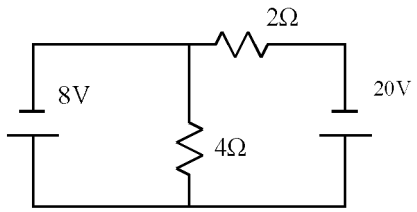
Base your answers to questions **1** and **2** on the circuit diagram below.



1. What is the current through the 2 Ω resistor?

   A) 2 A

   B) $\frac{10}{3}$ A

   C) 6 A

   D) 8 A

   E) 10 A

2. What is the potential drop across the 4 Ω resistor?

   A) 8 V

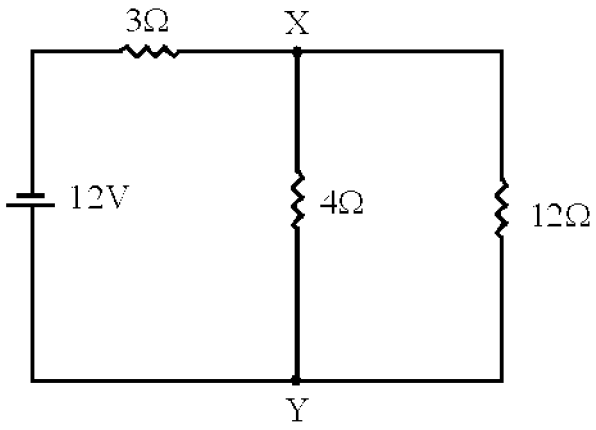
   B) 12 V

   C) 16 V

   D) 18 V

   E) 20 V

Base your answers to questions **3** and **4** on the circuit diagram shown below.



3. What is the potential drop from *X* to *Y*?

   A) 1 V

   B) 3 V

   C) 6 V

   D) 8 V

   E) 12 V

4. What is the current through the 12Ω resistor?

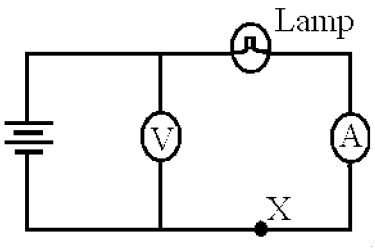
   A) ¢ A

   B) ¤ A

   C) ½ A

   D) 1 A

   E) ¦ A

5. 

A lamp, a voltmeter *V*, a ammeter *A*, and a battery with zero internal resistance are connected as shown above. Adding a second, identical lamp at point *X* would

A) increase the ammeter reading

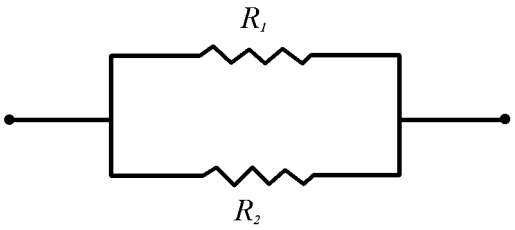
B) decrease the ammeter reading

C) increase the voltmeter reading

D) decrease the voltmeter reading

E) produce no change in either reading

6. Base your answer to the following question on the diagram below which shows two resistors connected in parallel. A voltage *V* is applied to the pair.



What is the ratio of the current through R_1 to the current through R_2 when $R_1 = 1.5R_2$?

A) $\frac{4}{9}$

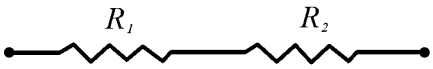
B) $\frac{2}{3}$

C) 1

D) $\frac{3}{2}$

E) $\frac{9}{4}$

7. Base your answer to the following question on the diagram below which shows two resistors connected in series. A voltage *V* is applied to the pair.



What is the ratio of the voltage drop over R_1 to the voltage drop over R_2 when $R_1 = 1.5R_2$?

A) $\frac{4}{9}$

B) $\frac{2}{3}$

C) 1

D) $\frac{3}{2}$

E) $\frac{9}{4}$

8. Kirchoff's loop rule is essentially a restatement of which of the following?

A) Ohm's Law

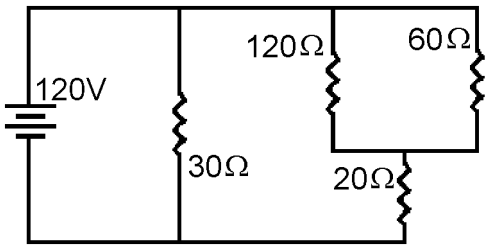
B) Faraday's Law

C) Conservation of momentum

D) Conservation of charge

E) Conservation of energy

9. Base your answer to the following question on the circuit shown below.



The current through the 30 Ω resistor is most nearly

A) 2 A

B) 3 A

C) 4 A

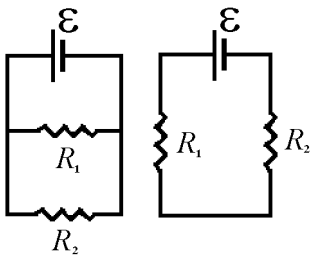
D) 6 A

E) 10 A

Base your answers to questions **10** and **11** on the diagram below which shows two different resistors, R_1 and R_2, in two different connections to the same source of emf ε that has no internal resistance.

For each question(s) pick your answer from the following list.

I. It is greater for the parallel connection.
II. It is greater for the series connection.
III. It is the same for both connections.
IV. It is different for each connection, but one must know the values of R_1 and R_2, to know which is greater.
V. It is different for each connection, but one must know the value of ε to know which is greater.



10. How does the total current for these two cases compare?

A) I

B) II

C) III

D) IV

E) V

11. How does the voltage drop over R_1 for these two cases compare?

A) I

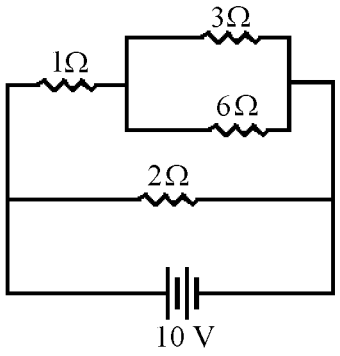
B) II

C) III

D) IV

E) V

Base your answers to questions **12** and **13** on the circuit diagram below which shows four resistors attached to a 10 V battery.



12. What is the total power dissipated by this circuit?

A) 12 W

B) 24 W

C) 60 W

D) 83.3 W

E) 240 W

13. What is the ratio of the current in the 3Þ resistor to the current in the 1Þ resistor?

A) $\frac{1}{6}$

B) $\frac{1}{3}$

C) $\frac{2}{3}$

D) $\frac{3}{2}$

E) 3

---

14. A battery is manufactured with an emf of 24 volts. However, when attached to a 2 Ω resistor, the potential between the terminals is only 20 V, what is the internal resistance of the battery?

A) 0.10 Ω

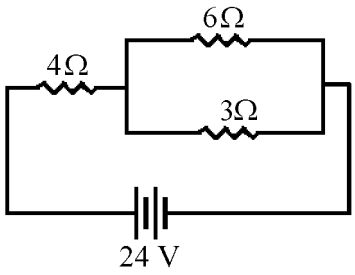
B) 0.20 Ω

C) 0.30 Ω

D) 0.40 Ω

E) 0.60 Ω

Base your answers to questions **15** and **16** on the circuit diagram below.



15. What is the current through the 3 Þ resistor?

    A) 1 A

    B) $\frac{4}{3}$ A

    C) 2 A

    D) $\frac{8}{3}$ A

    E) 4 A

16. What is the power dissipated by the 4 Þ resistor?

    A) 64 W

    B) 72 W

    C) 96 W

    D) 120 W

    E) 144 W

---

17. An Ohmic conductor has it's voltage doubled while the resistance remains constant. The current through the conductor will

    A) increase by a factor of 4

    B) increase by a factor of 2

    C) remain the same

    D) decrease by a factor of 2

    E) decrease by a factor of 4

18. A certain resistor has a resistance that is directly proportional to its temperature. If the temperature of the resistor is doubled, and the current through the resistor remains constant, the voltage drop across the resistor will

    A) increase by a factor of 4

    B) increase by a factor of 2

    C) remain the same

    D) decrease by a factor of 2

    E) decrease by a factor of 4

19. An 80 W light bulb operates at a voltage of 100 V. The resistance of the bulb is

    A) 0.8 Ω

    B) 1.25 Ω

    C) 8 Ω

    D) 40 Ω

    E) 125 Ω

20. Three identical light bulbs are connected in parallel to a voltage source. If one of the bulbs burns out

    A) more current will be drawn from the voltage source

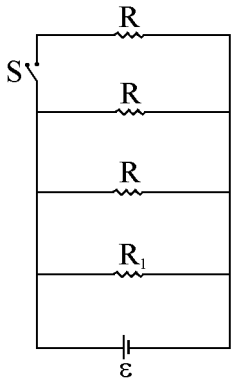
    B) the light intensity of the other bulbs will decrease, but they will not go out

    C) the light intensity of the other bulbs will remain the same

    D) the light intensity of the other bulbs will increase

    E) all the bulbs will go out

21.



In the diagram above, all the resistors have an identical resistance *R*. If the switch *S* is closed, the current through the resistor R_1 will

A) increase and the voltage will remain the same

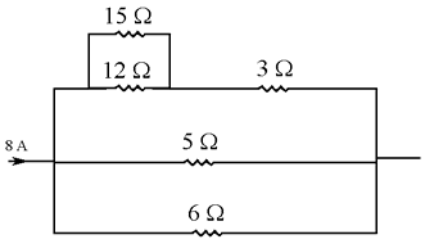
B) decrease and the voltage will remain the same

C) remain the same with constant voltage

D) remain the same but the voltage will increase

E) remain the same but the voltage will decrease

22.



The voltage drop across the 5 Ω resistor in the portion of the circuit shown above is most nearly

A) 12 V

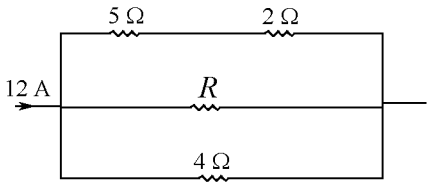
B) 18 V

C) 24 V

D) 40 V

E) 48 V

23.



In the diagram above, if the voltage drop across the 4 Ω resistor is 24 V, find the most likely value of the unknown resistance *R*.

A) 0.62 Ω

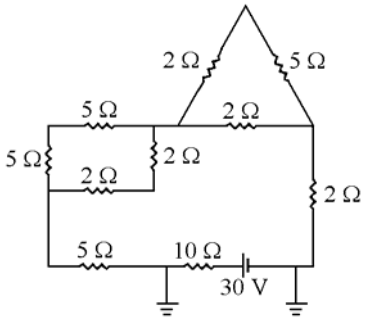
B) 3 Ω

C) 4.5 Ω

D) 9.3 Ω

E) There is not enough information to find the resistance.

24.



In the above circuit, find the current through the 10 Ω resistor.

A) 0.5 A

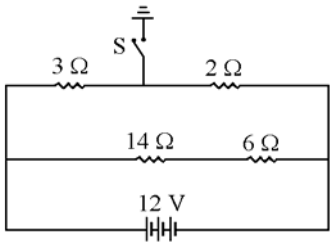
B) 1.25 A

C) 1.5 A

D) 3 A

E) 5 A

Base your answers to questions **25** and **26** on the following circuit diagram.



25. With switch *S* open, the current through the 3 Ω resistor is

A) 0.6 A

B) 0.8 A

C) 2.4 A

D) 4 A

E) 6 A

26. If the switch *S* is closed, the current through the 3 Ω resistor will be

A) 0.6 A

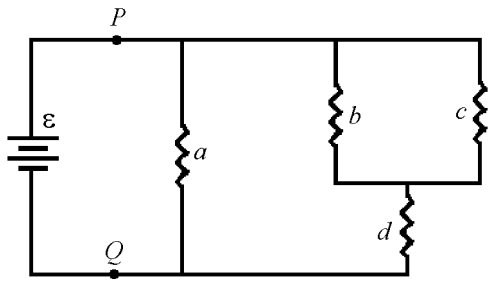
B) 0.8 A

C) 2.4 A

D) 4 A

E) 6 A

Base your answers to questions **27** and **28** on the circuit diagram shown below.



27. If each of the resistors in the circuit have a resistance of 4 Ω, what is the equivalent resistance from point *P* to point *Q*?

A) 1.2 Ω

B) 2.4 Ω

C) 3.6 Ω

D) 4.8 Ω

E) 6.0 Ω

28. The total current in the circuit is 10 A, the resistors are 4 ohms each. What is the emf of the battery?

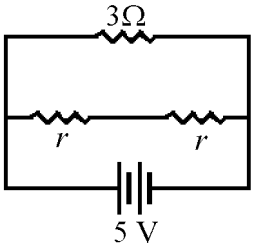
A) 12 V

B) 24 V

C) 36 V

D) 48 V

E) 60 V

29. 

In the circuit shown above, what is the appropriate value for *r* so that the current through the battery is 2.5 A?

A) 1 Ω

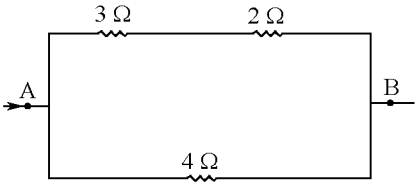
B) 2 Ω

C) 3 Ω

D) 4 Ω

E) 6 Ω

30. Base your answer to the following question on the part of the circuit shown below.



If the potential difference between *A* and *B* is 4 V, how much charge will pass though the 4 Ω resistor in 5 seconds?

A) 1 C

B) 2 C

C) 4 C

D) 5 C

E) 8 C

31. An electric circuit contains an operating heating element and a lit lamp. Which statement best explains why the lamp remains lit when the heating element is removed from the circuit?

A) The lamp has less resistance than the heating element.

B) The lamp has more resistance than the heating element.

C) The lamp and the heating element were connected in series.

D) The lamp and the heating element were connected in parallel.

E) The lamp and the heating element draw current from separate sources.

32. Base your answer to the following question on the following situation. A certain toaster draws 3 A of current while in household operation at 120 V.

What is the resistance of the toaster?

A) 20 Ω

B) 40 Ω

C) 60 Ω

D) 80 Ω

E) 120 Ω

33. In order to measure the power dissipated in a resistor of unknown value, the minimum equipment needed would be

A) a voltmeter only

B) an ammeter only

C) a voltmeter and an ammeter

D) an ammeter, a voltmeter, and a resistor of known value

E) a voltmeter and a magnet producing a known magnetic field

34. Several circuit components are placed in series in a circuit and connected to a voltage source. Across which component is the potential difference greatest?

A) The one with the least resistance.

B) The one with the greatest resistance.

C) The one whose resistance is nearest to the average resistance of the components.

D) The potential difference is the same across each component.

E) There is no potential difference across components because there is a voltage source connected.

Answer Key
Equivalent Resistors MC Questions [Mar 28, 2011]

1. C
2. A
3. C
4. C
5. B
6. B
7. D
8. E
9. C
10. A
11. A
12. D
13. C
14. D
15. D
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30. D
31. D
32. B
33. C
34. B

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