

REVISED EDITION

short  
readings  
in science

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A SCITECH READER

Dean Curry

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**A SCI/TECH READER**

Dean Curry

Intermediate/Advanced Level

English Language Programs Division  
Bureau of Educational and Cultural Affairs  
United States Information Agency  
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# FOREWORD

*Short Readings in Science* is aimed at the intermediate/advanced student of English as a foreign language who is also a student of science or technology. Although the reading material is not highly technical in nature, it can be used as an introduction to science-based information with its accompanying specialized lexicon. Thus, in a limited sense, the text can serve in some ESP-related classes as well as in general EFL classrooms in which a variety of reading material is used. The readings are short and are designed for rapid reading for content with intensive work for comprehension, word study, and grammatical “nuances” being relegated to the end-of-chapter exercises. Where possible, a number of illustrations have been incorporated into the chapters as an aid to comprehension/clarification. The Vocabulary List includes items above the 3,000-word level as determined by the *New Horizon Ladder Dictionary*. An Answer Key to the exercises is available as a separate publication.

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## SCIENCE BRIEFS

### Flying Monster

[1] The skeletal remains of a huge winged reptile, extinct for some 60 million years, have been found in the United States in the state of Texas. Its wingspan of 15.5 meters is greater than that of a modern jet fighter plane. The fossil remains indicate that the Texas pterosaur, according to its discoverer Douglas Lawson, a graduate student at the University of California at Berkeley, "is without doubt the largest flying creature presently known."

[2] The area in which the remains were found suggests that the pterosaur ate carrion and that it really could fly, instead of gliding from cliffs or mountains. "The soaring capacity of large pterosaurs was probably similar to that of vultures," says Lawson, "and the pterosaur had a neck long enough to probe into the carcass of a dinosaur."

### Barnacle Glue

[3] Barnacles, those bothersome little marine animals that attach themselves to everything underwater from dock pilings to ship hulls, may be of great help to the medical world.

[4] When the barnacle reaches its final larval form, a clear liquid cement, which enables it to attach itself to any inanimate object, is secreted from its antenna. After anchoring itself, the barnacle sheds its skin and forms a shell; as it grows to adulthood, more glue is produced to hold the barnacle firmly to its chosen home.

[5] This glue is what interests scientists. Nothing seems to dissolve it—water, exposure to high temperatures, or attack by bacteria. A cement like this, scientists feel, would be ideal for dentistry and medicine. It could be used to glue fillings into teeth or as fillings themselves; and, because it is tough and flexible, it could be helpful in mending broken bones.

[6] Dr. Paul Cheung of the Osborn Laboratories of Marine Sciences in Brooklyn, New York, is now in the process of trying to identify the components of barnacle glue so that it can be made in the laboratory. His studies may also aid the shipping industry to solve one of its major problems—how to prevent the costly buildup of barnacles on ship bottoms.

### "Slippery" Water

[7] Take some ordinary water, add long strings of molecules called polymers and it will flow faster and farther than regular water through a pipe or a fireman's hose.

[8] Dr. Carl Gryte and graduate student Jay Chapman of Columbia University in New York have found that the polymers make water slip and slide

over solid surfaces. One such polymer, polyethylene oxide, looks like a string of beads; each bead on the "necklace" is one small molecule. Research by the Rand Institute of New York City has shown that "slippery" water flows 70 percent faster than ordinary water and travels twice as far under the same pressure.

[9] Once it is known how these polymer "necklaces" work, scientists feel they may be of great help in saving energy. If polymers were attached to the insides of pipes, for example, less energy would be needed to pump water for irrigation.

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## EXERCISES

### I. Identification: Identify or define the following.

*pterosaur*

*barnacle*

*polyethylene oxide*

### II. Completion: Complete the following statements using information from "Science Briefs."

1. \_\_\_\_\_ make water flow more easily over solid surfaces.
2. Barnacles secrete a clear liquid cement from their \_\_\_\_\_ during the \_\_\_\_\_ stage of their growth.
3. The pterosaur, remains of which were found in the state of \_\_\_\_\_, has been extinct for more than \_\_\_\_\_ years.
4. Scientists feel that barnacle glue could be used in dentistry to \_\_\_\_\_ and in medicine to \_\_\_\_\_.
5. Because it looks like a \_\_\_\_\_, polyethylene oxide is called a polymer \_\_\_\_\_.
6. Dr. Paul Cheung's present job of research is trying to \_\_\_\_\_ of barnacle glue.
7. \_\_\_\_\_ water flows 70 percent faster than ordinary water.
8. The wings of a pterosaur are \_\_\_\_\_ long.
9. Barnacles are \_\_\_\_\_ animals that attach themselves to \_\_\_\_\_ pilings and ship \_\_\_\_\_.
10. By attaching polymers to the insides of pipes, less \_\_\_\_\_ would be needed to pump water for \_\_\_\_\_.

### III. True-False: Write + if the statement is true and 0 if it is false and then correct the false statements to make them true.

- \_\_\_ 1. Dr. Paul Cheung has done important research with polymers.
- \_\_\_ 2. Pterosaurs have been discovered near Berkeley, California.
- \_\_\_ 3. Barnacles produce liquid cement in their larval form.
- \_\_\_ 4. Polyethylene oxide is a polymer that can be used to make "slippery water."

- \_\_\_ 5. Pterosaurs had wings longer than those of a modern jet fighter plane.
- \_\_\_ 6. Barnacles create more glue as they grow to adulthood.
- \_\_\_ 7. "Slippery water" can save energy if used in the insides of pipes.
- \_\_\_ 8. Glue from barnacles can be combined with "slippery water" to produce a new kind of polymer.
- \_\_\_ 9. Pterosaurs could fly in a manner like that of vultures.
- \_\_\_ 10. Barnacles secrete liquid cement from their shells.

#### IV. Word Study

- A. Find the equivalent of the following words or expressions in column B.  
 B. Write the letter of the equivalent in the blank.

| <i>Column A</i>       | <i>Column B</i> |
|-----------------------|-----------------|
| ___ 1. according to   | a. truly        |
| ___ 2. presently      | b. in order to  |
| ___ 3. really         | c. doubtless    |
| ___ 4. probably       | d. securely     |
| ___ 5. similar (to)   | e. for instance |
| ___ 6. firmly         | f. like         |
| ___ 7. so that        | g. says         |
| ___ 8. also           | h. perhaps      |
| ___ 9. for example    | i. too          |
| ___ 10. without doubt | j. now          |

- B. Match the verbs in column A with their synonyms in column B. Place the letter of your answer in the blank.

| <i>Column A</i> | <i>Column B</i> |
|-----------------|-----------------|
| ___ 1. indicate | a. examine      |
| ___ 2. form     | b. recognize    |
| ___ 3. seem     | c. make         |
| ___ 4. mend     | d. appear       |
| ___ 5. prevent  | e. show         |
| ___ 6. probe    | f. repair       |
| ___ 7. identify | g. stop         |

- C. Circle the word similar in meaning to the first word.

- 1. *huge*—tall, big, dark, lazy
- 2. *modern*—recent, shy, wet, convenient
- 3. *final*—first, long, last, full
- 4. *clear*—sharp, common, bright, orderly
- 5. *inanimate*—dead, visible, historical, flexible
- 6. *tough*—hard, strong, ordinary, ideal
- 7. *major*—extinct, marine, main, final
- 8. *ordinary*—daily, costly, plain, weak

**V. Grammar Practice**

- A. List the verbs in the passive voice and then change them to the active voice.
- B. Noun clauses (embedded statements) are often used as direct objects after certain verbs or as the subject of a verb. *That* or *what* are the connectives or markers most often used to introduce noun clauses. Find the noun clauses used as objects or complements of the verb in paragraphs 1, 2, 5, and 8.

**VI. Dictation.** Copy paragraph 5 as your teacher dictates it.



# TORNADOES

[1] The great power of tornadoes is almost unbelievable. The speed of this whirling funnel-shaped wind may be more than 800 kilometers per hour. It can tear up trees, carry buildings away, and can even lift large trucks off the highway. The tornado is like a giant vacuum sweeper that sucks up anything in its path. Experts believe that the most violent force of a tornado is found inside the funnel, where a vacuum is created because of a very low air pressure. When this vacuum moves over a building which is filled with air under normal pressure, the difference between the air pressure inside the building and that outside causes the building to explode. The largest tornado on record had a funnel two kilometers wide.

[2] There are many interesting stories about the strange things that tornadoes have done in the United States. Common wheat straw has been driven several centimeters onto posts and trees. Buildings have been turned completely around on their foundations and have remained intact. People and animals have been carried hundreds of meters, often suffering no physi-

*This is reported to be the first photograph ever taken of a tornado, a violent funnel-shaped wind that usually destroys everything in its path. The picture was taken in the United States around 1880. Photography helps meteorologists understand the behavior of these "killer funnels."*



cal harm. Feathers have been removed from chickens. Cars, trucks, and even whole freight trains have been carried away.

[3] A few years ago in the state of Indiana, three people were walking into a church just as a tornado struck. Two walked up the steps into the church building and the third person went down into the basement. In that moment, the church building was carried away and the two persons upstairs were killed. The one in the basement was not hurt.

[4] Fortunately, a tornado does not last long, about 20 to 30 minutes on the average. Usually, it destroys an area about 26 kilometers long, and the great damage that it does in one place lasts only about 30 seconds. Tornadoes normally occur on hot, humid days but not necessarily in the summer. The biggest and most destructive tornado in the United States struck on March 18, 1925. Roaring along at a speed of 96 kilometers per hour, it swept clean a path two kilometers wide across the states of Missouri, Illinois, and Indiana. In its 354-kilometer long journey across these three states, the tornado killed 689 people.

[5] More than 200 tornadoes strike in the United States every year. It is not possible to predict when a tornado will strike although the U.S. Weather Bureau gives storm warnings when conditions are right to cause a tornado. The safest place to be if a tornado seems likely is in some underground area such as a cellar or a basement.

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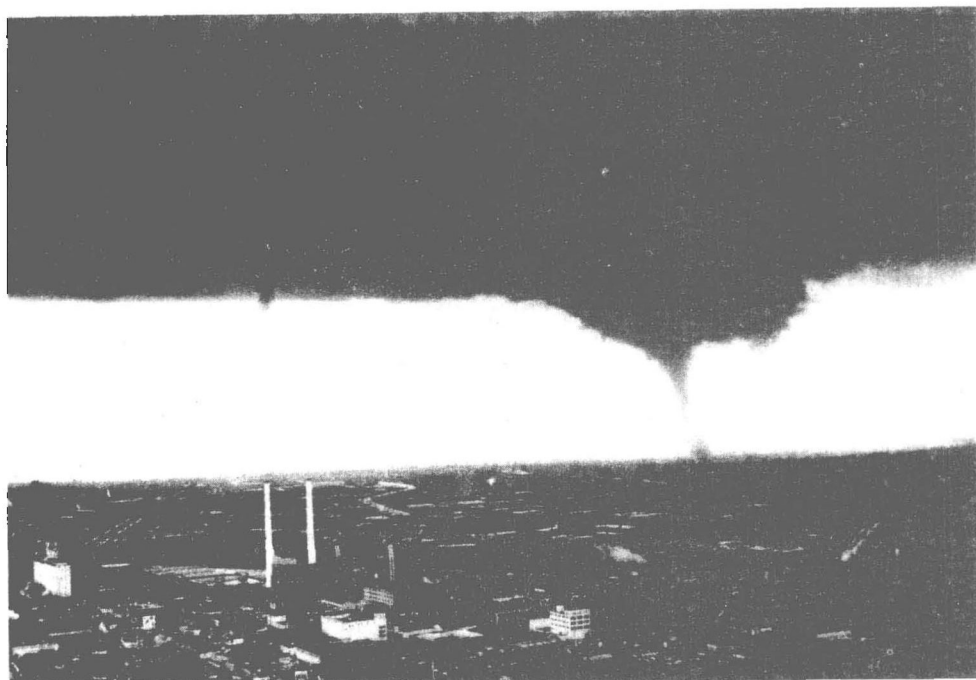
## EXERCISES

I. **Multiple Choice:** Circle the number of the item that best completes the sentence.

1. Low air pressure inside the funnel of a tornado creates (1) tension (2) vacuum (3) wind (4) speed.
2. Wheat straw has been driven into (1) posts (2) freight trains (3) churches (4) people.
3. The average duration of a tornado is about (1) five to ten minutes (2) 20 to 30 minutes (3) one hour (4) one day.
4. A tornado may reach a speed of more than (1) 800 (2) 1,125 (3) 1,600 (4) 80 kilometers per hour.
5. The best kind of weather for a tornado is (1) dry and dusty (2) hot and windy (3) cloudy and rainy (4) hot and humid.
6. The largest recorded tornado funnel was (1) two kilometers (2) six kilometers (3) ten kilometers (4) 18 kilometers wide.
7. A safe place to be in case of a tornado is (1) in a church (2) in a tall building (3) under a tree (4) in a basement.

II. **True-False:** Write + if the statement is true and 0 if it is false and then correct the false statements to make them true.

- \_\_\_\_\_ 1. The U.S. Weather Bureau gives warnings when weather conditions are favorable for a tornado.



*Aerial view of Dallas, Texas, showing an oncoming tornado.*

- \_\_\_ 2. Tornadoes occur only during the summer months.
- \_\_\_ 3. A cellar is a good place to be during a tornado.
- \_\_\_ 4. Tornadoes have enough force to move mountains.
- \_\_\_ 5. Usually, tornadoes destroy areas as large as 80–160 square kilometers.
- \_\_\_ 6. There have been instances in which tornadoes removed the feathers from chickens.
- \_\_\_ 7. The unequal air pressure brought by a tornado can cause buildings to explode.
- \_\_\_ 8. Fortunately, tornadoes occur in the United States only every 20 years.
- \_\_\_ 9. The most destructive tornado to strike the United States happened during the fall of the year.

### III. Word Study

A. In each of the following lists of words, one does not belong. Draw a circle around it.

- 1. highway, truck, feather, speed
- 2. upstairs, basement, building, train
- 3. remove, remain, carry away, take
- 4. wind, air, storm, journey
- 5. common, ordinary, plain, giant

B. Give the noun form of the following verbs.

1. believe \_\_\_\_\_
2. create \_\_\_\_\_
3. explode \_\_\_\_\_
4. roar \_\_\_\_\_
5. predict \_\_\_\_\_
6. cause \_\_\_\_\_
7. remove \_\_\_\_\_
8. remain \_\_\_\_\_

#### IV. Grammar Practice

- A. **Adjective Clauses:** These clauses always have subject/verb word order and modify nouns and pronouns. Adjective clauses are introduced by *that*, *which*, *who*, or *whom*. Underline the adjective clauses in paragraphs 1, 2, and 4. Give their antecedents.
- B. **Noun Clauses:** These clauses are embedded statements and are often used as direct objects of certain verbs or as the subject or complement of a verb. *That* and *what* are the relative pronouns most often used to introduce noun clauses. Underline the noun clauses in paragraph 1.
- C. **Adverbial Clauses:** *When* and *while* are generally used to introduce adverbial or time clauses which modify verbs or adverbs. Find the adverbial clauses(s) in paragraph 1. List the verb or adverb modified.
- D. List the verbs in the present perfect tense, active or passive voice.
- V. **Dictation:** Copy paragraph 2 as your teacher dictates it.

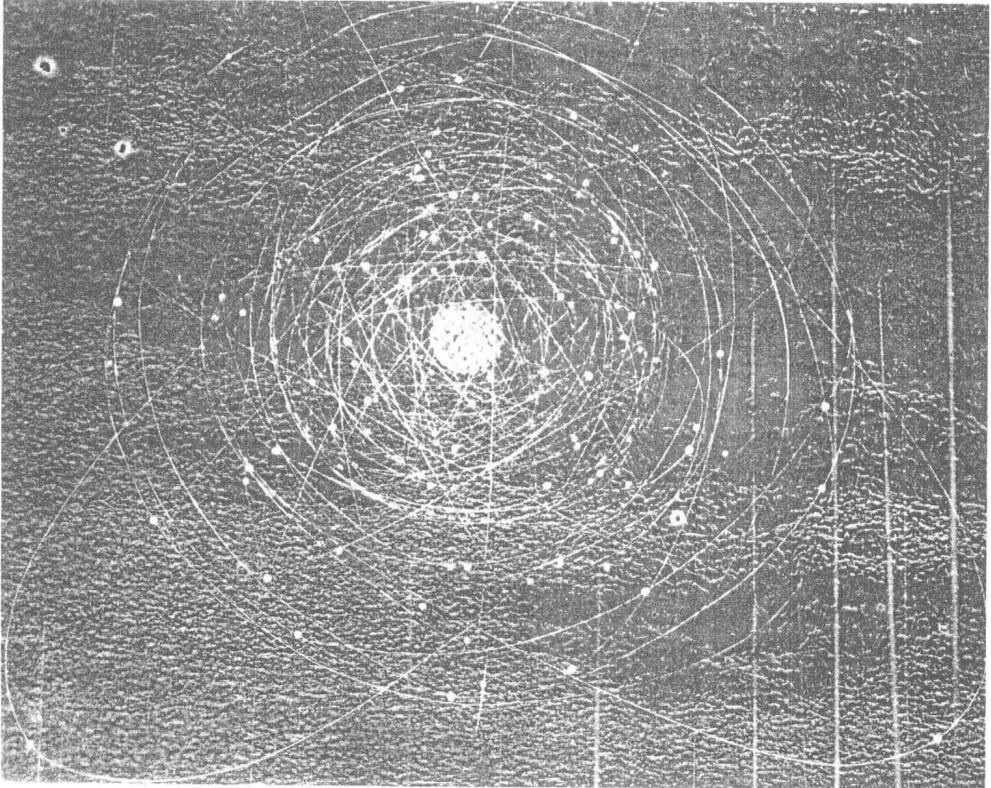
## ELECTRICITY: THE FORCE THAT TRANSFORMED THE WORLD

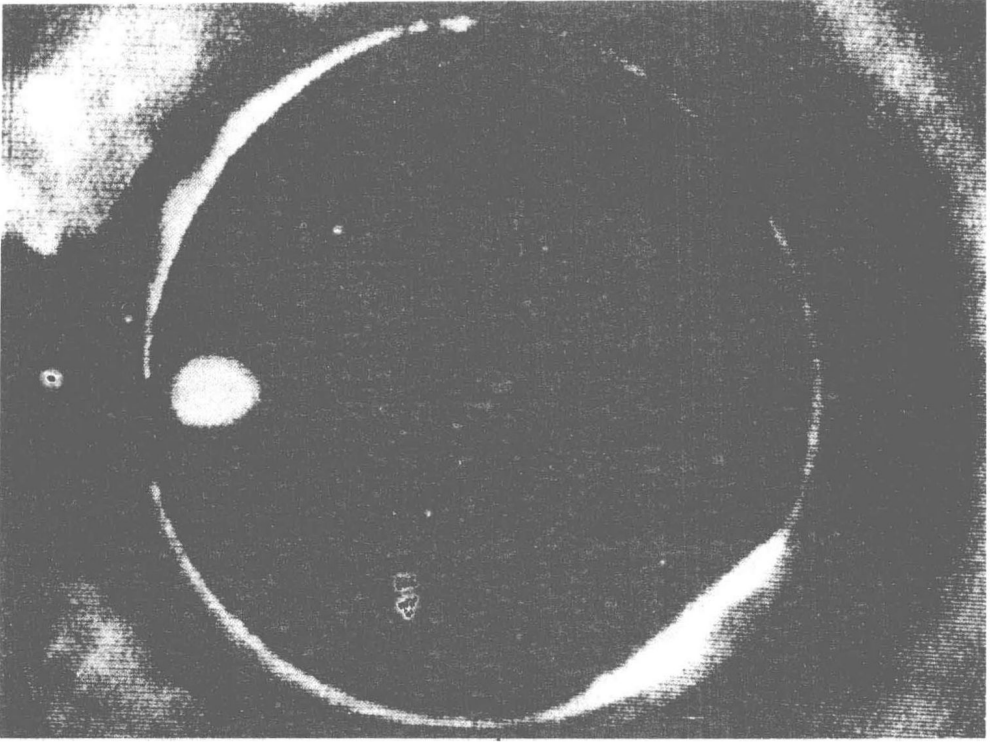
[1] In order to talk about electricity, it is necessary first to talk about the atom. The idea of the "atom" has a long history, one extending back to about 600 B.C. and the time of the ancient Greeks. They believed that all matter was made up of atoms. The word "atom," in fact, comes from the Greek word "atmos," which means "indivisible." It was not until 1897 that it was discovered that the atom is not indivisible but is composed of even smaller particles. Among these particles is one called the *electron*.

[2] Electrons orbit around the center or nucleus of the atom, much as the planets in the solar system orbit around the sun. Electrons closer to the nucleus are held more tightly than those in the outer orbits. It is the electrons in the outermost orbit of certain kinds of atoms that can be made to flow as electric current.

[3] Electrons flow easily through certain kinds of materials called "conductors." Many metals, such as silver, copper, gold, and aluminum, are good conductors. Good conductors are used in electric circuits to provide a path for the current.

*A representation of an atom of a plutonium.*





*Physicists at the University of California in Berkeley have taken the first photograph showing electricity in liquid form. It shows what the scientists call "electron-hole drop" created by laser light in a small circular crystal of an extremely cold germanium. Germanium is a chemical element of the class known as semiconductors, which are important in the technology of transistors, solar cells, and computers.*

[4] Other substances provide strong resistance to the flow of current. These substances are called "insulators," which are used to confine a current to the desired path. Substances, such as hard rubber, glass, wax, and certain kinds of plastic, are good insulators. Thus, the cord on an electric appliance consists of a piece of wire, generally copper, surrounded by a type of plastic or vinyl, which is the insulator confining the current to its path.

[5] The pressure that makes electrons flow along wires is called "voltage." Voltage may be created by a generator at a power plant or by an electric battery. When you turn on a light or an electric appliance, electrons are drawn from a generator at a power plant. When you turn the light or appliance off, there will be electric pressure or voltage built up at the switch, but no current will flow. It is somewhat similar to the way a water system works.

[6] When you turn on a water faucet, water flows through the pipes, which is like electric current flowing through wires. When you turn off a faucet, water pressure remains but no water flows through the faucet. Similarly, when you turn off an electric appliance, voltage remains, but no current flows. In a water system, the whole operation depends on water pressure generated by a water pump. In an electric system, the generator (or battery) creates the pressure called voltage.

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Adapted from *Lines*, a publication of the Potomac Electric Power Company (PEPCO), and reprinted with permission.

## EXERCISES

I. **Multiple Choice:** Circle the number of the item that best completes the statement.

1. Electrons will flow easily through copper and silver because they are good (1) particles (2) conductors (3) regulators (4) insulators.
2. Electrons are smaller particles of (1) circuits (2) currents (3) voltage (4) atoms.
3. One function of an insulator is to confine an electric current to its (1) voltage (2) orbit (3) path (4) generator.
4. Similar to the way that planets orbit around the sun, electrons in an atom orbit around the (1) nucleus (2) generator (3) flow (4) voltage.
5. A substance that offers strong resistance to the flow of electric current is called (1) a battery (2) a conductor (3) an appliance (4) an insulator.
6. Another term for electric pressure is (1) current (2) voltage (3) faucet (4) switch.
7. Rubber, glass, and wax are good (1) insulators (2) conductors (3) regulators (4) generators.
8. At a power plant a generator is used to create voltage, which is the pressure that makes (1) atoms (2) circuits (3) electrons (4) orbits flow along electric wires.

II. **True-False:** Write + if the statement is true and 0 if it is false and then correct the false statements to make them true.

- \_\_\_ 1. With a light turned off no current will flow but there will be voltage at the switch.
- \_\_\_ 2. It was discovered in 1897 that the electron was made up of particles called atoms.
- \_\_\_ 3. An electric cord consists of wire surrounded by an insulator.
- \_\_\_ 4. Electrons closer to the nucleus of an atom can easily be made to flow as electric current.
- \_\_\_ 5. Plastic or vinyl are often used as conductors.
- \_\_\_ 6. Voltage can be created by a battery.
- \_\_\_ 7. When a switch is turned on, voltage will prevent current from flowing.
- \_\_\_ 8. The Greeks believed that all electricity was made of atoms and electrons.
- \_\_\_ 9. Aluminum and gold can be used as conductors.

### III. Word Study

A. In the following list of words, one does not belong. Draw a circle around it.

1. copper, gold, planet, aluminum
2. voltage, plastic, vinyl, rubber
3. nucleus, atom, electron, wax
4. circuit, conductor, particle, current
5. faucet, matter, substance, material
6. generator, pump, battery, voltage
7. pipe, pump, faucet, glass

B. From column B select the equivalent of the italicized expression in column A and place the letter of your answer in the blank. In some cases more than one answer is possible.

| Column A   | Column B             |
|--|----------------------|
| ___ 1. <i>in order to</i> talk about electricity       | a. yet               |
| ___ 2. composed of <i>even</i> smaller particles       | b. similar to        |
| ___ 3. <i>much</i> as the planets                      | c. in most cases     |
| ___ 4. metals <i>such as</i> silver, copper            | d. about the same as |
| ___ 5. <i>Thus</i> , the cord on an electric appliance | e. still             |
| ___ 6. <i>generally</i> , copper surrounded by         | f. as a means to     |
| ___ 7. it is <i>somewhat</i> similar to the way        | g. usually           |
|  | h. like              |
|  | i. to                |
|  | j. slightly          |
|  | k. consequently      |
|  | l. therefore         |

### IV. Grammar Practice

A: **Adverbial Clauses:** *When* and *while* are used to introduce adverbial or time clauses which modify verbs or adverbs. How many adverbial clauses can you find in the reading? List the verb or adverb that they modify.

B: **Adjective Clauses:** These clauses always have subject/verb word order and modify nouns and pronouns. Adjective clauses are introduced by *that*, *which*, *who*, or *whom*. Underline the adjective clauses in paragraphs 1, 2, 4, and 6. Give the noun or pronoun that they modify.



C. **Synonymous Sentences:** Which sentence is closest in meaning to the model sentence? Place the letter of your answer in the blank.

- \_\_\_ 1. *In order to talk about electricity, it is necessary first to talk about the atom.*
- (a) The order of all discussion should include electricity and atoms.
  - (b) Discussion of the atom should precede any discussion of electricity.
  - (c) First, we ought to include atoms and electricity in the discussion.
- \_\_\_ 2. *It is the electrons in the outermost orbit of certain kinds of atoms that can be made to flow as electric current.*
- (a) Certain atoms flow as an electric current.
  - (b) The orbit of certain atoms has electrons flowing as electric current.
  - (c) Electrons orbiting furthest from the nucleus of certain atoms can be induced to move as an electric current.
- \_\_\_ 3. *When you turn the light or appliance off, there will be electric pressure or voltage built up at the switch, but no current will flow.*
- (a) With the switch turned off, electric current will be stationary and voltage will increase at the switch.
  - (b) No current will flow if the voltage keeps building up after you turn off the lights or the appliance.
  - (c) Voltage and electric pressure keep the current from flowing while the switch is turned off.

V. **Dictation:** Copy paragraph 6 as your teacher dictates it.