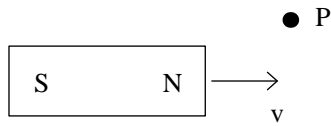


10. Electromagnetic Induction

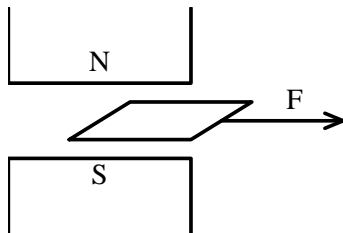
Self-test questions



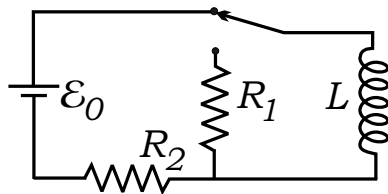
1. A bar magnet moves to the right, as shown. Describe the electric field at P .

2. Determine the self-inductance of a solenoid, making whatever approximations are necessary.

3. How much energy is stored in a solenoid with $I = 1$ A, $N = 1000$ turns, $\ell = 10$ cm, and $A = 3.14$ cm²?



4. A square conducting loop (size $\ell \times \ell$, resistance R) is pulled out of the region between the N and S poles of an electromagnet, as shown. Estimate the applied force F for constant velocity v .



5. The switch is flipped to the other position at $t = 0$. Determine the current $I(t)$ in the inductor for $t > 0$.

6. Suppose the magnetic field between the N and S poles of an electromagnet is $\mathbf{B} = \gamma t \hat{\mathbf{k}}$. What is the electric field?

7. A Rowland ring consists of a ferromagnetic toroid with a uniform coil of wire (n turns per unit length) wound uniformly around it. As the current I in the wire is changed in small steps ΔI , the change of the magnetic field ΔB in the core is measured with a “fluxmeter.” (This procedure gives B versus $H \equiv nI$, the magnetization curve of the material.)

Explain how to make the fluxmeter.