

**Series**

$I_T = I_1 = I_2 = I_3$

$V_T = V_1 + V_2 + V_3$

$R_T = R_1 + R_2 + R_3$

**Parallel**

$I_T = I_1 + I_2 + I_3$

$V_T = V_1 = V_2 = V_3$

$R_T = (R_1 * R_2) / (R_1 + R_2)$

$V = \text{Work/charge}$

$V = IR \quad P = VI$

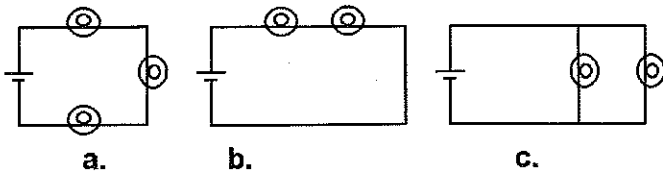
$\text{Energy} = \text{Power} * \text{time}$

**Multiple Choice – Choose the best answer**

- \_\_\_ 1. In order for there to be a flow of charge from one place to another, there must be
  - a. a potential difference between the two places
  - b. an electrical conductor, such as wire, between the two places.
  - c. both of these
  
- \_\_\_ 2. In a "typical" electric circuit, electric current is the flow of
  - a. positive and negative charges
  - b. negative ions
  - c. electrons
  - d. protons
  
- \_\_\_ 3. An ampere is a
  - a. unit of potential difference
  - b. type of charge
  - c. unit of electrical resistance
  - d. unit of current
  
- \_\_\_ 4. A volt is a
  - a. unit of potential difference
  - b. type of charge
  - c. unit of electrical resistance
  - d. unit of current
  
- \_\_\_ 5. An ohm is a
  - a. unit of potential difference
  - b. type of charge
  - c. unit of electrical resistance
  - d. unit of current
  
- \_\_\_ 6. An example of a voltage source is
  - a. an electric generator    b. a car battery    c. a transistor radio battery    d. all of these
  
- \_\_\_ 7. Electrical outlets in our homes generally have a potential difference (voltage) of
  - a. 120 amperes    b. 120 ohms    c. 240 ohms    d. 120 volts    e. 240 volts
  
- \_\_\_ 8. Electrical resistance in a wire depends on
  - a. the kind of metal
  - b. the length of the wire
  - c. the thickness of the wire
  - d. all of these
  
- \_\_\_ 9. As the temperature of a metal increases, its electrical resistance
  - a. increases    b. decreases    c. remains the same
  
- \_\_\_ 10. Compared to the resistance of thin wires, the electrical resistance of thick wires is
  - a. more    b. less    c. the same
  
- \_\_\_ 11. According to Ohm's law
  - a.  $V = I/R$     b.  $V = IR$     c.  $R = VI$     d.  $I = RV$
  
- \_\_\_ 12. A toaster draws 2.0 A when connected to a 120 V power source. What is the resistance of the toaster?
  - a. 2 ohms    b. 60 ohms    c. 120 ohms    d. 240 ohms
  
- \_\_\_ 13. When connected to a 120 V power supply, how much current exists in a light bulb that has a resistance of 240 ohms?
  - a. 0.5 A    b. 2 A    c. 120 A    d. 240 A    e. 28,800 A

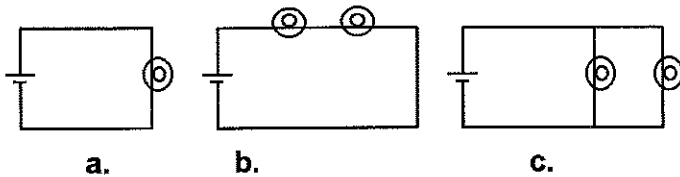
- \_\_\_ 14. Which has the greatest electrical resistance?  
a. dry skin   b. skin wet with tap water   c. skin wet with salty water
- \_\_\_ 15. While you are standing on the ground in your running shoes, the greatest resistance between you and the ground is  
a. your skin   b. your muscles   c. your legs   d. your shoes
- \_\_\_ 16. A bird can perch harmlessly on bare high voltage wires because:  
a. a bird has a large electrical resistance  
b. a bird has a protective layer of scales on its feet  
c. a bird can fly away fast enough if it gets a shock  
d. all parts of the bird are at the same potential
- \_\_\_ 17. To prevent shocks from occurring when touching an electrical appliance, the outside of the appliance is connected to the  
a. wall   b. house   c. ground   d. person operating the appliance
- \_\_\_ 18. Current from batteries is  
a. alternating   b. direct   c. can be either
- \_\_\_ 19. Electric power is  
a. measured in volts  
b. the same as electric energy  
c. measured in amperes  
d. the rate of converting electric energy
- \_\_\_ 20. What is the power of a flashlight that draws 0.5 A from a 6 V battery?  
a. 0.5 watt   b. 3 watt   c. 6 watt   d. 12 watt   e. 30 watt
- \_\_\_ 21. A toaster is rated at 1200 watts. When plugged into a 120 volt wall outlet, the current in the toaster is  
a. 10 A   b. 120 A   c. 1200 A   d. 144,000 A
- \_\_\_ 22. How much current flows in a 60 watt light bulb when operated from a 120 v outlet?  
a. 0.25 A   b. 0.5 A   c. 2 A   d. 4 A
- \_\_\_ 23. Identify the energy unit(s).  
a. kilowatt   b. watt   c. watt-second   d. kilowatt-hour
- \_\_\_ 24. Identify the power unit(s).  
a. kilowatt   b. watt   c. watt-second   d. kilowatt-hour
- \_\_\_ 25. In some Christmas tree lights, if one light goes out, they all go out. This is a  
a. series circuit   b. parallel circuit   c. short circuit
- \_\_\_ 26. When 2 light bulbs are connected in series  
a. the same amount of current exists in each bulb  
b. the light with the highest resistance will have less current  
c. there are at least two branches in the circuit  
d. if one light is unscrewed, the other stays on
- \_\_\_ 27. If 2 light bulbs are connected in series and one is unscrewed, the other  
a. will be dimmer   b. will get brighter   c. will stay the same brightness   d. will go out
- \_\_\_ 28. As more electrical devices are placed in a series circuit, the overall resistance of the circuit  
a. increases   b. decreases   c. remains the same
- \_\_\_ 29. As more electrical devices are placed in a series circuit, the overall current in the circuit  
a. increases   b. decreases   c. remains the same
- \_\_\_ 30. As more electrical devices are placed in a series circuit, the overall voltage of the circuit  
a. increases   b. decreases   c. remains the same
- \_\_\_ 31. As more electrical devices are placed in a series circuit, the voltage available for each device  
a. increases   b. decreases   c. remains the same
- \_\_\_ 32. As more electrical devices are placed in a parallel circuit, the overall resistance of the circuit  
a. increases   b. decreases   c. remains the same
- \_\_\_ 33. As more electrical devices are placed in a parallel circuit, the overall current in the circuit  
a. increases   b. decreases   c. remains the same

- \_\_\_ 34. As more electrical devices are placed in a parallel circuit, the overall voltage of the circuit  
 a. increases b. decreases c. remains the same
- \_\_\_ 35. As more electrical devices are placed in a parallel circuit, the voltage available for each device  
 a. increases b. decreases c. remains the same
- \_\_\_ 36. Identical light bulbs and identical batteries are used in these circuits. Which circuit has more current flowing through it?  
 a. A b. B c. both the same



all the same  
 d.

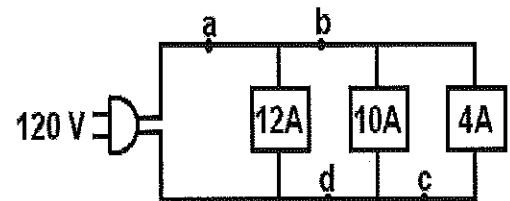
- \_\_\_ 37. Which diagram correctly shows a series circuit?



none of these  
 d.

- \_\_\_ 38. Which diagram correctly shows a parallel circuit? (same choices as #37)

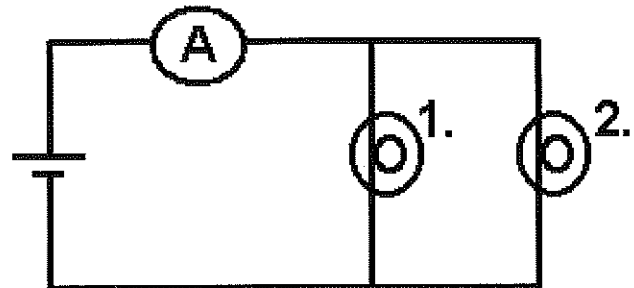
- \_\_\_ 39. A hair dryer (12 A), an electric iron (10 A) and a TV (4 A) are all plugged into the same power strip in the circuit shown. Where should the fuse be placed to protect the entire circuit?  
 a. b. c. d.



- \_\_\_ 40. In the circuit of question 39, if the fuse in the circuit is rated at 20 A and is placed in the circuit to protect all of the branches, will the fuse "blow" when all three devices are turned on?  
 a. yes b. no c. more info is needed.

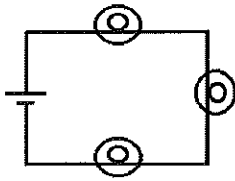
Questions 40 – 42: Two identical bulbs are connected as shown

- \_\_\_ 41. If bulb 1 is unscrewed, bulb 2 will:  
 a. go out  
 b. become dimmer  
 c. become brighter  
 d. be unchanged
- \_\_\_ 42. If bulb 1 is unscrewed, the reading of the ammeter will  
 a. increase  
 b. decrease  
 c. remain the same
- \_\_\_ 43. The above circuit is a  
 a. parallel circuit  
 b. series circuit  
 c. combination circuit  
 d. short circuit

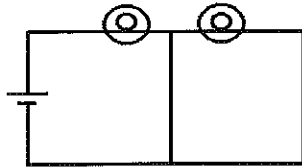


- \_\_\_ 44. A fuse is placed  
 a. in series with the device it protects  
 b. in parallel with the device it protects  
 c. either in series or parallel with the device it protects – it doesn't make any difference.

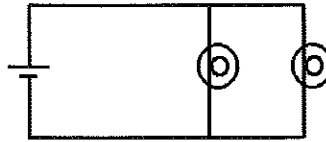
\_\_\_ 45. Which circuit shown here is a short circuit?



a.



b.



c.

none of these

d.

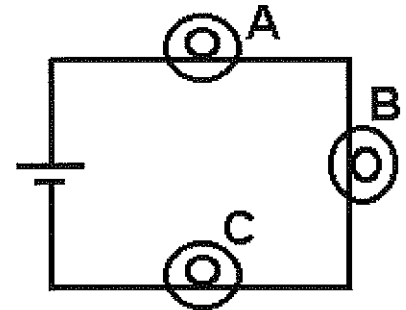
**Questions/Problems**

46. A 60 watt light bulb and a 100 watt light bulb are connected in parallel to a 120 volt source.

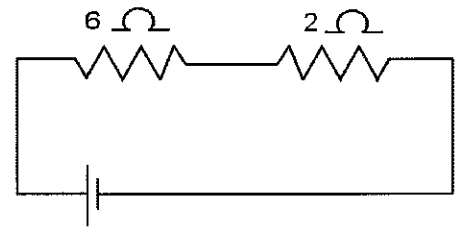
- Which bulb has the larger electrical resistance?
- How much current flows in each bulb?
- Which bulb has the thickest filament AND WHY?

47. Three identical light bulbs are connected as shown.

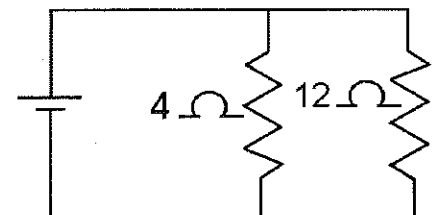
- When all three bulbs are screwed in, which bulb(s) are the brightest? How do you know?
- When bulb B is unscrewed, what happens to bulbs A and C? How do you know?



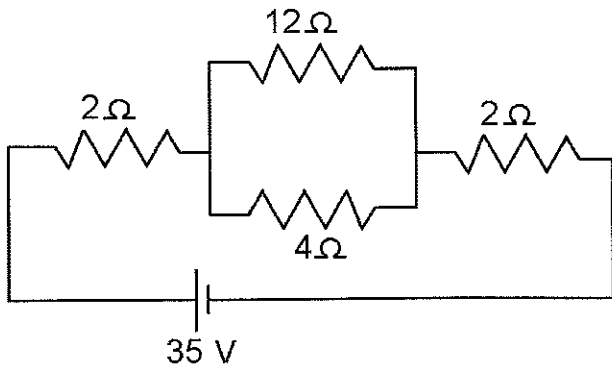
48. What single resistor could replace the resistors in the circuit to the right?



49. What single resistor could replace the resistors in the circuit to the right?



50. Complete the following table of information.



Item	R	I	V	P
R <sub>1</sub>	2 OHMS			
R <sub>2</sub>	4 OHMS			
R <sub>3</sub>	12 OHMS			
R <sub>4</sub>	2 OHMS			

(29.)

