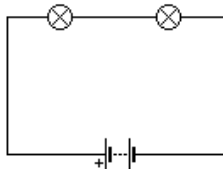
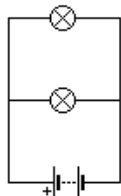
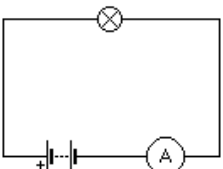
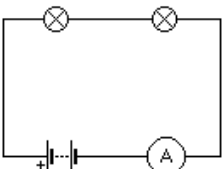
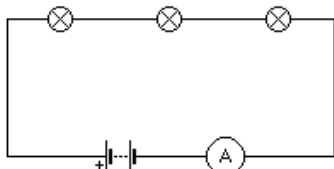


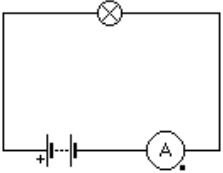
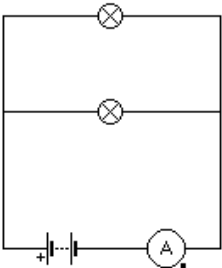
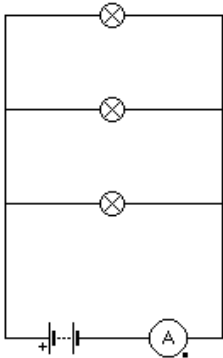
eRally Challenge - Sciences Learning Journey

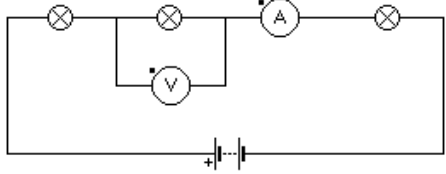
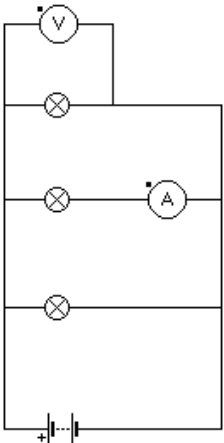
Circuit Diagrams and Challenge Questions

The text below each circuit diagram gives an indication of what is contained in the corresponding PhET cck (circuit construction kit) file. An A or V indicates the inclusion of an Ammeter or Voltmeter respectively. The values are the resistances of the light bulbs e.g. "2 Bulbs Series + A (2 x 10)" has two 10 ohm bulbs connected in series and an ammeter.

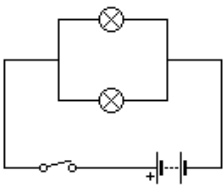
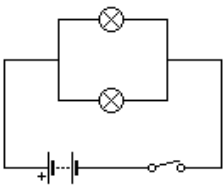
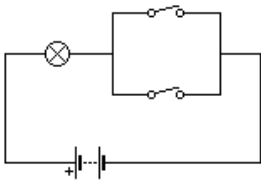
Circuit 1 – Headlights in series	Circuit 2 – Headlights in parallel
NB bulbs will be brighter in parallel circuit	
	
2 Bulbs Series	2 Bulbs Parallel
Remove one bulb (simulating a fault) – what effect does it have on the other?	Remove one bulb (simulating a fault) – what effect does it have on the other?

Circuits 3,4,5 – Adding bulbs in a Series Circuit		
		
1 Bulb + A (1 x 10)	2 Bulbs Series + A (2 x 10)	3 Bulbs Series + A (3 x 10)
Compare 1,2,3 identical bulbs in series Measure battery current in each		
Use these results to explain observations		

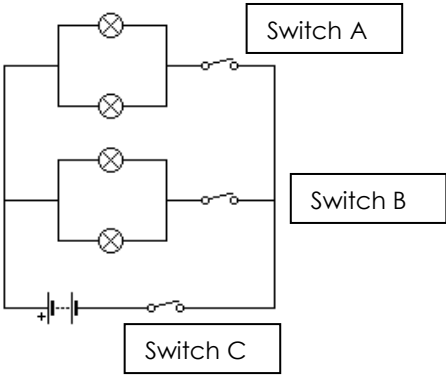
Circuits 3,6,7 – Adding bulbs in a Parallel Circuit		
		
1 Bulb + A (1 x 10)	2 Bulbs Parallel + A (2 x 10)	3 Bulbs Parallel + A (3 x 10)
Compare the brightness of 1,2,3 identical bulbs in parallel Measure current from the battery in each circuit and discuss observations of bulb brightness Use these results of your current measurement to explain observations of bulb brightness Compare the series and parallel circuits Which type of circuit is best for (insert application)? Give reasons for your choice?		

Circuit 8 – Measuring I&V for 3 different bulbs in series	Circuit 9 – Measuring I&V for 3 different bulbs in parallel
	
3 Bulbs Series + A&V	3 Bulbs Parallel + A&V
Measure current through and voltage across each bulb and make observations of bulb brightness Use your results of current and voltage measurements to explain your observations Can you write down the rules for current and voltage in a series circuit? For an extra challenge try writing them down mathematically.	Measure current through and voltage across each bulb Use these results to explain observations Make up rules

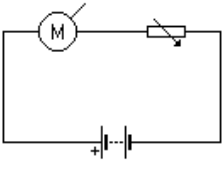
Switches

Circuits 10 & 11 – does it matter what side the switch is on?		Circuit 12 – Switches in series	Circuit 13 – Switches in parallel
			
2 Bulbs Parallel Switch L (2 x 10)	2 Bulbs Parallel Switch R (2 x 10)	2 Bulbs Parallel 2 Switches Series (2 x 10)	1 Bulb 2 Switches Parallel (1 x 10)
Does it matter what side the switch is on? Explain		When do the headlights come on? Explain	When do the headlights come on? Explain

Combinations

Circuit 14 – Headlights and Sidelights

Headlights & Sidelights (2 x 15, 2 x 5)
What combinations of switches make which lights come on? Measure current and voltage at various points Use these results to explain observations

Variable Control

Circuit 15 – Wiper Control
NB Can't be done with Phet CCK

Adjust the controller (variable resistor) and observe changes Measure current and/or voltage Use these results to explain observations