PHYSICS 1020
Homework #5

(Due April 22, 2019)

1. (KJF 21-19b) A 1.5-volt AA battery is connected to a parallel-plate capacitor having 4.0-cm-diameter plates spaced 7 mm apart. How much charge does the battery move from one plate to the other?

2. (KJF 21-35) A science-fair radio uses a homemade capacitor made of two 35 cm × 35 cm sheets of aluminum foil separated by a 0.25-mm-thick sheet of paper. What is its capacitance?

3. A *charging RC* circuit has $R = 100.0$ kΩ and $C = 470.0$ μF. The capacitor is initially uncharged. How long after closing the switch does it take the capacitor to charge to one half of its full charge?

4. Two magnetic poles of pole strength 47.0 A m are separated by a distance of 1.00 cm. What is the force between the two poles?

5. Consider a small wire of length 1.00 cm carrying an electric current of 2.0 amperes, lying in the x-y plane. The wire lies at $(x, y) = (0.00, -5.00)$ cm, and its current is flowing in the $+x$ direction. What is the direction and magnitude of the magnetic field at the origin due to the small wire?

6. Suppose you have a coil of 12 turns of wire of diameter 15 cm. The coil is in an external uniform magnetic field, and the direction of the magnetic field is perpendicular to the plane of the coils. Suppose further that the external magnetic field changes in magnitude from $B = 500$ μT to $B = 800$ μT in a time of 0.15 seconds. What is the emf induced in the coil?

7. What is the inductance of a solenoid, whose turns are circular and of diameter 4.00 cm, that has a winding of 12 turns per centimeter, and a total length of 14 cm? Assume the space inside the solenoid is filled with iron, whose relative permeability is 5000.

8. Suppose you have four identical inductors of the kind described in Problem 7. What is the equivalent inductance if they are connected (a) in series, and (b) in parallel?