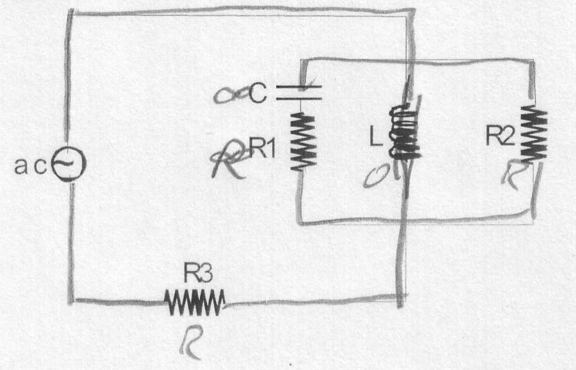
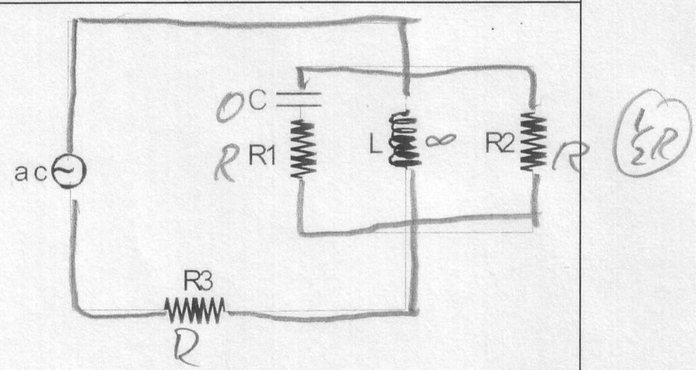
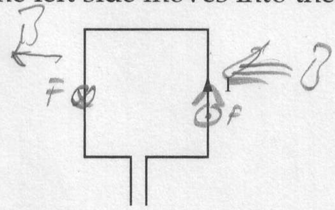
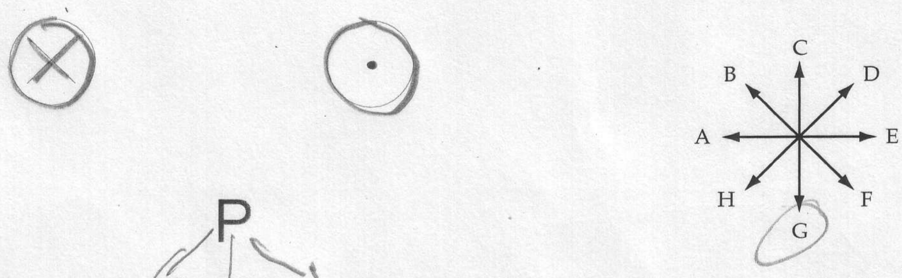
Exam 3 on APR 18. 2012 - Physics 106 – R. Schad

YOUR NAME
solution B

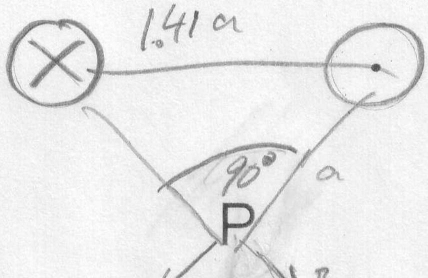
1.	**This is to identify the exam version you have – IMPORTANT** **Mark the B**
2.	**This is to identify the exam version you have – IMPORTANT** **Mark the E**
3.	We have the circuit shown with an ac power source. All resistors have 1Ω resistance. At zero frequency the total impedance of the circuit is:  a) 0 Ω b) 1 Ω c) 1.5 Ω d) 2 Ω e) none of the above
4.	We have the circuit shown with an ac power source. All resistors have 1Ω resistance. At very high (infinite) frequency the total impedance of the circuit is:  a) 0 Ω b) 1 Ω c) 1.5 Ω d) 3 Ω e) none of the above
5.	The magnetic field in a region of space is homogeneous. When counterclockwise current is present in the coil, the coil tends to rotate such that the left side moves into the page and the right side moves out of the page.  The magnetic field is a) pointing upwards. b) pointing downwards. c) pointing to the left d) pointing to the right. e) in a direction that cannot be determined in this experiment

6. Two equal currents in the wires are directed in and out of the page, respectively.
The direction of the total magnetic field at point P is approximately
[A set of directions A through H is shown next to the diagram]



a. C
b. E
c. F
d. G
e. zero

7. Same situation, the current values are 1 A each.
The point P is 1 μm away from each wire and the wires are 1 μm apart.
The strength of the total magnetic field at point P is



a. 0.2 T
b. 0.2 mT
c. 0.283 T
d. Zero
e. None of these

8. We have a B-field pointing North and
an E-field pointing downto the ground [and no gravity].
Which direction would a positive charge have to fly in order to fly on a straight line?

a) North
b) East
c) South
d) West
e) None of these

9. A negative charge is flying north in an area where the magnetic field points north.

E

The direction of the resulting Lorentz force is

a) East
b) West
c) Up
d) down
e) Lorentz force is zero

10. A rectangular wire loop (area 10 cm^2) lies completely within a perpendicular and uniform magnetic field. The field strength changes from 2 T to 7 T in 10 s.
A constant current of 1 mA is induced.

D

The resistance of the loop is

a) 70 Ω
b) 50 Ω
c) 7 Ω
d) 0.5 Ω
e) none of these

$I = \frac{\Delta V}{R} = \frac{d(A \cdot B)}{R\,dt} \neq$

$R = \frac{A}{I} \frac{dB}{dt} = \frac{10 \cdot (10^{-2})^2 m^2}{10^{-3} A} \cdot \frac{5T}{10s}$

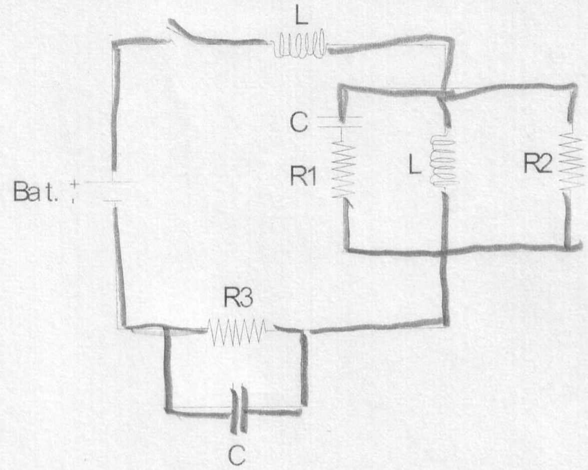
$= 0.5 \Omega$

11. The circuit to the right contains the usual suspects.

E

$\Delta V = 9$ V
$R_1 = 1$ Ω
$R_2 = 3$ Ω
$R_3 = 6$ Ω
C = 10 μF

Before we start, the switch is open, no charge on the capacitors.



Then we close the switch.
In the very first moment,
the voltage across R_3 is:

a) 3 V
b) 4.5 V
c) 6 V
d) 9 V
e) zero

12. Same circuit, we are still in the very first moment.
The current through R_1 is:

A

a) zero
b) 6 A
c) 3 A
d) 9 A
e) 1 A

13. E	Same circuit, we are still in the very first moment. The voltage across the upper inductor L is: a) zero b) 3 V c) 4.5 V d) 6 V e) 9 V
14. B	Same circuit, but we have waited now for a long while. The voltage across R_3 is: a) zero b) 9 V c) 3 V d) 4.5 V e) 6 V