PREX4 MG SOLD

2. In metals under electrostatic conditions, the electric field is zero everywhere inside. A

3. The electric field vector from the +Q charge points down and from the –Q charge points to the right so the resultant field points down and right D

4. The two vectors, each of magnitude $E = kQ/d^2$, point at right angles to each other so the resultant field is $\sqrt{2}E$ D

7. The force on the upper charge is to the left and twice the magnitude of the force on the bottom charge, which is to the right. This makes the net force to the left and the torque on the rod to be counterclockwise. B

9. The extra kinetic energy gained by the electron is $W = K = q\Delta V$, where ΔV is the potential difference between the midway line and the upper plate, which is 200 V. This makes the additional kinetic energy 200 eV. Kinetic energy is a scalar so the total KE of the electron is now 300 eV + 200 eV C

11. With equal charge, the forces are the same. The potential energy of the charges is equal in magnitude, but positive for the proton and negative for the electron. For scalars, positive numbers are higher than negative numbers. B

13. For steady power dissipation, the circuit must allow current to slow indefinitely. For the greatest power, the total resistance should be the smallest value. These criteria are met with the resistors in parallel. D

14. To retain energy, there must be a capacitor that will not discharge through a resistor. Capacitors in circuits C and E will discharge through the resistors in parallel with them. B

17. When the switch is closed, the circuit behaves as if the capacitor were just a wire and all the potential of the battery is across the resistor. As the capacitor charges, the voltage changes over to the capacitor over time, eventually making the current (and the potential difference across the resistor) zero and the potential difference across the capacitor equal to the emf of the battery. A

25. To dissipate 24 W means R = V2/P = 6 Ω. The resistances, in order, are: 8 Ω, 4/3 Ω, 8/3 Ω, 12 Ω and 6 Ω E

30. Charges moving through magnetic fields move in circles E

31. To be undeflected, the electric and magnetic forces must balance.

$F_e = F_b$ $Eq = qvB$ $B = E / v$ With v related to K by $K = ½ mv^2$

gives $B = E / \sqrt{(2K/m)}$ … which is equivalent to choice D

34. Charges moving without energy loss have to maintain a constant radius circle. For the circle to decrease in radius, energy would be radiated out from it. Since its an electron we use LHRflat to get a force pointing down making it follow path D.

35. When moving in a circle at constant velocity, no work is done A

36. Choose 1 proton moving in the circle. For this proton. $F_{net(C)} = mv^2/r$ $F_b = mv^2/r$

$qvB = mv^2/r$ $v = qBr/m = 1.6x10^{-19} (0.1)(0.1) / (1.67x10^{-27}) \sim 10^{-21} / 10^{-27}$ C