

Physics 152 Fourth Exam Review Suggestions

What's Covered:

This exam will cover only topics covered since the third exam, which includes simple DC circuits, resistor and capacitor networks, Ohm's and Kirchhoff's Laws, capacitors (including RC circuits). *However, you will be expected to understand topics covered previously in the course (both 151 and 152) that are needed to display a knowledge of topics included on this exam.*

Topics/Questions for Review – The exam will check your knowledge on any or all of the following:

Basic DC Circuits

Does current get used up when it flows through a bulb? What observations have you made that would support your answer?

Can you take a fairly simple direct current circuit with one fresh alkaline D-cell connected to several bulbs and switches and draw a proper circuit diagram for it.

Can you do qualitative analysis of circuits with a single battery and a network of bulbs and resistors based on current, voltage, and resistance concepts (ranking brightness, what happens if this connection is broken, or a short circuit is added between points a and b etc.)?

Can you recognize the difference between parallel and series arrangements, and how to redraw circuit diagrams so they look simpler but behave the same way electrically?

Networks

Can you find the equivalent value of a network of resistors or a network of capacitors with a complex array of series and parallel connections?

Can you explain on a conceptual basis why series resistances add, or why parallel resistances end up being less than either resistance?

Ohm's and Kirchhoff's Laws

Can you state and use Ohm's and Kirchhoff's Laws to analyze DC circuits with batteries and resistors quantitatively. This includes knowing voltage drops and currents in all parts of a circuit.

In terms of your understanding of the differences between current, voltage drop, and resistance can you explain why the rules of applying Kirchhoff's Laws make sense?

Capacitors

What is the definition of capacitor or capacitance? Can current flow through a capacitor? On the basis of electrostatic interactions between charges what do you expect the relationship between capacitance and area or capacitance and distance between conductors to be for a parallel plate capacitor?

What does the RC time constant tell you? How fast will a capacitor charge or discharge through a resistor if you know the initial voltage across it, its capacitance, and the resistance and voltage source, *e.g.*, battery, (if any) in series with it?

What is the half-life of a decay process and how do you find it?

If you know how long it takes for a capacitor in a circuit to charge or discharge to a certain % of full value, what is R or C or RC ? Can you find the RC time constant of an RC circuit, or the half-life of an RC circuit, if you have data for the voltage as a function of time for a capacitor as it charges or discharges through a resistor?

Magnetism

What is the Lorentz Force Law relating the force on a moving charge in the presence of a magnetic field? How can it be used to define magnetic field? How does the right-hand rule work to relate the directions of the velocity vector of a moving charge and the magnetic field vector to the direction of the force vector? How does the vector cross product allow you to find the magnitude and direction of the force on a charge moving in a magnetic field, or the force on a current carrying wire in a magnetic field?