

**Science In Action 9**

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# **Electrical Principles & Technologies**

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## **Unit Test**

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**Name**

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**Class**

## 1.1 Static Electricity

1. When **charged objects** are brought close to uncharged objects, this occurs ...
  - A. separation
  - B. attraction
  - C. neutralization
  - D. atomization
2. When you feel or see a spark while touching a doorknob – after rubbing your feet across a carpet, the spark is referred to as ...
  - A. static spark
  - B. electric charge
  - C. static discharge
  - D. electrical discharge
3. This device cleans the air and recovers products from the smoke coming out of smokestacks by the static charge it produces. The device is called ...
  - A. a particle accelerator
  - B. an electric generator
  - C. an electrostatic precipitator
  - D. a catalytic converter

## 1.2 Current Electricity

4. An **electrical current** can only be produced if there is a ...
  - A. large quantity of particles
  - B. a steady flow of charged particles
  - C. a safe supply of energy
  - D. discharge of electricity
5. Very small amounts of electrical energy are measured by a voltmeter in **millivolts**, which equal ...
  - A. 100 volts
  - B. 1000 volts
  - C. 1 one hundredth of a volt
  - D. 1 one thousandth of a volt
6. High-voltage transmission lines often give off an **eerie blue glow**. Sailors saw this same glow around the tips of ships' masts just before storms. They called it ...
  - A. Blue Mist Rain
  - B. St. Elmo's Fire
  - C. Sun Spot Sparkle
  - D. Mystic Glow

## 1.3 Electrical Safety

7. When lightning hits an area where there is sand and rock, these **glass-lined tubes** can be created. They are called ...
  - A. stalagmites
  - B. stalactites
  - C. fulgurites
  - D. fusinites

8. The **dangers of electrical shock** can vary depending on the situation. Which of the following would be the most dangerous (most likely to get a nasty shock!) ...
- A. Touching an electrified fence on a hot summer day while wearing running shoes.
  - B. Touching an electrified fence when you are barefoot in a rainstorm.
  - C. Touching a metal fence on a hot summer day while wearing running shoes.
  - D. Touching a metal fence when you are barefoot in a rainstorm.
9. A fuse and a circuit breaker interrupt a circuit when there is too much current flowing. The disadvantage of the fuse is that it ...
- A. can be easily repaired
  - B. has to be replaced when it works
  - C. doesn't work on really small overloaded circuits
  - D. can be used over and over – taking a long time to wear out

### 1.4 Cells and Batteries

10. Lead and zinc are usually used as the metal electrodes in a wet cell, such as a car battery. The sulfuric acid electrolyte reacts with the metal electrodes to make the battery produce electrical energy. Identify the statement that explains this correctly
- A. The electrolyte gradually eats the **lead** electrode giving it a **negative** charge
  - B. The electrolyte gradually eats the **zinc** electrode giving it a **negative** charge
  - C. The electrolyte gradually eats the **lead** electrode giving it a **positive** charge
  - D. The electrolyte gradually eats the **zinc** electrode giving it a **positive** charge
11. A **rechargeable battery** can be recharged because the ...
- A. chemical reactions can be reversed
  - B. electrodes can be reversed
  - C. electrolyte is being replaced
  - D. wet cells are drying out
12. Less expensive products can be coated with a thin layer of an expensive metal (like gold) to make them look more expensive and to make them last longer (helps prevent rusting). This **process** is called...
- A. electricity
  - B. electroplating
  - C. electrolysis
  - D. electrorefining

### 2.1 Controlling the Flow of Electrical Current

13. Electricity can be conducted by a gas. A good example of this is neon, which glows
- A. purple
  - B. orange-pink
  - C. yellowish-white
  - D. red
14. Solutions can also be resistors. The more charged particles in a solution,
- A. the more molecules it has
  - B. the more resistance it has
  - C. the less resistance it has
  - D. the fewer molecules it has

15. A lie detector indicates that a person is telling a lie because there is
- A. a decrease in resistance
  - B. an increase in resistance
  - C. no change in conductivity
  - D. a decrease in conductivity

## 2.2 Modeling and Measuring Electricity

16. A waterfall can be used to model current, voltage and resistance. If a fast flowing waterfall has a large number of very large boulders, it models greater resistance. Resistance is represented by ...
- A. the speed of the water
  - B. the size of the waterfall
  - C. the size of the boulders
  - D. the height of the waterfall


17. Using Ohm's Law ( $R = V / I$ ) calculate how much current is created when a **30 V** battery creates the current through a **15  $\Omega$**  resistor. Use this shortcut formula to solve the problem

- A. 0.5 A
- B. 2 A
- C. 45 A
- D. 1.5 A

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

18. Resistance varies with the length, length and thickness of the wire used for resistance. In general, resistance increases as the
- A. length and thickness increases
  - B. length and thickness decreases
  - C. length increases and thickness decreases
  - D. length decreases and the thickness increases

## 2.3 Analyzing and Building Electrical Circuits

19. Symbols are used to represent the electrical components in a schematic diagram. This symbol  is used to represent ...

- A. gauge of wire
  - B. generator
  - C. galvanometer
  - D. gap
20. A circuit that has only one pathway for the electricity to flow is called a
- A. series circuit
  - B. parallel circuit
  - C. integrated circuit
  - D. schematic circuit
21. Solid state components are used in many electronic devices. These are made from a solid material that has no moving parts. They are also called ...
- A. resistors
  - B. transistors
  - C. micro-components
  - D. photo-conductors

### 3.1 Energy Forms and Transformations

22. Electrical energy can be produced from other forms of energy, or it can be converted into other kinds of energy. The conversion in a battery is
- A. chemical energy into mechanical energy
  - B. mechanical energy into electrical energy
  - C. chemical energy into electrical energy
  - D. solar energy into electrical energy
23. A device which converts thermal energy into electrical energy is a
- A. thermostat
  - B. photoelectric cell
  - C. piezoelectric crystals
  - D. thermocouple
24. Based on the main purpose for which it is used, electrical devices can be grouped into four main categories, which include all of the following except.
- A. heat-producing
  - B. light-producing
  - C. chemical-producing
  - D. sound-producing

### 3.2 Energy Transformations Involving Electrical and Mechanical Energy

25. Drills, saws, vacuums, fans and food processors are all examples (applications) of this type of energy conversion ...
- A. electrical energy to mechanical energy
  - B. mechanical energy to thermal energy
  - C. electrical energy to chemical energy
  - D. mechanical energy to sound energy
26. When electrical energy passes over a compass, this happens to the compass needle. It
- A. spins
  - B. is deflected
  - C. rotates clockwise
  - D. rotates counterclockwise
27. Mr. Jones was trying to make an electromagnetic coil to demonstrate the power it has. His coil worked, but not very well. The most likely reason was because the
- A. coil was made of copper wire
  - B. battery was brand new
  - C. metal core was too thin
  - D. battery was dead

### 3.3 Measuring Energy Input and Output

28. It is necessary for Urban power companies to reduce voltage to communities. They are able to do this with a step-down transformer. This type of transformer reduces voltage because...
- A. the primary coil is larger than the secondary coil
  - B. the secondary coil is larger than the primary coil
  - C. it is coiled in reverse directions
  - D. it is coiled with more wires

29. The primary difference between direct and alternating current is that direct current .
- A. flows in only one direction
  - B. flows back and forth 10 times per second
  - C. flows back and forth 30 times per second
  - D. flows back and forth 60 times per second

### 3.4 Reducing the Energy Wasted by Devices

30. A kitchen clock is usually left on all day. It has a power rating of 4 watts. With the cost of electricity, in Alberta, \$0.11 per kilowatt hour, what is the cost of operating the clock for one year?
- A. \$ 385.44
  - B. \$ 38.54
  - C. \$ 3.85
  - D. \$ 0.39
31. A ghetto blaster has a power rating of 28 watts. If it was on each day (all day) during an average month (30 days) and the cost of electricity, in Alberta, is \$0.11 per kilowatt hour. What is the cost of operating the ghetto blaster for one month?
- A. \$ 221.78
  - B. \$ 22.18
  - C. \$ 2.22
  - D. \$ 2217.60
32. The efficiency of a device is the ratio of the useful energy that comes out of a device to the total energy that goes in. A light bulb gives off 5J of useful light energy for every 100J of electrical energy used to make it work. What is the efficiency of the light bulb?
- A. 105 %
  - B. 95 %
  - C. 20 %
  - D. 5 %

### 4.1 Electrical Energy Sources and Alternatives

33. Garbage is another source of fuel used to generate electrical energy. The particular type of garbage used is called
- A. bio-sludge
  - B. biomass
  - C. bio-matter
  - D. bioaccumulation
34. Water can also be used to generate electrical energy. The energy conversion is ...
- A. mechanical to gravitational to electrical
  - B. electrical to mechanical to gravitational
  - C. gravitational to electrical to mechanical
  - D. gravitational to mechanical to electrical
35. A single windmill produces a small amount of electricity, but many connected together can generate a large amount of electricity. Many windmills connected together are called wind...
- A. farms
  - B. clusters
  - C. groups
  - D. arrays

## 4.2 Electricity and The Environment

36. Sustainability means using resources at a rate that ...
- A. will eventually deplete them
  - B. can be maintained indefinitely
  - C. can generate more through regeneration
  - D. will compensate and eliminate waste
37. Using less energy will ensure that we will have energy in the future. Which of the following saves the most energy?
- A. Buying gas at the cheapest price
  - B. Using natural gas as a fuel
  - C. Buying an electric car
  - D. Buying a solar car
38. The very first electrical communication took place in 1844. Samuel Morse developed a series of dots and dashes (short and long electrical signals) to send messages from one place to another. The device that helped him accomplish that was the ...
- A. telephone
  - B. phonograph
  - C. telegraph
  - D. simple computer

## 4.3 Electrical Technology and Society

39. Storing and transmitting the information that is converted into numbers is accomplished by different technologies. A compact CD player is able to scan these numbers with the use of a ...
- A. laser
  - B. silicon chip
  - C. photodetector
  - D. electromagnetic coil
40. A hard drive in a computer is able to read and write information. The transmission of information happens when the hard drive sends information to the central processor after it ...
- A. stores the information
  - B. writes the information
  - C. converts the information
  - D. reads the information

**Identify the Electricity RULE not being observed in each scenario below**

41. "The problem with this computer game", said Matt, "is that the power bar keeps popping its circuit. I think that I need a better power bar, so I can play my game without interruption."
- A. Don't use electricity near water
  - B. Improper or unsafe equipment
  - C. Keep a safe distance high voltage
  - D. Don't use more electricity than recommended
42. Mr. Jones was cutting his lawn with his new electric lawn mower. He even continued, when it started to rain, because this model was able to pick up wet clippings with ease
- A. Don't use electricity near water
  - B. Improper or unsafe equipment
  - C. Keep a safe distance high voltage
  - D. Don't use more electricity than recommended
-

## ADDITIONAL Questions

(use the space below) ----- (10 marks)

**Search engines** were designed to sort out the '**information overload**' on the Internet. Describe an advantage of a Search Engine and a disadvantage.

Advantage - \_\_\_\_\_  
\_\_\_\_\_

Disadvantage - \_\_\_\_\_  
\_\_\_\_\_

### Circuits

Illustrate the following **symbols** that are often used in a *schematic* diagram  
[http://www.geocities.com/talkingelectronics/Circuit\\_Symbols.html](http://www.geocities.com/talkingelectronics/Circuit_Symbols.html)

<b>9V Battery</b>	<b>lamp</b>	<b>rheostat</b>	<b>motor</b>

Draw a schematic of a **parallel circuit**. (2 Marks)

It should have:

- 2 lamps, each of which can be turned off separately by its own switch,
- 1 lamp, which can be dimmed or brightened with a rheostat,
- 1 buzzer, which can be controlled independently by a switch,
- and 1 switch, which will shut everything off at once.



Complete these **Numerical Response Questions** in this booklet ...

1. A motor has an internal resistance of **12.1 Ω**. The motor is in a circuit with a current of **4.0 A**

What is the voltage?

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

.	.		
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

2. A current of **400 mA** runs through a bulb that is connected to **25V**.

What is the resistance of the bulb?

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

.	.		
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

3. Match the form with its description

There are four common forms of energy:

- 1 - Chemical
- 2 - Electrical
- 3 - Mechanical
- 4 - Thermal

         stored             charged             moving             kinetic

.	.		
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

4. There are many different alternative energy sources including:

- 1 – Tidal
- 2 – Wind
- 3 – Solar
- 4 – Waterfall


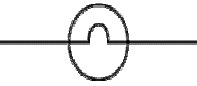


Match the Type of alternative energy you would most likely find in each region.

Alta    N.S.    B.C.    Ont.

.	.		
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

## Science In Action 9 - Unit Test - Answer Key

# Electrical Principles & Technologies

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	<b>A</b>	<b>C</b>	<b>C</b>	<b>D</b>	<b>B</b>	<b>D</b>	<b>A</b>
<b>Page 6</b>	36	37	38	39	40	41	42
	<b>B</b>	<b>D</b>	<b>C</b>	<b>A</b>	<b>D</b>	<b>D</b>	<b>A</b>
<b>Short Answers</b>	<b>Advantages</b>			<b>Disadvantages</b>			
	- able to locate many sources - quick and convenient			- unreliable - limited database			
<b>9V Battery</b>	<b>lamp</b>		<b>rheostat</b>		<b>motor</b>		
			Rheostat (Variable Resistor) 				
<b>Circuit Diagram</b>							
Student answers will vary but should correctly illustrate a <b>parallel circuit</b>							
<b>Numerical Response</b>							
1	2		3		4		
<b>4 8 . 4</b>	<b>6 2 . 5</b>		<b>1 2 3 4</b>		<b>2 1 4 3</b>		