Name: _____ Date: _____

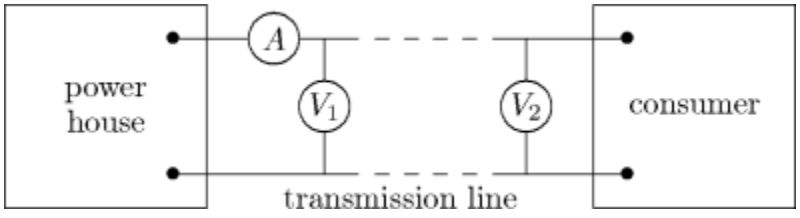
1. By using only two resistors, R_1 and R_2, a student is able to obtain resistances of 3 Ω, 4 Ω, 12 Ω, and 16 Ω. The values of R_1 and R_2 (in ohms) are:

A) 3, 4
B) 2, 12
C) 3, 16
D) 4, 12
E) 4, 16

2. Four 20-Ω resistors are connected in parallel and the combination is connected to a 20-V emf device. The current in any one of the resistors is:

A) 0.25 A
B) 1.0 A
C) 4.0 A
D) 5.0 A
E) 100 A

3. In the figure, voltmeter V_1 reads 600 V, voltmeter V_2 reads 580 V, and ammeter A reads 100 A. The power wasted in the transmission line connecting the power house to the consumer is:



A) 1 kW
B) 2 kW
C) 58 kW
D) 59 kW
E) 60 kW

4. A series circuit consists of a battery with internal resistance *r* and an external resistor *R*. If these two resistances are equal (*r* = *R*) then the thermal energy generated per unit time by the internal resistance *r* is:

A) the same as by *R*
B) half that by *R*
C) twice that by *R*
D) one-third that by *R*
E) unknown unless the emf is given

5. A certain ammeter has an internal resistance of 1 Ω and a range from 0 to 50 mA. To make its range from 0 to 5 A, use:

A) a series resistance of 99 Ω
B) an extremely large (say 10^6 Ω) series resistance
C) a resistance of 99 Ω in parallel
D) a resistance of 1/99 Ω in parallel
E) a resistance of 1/1000 Ω in parallel

6. A 120-V power line is protected by a 15-A fuse. What is the maximum number of "120 V, 500 W" light bulbs that can be operated at full brightness from this line?

A) 1
B) 2
C) 3
D) 4
E) 5

7. Two identical batteries, each with an emf of 18 V and an internal resistance of 1 Ω, are wired in parallel by connecting their positive terminals together and connecting their negative terminals together. The combination is then wired across a 4-Ω resistor. The potential difference across the 4-Ω resistor is:

A) 4.0 V
B) 8.0 V
C) 14 V
D) 16 V
E) 29 V

8. The resistance of resistor 1 is twice the resistance of resistor 2. The two are connected in parallel and a potential difference is maintained across the combination. Then:

A) the current in 1 is twice that in 2
B) the current in 1 is half that in 2
C) the potential difference across 1 is twice that across 2
D) the potential difference across 1 is half that across 2
E) none of the above are true

9. The emf of a battery is equal to its terminal potential difference:

A) under all conditions
B) only when the battery is being charged
C) only when a large current is in the battery
D) only when there is no current in the battery
E) under no conditions

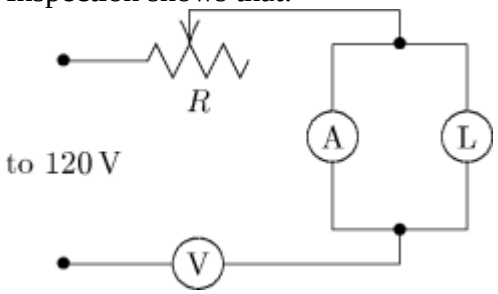
10. The terminal potential difference of a battery is less than its emf:

A) under all conditions
B) only when the battery is being charged
C) only when the battery is being discharged
D) only when there is no current in the battery
E) under no conditions

11. Resistor 1 has twice the resistance of resistor 2. The two are connected in series and a potential difference is maintained across the combination. The rate of thermal energy generation in 1 is:

A) the same as that in 2
B) twice that in 2
C) half that in 2
D) four times that in 2
E) one-fourth that in 2

12. The circuit shown was wired for the purpose of measuring the resistance of the lamp L. Inspection shows that:



A) voltmeter V and rheostat R should be interchanged
B) the circuit is satisfactory
C) the ammeter A should be in parallel with R, not L
D) the meters, V and A, should be interchanged
E) L and V should be interchanged

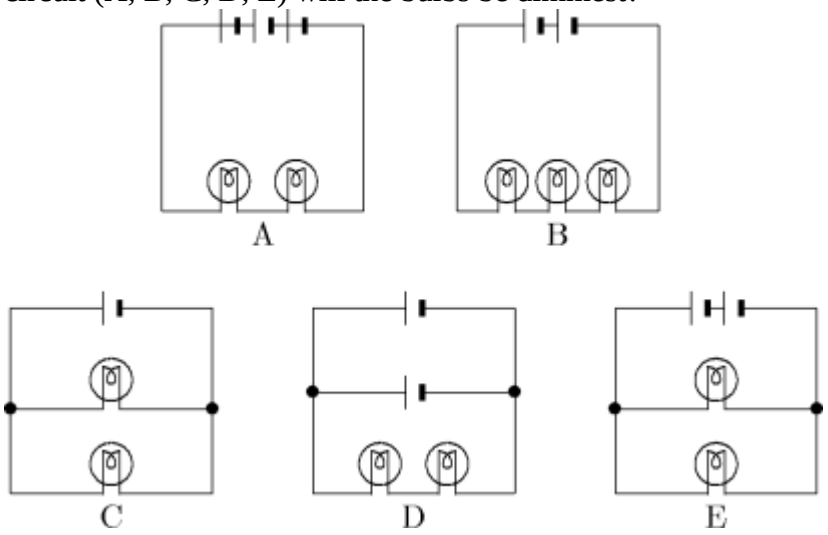
13. Four 20-Ω resistors are connected in series and the combination is connected to a 20-V emf device. The potential difference across any one of the resistors is:

A) 1 V
B) 4 V
C) 5 V
D) 20 V
E) 80 V

14. Four 20-Ω resistors are connected in parallel and the combination is connected to a 20-V emf device. The current in the device is:

A) 0.25 A
B) 1.0 A
C) 4.0 A
D) 5.0 A
E) 100 A

15. In the diagrams, all light bulbs are identical and all emf devices are identical. In which circuit (A, B, C, D, E) will the bulbs be dimmest?



A) A
B) B
C) C
D) D
E) E

16. Two wires made of the same material have the same lengths but different diameters. They are connected in parallel to a battery. The quantity that is NOT the same for the wires is:

A) the end-to-end potential difference
B) the current
C) the current density
D) the electric field
E) the electron drift velocity

17. A battery is connected across a parallel combination of two identical resistors. If the potential difference across the terminals is ΔV_B and the current in the battery is i, then:

A) the potential difference across each resistor is ΔV_B and the current in each resistor is i
B) the potential difference across each resistor is $(\Delta V_B)/2$ and the current in each resistor is $i/2$
C) the potential difference across each resistor is ΔV_B and the current in each resistor is $i/2$
D) the potential difference across each resistor is $(\Delta V_B)/2$ and the current in each resistor is i
E) none of the above are true

18. A 3-Ω and a 1.5-Ω resistor are wired in parallel and the combination is wired in series to a 4-Ω resistor and a 10-V emf device. The potential difference across the 3-Ω resistor is:

A) 2.0 V
B) 6.0 V
C) 8.0 V
D) 10 V
E) 12 V

19. Resistor 1 has twice the resistance of resistor 2. They are connected in parallel to a battery. The ratio of the thermal energy generation rate in 1 to that in 2 is:

A) 1 : 4
B) 1 : 2
C) 1 : 1
D) 2 : 1
E) 4 : 1

20. A battery with an emf of 24 V is connected to a 6-Ω resistor. As a result, current of 3 A exists in the resistor. The terminal potential difference of the battery is:

A) 0
B) 6 V
C) 12 V
D) 18 V
E) 24 V

21. Nine identical wires, each of diameter *d* and length *L*, are connected in parallel. The combination has the same resistance as a single similar wire of length *L* but whose diameter is:

A) 3*d*
B) 9*d*
C) *d*/3
D) *d*/9
E) *d*/81

22. A 3-Ω and a 1.5-Ω resistor are wired in parallel and the combination is wired in series to a 4-Ω resistor and a 10-V emf device. The current in the 3-Ω resistor is:

A) 0.33 A
B) 0.67 A
C) 2.0 A
D) 3.3 A
E) 6.7 A

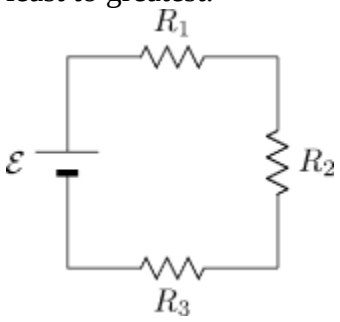
23. In the diagram, the current in the 3-Ω resistor is 4 A. The potential difference between points 1 and 2 is:

A) 0.75 V
B) 0.8 V
C) 1.25 V
D) 12 V
E) 20 V

24. Four 20-Ω resistors are connected in series and the combination is connected to a 20-V emf device. The current in any one of the resistors is:

A) 0.25 A
B) 1.0 A
C) 4.0 A
D) 5.0 A
E) 100 A

25. In the diagram $R_1 > R_2 > R_3$. Rank the three resistors according to the current in them, least to greatest.



A) 1, 2, 3
B) 3, 2, 1
C) 1, 3, 2
D) 3, 1, 3
E) All are the same

Answer Key

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