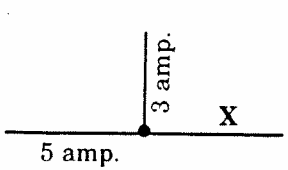
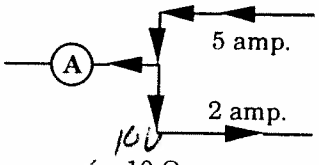
Questions

Series and Parallel Circuits and Kirchhoff's Laws

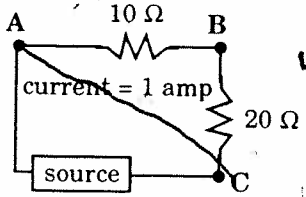
1 The diagram at the right represents a segment of a circuit. The current in wire *X* may be
(1) 1 ampere
(2) 2 amperes
(3) 3 amperes
(4) 4 amperes



2 In the diagram shown, how many amperes is the reading on ammeter *A*?
(1) 5 amperes
(2) 2 amperes
(3) 3 amperes
(4) 7 amperes



3 If the potential difference between points *A* and *B* in the electric circuit shown is 10 volts, what is the voltage between points *A* and *C*?
(1) 5 volts
(2) 10 volts
(3) 20 volts
(4) 30 volts



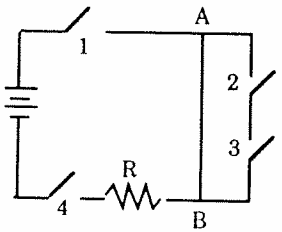
$V = IR$

20V

4 If 4 joules of work are required to move 2 coulombs of charge through a 6-ohm resistor, the potential difference across the resistor is
(1) 1 volt
(2) 2 volts
(3) 6 volts
(4) 8 volts

$V = \frac{W}{q}$ $\frac{4J}{2C}$

5 In the circuit represented, which switch or switches must be closed to produce a current in conductor *AB*?
(1) 1 and 4, only
(2) 2 and 3, only
(3) 1, 2, and 3
(4) 4, only

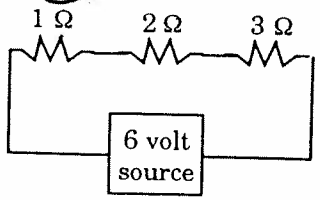


Which quantity must be the same for each component in a series circuit?
(1) voltage (2) power (3) resistance (4) current

What is the current in the circuit represented in the diagram?
(1) 1 amp
(2) 2 amp
(3) 3 amp
(4) 4 amp

$V_T =$

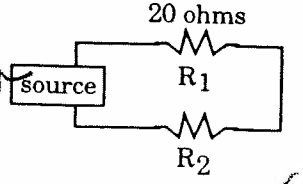
$6V = I_T 6\Omega$



The diagram represents a circuit with two resistors in series. If the total resistance of R_1 and R_2 is 24 ohms, the resistance of R_2 is
(1) 1.0 ohm
(2) 0.50 ohm
(3) 100 ohm
(4) 4.0 ohm

$R_T = R_1 + R_2$

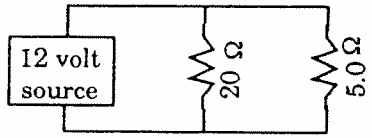
$24\Omega = 20\Omega + 4\Omega$



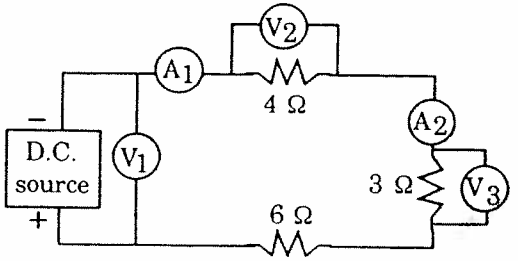
A 10-ohm and a 20-ohm resistor are connected in parallel to a constant voltage source. If the current through the 10-ohm resistor is 4.0 amperes, then the current through the 20-ohm resistor is
(1) 1 ampere (2) 2 amperes (3) 8 amperes (4) 4 amperes

As the number of resistors connected in parallel to a constant voltage source is increased, the potential difference across each resistor
(1) decreases (2) increases (3) remains the same

11 Compared to the current in the 20. ohm resistance in the circuit diagram shown, the current in the 5.0 ohm resistor is
(1) one-half as great
(2) one-fourth as great
(3) the same
(4) four times as great



Base your answers to questions 12 through 15 on the diagram in which the source voltage is 26 volts.



$V_T = 26V$

$I_T = 2A$

$\frac{26V}{13\Omega} = 2A$

12 What is the reading of voltmeter V_2?
(1) 52 volts (2) 26 volts (3) 13 volts (4) 8 volts

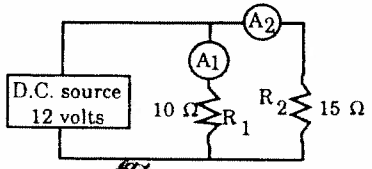
13 What is the total resistance of the circuit?
(1) ¾ ohm (2) ⅔ ohm (3) 10 ohm (4) 13 ohm

14 The reading of ammeter A_1 is
(1) 6 amperes
(2) 2 amperes
(3) 3 amperes
(4) 52 amperes

15 If additional resistances are added in series and the applied voltage is kept constant, the reading of voltmeter V_3 will
(1) decrease (2) increase (3) remain the same

$R = \frac{V}{I}$

Base your answers to questions 16 through 20 on the diagram below which represents an electrical circuit.



16 The equivalent resistance of the circuit is
(1) 25 Ω (2) 6.0 Ω (3) 5.0 Ω (4) 0.17Ω

17 The potential difference across R_2 is
(1) 1.0 V (2) 2.0 V (3) 10 V (4) 12 V

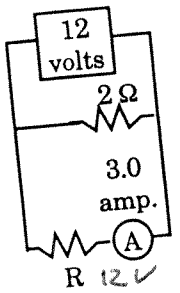
18 The magnitude of the current in ammeter A_1 is
(1) 120 A (2) 2.0 A (3) 1.2 A (4) 0.83 A

19 Compared to the current in A_1, the current in A_2 is
(1) less (2) greater (3) the same

20 If another resistor were added to the circuit in parallel, the equivalent resistance of the circuit would
(1) decrease (2) increase (3) remain the same

1 Which combination of current and electromotive force (emf) would use energy at the greatest rate?
(1) 10 amperes at 110 volts
(2) 8 amperes at 110 volts
(3) 3 amperes at 220 volts
(4) 5 amperes at 110 volts

2 Two resistors are connected in parallel to a 12-volt battery as shown in the diagram. If the current in resistance R is 3.0 amperes, the rate at which R consumes electrical energy is



(1) 1.1×10^2 watts
(2) 36 watts
(3) 24 watts
(4) 4.0 watts

3 The potential difference across a 100.-ohm resistor is 4.0 volts. What is the power dissipated in the resistor?
(1) 0.16 watt
(2) 25 watts
(3) 4.0×10^2 watts
(4) 4.0 watts

4 An electrical heater raises the temperature of a measured quantity of water. Six thousand joules of energy is absorbed by the water from the heater in 30.0 seconds. What is the minimum power rating of the heater?
(1) 5.00×10^2 W
(2) 2.00×10^2 W
(3) 2.00×10^3 W
(4) 1.80×10^5 W

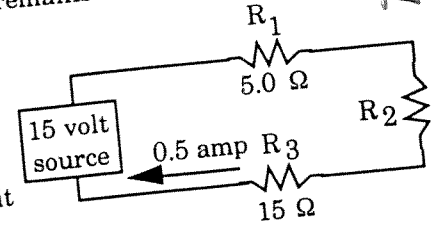
5 What is the current in a 1,200-watt heater operating on 120 volts?
(1) 0.10 ampere
(2) 5.0 amperes
(3) 10. amperes
(4) 20. amperes

6 A 10 -volt potential difference maintains a 2 -ampere current in a resistor. The total energy expended by this resistor in 5 seconds is
(1) 10 J
(2) 20 J
(3) 50 J
(4) 100 J

7 How long must a 100-watt light bulb be used in order to dissipate 1,000 joules of electrical energy?
(1) 10 sec
(2) 100 sec
(3) 1,000 sec
(4) 1000,000 sec

8 As the resistance of a lamp operated at a constant voltage increases, the power used by the lamp
(1) decreases
(2) increases
(3) remains the same

Base your answers to questions 9 through 13 on the diagram below which shows 3 resistors connected to a 15-volt source.



9 The equivalent resistance of the circuit is
(1) 10 ohms
(2) 20 ohms
(3) 30 ohms
(4) 40 ohms

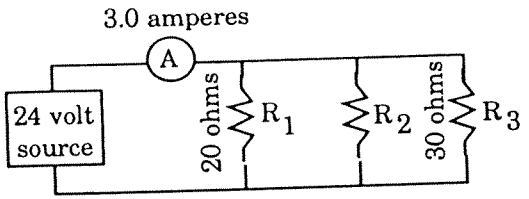
10 The potential difference across R_2 is
(1) 2.5 volts
(2) 5.0 volts
(3) 7.5 volts
(4) 10 volts

11 The total power developed in the circuit is
(1) 2.5 watts
(2) 5.0 watts
(3) 7.5 watts
(4) 10 watts

12 If resistor R_3 is removed and replaced by a resistor of lower value, the resistance of the circuit will
(1) decrease
(2) increase
(3) remain the same

13 Compared to the heat developed in resistor R_1, the heat developed in resistor R_3 is
(1) one-third as great
(2) two times as great
(3) three times as great
(4) one-fourth as great

Base your answers to questions 14 through 18 on the diagram below which represents three resistors connected in parallel across a 24-volt source. The ammeter reads 3 amperes.



14 The equivalent resistance in the circuit is
(1) 0.13 ohms
(2) 8.0 ohms
(3) 58 ohms
(4) 72 ohms

15 The current in R_1 is
(1) 0.83 amperes
(2) 1.5 amperes
(3) 3.0 amperes
(4) 1.2 amperes

16 The potential difference across R_3 is
(1) 8.0 volts
(2) 24 volts
(3) 48 volts
(4) 72 volts

17 If the ratio of the current in R_3 to the current in R_2 is 4:5, the resistance of R_2 is
(1) 5.0 ohms
(2) 8.0 ohms
(3) 24 ohms
(4) 60. ohms

18 The power supplied to the circuit is
(1) 220 watts
(2) 190 watts
(3) 72 watts
(4) 24 watts