These are due Friday, 21 March.

1. In Figure 1, the paths of some charged particles are traced through a uniform magnetic field directed into the page. What are the charges on the particles?

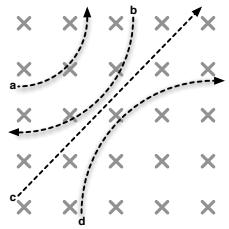

Figure 1: The paths of some charged particles.

2. Figure 2 shows the motion of electrons in a wire that is near the **S** pole of a magnet. In which direction will the wire experience a force?

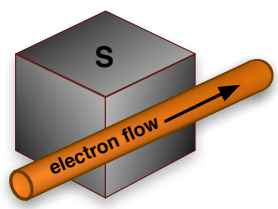

Figure 2: A wire passing near a magnet.

3. A rectangular loop is placed in a uniform magnetic field with the plane of the loop parallel to the direction of the field as in Figure 3. What net force will the loop experience?

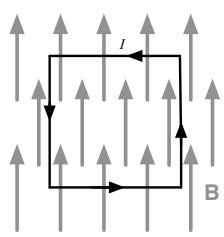

Figure 3: A current-carrying loop in a uniform magnetic field.

4. In Figure 4, a closed loop of wire travels at constant speed parallel to a long straight current-carrying wire. Will current be induced in the loop, and if so, in what direction?

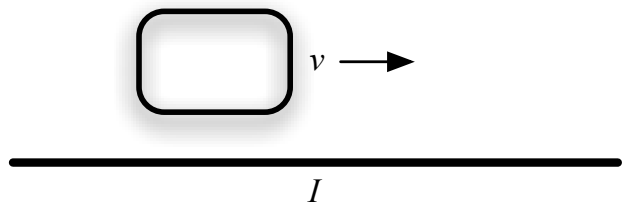

Figure 4: A wire loop traveling alongside a current-carrying wire.

5. A circular loop of radius 20 cm sits in a uniform magnetic field. The magnetic field is perpendicular to the plane of the coil and varies at a rate of 150 mT/s. What is the magnitude of the emf induced in the coil?

6. A solenoid of length 0.125 m and 225 loops carries a current of 0.55 A. What is the magnitude of the magnetic field inside the solenoid?

7. The segment of wire in Figure 5 carries a current of 1.3 A. The curved portion is a section of a circle with the center at point **C**. If $r = 0.04$ m, what is the magnitude of the magnetic field at point **C**?

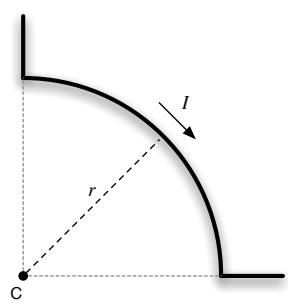

Figure 5: A segment of current-carrying wire.

8. In a region of space, the electric potential in volts is given by $V = 3y^2 - 4x^2z$. What is the electric field in this region?

9. The terminals of a 12 V battery are connected by a copper wire with resistivity 1.68×10^{-8} Ω·m and cross-sectional area 2.00×10^{-5} m^2. If the power dissipated is 1.90×10^3 W, what is the length of the wire?

10. (Bonus) For two extra points, on a separate sheet of paper, make a list of all the equations you used in solving the above problems. Define each variable in the context of that equation, just as we did in Homework 9. This time, also include the SI units for the value represented by each variable.