Series & Parallel Circuits

12PHYS - Electricity

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2019

Starter

A circuit has current $1.2A$ and voltage of 12V and has a single bulb.

1. How many Coulombs of electrical charge flow through a point in every second?
2. How much energy is used by the bulb in 5 seconds?
3. What is the resistance of the bulb?

Series Circuits

- The current has only one path to flow around
- The current is constant around the circuit
- The voltage is shared between the components in the circuit

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Parallel Circuits

- The current has multiple paths to flow around
- The current is shared between paths
- The voltage is shared between components on each separate path

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Constructing Circuits

Use the PhET simulation on Google Classroom to complete these questions:

1. Create a series circuit with a bulb and a switch
2. Create a parallel circuit with a bulb and a switch on each path, and one switch that controls the whole circuit.

Measure the resistance of the circuit in PhET when you add resistors to the different circuit and try make a rule for what happens.

Resistance in Circuits

- When you add resistors in series, the resistance **increases**
- When you add resistors in parallel the total resistance **decreases**

Calculating Resistance

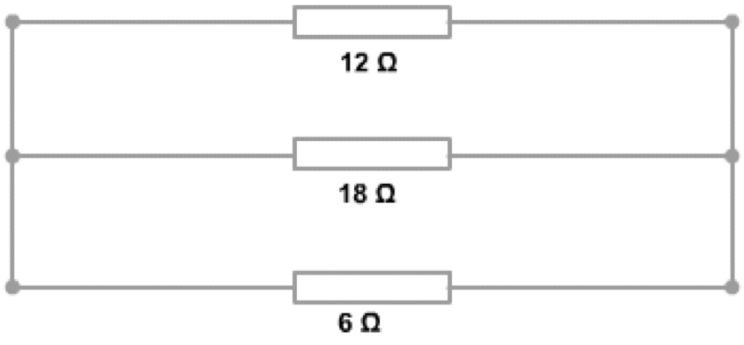
In series we can use this equation:

$$R_T = R_1 + R_2 + R_3 + ...$$

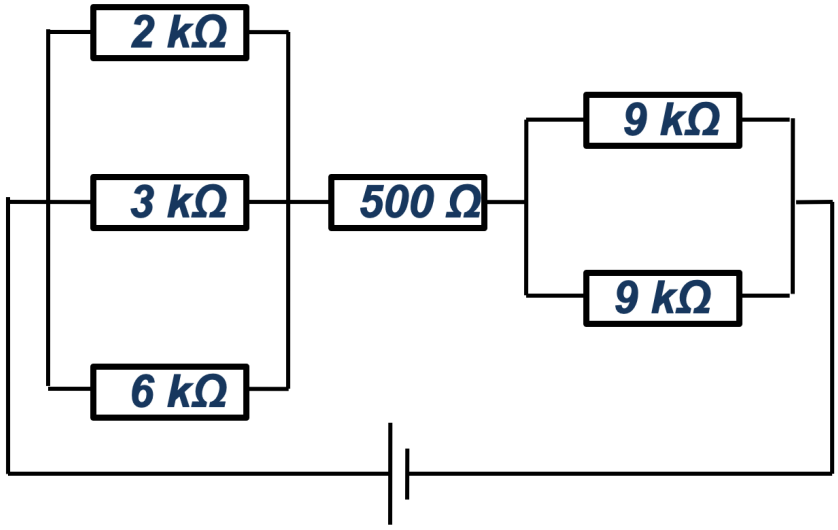
In parallel we can use this equation:

$$\frac{1}{R_t} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + ...$$

Question 1

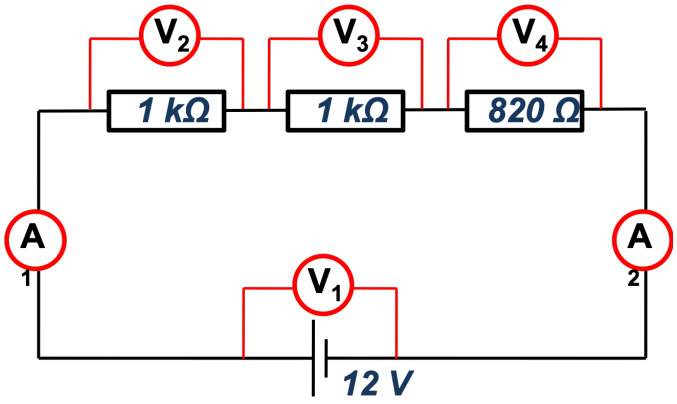


Question 2

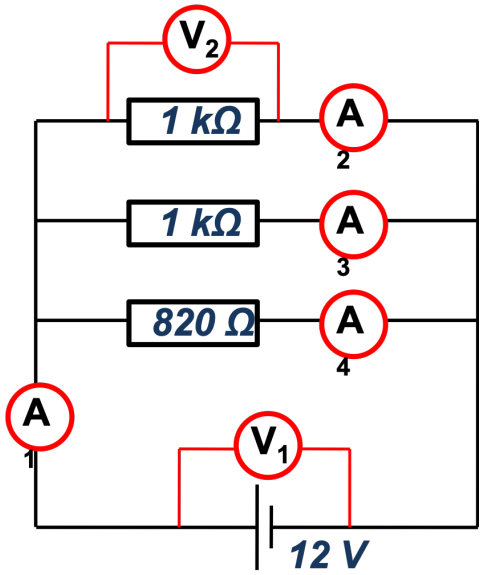


Calculate the values for each voltmeter and ammeter.

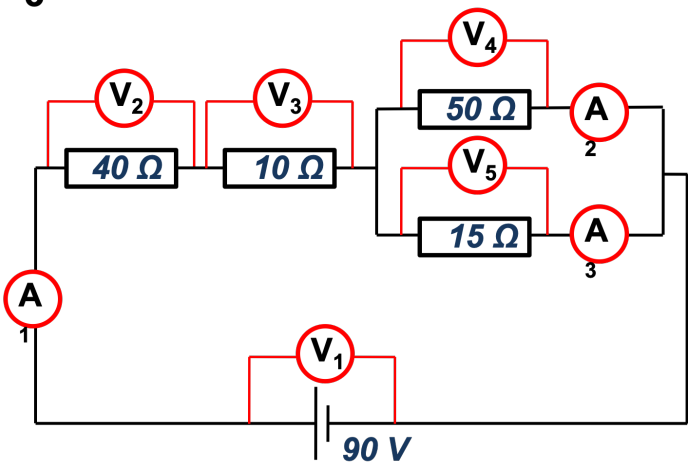
1



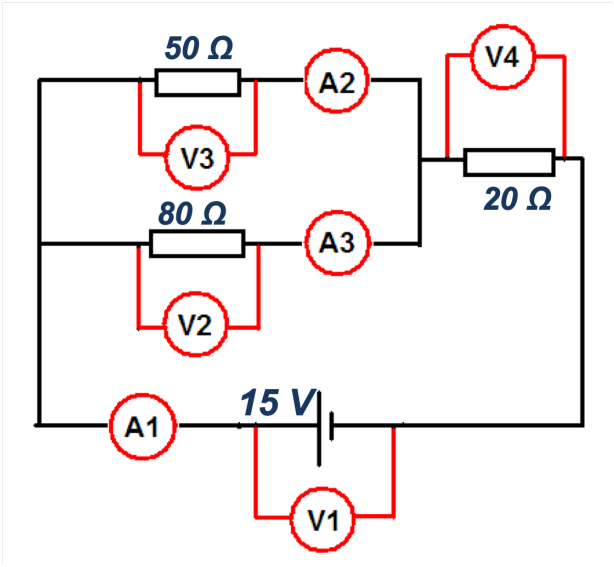
2


V2
1 kΩ
A
2
1 kΩ
A
3
820 Ω
A
4
A
1
V1
12 V

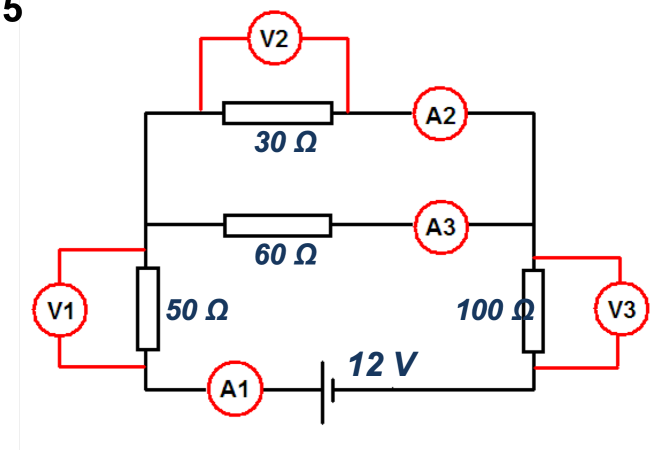
3


V4
V2
V3
50 Ω
A
2
40 Ω
10 Ω
V5
15 Ω
A
3
A
1
V1
90 V

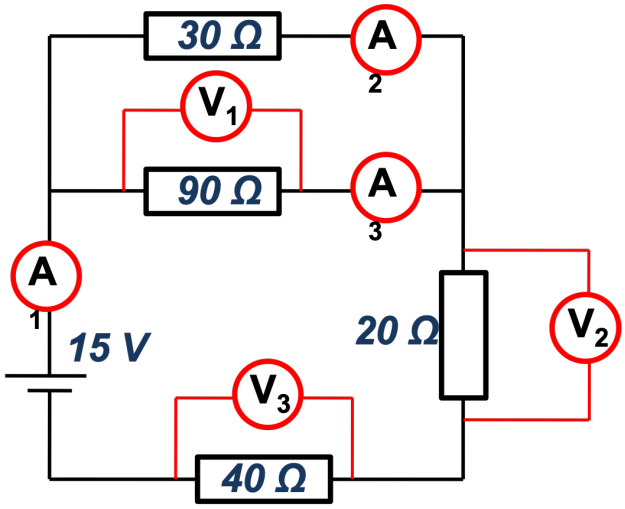
4


50 Ω
A2
V4
V3
20 Ω
80 Ω
A3
V2
15 V
A1
V1

5


V2
A2
30 Ω
A3
60 Ω
V1
50 Ω
100 Ω
V3
12 V
A1

6



1

A1	0.0042553
A2	0.0042553
V1	12
V2	4.2553
V3	4.2553
V4	3.4894

2

A1	0.03863
A2	0.012
A3	0.012
A4	0.01463
V1	12
V2	12

3

A1	1.4625
A2	0.3375
A3	1.125
V1	90
V2	58.5
V3	14.625
V4	16.875
V5	16.875

4

A1	0.2955
A2	0.1818
A3	0.1136
V1	15
V2	0.0909
V3	0.0909
V4	5.9091

5

A1	0.0706
A2	0.0471
A3	0.0235
V1	3.5294
V2	1.4118
V3	7.0588

6

A1	0.1818
A2	0.1363
A3	0.04545
V1	4.0909
V2	3.6363
V3	7.2727
