CP Physics Review Sheet: Electricity

Vocabulary Matching

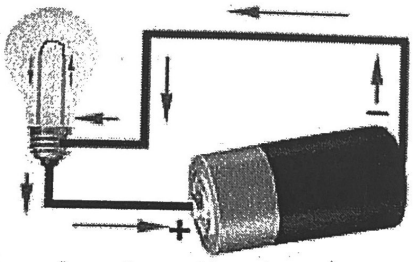
~~Ammeter~~	~~Circuit breaker~~	~~Load~~	~~Switch~~
~~Ampere (amp)~~	Circuit symbols	~~Ohm~~	~~Voltage~~
~~Anode~~	~~Conductor~~	~~Ohm's Law~~	~~Voltmeter~~
~~Battery~~	Current	~~Parallel circuit~~	~~Wire~~
~~Cathode~~	~~Energy~~	~~Resistance~~	
~~Circuit~~	Equivalent resistance	~~Series circuit~~	

Match the vocabulary words above to the correct definition. Use each word only once.

Energy 1. The ability to do work.
Series 2. A circuit with only one path for the current.
Cathode 3. The positive terminal of a battery.
Voltmeter 4. A device used to measure voltage and is placed in parallel to the resistor.
Conductor 5. Material that has free electrons and allows the flow of charge.
Battery 6. Was originally known as a Voltaic Pile.
Resistance 7. "Electric friction"
Switch 8. Device that controls a circuit.
ohm 9. The unit for resistance.
wire 10. Represented by a straight line in a circuit diagram.
ammeter 11. A device used to measure current that is placed in series with the load.
EQ-R 12. The sum of all the resistors in a circuit.
anode 13. The negative terminal of a battery.
Symbols 14. These are used to draw a schematic diagram.
parallel 15. A circuit with multiple paths/branches.
current 16. The flow of charge/electrons.
breaker 17. Interrupts current flow when a fault is detected.
Circuit 18. The path for the flow of charge.
load 19. Any appliance/object that uses the electricity in a circuit.
ampere 20. The unit for current.
voltage 21. This variable is also known as potential difference.
ohm's law 22. Current is directly proportional to voltage and inversely proportional to resistance

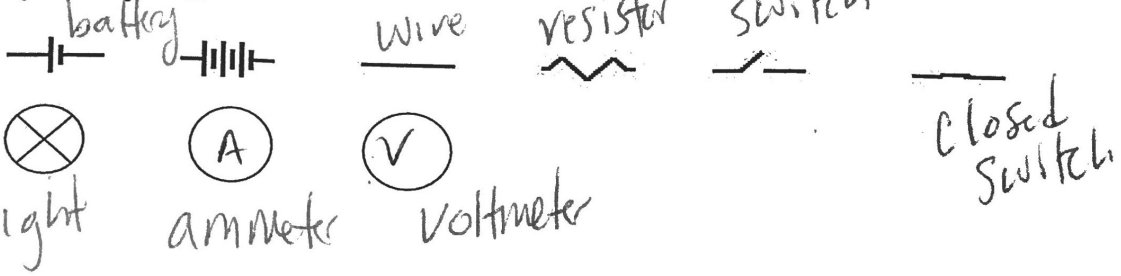
Parts of a circuit

1) battery
2) conducting wire
3) load
4) controller (switch) & Not shown



Simple circuit with light

Identify each symbol



Variables and units

Identify the letter used for the variable and the unit. Example: Work-W-Joule

Charge C - Coulomb

Potential Difference V - voltage

Current I - Ampere

Resistance R = ohm

Fill in the Blank

1. Current flows from the anode (cathode/anode) to the cathode (cathode/anode) of a battery. This is known as electron flow.
2. Benjamin Franklin proposed the idea of conventional current which states that charge flows from the positive to the negative.
3. The resistance in a piece of wire depends on length, temperature, material, and diameter.
4. Galvani's work with frog legs led to Volta's creation of the battery.
5. Gilbert coined the term "electrica"
6. When additional batteries are added to a circuit the voltage increases.
7. When additional resistors are added to a series circuit the total resistance goes up.
8. When additional resistors are added to a parallel circuit, the total resistance goes down
9. The best conducting metal is silver, but is too expensive to use.
10. A variable resistor is used in a radio to control the volume.

Conceptual Review

1. Write the equations used to describe series and parallel circuits.

a. Series	b. Parallel
$V_T = V_1 + V_2 + V_3$	$V_T = V_1 = V_2 = V_3$
$I_T = I_1 = I_2 = I_3$	$I_T = I_1 + I_2 + I_3$
$R_T = R_1 + R_2 + R_3$	$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$

Which variable stays the same across each resistor in series? current

Which variable stays the same across each resistor in parallel? Voltage

2. Compare and contrast series and parallel circuits.

a) Series = 1 path / parallel = 2+ paths

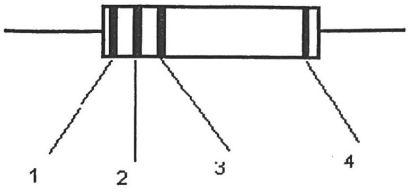
b) Series → current stays same / parallel current adds to total

c) Series → voltage adds to total / parallel → voltage same across each branch

d) Series → resistance goes up / parallel → resistance goes down

e) Both convert electrical energy to other forms

3. Determine the nominal, minimum and maximum value for the fixed resistor below.



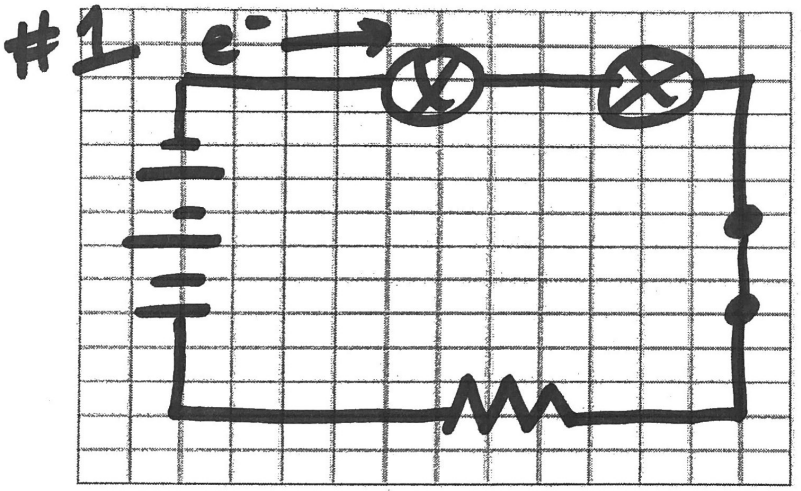
Red	Black	Brown	Gold
2	0	0	+/- 5%

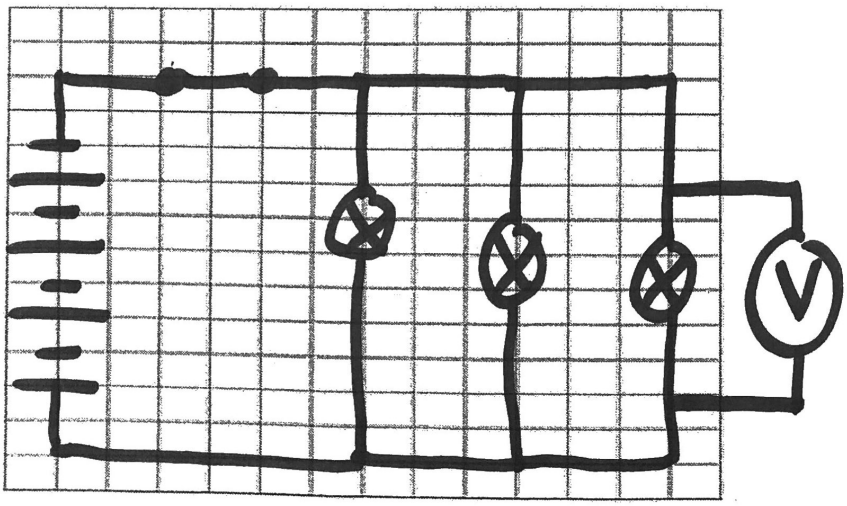
200 Ω
Range = 190-210 Ω

Schematic Diagrams – Draw the following

1. A series of 3 cells supply the voltage to a circuit with two lights connected in series with a switch, an ammeter and a fixed resistor. Indicate the direction of electron flow.

2. A circuit has three pathways and 4 cells. There is a lamp on each pathway and a switch that controls all three branches. A voltmeter is placed across the lamp on the third path.





Problems

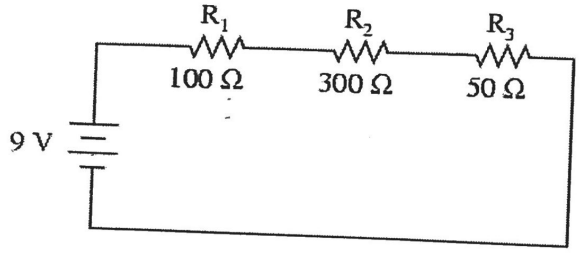
1. It takes 4 seconds for 2.5×10^6 C of charge to move through a light fixture. How much current is moving through the circuit?

$I = \frac{Q}{t}$ $I = \frac{2.5 \times 10^6 C}{45}$ $= 6.25 \times 10$

2. The potential difference between the two terminals on a battery is 12 volts. How much work (energy) is required to transfer 17 coulombs of charge across the terminals?

$V = \frac{W}{Q}$ $W = 12V(17C)$ $= 204\ J$

3. Use the diagrams below to answer the questions for each circuit.



A. What is the equivalent (total) resistance?

$R = 450\ \Omega$

B. What is the total current in the circuit?

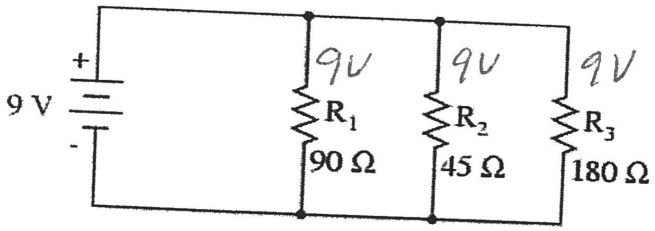
$I = .02\ A$

C. What is the voltage drop across each resistor?

$V_1 = 100(.02) = 2V$

$V_2 = 300(.02) = 6V$

$V_3 = 50(.02) = 1V$



A. What is the equivalent (total) resistance?

$R_T = 25.7\ \Omega$

B. What is the total current in the circuit?

$I = \frac{V}{R} = \frac{9V}{25.7} = .36$

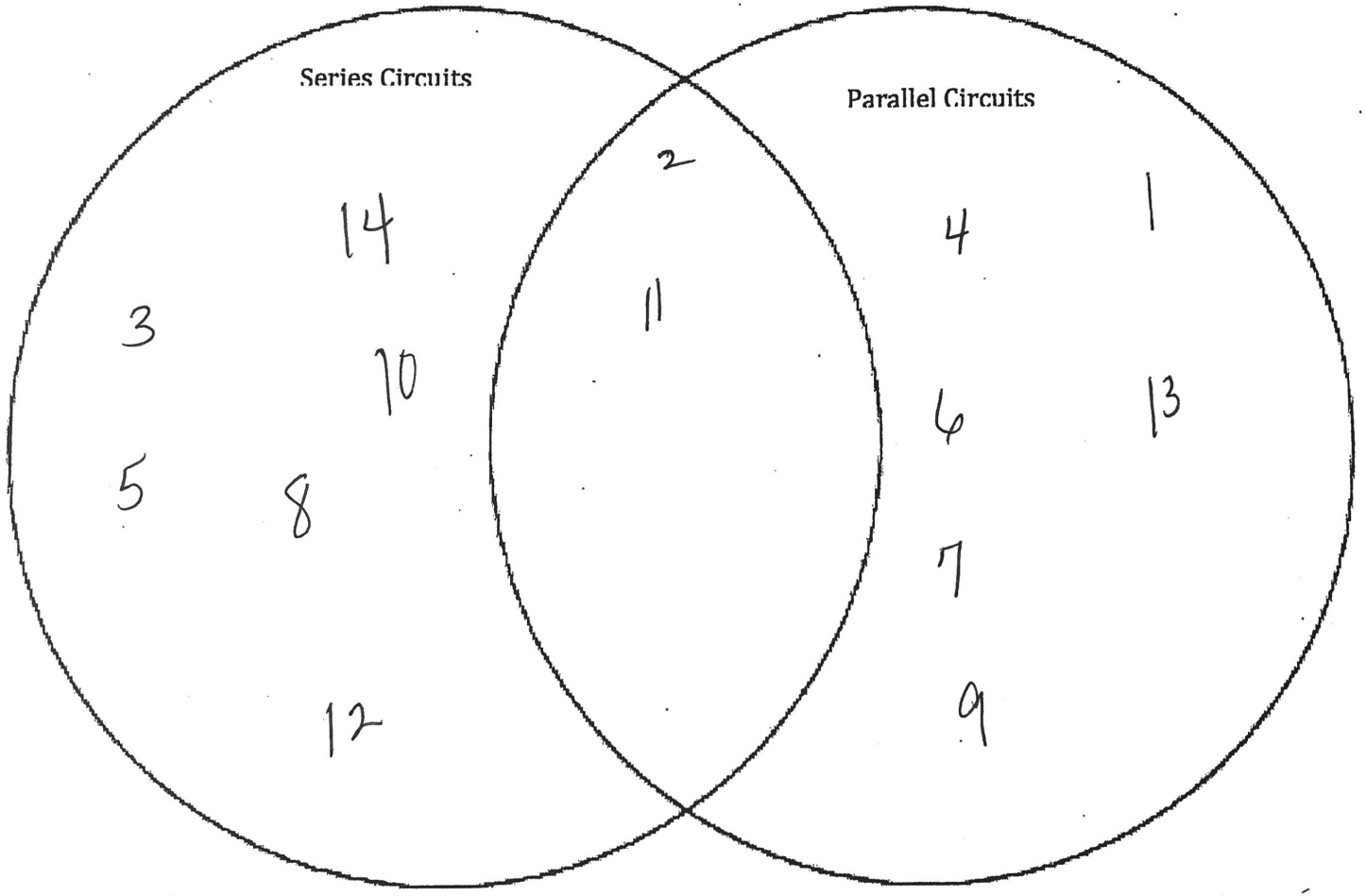
C. How much current flows through each of the resistors?

$I_1 = \frac{9V}{90} = .1A$

$I_2 = \frac{9V}{45\Omega} = .2A$

$I_3 = \frac{9V}{180\Omega} = .05A$

Series Vs. Parallel Circuits



- 1 Bulbs don't dim P
- 2 Electrical energy is converted to heat B
- 3 One current pathway S
- 4 Current adds up to a total P
- 5 Voltage adds to the total supplied by battery S
- 6 Two or more current pathways P
- 7 Voltage is the same through each branch P
- 8 Resistance increases S
- 9 Resistance decreases P
- 10 Brightness of bulbs decreases S
- 11 Electrical energy is converted to light B
- 12 If one bulb goes out all go out S
- 13 If one bulb goes out the others remain on P
- 14 Current is the same through each resistor S