- **Electric potential energy** [1J]: Attribute of charge q in electric field $\vec{E}(\vec{r})$

$$U(\vec{r}) = -\int_{\vec{r}_0}^{\vec{r}} \vec{F} \cdot d\vec{s} = -q \int_{\vec{r}_0}^{\vec{r}} \vec{E} \cdot d\vec{s}$$

- **Electric potential** [1J/C=1V]: Attribute of space in the presence of field $\vec{E}(\vec{r})$

$$V(\vec{r}) = \frac{U(\vec{r})}{q} = -\int_{\vec{r}_0}^{\vec{r}} \vec{E} \cdot d\vec{s}$$

- **Work** [1J]: done by field $\vec{E}(\vec{r})$ on charge q

$$W_{if} = q \int_{\vec{r}_i}^{\vec{r}_f} \vec{E} \cdot d\vec{s} = -(U_f - U_i) = -\Delta U$$

- **Voltage** [1V]: potential difference

$$\Delta V = V_f - V_i = -\int_{\vec{r}_i}^{\vec{r}_f} \vec{E} \cdot d\vec{s} = -\frac{W_{if}}{q}$$