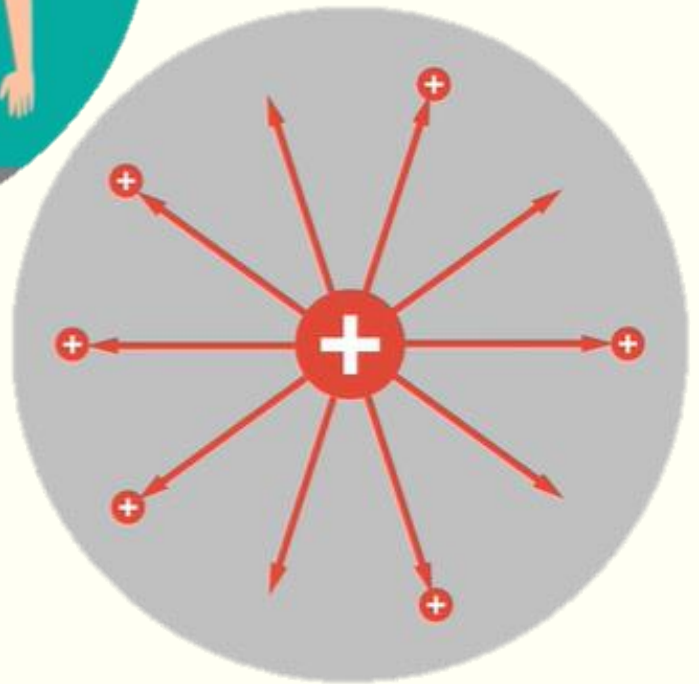
27-5

ELECTRIC POTENTIAL DIFFERENCE

Work and Charges

- **Work** is required **to move a charge** in an electric field

- The **electric potential energy** describes the amount of **stored energy** a charge has when moved by an electrostatic force.

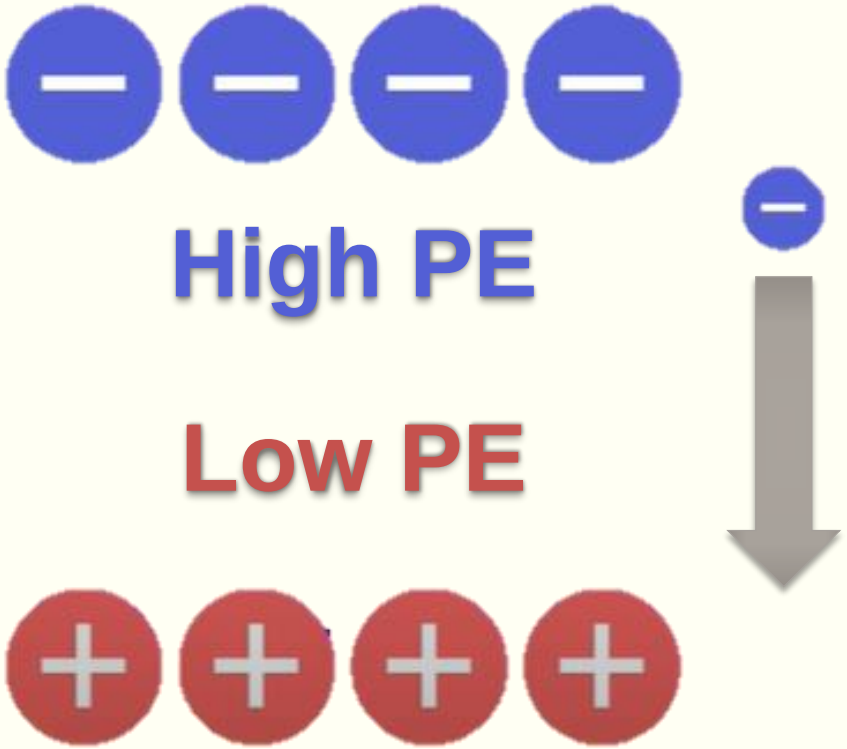


Electric Potential Difference

- Work done to move a unit charge from **one point to another**

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

V : potential difference [volts]
W: work [Joules]
q : charge [Coulombs]



Electron-volts

- **Energy** needed to move an elementary charge through a potential difference of **1 V**

$$1\ \text{eV} = 1.6 \times 10^{-19}\ \text{J}$$

Example Problem

In an electric field, **0.90 joules** of work is required to bring **0.45 coulombs** of charge from point A to point B. What is the **electric potential difference** between point A and B?

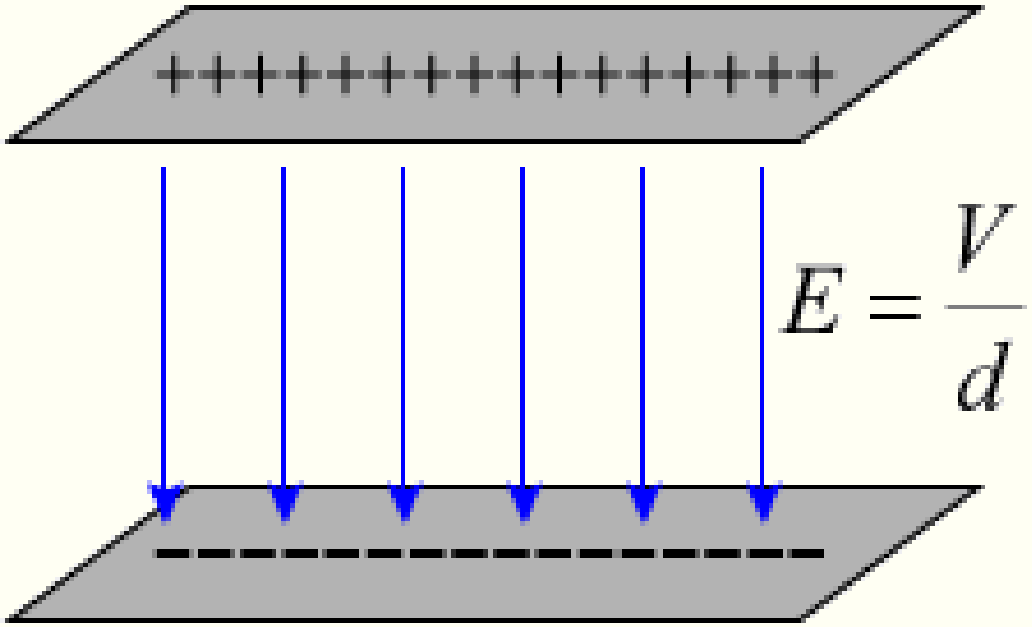
$W = 0.90$ [J]
$q = 0.45$ [C]
$V = ?$

Parallel Plates

- **Electric field strength**
- **Strength** of the field is the **same** between the plates
- How are the units **equivalent**?

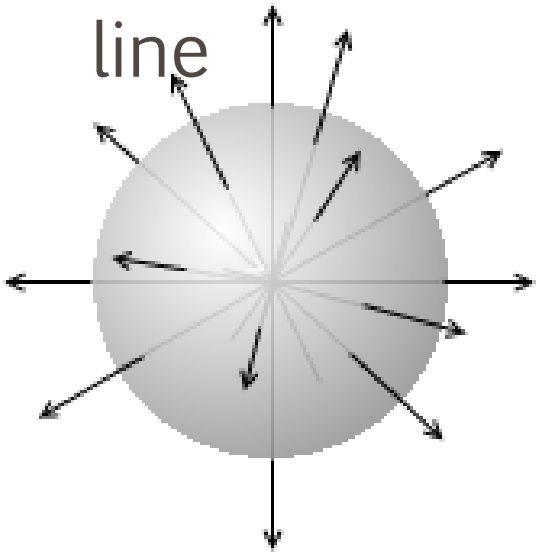
$$\frac{\mathrm{N}}{\mathrm{C}} = \frac{\mathrm{N} \times \mathrm{m}}{\mathrm{C} \times \mathrm{m}} = \frac{\mathrm{J}}{\mathrm{C} \times \mathrm{m}} = \frac{\frac{\mathrm{J}}{\mathrm{C}}}{\mathrm{m}} = \frac{\mathrm{V}}{\mathrm{m}}$$

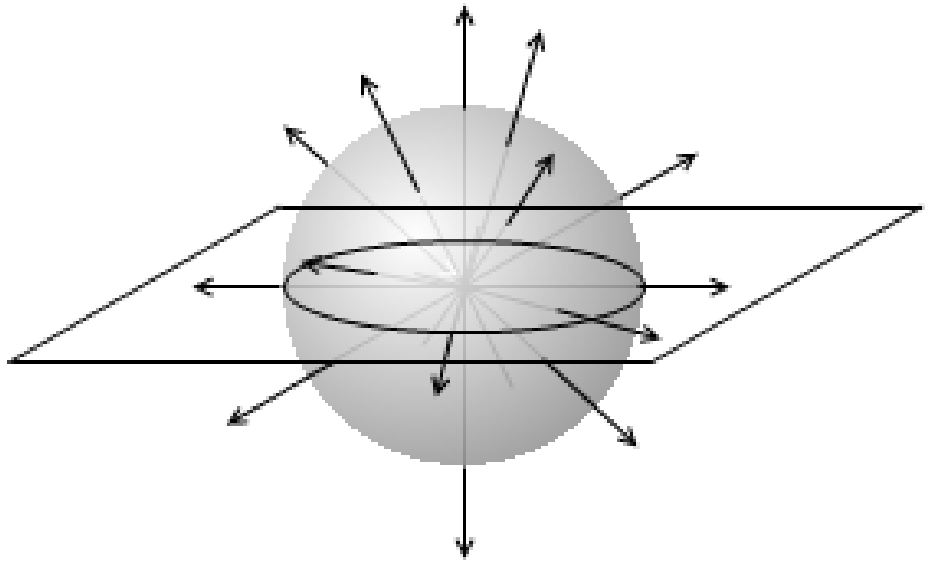
E : electric field strength [N/C]
V : potential difference [volts]
d : separation distance [m]

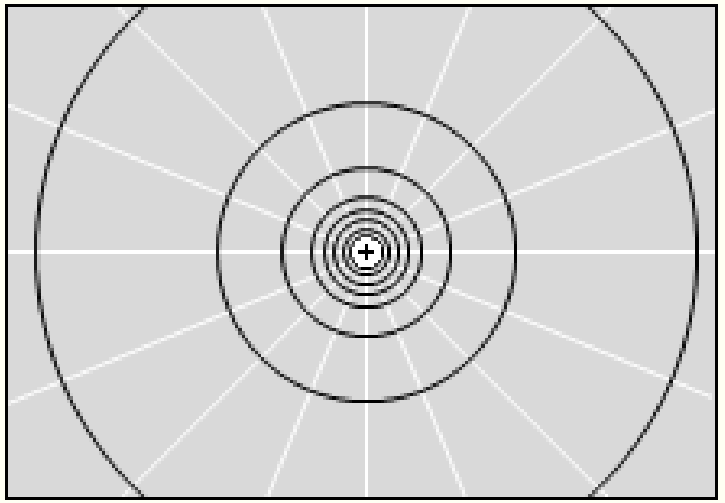


Equipotential Lines

- Lines of **equal** electrical potential
- Always cross electrical field lines at **right angles**
- **No work** will be done if a charged particle stays on the line







THE END

Thank you for listening !