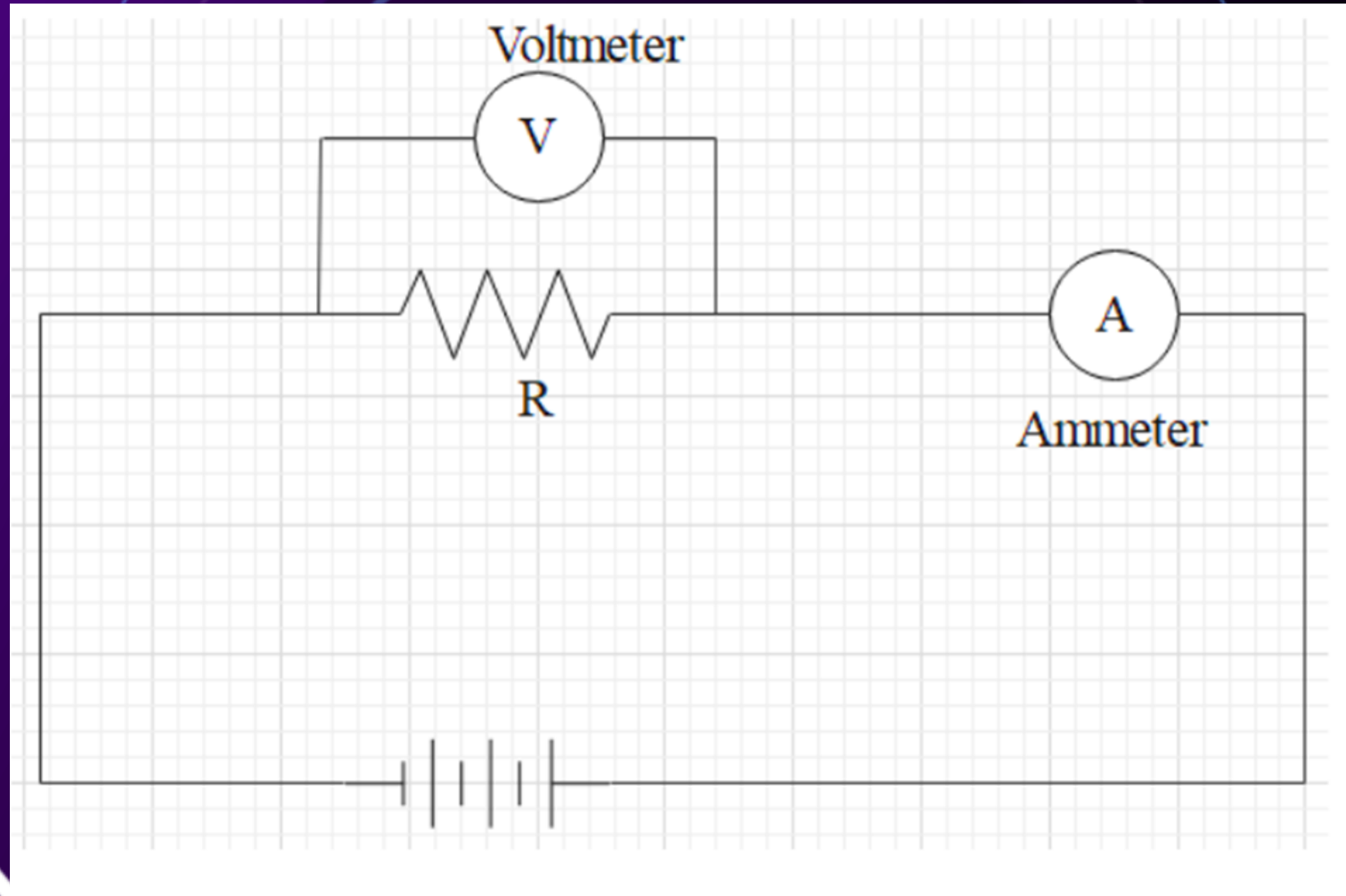


ELECTRICITY LESSON 5: SERIES AND PARALLEL CIRCUITS

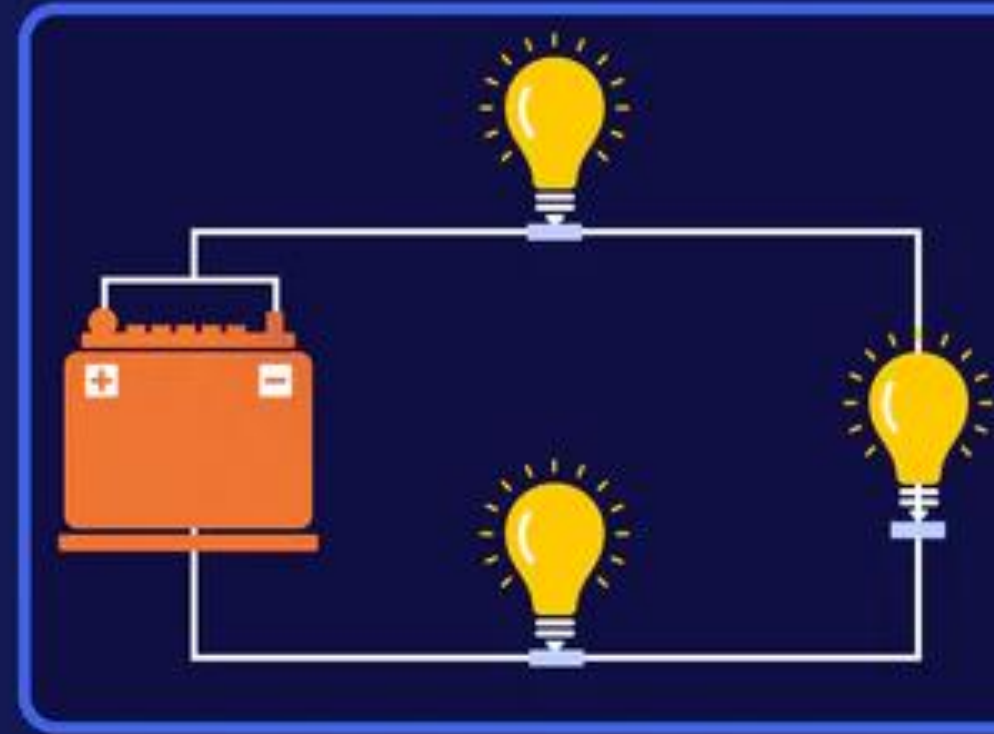
BY MR.K

THE RESISTOR USES 6KJ OF ENERGY, AND 300C OF CHARGE PASS THROUGH IT EVERY MINUTE. WHAT IS THE RESISTANCE OF THE CIRCUIT?



SERIES CIRCUITS

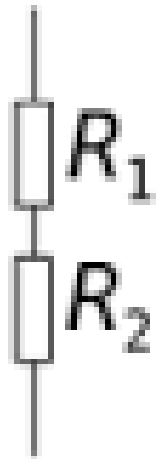
- All resistors are in one continuous loop
- Does the current differ at any point in the circuit?
- What about the potential difference?



SERIES CIRCUITS

- In series, current remains constant across the entire circuit
- Each resistor added to a series circuit will decrease the current, but the current will remain constant over the loop
- This is because there are no branch points where the current would be split
- In series, the voltage is split between the resistors depending on their resistance
- Since current remains constant in a series loop, the resistance determines what potential difference each resistor gets
- The sum of each individual potential difference will be equal to the overall voltage

EQUIVALENT RESISTANCE

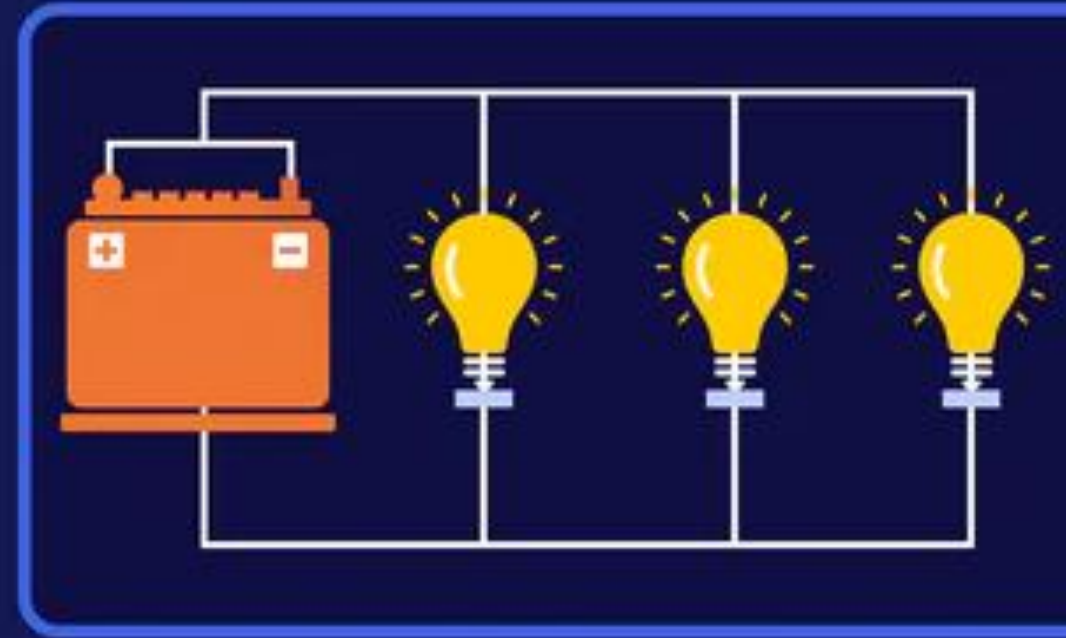


$$R_{TOTAL} = R_1 + R_2 \dots R_n$$

- Total resistance (or equivalent resistance) refers to the resistance felt over the entirety of a circuit
- In series, the total resistance is simply the sum of each individual resistance

PARALLEL CIRCUITS

- Resistors dispersed over 2 or more branches
- Does the current differ at any point over the circuit?
- What about the potential difference?

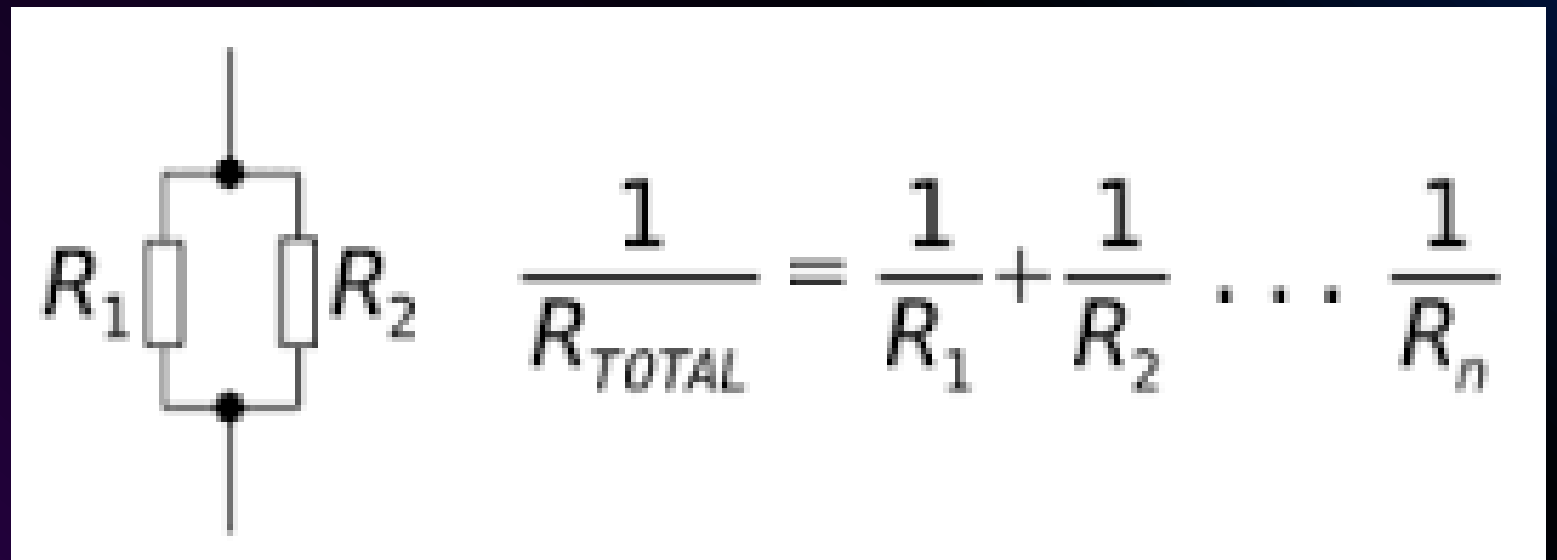


PARALLEL CIRCUITS

- In parallel, overall current is split amongst the branches in the circuit
- The division of the current over each branch depends on the resistance of each branch
- If branches have the same resistance, then they receive same current, but if their resistance differs, then so will their current
- In parallel, the voltage is not split between branches. Each branch gets the same total potential difference
- If there are multiple resistors sharing a branch, then the potential difference for that branch will be split between the resistors based on their resistance
- The sum of the individual potential differences on each branch will be equal to the overall voltage

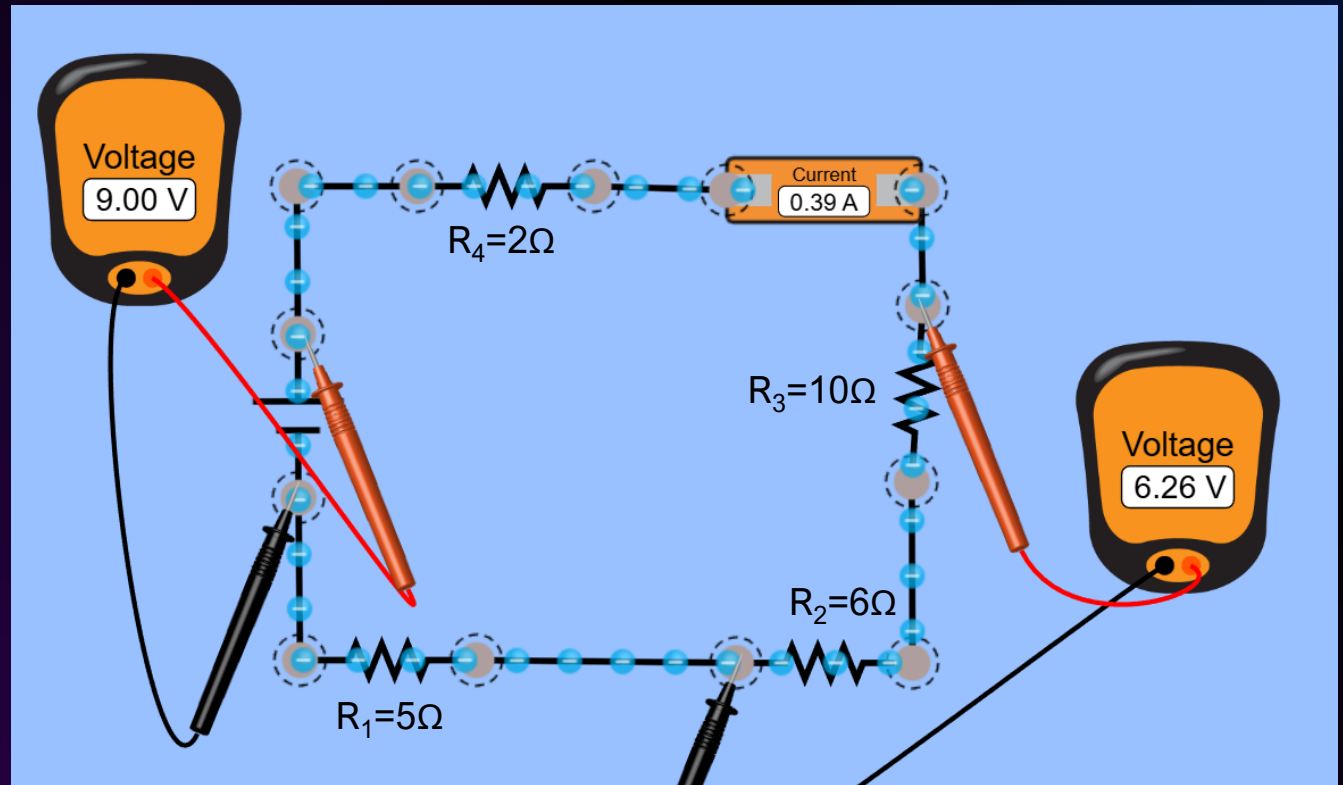
EQUIVALENT RESISTANCE

- Total resistance (or equivalent resistance) refers to the resistance felt over the entirety of a circuit
- In parallel, the total resistance is actually smaller than the smallest individual resistance. The total resistance is equal to the sum of the inverse resistance of each branch

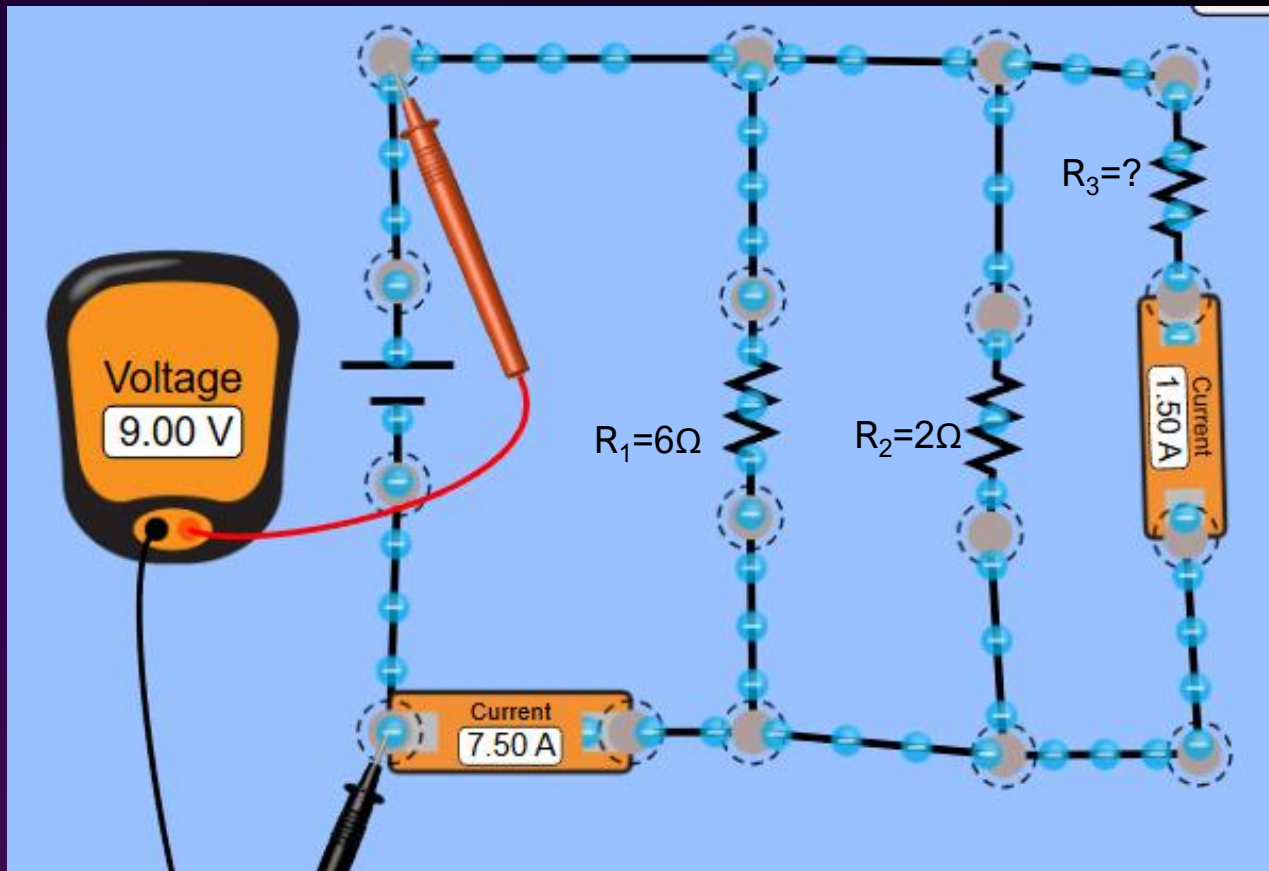


WHAT KIND OF CIRCUIT IS THIS?

1. What is R_{eq}
 - $R_{eq} = R_1 + R_2 + R_3 + R_4 = 23\Omega$
2. What is the voltage across R_4
 - $V=I \times R = 0.39A \times 2\Omega = 0.78V$
3. What is the voltage across R_1
 - $V=I \times R = 0.39A \times 5\Omega = 1.95V$
4. What current flows through each resistor?
 - Current is constant! 0.39A for all!



WHAT KIND OF CIRCUIT IS THIS?



1. What is R_3
 - $R=V/I = 9V/1.5A = 6\Omega$
2. What is the current through R_1
 - R_1 and R_3 are the same, so they get the same current (1.5A)
3. What is the voltage through each branch
 - Voltage is constant in parallel, 9V for each
4. What is R_{eq}
 - $1/R_{eq} = 1/6+1/2+1/6 \mid R_{eq} = 1.2\Omega$ ¹⁰



SEE YOU NEXT CLASS!

REFERENCES

- https://www.google.com/imgres?q=series%20circuit&imgurl=https%3A%2F%2Fnassaunationalcable.com%2Fcdn%2Fshop%2Farticles%2FSeries_vs_Parallel_circuits_3484x.jpg%3Fv%3D1700829273&imgrefurl=https%3A%2F%2Fnassaunationalcable.com%2Fen-ca%2Fblogs%2Fblog%2Fwiring-in-series-vs-parallel-circuit-the-difference%3Fsrsltid%3DAfmBOoq1O-WVur1c8EHN9WPrqXWDkd2DUNpEMK-SOQCHlpt1YTOEf057&docid=RMhWcfaSgmRnTM&tbnid=hfLDnlK8vXyorM&vet=12ahUKEwiGnKiCj9-QAxUy4skDHUJvGTYQM3oECBMQAA..i&w=3484&h=3370&hcb=2&ved=2ahUKEwiGnKiCj9-QAxUy4skDHUJvGTYQM3oECBMQAA
- <https://www.google.com/url?sa=i&url=https%3A%2F%2Felectronics.stackexchange.com%2Fquestions%2F171451%2Fwhat-is-the-equivalent-resistor-of-different-resistors-in-series-or-in-parallel&psig=AOvVaw3ayjTCxEegzR3dd5D0D9YE&ust=1762575230656000&source=images&cd=vfe&opi=89978449&ved=0CBUQjRxqFwoTCNC5obSX35ADFQAAAAAdAAAAABAL>
- https://www.google.com/imgres?q=equivalent%20resistance%20circuit%20questions&imgurl=https%3A%2F%2Fwww.tutorialspoint.com%2Fnetwork_theory%2Fimages%2Fequivalent_resistance.jpg&imgrefurl=https%3A%2F%2Fwww.tutorialspoint.com%2Fnetwork_theory%2Fnetwork_theory_equivalent_circuits_example_problem.htm&docid=ndTc5CmnMfIYbM&tbnid=xs3oh2EIADJOcM&vet=12ahUKEwjppjXHmt-QAxUwrYkEHZa_NEOQM3oECBwQAA..i&w=500&h=295&hcb=2&ved=2ahUKEwjppjXHmt-QAxUwrYkEHZa_NEOQM3oECBwQAA