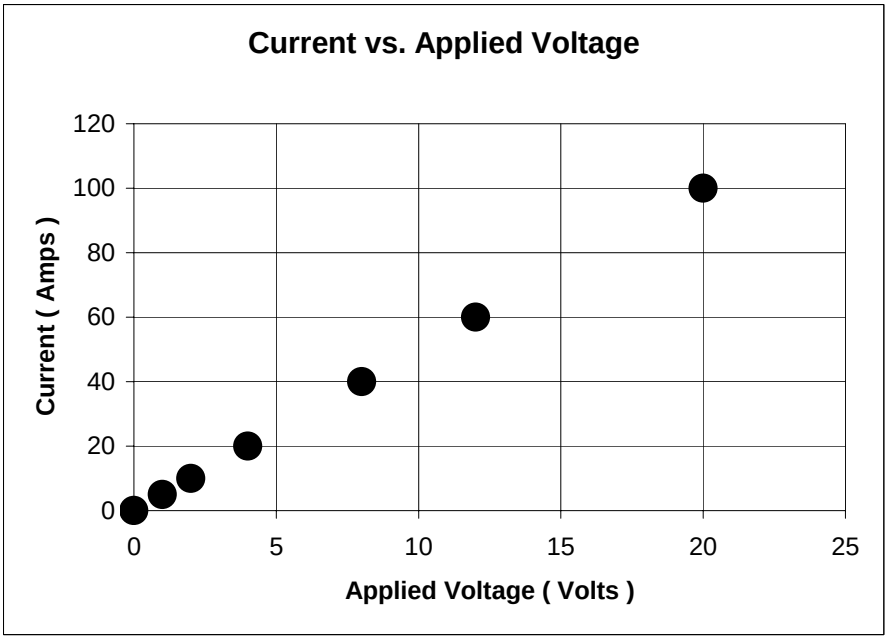
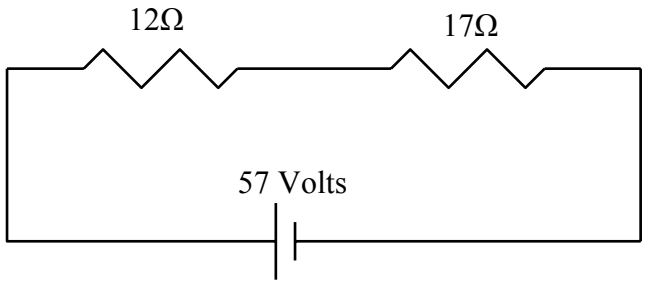
Practice Problems for Exam #2

1. A resistor has different voltages applied to it and the corresponding currents are measured. The data are plotted in this graph. What is the resistance?

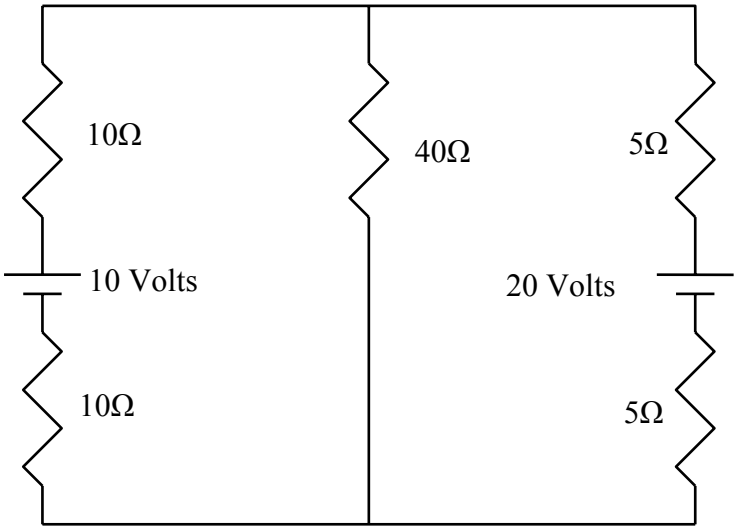


2. The power dissipated in which resistor will be larger?

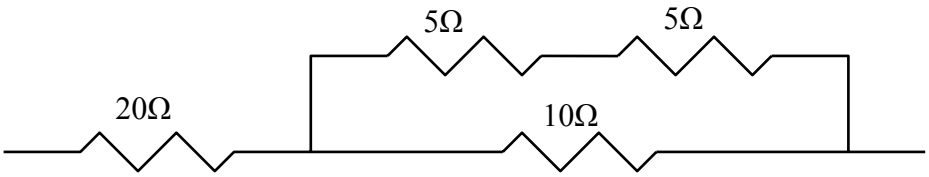


3. The resistivity for a certain material is 20Ω/m. If I want a 2.5m long rod to have a resistance of 5kΩ, what should the diameter of the rod be?

4. Find the size and direction of the current through the 10 Volt battery.

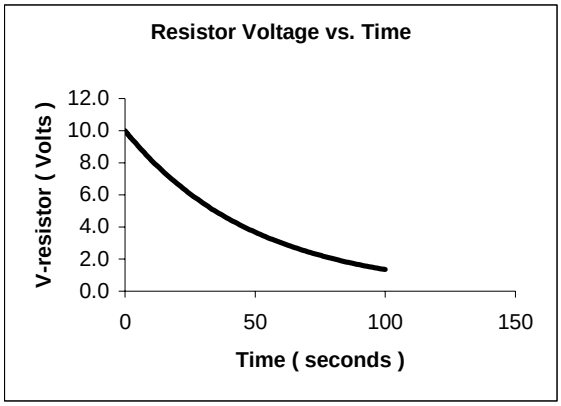


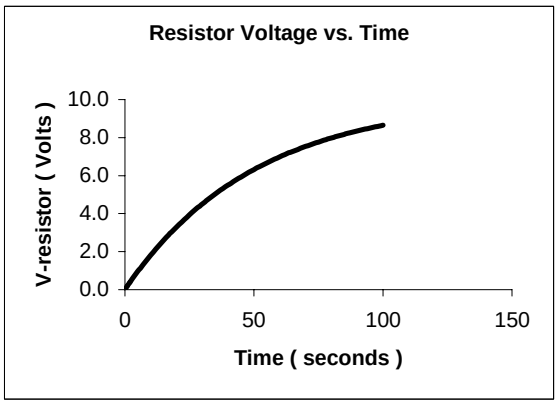
5. Find the equivalent resistance.

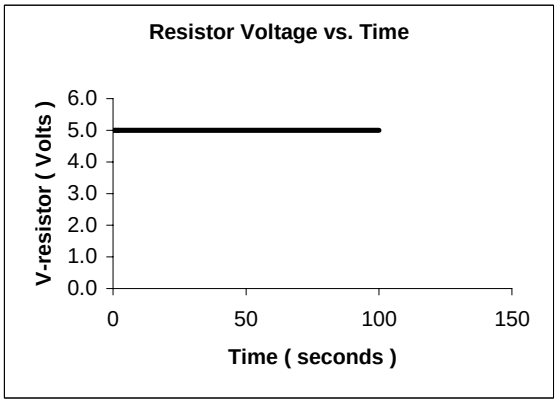


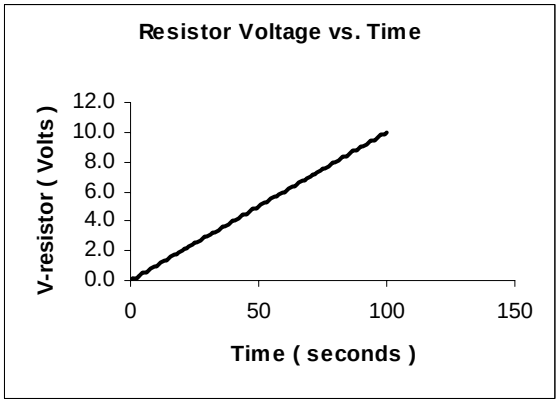
6. In an RC circuit the battery voltage is 20 Volts, the capacitance is 0.002F and the resistance is 3,000Ω. If we start with an uncharged capacitor, how long does it take for the voltage across the capacitor to reach 15Volts? How long does it take for the voltage across the resistor to reach 5 Volts?

7. In an RC circuit the capacitor begins with no charge on it. Which of the following graphs could correct for the voltage measured across the resistor?

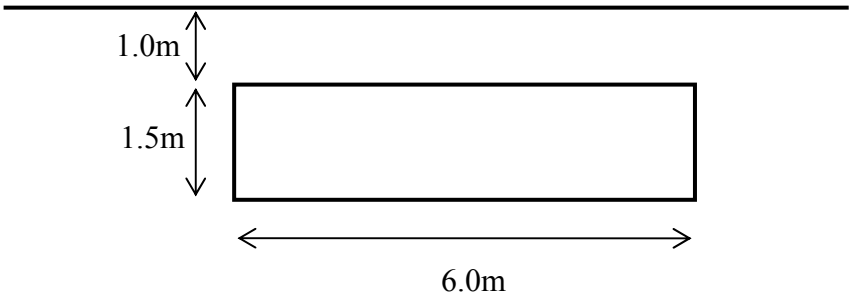








8. There is a horizontal wire that carries a 12.0A current to the right. Below it there is a rectangular loop of wire carrying a 6.0A current in the counter-clockwise sense. What is the size and direction of the total force on the loop of wire?



9. A single loop of wire carries a current of 2.0A and has an area of $0.5m^2$. It is in a uniform magnetic field. If you turn it to different orientations it feels a torque of varying size. The largest the torque gets is 0.17Nm. What is the size of the magnetic field?

10. A particle has a mass of 0.001kg and carries a charge of 0.002C. It travels in the plane of this sheet of paper toward the top of the sheet at 2.0m/s. When it is below the line drawn on the sheet, it is in a region of space where there is no magnetic field. Above the line there is a uniform magnetic field of 2.0T that points down, into the paper.
    a. What is the size and direction of the force on the particle just as it has crossed the line?
    b. Sketch the path of the particle for a distance sufficient to clearly show what it is doing.
    c. How long will it take for the particle to exit the magnetic field?
    d. What is the Kinetic energy of the particle when it enters the field? What is the kinetic energy when it leaves the field?

1. 0.20Ω
2. 17Ω resistor dissipates more power
3. 0.11m
4. 0.21A downward
5. 25Ω
6. 8.32 seconds for either
7. top left graph
8. $5.18 \cdot 10^{-5}$ N downward
9. 0.17T
10.
    a. 0.008N to the left
    b. It should be a half circle moving the particle off to the left and having the particle exit the field toward the bottom of the page.
    c. 0.79 seconds
    d. Both are the same as the magnetic force does no work. KE = $2 \cdot 10^{-3}$J