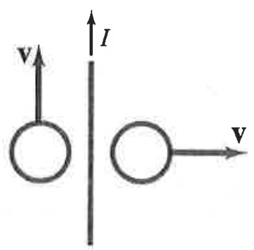
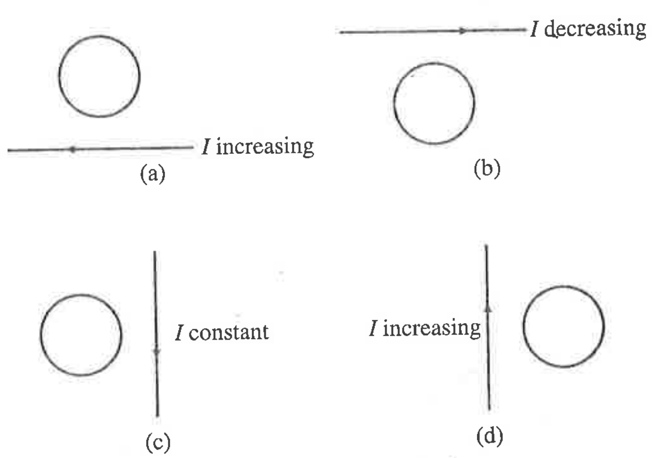
Two loops of wire are moving in the vicinity of a very long straight wire carrying a steady current as shown in Fig. 29–26. Find the direction of the induced current in each loop.

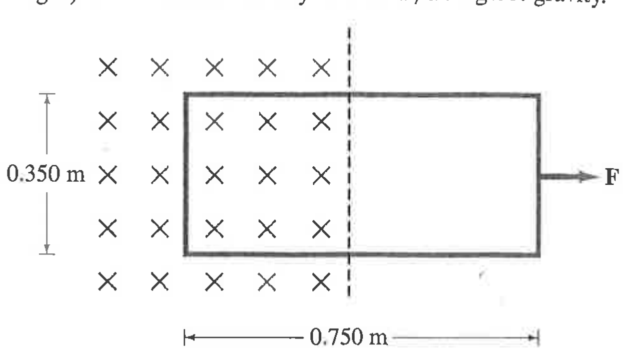


(I) A 26-cm-diameter circular loop of wire lies in a plane perpendicular to a 0.90-T magnetic field. It is removed from the field in 0.15 s. What is the average induced emf?

(II) What is the direction of the induced current in the circular loop due to the current shown in each
? Explain.

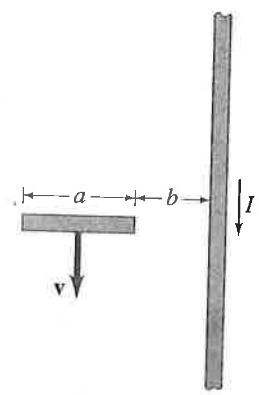


(II) A single rectangular loop of wire with the dimensi shown in Fig. 29–33 is situated so that part is inside a region of uniform magnetic field of 0.450 T and part is outside the field. The total resistance of the loop is 0.230 Ω. Calculate the force required to pull the loop from the field (to the right) at a constant velocity of 3.40 m/s. Neglect gravity.



(II) The area of an elastic circular loop decreases at a constant rate, $dA/dt = -3.50 \times 10^{-2}\ \mathrm{m^2/s}$. The loop is in a magnetic field $B = 0.48\ \mathrm{T}$ whose direction is perpendicular to the plane of the loop. At $t = 0$, the loop has area $A = 0.285\ \mathrm{m^2}$. Determine the induced emf at $t = 0$, and at $t = 2.00\ \mathrm{s}$.

(III) A short section of wire, of length a, is moving with velocity **v**, parallel to a very long wire carrying a current I as shown in Fig. 29–36. The near end of the wire section is a distance b from the long wire. Assuming the vertical wire is very long compared to $a + b$, determine the emf between the ends of the short section. Assume **v** is (a) in the same direction as I, (b) in the opposite direction to I.



A simple generator is used to generate a peak output voltage of 24.0 V. The square armature consists of windings that are 7.0 cm on a side and rotates in a field of 0.420 T at a rate of 60 rev/s. How many loops of wire should be wound on the square armature?

Explain why, exactly, the lights may dim briefly when a refrigerator motor starts up. When an electric heater is turned on, the lights may stay dimmed as long as it is on. Explain the difference.

What is the energy dissipated as a function of time in a circular loop of ten turns of wire having a radius of 10.0 cm and a resistance of 2.0 Ω if the plane of the loop is perpendicular to a magnetic field given by

$$B(t) = B_0 e^{-t/\tau}$$

with $B_0 = 0.50\ \mathrm{T}$ and $\tau = 0.10\ \mathrm{s}$?

A small electric car overcomes a 250-N friction force when traveling 30 km/h. The electric motor is powered by ten 12-V batteries connected in series and is coupled directly to the wheels whose diameters are 50 cm. The 300 armature coils are rectangular, 10 cm by 15 cm, and rotate in a 0.60-T magnetic field. (a) How much current does the motor draw to produce the required torque? (b) What is the back emf? (c) How much power is dissipated in the coils? (d) What percent of the input power is used to drive the car?