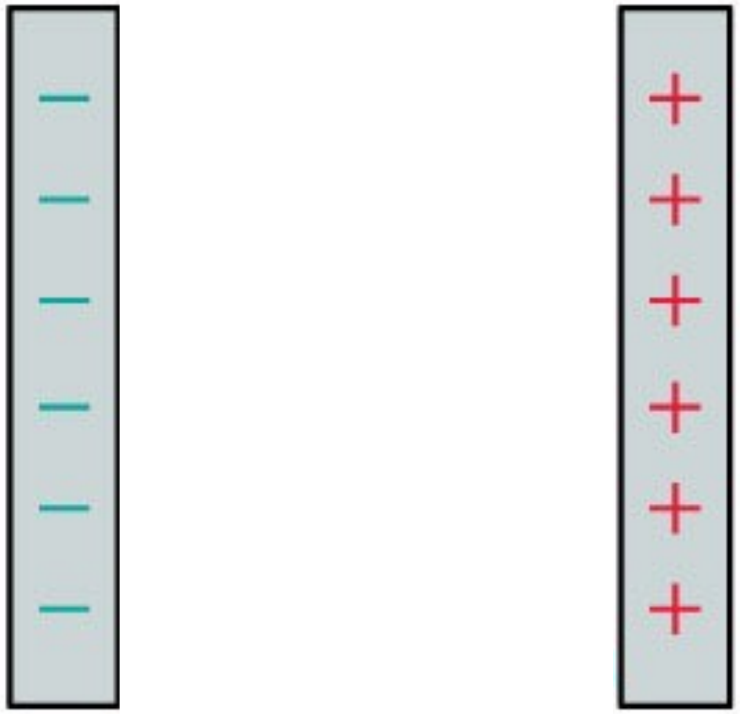
"If the E field goes down, then the voltage… and the charge on the plates….."

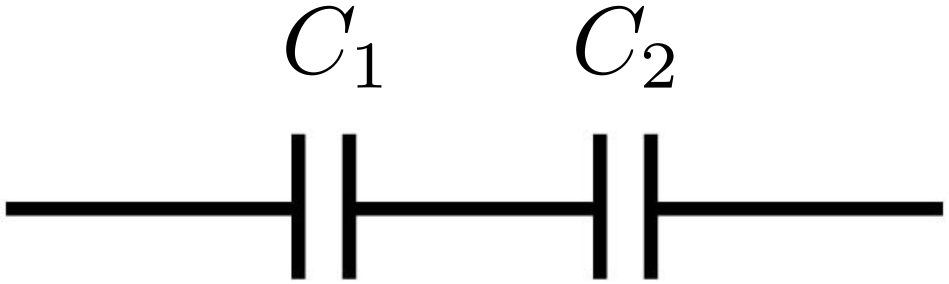
$$\kappa \equiv \frac{E_0}{E}$$

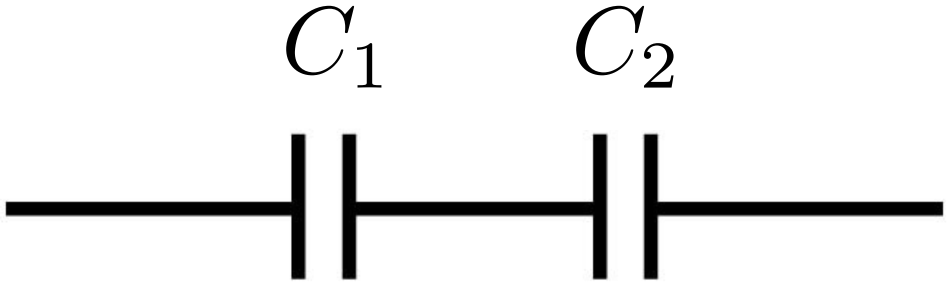
$$C = \frac{Q}{\Delta V_C} = \frac{Q_0}{(\Delta V_C)_0/\kappa} = \kappa \frac{Q_0}{(\Delta V_C)_0} = \kappa C_0$$

Real capacitors






C_1
C_2


C_1
C_2