**Units: Formulae**

**point charges only**

Electrostatic Force: $\rightharpoonaccent{F\_{e}}$ Newtons: N = $\frac{kg m}{s^{2}}$ $F\_{e}= k\_{e }\frac{\left|q\_{1}q\_{2}\right|}{r^{2}}$

$$\rightharpoonaccent{F}=q\rightharpoonaccent{E}$$

Vectors

Electric Field : $\rightharpoonaccent{E}$ $\frac{Newtons}{Coulomb}= \frac{N}{C}= \frac{V}{m}$ $E = k\_{e }\frac{\left|q\right|}{r^{2}}$

Electric Potential Energy: *PE* Joules: J = N m = V C $PE= $ $k\_{e} \frac{q\_{1}q\_{2}}{r}$ *PE = qV = -qEx*

Scalars

Electrostatic potential: *V* Volts: V = $\frac{N m}{C}$ $V= k\_{e }\frac{q}{r}$ *V = -Ex*

Scalars

Change in Potential Energy = *PE*

Potential Difference *= V* (units areV)

Charge: *Q* Coulomb: C

Capacitance: *C* Farad: F

*CQV C = o**A/d E = ½ QV = ½ C(V)2 = ½ Q2/C*

*ke* = 8.99 x 109 Nm2/C2 *o*= $\frac{1}{4πk\_{e}} $= 8.85 x 10-12 C2/Nm2 Electron charge:qe = – 1.6 x 10-19 C

= micro = 10-6  n = nano = 10-9 p = pico = 10-12