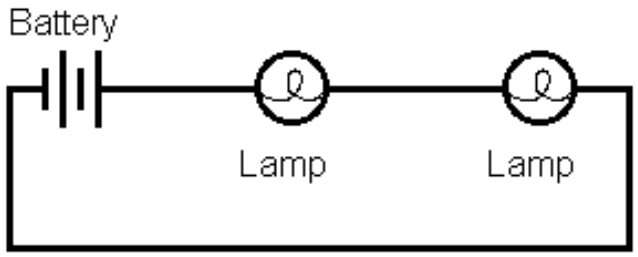
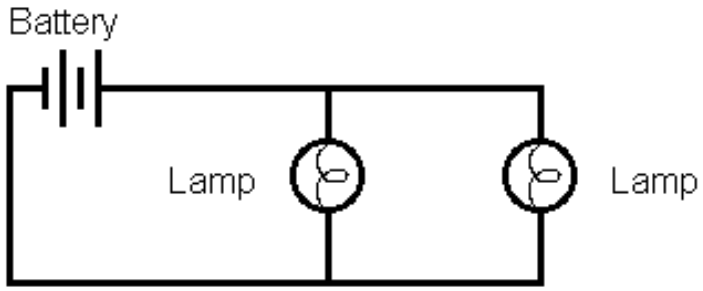
CIRCUITS:

SERIES



PARALLEL



Series Vs. Parallel

OUTCOME QUESTION(S):

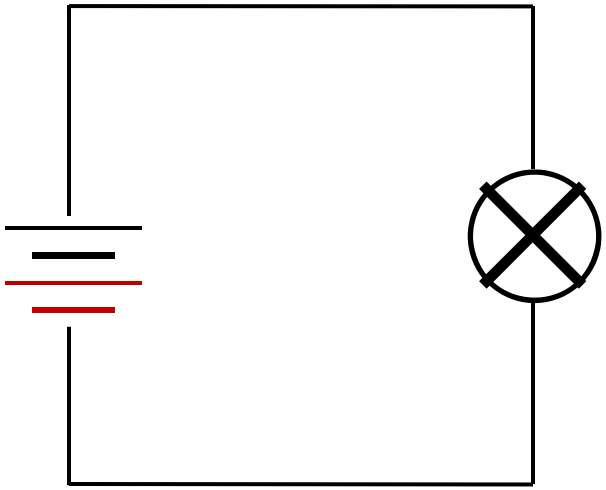
S1-3-17:

What are the similarities and differences between series and parallel circuits?

Vocabulary & *Concepts*

Three key statements of electric circuits:

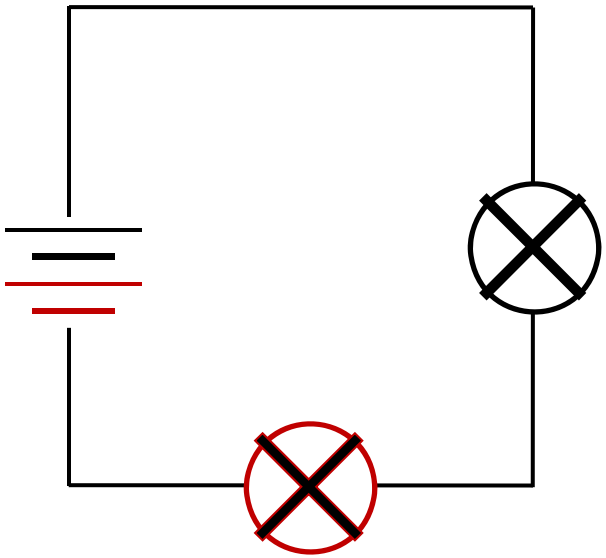
1. Voltage and current are **directly** related.
2. Voltage and resistance are **directly** related.
3. Current and resistance are ***inversely*** related



more energy (↑ voltage)
\+ *same* obstacles (same resistance)
move faster (↑ current)

The opposite is true: ***less energy*** (↓ voltage) will mean ***less speed*** (↓ current) for the electrons

2. Voltage and resistance are **directly** related.

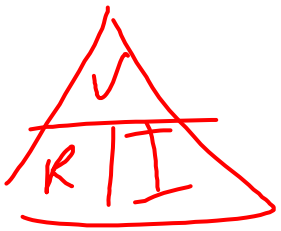


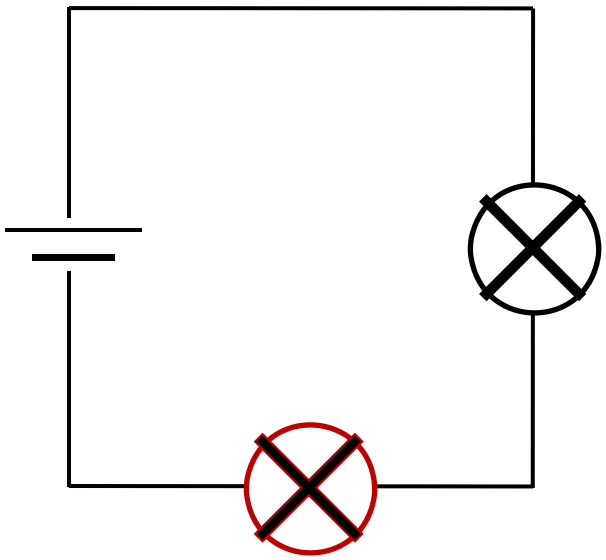
more obstacles (↑ resistance)
\+ *same* speed same current
more energy (↑ voltage)

The opposite is true: **less obstacles** (↓ resistance) requires **less energy** (↓ voltage) from the electrons

3. Current and resistance are ***inversely*** related.

$R = \frac{V}{I}$



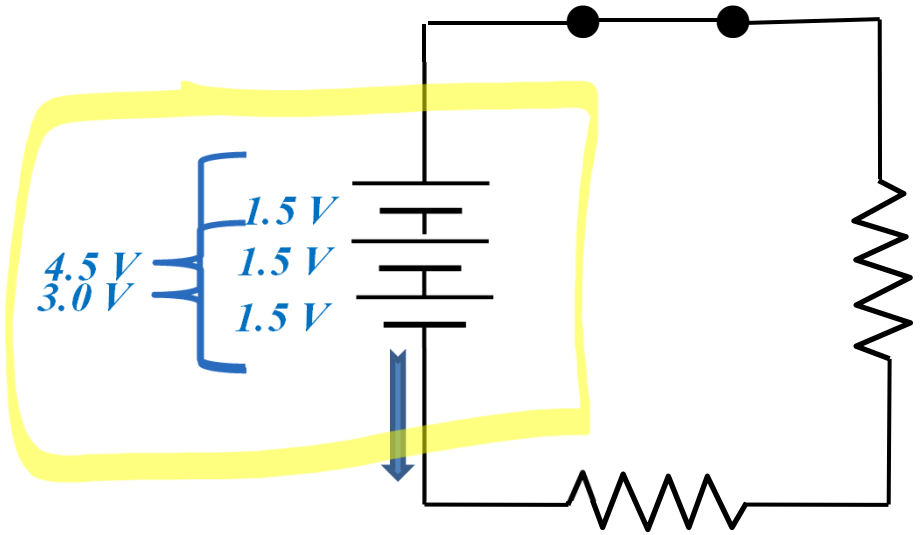


\+ **more obstacles** (↑ resistance)
same energy Same voltage
less speed (↓ current)

The opposite is true: **less obstacles** (↓ resistance) will mean **more speed** (↑current) for the electrons

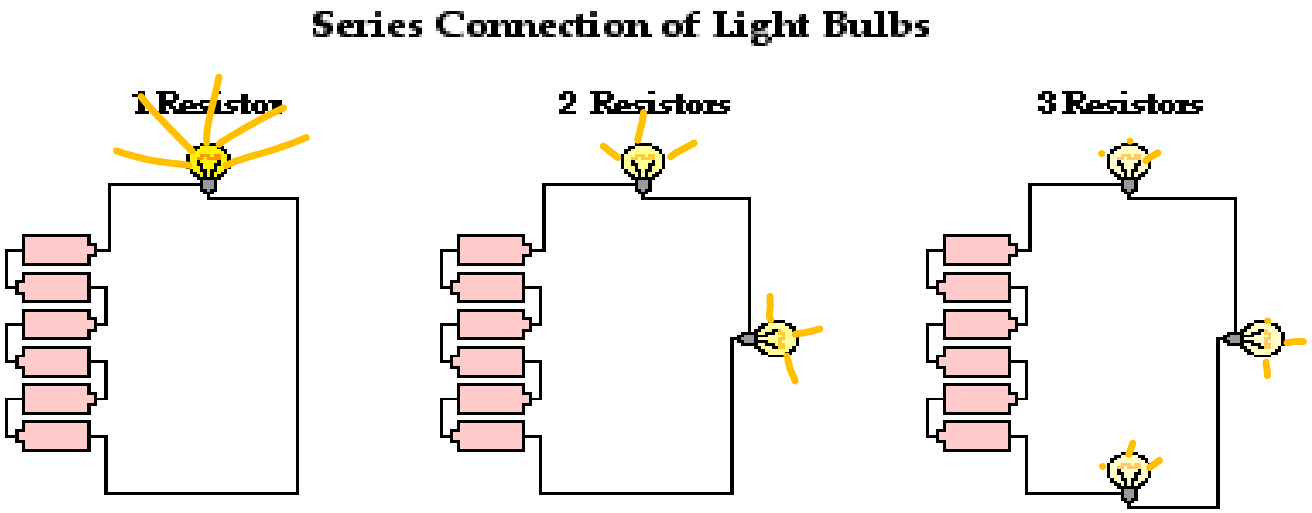
Series circuit: *one path*

Electrons pushed through all cells in series – add them up



Total ***potential*** (voltage) of the electrons is the ***sum*** of the ***cells*** in *series*

Series circuit: *one path*



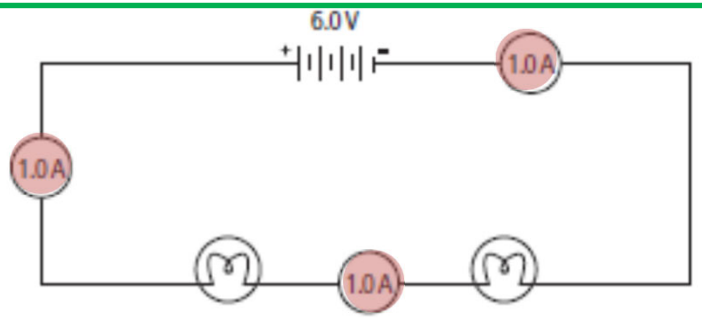
*Overall **current** in the circuit **decreases** as more **resistors** are added in **series***

Bulbs get *dimmer* - **more resistance** will mean **less current** and *less energy per second* to the bulbs

Series circuit: ***one path***

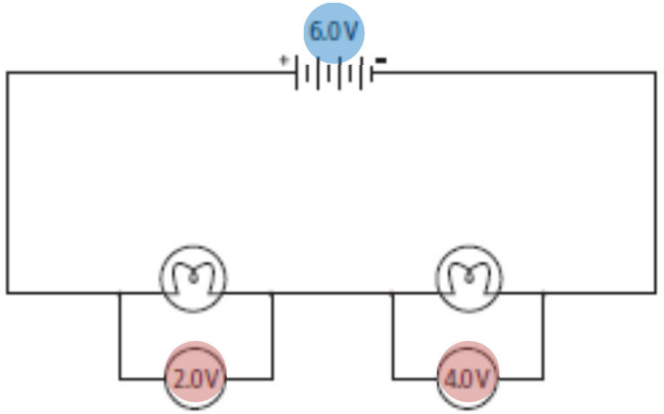
Electrons move at constant speed - measured anywhere

Current is the **same** at *any point*



Different resistors take different amounts of energy to get past

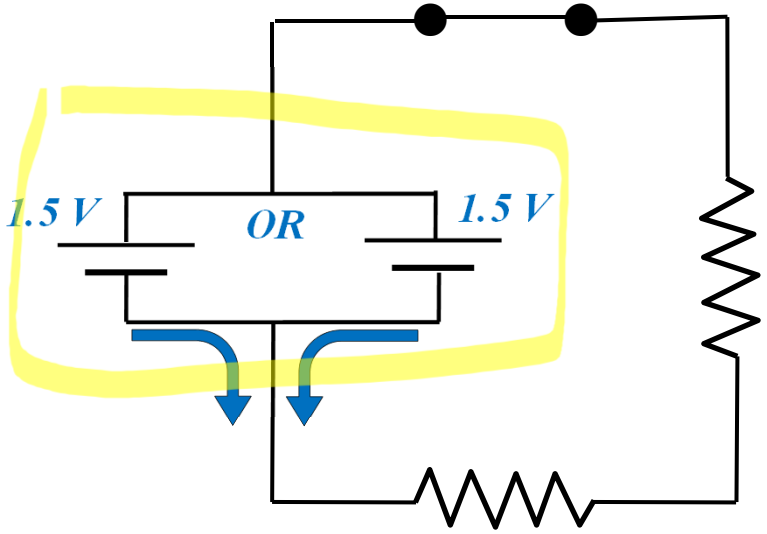
Sum of voltage drop by all components **equals** total voltage supplied by **source**



Parallel circuit: ***multiple pathways***

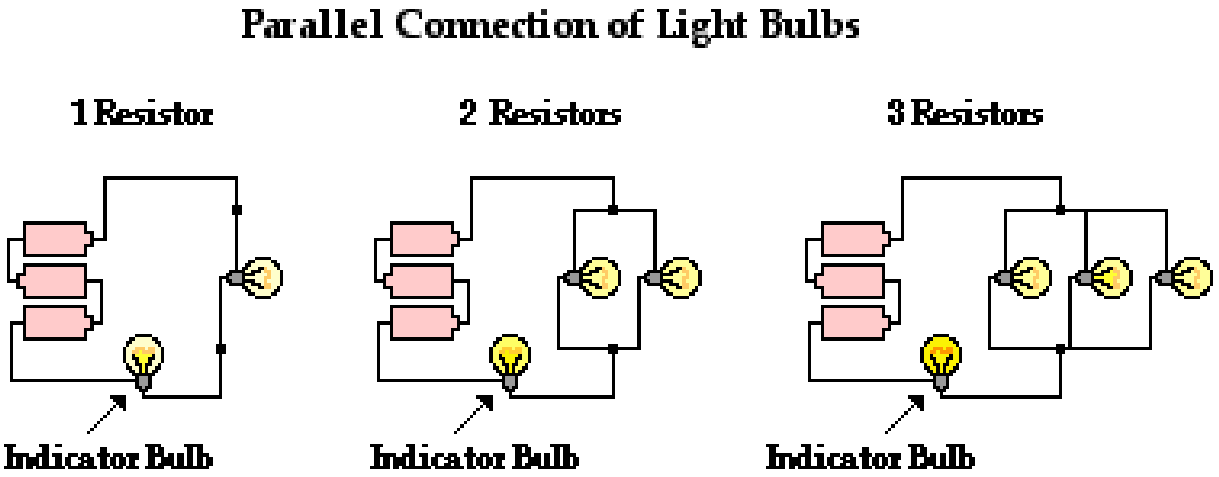
Electrons pushed through *only one* branch – energy of one

Since cells are ***splitting current*** *of the circuit, each cell* ***lasts longer***



Total *potential* of the electrons is the ***voltage*** of a ***single*** *branch* in ***parallel***

Parallel circuit: *multiple pathways*



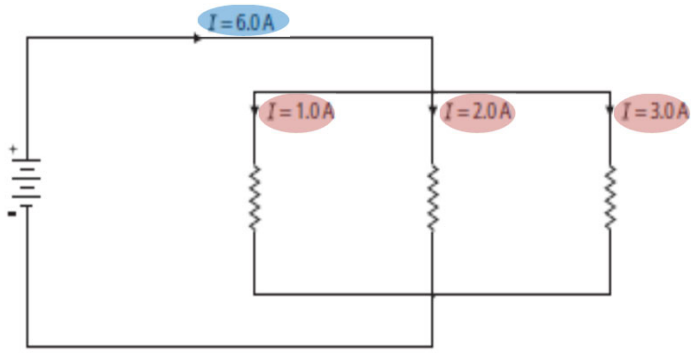
*Overall **current** in the circuit **increases** as more **resistors** are added in **parallel***

Bulbs get *brighter:* **more junctions** (pathways) **increases current** which means *more energy per second* to the bulbs

Parallel circuit: ***multiple pathways***

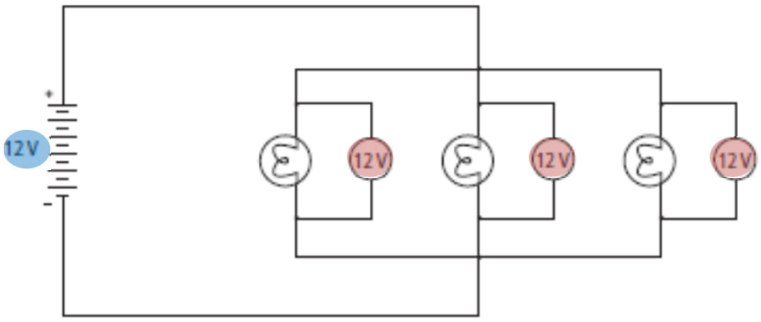
Electrons move quickest through the weakest resistors

Sum of all **branches** equals total **current** at the junction



Electrons **lose all** energy through circuit – regardless of path

Voltage drop in each ***branch*** is the **same** as total voltage supplied by the source



SERIES	PARALLEL
One path	**Multiple** paths
Removing a component **kills** circuit	Current flows in other **branches** if one is **broken**
BATTERIES ONLY Total **voltage** is **sum** ALL **cells**	**Voltage** is **same** as single **branch** (*but it lasts longer*)
Sum of **voltage drop** by **ALL** components **equals** the total voltage supplied by **source**	**Voltage** drop in **EACH** branch **equals** the total voltage supplied by the **source**
Total **current** is the **same** at any point	**Total** **current** before or after the junction is the **sum** of current in all **branches**

What will happen to the current in the circuit below for each case:

a) the switch is closed

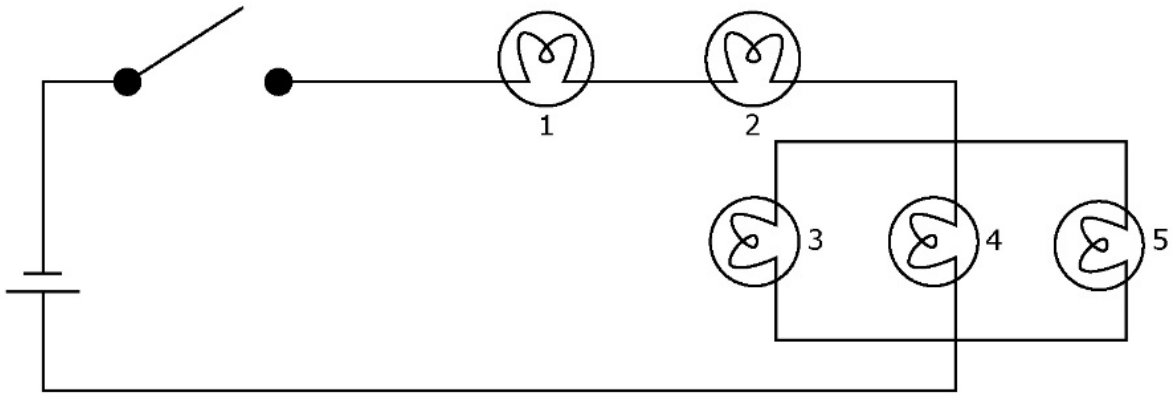
Main current flowing - All bulbs will be "on"

b) the switch is closed and bulb 1 is removed

Main current cut - all bulbs will be "off"

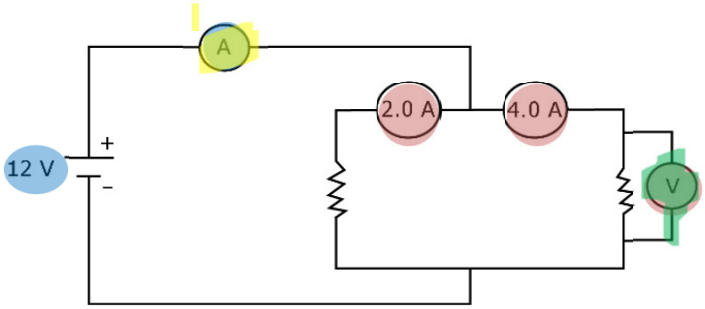
c) the switch is closed and bulb 5 is removed

Current cut in branch 5 only - 1,2,3,4 will be "on"

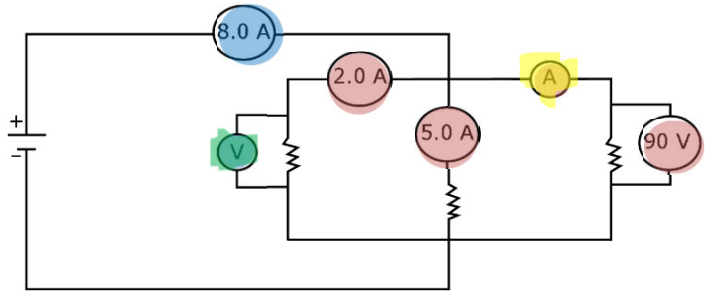


Find the unknown voltage, V and current, A:

Current = $2.0 + 4.0 = 6.0\ A$
Voltage = 12 V



Current = $8.0 - 5.0 - 2.0 = 1.0\ A$
Voltage = 90 V



Sum of all **branches equals** total **current** at the junction

Drop in each ***branch*** **same** as total voltage supplied by the **source**

CAN YOU ANSWER THESE QUESTIONS?

S1-3-17:

What are the similarities and differences between series and parallel circuits?

Vocabulary & *Concepts*