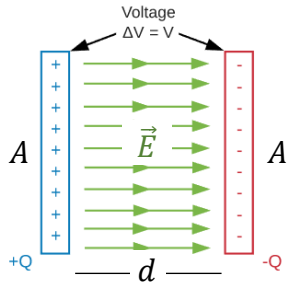
CONCEPT: CAPACITANCE OF SPECIAL CAPACITOR SHAPES USING CALCULUS

● Remember, the capacitance between ANY two charged surfaces: $\boldsymbol{C = \frac{Q}{V}}$

- In some problems, **V** is not given and $\vec{\mathbf{E}}$ is not constant, so you'll need to use _____ to solve for **V.**

Parallel Plate Capacitors

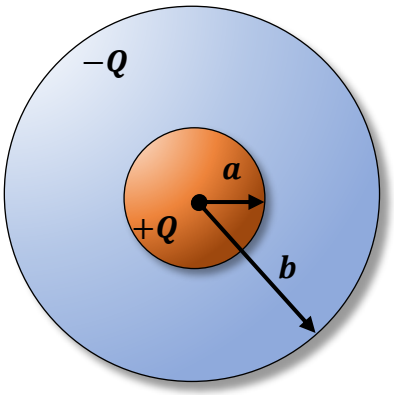


- Capacitance: $\boldsymbol{C = \frac{Q}{V} = \epsilon_0 \frac{A}{d}}$
- **E** is **[CONSTANT | CHANGING]**
- Voltage: $\boldsymbol{V = -E \cdot d}$

Any Capacitor

- Capacitance: $\boldsymbol{C = \frac{Q}{V}}$
- **E** is **[CONSTANT | CHANGING]**
- Voltage: _____

EXAMPLE: A spherical capacitor is made of two concentric spherical shells of charge. The inner shell has radius **a** and charge $+\boldsymbol{Q}$ and the outer shell has radius **b** and charge $-\boldsymbol{Q}$. What is the capacitance between these two shells?



PROBLEM**:** Two long charged coaxial cylinders form a capacitor, one of radius a, and the other of radius b, where $a < b$. The inner conductor has charge density $+\lambda$, the outer one with $-\lambda$. Write an expression for the capacitance per length.