1) If a quantity you calculated has units of A • s, what is that quantity?
A) resistance B) resistivity C) potential D) capacitance E) charge

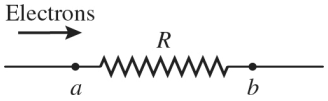
2) When current is flowing in an ordinary metal wire, the magnitude of the average velocity of the electrons is closest to
A) 1 m/s.
B) 10 m/s.
C) 1 mm/s.
D) 1 km/s.
E) the speed of light.

3) When a current flows through a metal wire, the moving charges are
A) only electrons.
B) only protons.
C) negative metal ions.
D) positive metal ions.
E) both protons and electrons.

4) When a current flows through an ionic liquid such as salty water, the moving charges are
A) only positive ions.
B) only electrons.
C) only negative ions.
D) only protons.
E) both positive and negative ions.

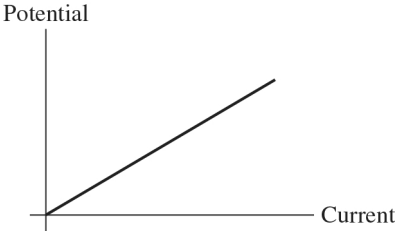
5) If a quantity you calculated has units of Ω • m what is that quantity?
A) resistance B) charge C) resistivity D) capacitance E) potential

6) The figure shows electrons passing through a resistor. The arrow shows the direction in which the electrons are moving. Which of the following statements are correct? (There could be more than one correct choice.)



A) The electrons are moving slower at point *b* than at point *a*.
B) The electrons are losing electric potential energy as they move through the resistor from *a* to *b*.
C) The electric potential is lower at point *b* than at point *a*.
D) The speed of the electrons at point *b* is the same as it is at point *a*.
E) The electric potential is higher at point *b* than at point *a*.

7) For the graph shown in the figure, what physical quantity does the slope of the graph represent for ohmic material?



A) 1/(resistivity)
B) resistivity
C) resistance
D) power
E) 1/(resistance)

8) You are given a copper bar of dimensions 3 cm × 5 cm × 8 cm and asked to attach leads to it in order to make a resistor. If you want to achieve the *smallest* possible resistance, you should attach the leads to the opposite faces that measure
A) 3 cm × 5 cm.
B) 3 cm × 8 cm.
C) 5 cm × 8 cm.
D) Any pair of faces produces the same resistance.

9) Copper wire #1 has a length L and a radius b. Copper wire #2 has a length $2L$ and a radius $2b$. Which statement about the resistance across the ends of the wires is true?
A) The resistance of wire #1 is four times higher than that of wire #2.
B) The resistance of wire #1 is twice as high as that of wire #2.
C) The resistance of wire #1 is half that of wire #2.
D) The resistance of wire #1 is equal to that of wire #2.

10) Which one of the following quantities is equivalent to 1 Ω?
A) 1 A • s B) 1 V • A C) 1 W/A D) 1 V/A E) 1 J/s

11) Which one of the following quantities is equivalent to 1 W?
A) 1 Ω • m B) 1 V/A C) 1 V/Ω D) 1 A • s E) 1 V • A

12) A kilowatt–hour is equivalent to
A) 3600 J
B) 3600 J/s
C) 3,600,000 J
D) 1000 W
E) 3,600,000 J/s

13) If the resistance in a constant voltage circuit is doubled, the power dissipated by that circuit will
A) decrease to one–fourth its original value.
B) increase by a factor of two.
C) decrease to one–half its original value.
D) increase by a factor of four.

14) If the current flowing through a circuit of constant resistance is doubled, the power dissipated by that circuit will
A) decrease to one–fourth of what it was.
B) quadruple in magnitude.
C) decrease to one–half of what it was.
D) double in magnitude.

15) During a period of high power demand, the voltage output of the power company is reduced by 5.0%. By what percentage is the power in a resistor decreased?

A) 90% B) 2.5% C) 10% D) 15% E) 5.0%

16) Over ordinary temperature ranges, the resistance of most metals such as copper

A) is a maximum at 20°C.
B) is independent of the temperature of the metal.
C) decreases as the metal gets hotter.
D) increases as the metal gets hotter.

17) A 10–A current flows through a wire for 2.0 min. ($e = 1.60 \times 10^{-19}$ C)

(a) How much charge has passed through this wire?
(b) How many electrons have passed any point in the wire?

18) A total of 2.0×10^{13} electrons pass a given point in a wire in 15 s. What is the current in the wire? ($e = 1.60 \times 10^{-19}$ C)

19) In an electroplating process, it is desired to deposit 40 mg of silver on a metal part by using a current of 2.0 A. How long must the current be allowed to run to deposit this much silver? The silver ions are singly charged, and the atomic mass of silver is 108 g/mol. ($e = 1.60 \times 10^{-19}$ C, $N_A = 6.02 \times 10^{23}$ atoms/mol)

20) What potential difference is required across an 8.0–Ω resistor to cause 2.0 A to flow through it?

21) A light bulb operating at 110 V draws 1.40 A of current. What is its resistance?

22) A 12–V battery is connected across a 100–Ω resistor. How many electrons flow through the wire in 1.0 min? ($e = 1.60 \times 10^{-19}$ C)

23) A certain metal wire has a cross–sectional area of 1.0 cm^2 and a resistivity of $1.7 \times 10^{-8}\ \Omega \cdot m$. How long would it have to be to have a resistance of 1.0 Ω?

24) A rod is 4.0 m long and has a square cross–section that is 1.5 cm on each side. An ohmmeter measures 0.040 Ω across its ends. What is the resistivity of the material from which this rod is made?

25) A 1.0–mm diameter extension cord is made of metal having a resistivity of $1.68 \times 10^{-8}\ \Omega \cdot m$. When it carries a current of 15 A, what is the potential difference between two points in the cord that are 100 m apart?

26) A tube of mercury with resistivity $9.84 \times 10^{-7}\ \Omega \cdot m$ has a uniform electric field of 23 N/C inside the mercury. How much current is flowing in the tube, if the radius of the tube is 0.495 mm?

27) The power rating of a 400–Ω resistor is 0.800 W.

(a) What is the maximum safe voltage across this resistor?
(b) What is the maximum current the resistor can safely draw?

28) A light bulb operating at a dc voltage of 120 V has a resistance of 200 Ω. How much power is dissipated in this bulb?

29) A toaster is rated at 800 W when operating at 120 V dc. What is the resistance of its heating element?

30) How much does it cost to operate a 25–W soldering iron for 8.0 hours if energy costs 8.0¢/kWh?

31) How much energy does a 100–W light bulb use in 8.0 hours?

32) A 1500–W heater is connected to a 120–V line for 2.0 hours. How much heat energy is produced?

33) A battery is rated at 12 V and 160 A–h. How much energy does this battery store?

34) An electronic component with a 17–Ω resistor is rated for use at power levels not exceeding 14 W. How much current can safely flow through the component?

35) A 100–W driveway light bulb is on 10 hours per day. If the power company charges 10¢ for each kilowatt–hour of electricity used, estimate the yearly cost to operate the bulb if it is used every day for a 365–day year.

36) The temperature coefficient of resistivity of platinum is $3.9 \times 10^{-3}/\text{C}^\circ$. If a platinum wire has a resistance of R at a temperature of 23°C, to what temperature must it be heated in order to double its resistance to $2R$?

Answer Key
Testname: CH18_ELECTRIC_CURRENT

1) E
2) C
3) A
4) E
5) E
6) B, D, E
7) C
8) C
9) B
10) D
11) E
12) C
13) C
14) B
15) C
16) D
17) (a) 1200 C (b) 7.5×10^{21}
18) 0.21 μA
19) 18 s
20) 16 V
21) 78.6 Ω
22) 4.5×10^{19}
23) 5.9 km
24) 2.3×10^{-6} Ω • m
25) 32 V
26) 18 A
27) (a) 17.9 V (b) 44.7 mA
28) 72 W
29) 18 Ω
30) 1.6¢
31) 0.80 kWh
32) 11 MJ
33) 6.9 MJ
34) 0.91 A
35) $37
36) 280°C