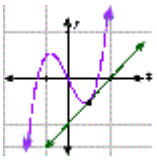


Circuit Lab Test

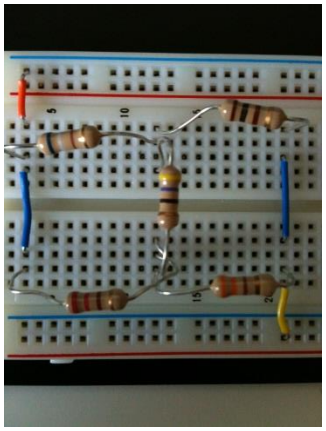
Note: Since some answers build upon past answers, feel free to look at the solutions if you are stuck.

Part 1: Circuit Analysis

Use conventional current (top to bottom in pic)

Use this circuit for questions 1-7

Color	Digit	Multiplier	Tolerance (%)
Black	0	10^0 (1)	
Brown	1	10^1	1
Red	2	10^2	2
Orange	3	10^3	
Yellow	4	10^4	
Green	5	10^5	0.5
Blue	6	10^6	0.25
Violet	7	10^7	0.1
Grey	8	10^8	
White	9	10^9	
Gold		10^{-1}	5
Silver		10^{-2}	10
(none)			20



1. What is the name of the circuit displayed? (1)

2. Draw a schematic of the circuit connected to a **9V** battery, labeling the resistances (3)

[Note: Top left resistor is blue, grey, brown, gold while the bottom left is red, red, brown, gold]

3. Calculate the equivalent resistance of the entire circuit (3)

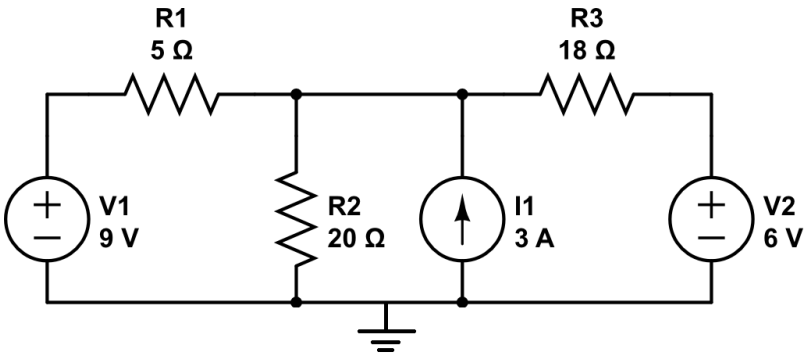
4. Calculate the current through the resistor with the smallest resistance (4)

5. The middle resistor is replaced with another resistor such that that one resistor dissipates maximum power. What is its resistance (keeping all other resistors in the picture)? (3)

6. The top right resistor in the picture is replaced with one such that there is no current flowing through the middle resistor (keeping all other resistors in the picture). What is its resistance? (2)

7. If the bottom right resistor was shorted out, what would happen to the current through the top right resistor? (2)

Use the following circuit for questions 8-11



8. Draw the Thevenin equivalent circuit with R3 as the load resistor. (4)

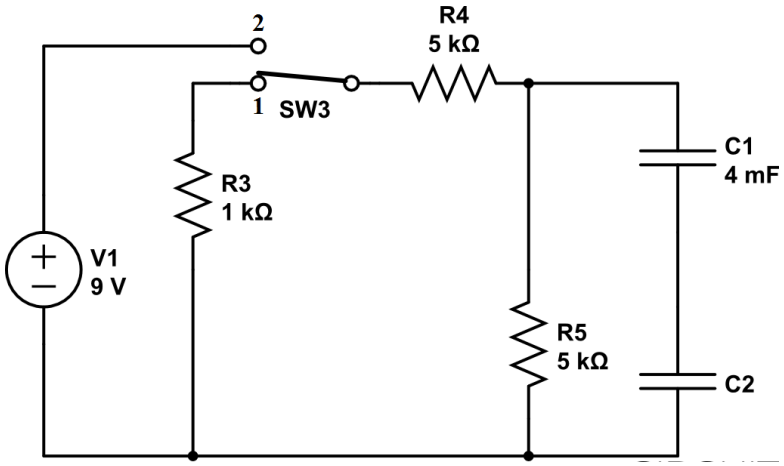
9. What is the total energy used by the load in 5 seconds? (3)

10. Calculate the current through R1. (3)

11. Calculate the voltage dropped across the 20 ohm resistor in the schematic. (3)

Part 2: RC Circuits

Use the following circuit for questions 12-16



12. After a very long period of time, the switch is moved from position 1 to position 2 and then after 2 time constants, the voltage across capacitor 1 is .972748 V. What is the time constant? (5)

13. During the first 2 time constants, write a function I(t) where t is in seconds and I is in amps of the current through resistor 4. (3)

14. As soon as 2 time constants pass, the switch is flipped back to position 1. What is the new time constant? (3)

15. In the first 2 seconds after the switch is moved back to position 1, how much energy does capacitor 2 release? (4)

16. Bonus: Identify the circuit component “SW3” (1)

Part 3: Miscellaneous and Lab

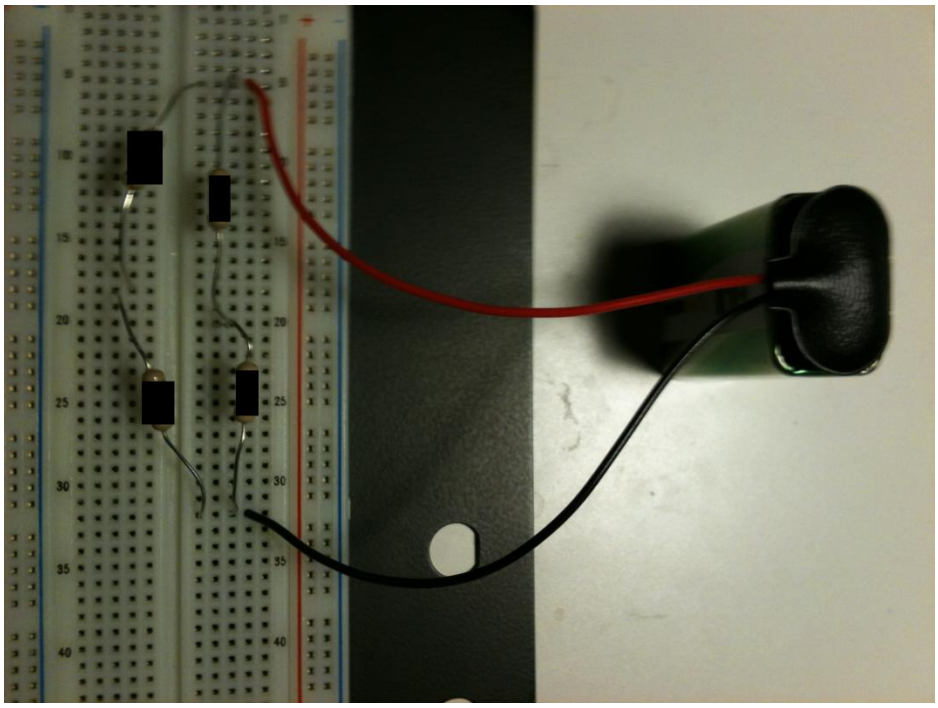
17. Siemens is a unit measuring what? (2)

18. A wire has a measure of .6 Siemens per meter. How many Siemens does 2 meters of this wire have? (2)

19. What is the SI unit for a Siemen? (2)

20. To light an LED, what side of the battery would you connect the cathode to? (2)

Using a multi-meter, describe how you would measure each of the following quantities (without disconnecting any parts or doing calculations) or explain why you cannot.



21. The voltage between the different sides of line 18. (2)

22. The resistance between the different sides of line 18. (2)

23. The current through the left branch. (2)