Name: _____ **Class:** _____ **Date:** _____ **ID: A**

AP physics B - Webreview ch 17 and 18 circuits

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. The current in an electron beam in a cathode-ray tube is measured to be 70 μA. How many electrons hit the screen in 5.0 s? ($e = 1.6 \times 10^{-19}$ C)
   a. 2.2×10^{11} electrons
   b. 8.8×10^{13} electrons
   c. 2.2×10^{15} electrons
   d. 8.8×10^{18} electrons
   e. 2.2×10^{20} electrons

____ 2. A flashlight bulb operating at a voltage of 4.5 V has a resistance of 8.0 Ω. How many electrons pass through the bulb filament per second ($e = 1.6 \times 10^{-19}$ C)?
   a. 3.7×10^{16}
   b. 1.8×10^{21}
   c. 9.4×10^{17}
   d. 3.5×10^{18}
   e. 1.5×10^{17}

____ 3. Two cylindrical resistors are made of the same material and have the same resistance. The resistors, R_1 and R_2, have different radii, r_1 and r_2, and different lengths, L_1 and L_2. Which of the following relative values for radii and lengths would result in equal resistances?
   a. $r_1 = r_2$ and $L_1 = 2L_2$
   b. $2r_1 = r_2$ and $L_1 = 2L_2$
   c. $r_1 = r_2$ and $4L_1 = L_2$
   d. $2r_1 = r_2$ and $4L_1 = L_2$
   e. $r_1 = 2r_2$ and $L_1 = 2L_2$

____ 4. How long is a wire made from 100 cm^3 of copper if its resistance is 8.5 ohms? The resistivity of copper is 1.7×10^{-5} Ω·m.
   a. 7.1 m
   b. 1.7×10^2 m
   c. 2.2×10^2 m
   d. 3.0×10^3 m
   e. 4.7×10^3 m

____ 5. A 0.20-m-long metal rod has a radius of 1.0 cm and a resistance of 3.2×10^{-5} Ω. What is the resistivity of the metal?
   a. 1.6×10^{-8} Ω·m
   b. 5.0×10^{-8} Ω·m
   c. 16×10^{-8} Ω·m
   d. 160×10^{-8} Ω·m
   e. 500×10^{-8} Ω·m

____ 6. Number 10 copper wire (radius = 1.3 mm) is commonly used for electrical installations in homes. What is the voltage drop in 40 m of #10 copper wire if it carries a current of 10 A? (The resistivity of copper is 1.7×10^{-8} Ω·m.)
   a. 1.3 V
   b. 0.77 V
   c. 0.50 V
   d. 0.13 V
   e. 0.10 V

____ 7. A 60-W light bulb is in a socket supplied with 120 V. What is the current in the bulb?
   a. 0.50 A
   b. 2.0 A
   c. 60 A
   d. 7 200 A
   e. 10 000 A

____ 8. A resistor is connected to a battery with negligible internal resistance. If you replace the resistor with one that has twice the resistance, by what factor does the power dissipated in the circuit change?
   a. 0.50
   b. 0.25
   c. 4.0
   d. 2.0
   e. 1.0

____ 9. If a 500-W heater carries a current of 4.00 A, what is the resistance of the heating element?
   a. 85.7 Ω
   b. 42.8 Ω
   c. 31.3 Ω
   d. 11.2 Ω
   e. 10.0 Ω

____ 10. The two ends of a 3.0-Ω resistor are connected to a 9.0-V battery. What is the current through the resistor?
   a. 27 A
   b. 6.3 A
   c. 3.0 A
   d. 0.33 A
   e. 0.17 A

____ 11. The internal resistances of an ideal voltmeter and an ideal ammeter are respectively (*ideal* meaning the behavior of the system is not changed when using the meter):
   a. zero and zero.
   b. infinite and infinite.
   c. zero and infinite.
   d. infinite and zero.
   e. Both resistances are finite and non-zero.

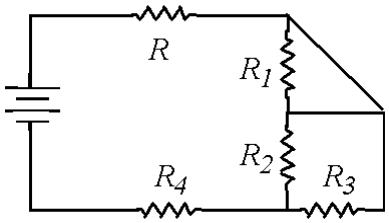
____ 12. When a 24.0-Ω resistor is connected across a 12.0-V battery, a current of 482 mA flows. What is the power output delivered by the emf of the battery?
a. 0.21 W
b. 5.57 W
c. 5.78 W
d. 6.00 W
e. 7.19 W

____ 13. Three 8.0-Ω resistors are connected in series. What is their equivalent resistance?
a. 24.0 Ω
b. 8.0 Ω
c. 0.38 Ω
d. 0.13 Ω
e. 0.075 Ω

____ 14. Three resistors connected in series have individual voltages labeled ΔV_1, ΔV_2 and ΔV_3, respectively. Which of the following expresses the value of the total voltage ΔV_T taken over the three resistors together?
a. $\Delta V_T = \Delta V_1 + \Delta V_2 + \Delta V_3$
b. $\Delta V_T = (1/\Delta V_1 + 1/\Delta V_2 + 1/\Delta V_3)$
c. $\Delta V_T = \Delta V_1 = \Delta V_2 = \Delta V_3$
d. $\Delta V_T = (1/\Delta V_1 + 1/\Delta V_2 + 1/\Delta V_3)^{-1}$
e. $\Delta V_T = 3\Delta V_1 = 3\Delta V_2 = 3\Delta V_3$

____ 15. Three resistors with values of R_1, R_2 and R_3, respectively, are connected in series. Which of the following expresses the total resistance, R_T, of the three resistors?
a. $R_T = R_1 + R_2 + R_3$
b. $R_T = (1/R_1 + 1/R_2 + 1/R_3)$
c. $R_T = R_1 = R_2 = R_3$
d. $R_T = (1/R_1 + 1/R_2 + 1/R_3)^{-1}$
e. $R_T = 3R_1 = 3R_2 = 3R_3$

____ 16. Which resistor is in series with resistor R?

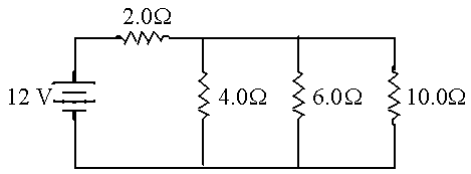


a. R1
b. R2
c. R3
d. R4
e. None of the four resistors above is valid.

____ 17. If $R_1 < R_2 < R_3$, and if these resistors are connected in series in a circuit, which one dissipates the greatest power?
a. R_1
b. R_2
c. R_3
d. All are equal in power dissipation.
e. More information is needed.

____ 18. When a light bulb is turned on, its resistance increases until it reaches operating temperature. What happens to the current in the bulb as it is warming up?
a. It stays constant.
b. It increases.
c. It decreases.
d. It increases at first and then decreases.
e. It decreases at first and then increases.

____ 19. Three resistors connected in parallel have individual values of 4.0, 6.0 and 10.0 Ω, respectively. If this combination is connected in series with a 12-V battery and a 2.0-Ω resistor, what is the current in the 10-Ω resistor?



a. 0.59 A
b. 1.0 A
c. 11 A
d. 16 A
e. 23 A

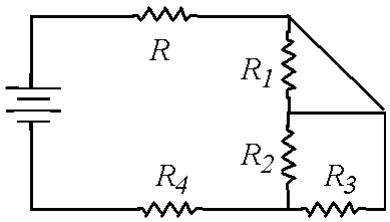
____ 20. Three resistors connected in parallel have the individual voltages labeled ΔV_1, ΔV_2 and ΔV_3, respectively. Which of the following expresses the total voltage ΔV_T across the three resistors when connected in this manner?
a. $\Delta V_T = \Delta V_1 + \Delta V_2 + \Delta V_3$
b. $\Delta V_T = (1/\Delta V_1 + 1/\Delta V_2 + 1/\Delta V_3)$
c. $\Delta V_T = \Delta V_1 = \Delta V_2 = \Delta V_3$
d. $\Delta V_T = (1/\Delta V_1 + 1/\Delta V_2 + 1/\Delta V_3)^{-1}$
e. $\Delta V_T = 3\Delta V_1 = 3\Delta V_2 = 3\Delta V_3$

____ 21. Three resistors with values R_1, R_2 and R_3, respectively, are connected in parallel. Which of the following expresses the total resistance, R_T, of the three resistors when connected in parallel?
a. $R_T = R_1 + R_2 + R_3$
b. $R_T = (1/R_1 + 1/R_2 + 1/R_3)$
c. $R_T = R_1 = R_2 = R_3$
d. $R_T = (1/R_1 + 1/R_2 + 1/R_3)^{-1}$
e. $R_T = 3R_1 = 3R_2 = 3R_3$

____ 22. Two resistors of values 6.0 and 12.0 Ω are connected in parallel. This combination in turn is hooked in series with a 2.0-Ω resistor and a 24-V battery. What is the current in the 2-Ω resistor?

a. 2.0 A
b. 4.0 A
c. 6.0 A
d. 12 A
e. 20 A

____ 23. Which two resistors are in parallel with each other?

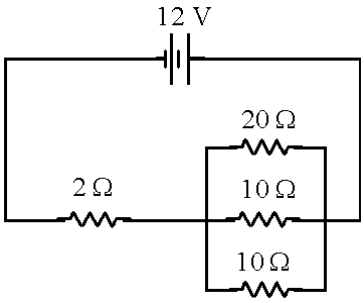


a. R and R4
b. R2 and R3
c. R2 and R4
d. R and R1
e. R1 and R2

____ 24. Three resistors, each with resistance R_1, are in parallel in a circuit. They are replaced by one equivalent resistor, R. Compare this resistor to the first resistor of the initial circuit. Which of the following statements is true?

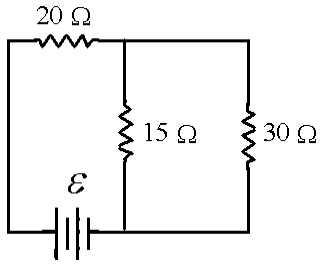
a. The current through R equals the current through R_1.
b. The voltage across R equals the voltage across R_1.
c. The power given off by R equals the power given off by R_1.
d. R is greater than R_1.
e. R is less than R_1.

____ 25. How much power is being dissipated by one of the 10-Ω resistors?



a. 24 W
b. 9.6 W
c. 16 W
d. 6.4 W
e. 8.2 W

____ 26. If ε = 24 V, at what rate is thermal energy generated in the 20-Ω resistor?



a. 13 W
b. 3.2 W
c. 23 W
d. 39 W
e. 0.51 W

AP physics B - Webreview ch 17 and 18 circuits
Answer Section

MULTIPLE CHOICE

1. C
2. D
3. D
4. A
5. B
6. A
7. A
8. A
9. C
10. C
11. D
12. C
13. A
14. A
15. A
16. D
17. C
18. C
19. A
20. C
21. D
22. B
23. B
24. B
25. D
26. A