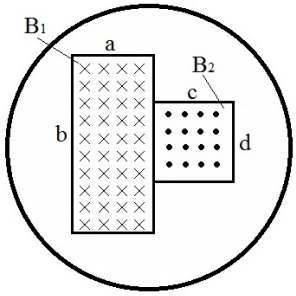
PHYS 212 Homework Assignment

Chapter 13

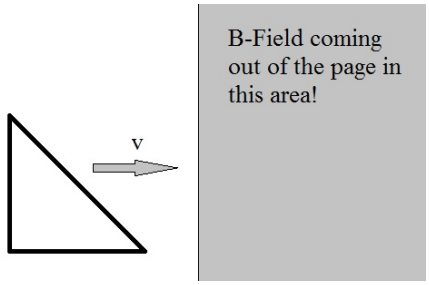
Problem 1 What is the magnetic flux through the loop shown below? The loop had a radius of R, inside the loop are two areas of magnetic field (B_1 and B_2) with side lengths of a, b, c and d.



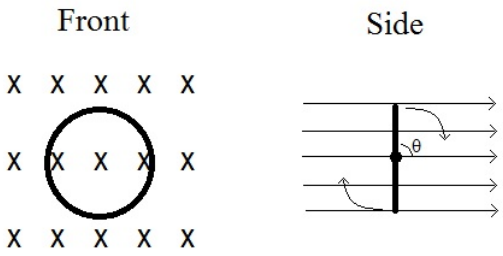
Problem 2 The triangular loop below (with width w and height h) is moving to the right with a constant speed v towards a region of magnetic field strength B coming out of the page. The loop has a resistance of R and first enters the loop at time $t = 0$.

(a) Find an expression for the magnetic flux through the loop in terms of t. Only consider between the time it first enters the magnetic field and when it is fully within the shaded area.

(b) Find an expression for the induced current around the loop, which direction will it be in?



Problem 3 A loop of radius r and resistance R is placed in a constant uniform magnetic field of magnitude B pointing along the horizontal. The loop is placed such that at time $t = 0$ the loop is vertical ($\theta = 90°$). If the loop spins about its center at an angular frequency of ω, what is the induced current through the loop as a function of time?

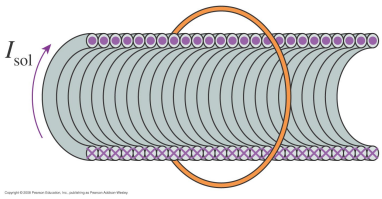


Problem 4 The solenoid below has a radius of 2.0 cm, 10 loops/cm. A loop of resistance $R = 2\,\Omega$ is placed around the solenoid with a radius of 5.0 cm. The current through the solenoid is given by $i(t) = 5t^2 - 3$ A.

(a) What is the magnitude of the magnetic field from the solenoid at the location of the loop?

(b) What is the induced electric field at the loop?

(c) What is the induced current through the loop?



Problem 5 A square loop of wire with dimensions $L \times L$ lies in the xy plane, moving along the x-direction with a speed v. A magnetic field B points up (in the z-direction) in the positive x half-plane, but points down (in the -z-direction) in the negative x half-plane. Find the induced emf as the loop moves from one region to the next.

Problem 6 A vertically oriented loop of wire rotates about its diameter with a period of T. A constant magnetic field points to the right. At $t = 0$, the loop is oriented such that its magnetic flux is zero. What is the induced emf as a function of time? Then, find the direction of the induced emf at

(a) $t = 0$,

(b) $t = T/4$,

(c) $t = T/2$,

(d) $t = 3T/4$,

(e) $t = T$.