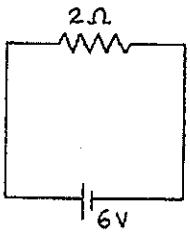
Name _____ Date _____

CONCEPTUAL Physics PRACTICE PAGE

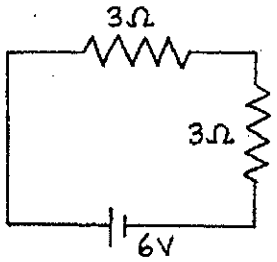
Chapter 23 Electric Current

Series Circuits



1. 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.



2. Two 3-Ω resistors and a 6-V battery comprise the circuit on the right. The total resistance of the circuit is _____ Ω. The current in the circuit is then _____ A.

3. The equivalent resistance of three 4-Ω resistors in series (not shown) is

   _____ Ω.

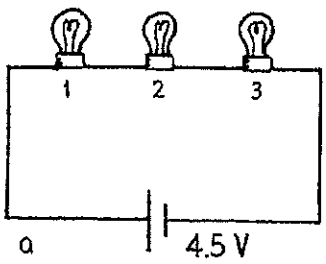
4. Does current flow *through* a resistor or *across* a resistor? _____

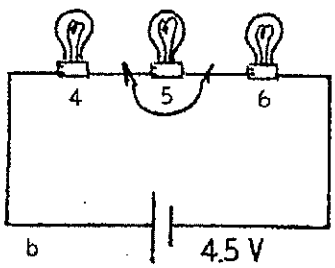
   Is voltage established *through* a resistor or *across* a resistor? _____

5. Does current in the lamps of a circuit occur simultaneously or does charge flow first through one lamp, then the other, and finally the last in turn?

   _____

6. 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. Which bulb(s) is the brightest? _____

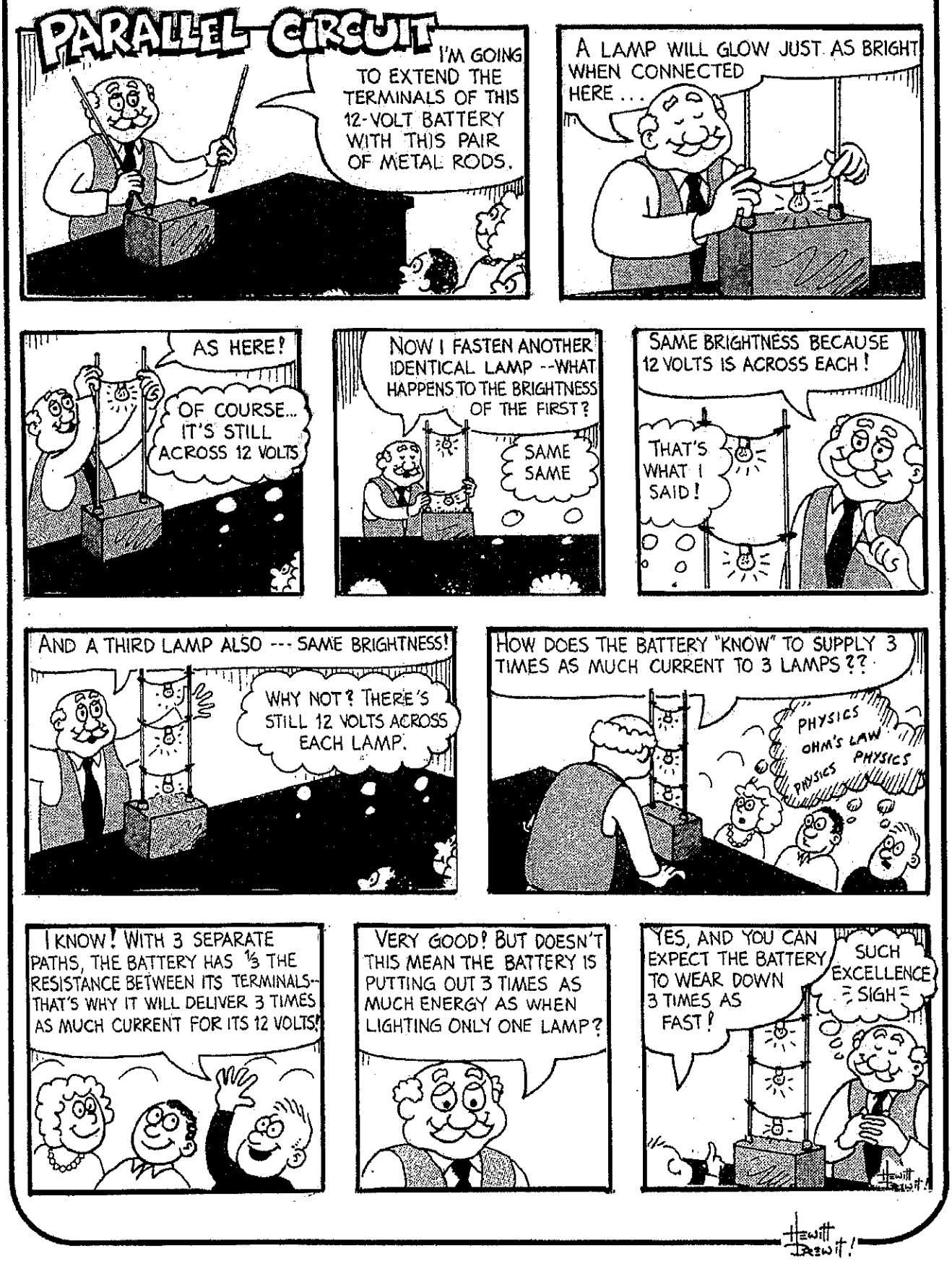
   d. Which bulb(s) is the dimmest? _____

   e. Which bulb(s) has the largest voltage drops across them? _____

   f. Which circuit dissipates more power? _____

   g. Which circuit produces more light? _____

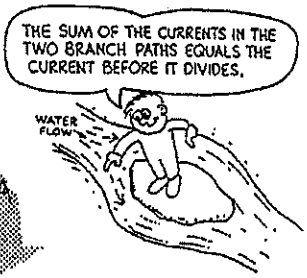
Hewitt Drew-it!


PARALLEL CIRCUIT
I'M GOING TO EXTEND THE TERMINALS OF THIS 12-VOLT BATTERY WITH THIS PAIR OF METAL RODS.
A LAMP WILL GLOW JUST AS BRIGHT WHEN CONNECTED HERE . . .
AS HERE!
OF COURSE... IT'S STILL ACROSS 12 VOLTS
NOW I FASTEN ANOTHER IDENTICAL LAMP --WHAT HAPPENS TO THE BRIGHTNESS OF THE FIRST?
SAME SAME
SAME BRIGHTNESS BECAUSE 12 VOLTS IS ACROSS EACH!
THAT'S WHAT I SAID!
AND A THIRD LAMP ALSO --- SAME BRIGHTNESS!
WHY NOT? THERE'S STILL 12 VOLTS ACROSS EACH LAMP.
HOW DOES THE BATTERY "KNOW" TO SUPPLY 3 TIMES AS MUCH CURRENT TO 3 LAMPS??
PHYSICS
OHM'S LAW
PHYSICS
PHYSICS
I KNOW! WITH 3 SEPARATE PATHS, THE BATTERY HAS 1/3 THE RESISTANCE BETWEEN ITS TERMINALS-- THAT'S WHY IT WILL DELIVER 3 TIMES AS MUCH CURRENT FOR ITS 12 VOLTS!
VERY GOOD! BUT DOESN'T THIS MEAN THE BATTERY IS PUTTING OUT 3 TIMES AS MUCH ENERGY AS WHEN LIGHTING ONLY ONE LAMP?
YES, AND YOU CAN EXPECT THE BATTERY TO WEAR DOWN 3 TIMES AS FAST!
SUCH EXCELLENCE =SIGH=
Hewitt Drew it!

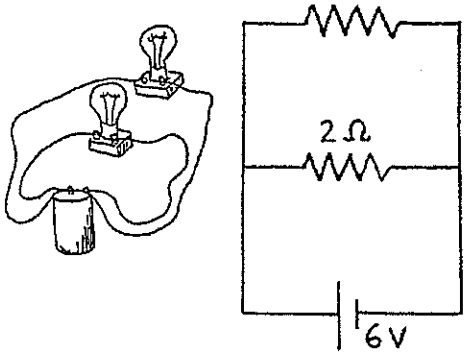
Name _____ Date _____

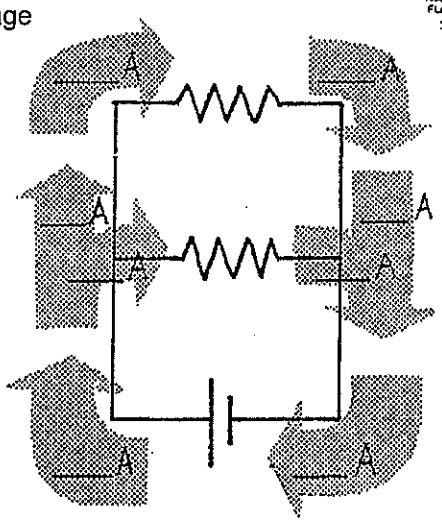
CONCEPTUAL Physics PRACTICE PAGE

Chapter 23 Electric Current
Parallel Circuits



1. In the circuit shown below there is a voltage drop of 6 V across *each* 2 Ω resistors.



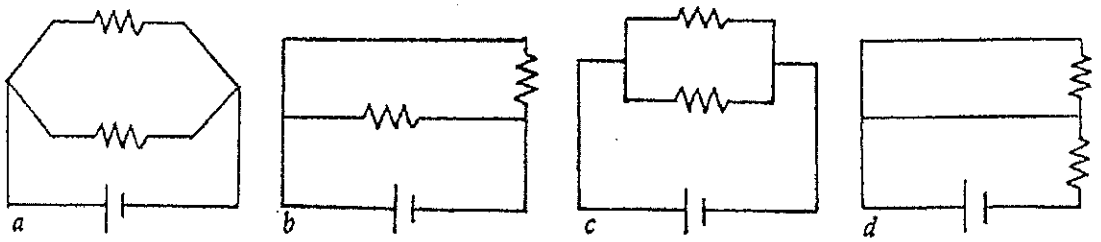


a. By Ohm's Law, the current in *each* resistor is _____ A.

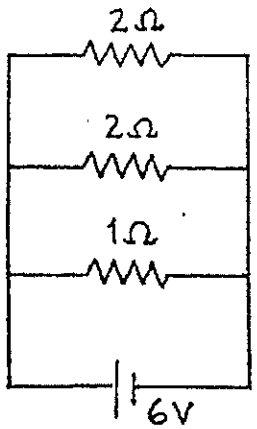
b. The current through the battery is the sum of the currents in the resistors, _____ A.

c. Fill in the current in the eight blank spaces in the diagram above of the same circuit.

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



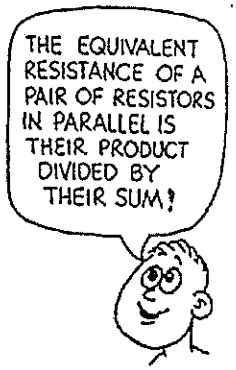
3. Consider the parallel circuit at the right.
   a. The voltage drop across each resistor is _____ V.



   b. The current in each branch is:
      2-Ω resistor _____ A.
      2-Ω resistor _____ A.
      1-Ω resistor _____ A.

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

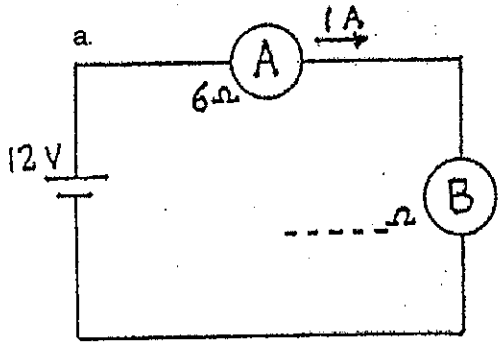
   d. The equivalent resistance of the circuit equals _____ Ω.

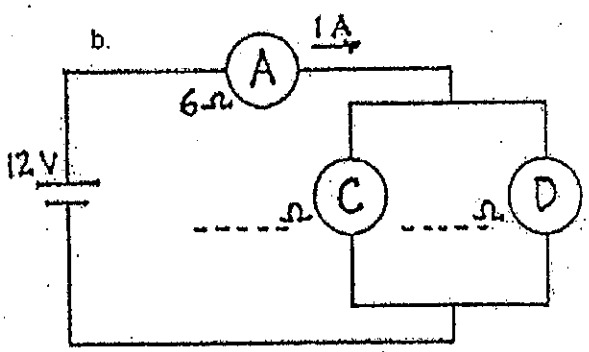


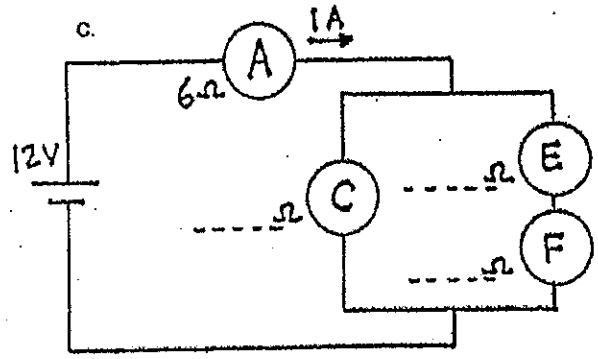
Chapter 23 Electric Current
Circuit Resistance

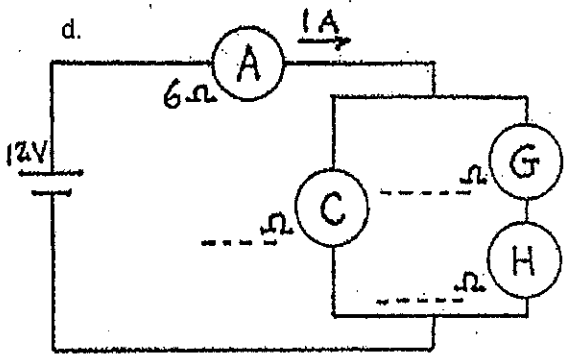
Figure what the resistances are, then show their values in the blanks to the left of each lamp.

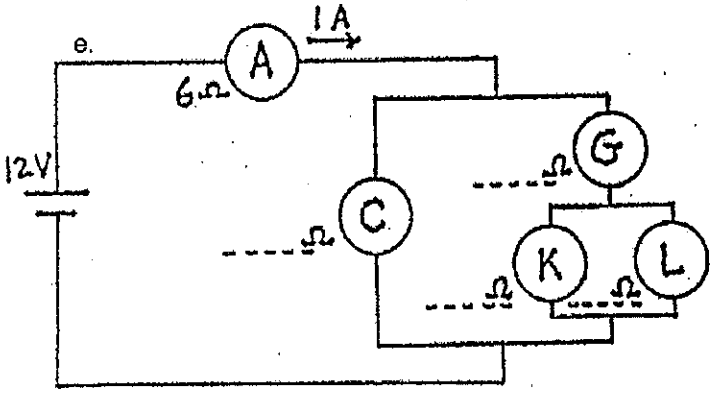
All circuits below have the same lamp A with resistance of 6 Ω and the same 12-volt battery with negligible resistance. The unknown resistances of lamps B through L are such that the current in lamp A remains 1 ampere. *Fill in the blanks.*











Circuit a: How much current flows through the battery? _____ A.

Circuit b: Assume lamps C and D are identical. Current through lamp D is _____ A.

Circuit c: Identical lamps E and F replace lamp D. Current through lamp C is _____ A.

Circuit d: Lamps G and H replace lamps E and F, and the resistance of lamp G is twice that of lamp H. Current through lamp H is _____ A.

Circuit e: Identical lamps K and L replace lamp H. Current through lamp L is _____ A.

Handy rule: For a pair of resistors in parallel:

$$\text{Equivalent resistance} = \frac{\text{product of resistances}}{\text{sum of resistances}}$$

The equivalent resistance of a circuit is the value of a single resistor that will replace all the resistors of the circuit to produce the same load on the battery. How do the equivalent resistances of the circuits a through e compare?

_____

Hewitt Drew It!