Chapter 8 Ohm's law describes the relationship of current, voltage, and resistance.

Section 8.1 Electric Potential Energy and Voltage

Reading Checks

Pages 110–111

1. stored energy that has the potential to make something move or change
2. potential difference

Vocabulary Puzzle

Electricity crossword puzzle

Page 112

Across

2. potential energy
3. electrolyte
7. electrodes
9. coulomb
10. dry cell
13. voltage
14. electrochemical cell

Down

1. kinetic energy
2. potential difference
4. terminals
5. voltmeter
6. wet cell
8. volt
11. battery
12. energy

Cloze Activity

Electric potential energy

Page 113

1. energy
2. Answers can be in either order: electrochemical cell, battery
3. potential energy
4. chemical, electrical
5. separated
6. chemical
7. electrodes, electrolyte
8. negatively, positively
9. potential difference

Interpreting Illustrations

Electrochemical cells

Page 114

1. **(a)** positive terminal
   (b) plastic insulator
   (c) electrolyte
   (d) carbon rod
   (e) negative terminal
2. **(a)** negative terminal
   (b) positive terminal
   (c) lead plate
   (d) electrolyte

Assessment

Electric potential energy and voltage

Page 115

1. C **2.** F **3.** D **4.** A **5.** B **6.** B **7.** A **8.** A **9.** B **10.** A

Section 8.2 Electric Current

Reading Checks

Page 116

1. a complete pathway through which electrons can flow
2. ammeter

Applying Knowledge

Identifying circuit symbols

Page 118

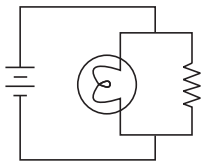
1. C, IV
2. B, V
3. D, II
4. E, I
5. A, III
6. In any order: conducting wire, battery, switch, bulb

Illustrating Concepts

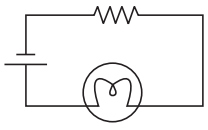
Drawing circuit diagrams

Page 119

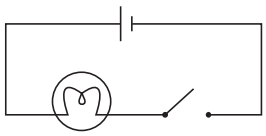
1.



2.



3.



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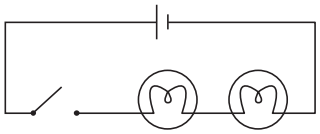


Comprehension

True or false?

Page 120

1. True

2. False. An electric load transforms **electrical energy into other forms of energy.**

3. True

4. True

5. False. A switch is a **device that can turn the circuit on and off by closing or opening the circuit.** *or* A **battery** is the source of electric potential energy in a circuit.

6. True

7. False. Current electricity is the **continuous flow of charge in a complete circuit.** *or* **Static electricity** is charge that remains stationary on an insulator.

8. True

9. False. Electric current is measured in **amperes.** *or* Potential difference (voltage) is measured in volts.

10. True

Assessment

Electric current

Page 121

1. A **2.** D **3.** B **4.** F **5.** C **6.** D **7.** A **8.** D **9.** A

Section 8.3 Resistance and Ohm's Law

Reading Checks

Page 123

1. Resistance equals voltage divided by current.

2. a component in an electric circuit that has a specific resistance

Comprehension

Voltage, current, and resistance

Page 124

1. **(a)** amount of charge passing a point in a conductor every second

(b) amount of electric potential energy per one coulomb of charge

(c) opposition to the flow of current through a circuit

(d) mathematical equation that shows how voltage, current, and resistance are related (resistance equals voltage divided by current)

(e) a component in a circuit that has a specific resistance, used to control current or voltage

	CURRENT	VOLTAGE	RESISTANCE
Symbol	I	V	R
Unit	amperes (A)	volts (V)	ohms (Ω)
Meter used for measurement	ammeter	voltmeter	ohmmeter
Symbol for Meter			
Formula	$I = V \div R$	$V = I \times R$	$R = V \div I$

Applying Knowledge

Calculations with Ohm's law

Page 125

2. $R = V \div I = 120\ \text{V} \div 10\ \text{A} = 12\ \Omega$

3. $V = I \times R = (0.2\ \text{A})(30\ \Omega) = 6\ \text{V}$

4. $I = V \div R = 3\ \text{V} \div 24\ \Omega = 0.125\ \text{A}$

5. $V = I \times R = (6\ \text{A})(20\ \Omega) = 120\ \text{V}$

Analyzing Information

Relationship between current, voltage, and resistance

Page 126

1. **(a)** As current increases, voltage increases.

(b) This suggests that there is a positive correlation between voltage and current. It also suggests that there is a direct relationship between voltage and current.

2. The voltage doubles when the current is doubled.

Assessment

Resistance and Ohm's law

Page 127

1. E **2.** F **3.** D **4.** A **5.** C **6.** B **7.** D **8.** A **9.** B **10.** B

11. B **12.** A

Chapter 9 Circuits are designed to control the transfer of electrical energy.

Section 9.1 Series and Parallel Circuits

Reading Checks

Page 128

1. an electric circuit with one path for current to take

2. an electric circuit with two or more pathways for electric current to take

Comprehension

Series or parallel?

Page 130

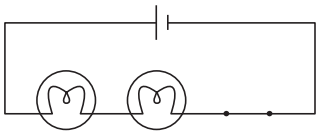
1. series
2. parallel
3. parallel
4. series
5. series
6. series
8. parallel
9. parallel
10. series
11. parallel

Interpreting Illustrations

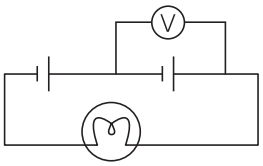
Is it in series or in parallel?

Page 131

1. B
2. D
3. E
4. A
5.



6.



Applying Knowledge

Calculations with series circuits

Page 132

1. (a) 10 Ω
(b) 3 A
(c) 18 V
(d) 12 V
2. (a) 18 V
(b) 2 A
(c) 3 Ω

Assessment

Series and parallel circuits

Page 133

1. B **2.** A **3.** A **4.** B **5.** A **6.** B **7.** B **8.** A **9.** C **10.** D

Section 9.2 The Power of Electricity

Reading Checks

Pages 134–135

1. $P = IV$
2. $E = Pt$

Comprehension

Power calculations

Page 136

1. $P = I \times V = (20)(240) = 3\ 600$ W
2. $P = I \times V = (12)(120) = 1\ 440$ W
3. $I = P \div V = 120 \div 15 = 8$ A
4. $I = P \div V = 210 \div 120 = 1.75$ A
5. $V = P \div I = 2.4 \div 0.8 = 3$ V
6. $P = I \times V = (2)(30) = 60$ W

Comprehension

Energy calculations

Page 137

1. $E = P \times t = (1.2)(0.5) = 0.6$ kW•h
2. $E = P \times t = (0.7)(12) = 8.4$ kW•h
3. $P = E \times t = 0.6 \div 6 = 0.1$ kW or 100 W
4. $t = E \div P = 1.75 \div 1 = 1.75$ h $\div 7 = 0.25$ h (15 min)
5. $P = I \times V = (3)(30) = 90$ W $= (0.09)(2) = 0.18$ kW•h

Applying Knowledge

Paying for electricity

Page 138

1. (a) $E = P \times t = (15)(240)(1.5)(0.09) \div 1000 = \$0.49$
(b) $E = P \times t = (0.1)(5)(0.09) = (\$0.05)(6) = \$0.27$
(c) $E = P \times t = (2)(120)(0.25)(24)(7)(0.09) \div 1000 = \$0.91$
2. $E = P \times t = (2.5)(120)(4)(7)(2)(0.09) \div 1000 = \$1.51$
3. $\$0.54 \div \$0.09 = 6$ kWh; $t = E \div P = 6 \div 4 = 1.5$ h

Assessment

The power of electricity

Page 139

1. A **2.** B **3.** E **4.** D **5.** B **6.** A **7.** B **8.** B