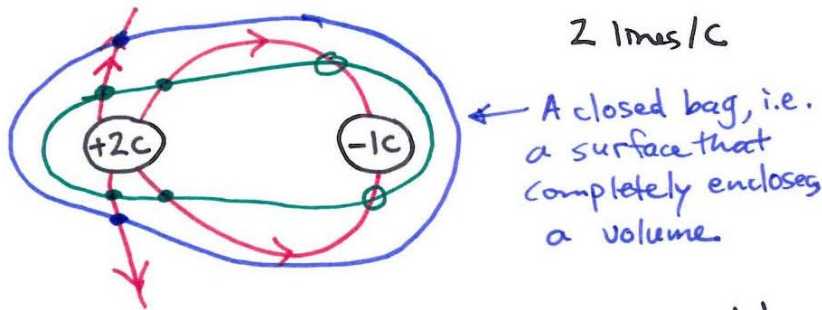


PHYSICS 102b CLASS 10 WEDNESDAY 2-8-12 SUMMARY

Maxwell's equations: The four fundamental equations of electricity & magnetism. They describe the relationships between q , \vec{E} , and the magnetic field \vec{B} .

The first of these: Gauss's Law

Graphical version of Gauss's Law:



Count the times each surface is pierced by a field line. Outward piercings count +1
Inward piercings count -1

Blue bag: 2 outward - 0 inward = +2 piercings

Green bag: 4 outward - 2 inward = +2 piercings

+2 piercings, 2 lines/C \Rightarrow net charge inside the bag is +1C

\Rightarrow Net # of piercings \propto charge contained

Quantitative version of Gauss's Law

$$\oint \vec{E} \cdot \hat{n} dA = \frac{Q_{\text{net enclosed}}}{\epsilon_0}$$

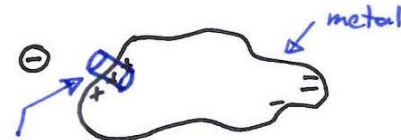
The circle indicates an integral over a closed surface, i.e. a surface that encloses a volume

Gauss's Law (equivalent to Coulomb's Law)

\hat{n} : a vector that is locally \perp to the surface

Gauss's law can be used to quickly find the electric field due to a symmetrical charge distribution

Example: \vec{E}_{TOT} near the surface of a metal



To apply Gauss's law, must choose a "Gaussian surface"

Enlarged view:

