

Physics 122 Spring 2025

DC Circuits

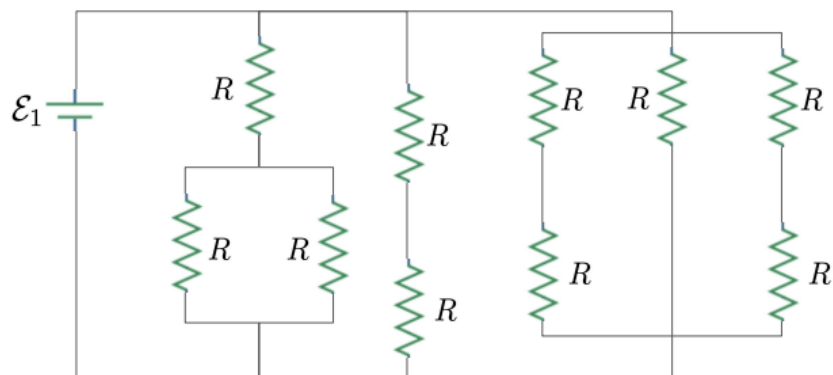
Homework 9

Due: Sunday April 20, 11:59PM

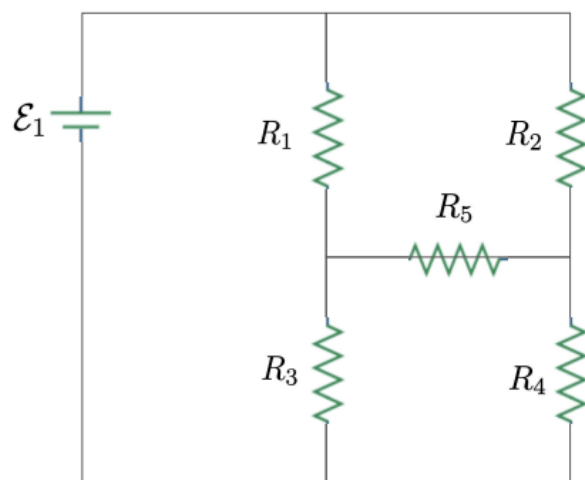
Guidelines

1. Please write clearly. If necessary solve the problem first on scratch paper. Then write a cogent and legible solution based on your scratch work. Learning to make a clear and logical presentation of your work is an invaluable asset, well worth the trouble of having to write it twice.
2. Please begin each problem on a new page just as we have done with the questions.
3. Parts of problems marked with an asterisk (if any) are only to be read. No response is needed.

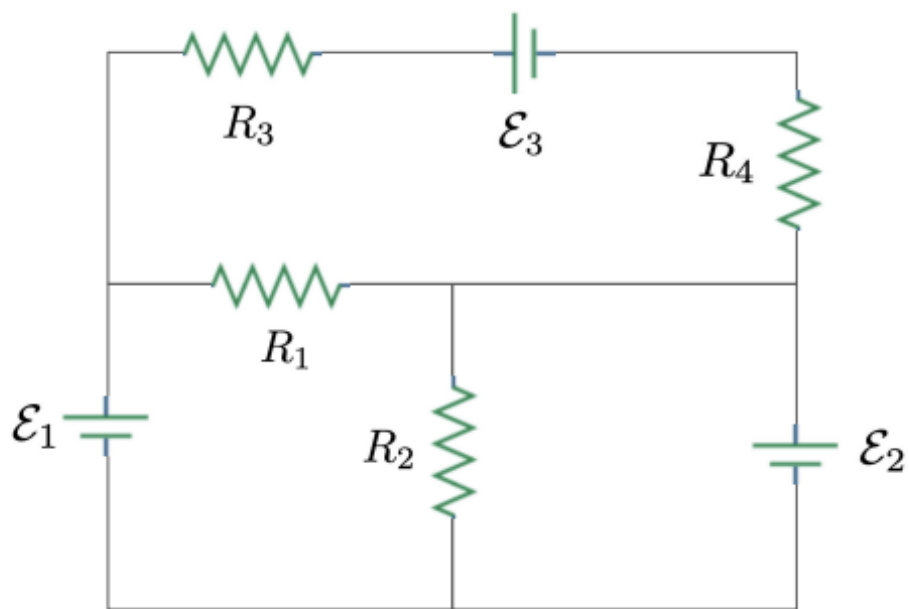
How to submit homework: Submit your homework in PDF format via Canvas. You will find a link to submit under Assignments. Please submit before the deadline. Deadlines are enforced and late homework may not be graded. If you have compelling reasons to miss the deadline please contact the instructor preferably before the deadline. In order to generate a PDF of your homework you should scan it. If you do not have access to a scanner there are a number of effective and free scanner apps available for phones. AdobeScan is one that many students have found worked well for them in previous courses. The other option is to take pictures of your homework and convert them to PDFs using your computer. Finally if you work with a tablet you can of course easily save your work as a PDF.



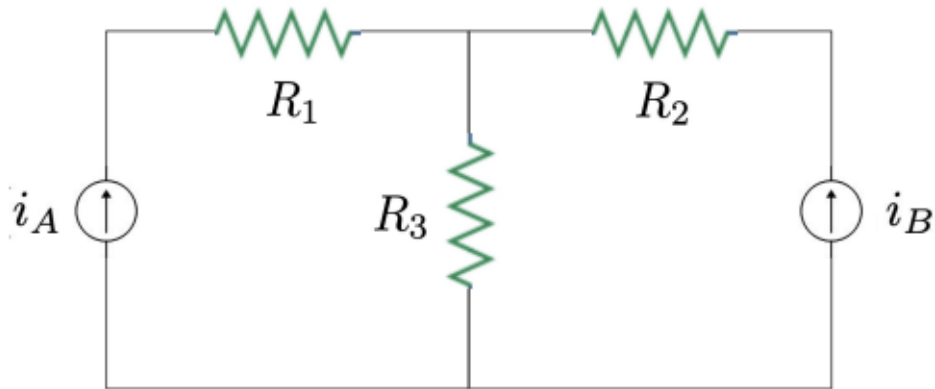
1. Consider the following circuit of ten resistors all with the same resistance R . Is the resistance of the circuit greater or less than R ? By what factor?



2. Consider the following circuit of five resistors $R_1 = 3\Omega$, $R_2 = 4\Omega$, $R_3 = 7\Omega$, $R_4 = 5\Omega$, $R_5 = 6\Omega$ and one battery $V = 12V$. What is the current flowing through each resistor?



3. Consider the following circuit of four resistors $R_1 = 1\Omega$, $R_2 = 5\Omega$, $R_3 = 3\Omega$, $R_4 = 6\Omega$ and three batteries $\mathcal{E}_1 = 12V$, $\mathcal{E}_2 = 6V$, $\mathcal{E}_3 = 24V$. What is the current flowing through each resistor?



4. An ideal current source is a circuit element that is complementary to a battery. An ideal battery maintains a constant voltage across its terminals. The current that flows in the battery is determined by the details of the circuit to which the battery is connected. An ideal current source supplies a definite current. The voltage across the terminals of the current source is determined by the details of the circuit to which it is connected. The symbol for a current source is a circle with an arrow inside. The direction of the arrow indicates the direction in which the current flows through the current source.
- (a) Determine the currents through the three resistors in terms of their resistances (R_1, R_2, R_3) and the currents of the two sources (i_A, i_B).
- (b) Determine the voltage across each of the current sources.

5. A laboratory power supply delivers a constant voltage of $V = 12\text{ V}$. You are provided with several identical resistors, each having a resistance of $R = 4\ \Omega$.
- (a) Connect a single resistor to the power supply. What is the power dissipated across this single resistor?
 - (b) Connect 3 of these resistors in series with the power supply. What is the power dissipated across the entire series configuration? How much power is dissipated across each resistor?
 - (c) Connect 4 of these resistors in parallel with the power supply. What is the power dissipated across the entire parallel configuration? How much power is dissipated across each resistor?