Honors Physics
Current Electricity and Circuits

This unit will allow each student to:

a. gain a better understanding of electric circuits and motors
b. continue making proper scientific measurements and calculations
c. define and properly use all vocabulary
d. properly apply all terms and concepts in describing/explaining real world examples
e. continue making and interpreting scientific graphs
f. practice proper laboratory safety

This will be accomplished by each student that is able to:

1. identify SI units of electric resistance, electric current, voltage, and power
2. recognize electric resistance, electric current, voltage, and power by the units only
3. conceptually relate potential difference, resistance, and current using Ohm's law
4. perform calculations using proper problem solving techniques using Ohm's Law and electrical power
5. differentiate between series and parallel circuits and list their applications
6. identify characteristics of series and parallel circuits
7. construct simple electric circuits
8. sketch schematic (circuit) diagrams of electric circuits using proper circuit symbols
9. determine the equivalent resistance of several resistors wired in series and parallel
10. determine the voltage across resistors in series and parallel
11. determine the current at various locations in a series and in a parallel circuit
12. recognize the function of fuses and circuit breakers
13. describe electrical power and energy usage
14. explain the magnetic effects produced by an electric current in a wire

Textbook Reference – Physics

Chapter 17.3, 17.4 - Electrical Energy and Current; Chapter 18 - Circuits and Circuit Elements

Key Terms
circuit, electrical power, Ohm's law, parallel circuit, series circuit, alternating current, ammeter, direct current, voltmeter, schematic (circuit) diagram, fuse, switch, equivalent resistance.

Electric circuits and current review sheet – Answer completely.

1. What is an electric circuit? If at 20 Volts of applied voltage, 5 Coulombs of charge go past a given point in a wire in 20 seconds, then what is the current flowing through the wire?

2. If the voltage impressed across a circuit is held constant while the resistance doubles, what change occurs in the current?

3. If the resistance of a circuit remains constant while the voltage across the circuit decreases to half its former value, what change occurs in the current?

4. What is the effect on current in a wire if both the voltage across it and its resistance are doubled? If both are halved?

5. Will the current in a light bulb connected to a 220 V source be greater or less than when the same bulb is connected to a 110 V source?

6. A certain device in a 120 V circuit has a current rating of 20 A. What is the resistance of the device?

7. Will a lamp with a thick filament draw more current or less current than a lamp with a thin filament? What are some other factors that affect the resistance of a material?

8. In a circuit of two lamps in series, if the current through one lamp is 1 A, what is the current through the other lamp? Defend your answer.

9. If 6 V are impressed across the above circuit and the voltage across the first lamp is 2 V. what is the voltage across the second lamp? Defend your answer.

10. What is a main shortcoming of a series circuit?

11. In a circuit of two lamps in parallel, if there are 6 V across one lamp. What is the voltage across the other lamp?

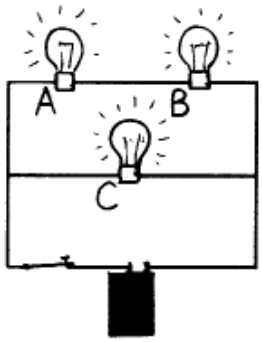
12. How does the sum of the currents though the branches of a simple parallel circuit compare to the current that flows through the voltage source?

13. Are automobile headlights wired with the rest of the car in parallel or in series? What is your evidence?

14. To connect a pair of resistors so their equivalent resistance will be more than the resistance of either one, should you connect them in series or in parallel?

15. To connect a pair of resistors so their equivalent resistance will be less than the resistance of either one, should you connect them in series or in parallel?

16. Consider a pair of flashlight bulbs connected to a battery. Will they glow brighter connected in series or in parallel? Will the battery run down faster if they are connected in series or in parallel?



17. In the circuit shown, how does the brightness of the identical lightbulbs compare? Which lightbulb draws the most current? What will happen if bulb "A" is unscrewed? If bulb "C" is unscrewed?

18. When a pair of identical resistors are connected in series, which of the following is the same for both resistors: Voltage across each, power dissipated in each, current through each? Do any of your answers change if the resistors are different from each other?

19. When a pair of identical resistors are connected in parallel, which of the following is the same for both resistors: Voltage across each; power dissipated in each; current through each? Do any of your answers change if the resistors are different from each other?

20. If a 60 W bulb and a 100 W bulb are connected in series in a circuit, across which bulb will there be the greater voltage drop? How about if they are connected in parallel?

21. The wattage marked on a light bulb is not an inherent property of the bulb but depends on the voltage to which it is connected, usually 110 or 120 V. How many amperes flow through a 60 W bulb connected in a 120 V circuit?

22. Find the current drawn by a 1200 W hair dryer connected to120 V voltage source.

23. A 4 W night-light is plugged into a 120 V circuit and operates continuously for 1 year. Find the following: (a) the current it draws, (b) the resistance of its filament, (c) the energy consumed in a year, and (d) the cost of its operation for a year at the utility rate of 15 cents/kWh.

24. An antique car's headlights dissipate 40 W on low beam, and 50 W on high beam. Is there more or less resistance in the high beam's filament? Which headlight's filament is thicker?