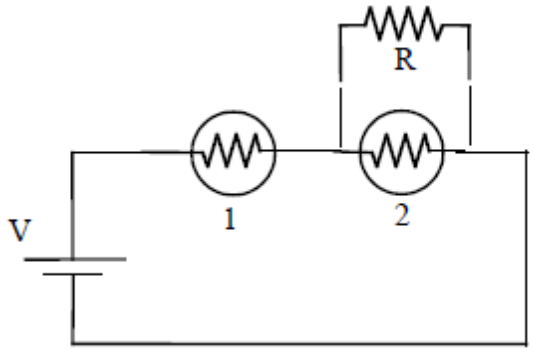
Exam 4

Physics 221

Name: _____

1. The circuit to the right has two bulbs, 1 and 2, both with a resistance of 30 Ω. The extra resistor has a resistance of 60 Ω and the potential difference is ΔV = 100 V.



   a. Consider the circuit with just the 2 bulbs while the extra resistor R is not attached. Determine the current through and potential difference across each bulb.
   b. Consider the circuit with the extra resistor attached across bulb 2 as shown. What is the current through and the potential difference across each bulb in that case.
   c. Compare the brightness of each bulb with and without the extra resistor in place.

2. Explain how a magnet can be used to generate electricity. Include step by step how the energy is transferred.

3. Relationship between currents and magnetic fields.
   a. Use the right hand rule to determine the direction of the magnetic field produced by a current carrying wire with current directed in the positive y direction.
   b. Use the right hand rule to determine the direction of force when a positively charged particle moving initially in the positive y direction enters a magnetic field pointing in the positive x direction. Describe the path of this charge after it enters the field and why it follows it.
   c. Explain the relationship between the current and magnetic field in parts a and b.

4. Compare and contrast a continuous spectrum to an emission spectrum including a specific example of a phenomena that produces each type and why.

5. Consider the hydrogen atom.
   a. What is the energy of the n = 2 and n = 4 energy levels?
   b. Is a photon emitted or absorbed when an electron transitions from level 4 to level 2?
   c. What is the energy and wavelength of the photon emitted/absorbed when the electron transitions from level 4 to level 2?

$\Delta V = IR$ | $I = \Delta Q/\Delta t$ | $P = I\Delta V = (\Delta V)^2/R = I^2R$

$C=Q/\Delta V$ | $R_{eq} = R_1 + R_2 + R_3 + \ldots$ | $1/R_{eq} = 1/R_1 + 1/R_2 + 1/R_3 + \ldots$

$q = Q\,(1-e^{-t/RC})$ | $q = Q\,e^{-t/RC}$ | $\tau = RC$

$F = qvB\sin\theta$ | $F = IlB\sin\theta$ | $B = \mu_o I/2\pi r$

$\mu_o = 1.26 \times 10^{-6}$ Tm/A

$KE_{max} = hf - E_o$ | $E = hf$ | $E = -13.6\,eV/n^2$

$\lambda = h/mv$ | $c = \lambda f$ | $c = 3.00 \times 10^8$ m/s

$h = 6.63 \times 10^{-34}$ Js $= 4.14 \times 10^{-15}$ eVs | | 1.6×10^{-19} J = 1 eV