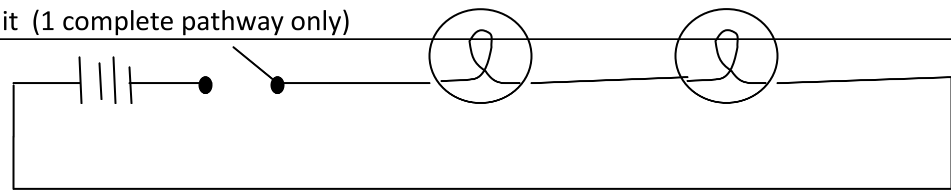
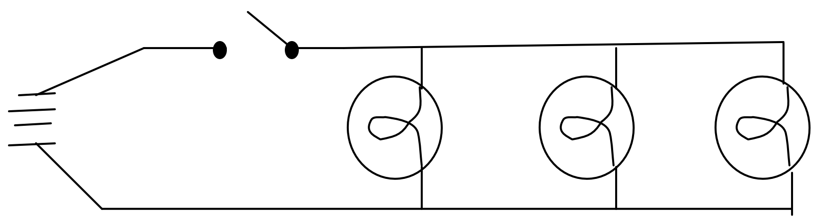
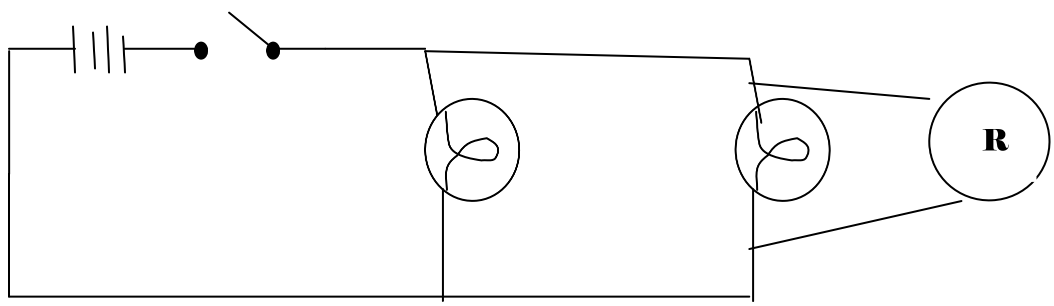
Answers to Chapter 13 Questions

13.1	**Circuits & Circuit Diagrams # 1,2,4,5,6,7**
1.	a) 1 complete pathway b) 4 complete pathways
2.	a) parallel circuit (more than 1 complete pathway – 2 actually) b) series circuit (1 complete pathway only)
4	a)  b)  c) and d) see answers posted in classroom.
5.	When items are wired ***in series***, the amount of energy going to each one lessens. So...3 outlets wired in series would mean each outlet would receive a little amount of electrical energy. If the 3 outlets were wired i***n parallel,*** each outlet gets a lot of energy!
6.	When you wire ***in parallel,*** each load (lamp, motor, appliance etc.) can have its OWN on/off switch. That's what you want in your home. Loads wired ***in series*** have only 1 switch that turns the WHOLE circuit off and turns the WHOLE circuit on.
7.	The 'switch is closed' means that the circuit is completed and this allows the electrons to flow and the lamp turns on. When the 'switch is open', that means the circuit is broken and electrons don't have a complete path to travel and lamp is off.

13.3	**Electric Current p. 557 # 1,2,3,4**
1.	Electrical quantity Symbol Unit of measure Symbol Current **I** amps (amperes) **A**
2.	When using an ammeter - always set to highest setting and never touch the tips when they are connected in a circuit.
3	This ammeter is connected in parallel. One needs to connect the ammeter in series. This is shown incorrectly.
4.	Electric currents can give you a tingling sensation (0.001 A) which is not dangerous but at 0.050 – 0.150 Amps your muscles can convulse. This is considered the 'let go' threshold because more current than that and you cannot let go! Greater current (1.0 - 4.3A) can stop your heart. Current can kill!

13.5	**(potential difference) Voltage p. 561 # 2,4**
2.	Electrical quantity Symbol Unit of measure Symbol Voltage **V** volts **V**

4.	This voltmeter is connected in series which is wrong. It needs to be wired in parallel.

13.7	**Resistance in Circuits p. 566 # 2,3,4,5,6**
2.	Electrical quantity Symbol Unit of measure Symbol Resistance **R** ohms Ω
3.	Plastic will have greater resistance as it is an insulator. Silver is a conductor and easily allows electrons to flow.
4.	
5.	I would want relatively high resistance in the wire of a toaster because I want the wire to heat up and toast my bread. When I have a volume or dimness control, I want low resistance when I want the sound loud or I want the bulb bright. I want high resistance when I want the sound low or the bulb dim.
6.	a) decrease the diameter → the resistance goes UP b) place extension cord outsie in winter → cold means resistance goes DOWN. c) plugging 2 extension cords together → makes wire longer so resistance goes UP d) changing copper wire to silver → resistance goes DOWN (silver has lower resistance but is more extensive to use in wiring than copper.)

13.9	**Relating Current, Voltage & Resistance (Ohm's Law)**
2	Graph b) has a steeper slope and thus has a greater resistance. (The resistance is the rise/run...or slope)
4	Remember: R= V/I V = IR I = V/R Use these formulas to complete chart. Answers in order from top of chart to bottom: R = 480 Ω, V = 338 V, I = 0.23 A, I = 0.0001 A, V = 2220 V
5	V = 36 V I = 2.0 A R = V/I R = 36 / 2 R = 18 Ω Resistance is 18 Ω
6	V = 19 V R = 4.0 Ω I = ? I = V/R I = 19 / 4.0 = 4.75 current is 4.75 Amps
7	A = 15 A R = 8.0 Ω

	V = ? V = (I) x (R) V = 15 x 8.0 = 120 V The voltage is 120 V
8	V = 12 V A = 505 A R = ? R = V/I R = 12/505 = 0.024 Ω The resistance is 0.024 Ω
9	The voltage would be the same for each 'shock' but wet skin has less resistance, so the current increase. So..more current = more dangerous.

13.10	**(How Series & Parallel Circuits Differ) Kirchoff Rules p. 574 # 3,4,5,6,7**
3	The current gets very high when you connect a lot of loads in parallel. This can cause the wire to get very hot and become a potential fire hazard.
4	a) For every load you add in series, the voltage decreases across each load (each light bulb). b) This would make the lights dimmer. (less voltage = less brightness)
5	R = 25 Ω V = 6.0 V a) I = ? I = V/R = 6.0 / 25 = 0.24 amps The current is **0.24 A** b) Vsource = V1 + V2 Since the light bulbs are identical, Vload = Vsource/#loads = 6.0 V / 2 = 3.0 V Each load bulb has a voltage drop of **3.0 volts**
6	Vsource = 120 V Rt = 10 Ω a) **I** load = **I**source / # loads But I don't know the **I** load! Need to calculate **I** load!! **I** load = Vsource / Rt = 120 V / 10 Ω = 12 amps Now…. **I** load = **I**source / # loads = 12 amps / 4 loads **= 3 amps for each load** b) The voltage across each load in parallel is the same as the battery (assuming the loads are the same which they are). So the voltage across each light is **120 V.**
7	**I**source = 0.75 A Rt = 52 Ω V = ? V = (**I**) x (R) = 0.75 x 52 = **39 volts** The voltage of the battery is 39 volts In series, with the same load, Vload = Vsource / # loads = 39 volts / 5 loads = **7.8 volts across each lightbulb.**