

Ohm's Law Problems

ANSWER KEY

1. (a) What is the voltage across the resistor if the two cells are each 1.5 V in Figure 1?

$V = 3.0V$

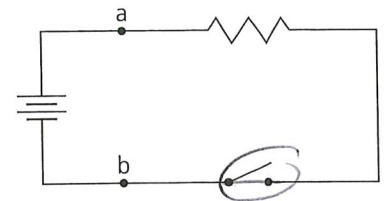


Figure 1

close cell

- (b) If a current of 0.10 A is measured at point a, what is the resistance of the resistor? What is the current at b?

$I = 0.10A$

2. If a toaster has a resistance of 220 Ω, how much current will it draw from a 110 V outlet?

$R = 220\Omega$

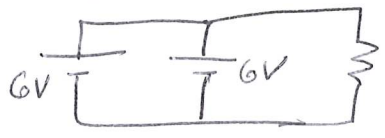
$I = \frac{V}{R} = \frac{110V}{220\Omega} = 0.5 V/\Omega$

$V = 110V$

$I = ?$

$I = 0.5A$

3. A calculator runs on two 6.0 V dry cells connected in parallel. If the calculator draws 0.001 A, how many milliamps (mA) does it draw? What is the effective resistance of the calculator?



$I = 1.0mA$

$R = \frac{V}{I} = \frac{6V}{0.001A} = 6000\Omega$

4. A resistor has a value of 100 Ω. If a current of 5 mA passes through it, what is the applied voltage?

$R = 100\Omega$

$I = 5mA = 0.005A$

$V = IR = (0.005A)(100\Omega)$

$V = 0.5V$

5. A resistance has a voltage of 10 mV (millivolts) applied to it. The current through the resistance is 0.5 mA. What is the value of the resistance?

$V = 10mV = 0.010V$

$I = 0.5mA = 0.0005A$

$R = \frac{V}{I} = \frac{0.010V}{0.0005A} = 20\Omega$

6. A hair dryer uses a current of 10 A when plugged into a 120 V outlet. What is the resistance of the hair dryer?

$I = 10A$

$V = 120V$

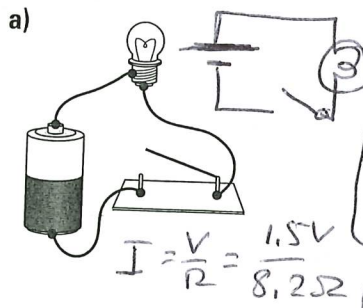
$R = ?$

$R = \frac{V}{I} = \frac{120V}{10A}$

$R = 12\Omega$

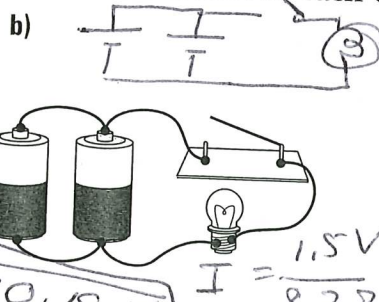
Ohm's Law Problems (continued)

7. Draw circuit diagrams for the following circuits. The resistance of the filament in each light bulb is 8.2Ω and the voltage of each cell is 1.5 V . Determine the current through the bulbs when the switch is closed in each circuit.



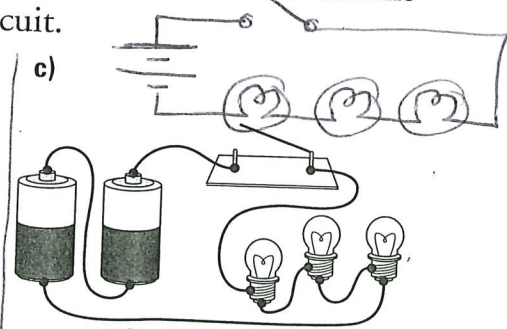
$$I = \frac{V}{R} = \frac{1.5\text{V}}{8.2\Omega}$$

$$= 0.18 \text{ A}$$



$$I = \frac{1.5\text{V}}{8.2\Omega}$$

$$I = 0.18 \text{ A}$$



$$I = \frac{2 \times 1.5\text{V}}{3 \times 8.2\Omega} = 0.12 \text{ A}$$

8. Complete the following chart.

Voltage (V)	Current (A or mA)	Resistance (Ω)
1000 V	5 A	200
250	0.5 A	500
4.5	900 mA = 0.9 A	5.0 Ω
1 V	250 mA = 0.25 A	4.0
4.0	2.0 A	2.0
12	400 mA = 0.4 A	30 Ω
15	0.5 A	30
9	0.05 A = 50 mA	180
12	600 mA = 0.6 A	20 Ω
0.05 V	50 mA = 0.05 A	1.0
6	3 A	2
12	750 mA = 0.75 A	16 Ω
3.0	0.03 A 30 mA	100
50 V	200 mA = 0.2 A	250
10	0.2 A	50

Chapter 10 Quiz

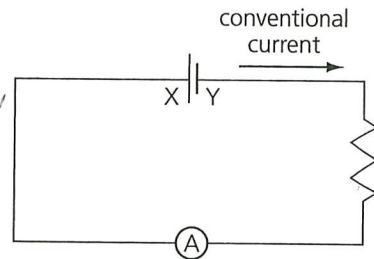
Part A: Modified True/False

Indicate whether each statement is true or false. If false, modify the statement to make the statement true.

F 1. The positive terminal of the cell in the figure is labelled "Y."

F 2. The arrow shows the direction of conventional current.

T 3. The direction of conventional current is opposite to the direction of electron flow.



Part B: Multiple Choice

Circle the letter beside the answer that best answers the question or completes the statement.

4. Three cells, each with a voltage of 1.3 V, are connected as shown in the circuit diagram. The cells are connected to a voltmeter. What is the voltage shown by the voltmeter?

(a) 0.65 V

(b) 1.3 V

(c) 2.6 V

(d) 3.9 V

5. What is the minimum number of cells needed to make a 6 V battery if each cell has an individual rating of 1.5 V?

(a) 1

(b) 2

(c) 3

(d) 4

6. A current of 24 mA is equivalent to

(a) 0.024 A

(b) 0.24 A

(c) 24 A

(d) 24 000 A

7. The circuit shows two light bulbs (L_1 and L_2).

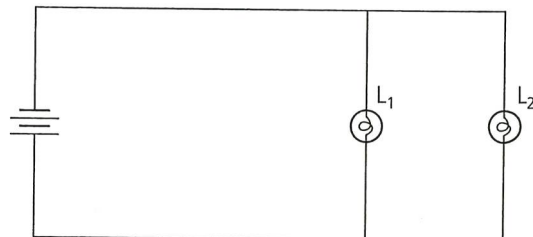
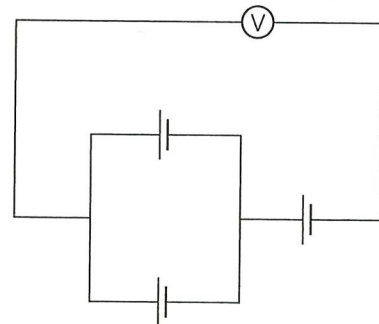
If the second light bulb (L_2) burns out, what happens to the first light bulb (L_1)?

(a) It goes out.

(b) It gets dimmer.

(c) It becomes brighter.

(d) It will stay on without changing its brightness.



Name: _____ Date: _____

Chapter 10 Quiz (continued)

8. Select the choice that indicates how a voltmeter and an ammeter are connected with the resistor.

	Voltmeter	Ammeter
(a)	in series	in series
(b)	in series	in parallel
(c)	in parallel	in series
(d)	in parallel	in parallel

9. A student connects a resistor as shown in the circuit in question 8. The ammeter has a reading of 41 mA and the voltmeter has a reading of 2.6 V. What is the resistance of the resistor?

- (a) 0.016 Ω (b) 0.28 Ω
(c) 16 Ω (d) 63 Ω

10. A student replaces the resistor in question 9 with a 22 Ω resistor. The voltmeter has a reading of 2.6 V. What is the ammeter reading?

- (a) 8.4 mA (b) 19 mA
(c) 57 mA (d) 120 mA

Part C: Short Answer Questions

Use complete sentences to answer each question.

11. What is the voltage in a 1 kΩ resistor having a current of 50 mA flowing through it?

$R = 1 \text{ k}\Omega = 1000 \Omega$
 $I = 50 \text{ mA} = 0.05 \text{ A}$

$V = IR = (0.05)(1000)$

$V = 50 \text{ V}$

12. Three 1.5 V dry cells are connected in parallel and hooked up to a single lamp with a resistance of 30 Ω. How much current is flowing through the lamp?



$I = \frac{V}{R} = \frac{1.5 \text{ V}}{30 \Omega} = 0.05 \text{ A}$

13. A 9 V battery is connected to three 30 Ω lamps that are connected in series. Draw a circuit diagram.

(a) What is the total resistance of the three lamps?

$R = 90 \Omega$

(b) How much current flows from the battery?

$I = \frac{V}{R} = \frac{9 \text{ V}}{90 \Omega} = 0.1 \text{ A}$

(c) What is the voltage across the first lamp?

$V_1 = IR_1 = (0.1 \text{ A})(30 \Omega) = 3 \text{ V}$

