

Materials covered in Midterm

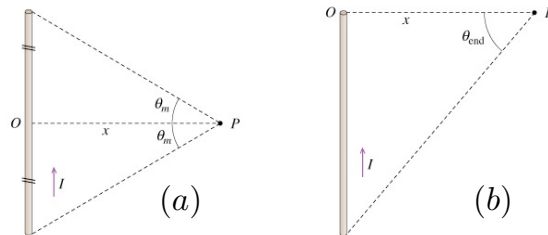
Chapter	Sections
27	1, 2, 3, 4, 6, 7, 9
28	1, 2, 3, 4, 5, 6, 7
29	1, 2, 3, 4, 5, 7
30	1, 2, 3, 4, 5, 6
31	1, 2, 3, 4
32	1, 2, 3, 4, 5

Physics 1C – Practice Midterm

(1) A steady current I is flowing through a straight wire of finite length.

(a) Find B_1 , the magnitude of the magnetic field generated by this wire at a point P located a distance x from the center of the wire. Assume that at P the angle subtended from the midpoint of the wire to each end is θ_m as shown in the diagram (Figure a). Express your answer in terms of I , x , θ_m , and μ_0 .

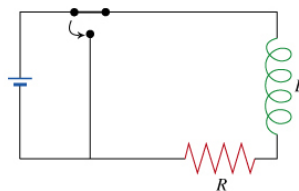
(b) Now find B_2 , the magnetic field generated by this wire at a point P located a distance x from either end of the wire. Assume that at P the angle subtended from the end of the wire to the other end is θ_{end} as shown in the diagram (Figure b). Express your answer in terms of I , x , θ_{end} , and μ_0 .



(2) Consider the $L - R$ circuit shown in the figure below. Initially, the switch connects a resistor of resistance R and an inductor to a battery, and a current I_0 flows through the circuit. At time $t = 0$, the switch is thrown open with the motion indicated by the arrow, removing the battery from the circuit. Suppose you measure that the current decays to I_1 at time t_1 .

(a) Determine the time constant τ of the circuit. Express your answer in terms of t_1 , I_1 , and I_0 .

(b) What is the inductance L of the inductor? Express your answer in terms of R , I_0 , I_1 , and t_1 .



(3) An electromagnetic standing wave in air of frequency 750 (MHz) is set up between two conducting planes 80.0 (cm) apart. At how many positions between the planes could a point charge be placed at rest so that it would remain at rest?