Electricity and Magnetism

- Physics 259 – L02
- Lecture 20

UNIVERSITY OF CALGARY

Midterm Review and Class Activity

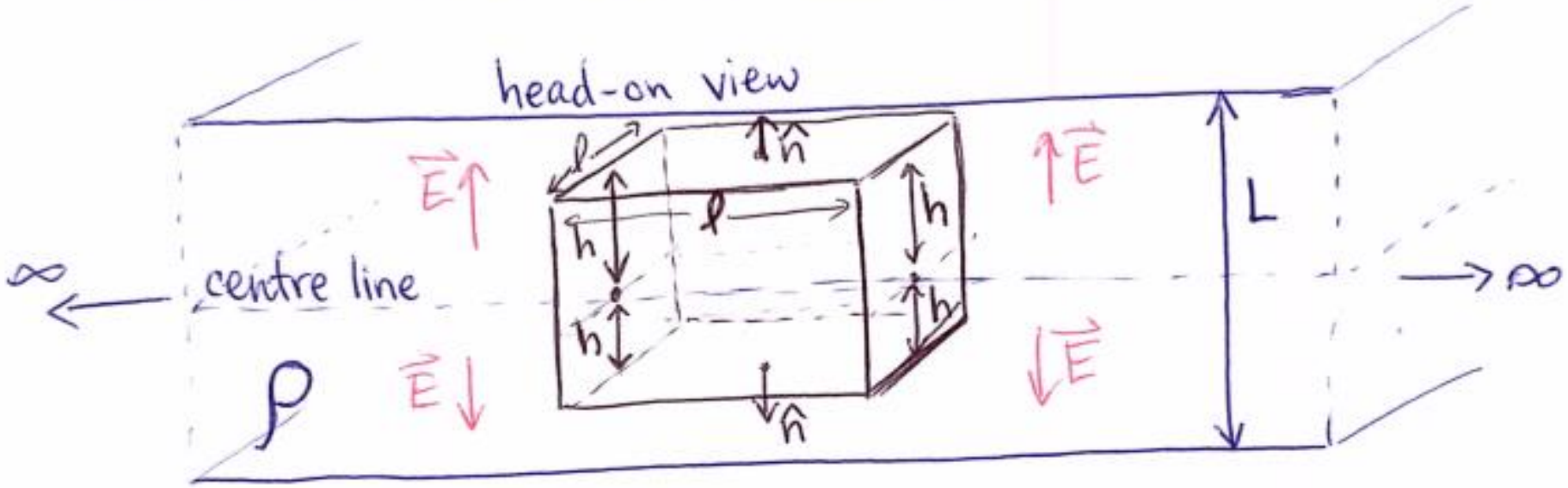
Last time

- Chapter 23

This time

- Midterm Review and Class Activity

What is the field inside the slab?



The slab has thickness L, we have to choose a Gaussian surface with the same symmetries as the slab: choose a box whose centre coincides with the centre of the slab.

What about cylinder?

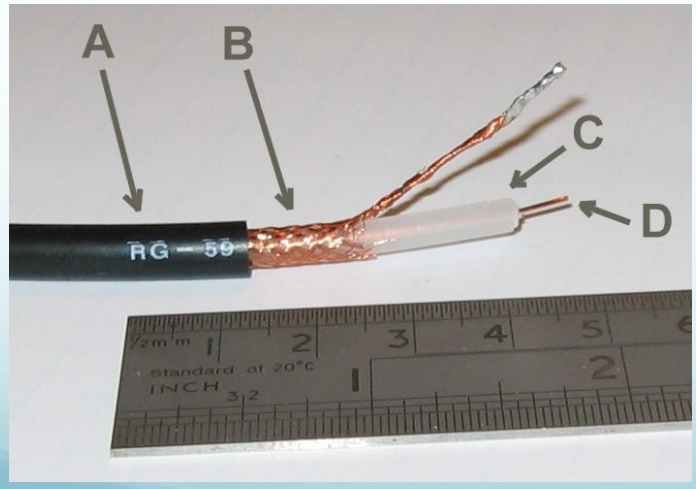
Study appendix 1-chapter 23 posted on D2l.

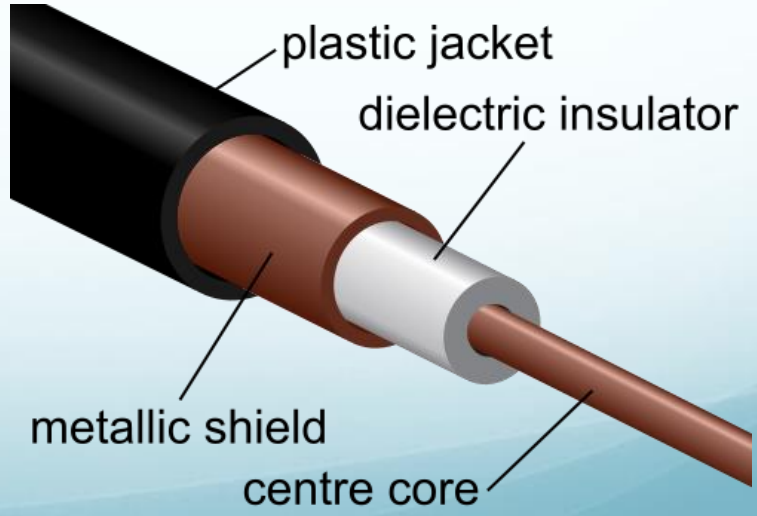
Exercise: Coaxial Cable

Study appendix 1-Chapter 23

Assume there is a charge **+Q** on the centre core and **-Q** on the metallic shield. (Ignore the dielectric insulator and plastic jacket.)

Find the electric field outside the metallic shield ($\mathbf{E_2}$) and just outside the central core ($\mathbf{E_1}$).





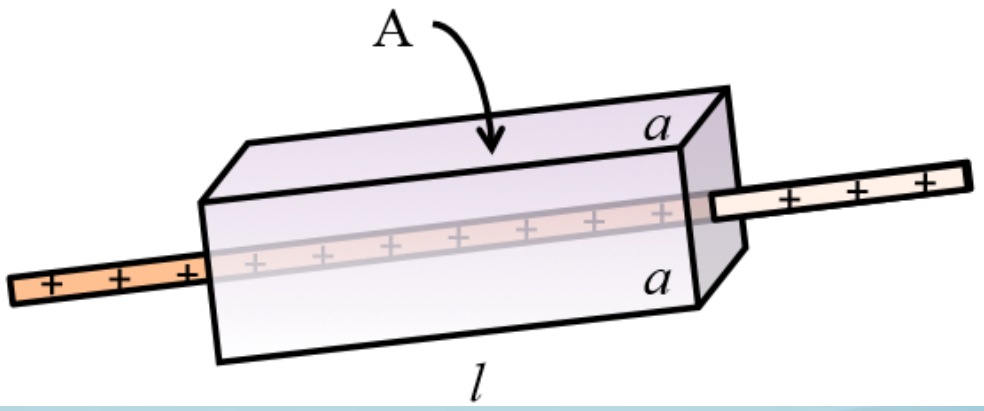
TopHat Question

What is the charge of the insulating wire (the wire is reshaped to form a rectangle) with charge density $-\lambda$?

A) $L^2\lambda$
B) $-L^2\lambda$
C) $4L\lambda$
D) $-4L\lambda$

Field of a line charge

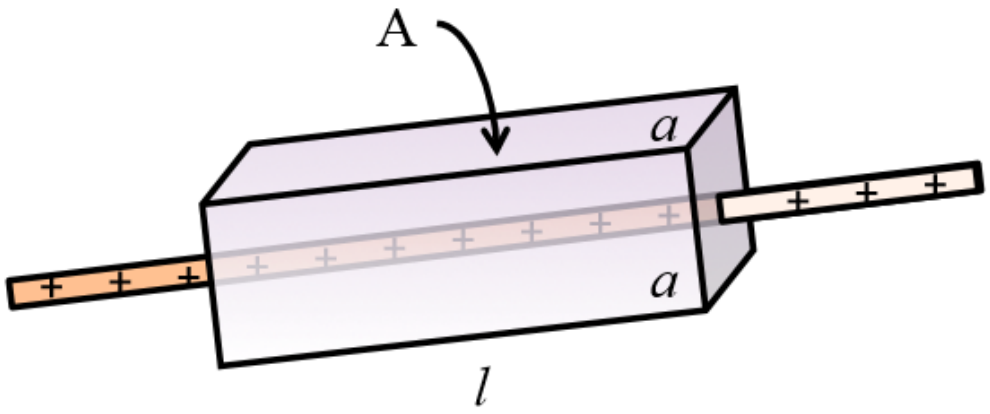
Consider an infinitely long, positively charged rod of linear charge density λ. How large is the flux through side A of the box? Suppose the values for l, a and λ are given.



Field of a line charge

- Consider an infinitely long, positively charged rod of linear charge density λ. How large is the flux through side A of the box? Suppose the values for l, a and λ are given.
- Gauss' law tells us that the total electric flux only depends on the enclosed charge – not the shape of the (closed) Gaussian surface:

$$\Phi_{tot} = Q_{encl}/\varepsilon_0 = \lambda l/\varepsilon_0$$



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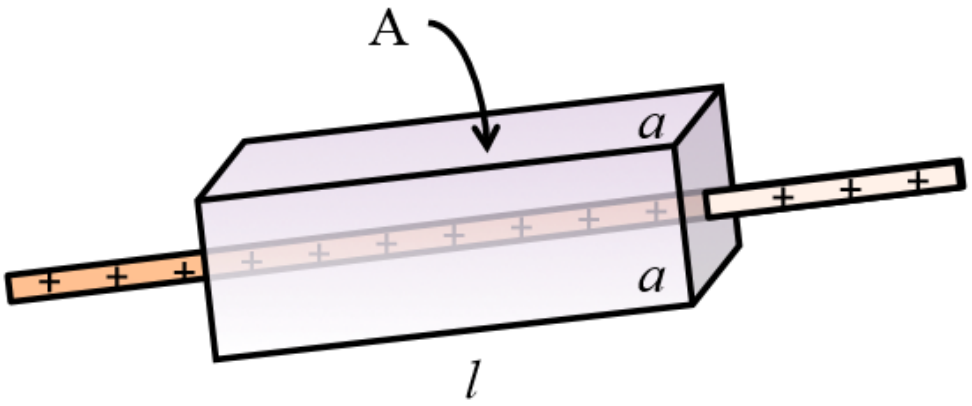
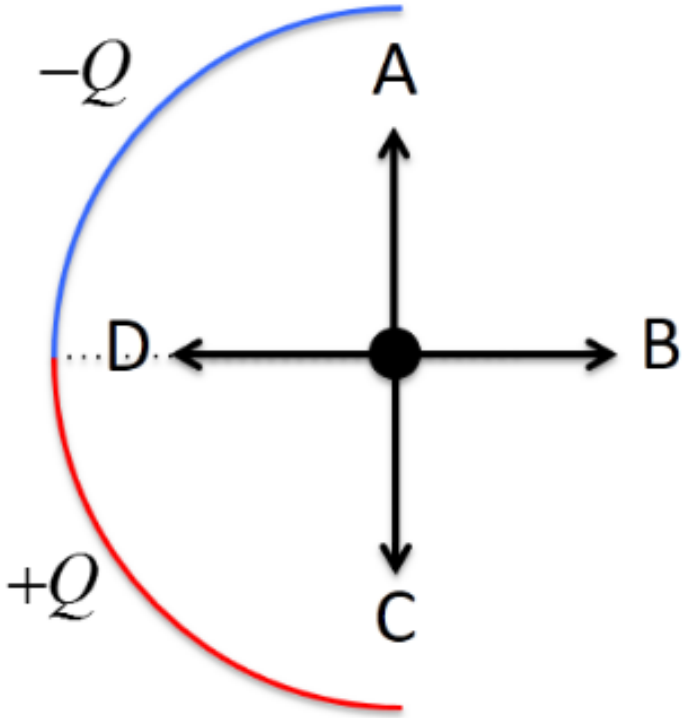
  $\Phi_{tot} = Q_{encl}/\varepsilon_0 = \lambda l/\varepsilon_0$
- The total flux must be equally partitioned into flux through the four surfaces whose area vectors are parallel to the electric field.
  Hence, $\Phi_A = \lambda l/4\varepsilon_0$



TopHat Question #1:

What is the direction of electric field at point indicated?



This section we talked about:

Midterm Review & Class Activity

See you on Monday