PHYSICS 4B LAB FINAL REVIEW

Here is a summary of the material that will be covered on the lab final. The format for the final will include: practical component, short-answer conceptual questions/explanations, and theory. You should also be familiar with the components of the format for a comprehensive scientific lab report that you've been using for the quarter.

LAB 1- Measuring Resistance

1. What was the objective of this lab?
2. What was the theory associated with this lab?
3. What is electric current?
4. What is resistance? What is the atomic model of resistance?
5. What is a resistor?
6. What are resistors used for in a circuit?
7. What type of materials are resistors made of?
8. What are insulators? What are conductors?
9. Know how to use a color-code table to find resistance.
10. What are the steps in the procedure for using the VOM, DMM, HP-DMM to measure resistance?
11. What are the uncertainties of the measuring devices?
12. Identify the systematic and random errors involved and how they affected the results.

LAB 2 – Ohmic Resistors

1. What was the objectives of the lab?
2. What was the theory associated with this lab?
3. What is an ohmic resistor? What is a non-ohmic resistor?
4. What is a characteristic curve?
5. Know how to sketch the characteristic curve for an ohmic or non-ohmic resistor.
6. What is potential difference? What does it measure from a practical viewpoint?
7. Know how to use a circuit diagram to construct a circuit.
8. What is power supply? What is it used for?
9. What is the direction of current in a circuit?
10. Is it electrons or protons that produce the current in a circuit?
11. What are the steps in the procedure for using the VOM, DMM, HP-DMM to measure voltage and current?
12. Explain why you cannot connect ammeter in parallel.
13. Explain why you cannot connect voltmeter meter in series.
14. Know how to use MS EXCEL to obtain the equation of best curve-fit to obtain resistance of a resistor graphically.
15. Identify the systematic and random errors involved and how they affected the results.

LAB 3 – Type-47 Lamp Resistance

1. What was the objectives of the lab?
2. What was the theory associated with this lab?
3. Be able to draw the circuit diagram for this lab.
4. What was the characteristic curve for the type-47 lamp? Was is ohmic or non-ohmic?

5. Know how to use MS EXCEL to obtain the equation of best curve-fit to obtain the characteristic curve.
6. How did you obtain resistance from characteristic curve?
7. Was the lamp resistance ohmic or non-ohmic?
8. Sketch the characteristic curve and explain its behavior. Did resistance increase or decrease? Explain!!!
9. Identify the systematic and random errors involved and how they affected the results.

LAB 4 – DIODES

1. What was the objective of this lab?
2. What was the theory associated with this lab?
3. What is a diode?
4. What's the purpose of a diode in a circuit?
5. What is a rectifier diode? What is a signal diode?
6. Give 2 examples of the practical applications of diodes.
7. What two diodes were you able to identify in the lab?
8. What is the threshold forward bias voltage?
9. What is the breakdown voltage?
10. What was the characteristic curve for a diode? Was is ohmic or non-ohmic?
11. Know how to use MS EXCEL to obtain the equation of best curve-fit to obtain the characteristic curve.
12. How did you obtain resistance from characteristic curve?
13. Sketch the characteristic curve and explain its behavior. Did resistance increase or decrease? Explain!!!
14. Identify other systematic and random errors involved and how they affected the results.

LAB 5 – Resistors in Series and Parallel

1. What was the objective of this lab?
2. What was the theory associated with this lab?
3. What are the properties of resistors connected in parallel or series?
4. How do resistors add in series? In parallel?
5. Construct a circuit in a circuit board with resistors connected in series or parallel.
6. What is a junction in a circuit?
7. What is the loop rule?
8. Know how to measure the current before and after a junction.
9. How are the buses connected in the circuit board?
10. Identify other systematic and random errors involved and how they affected the results.

LAB 6 – Using the Oscilloscope and Function Generator

1. What was the objective of this lab?
2. What is the main use of an oscilloscope? Of a function generator?
3. How do you use the FLUKE oscilloscope to measure amplitude, period, and frequency?
4. How do you use the cursors to analyze a signal?
5. How do you adjust the displayed amplitude and period of a signal?
6. How do you check the calibration signal of an oscilloscope?
7. How do you setup the function generator to output a signal to the oscilloscope?

8. What are the 3 different function outputs of the FG used?
9. Identify systematic and random errors involved and how they affected the results.

LAB 7 – RC Cicuits

1. What was the objective of this lab?
2. What was the theory associated with this lab?
3. Know how to sketch the circuit diagram.
4. Know how to build the circuit from the circuit diagram on the circuit board.
5. Know how to connect to the oscilloscope and function generator to the circuit on the circuit board.
6. Know how to apply the loop rule to the RC-circuit to obtain loop-rule equation.
7. Know how to analyze loop-rule equation to find the initial current and maximum charge.
8. From the loop-rule equation know how to derive the equations for I(t), V(t), and q(t) for both charging/discharging.
9. What is the time-constant? What's the physical interpretation?
10. What is the expected value of the time-constant for charging/discharging?
11. How did you measure the experimental value for the time-constant for charging/discharging?
12. What does capacitance measure?
13. What signal output from FG was used for RC-circuit?
14. What is the half-life time $t_{1/2}$? What is it for charging/discharging?
15. How did you measure the experimental value for the half-life time $t_{1/2}$ for charging/discharging?
16. Identify systematic and random errors involved and how they affected the results.

LAB 8 – Magnetic Force on a Current-Carrying Conductor

1. What was the objective of this lab?
2. What was the theory associated with this lab?
3. What is the magnetic force on a current-carrying conductor?
4. What is the direction of the length vector $\boldsymbol{\ell}$?
5. Graphically, how did you obtain the magnetic field? The weight of the magnetic assembly?
6. Know how to draw the free-body diagram of the current-carrying conductor in the magnetic field.
7. Determine the net magnetic force on current-carrying conductor.
8. Derive the equation for the normal force acting on the pan-balance.
9. Identify systematic and random errors involved and how they affected the results.

LAB 9 – e/m

1. What was the objective of this lab?
2. What was the theory associated with this lab?
3. What are the 3 main components of the e/m apparatus?
4. What's the purpose of the electron gun?
5. What's the purpose of the He tube?
6. What's the purpose of the Helmholz coil?
7. What is a Helmholz coil?

8. How do the electrons begin their motion?
9. How are the electrons accelerated?
10. Why do the electrons move in a circular path?
11. Is the circular “blue” light-beam the actual electrons? Explain!
12. How do you determine the magnetic force on a moving charge?
13. Explain how you measure the radius of the beam electrons.
14. Using the Biot-Savart Law one can show that the B-field produced near the axis of a pair of Helmholz coils is:

$$B = \frac{(N\mu_o)I}{a(5/4)^{3/2}}$$

15. Show that the final result for the charge to mass ratio of the electron:

$$\frac{e}{m} = \frac{2Va^2(5/4)^3}{(N\mu_o Ir)^2}$$

16. Identify systematic and random errors involved and how they affected the results.