

Induced EMF Worksheet

1. A magnetic field ($B=3.2 \times 10^{-3}$ T) passes perpendicular through a circular loop of wire (radius = 5.0 cm). What is the magnetic flux through the loop?

(2.5×10^{-5} Wb)

2. A circular coil (200 turn radius of 6.0 cm) is rotated in a uniform magnetic field ($B = 3.6 \times 10^{-4}$ T) At $t = 0$ the coil is perpendicular to the field and at $t = 0.015$ s the coil is parallel to the field what is the average emf induced in the coil?

(5.4×10^{-2} V)

3. A square loop of wire with an area of 2.5×10^{-3} m² is perpendicular to a uniform magnetic field ($B = 2.2 \times 10^{-2}$ T). If the square collapsed to an area of essentially 0 m² in a time of 0.100 s as shown in the diagram what is the average induced emf as it is collapsed and what is the direction of the induced current? (Remember to use conventional current)

(5.5×10^{-4} V clockwise)



4. Find the average emf induced in a circular coil (50 turns radius of 0.050 m) if the magnetic flux through the loops is changing at a rate of 15.0 Wb/s? (750 V)

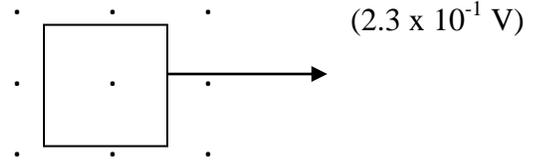
5. A square coil (100 turns area of each square loop = $4.0 \times 10^{-3} \text{ m}^2$) is perpendicular to a uniform magnetic field. When the coil is rotated through 90° in 0.12 s, the average induced emf is 0.92 V. What is the magnetic field strength? (2.8 x 10⁻¹ T)

6. A circular coil (10 turns, diameter = 25 cm) is placed perpendicular to a uniform magnetic field ($B = 2.7 \times 10^{-3} \text{ T}$). If the direction of the magnetic field is reversed in 0.30s, what is the average emf induced in the coil? (8.8 x 10⁻³ V)

7. A magnet is quickly removed from a circular coil (25 turns, area = $5.0 \times 10^{-3} \text{ m}^2$) changing the magnetic field within the coil at a rate of 0.40 T/s. What is the average emf induced in the coil? (5.0 x 10⁻² V)

8. A square loop of wire (area= $7.2 \times 10^{-3} \text{ m}^2$) has a resistance of 12.0Ω . Assume that the magnetic field drops uniformly from 1.6 T to zero in 0.050 s as the loop is pulled from the magnetic field.

a) What is the average emf induced in the loop?



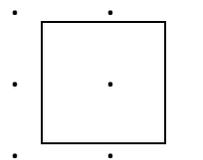
b) What is the current induced in the loop?

($1.9 \times 10^{-2} \text{ A}$)

c) What is the direction of the **electron flow** in the loop?

(clockwise)

9. A square loop of wire (4.0 cm per side) is placed in a magnetic field ($B= 0.20 \text{ T}$). The magnetic field is increased to 0.50 T in 0.30 s.



a) Find the current through the loop if the resistance of the loop is 2.0Ω .

($8.0 \times 10^{-4} \text{ A}$)

b) Find the direction of the **electron flow** through the loop.

(counter-clockwise)