Name:_____

Solve the following problems in the space provided. Use the back of the page if needed. Each problem is worth 20 points. You must show your work in a logical fashion starting with the correctly applied physical principles which are on the last page. Your score will be maximized if your work is easy to follow because partial credit will be awarded.

1. In the lab you conducted the e/m experiment by accelerating electrons with a potential difference of 2500V and sending them into a magnetic field which was adjusted so that the radius of curvature was 26.0cm. Find (a)the speed of the electrons and (b)the strength of the magnetic field. Some data you will need is on the last page.

2. A coil of wire with 300 turns and a 12.0cm radius is oriented vertically with its plane parallel to the horizontal component of the earth's magnetic field which is 24.4μT. A compass placed at the center of the coil will align itself with the plane of the coil when no current is sent through it. Find the current needed in the coil to rotate the compass by 60.0˚.

3. A coil of wire is connected to 1.50V battery. After 3.00s have elapsed the current is 2.00mA and after 10.0minutes the current is 5.00mA. Find the inductance and resistance of the coil.

4. A 1000 turn coil with a 5.00cm radius has its axis pointing perpendicular to the earth's magnetic field of 52.0μT spins at 125rpm. (a)Find the peak voltage induced in the coil. (b)Find the rms voltage induced in the coil. (c)Sketch a graph of the voltage as a function of time. Label the two key parameters associated with the graph.

5. In the lab you studied a transformer with the primary coils connected to a battery and the secondary coils connected to a small light bulb as shown at the right. Explain how you got the light bulb to light and what fundamental physical laws are illustrated by the systems behavior.