JEEt Lo 2021

PHYSICS

GRADE - 12

• LIVE

ELECTRIC POTENTIAL & POTENTIAL ENERGY

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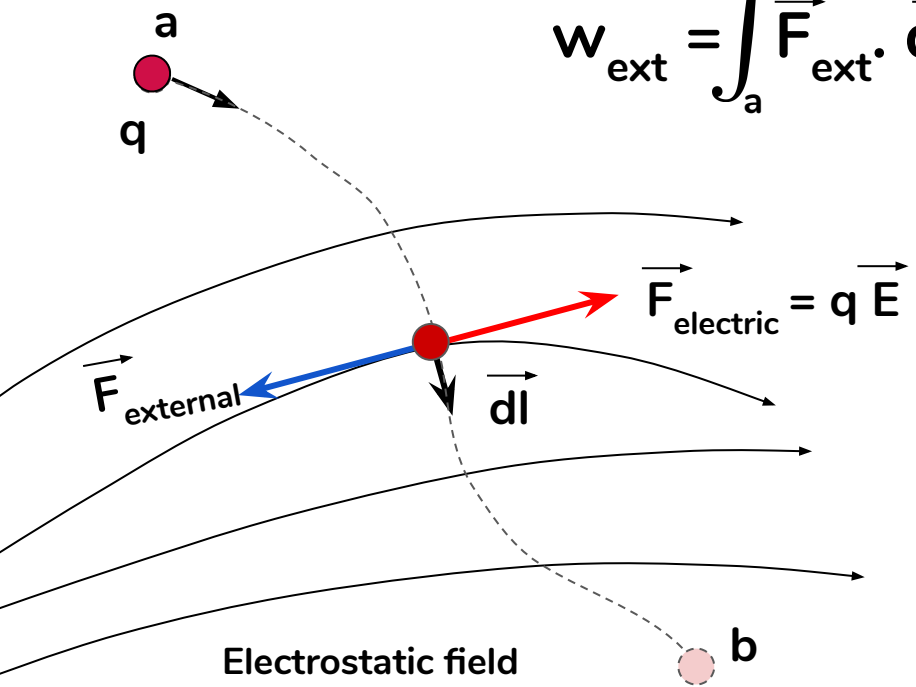
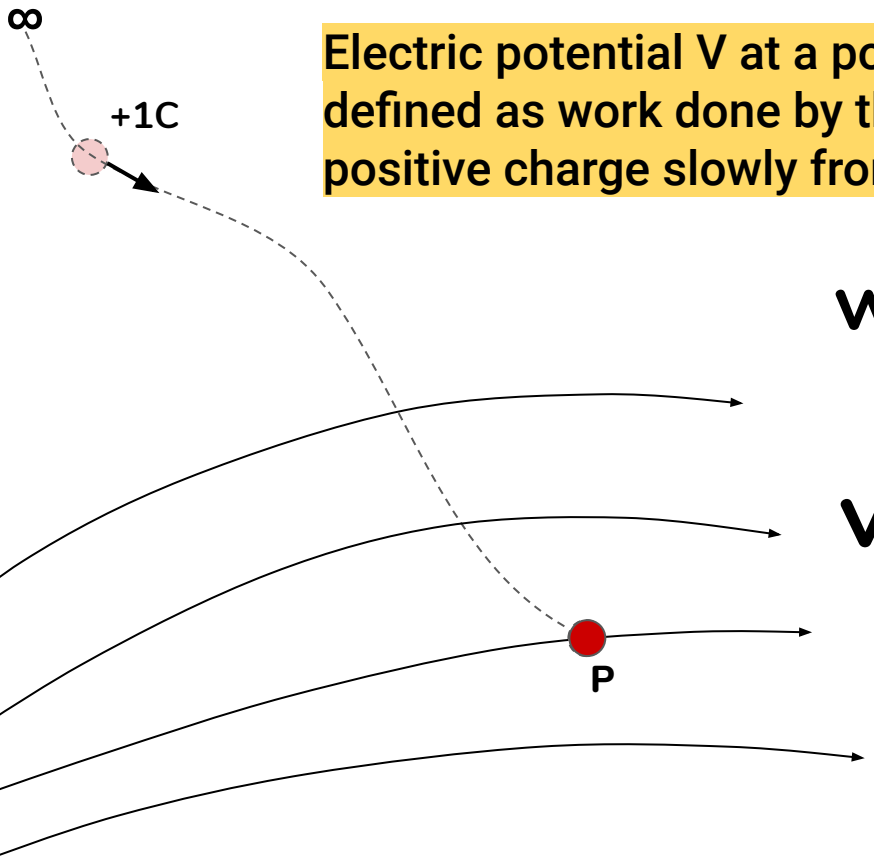
Electric potential and potential energy

Expression for work done to move a charge in an electric field

$$W_{ext} = \int_a^b \vec{F}_{ext} \cdot \vec{dl} = \int_a^b (-q\vec{E}) \cdot \vec{dl} = -q \int_a^b \vec{E} \cdot \vec{dl}$$



Definition of electric potential

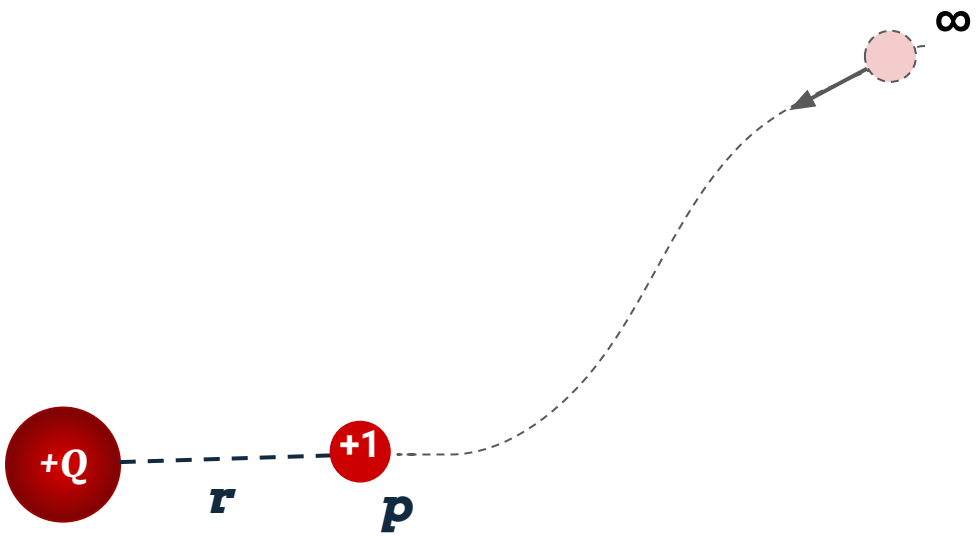


Electric potential V at a point P in an electrostatic field is defined as work done by the external force in bringing unit positive charge slowly from infinity to the given point.

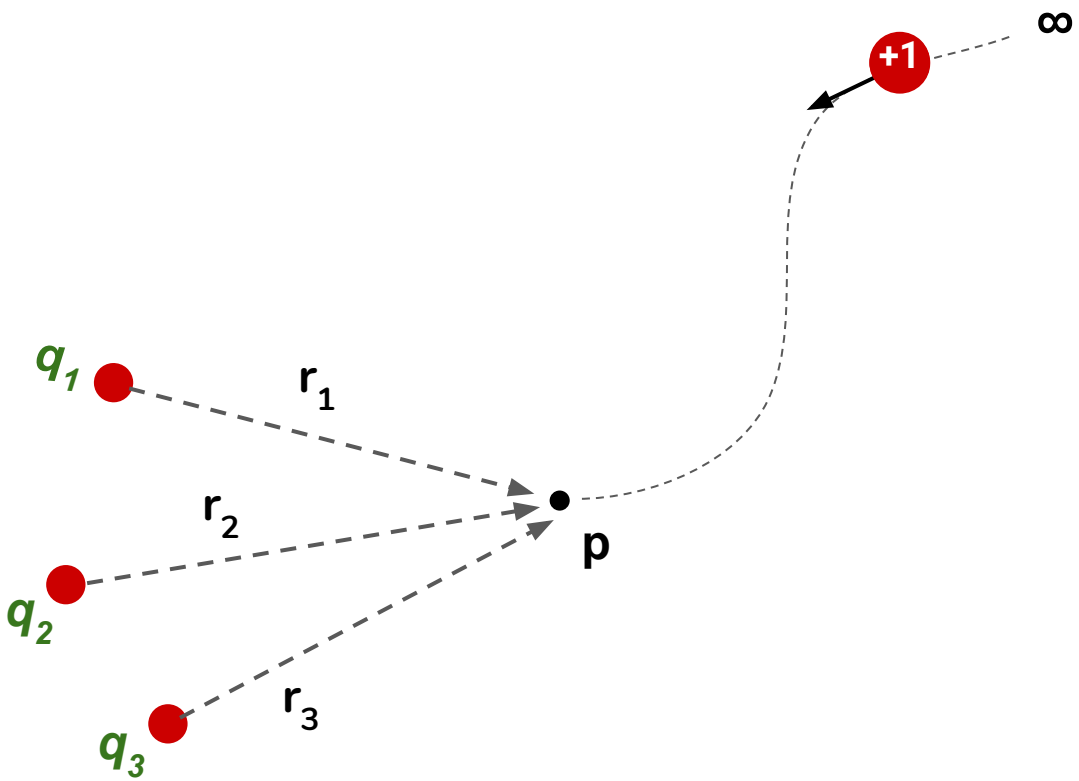
$$W_{ext} = -q\int_{\infty}^{p} \vec{E}.\vec{dl}$$

$$V = \frac{W_{ext}}{q} = -\int_{\infty}^{p} \vec{E}.\vec{dl}$$

Potential of a point charge

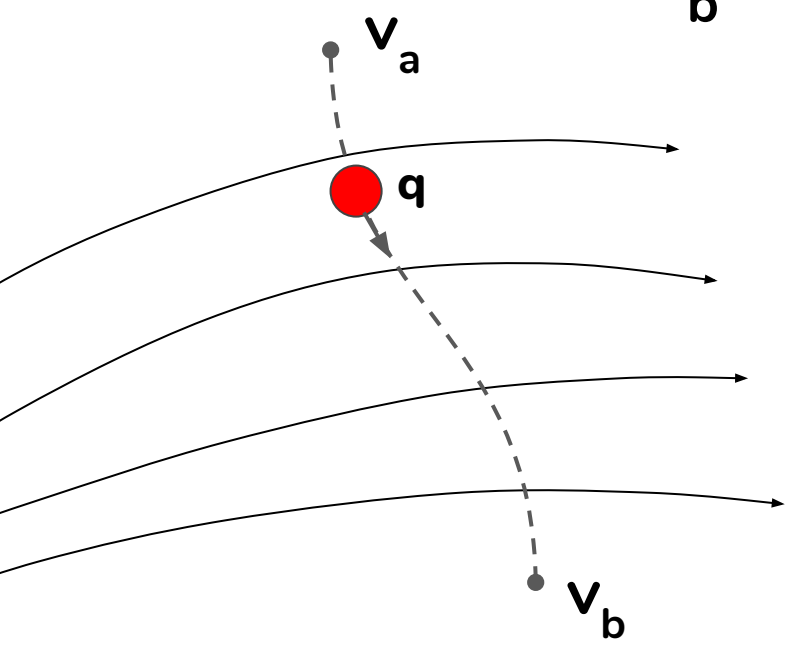


Potential due to system of charges



Potential difference

$$V_b - V_a = \frac{W}{q}$$

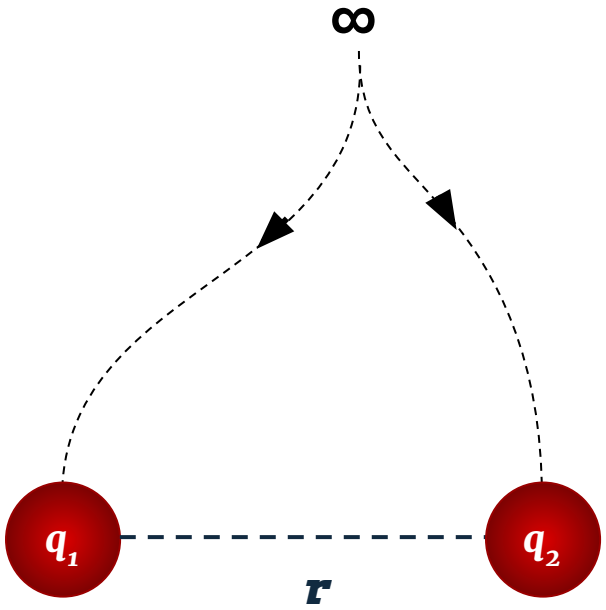


Potential energy

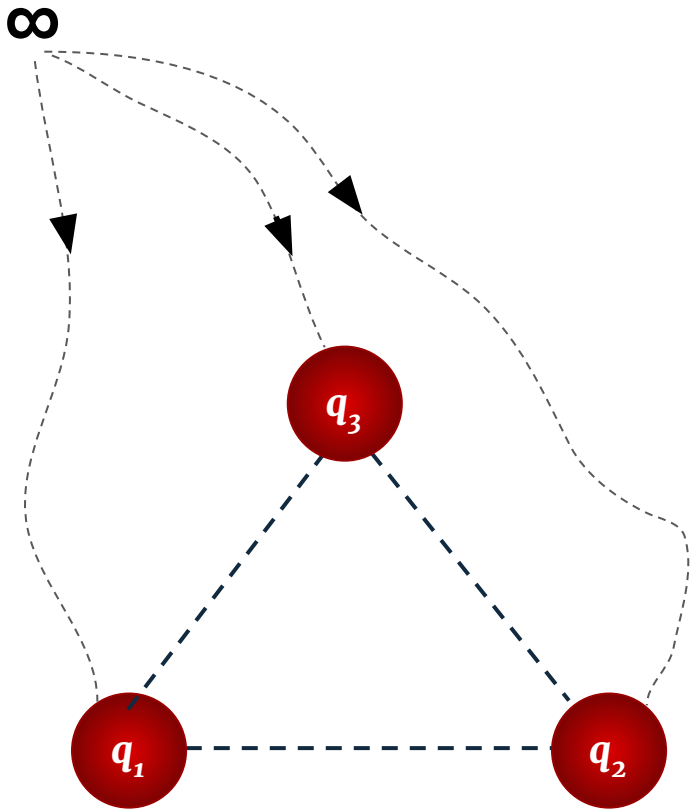
Potential energy is nothing but the energy stored in a charged particle due to work done on it by the external force in bringing it slowly from infinity (reference point) to the given point. It is similar to gravitational potential energy

$$U = W_{ext} = qV$$

Potential energy of two charges put together



Potential energy of system of three charges



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