4.10 b

You have a boundary between two linear dielectric materials (ε_r has one value above, another below, the boundary)

Choose the correct formula(s) for V at the boundary

A) $V\big|_{out} - V\big|_{in} = 0$

B) $V\big|_{out} - V\big|_{in} = \frac{-\sigma_{tot}}{\varepsilon_0}$

C) $\varepsilon_{out} V\big|_{out} - \varepsilon_{in} V\big|_{in} = 0$

D) $\varepsilon_{out} V\big|_{out} - \varepsilon_{in} V\big|_{in} = -\frac{\sigma_{tot}}{\varepsilon_0}$

E) None of these, or MORE than one...

4.10

You have a boundary between two linear dielectric materials (ε_r has one value above, another below, the boundary) Define $\varepsilon=\varepsilon_0\varepsilon_r$

Choose the correct formula(s) for V at the boundary

A) $\frac{\partial V}{\partial n}\Big|_{out} - \frac{\partial V}{\partial n}\Big|_{in} = \frac{-\sigma_{free}}{\varepsilon_0}$

B) $\frac{\partial V}{\partial n}\Big|_{out} - \frac{\partial V}{\partial n}\Big|_{in} = \frac{-\sigma_{tot}}{\varepsilon_0}$

C) $\varepsilon_{out}\frac{\partial V}{\partial n}\Big|_{out} - \varepsilon_{in}\frac{\partial V}{\partial n}\Big|_{in} = -\sigma_{free}$

D) $\varepsilon_{out}\frac{\partial V}{\partial n}\Big|_{out} - \varepsilon_{in}\frac{\partial V}{\partial n}\Big|_{in} = -\sigma_{bound}$

E) None of these, or MORE than one...

4.11

We argued that C goes UP by a factor of ε_r if you fill a capacitor with dielectric.

What happens to the stored energy of a capacitor if it's filled with a dielectric?

A) It goes up

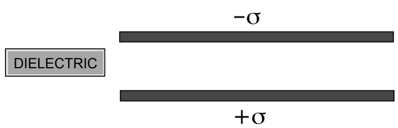
B) It goes down

C) It is unchanged

D)The answer depends on what else is "held fixed" (V? Q?)

4.12 b

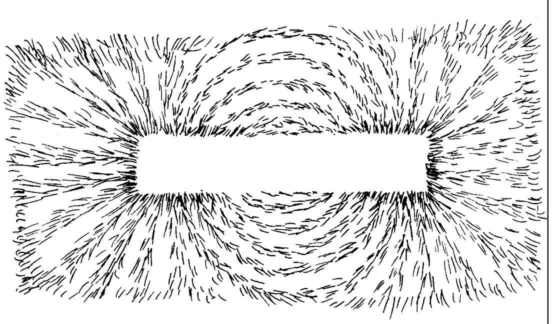
If we push this dielectric inside the *isolated* capacitor, will it be drawn into the capacitor or repelled?

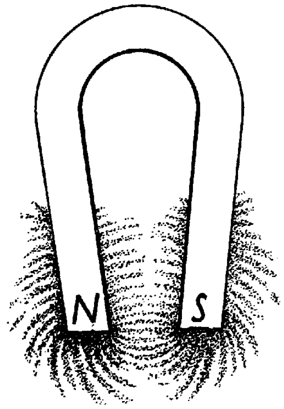


A. It gets sucked into the capacitor
B. It gets pushed out from the capacitor
C. I just don't know.

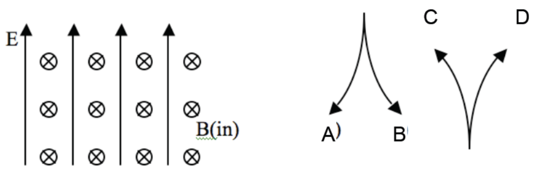
Magnetic fields, **B**

- Features
- Force
- Sources





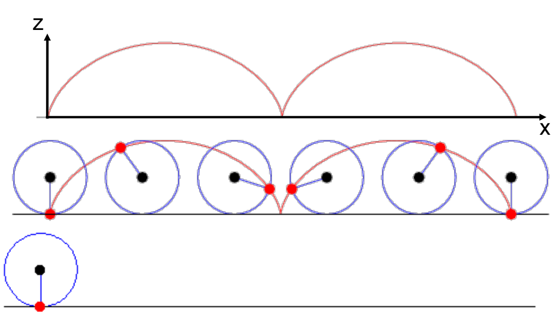
A proton (q=+e) is released from rest in a uniform **E** and uniform **B**. **E** points up, **B** points into the page. Which of the paths will the proton initially follow?



E. It will remain stationary

(To think about: what happens after longer times?)

Cycloid

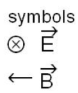


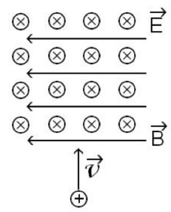
Source: Wofram Research, Inc.

5.1

A + charged particle moving up (speed v) enters a region with uniform **B** (left) and uniform **E** (into page).

What's the direction of $\mathbf{F}_{net}$ on the particle, at the instant it enters the region?



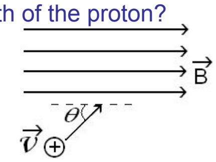


A. To the left
B. Into the page
C. Out of the page
D. No net force
E. Not enough information

5.3

A proton (speed v) enters a region of uniform **B**. **v** makes an angle θ with **B**.

What is the subsequent path of the proton?



A) Helical
B) Straight line
C) Circular motion, ⊥ page. (plane of circle is ⊥ **B**)
D) Circular motion ⊥ page. (plane of circle at angle θ w.r.t. **B**)
E) Impossible. **v** should always be ⊥ **B**