

The work energy theorem states:

$$W = \int_i^f \mathbf{F}_{net} \cdot d\mathbf{l} = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2$$

This theorem is valid:

- A. only for conservative forces.
- B. only for non-conservative forces.
- C. only for forces which are constant in time
- D. only for forces which can be expressed as potential energies
- E. for all forces.

A + and - charge are held a distance R apart and released. The two particles accelerate toward each other as a result of the Coulomb attraction. As the particles approach each other, the energy contained in the electric field surrounding the two charges...



- A. increases
- B. decreases
- C. stays the same

The time rate of change of the energy density is,

$$\frac{\partial}{\partial t} u_q = -\frac{\partial}{\partial t} \left(\frac{\epsilon_0}{2} E^2 + \frac{1}{2\mu_0} B^2 \right) - \nabla \cdot \mathbf{S}$$

$$\text{where } \mathbf{S} = \frac{1}{\mu_0} \mathbf{E} \times \mathbf{B}.$$

How do you interpret this equation? In particular: Does the minus sign on the first term on the right seem ok?

A. Yup

B. It's disconcerting, did we make a mistake?

C. ??

If we integrate the energy densities over a closed volume,
how would interpret \mathbf{S} ?

$$\frac{\partial}{\partial t} \iiint (u_q + u_E) d\tau = - \iiint \nabla \cdot \mathbf{S} d\tau$$

- A. OUTFLOW of energy/area/time or
- B. INFLOW of energy/area/time
- C. OUTFLOW of energy/volume/time
- D. INFLOW of energy/volume/time
- E. ???

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$$\frac{\partial}{\partial t} \iiint (u_q + u_E) d\tau = - \iiint \nabla \cdot \mathbf{S} d\tau = - \iint \mathbf{S} \cdot d\mathbf{A}$$

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