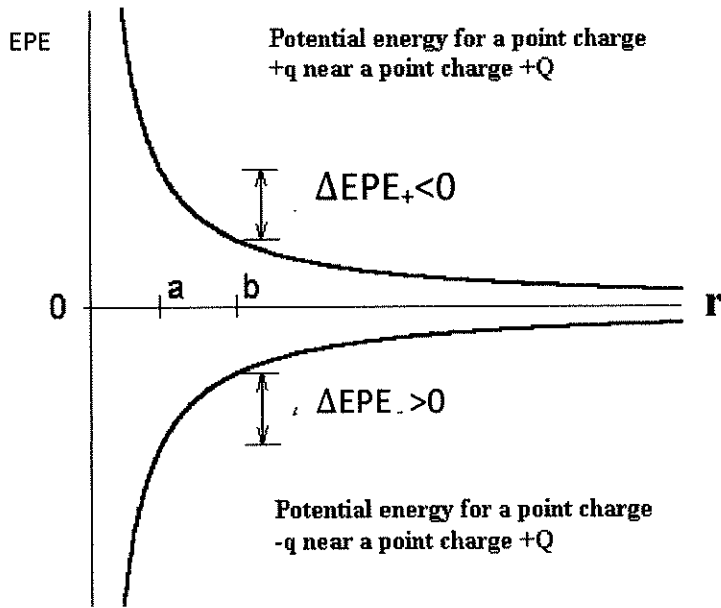ELECTRIC POTENTIAL ENERGY AND ELECTRIC POTENTIAL

EPE = electric potential energy

Units: _____

Potential energy for a point charge
+q near a point charge +Q

$\Delta EPE_+ < 0$

a   b

0   r

$\Delta EPE_- > 0$

Potential energy for a point charge
-q near a point charge +Q

EPE

> A charged object can have electric
  potential energy by virtue of its
  location in electric field
> Work is required to push a charged
  particle against the electric field

$$W = \Delta\, EPE$$

ELECTRIC POTENTIAL = V

Units: _____

Alternative name: potential

= electric potential energy per charge

ELECTRIC POTENTIAL DIFFERENCE = ΔV

Units:_____

Alternative names: potential difference, voltage, potential drop, change in potential

NET POTENTIAL =$\sum V$

Units:_____

ELECTRIC POTENTIAL INSIDE A BATTERY

F_e causes the positive charge to move to the negative plate (Coulomb's Law). This means work is done to move the charge.

$W = Fd$ when F and d are parallel vectors

As $F_e = Eq$ then it follows that $W = Eqd$

➤ If q is negative, work is negative (negative charge moves opposite to the direction of the electric field)
➤ If q is positive, work is positive
➤ We say a battery has a voltage (potential drop or potential difference)

$\Delta V = Ed$ That is, voltage = electric field multiplied by distance between parallel plates

! this formula can be used only when electric field is constant!

Work done when a charge moves through a potential difference:

$$W = q\Delta V$$

Example 1:A 0.16C charge is moved in an electric field from a point with a potential of 25V to another location with a potential of 95 V. How much work was done to move this charge?

Example 2: What is the magnitude of the voltage between two points A and B if 0.00025 N of force is required to move the 1.6 μC charge from A to B, a distance of 0.50 m?

Example 3: What is the magnitude and direction of the electric field created by the plates shown below?

NOTE: V/m = N/C for parallel plates

Practice:
1. Find the potential difference between two parallel plates separated by 0.0006 m and creating an electric field of 3.0×10^6 V/m down.

2. How strong is the electric field between 2 parallel plates that are separated by 1.5 cm and connected to a circuit with 25000 voltage?

3. How much work needs to be done to move a 3.6×10^5 C charge to a point in the electric field that has voltage higher by 12V?

4. If moving a positive charge from a location with potential 20V to another location with potential 80V resulted in 1.92×10^{-17} J of change in EPE, what is the magnitude of the charge?