# Physics 112, spring 2014 Exam 2 40 pts

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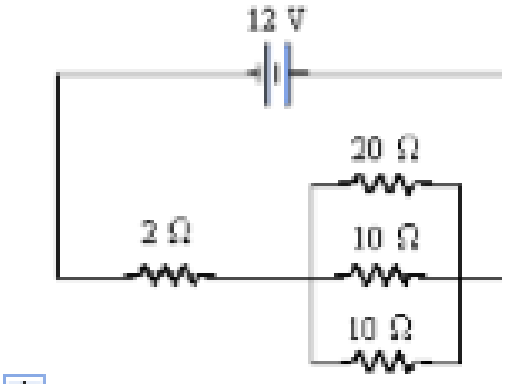
## RULES

You may use an equation sheet with whatever you want on both sides, you may not use a tablet or a smartphone or a laptop as a calculator. Do not forget to include direction in all answers. Please return the test to me. Write all your answers on a separate piece of paper. Paper and staplers will be provided.

## Problems

1:) Consider the circuit below




A) Calculate the equivalent resistance of the circuit. (8 pts)

B) Calculate the total current and the current in each resistor. (4 pts)

C) Calculate the voltage drop across each resistor. (notice, you already had to do this in part B)(4 pts)

D) Calculate the power dissipated in each resistor. (4 pts)

E) Imagine each resistor is a lightbulb. What happens to the lightbulbs in the resistors in parallel if the lightbulb in the 2 ohm resistor burns out? Now, What happens to the lightbulbs if the lightbulb in the 20 ohm wire burns out and the lightbulb in the 2 ohm resistor stays working?(2 pts)

2) A circular wire loop with a radius of 2 cm and 10 turns is placed in space. A magnetic field perpendicular to the plane of the wire and pointing out of the plane of the wire is turned on slowly and starts out with zero tesla strength and reaches 10 teslas in 5 seconds.

A) Calculate the average emf induced in the wire. (6 pts)

B) What is the direction of the induced current in the wire as viewed from above (see the diagram on the board)? (2 pts)

C) Calculate the torque on the loop once the field stops changing. What is the formula you use

for this calculation? (3 pts)

D) The field is now slowly tuned off, what is the direction of the induced current in the wire? (2 pt)

3) A singly ionized gold atom ($m = 79m_p$) is sent horizontally, with an initial velocity of $1 \times 10^6 m/s$ into a uniform magnetic field of strength 10 teslas appointing 45 degrees from above the horizontal (see the diagram on the board).

A) What is the magnitude of force the atom experiences? (2 pts)

B) What is the acceleration the atom experiences? (2 pts)

C) Which direction is the atom deflected?(1 pt)

# Constants

$m_e = 9.1 \times 10^{-31} kg$

$m_p = 1.67 \times 10^{-27} kg$

$|e| = 1.6 \times 10^{-19} C$

$\mu_0 = 4\pi \times 10^{-7} Tm/A$