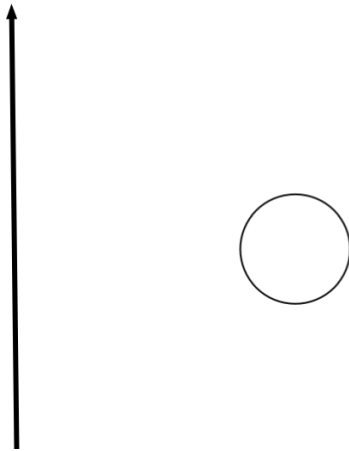


Physics 10164 - Exam 3B

Partial credit will be given provided you show all work and are solving parts of the problem correctly. Points will be deducted if you don't show your work even if you get the right answer. Clearly indicate your answer with a circle or a box and remember to include correct units and significant figures.

1. (35 pts) A single-turn circular wire loop of radius 5.5 cm is located near a long straight wire carrying a current of 5.0 Amps towards the top of the page. The center of the loop is 15 cm away from the straight wire. Assume that the magnetic field due to the straight wire is uniform throughout the loop and has a magnitude equal to the magnetic field strength where the loop is centered.

If the current in the straight wire is increased from 5.0 Amps to 8.0 Amps in a time interval of 0.35 sec, determine (a) the magnitude of the average induced EMF in the loop during that time and (b) the direction of the induced current in the loop. Be sure to show all work and/or explain your logic for each part.



2. (35 pts) An alternating-current RL circuit contains a 3.5 Ohm resistor, a 15 mH inductor, a 95 Volt (rms) voltage source and is operated at a frequency of 45 Hz.

- a) What is the rms current?
- b) What is the maximum current?
- c) When the current has its maximum value, what is the voltage drop across the (i) resistor, (ii) inductor and (iii) voltage source? Justify each answer.

3. (30 pts) An object is 12 cm in front of an unknown mirror. The image is upright and 1.5 times larger than the object.

- a) What type of mirror is this (convex or concave)? Justify your answer.
- b) For what object distance is the image 1.5 times smaller than the object and inverted?