Friday Feb 3, 2017

Last time

- Re-examined the charged ball
- Electric field of line of charge and infinite plane
- More examples

This time

- Van de Graaff generator: demonstration
- Calculating electric field flux: Group Activity

Conductors

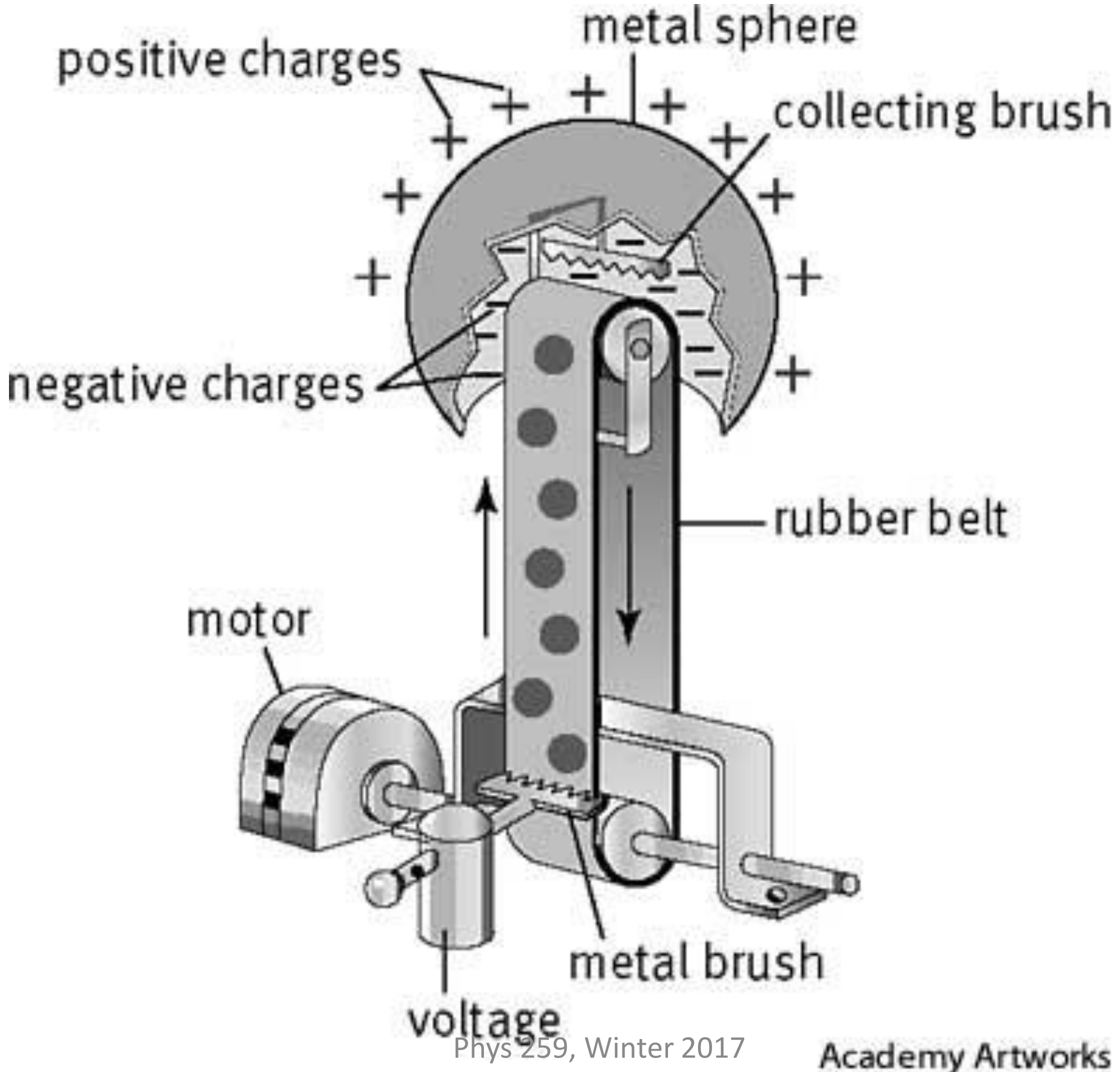
A conductor is a material in which the charges are free to move.

This means that two things are true:

1. There is zero net charge inside a conductor. ($Q_{net} = 0$)

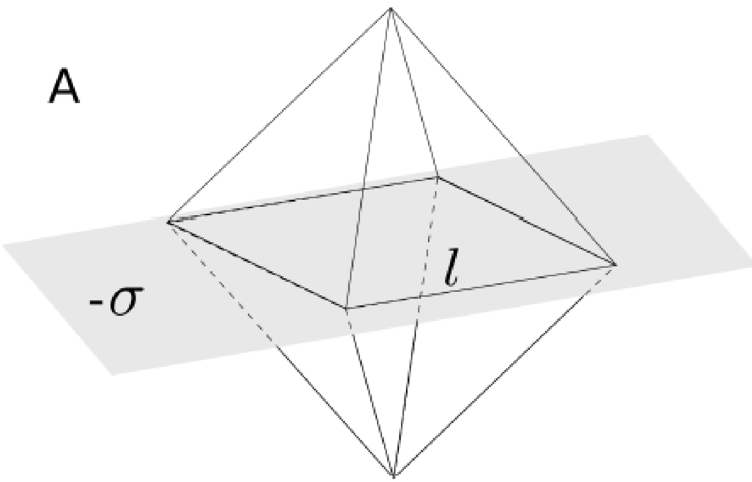
2. There is zero electric field inside a conductor. ($E_{in} = 0$)

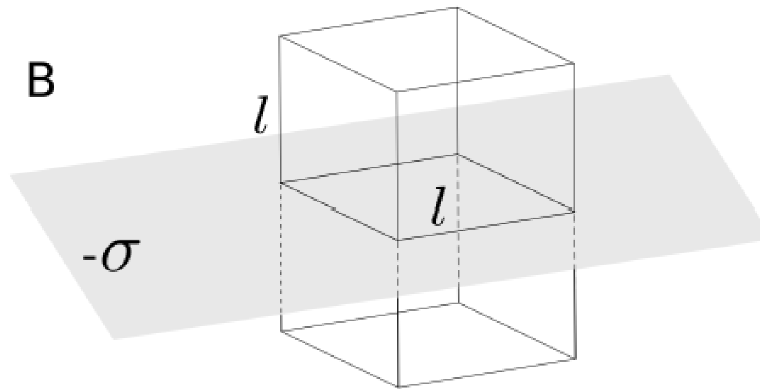
Van de Graaff generator



http://www.dictionary.com/browse/van-de-graaff-generator

(10 marks) The figure below shows an octahedral Gaussian surface made up of equilateral triangles with a square base of length l and a pill-box with a square base of length l. The horizontal plane represents a large thin sheet with uniform surface charge density $-\sigma$. Find the electric flux through the octahedral Gaussian surface.





1. **(1 mark)** In one sentence, state the meaning of Gauss' relation $\oiint \vec{E} \cdot d\vec{A} = \frac{Q}{\epsilon_0}$.

2. **(3 marks)** Find the total electric flux through the Gaussian surface in figure B and draw the surface area vectors for each face.

3. **(2 marks)** For the pill-box in figure B, using Gauss's relation; $\oint \vec{E} \cdot d\vec{A} = \frac{Q}{\epsilon_0}$, find an expression for the electric field in terms of the charge density σ.

4. **(1 mark)** What is the difference between the electric field flux through the pill-box and the octahedron? Explain.

5. **(2 marks)** Find the total electric flux through the octahedral Gaussian surface?

(1 mark for the correct answer) What is the electric flux through the octahedron? Express your answer in terms of σ using the relation $E = \sigma/2\epsilon_0$.

A. $-\frac{\sigma}{2\epsilon_0}l^2$ B. $-\frac{\sigma}{\epsilon_0}l^2$ C. $\frac{\sigma}{2\epsilon_0}l^2$ D. $\frac{\sigma}{\epsilon_0}l^2$