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Generating induced currents

Activity 3 explanation sheet

Varying the relative orientation of the magnetic field and the coil's surface

When we connect coil A to power, alternating current (AC) flows through it, which generates an alternating magnetic field through it.

As we approach coil A with coil B, the (oscillating) magnetic field generated by coil A will penetrate coil B, generating a continuously changing flux and therefore an AC current through it. This AC current will illuminate the LED in coil B.

As mentioned previously, the magnetic flux is given by

$$\emptyset = B \cdot S \cdot \cos\Theta,$$

when coils A and B are parallel, $\theta = 0$ and the magnetic flux through coil B is maximum, as are the induced current and the intensity of the light in the LED. If we now rotate the coil, the effective area of coil B is reduced by a factor $\cos\theta$, so the magnetic flux (and the induced current) decreases, and along with it, the intensity of the light in the LED. When we reach $\theta = 90°$, coils A and B are perpendicular to each other. The flux through coil B is zero, that means no field lines penetrate its surface. Thus, no current is induced in the coil B, and we observe that the LED does not light up (see figure 6 in the main text).