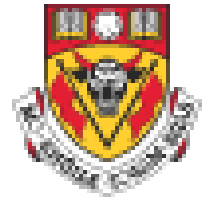


Electricity and Magnetism

- Physics 259 – L02
 - Lecture 12



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Chapter 23

(please read chapter 22 of the textbook)



Last time

- Chapter 22



This time

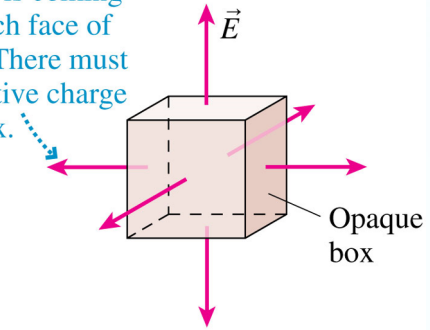
- Chapter 23



23-1: The Electric Flux

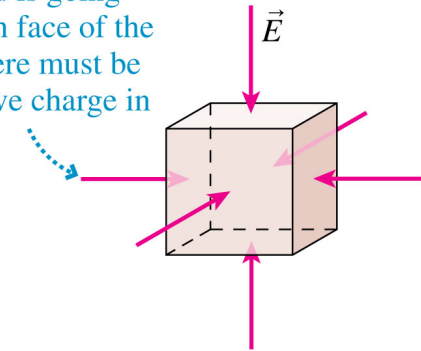


- (a) The field is coming out of each face of the box. There must be a positive charge in the box.



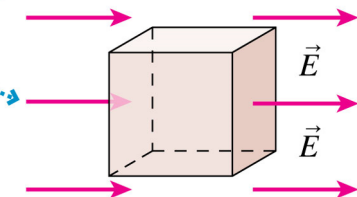
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- (b) The field is going into each face of the box. There must be a negative charge in the box.

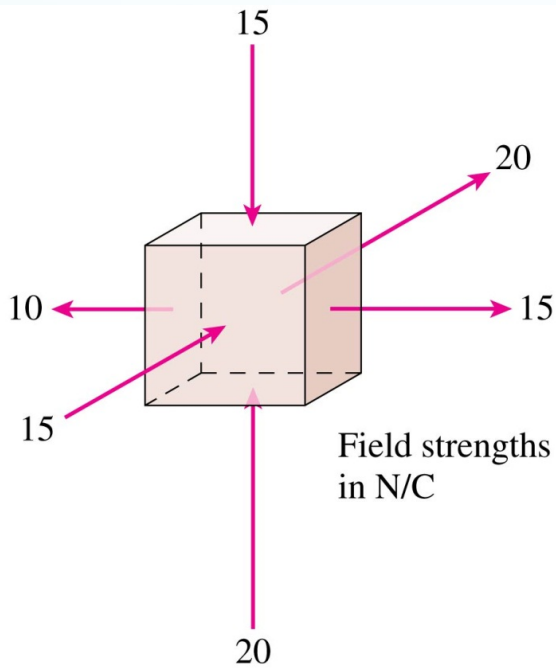


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- (c) A field passing through the box implies there's no net charge in the box.



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A closed surface through which an electric field passes
is called **Gaussian surface**

An imaginary mathematical surface

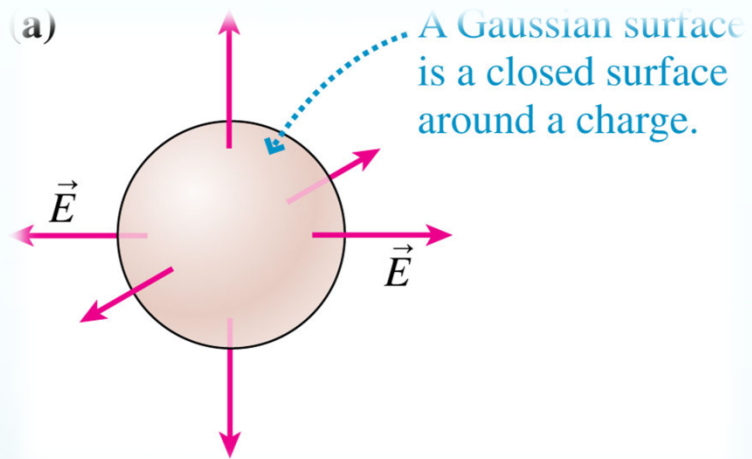


Electric Flux; Gauss' Law

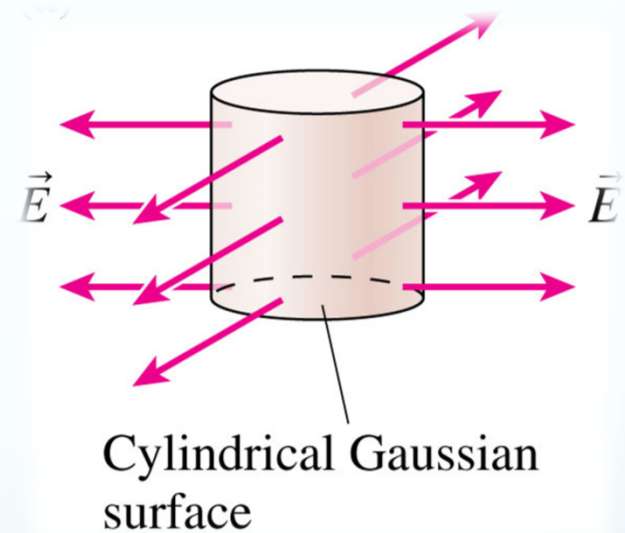
Gauss' Law is equivalent to Coulomb's law. It will provide us:

- (i) an **easier way to calculate the electric field** in specific circumstances (especially situations with a **high degree of symmetry**)
- (ii) a better understanding of the properties of conductors in electrostatic equilibrium (more on this as we go)
- (iii) It is valid for moving charges – not limited to electrostatics.

The Gaussian surface is most useful when it matches the shape of the field



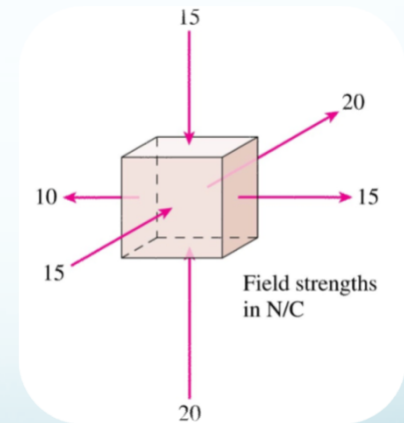
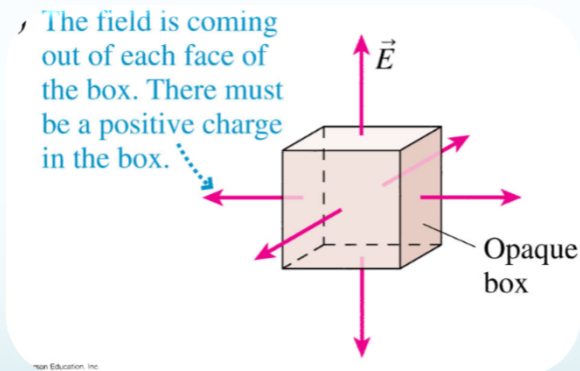
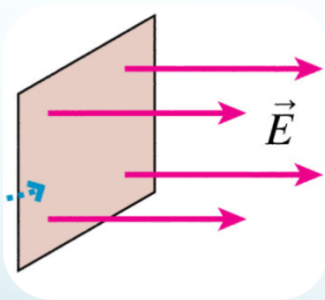
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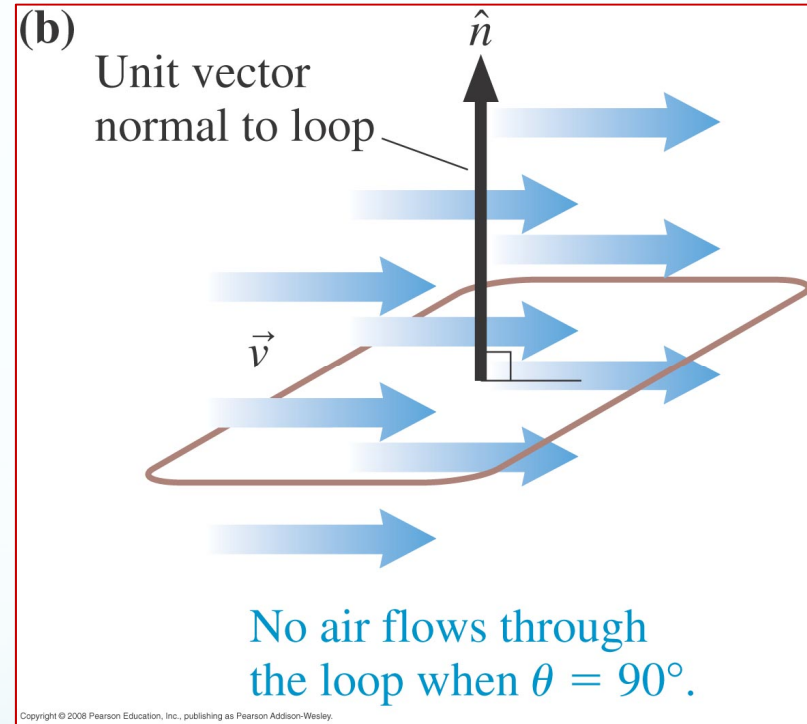
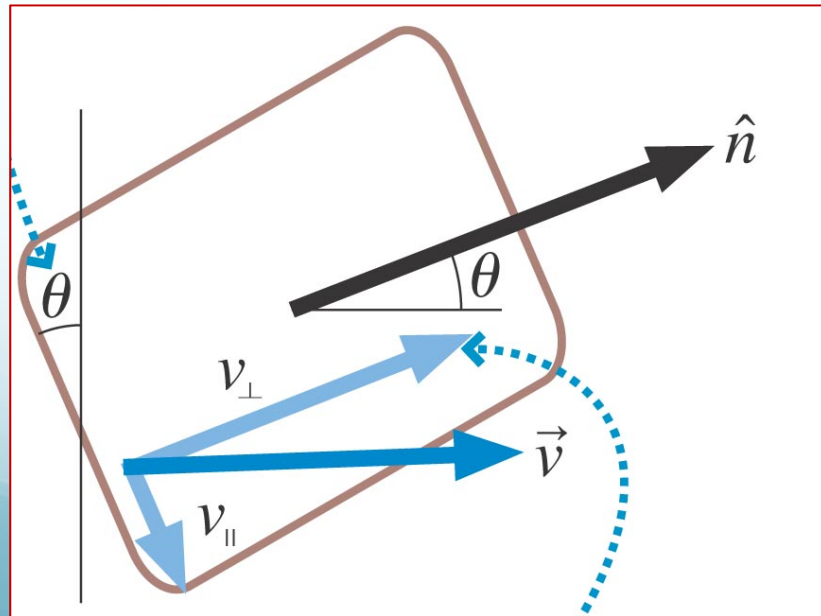
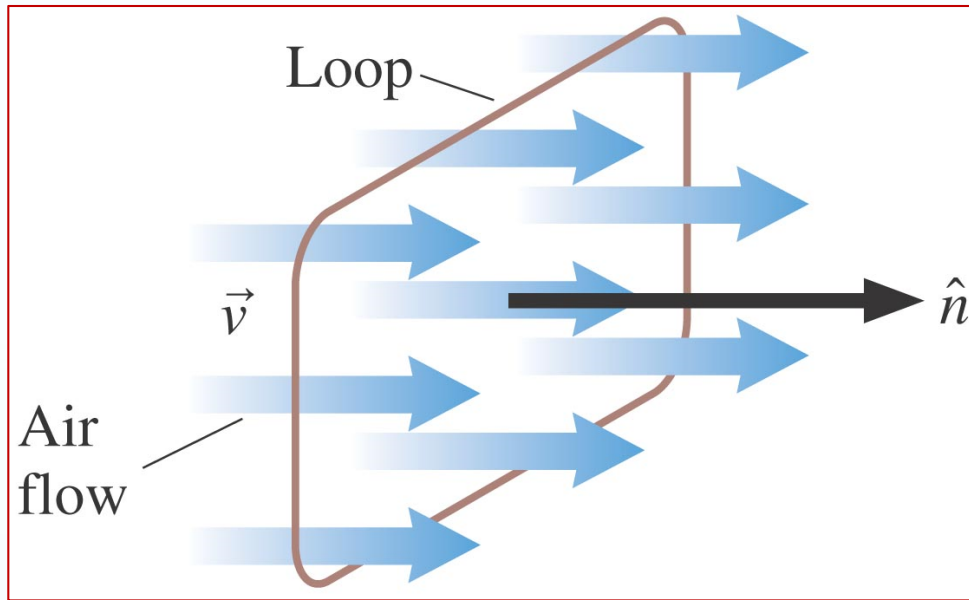
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Electric Flux (Φ_e)

- Amount of electric field going through a surface
- The number of field lines coming through a surface



Wind going through a loop



The Electric Flux

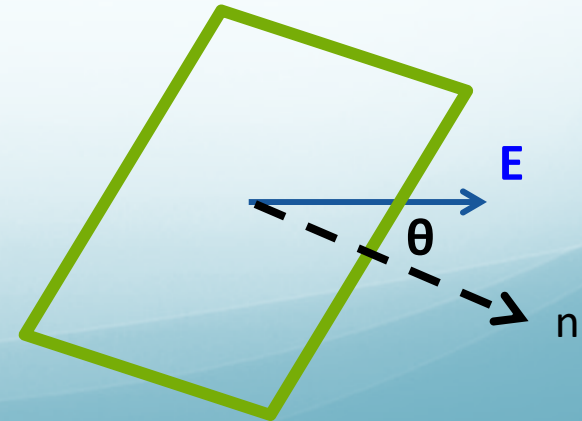
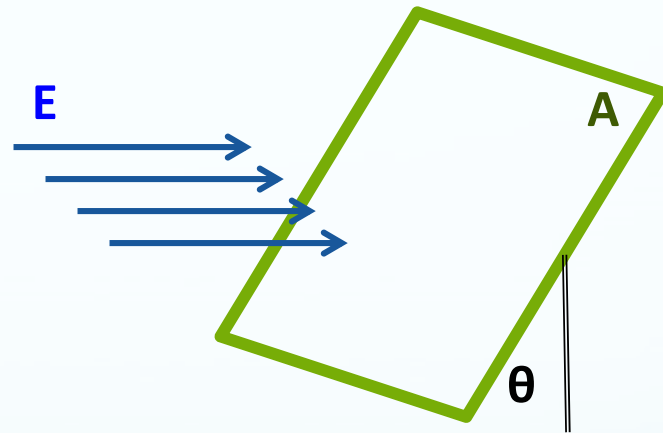
Amount of electric field going through a surface

$$\Phi_e \propto E$$

$$\Phi_e \propto A$$

$$\Phi_e \propto \theta$$

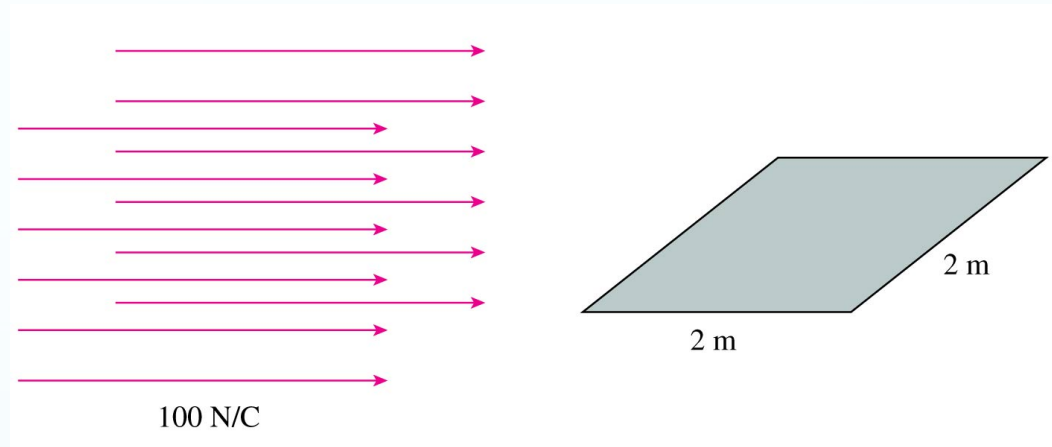
$$\Phi_e = E_{\perp} A = EA \cos \theta$$



QuickCheck 27.2

The electric flux through the shaded surface is

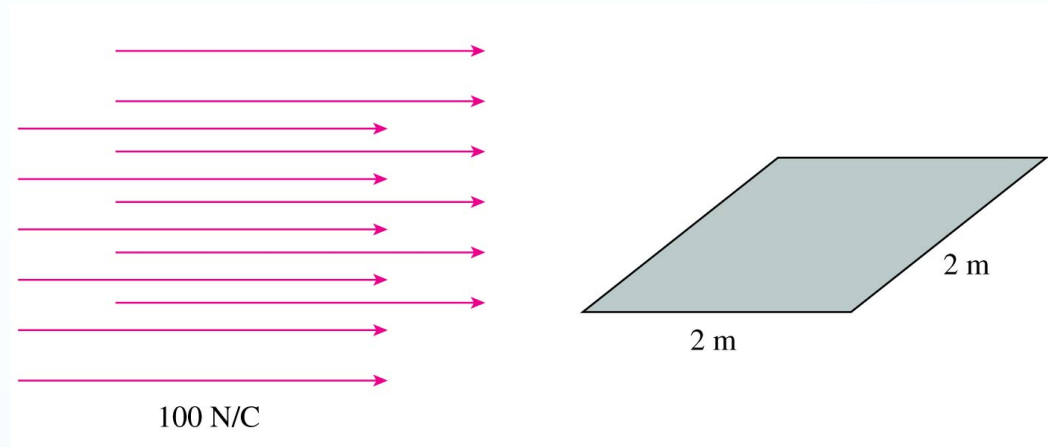
- A. 0.
- B. 200 N m/C .
- C. $400 \text{ N m}^2/\text{C}$.
- D. Some other value.



QuickCheck 27.2

The electric flux through the shaded surface is

- ✓ **A. 0.**
- B. 200 N m/C.
- C. 400 N m²/C.
- D. Some other value.



This section we talked about:

Chapter 23.1

See you on Monday

