Name: _____

Class: _____

Due Date: _____

49 – Circuits and Kirchoff's Laws

Answer the following questions. The solutions to this worksheet can be found on the YouTube channel Go Physics Go.

1. C: State *Kirchhoff's loop rule*. Which conservation rule does this law obey?

2. State *Kirchhoff's junction rule*. Which conservation rule does this law obey?

3. C: Resistors in series have the same _____.

4. C: Resistors in parallel have the same _____.

5. C: How can we simplify many *resistors in series*?

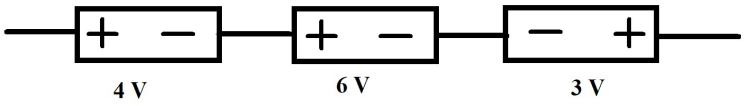
6. C: How can we simplify many *resistors in parallel*?

7. E: Six 2.02 Volt cells are connected in series. What will be the total emf produced?

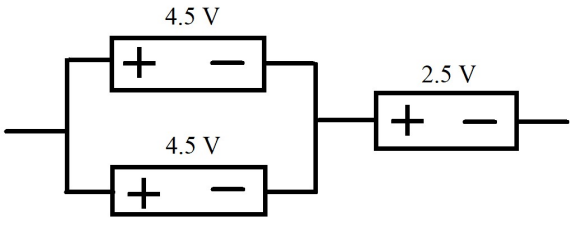
8. E: What will be the emf produced by four 1.50 Volt cells connected in series?

9. E: What will be the emf produced by three 6.00 Volt batteries connected in parallel?

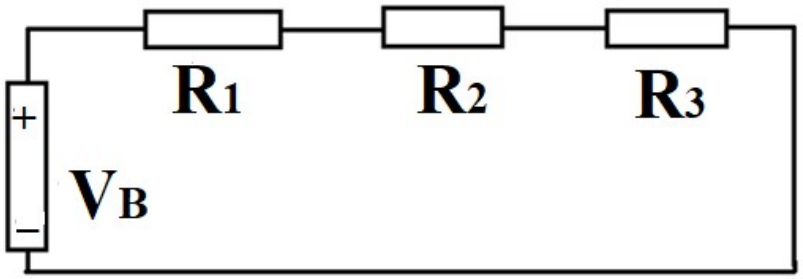
10. E: What will be the emf produced by the combination of cells below?



11. E: What will be the emf produced by the combination of cells below?



12.E: Solve for the unknowns. Give your answers in reduced fractions.

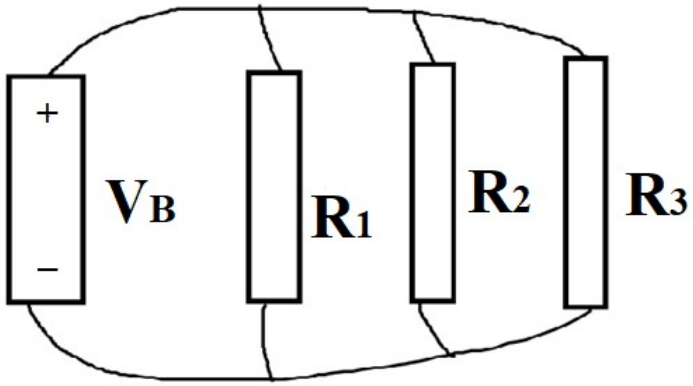
	Given: $V_B = 10\ V$ $R_1 = 2\ \Omega$ $R_2 = 4\ \Omega$ $R_3 = 6\ \Omega$

$R_{\text{equivalent}} =$ $I_{\text{battery}} =$	$V_1 =$ $V_2 =$ $V_3 =$	$I_1 =$ $I_2 =$ $I_3 =$

What will happen to the current leaving the battery if the number of resistors in series increases? Will the current increase, decrease, or stay the same?

What will happen to the overall resistance of the circuit if the number of resistors in series increases? Will the overall resistance increase, decrease, or stay the same?

13.E: Solve for the unknowns. Give your answers in reduced fractions.



Given:

$V_B = 10\ V$

$R_1 = 2\ \Omega$

$R_2 = 4\ \Omega$

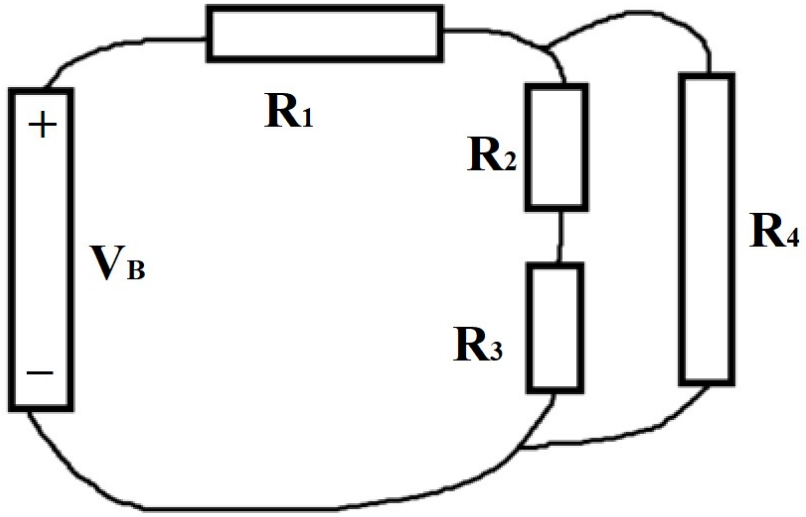
$R_3 = 6\ \Omega$

$R_{\text{equivalent}} =$ $I_{\text{battery}} =$	$V_1 =$ $V_2 =$ $V_3 =$	$I_1 =$ $I_2 =$ $I_3 =$

What will happen to the current leaving the battery if the number of resistors in parallel increases? Will the current increase, decrease, or stay the same?

What will happen to the overall resistance of the circuit if the number of resistors in parallel increases? Will the overall resistance increase, decrease, or stay the same?

14.E: Solve for the unknowns. Give your answers in reduced fractions.



Given:

$V_B = 10\ V$

$R_1 = 2\ \Omega$

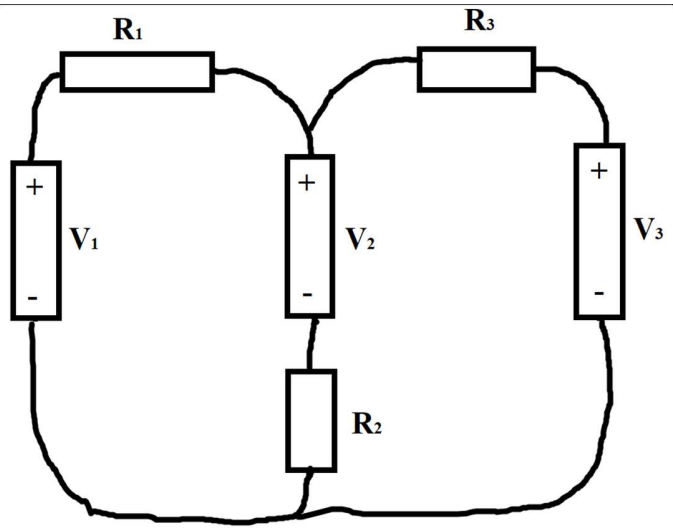
$R_2 = 4\ \Omega$

$R_3 = 6\ \Omega$

$R_4 = 8\ \Omega$

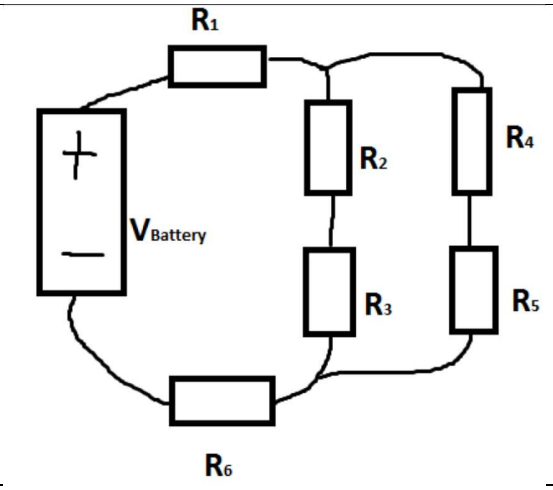
$R_{\text{equivalent}} =$	$V_1 =$	$I_1 =$
	$V_2 =$	$I_2 =$
$I_{\text{battery}} =$	$V_3 =$	$I_3 =$
	$V_4 =$	$I_4 =$

15.E: Solve for the unknowns. Give your answers in reduced fractions.

	$V_1 = 6\ \text{V}$ $V_2 = 11\ \text{V}$ $V_3 = 17\ \text{V}$ $R_1 = 3\ \Omega$ $R_2 = 1\ \Omega$ $R_3 = 4\ \Omega$

$I_1 =$ $I_2 =$ $I_3 =$	$V_{R_1} =$ $V_{R_2} =$ $V_{R_3} =$

16.E: Solve for the unknowns. Give your answers in reduced fractions.



$V_{\text{battery}} = 10\ \text{V}$

$R_1 = 1\ \Omega$

$R_2 = 2\ \Omega$

$R_3 = 3\ \Omega$

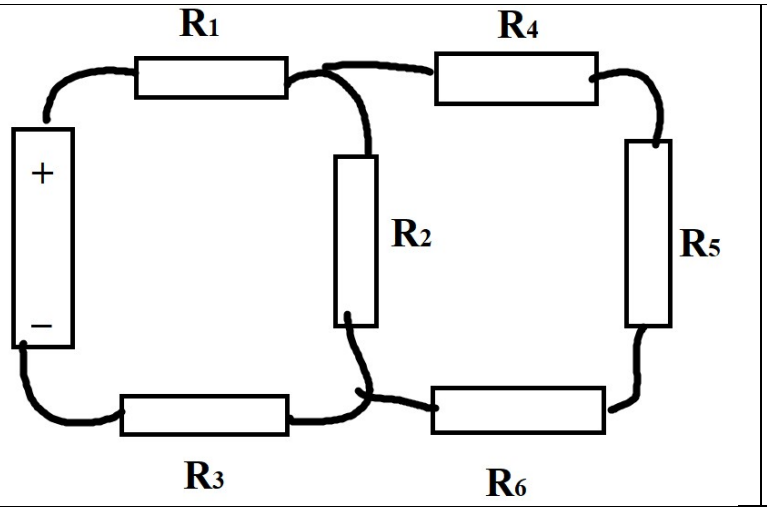
$R_4 = 4\ \Omega$

$R_5 = 5\ \Omega$

$R_6 = 6\ \Omega$

$R_{\text{equivalent}} =$			$I_{\text{battery}} =$		
$I_1 =$	$I_2 =$	$I_3 =$	$I_4 =$	$I_5 =$	$I_6 =$
$V_1 =$	$V_2 =$	$V_3 =$	$V_4 =$	$V_5 =$	$V_6 =$

17.E: Solve for the unknowns. Give your answers in reduced fractions.



$V_{\text{battery}} = 30\ \text{V}$

$R_1 = 1\ \Omega$

$R_2 = 2\ \Omega$

$R_3 = 3\ \Omega$

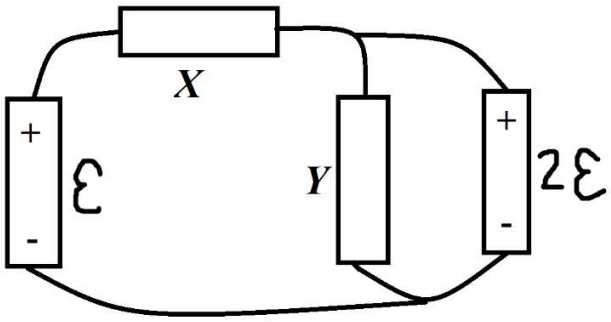
$R_4 = 4\ \Omega$

$R_5 = 5\ \Omega$

$R_6 = 6\ \Omega$

$R_{\text{equivalent}} =$			$I_{\text{battery}} =$		
$I_1 =$	$I_2 =$	$I_3 =$	$I_4 =$	$I_5 =$	$I_6 =$
$V_1 =$	$V_2 =$	$V_3 =$	$V_4 =$	$V_5 =$	$V_6 =$

18. E: The image below shows a circuit two resistors *X* and *Y* with a resistance *R* and two cells with negligible internal resistance. Use Kirchoff's laws to calculate the current through each resistor and cell.



19.C: What is a *potential/voltage divider*?

A *voltage divider* circuit is a very common circuit that takes a higher voltage and converts it to a lower one by using a pair of resistors.