

Topics 10-12 Study Guide

I. Things to memorize. The first question on the test will be a blank space where you will be asked to reproduce the following information from memory.

A. Units:

| Quantity | SI Unit |
|--------------------|------------------------------------|
| Magnetic field (B) | Tesla (T) or N·s/(C·m) or kg/(C·s) |

B. Equations for electrodynamics

- Lorentz Force: $\vec{F} = q(\vec{v} \times \vec{B} + \vec{E})$
- Biot-Savart Law: $d\vec{B} = \frac{\mu_0}{4\pi} \frac{I d\vec{l} \times \hat{r}}{r^2}$

C. Maxwell's equations

- Gauss's Law: $\oint \vec{E} \cdot d\vec{A} = q_{enc}/\epsilon_0$
- Gauss's Law for Magnetism: $\oint \vec{B} \cdot d\vec{A} = 0$
- Ampere-Maxwell Law: $\oint \vec{B} \cdot d\vec{s} = \mu_0 I + \epsilon_0 \mu_0 \frac{d\Phi_E}{dt}$
- Faraday's Law: $\oint \vec{E} \cdot d\vec{s} = -\frac{d\Phi_m}{dt}$

II. Proofs.

- Show that the magnetic field due to an infinitely long straight wire is given by $B = \frac{\mu_0 I}{2\pi R}$ using either Ampere's Law or the Biot-Savart Law.

III. Problem solving.

There will be 1 or 2 questions directly from the HW and 1 or 2 original questions.