Local conservation of electric charge is expressed mathematically by:

\[
\frac{\partial \rho}{\partial t} = -\nabla \cdot \vec{J}
\]

where \( \vec{J} \) is “current density”

\[
\vec{J} = \rho \vec{v}
\]

has units of \((\text{charge/sec})/\text{m}^2\)

We are trying to come up with a “conservation of energy” expression:

\[
\frac{\partial (\text{energy density})}{\partial t} = -\nabla \cdot (\text{something})
\]

What sort of beast is this “something”?
- Is it a scalar, vector, something else?
- How would you interpret it, what words would you use to try to describe it?
- What are its UNITS?
Local conservation of electric charge is expressed mathematically by:

\[
\frac{\partial \rho}{\partial t} = -\nabla \cdot \mathbf{J}
\]

where J is “current density”

\[
J = \rho \mathbf{v}
\]

has units of \((\text{charge/sec})/\text{m}^2\)

We are trying to come up with a “conservation of energy” expression:

\[
\frac{\partial (\text{energy density})}{\partial t} = -\nabla \cdot (\text{something})
\]

What sort of beast is this “something”? 
- Is it a scalar, vector, something else? 
- How would you interpret it, what words would you use to try to describe it? 
- What are its UNITS?

A) J  B) J/s  C) J/m^2  D) J/(s m^2)  E) Other!