Electricity Worksheet (p.1)

All questions should be answered on your own paper.

1. In terms of attraction and repulsion, how do negative particles affect negative particles? How do negatives affect positives?
2. What happens to electrons in any charging process? What happens to protons in the same processes?
3. Give an example of something charged by friction.
4. Give an example of something charged by simple contact.
5. Give an example of temporarily charging an object by induction.
6. What is an electrostatic discharge?
7. How does an electrically polarized object differ from an electrically charged object?
8. Rub an inflated balloon against your hair and place it against a door. What does the balloon do? Explain how it does this.
9. How does the magnitude of electrical force between a pair of charged objects change when the objects are moved twice as far apart? Three times as far apart?
10. What is the electrostatic force between two metal spheres, each having 5 C of charge. The balloons are 0.30 m apart.

    2.5×10^{12} N
11. Suppose that two point charges, each with a charge of +1 Coulomb are separated by a distance of one meter. (a) Will they attract or repel? (b) Determine the magnitude of the electrical force between them. *9×10^{9} N*
12. Two balloons are charged with an identical quantity and type of charge: -0.0025 C. They are held apart at a separation distance of 8 m. Determine the magnitude of the electrical force of repulsion between them. *878.9 N*
13. Two charged boxes are 4 meters apart from each other. The blue box has a charge of +0.000337 C and is attracting the red box with a force of 626 Newtons. Determine charge of the red box. Remember to indicate if it is positive or negative. *0.0033 C*
14. A piece of styrofoam has a charge of -0.004 C and is placed 3 m from a piece of salt with a charge of -0.003 C. How much electrostatic force is produced? *12,000 N*

Electricity Worksheet (p.2)

All questions should be answered on your own paper.

15. What occurs when we “ground” an object?
16. What are two purposes of a lightning rod? Which is primary?
17. How can you charge an object negatively by using a positively charged object?
18. Why is it safe to be in a car when it is struck by lightning? No, it’s not “grounding”.
19. Sketch the electric field surrounding two electrons that are 2 cm apart.
20. Where is the magnitude of an electric field the strongest?
21. Describe how a charged particle would gain electrical potential energy.
22. Compare and contrast electrical potential energy and electric potential.
23. If you put in 10 joules of work to push 1 coulomb of charge against an electric field, what will be its voltage with respect to its starting position? *10 V*
24. What is the voltage at the location of a 0.0001 C charge that has an electric potential energy of 0.5 J? *5000 V*
25. How much electrical potential energy is given to each coulomb of charge that flows through a 1.5 volt battery? *1.5 J*
26. What voltage is produced by a balloon with 35 J of electric potential energy and containing 0.0005 C of charge? *70,000 V*
27. A balloon may be charged to several thousand volts. Does this mean it has several thousand joules of energy? Explain your answer.
28. How much charge is carried by a 120,000,000 volt lightning bolt? The electric potential energy of the built up charge before it discharged as lightning was 3,000,000,000 J. *25 C*
29. What condition is necessary for the sustained flow of water in a pipe? What analogous condition is necessary for the sustained flow of charge in a wire?
30. What is an ampere?

Electricity Worksheet (p.3)

All questions should be answered on your own paper.

31. Why is a current-carrying wire normally not electrically charged?
32. Does charge flow through a circuit or into a circuit? Does voltage flow through a circuit, or is voltage established across a circuit?
33. Will water flow more easily through a wide pipe or a narrow pipe? Will current flow more easily through a thick wire or a thin wire?
34. Does heating a metal wire increase or decrease its electrical resistance?
35. If the voltage impressed across a circuit is held constant while the resistance increases, what change occurs in the current?
36. If the resistance of a circuit remains constant while the voltage across the circuit decreases, what change occurs in the current?
37. What is the error in saying that electrons in a common battery driven circuit travel at about the speed of light?
38. What is the error in saying the source of electrons in a circuit is the battery or generator?
39. What is an electric circuit?
40. How much current flows in a 1000 ohm resistor when 1.5 volts are impressed across it?
41. If the filament in an automobile headlamp is 3 ohms, how many amperes does it draw when connected to a 12 volt battery?
42. How much resistance allows an impressed voltage of 6 V to produce a current of 2 A
43. What is the voltage across a 100 ohm circuit that draws a current of 2 amperes?
44. What is the power when 120 V drives a 2 ampere current through a CD player?
45. What is the current in a typical 60 watt light bulb which is plugged into a 120 V socket?
46. If part of a circuit dissipates energy at a rate of 6 watts when it draws a current of 3 amperes, what voltage is impressed across it?

Electricity Worksheet (p.4)

All questions should be answered on your own paper.

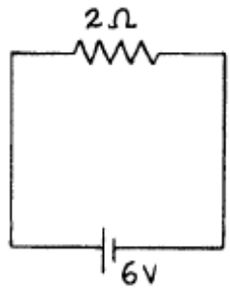
Name Period Date

Concept-Development Practice Page 35-1

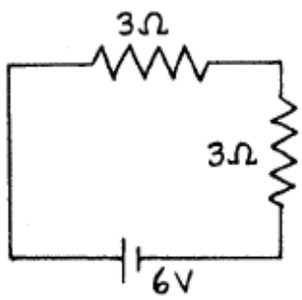
Series Circuits

47 In the circuit shown at the right, a voltage of 6 V pushes charge through a single resistor of 2 Ω. According to Ohm's law, the current in the resistor (and therefore in the whole circuit) is

_____ A.



48



If a second identical lamp is added, as on the left, the 6-V battery must push charge through a total resistance of _____ Ω. The current in the circuit is then ____ A.

49 The equivalent resistance of three 4-Ω resistors in series is _____ Ω.

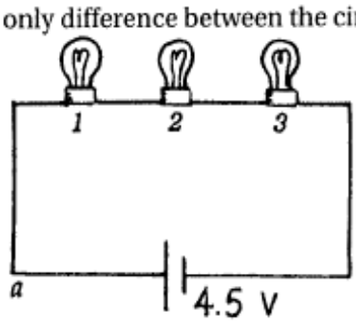
50 Does current flow *through* a resistor, or *across* a resistor? _____

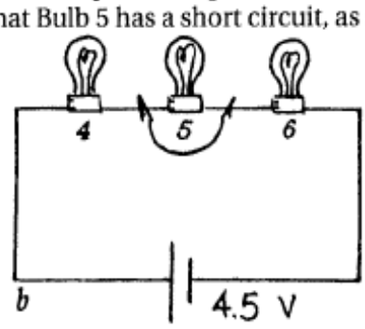
Is voltage established *through* a resistor, or *across* a resistor? _____

51 Does current in the lamps occur simultaneously, or does charge flow first through one lamp, then the other, and finally the last in turn?

_____

52 Circuits *a* and *b* below are identical with all bulbs rated at equal wattage (therefore equal resistance). The only difference between the circuits is that Bulb 5 has a short circuit, as shown.





a. In which circuit is the current greater? _____

b. In which circuit are all three bulbs equally bright? _____

c. What bulbs are the brightest? _____

d. What bulb is the dimmest? _____

e. What bulbs have the largest voltage drops across them? _____

f. Which circuit dissipates more power? _____

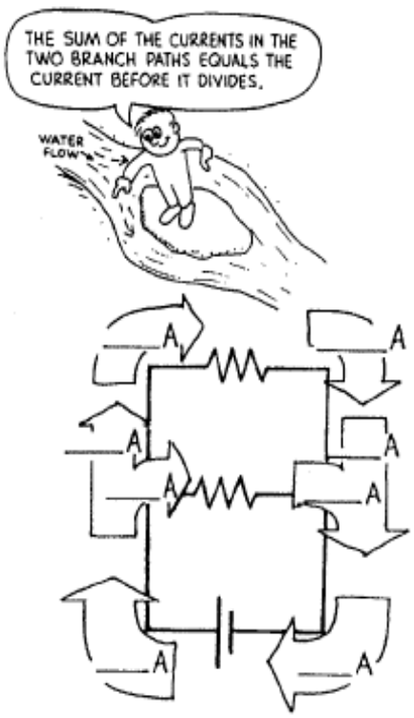
g. What circuit produces more light? _____

Conceptual PHYSICS

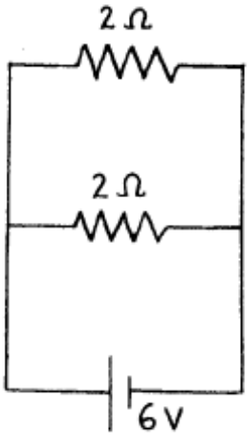
Electricity Worksheet (p.5)

All questions should be answered on your own paper.

Parallel Circuits



53. In the circuit shown below, there is a voltage drop of 6 V across *each* 2-Ω resistor.

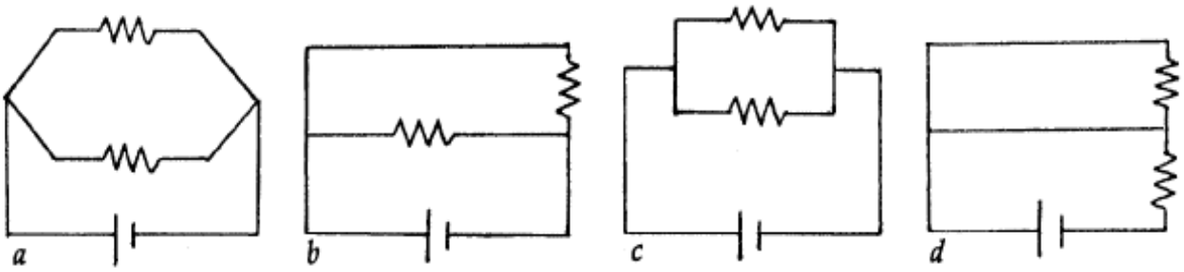


a. By Ohm's law, the current in *each* resistor is _____ A.

b. The current through the battery is the sum of the currents in the resistors, _____ A.

c. Fill in the current in the eight blank spaces in the view of the *same circuit* shown again at the right.

54. Cross out the circuit below that is *not* equivalent to the circuit above.



55. Consider the parallel circuit at the right.

a. The voltage drop across each resistor is _____ V.

b. The current in each branch is:

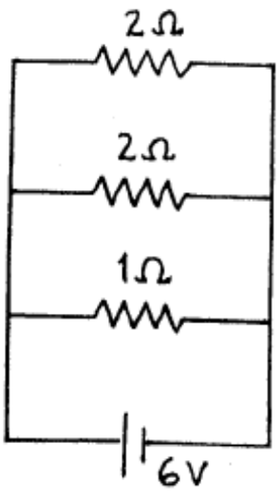
2-Ω resistor _____ A

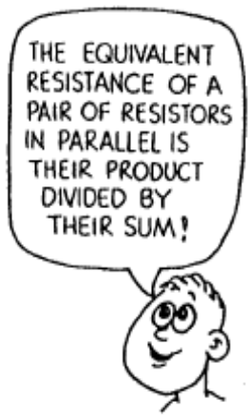
2-Ω resistor _____ A

1-Ω resistor _____ A

b. The current through the battery equals the sum of the currents which equals _____ A.

c. The equivalent resistance of the circuit equals _____ Ω.





Conceptual PHYSICS

Electricity Worksheet (p.6)

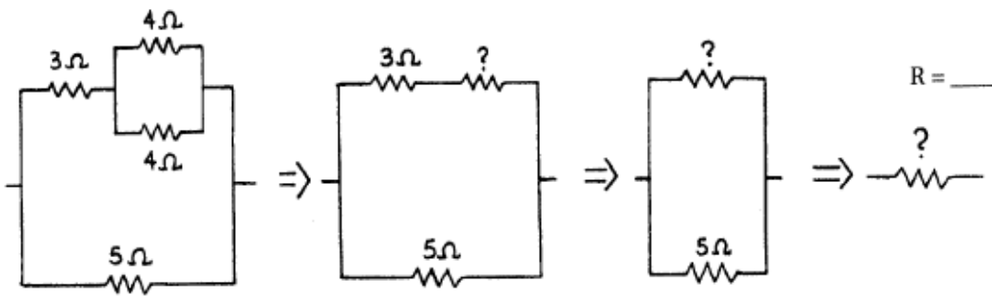
All questions should be answered on your own paper.

Name Period Date

Concept-Development Practice Page 35–2

Compound Circuits

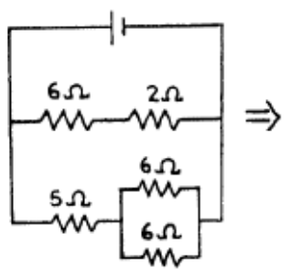
56 The initial circuit, below left, is a compound circuit made of a combination of resistors. It is reduced to a single equivalent resistance by the three steps, the circuits to its right, *a*, *b*, *c*. In step *a*, show the equivalent resistance of the parallel 4-Ω resistors. In step *b* combine this in series with the 3-Ω resistor. In step *c*, combine the last parallel pair to obtain the equivalent resistance of the circuit. (Note the similarity of this circuit and Figure 35.10 in your textbook.)



R = _____

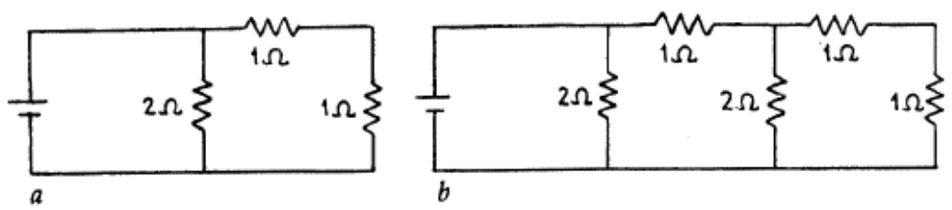
Initial Circuit *a.* *b.* *c.*

57 The circuit below is similar to Figure 35.11 in your textbook. In three successive steps, as in Question 1, replace each pair of resistors by a single resistor of equivalent resistance.

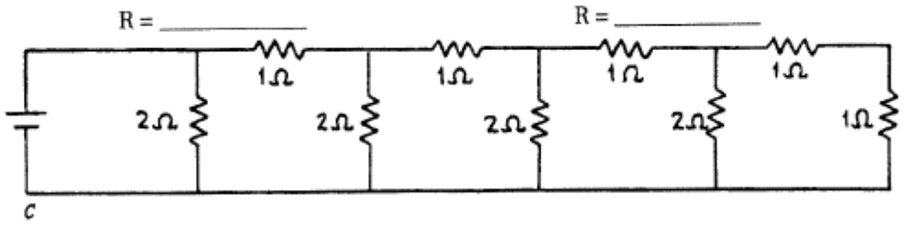


R = _____

58 Find the equivalent resistance of these three circuits.



R = _____ R = _____



R = _____

conceptual PHYSICS