**HW 14.3 - Electromagnetic Induction Name: ………………………………….**

1. Question 3, page 685. A square loop of 2.00 m on a side is placed in a magnetic field of magnitude 0.300 T. If the field makes an angle of 50.0˚ with the normal to the plane of the loop, find the magnetic flux through the loop.
2. A plane coil of 2000 turns of wire, each of cross-sectional area 5.0 × 10-4 m2 is rotated at a frequency of 50 Hz. The coil rotates in a magnetic field of flux density 0.4 T. Find the EMF induced in the coil.
3. A coil of radius 5.0 cm is constructed from 10 turns of wire. If the magnetic field strength changes from zero to 1.2 mT in four seconds, calculate the induced EMF.
4. Similar to question 9, page 686. A square, single-turn coil of 0.15 m on a side is placed with its plane perpendicular to a constant magnetic field. An emf of 25 mV is induced the coil winding when the area of the coil decreases at the rate of 0.14 m2/s. What is the magnitude of the magnetic field?
5. A square loop of wire 3.0 cm on each side contains 15 tight turns and has a total resistance of 0.004 Ω. It is placed 12 cm from a long, straight, current-carrying wire. If the current in the straight wire is increased at a steady rate 15 A to 30 A in 3.5 s, determine the magnitude and direction of the current induced in the square loop.
6. A 25-turn circular coil of wire has diameter 1.00 m. It is placed with its axis along the direction of the Earth’s magnetic field of 50.0 mT, and then in 0.200 s it is flipped 180°. An average emf of what magnitude is generated in the coil?
7. A sliding bar, similar to the diagram in your notes, has a length of 0.300 m and moves at 4.00 m/s in a magnetic field of magnitude 0.650 T. Using the concept of motional emf, find the induce voltage in the moving rod. If the resistance in the circuit is 2.50 Ω, find the current in the circuit and the power delivered to the resistor.
8. Similar to question 21, page 687. An automobile has a vertical radio antenna 1.50 m long. The automobile travels at 20 m/s on a horizontal road where the Earth’s magnetic field is 40.0 µT directed toward the north and downward at an angle of 55.0° below the horizontal. (a) Specify the direction that the automobile should move in order to generate the maximum motional emf in the antenna, with the top of the antenna positive relative to the bottom. (b) Calculate the magnitude of this induced emf.



1. The diagram shows a top view of a bar that can slide without friction. The resistor is 6.00 Ω and a 2.50-T magnetic field is directed perpendicularly downward, into the paper. Let l = 1.20 m. (a) Calculate the applied force required to move the bar to the right at a constant speed of 2.00 m/s. (b) At what rate is energy delivered to the resistor?