

Exercises for Experimental Physics 3 – IPSP

Prof. Dr. J. Käs, Dr. M. Zink

Exercise Sheet 2 (WS 2010/11)

Date of Issue to Students: Oct. 21st 2010

Date of Submission: Oct. 28th 2010

Submission Place: Marked mailbox next to room 302 (Linnestr. 5)

Submission Time: 11:00 a.m. at the submission day noted above

Please note: Write your name and matriculation number on EACH sheet of paper. Only submit the calculations and results for exercise 1-3, exercise 4 will be discussed during the instruction classes.

Exercises:

1. At the equator, a 1000-turn coil that has a cross-sectional area of 300 cm^2 and a resistance of 15.0Ω is aligned so that its plane is perpendicular to Earth's magnetic field of 0.700 G .
(a) If the coil is flipped over in 0.350 s , what is the average induced current in it during the 0.350 s ? (b) How much charge flows through a cross section of the coil wire during the 0.350 s ? ($10 \text{ G} = 1 \text{ mT}$) (6 Points)
2. A 30.0-cm long rod moves steadily at 8.00 m/s in a plane that is perpendicular to a magnetic field of 500 G . The velocity of the rod is perpendicular to its length. Find (a) the magnetic force on an electron in the rod, (b) the electrostatic field in the rod, and (c) the potential difference between the ends of the rod. (6 Points)
3. An insulated wire that has a resistance of $18.0 \Omega/\text{m}$ and a length of 9.00 m will be used to construct a resistor. First, the wire is bent in half and then the doubled wire is wound on a cylindrical form (Figure 1) to create a 25.0-cm -long helix that has a diameter equal to 2.00 cm . Find both the resistance and the inductance of this wire-wound resistor. (3 Points)
4. In Figure 2, circuit 2 has a total resistance of 300Ω . After switch S is closed, the current in circuit 1 increases – reaching a value of 5.00 A after a long time. A charge of $200 \mu\text{C}$ passes through the galvanometer in circuit 2 during the time that the current in circuit 1 is increasing. What is the mutual inductance between the two coils?

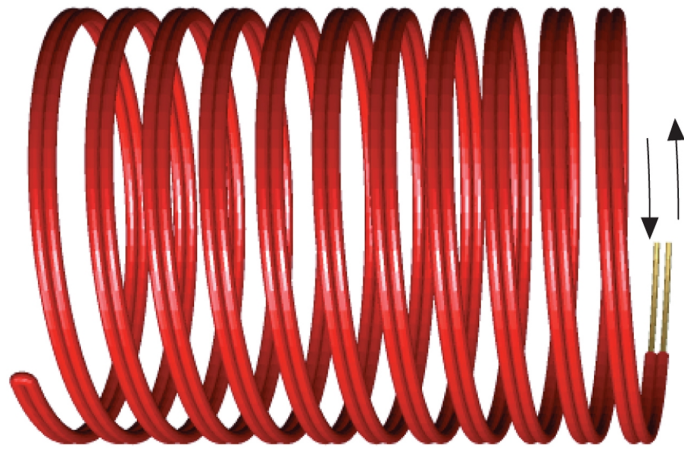


Figure 1: Exercise 3

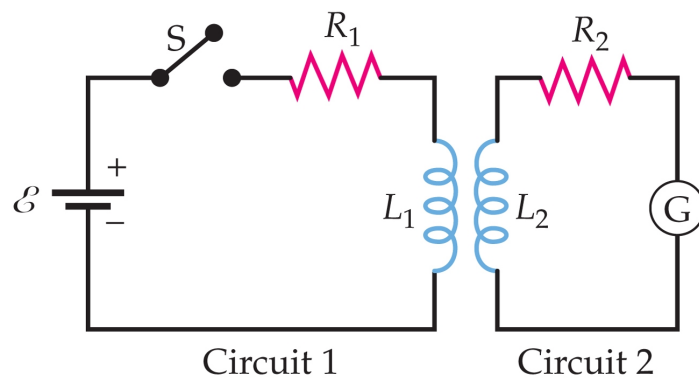


Figure 2: Exercise 4