

Last Test!: Circuits

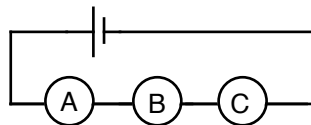
Some equations you may find useful:

$$V = \frac{\text{Energy}}{Q} \quad I = \frac{Q}{t} \quad V = IR \quad P = IV \quad R_e = \sum R \quad \frac{1}{R_e} = \sum \frac{1}{R}$$

Some constants you may find useful: $e = 1.6 \times 10^{-19} \text{ C}$

Multiple Choice: Choose the letter of the best answer. 3 points each.

1. _____ Compared to the amount of electric current in the filament of a light bulb, the amount of electric current in the wire that connects to the light bulb is
a. the same. b. more. c. less. d. more or less, depending on the bulb.
2. _____ What is 1 W equivalent to?
a. 1 V/A. b. 1 $\Omega \cdot \text{A}$. c. 1 V/ Ω . d. 1 V \cdot A.
3. _____ Four 20 Ω resistors are connected in parallel. What is their equivalent resistance?
a. 80 Ω . b. 40 Ω . c. 20 Ω . d. 10 Ω . e. 5 Ω .
4. _____ When resistors are connected in parallel, we can be certain that
a. the potential difference across each is the same.
b. the same current flows through each one.
c. the power dissipated in each resistor is the same.
d. their equivalent resistance is greater than the resistance of any one of the individual resistances.
5. _____ You have three identical 6 Ω resistors. Hooking them up any way you want, but always using all three of the resistors, you could make a little circuit with a total resistance of all the following EXCEPT
a. 18 Ω . b. 12 Ω . c. 9 Ω . d. 4 Ω . e. 2 Ω .

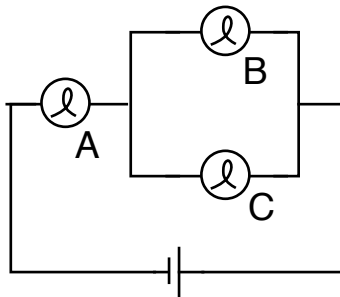


6. _____ Three light bulbs are connected in series as shown above. Bulb B is then shorted out. Which of the following is true?
a. B goes out and the others remain the same.
b. B goes out and the others get brighter.
c. The total current stays the same.
d. All the bulbs go out.
e. All the bulbs get brighter.
7. _____ Current is a measure of:
a. force that moves a charge past a point.
b. resistance to the movement of a charge past a point.
c. amount of charge that moves past a point per unit time.
d. energy used to move a charge past a point.
e. speed with which a charge moves past a point.
8. _____ If you double the voltage across a resistor, what will happen to the current through the resistor?
a. The current will also double.
b. The current will remain the same.
c. The current will be cut in half.
d. The answer depends on if the resistor is connected in series or in parallel.
e. None of the above are true.

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9. _____ A battery does 18 J of work on 3 C of charge. What is its voltage?
 a. 48 V. b. 18 V. c. 9 V. d. 6 V. e. 3 V.
10. _____ The resistance of resistor A is twice the resistance of resistor B. The two are connected in parallel and a potential difference is maintained across the combination. Then:
 a. the current in A is twice that in B.
 b. the current in A is half that in B.
 c. the potential difference across A is twice that across B.
 d. the potential difference across A is half that across B.
 e. none of the above are true.
11. _____ An ordinary light bulb is marked "60 W" and "120 V." What is its resistance?
 a. 15 Ω . b. 60 Ω . c. 120 Ω . d. 180 Ω . e. 240 Ω .

Questions 12 and 13 refer to the following diagram of identical light bulbs:



12. _____ Which light bulb is the brightest?
 a. A. b. B. c. C. d. B & C. e. all the same.
13. _____ If you unscrew bulb C, which of the following are true?
 I. A will get dimmer.
 II. B will get dimmer.
 III. C will go out.
 a. III only. b. I & III only. c. II & III only. d. I, II & III. e. none of those.
14. _____ Connect a pair of light bulbs in series, and you draw a certain amount of current. Connect the same light bulbs in parallel and you draw
 a. more current. b. less current. c. the same current. d. more or less current.
15. _____ A current of 5 amps flows through a wire for 1 minute. How many electrons flow through in that time?
 a. 3.1×10^{19} . b. 7.5×10^{19} . c. 3.8×10^{20} . d. 1.9×10^{21} . e. 4.8×10^{21} .

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Problem Solving: *Show all work.*

16. A $25\ \Omega$ resistor has $0.27\ \text{C}$ of charge flow through it in 4.5 seconds.
- What is the current flowing through the resistor?

 - What is the voltage of the resistor?
17. A lightbulb is connected to a $12\ \text{V}$ battery and has a current of $0.25\ \text{A}$ flowing through it.
- What is the resistance of the lightbulb?

 - What is the power of the light bulb?

 - In 1 minute, how many electrons flow through the light bulb?
18. A $30\ \Omega$ resistor has a potential difference of $6\ \text{V}$ across the resistor.
- How much current is flowing through the resistor?

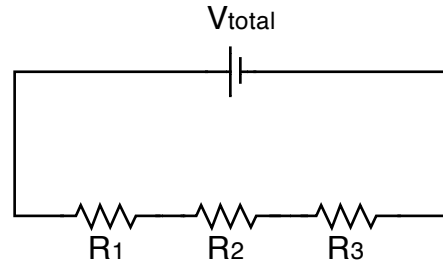
 - How much power is dissipated by the resistor?

 - How much energy would it take for $3\ \text{C}$ of charge to flow through the resistor?

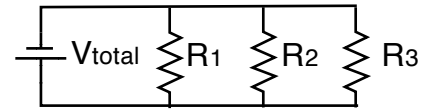
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19. Fill in the missing numbers in the chart for the circuits shown. (1 point each.)

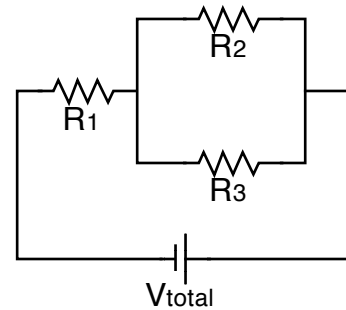
| | R | I | V | |
|-------|-----|-----|-----|------------|
| R_1 | 2 | | | $V_t =$ |
| R_2 | 4 | | | $I_t =$ |
| R_3 | | | 24 | $R_t = 12$ |



| | R | I | V | |
|-------|-----|-----|-----|-----------|
| R_1 | | 2 | | $V_t =$ |
| R_2 | 10 | | | $I_t = 6$ |
| R_3 | | 1 | | $R_t =$ |



| | R | I | V | |
|-------|-----|-----|-----|-----------|
| R_1 | 2 | 3 | | $V_t =$ |
| R_2 | | | | $I_t =$ |
| R_3 | 6 | | | $R_t = 6$ |



| | R | I | V | |
|-------|-----|-----|-----|-------------|
| R_1 | | | | $V_t =$ |
| R_2 | | | 3 | $I_t = 2.5$ |
| R_3 | 8 | | | $R_t = 4.8$ |

