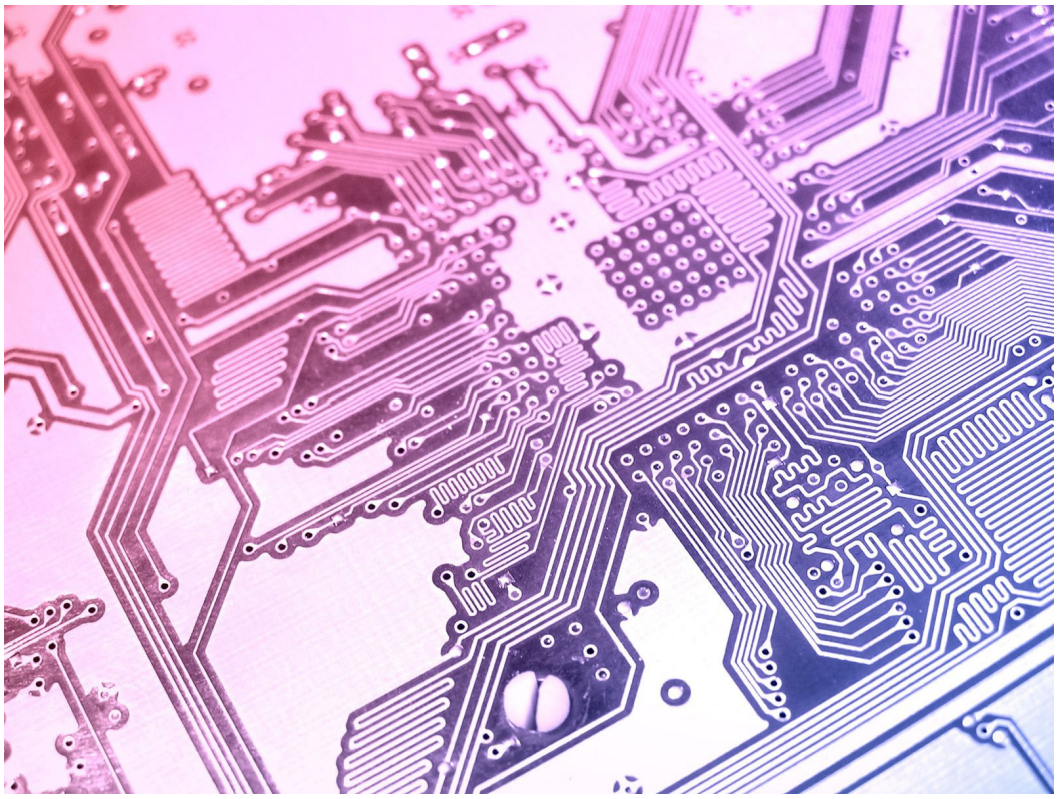
JSGandora's Circuit Lab Test

Rules and Scoring:

1. 6 points are awarded for each question while parts of questions are worth an equal number of points adding up to 6 points for the entire question.
2. Have fun. ☺

Good Luck!



Section I

1. The resistors inside an ammeter are called what? Shunt Resistors Multiplier Resistors
2. The resistors inside a voltmeter are called what? Shunt Resistors Multiplier Resistors
3. Why are Zener diodes advantageous? _____

   _____
4. Why is electromotive force a misnomer? _____
5. What happens when you put two batteries of different voltage in parallel with each other?

   _____
6. What happens when you put two batteries of different voltage in series with each other?

   _____
7. Nodal analysis is based on which one of Kirchhoff's Laws (First, Second)?

   _____
8. Who was the Wheatstone Bridge named after? _____
9. What direction is the electron current relative to the conventional current?

   _____
10. When is a Wheatstone Bridge considered "balanced"? _____
11. When the diode is reverse-biased, it allows a small reverse current also called a

    _____.
12. In which case are the three light bulbs the brightest? (Circle One)
    a. When the three light bulbs are wired in series to a voltage source.
    b. When the three light bulbs are wired in parallel to a voltage source and to each other.

13. Pipes are to wire as valves are to what electrical component? _____

14. Explain why capacitances add when capacitors are joined in parallel.

_____

_____

_____

_____

15. Define permittivity _____

_____

_____

_____

_____

16. Express the following measurements in SI base units.

    a. Voltage

    b. Current

    c. Resistance

    d. Capacitance

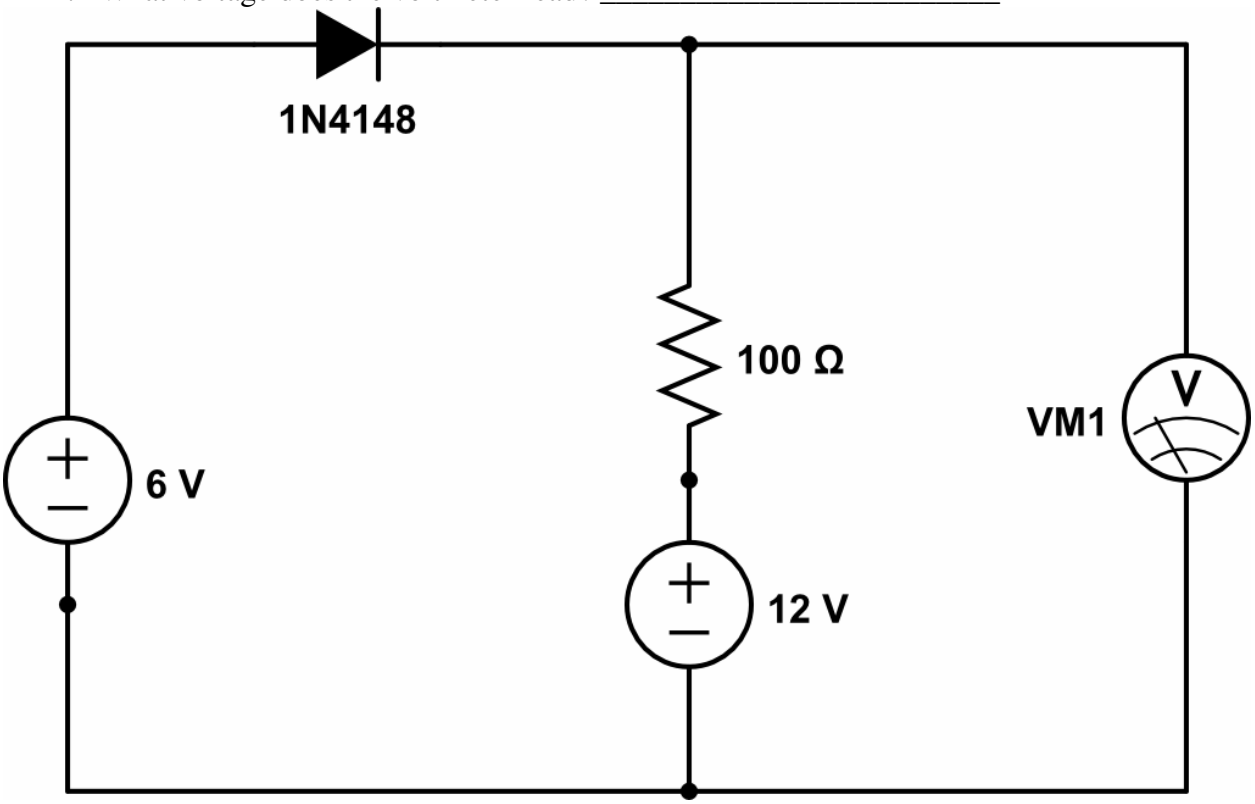
    e. Charge

    f. Power

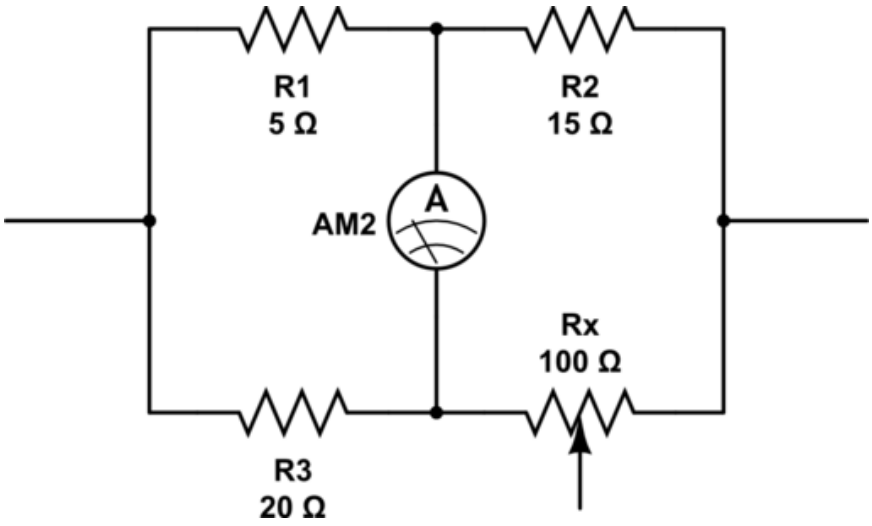
17. What is the voltage output of household outlets in America? _____

Section II

1. What voltage does the voltmeter read? _____

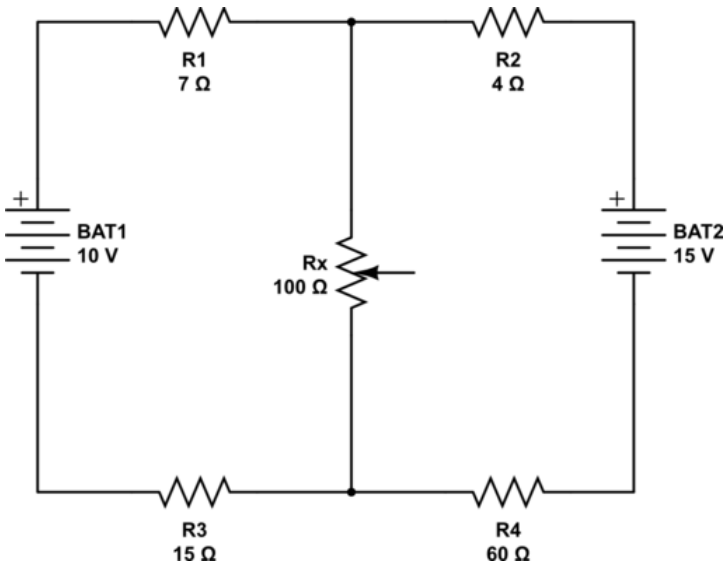


2. What is the value of R_x balances the Wheatstone Bridge below? _____

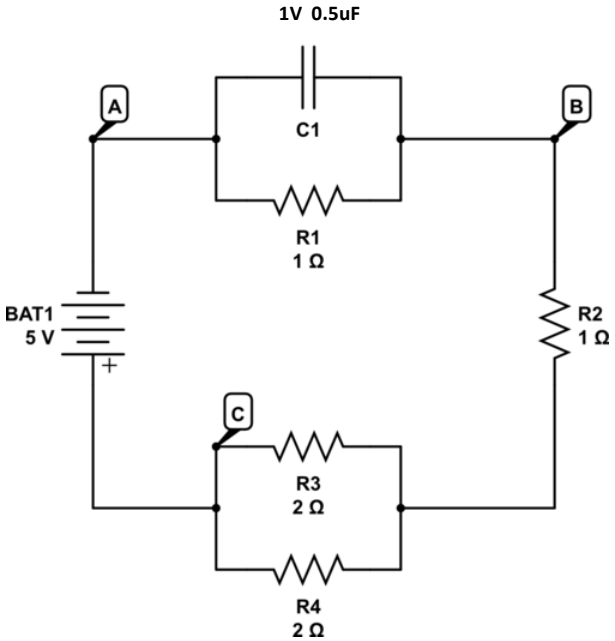


3. What value of R_x allows for greatest power dissipation of said resistor? _____

   a. What is the maximum power dissipation in joules? _____



4.



   a. What is the potential difference between points B and C after a long time? _____

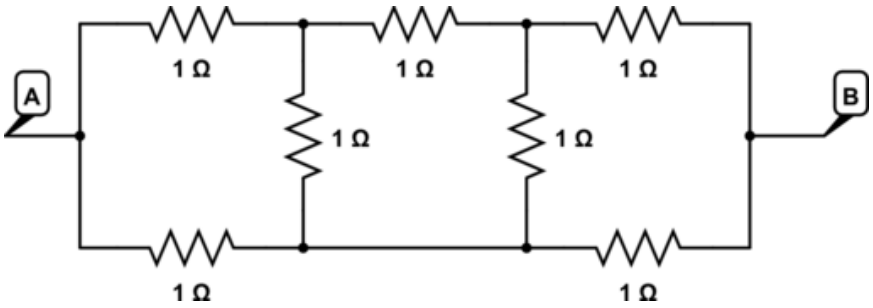
   b. What is the potential difference between points A and B after a long time?_____

   c. What is the total current in the circle after a long time? _____

5. An octahedron (polyhedron with 12 edges) has a resistor of 1Ω on each side.

    a. What is the equivalent resistance between two adjacent vertices? _____

    b. What is the equivalent resistance between two opposite vertices? _____

6. 

    Find the equivalent resistance between points A and B. _____
    What would the equivalent capacitance be if all the resistors were replaced with 1 Farad capacitors? _____

7. You have an infinite ladder of 1Ω resistors. What is the equivalent resistance between two vertices of a rung? _____

8. Which of the following properties is most valuable in a dielectric?
    a. Resistance to the flow of current
    b. Polarizability
    c. Material Strength
    d. None of these

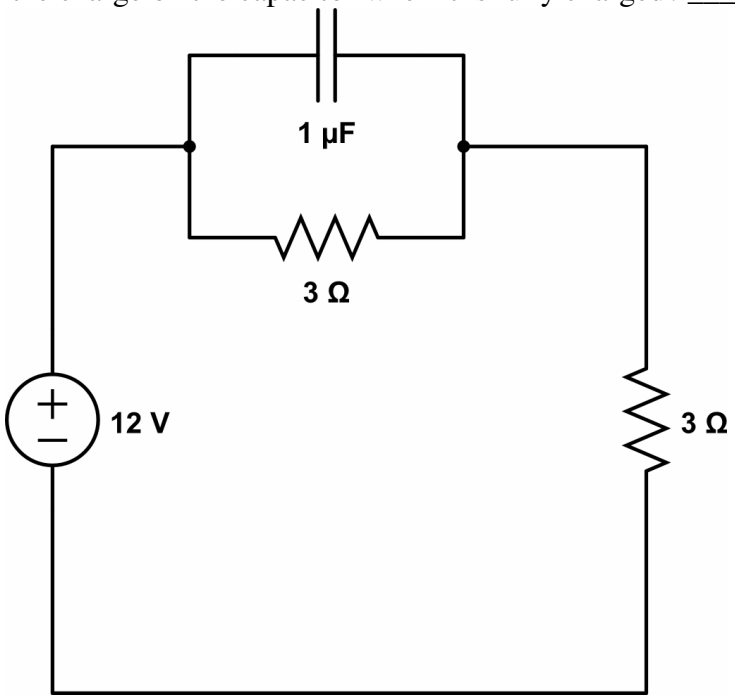
9. A **potentiometer** is a circuit component that has variable function in circuits depending on how many of the terminals are engaged. Which of the following statements is true of potentiometers?
    a. When three terminals are engaged, the potentiometer acts as a non-adjustable voltage divider; when only two (one end and the wiper) are engaged, it acts as a rheostat.
    b. When three terminals are engaged, the potentiometer acts as a variable voltage divider; when only two (one end and the wiper) are engaged, it acts as a rheostat.
    c. When two (one end and the wiper) terminals are engaged, the potentiometer acts as a non-adjustable voltage divider; when al three engaged, it acts as a rheostat.
    d. A potentiometer serves none of these functions, and is instead better used to measure electric potential in a multimeter.

10. In 1873, Frederick Guthrie discovered what circuit component when he observed that a grounded piece of white-hot metal would discharge a positively, but not a negatively, charged electroscope?

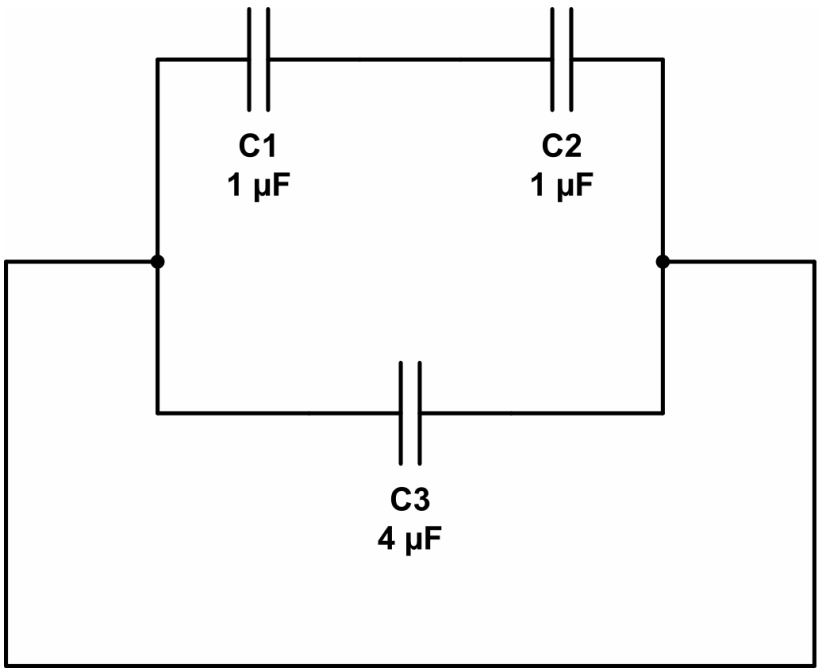
11. Does the Wheatstone Bridge in Question 2 have any practical applications? If it does, briefly describe below an experiment in which it might be used.

12. Part of the resistor color coding scheme, of any almost band count, is the use of tolerance values to account for uncertainties in resistance. Below, briefly describe **two** parameters which may cause resistors to fluctuate, and the physical explanation for the variance.

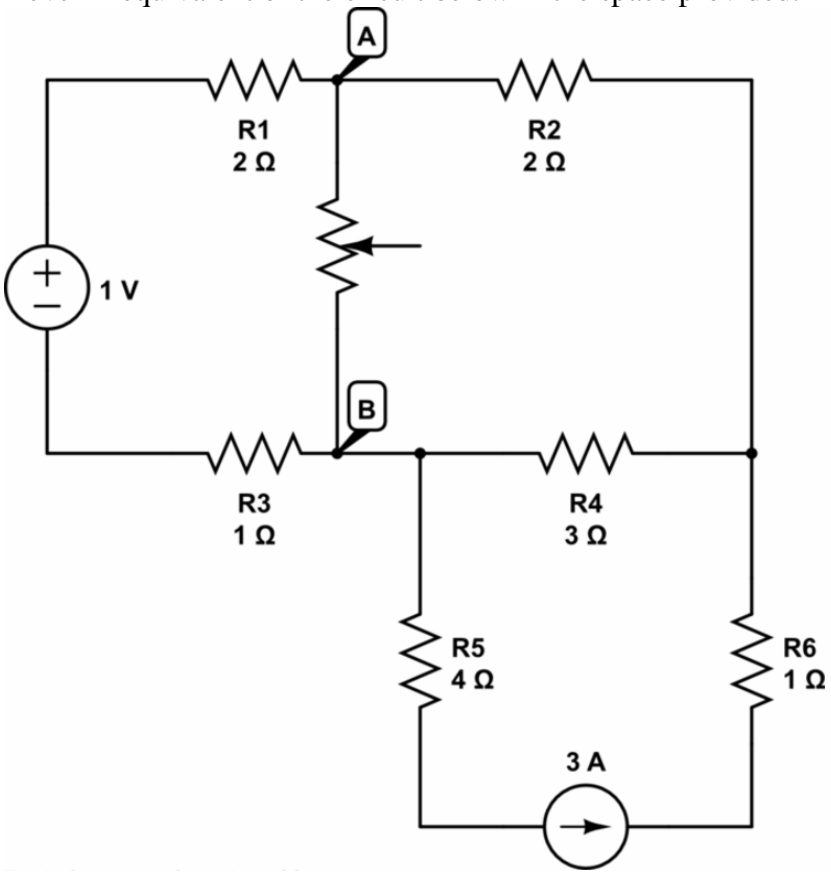
13. Examine the circuit below.
    a. What is the RC time constant?_____
    b. At time t=0.0015 seconds, what is the current through the capacitor?_____
    c. What the charge on the capacitor when it is fully charged? _____



14. Examine the setup below. If the voltage drop across C1 is 1V, what is the charge stored in C3 when the circuit is at equilibrium? _____



15. Draw the Thévenin equivalent of the circuit below in the space provided.



a. What resistance of the load resistor maximizes the power dissipated at that resistor? _____