$$-\frac{d}{dt}\int (u_K + u_{EM})dV = \int \nabla \cdot \vec{\mathbf{S}} dV$$

(Where **S**=**E** x **B** /$\mu_0$)

energy/time   energy/time

Would you interpret $\nabla \cdot \vec{S}$ as the

energy/time/volume

A) Outflow of energy/area/time
B) Inflow of energy/area/time
C) Outflow of energy/volume/time
D) Inflow of energy/volume/time

The quantity $\vec{E} \cdot \vec{J}$ represents

A) The energy contained within an electromagnetic field
B) The energy being transferred by a field into charged particles
C) The energy flux associated with an electromagnetic field

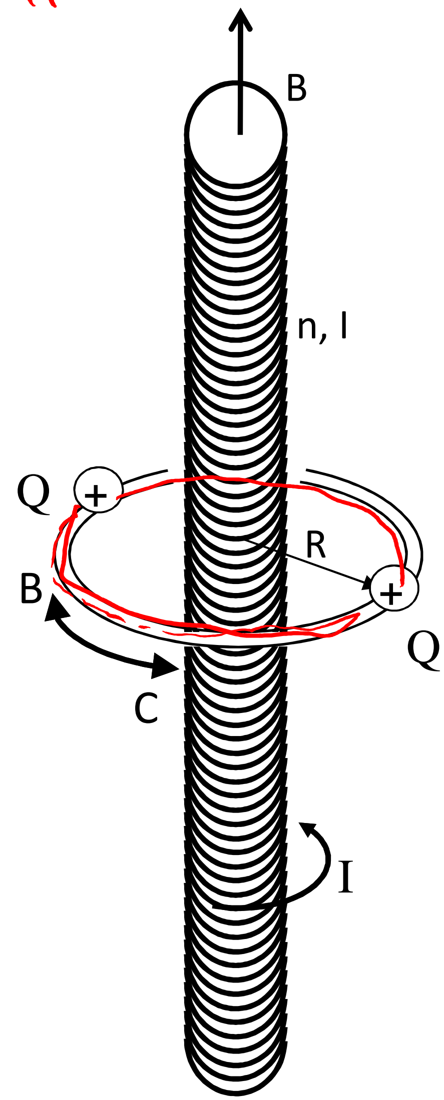
$-\frac{d\Phi}{dt} = EMF$

Feynman's Paradox:
Two charged balls are attached to a horizontal ring that can rotate about a vertical axis without friction. A solenoid with current I is on the axis. Initially, everything is at rest.

The current in the solenoid is turned off.
What happens to the charges?

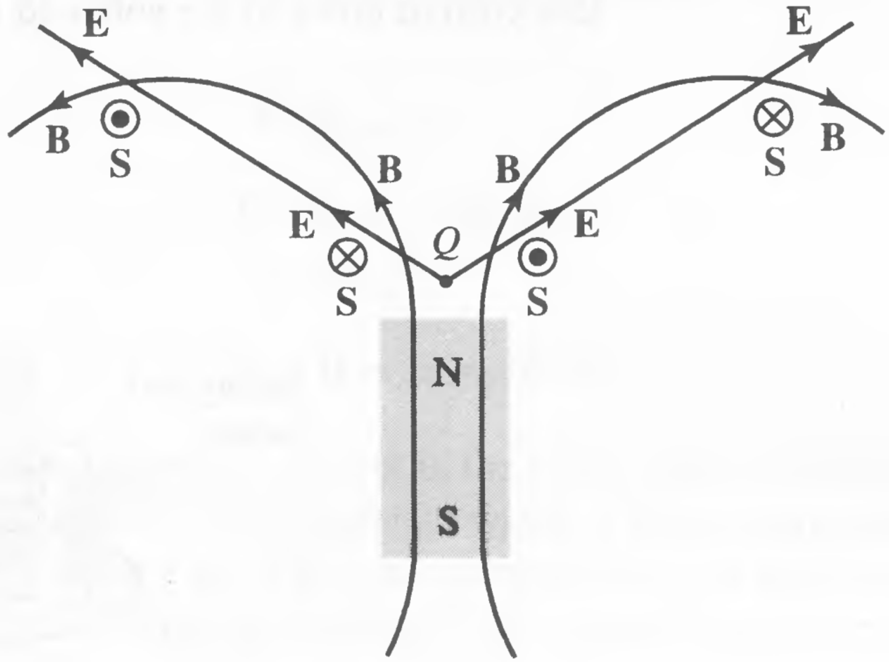
A) They remain at rest 7
B) They rotate clockwise as seen from above 10
C) They rotate counterclockwise 28

$\nabla \times E \neq 0$

Consider a charging capacitor. There are both E-fields and B-fields present in this situation. The E-field in between the plates is strengthening, meaning that region is gaining energy. Think about E, B, and S and figure out from where the energy comes.

A) The energy going into the region between the plates flows down the length of the wires
B) The energy flows in radially from the space outside the plates
C) The Poynting vector is null, meaning the energy comes in via particles, not fields


E
E
B
S
B
S
B
B
E
E
Q
S
S
N
S

# Solar sails and tacking into the wind

Since a solar sail in orbit around the sun is always being pushed radially outward by the light/solar wind, it seems impossible that you could (without using non-sail propulsion) sail into an orbit that takes you *closer* to the sun.

But you can.

How?