Module #6:

Reading Comprehension

- Reading Strategies
- Technical Writing
- Technical Concepts

Reading Strategies

The 3 Steps for Passage-Based Questions

Be systematic on every passage-based question.

1. Understand the question.

- Underline key words and phrases.
- Restate the question in your own words.

2. Read the passage for important information.

- Read for the main idea or “heart” of the passage. Identify the "who" and the "what" of the passage.
- Underline information relevant to the questions.
- Skim the supporting details.

3. Predict and select the best answer.

- Predict an answer and then look for the answer choice that matches your prediction.
- Identify key words in the answer choices.
- If you are unsure which choice is the best answer, research the passage for more information.
- If you are still unsure which choice is the best answer, eliminate obviously incorrect answer choices and make an educated guess.

Reading Strategies

Understanding Question Types

There are three main types of passage-based questions:

Main Idea Questions

Ask you to give an *accurate restatement* of the passage as a whole.

> Ex. The views expressed in this selection are most consistent with which of the following statements?

Detail Questions

Ask you to locate a specific term or phrase in the passage, and determine its meaning based on its context in the passage.

> Ex. Which stage is *evaporation* necessary in salt production?

Inference Questions

Ask you to take the *next logical step beyond* the passage.

> Ex. Based on information in the passage, it is reasonable to infer that the author would most likely support implementing which of the following changes?

Reading Strategies

Reading Comprehension Tips

How to read:

- Skim questions first (optional).
- Read for location of information, not full memorization or comprehension.
- Don't focus on the details initially—go back for those for each question.

Questions:

- Do these in the "best" order—start with easier questions whose answers can be located quickly.
- Leave main idea/bigger picture questions for later to help you build your sense of the overall focus of the passage.
- Read each question stem carefully. Know where in the passage to look back at and what you are looking for.
- Try to answer the question in your own words, if possible, before looking at the answer choices. This will help you to eliminate wrong choices quickly.

Answer Choices:

- Always use Process of Elimination (POE)! There are several wrong answers for each question and only one correct one, so focus on eliminating the choices you know are wrong.
- Specify the reason you're crossing off each answer choice. Eliminating a choice just because "it sounds bad" is NOT a valid reason to get rid of it. Often the correct answer will be written to sound not so great, but if there is nothing wrong with it, then you can't cross it out.
- Be able to support the answer you choose from the passage. There has to be something in the passage to back up the correct answer.
- Always go back to reread the relevant portion of the passage; don't rely on your memory. You will spend less time choosing between similar choices if you take the time to look back and review what the passage actually said.

Reading Strategies

- Avoid the common types of wrong answer choices:
  - True, but doesn't answer the question asked.
  - Same words as in the passage, but the meaning has been changed.
  - Information from the wrong part of the passage.
  - Common sense information, but never stated in the passage.
  - Partly wrong = all wrong. One wrong word is enough to eliminate an answer choice.
  - EXCEPT questions: be sure to pick what's NOT mentioned in the passage. Write down Yes and No for each choice; you want to pick the lone No answer rather than one of the Yes choices.
- For Inference questions, don't extrapolate beyond the passage; "infer" here really means "paraphrase." The Reading Comprehension section assumes no particular subject knowledge, so if it's not paraphrased in the passage, it can't be the correct answer.
- Use your scratch paper! Write down ABCD for each question and cross off each choice that you eliminate; don't try to keep track of it all in your head.

Suggestions for General Reading Practice

If you feel that you need more practice reading material at the level of the test or would like to get more comfortable with certain reading content, the following publications are good places to find comparable articles. Most should have content available freely without the need to sign up for an account or subscription.

- Smithsonian
- Scientific American
- National Geographic
- New York Times Science & Technology section
- The Economist (science, health, technology sections)

Also, prep books for the ACT exam may contain science passages on par with what you could find on the test; you can likely find samples at your local library. For free sample practice questions, go to www.act.org.

Find and read one article per day or, alternatively, 5 articles per week. For each article, read for the main idea and location of information rather than trying to memorize every detail. This will help you practice the skills you'll need to tackle the reading comprehension passages on the test.

Reading Strategies

Sample Problem 1:

Employee safety has become a growing concern for American industry. Because of governmental regulation, companies are more concerned with hazards in the work environment. The Occupational Safety and Health Administration (OSHA) was established to monitor these activities. With proper training, the majority of industrial accidents can be avoided. Safety can also be emphasized with poster programs and top management support.

1. Safety has become a concern for industry because of

   A. an interest in employee needs.

   B. a decrease in profits.

   C. governmental regulations.

   D. management pressure.

2. OSHA was established to

   A. reduce accidents.

   B. monitor safety compliance.

   C. improve the work environment.

   D. increase safety awareness.

3. Industrial accidents can be avoided by

   A. training.

   B. safety awareness.

   C. improved working conditions.

   D. complying with OSHA regulations.

Reading Strategies

SAMPLE PROBLEM 2:

Copper is an excellent conductor having very low resistance. However, when electric current flows through copper wire, there is a small amount of power lost. The higher the current for a fixed diameter of wire, the greater will be the power absorbed by the wire, This power loss becomes evident as heat, When too great a current flows through a wire, the heat generated may burn the insulation and cause a tire. The safe current- handling capacity of a copper wire depends on the diameter of the wire, Thus, the choice of wire size is affected by the expected current,

4. The amount of power lost when electric current flows through copper wire

   A. is fairly small.

   B. is quite large.

   C. always remains the same.

   D. cannot be determined.

5. For a fixed diameter of copper wire, the smaller the power loss, the

   A. higher the current.

   B. lower the current.

   C. higher the resistance.

   D. lower the resistance.

6. For safety, the diameter of the wire used is determined by

   A. the expected resistance.

   B. the frequency of use.

   C. the expected current.

   D. the size of the appliance,

Reading Strategies

SAMPLE PROBLEM 3

The heat capacity (kcal per degree C) of a body is the amount of heat that must be added to it, or subtracted from it, so as to produce a change of 1 degree C in its temperature. The thermal resistance is the reciprocal of the thermal conductivity and provides a direct indication of the heat—insulating power of a material. The thicker the layer of material and the lower its thermal conductivity, the higher will be its resistance.

7. The heat capacity of a body to make a change of 1 degree C in its temperature is the amount of heat that must be

A. added.

B. subtracted.

C. added or subtracted.

D. added and subtracted,

8. The thinner the layer of material, the _____ its resistance.

A. higher

B. lower

C. better

D. more constant

Technical Writing

The answers to this section begin on page 150.

The coast of the state of Maine is one of the most irregular in the world. A straight line running from the southernmost coastal city to the northernmost coastal city would measure about 225 miles. If you followed the coastline between these points, you would travel more than ten times as far. This irregularity is the result of what is called a drowned coastline. The term comes from the glacial activity of the ice age. At that time, the whole area that is now Maine was part of a mountain range that towered above the sea. As the glacier descended, however, it expended enormous force on those mountains, and they sank into the sea.

As the mountains sank, ocean water charged over the lowest parts of the remaining land, forming a series of twisting inlets and lagoons of contorted grottos and nooks. The highest parts of the former mountain range, nearest the shore, remained as islands. Mt. Desert Island is one of the most famous of all the islands left behind by the glacier. Marine fossils found here were 225 feet above sea level, indicating the level of the shoreline prior to the glacier.

The 2,500-mile-long rocky and jagged coastline of Maine keeps watch over nearly two thousand islands. Many of these islands are tiny and uninhabited, but many are home to thriving communities. Mt. Desert Island is one of the largest, most beautiful of the Maine coast islands. Measuring 16 miles by 12 miles, Mt. Desert was essentially formed as two distinct islands. It is split almost in half by Somes Sound, a deep and narrow stretch of water, seven miles long.

For years, Mt. Desert Island, particularly its major settlement, Bar Harbor, afforded summer homes for the wealthy. Recently though, Bar Harbor has become a burgeoning arts community as well. But, the best part of the island is the unspoiled forest land known as Acadia National Park. Because the island sits on the boundary line between the temperate and sub-Arctic zones, the island supports the flora and fauna of both zones as well as beach, inland, and alpine plants. It also lies in a major bird migration lane and is a resting spot for many birds. The establishment of Acadia National Park in 1916 means that this natural reserve will be perpetually available to all people, not just the wealthy. Visitors to Acadia may receive nature instruction from the park naturalists as well as enjoy camping, hiking, cycling, and boating. Or they may choose to spend time at the archeological museum, learning about the Stone Age inhabitants of the island.

The best view on Mt. Desert Island is from the top of Cadillac Mountain. This mountain rises 1,532 feet, making it the highest mountain on the Atlantic seaboard. From the summit, you can gaze back toward the mainland or out over the Atlantic Ocean and contemplate the beauty created by a retreating glacier.

Technical Writing

365. Which of the following lists of topics best outlines the information in the selection?

a. Ice-age glacial activity
The Islands of Casco Bay
Formation of Cadillac Mountain
Summer residents of Mt. Desert Island

b. Formation of a drowned coastline
The topography of Mt. Desert Island
The environment of Mt. Desert Island
Tourist attractions on Mt. Desert Island

c. Mapping the Maine coastline
The arts community at Bar Harbor
History of the National Park System
Climbing Cadillac Mountain

d. The effect of glaciers on small islands
Stone-age dwellers on Mt. Desert Island
The importance of biodiversity
Hiking in Acadia National Park

366. Which of the following statements best expresses the main idea of the fourth paragraph of the selection?

a. The wealthy residents of Mt. Desert Island selfishly kept it to themselves.

b. Acadia National Park is one of the smallest of the national parks.

c. On Mt. Desert Island, there is great tension between the year-round residents and the summer tourists.

d. Due to its location and environment, Mt. Desert Island supports an incredibly diverse animal and plant life.

367. According to the selection, the large number of small islands along the coast of Maine are the result of

a. glaciers forcing a mountain range into the sea.

b. Maine's location between the temperate and sub-Arctic zones.

c. the irregularity of the Maine coast.

d. the need for summer communities for wealthy tourists and artists.

368. The content of the fourth paragraph indicates that the writer believes that

a. the continued existence of national parks is threatened by budget cuts.

b. the best way to preserve the environment on Mt. Desert Island is to limit the number of visitors.

c. national parks allow large numbers of people to visit and learn about interesting wilderness areas.

d. Mt. Desert Island is the most interesting tourist attraction in Maine.

369. According to the selection, the coast of Maine is

a. 2,500 miles long.

b. 3,500 miles long.

c. 225 miles long.

d. 235 miles long.

Technical Writing

(1) Glaciers consist of fallen snow that compresses over many years into large, thickened ice masses. Most of the world's glacial ice is found in Antarctica and Greenland, but glaciers are found on nearly every continent, even Africa. Presently, 10% of land area is covered with glaciers. Glacial ice often appears blue because ice absorbs all other colors but reflects blue. Almost 90% of an iceberg is below water; only about 10% shows above water. What makes glaciers unique is their ability to move. Due to sheer mass, glaciers flow like very slow rivers. Some glaciers are as small as football fields, whereas others grow to be over 100 kilometers long.

(2) Within the past 750,000 years, scientists know that there have been eight Ice Age cycles, separated by warmer periods called *interglacial* periods. Currently, the earth is nearing the end of an interglacial, meaning that another Ice Age is due in a few thousand years. This is part of the normal climate variation cycle. Greenhouse warming may delay the onset of another glacial era, but scientists still have many questions to answer about climate change. Although glaciers change very slowly over long periods, they may provide important global climate change signals.

(3) The girth of the ice, combined with gravity's influence, causes glaciers to flow very slowly. Once a mass of compressed ice reaches a critical thickness of about 18 meters thick, it becomes so heavy that it begins to deform and move. Ice may flow down mountains and valleys, fan across plains, or spread out to sea. Movement along the underside of a glacier is slower

Technical Writing

than movement at the top due to the friction created as it slides along the ground's surface.

(4) Most glaciers are found in remote mountainous areas. However, some found near cities or towns present a danger to the people living nearby. On land, lakes formed on top of a glacier during the melt season may cause floods. At the narrow part of a valley glacier, ice falling from the glacier presents a hazard to hikers below. When ice breaks off over the ocean, an iceberg is formed.

(5) Glaciers are a natural resource and contain 75% of the world's freshwater. People worldwide are trying to harness the power of these frozen streams. Some towns rely on glacial melting from a nearby ice cap to provide drinking water. Some farmers spread soil or ashes over snow to promote melting, hoping that the melting will provide water to irrigate crops in drought-stricken areas. Others have channeled meltwater from glaciers to their fields. Scientists and engineers have worked together to tap into glacial resources, using electricity that has been generated in part by damming glacial meltwater.

490. According to paragraph 4, what is a negative effect of living too close to a glacier?
- **a.** The mass of the glacier reaches a critical thickness.
- **b.** About 10% of a glacier shows above water.
- **c.** Spreading dark material over snow promotes melting.
- **d.** Lakes formed on top of glaciers may cause floods.

491. The underlined word *remote*, as used in paragraph 4 of the passage, most nearly means
- **a.** isolated.
- **b.** nearby.
- **c.** slow traveling.
- **d.** difficult to see.

492. The passage explains that glaciers can be found where?
- **a.** only on Antarctica
- **b.** only Greenland and Alaska
- **c.** on nearly every continent
- **d.** only the north and south poles

493. According to the passage, why does glacial ice often appear blue?
- **a.** because it does not absorb the color blue
- **b.** because it absorbs all other colors but reflects blue
- **c.** because it does not absorb all other colors including blue
- **d.** because it is blue in color

494. After reading the passage, what can one conclude about glaciers?
- **a.** There will not be another Ice Age coming.
- **b.** Glaciers have both negative and positive effects on human life.
- **c.** Scientists have difficulty studying glaciers.
- **d.** Scientists have minimal data on the formation of glaciers.

Technical Writing

(1) The atmosphere forms a gaseous, protective envelope around Earth. It protects the planet from the cold of space, from harmful ultraviolet light, and from all but the largest meteors. After traveling over 93 million miles, solar energy strikes the atmosphere and Earth's surface, warming the planet and creating what is known as the biosphere, the region of Earth capable of sustaining life. Solar radiation in combination with the planet's rotation causes the atmosphere to circulate. Atmospheric circulation is one important reason that life on Earth can exist at higher latitudes because equatorial heat is transported poleward, moderating the climate.

(2) The equatorial region is the warmest part of the earth because it receives the most direct and, therefore, strongest solar radiation. The plane in which the earth revolves around the sun is called the *ecliptic*. Earth's axis is inclined $23\frac{1}{3}$ degrees with respect to the ecliptic. This inclined axis is responsible for our changing seasons because, as seen from the earth, the sun oscillates back and forth across the equator in an annual cycle. On or about June 21 each year, the sun reaches the Tropic of Cancer, $23\frac{1}{3}$ degrees north latitude. This is the northernmost point where the sun can be directly overhead. On or about December 21 of each year, the sun reaches the Tropic of Capricorn, $23\frac{1}{3}$ degrees south latitude. This is the southernmost point at which the sun can be directly overhead. The polar regions are the coldest parts of the earth because they receive the least direct and, therefore, the weakest solar radiation. Here solar radiation strikes at a very oblique angle and thus spreads the same amount of energy over a greater area than in the equatorial regions. A static envelope of air surrounding the earth would produce an extremely hot, uninhabitable equatorial region, while the polar regions would remain inhospitably cold.

(3) The transport of water vapor in the atmosphere is an important mechanism by which heat energy is redistributed poleward. When water evaporates into the air and becomes water vapor, it absorbs energy. At the equator, air saturated with water vapor rises high into the atmosphere where winds aloft carry it poleward. As this moist air approaches the polar regions, it cools and sinks back to earth. At some point, the water vapor condenses out of the air as rain or snow, releasing energy in the process. The now-dry polar air flows back toward the equator to repeat the convection cycle. In this way, heat energy absorbed at the equator is deposited at the poles and the temperature gradient between these regions is reduced.

(4) The circulation of the atmosphere and the weather it generates is but one example of the many complex, interdependent events of nature. The web of life depends on the proper functioning of these natural mechanisms for its continued existence. Global warming, the hole in the atmosphere's ozone layer, and increasing air and water pollution pose serious, long-term threats to the biosphere. Given the high degree of nature's interconnectedness, it is quite possible that the most serious threats have yet to be recognized.

460. Which of the following best expresses the main idea of the passage?

a. The circulation of atmosphere, threatened by global warming and pollution, protects the biosphere and makes life on Earth possible.

b. If the protective atmosphere around the earth is too damaged by human activity, all life on Earth will cease.

c. Life on Earth is the result of complex interdependent events of nature, and some of these events are a result of human intervention.

d. The circulation of atmosphere is the single most important factor in keeping the biosphere alive, and it is constantly threatened by harmful human activity.

Technical Writing

461. Which of the following best represents the organization of the passage?

a. I. Definition and description of the circulation of the atmosphere
II. How the atmosphere affects heat and water in the biosphere
III. How the circulation of the atmosphere works
IV. What will happen if human activity destroys the atmosphere and other life-sustaining mechanisms

b. I. Origin of the atmosphere and ways it protects the biosphere
II. How the circulation of the atmosphere affects the equator and the poles
III. How the circulation of the atmosphere interrelates with other events in nature to protect life on Earth
IV. Threats to life in the biosphere

c. I. Definition and description of the circulation of the atmosphere
II. Protective functions of the circulation of the atmosphere
III. Relationship of the circulation of the atmosphere to other life-sustaining mechanisms
IV. Threats to nature's interconnectedness in the biosphere

d. I. The journey of the atmosphere 93 million miles through space.
II. How the atmosphere circulates and protects the biosphere
III. How the atmosphere interrelates with weather in the biosphere
IV. How damage to the biosphere threatens life on Earth

462. Which of the following is the best definition of the underlined word *biosphere* as it is used in the passage?

a. the protective envelope formed by the atmosphere around the living earth
b. that part of the earth and its atmosphere in which life can exist
c. the living things on Earth whose existence is made possible by circulation of the atmosphere
d. the circulation of the atmosphere's contribution to life on Earth

463. Which of the following sentences from the passage best supports the author's point that circulation of the atmosphere is vital to life on Earth?

a. The equatorial region is the warmest part of the earth because it receives the most direct and, therefore, strongest solar radiation.
b. The circulation of the atmosphere and the weather it generates is but one example of the many complex, interdependent events of nature.
c. [The atmosphere] protects Earth from the cold of space, from harmful ultraviolet light, and from all but the largest meteors.
d. A static envelope of air surrounding the earth would produce an extremely hot, uninhabitable equatorial region, while the polar regions would remain inhospitably cold.

Technical Writing

464. Based on the passage, which of the following is directly responsible for all temperature changes on Earth?

a. variations in the strength of solar radiation
b. variations in the amount of ultraviolet light
c. variation of biologic processes in the biosphere
d. variation in global warming

465. The first paragraph of the passage deals mainly with which of the following effects of the atmosphere on the earth?

a. its sheltering effect
b. its reviving effect
c. its invigorating effect
d. its cleansing effect

(1) Medical waste has been a growing concern because of recent incidents of public exposure to discarded blood vials, needles (sharps), empty prescription bottles, and syringes. Medical waste can typically include general refuse, human blood and blood products, cultures and stocks of infectious agents, laboratory animal carcasses, contaminated bedding material, and pathological wastes.

(2) Wastes are generally collected by gravity chutes, carts, or pneumatic tubes, each of which has its own advantages and disadvantages. Chutes are limited to vertical transport, and there is some risk of exhausting contaminants into hallways if a door is left open during use. Another disadvantage of gravity chutes is that the waste container may get jammed while dropping, or it may be broken upon hitting the bottom. Carts are primarily for horizontal transport of bagged or containerized wastes. The main risk here is that bags may be broken or torn during transport, potentially exposing the worker to the wastes. Using automated carts can reduce the potential for exposure. Pneumatic tubes offer the best performance for waste transport in a large facility. Advantages include high-speed movement, movement in any direction, and minimal intermediate storage of untreated wastes. However, some objects cannot be conveyed pneumatically.

(3) Off-site disposal of regulated medical wastes remains a viable option for smaller hospitals (those with less than 150 beds). Some preliminary on-site processing, such as compaction or hydropulping, may be necessary prior to sending the waste off site. Compaction reduces the total volume of solid wastes, often reducing trans-

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portation and disposal costs, but it does not change the hazardous characteristics of the waste. Compaction may not be economical if transportation and disposal costs are based on weight rather than volume.

(4) Hydropulping involves grinding the waste in the presence of an oxidizing fluid, such as hypochlorite solution. The liquid is separated from the pulp and discharged directly into the sewer unless local limits require additional pretreatment prior to discharge. The pulp can often be disposed of at a landfill. One advantage is that waste can be rendered innocuous and reduced in size within the same system. Disadvantages are the added operating burden, difficulty of controlling fugitive emissions, and the difficulty of conducting microbiological tests to determine whether all organic matters and infectious organisms have been destroyed from the waste.

(5) On-site disposal is a feasible alternative for hospitals generating two tons or more per day of total solid waste. Common treatment techniques include steam sterilization and incineration. Although other options are available, incineration is currently the preferred method for on-site treatment of hospital waste.

(6) Steam sterilization is limited in the types of medical waste it can treat, but is appropriate for laboratory cultures and/or substances contaminated with infectious organisms. The waste is subjected to steam in a sealed, pressurized chamber. The liquid that may form is drained off to the sewer or sent for processing. The unit is then reopened after a vapor release to the atmosphere, and the solid waste is removed for further processing or disposal. One advantage of steam sterilization is that it has been used for many years in hospitals to sterilize instruments and containers and to treat small quantities of waste. However, since sterilization does not change the appearance of the waste, there could be a problem in gaining acceptance of the waste for landfilling.

(7) A properly designed, maintained, and operated incinerator achieves a relatively high level of organism destruction. Incineration reduces the weight and volume of the waste as much as 95% and is especially appropriate for pathological wastes and sharps. The most common incineration system for medical waste is the controlled-air type. The principal advantage of this type of incinerator is low particulate emissions. Rotary-kiln and grate-type units have been used, but use of grate-type units has been discontinued because of high air emissions. The rotary kiln also puts out high emissions, and the costs have been prohibitive for smaller units.

442. Which of the following organizational schemes is most prevalent in the passage?
- **a.** chronological order
- **b.** comparison-contrast
- **c.** order by topic
- **d.** hierarchical order

443. One disadvantage of the compaction method of waste disposal is that it
- **a.** cannot reduce transportation costs.
- **b.** reduces the volume of solid waste material.
- **c.** does not allow hospitals to confirm that organic matter has been eliminated.
- **d.** does not reduce the weight of solid waste material.

Technical Writing

444. For hospitals that dispose of waste on their own premises, the optimum treatment method is
a. incineration.
b. compaction.
c. sterilization.
d. hydropulping.

445. According to the passage, which of the following could be safely disposed of in a landfill but might not be accepted by landfill facilities?
a. hydropulped material
b. sterilized waste
c. incinerated waste
d. laboratory cultures

446. The two processes mentioned in the passage that involve the formation of liquid are
a. compaction and hydropulping.
b. incineration and compaction.
c. hydropulping and sterilization.
d. sterilization and incineration.

447. According to the passage, two effective methods for treating waste caused by infectious matter are
a. steam sterilization and incineration.
b. hydropulping and steam sterilization.
c. incineration and compaction.
d. hydropulping and incineration.

448. Hospitals can minimize employee contact with dangerous waste by switching from
a. a manual cart to a gravity chute.
b. an automated cart to a hydropulping machine.
c. a gravity chute to a manual cart.
d. a manual cart to an automated cart.

449. The process that transforms waste from hazardous to harmless *and* diminishes waste volume is
a. sterilization.
b. hydropulping.
c. oxidizing.
d. compacting.

450. The underlined word *exhausting*, as it is used in the second paragraph of the passage, most nearly means
a. debilitating.
b. disregarding.
c. detonating.
d. discharging.

451. Budgetary constraints have precluded some small hospitals from purchasing
a. pneumatic tubes.
b. rotary kilns.
c. sterilization equipment.
d. controlled-air kilns.

452. The underlined phrase *fugitive emissions* in the fourth paragraph most nearly means
a. contaminants that are extremely toxic.
b. contaminants that are illegally discharged.
c. contaminants that escape the disposal process.
d. contaminants that come from microbiological testing.

Technical Writing

The next passages are typical of those you might find in textbooks. The paragraphs are numbered for convenience.

(1) For centuries, time was measured by the position of the sun with the use of sundials. Noon was recognized when the sun was the highest in the sky, and cities would set their clock by this apparent solar time, even though some cities would often be on a slightly different time. Daylight Saving Time (DST), sometimes called summer time, was instituted to make better use of daylight. Thus, clocks are set forward one hour in the spring to move an hour of daylight from the morning to the evening and then set back one hour in the fall to return to normal daylight.

(2) Benjamin Franklin first conceived the idea of daylight saving during his tenure as an American delegate in Paris in 1984 and wrote about it extensively in his essay, "An Economical Project." It is said that Franklin awoke early one morning and was surprised to see the sunlight at such an hour. Always the economist, Franklin believed the practice of moving the time could save on the use of candlelight, as candles were expensive at the time.

(3) In England, builder William Willett (1857–1915) became a strong supporter for Daylight Saving Time upon noticing blinds of many houses were closed on an early sunny morning. Willet believed everyone, including himself, would appreciate longer hours of light in the evenings. In 1909, Sir Robert Pearce introduced a bill in the House of Commons to make it obligatory to adjust the clocks. A bill was drafted and introduced into Parliament several times but met with great opposition, mostly from farmers. Eventually, in 1925, it was decided that summer time should begin on the day following the third Saturday in April and close after the first Saturday in October.

(4) The U.S. Congress passed the Standard Time Act of 1918 to establish standard time and preserve and set Daylight Saving Time across the continent. This act also devised five time zones throughout the United States: Eastern, Central, Mountain, Pacific, and Alaska. The first time zone was set on "the mean astronomical time of the seventy-fifth degree of longitude west from Greenwich" (England). In 1919, this act was repealed.

(5) President Roosevelt established year-round Daylight Saving Time (also called War Time) from 1942–1945. However, after this period, each state adopted its own DST, which proved to be disconcerting to television and radio broadcasting and transportation. In 1966, President Lyndon Johnson created the Department of Transportation and signed the Uniform Time Act. As a result, the Department of Transportation was given the responsibility for the time laws. During the oil embargo and energy crisis of the 1970s, President Richard Nixon extended DST through the Daylight Saving Time Energy Act of 1973 to conserve energy further. This law was modified in 1986, and Daylight Saving Time was reset to begin on the first Sunday in April (to spring ahead) and end on the last Sunday in October (to fall back).

Technical Writing

426. As it is used in paragraph 3, the word *obligatory* most nearly means
- **a.** approved.
- **b.** sparse.
- **c.** aberrant.
- **d.** requisite.

427. Who first established the idea of DST?
- **a.** President Richard Nixon
- **b.** Benjamin Franklin
- **c.** Sir Robert Pearce
- **d.** President Lyndon Johnson

428. Who opposed the bill that was introduced in the House of Commons in the early 1900s?
- **a.** Sir Robert Pearce
- **b.** farmers
- **c.** television and radio broadcasting companies
- **d.** the U.S. Congress

429. Which of the following statements is true of the U.S. Department of Transportation?
- **a.** It was created by President Richard Nixon.
- **b.** It set standards for DST throughout the world.
- **c.** It constructed the Uniform Time Act.
- **d.** It oversees all time laws in the United States.

430. Which of the following would be the best title for this passage?
- **a.** The History and Rationale of Daylight Saving Time
- **b.** Lyndon Johnson and the Uniform Time Act
- **c.** The U.S. Department of Transportation and Daylight Saving Time
- **d.** Daylight Saving Time in the United States

431. The Daylight Saving Time Energy Act of 1973 was responsible for
- **a.** preserving and setting Daylight Saving Time across the continent.
- **b.** instituting five time zones in the United States.
- **c.** extending Daylight Saving Time in the interest of energy conservation.
- **d**. conserving energy by giving the Department of Transportation authority over time laws.

Technical Writing

One of the most hazardous conditions a firefighter will ever encounter is a backdraft (also known as a smoke explosion). A backdraft can occur in the hot-smoldering phase of a fire when burning is incomplete and there is not enough oxygen to sustain the fire. Unburned carbon particles and other flammable products, combined with the intense heat, may cause instantaneous combustion if more oxygen reaches the fire.

Firefighters should be aware of the conditions that indicate the possibility for a backdraft to occur. When there is a lack of oxygen during a fire, the smoke becomes filled with carbon dioxide or carbon monoxide and turns dense gray or black. Other warning signs of a potential backdraft are little or no visible flame, excessive heat, smoke leaving the building in puffs, muffled sounds, and smoke-stained windows.

Proper ventilation will make a backdraft less likely. Opening a room or building at the highest point allows heated gases and smoke to be released gradually. However, suddenly breaking a window or opening a door is a mistake, because it allows oxygen to rush in, causing an explosion.

376. A backdraft is a dangerous condition for firefighters mainly because
- **a.** there is not enough oxygen for breathing.
- **b.** the heat is extremely intense.
- **c.** the smoke is dangerously thick.
- **d.** an explosion occurs.

377. Which of the following is NOT mentioned as a potential backdraft warning sign?
- **a.** windows stained with smoke
- **b.** flames shooting up from the building
- **c.** puffs of smoke leaving the building
- **d.** more intense heat than usual

378. To prevent the possibility of a backdraft, a firefighter should
- **a.** carry an oxygen tank.
- **b.** open a door to allow gases to escape.
- **c.** make an opening at the top of the building.
- **d.** break a window to release carbon particles.

379. When compared with a hot, smoldering fire, a fire with visible, high-reaching flames
- **a.** has more oxygen available for combustion.
- **b.** has more carbon dioxide available for consumption.
- **c.** produces more dense gray smoke.
- **d.** is more likely to cause a backdraft.

Technical Writing

Today, bicycles are elegantly simple machines that are common around the world. Many people ride bicycles for recreation, whereas others use them as a means of transportation. The first bicycle, called a *draisienne*, was invented in Germany in 1818 by Baron Karl de Drais de Sauerbrun. Because it was made of wood, the *draisienne* wasn't very durable nor did it have pedals. Riders moved it by pushing their feet against the ground.

In 1839, Kirkpatrick Macmillan, a Scottish blacksmith, invented a much better bicycle. Macmillan's machine had tires with iron rims to keep them from getting worn down. He also used foot-operated cranks, similar to pedals, so his bicycle could be ridden at a quick pace. It didn't look much like the modern bicycle, though, because its back wheel was substantially larger than its front wheel. Although Macmillan's bicycles could be ridden easily, they were never produced in large numbers.

In 1861, Frenchman Pierre Michaux and his brother Ernest invented a bicycle with an improved crank mechanism. They called their bicycle a *vélocipède*, but most people called it a "bone shaker" because of the jarring effect of the wood and iron frame. Despite the unflattering nickname, the *vélocipède* was a hit. After a few years, the Michaux family was making hundreds of the machines annually, mostly for fun-seeking young people.

Ten years later, James Starley, an English inventor, made several innovations that revolutionized bicycle design. He made the front wheel many times larger than the back wheel, put a gear on the pedals to make the bicycle more efficient, and lightened the wheels by using wire spokes. Although this bicycle was much lighter and less tiring to ride, it was still clumsy, extremely top-heavy, and ridden mostly for entertainment.

It wasn't until 1874 that the first truly modern bicycle appeared on the scene. Invented by another Englishman, H.J. Lawson, the safety bicycle would look familiar to today's cyclists. The safety bicycle had equal-sized wheels, which made it much less prone to toppling over. Lawson also attached a chain to the pedals to drive the rear wheel. By 1893, the safety bicycle had been further improved with air-filled rubber tires, a diamond-shaped frame, and easy braking. With the improvements provided by Lawson, bicycles became extremely popular and useful for transportation. Today, they are built, used, and enjoyed all over the world.

370. There is enough information in this passage to show that

- **a.** several people contributed to the development of the modern bicycle.
- **b.** only a few *vélocipèdes* built by the Michaux family are still in existence.
- **c.** for most of the nineteenth century, few people rode bicycles just for fun.
- **d.** bicycles with wheels of different sizes cannot be ridden easily.

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371. The first person to use a gear system on bicycles was
- **a.** H.J. Lawson.
- **b.** Kirkpatrick Macmillan.
- **c.** Pierre Michaux.
- **d.** James Starley.

372. This passage was most likely written in order to
- **a.** persuade readers to use bicycles for transportation.
- **b.** describe the problems that bicycle manufacturers encounter.
- **c.** compare bicycles used for fun with bicycles used for transportation.
- **d.** tell readers a little about the history of the bicycle.

373. Macmillan added iron rims to the tires of his bicycle to
- **a.** add weight to the bicycle.
- **b.** make the tires last longer.
- **c.** make the ride less bumpy.
- **d.** make the ride less tiring.

374. Read the following sentence from the fourth paragraph:

Ten years later, James Starley, an English inventor, made several innovations that revolutionized bicycle design.

As it is used in the sentence, the underlined word *revolutionized* most nearly means
- **a.** cancelled.
- **b.** changed drastically.
- **c.** became outdated.
- **d.** exercised control over.

375. Which of the following statements from the passage represents the writer's *opinion*?
- **a.** The safety bicycle would look familiar to today's cyclists.
- **b.** Two hundred years ago, bicycles didn't even exist.
- **c.** The Michaux brothers called their bicycle a *vélocipède*.
- **d.** Macmillan's machine had tires with iron rims.

Technical Writing

During those barren winter months, with windows overlooking long-dead gardens, leafless trees, and lawns that seem to have an ashy look about them, nothing soothes the jangled nerves more than the vibrant green of plants surrounding the living spaces of one's home. People browse through garden stores just to get a whiff of chlorophyll and to choose a plant or two to bring spring back into their winter-gray lives.

Now there is even more of a need for "the green," in light of recent articles warning us of the hazards of chemicals that we, ourselves, introduce into our homes. Each time we bring clothes home from the cleaners, we release those chemicals into the closed-in air of our dwellings. Every cleanser releases its own assortment of fumes. Some of the chemicals are formaldehyde, chlorine, benzene, styrene, etc. Read the labels on many home products, the ingredients aren't even listed! During the winter, when those same windows are shut tight, we breathe in these chemicals—causing symptoms much like allergies. In fact, most people probably dismiss the effects of these chemicals simply as a flare up of some allergy or other. The truth is that we are experiencing a syndrome that is called Multiple Chemical Sensitivity. Now, what has this got to do with green plants? Everything healthy! Research has been conducted with two types of plants that have actually removed much of these harmful chemicals from the air.

The two plants that seem to be the best bet for ridding one's home of such chemicals are ferns and palms. These plants release moisture as part of photosynthesis and, as they do, pull chemicals from the air into their leaves. Even NASA has conducted some greenhouse experiments for long-term space exploration. Within hours, their plants [palms] had removed almost all traces of formaldehyde in the room. Both species of plants are ancient, dating back more than a hundred million years. Another trait they share is that they both live long lives, 100 years or more. This we expect from trees, but ferns and palms are plants; plants that can grow to 65 feet in the proper setting! Even their individual leaves live for one to two years [ferns] and one to nine years [palms]. Perhaps it is their primal qualities that have contributed to their ability to purify their environment.

275. What is the main idea of the passage?
- **a.** Our homes are full of contaminants.
- **b.** Our allergies are caused by chemicals found in the home.
- **c.** All plants release moisture in the home.
- **d.** Certain plants can purify the home of many harmful chemicals.

276. According to the passage, when a few harmful chemicals combine, they can
- **a.** cause us to experience allergies.
- **b.** cause a monumental task for homeowners.
- **c.** contribute to a syndrome called Multiple Chemical Sensitivity.
- **d.** contribute to photosynthesis in plants.

277. The passage indicates that research
- **a.** has only been conducted using specific plants.
- **b.** has only been conducted by NASA.
- **c.** has not identified the sources of these chemical impurities.
- **d.** has only benefited long term space exploration.

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278. The passage infers a relationship between the antiquity of ferns and palms and their ability to
- **a.** live long.
- **b.** purify the air.
- **c.** grow leaves that live long.
- **d.** react successfully in research experiments.

279. A good title for this passage is
- **a.** Research in the New Millennium.
- **b.** Home Dangers.
- **c.** Common Houseplants May Purify Your Home.
- **d.** NASA Experiment Finds the Cure.

Despite their similarities, the pyramids of Egypt and Mesoamerica seem to be unrelated because of distinct differences in the time of construction as well as their design and function. Historians have discovered that the construction of the pyramids in Egypt and Mesoamerica are separated by over 2,000 years. The Egyptians used only cut stone quarried many miles away from the pyramid sites—a construction method that enabled them to construct sturdy buildings that could withstand the test of time.

On the other hand, the pyramids of Mesoamerica were not built to withstand the ravages of time. Rather, the step pyramids rose in tiers, on the top of which a small temple was erected. Unlike the Egyptians, they used irregular stones.

Also, they did not share the same basic design function. While the Egyptian pyramids were private tombs meant to seperate the pharaoh's remains from the mainstream of society and protect him for eternity, the pyramids of Mesoamerica were primarily public temples of ritual and celebration.

280. The main idea of this passage is best summed up in which statement?
- **a.** Pyramids in Egypt and Mesoamerica are similar.
- **b.** Egyptians assisted Mesoamerican pyramid builders.
- **c.** Pyramids in Egypt and Mesoamerica have distinct differences.
- **d.** Scientists do not know who built the pyramids.

281. This passage best supports the statement that
- **a.** the Egyptians used stone quarried many miles away from the pyramid site.
- **b.** the pyramids of Mesoamerica were built to last for eternity.
- **c.** the Egyptian pyramids were public tombs.
- **d.** the Egyptian and Mesoamerican pyramids were built during the same time period.

282. The passage best supports the statement that
- **a.** Egyptian and Mesoamerican pyramids shared the same design function.
- **b.** both pyramids were used as temples of ritual and celebration.
- **c.** Egyptian and Mesoamerican pyramids shared the same construction methods.
- **d.** Mesoamerican pyramids were used for ritual and celebration.

283. The underlined word *eternity* in the passage most nearly means which of the following?
- **a.** for a short time
- **b.** temporary
- **c.** for all time
- **d.** never

Technical Writing

The answers to this section begin on page 141.

Firefighters are often asked to speak to school and community groups about the importance of fire safety, particularly fire prevention and detection. Because smoke detectors reduce the risk of dying in a fire by half, firefighters often provide audiences with information on how to install these protective devices in their homes.

Specifically, they tell them these things: A smoke detector should be placed on each floor of a home. While sleeping, people are in particular danger of an emergent fire, and there must be a detector outside each sleeping area. A good site for a detector would be a hallway that runs between living spaces and bedrooms.

Because of the dead-air space that might be missed by turbulent hot air bouncing around above a fire, smoke detectors should be installed either on the ceiling at least four inches from the nearest wall, or high on a wall at least four, but no further than twelve, inches from the ceiling.

Detectors should not be mounted near windows, exterior doors, or other places where drafts might direct the smoke away from the unit. Nor should they be placed in kitchens and garages, where cooking and gas fumes are likely to cause false alarms.

210. Which organizational scheme does this list of instructions follow?
- **a.** hierarchical order
- **b.** comparison-contrast
- **c.** cause-and-effect
- **d.** chronological order by topic

211. What is the main focus of this passage?
- **a.** how firefighters carry out their responsibilities
- **b.** the proper installation of home smoke detectors
- **c.** the detection of dead-air space on walls and ceilings
- **d.** how smoke detectors prevent fires in homes

212. The passage implies that dead-air space is most likely to be found
- **a.** on a ceiling, between four and twelve inches from a wall.
- **b.** close to where a wall meets a ceiling.
- **c.** near an open window.
- **d.** in kitchens and garages.

213. The passage states that, compared with people who do not have smoke detectors, persons who live in homes with smoke detectors have a
- **a.** 50% better chance of surviving a fire.
- **b.** 50% better chance of preventing a fire.
- **c.** 75% better chance of detecting a hidden fire.
- **d.** 100% better chance of not being injured in a fire.

214. A smoke detector should NOT be installed near a window because
- **a.** outside fumes may trigger a false alarm.
- **b.** a draft may create dead-air space.
- **c.** a draft may pull smoke away from the detector.
- **d.** outside noises may muffle the sound of the detector.

Technical Writing

Remember that much scientific and technical writing deals with cold, hard, explicit facts. This means that, with close reading, you stand a good chance of answering most, if not all, of the questions with confidence.

No longer is asthma considered a condition with isolated, acute episodes of bronchospasm. Rather, asthma is now understood to be a chronic inflammatory disorder of the airways—that is, inflammation makes the airways chronically sensitive. When these hyperresponsive airways are irritated, airflow is limited, and attacks of coughing, wheezing, chest tightness, and breathing difficulty occur.

Asthma involves complex interactions among inflammatory cells, mediators, and the cells and tissues in the airways. The interactions result in airflow limitation from acute bronchoconstriction, swelling of the airway wall, increased mucus secretion, and airway remodeling. The inflammation also causes an increase in airway responsiveness. During an asthma attack, the patient attempts to compensate by breathing at a higher lung volume in order to keep the air flowing through the constricted airways, and the greater the airway limitation, the higher the lung volume must be to keep airways open. The morphologic changes that occur in asthma include bronchial infiltration by inflammatory cells. Key effector cells in the inflammatory response are the mast cells, T lymphocytes, and eosinophils. Mast cells and eosinophils are also significant participants in allergic responses, hence the similarities between allergic reactions and asthma attacks. Other changes include mucus plugging of the airways, interstitial edema, and microvascular leakage. Destruction of bronchial epithelium and thickening of the subbasement membrane is also characteristic. In addition, there may be hypertrophy and hyperplasia of airway smooth muscle, increase in goblet cell number, and enlargement of submucous glands.

Although causes of the initial tendency toward inflammation in the airways of patients with asthma are not yet certain, to date the strongest identified risk factor is atopy. This inherited familial tendency to have allergic reactions includes increased sensitivity to allergens that are risk factors for developing asthma. Some of these allergens include domestic dust mites, animals with fur, cockroaches, pollens, and molds. Additionally, asthma may be triggered by viral respiratory infections, especially in children. By avoiding these allergens and triggers, a person with asthma lowers his or her risk of irritating sensitive airways. A few avoidance techniques include: keeping the home clean and well ventilated, using an air conditioner in the summer months when pollen and mold counts are high, and getting an annual influenza vaccination. Of course, asthma sufferers should avoid tobacco smoke altogether. Cigar, cigarette, or pipe smoke is a trigger whether the patient smokes or inhales the smoke from others. Smoke increases the risk of allergic sensitization in children, increases the severity of symptoms, and may be fatal in children who already have asthma. Many of the risk factors for developing asthma may also provoke asthma attacks, and people with asthma may have one or more triggers, which vary from individual to individual. The risk can be further reduced by taking medications that decrease airway inflammation. Most exacerbations can be prevented by the combination of avoiding triggers and taking anti-inflammatory medications. An exception is physical activity, which is a common trigger of exacerbations in asthma patients. However, asthma patients should not necessarily avoid all physical exertion, because some types of activity have been proven to reduce symptoms. Rather, they should work in conjunction with a doctor to design a proper training regimen, which includes the use of medication.

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In order to diagnose asthma, a healthcare professional must appreciate the underlying disorder that leads to asthma symptoms and understand how to recognize the condition through information gathered from the patient's history, physical examination, measurements of lung function, and allergic status. Because asthma symptoms vary throughout the day, the respiratory system may appear normal during physical examination. Clinical signs are more likely to be present when a patient is experiencing symptoms; however, the absence of symptoms upon examination does not exclude the diagnosis of asthma.

384. According to the passage, what is the name for the familial inclination to have hypersensitivity to certain allergens?
a. interstitial edema
b. hyperplasia
c. hypertrophy
d. atopy

385. Why does a person suffering from an asthma attack attempt to inhale more air?
a. to prevent the loss of consciousness
b. to keep air flowing through shrunken air passageways
c. to prevent hyperplasia
d. to compensate for weakened mast cells, T lymphocytes, and eosinophils

386. The passage suggests that in the past, asthma was regarded as which of the following?
a. a result of the overuse of tobacco products
b. a hysterical condition
c. mysterious, unrelated attacks affecting the lungs
d. a chronic condition

387. Which of the following would be the best replacement for the underlined word *exacerbations* in this passage?
a. allergies
b. attacks
c. triggers
d. allergens

388. The passage mentions all of the following bodily changes during an asthma attack EXCEPT
a. severe cramping in the chest.
b. heavy breathing.
c. airways blocked by fluids.
d. constricted airways.

389. Although it is surprising, which of the following triggers is mentioned in the passage as possibly reducing the symptoms of asthma in some patients?
a. using a fan instead of an air conditioner in summer months
b. exposure to second-hand cigarette smoke
c. the love of a family pet
d. performing physical exercise

390. Why might a patient with asthma have an apparently normal respiratory system during an examination by a doctor?
a. Asthma symptoms come and go throughout the day.
b. Severe asthma occurs only after strenuous physical exertion.
c. Doctor's offices are smoke free and very clean.
d. The pollen and mold count may be low that day.

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391. Who might be the most logical audience for this passage?

a. researchers studying the respiratory system
b. healthcare professionals
c. a mother whose child has been diagnosed with asthma
d. an antismoking activist

392. What is the reason given in this article for why passive smoke should be avoided by children?

a. A smoke-filled room is a breeding ground for viral respiratory infections.
b. Smoke can stunt an asthmatic child's growth.
c. Smoke can heighten the intensity of asthma symptoms.
d. Breathing smoke can lead to a fatal asthma attack.

Millions of people in the United States are affected by eating disorders. More than 90% of those afflicted are adolescents or young adult women. Although all eating disorders share some common manifestations, anorexia nervosa, bulimia nervosa, and binge eating each have distinctive symptoms and risks.

People who intentionally starve themselves (even while experiencing severe hunger pains) suffer from anorexia nervosa. The disorder, which usually begins around the time of puberty, involves extreme weight loss to at least 15% below the individual's normal body weight. Many people with the disorder look emaciated but are convinced they are overweight. In patients with anorexia nervosa, starvation can damage vital organs such as the heart and brain. To protect itself, the body shifts into slow gear: Menstrual periods stop, blood pressure rates drop, and thyroid function slows. Excessive thirst and frequent urination may occur. Dehydration contributes to constipation, and reduced body fat leads to lowered body temperature and the inability to withstand cold. Mild anemia, swollen joints, reduced muscle mass, and light-headedness also commonly occur in anorexia nervosa.

Anorexia nervosa sufferers can exhibit sudden angry outbursts or become socially withdrawn. One in ten cases of anorexia nervosa leads to death from starvation, cardiac arrest, other medical complications, or suicide. Clinical depression and anxiety place many individuals with eating disorders at risk for suicidal behavior.

People with bulimia nervosa consume large amounts of food and then rid their bodies of the excess calories by vomiting, abusing laxatives or diuretics, taking enemas, or exercising obsessively. Some use a combination of all these forms of purging. Individuals with bulimia who use drugs to stimulate vomiting, bowel movements, or urination may be in considerable danger, as this practice increases the risk of heart failure. Dieting heavily between episodes of binging and purging is common.

Because many individuals with bulimia binge and purge in secret and maintain normal or above normal body weight, they can often successfully hide their problem for years. But bulimia nervosa patients—even those of normal weight—can severely damage their bodies by frequent binge eating and purging. In rare instances, binge eating causes the stomach to rupture; purging may result in heart failure due to loss of vital minerals such as potassium. Vomiting can cause the esophagus to become inflamed and glands near the cheeks to become swollen. As in anorexia nervosa, bulimia may lead to irregular menstrual periods. Psychological effects include compulsive stealing as well as possible indications of obsessive-compulsive disorder, an illness characterized by repetitive thoughts and behaviors. Obsessive-compulsive disorder can also accompany anorexia nervosa. As with anorexia nervosa, bulimia typically begins during adolescence. Eventually, half of those with

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anorexia nervosa will develop bulimia. The condition occurs most often in women but is also found in men.

Binge-eating disorder is found in about 2% of the general population. As many as one-third of this group are men. It also affects older women, though with less frequency. Recent research shows that binge-eating disorder occurs in about 30% of people participating in medically supervised weight-control programs. This disorder differs from bulimia because its sufferers do not purge. Individuals with binge-eating disorder feel that they lose control of themselves when eating. They eat large quantities of food and do not stop until they are uncomfortably full. Most sufferers are overweight or obese and have a history of weight fluctuations. As a result, they are prone to the serious medical problems associated with obesity, such as high cholesterol, high blood pressure, and diabetes. Obese individuals also have a higher risk for gallbladder disease, heart disease, and some types of cancer. Usually they have more difficulty losing weight and keeping it off than do people with other serious weight problems. Like anorexic and bulimic sufferers who exhibit psychological problems, individuals with binge-eating disorder have high rates of simultaneously occurring psychiatric illnesses, especially depression.

393. Fatalities occur in what percent of people with anorexia nervosa?
- **a.** 2%
- **b.** 10%
- **c.** 15%
- **d.** 30%

394. Which of the following consequences do all the eating disorders mentioned in the passage have in common?
- **a.** heart ailments
- **b.** stomach rupture
- **c.** swollen joints
- **d.** diabetes

395. According to the passage, people with binge-eating disorder are prone to all of the following EXCEPT
- **a.** loss of control.
- **b.** depression.
- **c.** low blood pressure.
- **d.** high cholesterol.

396. Which of the following is NOT a statement about people with eating disorders?
- **a.** People with anorexia nervosa commonly have a blood-related deficiency.
- **b.** People with anorexia nervosa perceive themselves as overweight.
- **c.** The female population is the primary group affected by eating disorders.
- **d.** Fifty percent of people with bulimia have had anorexia nervosa.

397. People who have an eating disorder but nevertheless appear to be of normal weight are most likely to have
- **a.** obsessive-compulsive disorder.
- **b.** bulimia nervosa.
- **c.** binge-eating disorder.
- **d.** anorexia nervosa.

398. Glandular functions of eating-disorder patients slow down as a result of
- **a.** lowering body temperatures.
- **b.** excessive thirst and urination.
- **c.** protective measures taken by the body.
- **d.** the loss of essential minerals.

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399. The inability to eliminate body waste is related to
- **a.** dehydration.
- **b.** an inflamed esophagus.
- **c.** the abuse of laxatives.
- **d.** weight-control programs.

400. According to the passage, which of the following is true of bulimia patients?
- **a.** They may demonstrate unpredictable social behavior.
- **b.** They often engage in compulsive exercise.
- **c.** They are less susceptible to dehydration than are anorexia patients.
- **d.** They frequently experience stomach ruptures.

401. Which of the following represent up to two-thirds of the binge-eating disorder population?
- **a.** older males
- **b.** older females
- **c.** younger males
- **d.** younger females

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Arteries of the heart blocked by plaque can reduce the flow of blood to the heart possibly resulting in heart attack or death. Plaque is actually fat and cholesterol that accumulates on the inside of the arteries. The arteries of the heart are small and can be blocked by such accumulations. There is a medical procedure that creates more space in the blocked artery by inserting and inflating a tiny balloon into the blood vessel. It is called coronary balloon angioplasty. *Angioplasty* means "blood vessel repair." When the balloon is inflated, it compresses the plaque against the wall of the artery, creating more space and improving the flow of blood.

Many doctors choose this technique, because it is less invasive than bypass surgery. Yes, both involve entering the body cavity, but in bypass surgery, the chest must be opened, the ribs must be cut, and the section of diseased artery must be removed and replaced. To replace it, the patient's body is opened, once again, to acquire a healthy section of artery. Usually, this blood vessel is removed from an artery located in the calf of the leg. This means the patient now has two painful incisions that must heal at the same time. There is far more risk in such bypass surgery than in angioplasty, which involves threading a thin tube, called a catheter, into the circulatory system and working it to the damaged artery.

Angioplasty may take between 30 minutes to 3 hours to complete. It begins with a distinctive dye that is injected into the bloodstream. A thin catheter is then inserted into the femoral artery of the leg, near the groin. The doctor monitors the path of the dye using x-rays. He moves the tube through the heart and into the plaque-filled artery. He inflates the balloon, creating more space, deflates the balloon, and removes the tube. It is important to note that the plaque has not been removed; it has just been compressed against the sides of the artery. Sometimes, a *stent* may be implanted, a tiny tube of stainless steel that is expandable when necessary. Its function is to keep the artery open.

There is good news and there is bad news. The good news is that the statistics compiled are superb. Ninety percent of all angioplasty procedures are successful. The risk of dying during an operation of this type is less than 2%. The risk of heart attack is also small: 3–5%. Yet heart surgeons do not take any risk lightly; therefore, a team of surgeons stands ready to perform bypass surgery if needed. The length of hospitalization is only three days. The bad news is twofold. First, this procedure treats the condition but does not eradicate the cause. In 20% of the cases, there is a recurrence of plaque. Second, angioplasty is not recommended for all patients. The surgeons must consider the patient's age, physical history, how severe the blockage is, and, finally, the degree of damage to the artery before they make their determination.

420. When coronary arteries are blocked by plaque, one of the results could be
- **a.** stroke.
- **b.** heart attack.
- **c.** hospitalization.
- **d.** femoral artery deterioration.

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421. According to the passage, angioplasty is defined as
- **a.** a tiny balloon.
- **b.** a plaque-laden artery.
- **c.** blood vessel repair.
- **d.** bypass surgery.

422. It can be inferred from the passage that *invasive* most closely means
- **a.** entering the body cavity.
- **b.** causing infection.
- **c.** resulting in hospitalization.
- **d.** requiring a specialist's opinion.

423. The angioplasty procedure begins with
- **a.** a thin catheter being inserted into the femoral artery.
- **b.** a balloon being inflated in the heart.
- **c.** a special dye being injected into the bloodstream.
- **d.** a healthy artery being removed from the calf.

424. It can be inferred from the passage that
- **a.** a healthy artery is removed and awaits possible bypass surgery.
- **b.** patients have trouble accepting the idea that a tiny balloon will cure the problem.
- **c.** 3–5% of the patients refuse to undergo this procedure.
- **d.** surgeons do not take even a 2% chance of death lightly.

425. Which one of the following statements is true?
- **a.** The plaque that has caused the problem is not removed during angioplasty.
- **b.** The risk of dying during an angioplasty procedure is 3–5%.
- **c.** The coronary balloon angioplasty is a separate procedure from inflating a balloon into a blocked artery.
- **d.** All of the above statements are true.

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464. Based on the passage, which of the following is directly responsible for all temperature changes on Earth?

a. variations in the strength of solar radiation
b. variations in the amount of ultraviolet light
c. variation of biologic processes in the biosphere
d. variation in global warming

465. The first paragraph of the passage deals mainly with which of the following effects of the atmosphere on the earth?

a. its sheltering effect
b. its reviving effect
c. its invigorating effect
d. its cleansing effect

(1) There are two types of diabetes, *insulin-dependent* and *non-insulin-dependent*. Between 90–95% of the estimated 13–14 million people in the United States with diabetes have non-insulin-dependent, or Type II, diabetes. Because this form of diabetes usually begins in adults over the age of 40 and is most common after the age of 55, it used to be called adult-onset diabetes. Its symptoms often develop gradually and are hard to identify at first; therefore, nearly half of all people with diabetes do not know they have it. For instance, someone who has developed Type II diabetes may feel tired or ill without knowing why. This can be particularly dangerous because untreated diabetes can cause damage to the heart, blood vessels, eyes, kidneys, and nerves. While the causes, short-term effects, and treatments of the two types of diabetes differ, both types can cause the same long-term health problems.

(2) Most importantly, both types affect the body's ability to use digested food for energy. Diabetes does not interfere with digestion, but it does prevent the body from using an important product of digestion, *glucose* (commonly known as sugar), for energy. After a meal, the normal digestive system breaks some food down into glucose. The blood carries the glucose or sugar throughout the body, causing blood glucose levels to rise. In response to this rise, the hormone insulin is released into the bloodstream and signals the body tissues to metabolize or burn the glucose for fuel, which causes blood glucose levels to return to normal. The glucose that the body does not use right away is stored in the liver, muscle, or fat.

(3) In both types of diabetes, however, this normal process malfunctions. A gland called the *pancreas*, found just behind the stomach, makes *insulin*. In people with insulin-dependent diabetes, the pancreas does not produce insulin at all. This condition usually begins in childhood and is known as Type I (formerly called juvenile-onset) diabetes. These patients must have daily insulin injections to survive. People with non-insulin-dependent diabetes usually produce some insulin in their pancreas, but their bodies' tissues do not respond well to the insulin signal and, therefore, do not metabolize the glucose properly, a condition known as insulin resistance.

(4) Insulin resistance is an important factor in non-insulin-dependent diabetes, and scientists are searching for the causes of insulin resistance. They have identified two possibilities. The first is that there could be a defect in the insulin receptors on cells. Like an appliance that needs to be plugged into an electrical outlet, insulin has to

Technical Writing

bind to a receptor in order to function. Several things can go wrong with receptors. For example, there may not be enough receptors to which insulin may bind, or a defect in the receptors may prevent insulin from binding. The second possible cause of insulin resistance is that, although insulin may bind to the receptors, the cells do not read the signal to metabolize the glucose. Scientists continue to study these cells to see why this might happen.

(5) There's no cure for diabetes yet. However, there are ways to alleviate its symptoms. In 1986, a National Institute of Health panel of experts recommended that the best treatment for non-insulin-dependent diabetes is a diet that helps one maintain a normal weight and pays particular attention to a proper balance of the different food groups. Many experts, including those in the American Diabetes Association, recommend that 50–60% of daily calories come from carbohydrates, 12–20% from protein, and no more than 30% from fat. Foods that are rich in carbohydrates, like breads, cereals, fruits, and vegetables, break down into glucose during digestion, causing blood glucose to rise. Additionally, studies have shown that cooked foods raise blood glucose higher than raw, unpeeled foods. A doctor or nutritionist should always be consulted for more of this kind of information and for help in planning a diet to offset the effects of this form of diabetes.

466. According to the passage, what may be the most dangerous aspect of Type II diabetes?
- **a.** Insulin shots are needed daily for treatment of Type II diabetes.
- **b.** Type II diabetes may go undetected and, therefore, untreated.
- **c.** In Type II diabetes, the pancreas does not produce insulin.
- **d.** Type II diabetes interferes with digestion.

467. Which of the following are the same for Type I and Type II diabetes?
- **a.** treatments
- **b.** long-term health risks
- **c.** short-term effects
- **d.** causes

468. According to the passage, one place in which excess glucose is stored is the
- **a.** stomach.
- **b.** insulin receptors.
- **c.** pancreas.
- **d.** liver.

469. A diet dominated by which of the following is recommended for non-insulin-dependent diabetics?
- **a.** protein
- **b.** fat
- **c.** carbohydrates
- **d.** raw foods

Technical Writing

470. Which of the following is the main function of insulin?
- **a.** It signals tissues to metabolize sugar.
- **b.** It breaks down food into glucose.
- **c.** It carries glucose throughout the body.
- **d.** It binds to receptors.

471. Which of the following statements best summarizes the main theme of the passage?
- **a.** Type I and Type II diabetes are best treated by maintaining a high-protein diet.
- **b.** Type II diabetes is a distinct condition that can be managed by maintaining a healthy diet.
- **c.** Type I diabetes is an insidious condition most harmful when the patient is not taking daily insulin injections.
- **d.** Adults who suspect they may have Type II diabetes should immediately adopt a high-carbohydrate diet.

472. Which of the following is mentioned in the passage as a possible problem with insulin receptors in insulin-resistant individuals?
- **a.** Overeating causes the receptors to function improperly.
- **b.** There may be an overabundance of receptors present.
- **c.** A defect causes the receptors to bind with glucose.
- **d.** A defect hinders the receptors from binding with insulin.

473. According to the passage, in normal individuals, which of the following processes occur immediately after the digestive system converts some food into glucose?
- **a.** The glucose is metabolized by body tissues.
- **b.** Insulin is released into the bloodstream.
- **c.** Blood sugar levels rise.
- **d.** The pancreas manufactures increased amounts of insulin.

474. Based on the information in the passage, which of the following best describes people with Type I diabetes?
- **a.** They do not need to be treated with injections of insulin.
- **b.** They comprise the majority of people with diabetes.
- **c.** Their pancreases do not produce insulin.
- **d.** They are usually diagnosed as adults.

475. What is the closest meaning of the underlined word *offset* in the final sentence of the passage?
- **a.** counteract
- **b.** cure
- **c.** soothe
- **d.** erase

Technical Writing

(1) The immune system is equal in complexity to the combined intricacies of the brain and nervous system. The success of the immune system in defending the body relies on a dynamic regulatory communications network consisting of millions and millions of cells. Organized into sets and subsets, these cells pass information back and forth like clouds of bees swarming around a hive. The result is a sensitive system of checks and balances that produces an immune response that is prompt, appropriate, effective, and self-limiting.

(2) At the heart of the immune system is the ability to distinguish between self and non-self. When immune defenders encounter cells or organisms carrying foreign or non-self molecules, the immune troops move quickly to eliminate the intruders. Virtually every body cell carries distinctive molecules that identify it as self. The body's immune defenses do not normally attack tissues that carry a self-marker. Rather, immune cells and other body cells coexist peaceably in a state known as *self-tolerance.* When a normally functioning immune system attacks a non-self molecule, the system has the ability to remember the specifics of the foreign body. Upon subsequent encounters with the same species of molecules, the immune system reacts accordingly. With the possible exception of antibodies passed during lactation, this so-called immune system memory is not inherited. Despite the occurrence of a virus in your family, your immune system must learn from experience with the many millions of distinctive non-self molecules in the sea of microbes in which we live. Learning entails producing the appropriate molecules and cells to match up with and counteract each non-self invader.

(3) Any substance capable of triggering an immune response is called an *antigen*. Antigens are not to be confused with *allergens,* which are most often harmless substances (such as ragweed pollen or cat hair) that provoke the immune system to set off the inappropriate and harmful response known as *allergy*. An antigen can be a virus, a bacterium, a fungus, a parasite, or even a portion or product of one of these organisms. Tissues or cells from another individual (except an identical twin, whose cells carry identical self-markers) also act as antigens; because the immune system recognizes transplanted tissues as foreign, it rejects them. The body will even reject nourishing proteins unless they are first broken down by the digestive system into their primary, non-antigenic building blocks. An antigen announces its foreignness by means of intricate and characteristic shapes called *epitopes,* which protrude from its surface. Most antigens, even the simplest microbes, carry several different kinds of epitopes on their surface; some may even carry several hundred. Some epitopes will be more effective than others at stimulating an immune response. Only in abnormal situations does the immune system wrongly identify self as non-self and execute a misdirected immune attack. The result can be a so-called autoimmune disease such as rheumatoid arthritis or systemic lupus erythematosis. The painful side effects of these diseases are caused by a person's immune system actually attacking itself.

476. What is the analogy used to describe the communications network among the cells in the immune system?

a. the immune system's memory
b. immune troops eliminating intruders
c. bees swarming around a hive
d. a sea of microbes

Technical Writing

477. The immune cells and other cells in the body coexist peaceably in a state known as
- **a.** equilibrium.
- **b.** self-tolerance.
- **c.** harmony.
- **d.** tolerance.

478. What is the specific term for the substance capable of triggering an inappropriate or harmful immune response to a harmless substance such as ragweed pollen?
- **a.** antigen
- **b.** microbe
- **c.** allergen
- **d.** autoimmune disease

479. How do the cells in the immune system recognize an antigen as foreign or non-self?
- **a.** through an allergic response
- **b.** through blood type
- **c.** through fine hairs protruding from the antigen surface
- **d.** through characteristic shapes on the antigen surface

480. After you have had the chicken pox, your immune system will be able to do all of the following EXCEPT
- **a.** prevent your offspring from infection by the chicken pox virus.
- **b.** distinguish between your body cells and that of the chicken pox virus.
- **c.** remember previous experiences with the chicken pox virus.
- **d.** match up and counteract non-self molecules in the form of the chicken pox virus.

481. Which of the following best expresses the main idea of this passage?
- **a.** An antigen is any substance that triggers an immune response.
- **b.** The basic function of the immune system is to distinguish between self and non-self.
- **c.** One of the immune system's primary functions is the allergic response.
- **d.** The human body presents an opportune habitat for microbes.

482. Why would tissue transplanted from father to daughter have a greater risk of being detected as foreign than a tissue transplanted between identical twins?
- **a.** The age of the twins' tissue would be the same and, therefore, less likely to be rejected.
- **b.** The identical twin's tissue would carry the same self-markers and would, therefore, be less likely to be rejected.
- **c.** The difference in the sex of the father and daughter would cause the tissue to be rejected by the daughter's immune system.
- **d.** The twins' immune systems would remember the same encounters with childhood illnesses.

483. What is the meaning of the underlined word *intricacies* as it is used in the first sentence of the passage?
- **a.** elaborate interconnections
- **b.** confusion of pathways
- **c.** inherent perplexity
- **d.** comprehensive coverage

Technical Writing

Anyone who pans for gold hopes to be rewarded by the glitter of colors in the fine material collected in the bottom of the pan. Although the exercise and outdoor activity experienced in prospecting are rewarding, there are few thrills comparable to finding gold. Even an assay report showing an appreciable content of gold in a sample obtained from a lode deposit is exciting. The would-be prospector hoping for financial gain, however, should carefully consider all the pertinent facts before deciding on a prospecting venture.

Only a few prospectors among the many thousands who searched the western part of the United States ever found a valuable deposit. Most of the gold mining districts in the West were located by pioneers, many of whom were experienced gold miners from the southern Appalachian region, but even in colonial times only a small proportion of gold seekers were successful. Over the past several centuries the country has been thoroughly searched by prospectors. During the depression of the 1930s, prospectors searched the better-known gold-producing areas throughout the nation, especially in the West, and the little-known areas as well. The results of their activities have never been fully documented, but incomplete records indicate that an extremely small percentage of the total number of active prospectors supported themselves by gold mining. Of the few significant discoveries reported, nearly all were made by prospectors of long experience who were familiar with the regions in which they were working.

The lack of outstanding success in spite of the great increase in prospecting during the depression of the 1930s confirms the opinion of those most familiar with the occurrence of gold and the development of gold mining districts that the best chances of success lie in systematic studies of known productive areas rather than in efforts to discover gold in hitherto unproductive areas. The development of new, highly sensitive, and relatively inexpensive methods of detecting gold, however, has greatly increased the possibility of discovering gold deposits which are too low grade to have been recognized earlier by the prospector using only a gold pan.

1. According to the passage, which of the following is true?
   A. Panning for gold in the western United States is a useful and profitable activity.
   B. Many prospectors got rich by panning for gold.
   C. There are many places in the United States where gold can be found.
   D. Prospectors who were successful knew the areas where they worked.

2. In this passage the word pertinent means
   A. confusing.
   B. contradictory.
   C. relevant.
   D. identifiable.

Technical Writing

3. According to the passage, which of the following is true?
   A. Prospectors were hopeless people looking to strike it rich.
   B. Prospectors could not earn enough to support a family.
   C. Only a few prospectors found gold.
   D. The only successful prospectors were from the southern Appalachian region.

4. Which of the following would be the best title for the passage?
   A. Prospectors Strike It Rich
   B. Technology Finds Gold in the United States
   C. The Gold Rush—A Big Hoax
   D. Few Find It—Many Have Tried

5. With regard to the future of gold mining, the passage suggests which of the following?
   A. Gold mining will never be profitable.
   B. Only the prospectors from the southern Appalachian region seem to be able to find gold.
   C. There is no more gold to be found in the United States.
   D. New technologies will help to find more gold.

Technical Writing

Organic food is produced by farmers who emphasize the use of renewable resources and the conservation of soil and water to enhance environmental quality for future generations. Organic meat, poultry, eggs, and dairy products come from animals that are given no antibiotics or growth hormones. Organic food is produced without using most conventional pesticides, petroleum-based fertilizers or sewage sludge-based fertilizers, bioengineering, or ionizing radiation. Before a product can be labeled "organic," a Government-approved certifier inspects the farm where the food is grown to make sure the farmer is following all the rules necessary to meet federal organic standards. Companies that handle or process organic food before it gets to your local supermarket or restaurant must be certified, too.

No organization claims that organically produced food is safer or more nutritious than conventionally produced food. Organic food differs from conventionally produced food in the way it is grown, handled, and processed. At the supermarket, in order to distinguish organically produced food from conventionally produced food, consumers must look at package labels and watch for display signs. Along with the national organic standards, there are strict labeling rules to help consumers know the exact organic content of the food they buy. An official seal also tells you that a product is at least 95 percent organic.

The word "organic" and a small sticker version of the Official Organic seal will be on organic vegetables or pieces of fruit, or they may appear on the sign above the organic produce display. The word "organic" and the seal may also appear on packages of meat, cartons of milk or eggs, cheese, and other single-ingredient foods.

"Natural" foods are not necessarily organic foods. Truthful claims, such as "free-range," "hormone-free," and "natural," can still appear on food labels. However, this does not mean that they are "organic." Only food labeled "organic" has been certified as meeting government organic standards.

6. According to this passage, organic farming is helpful because
   A. food grown organically is generally healthier than conventional food.
   B. organic food uses no fertilizers or harmful rays.
   C. growing organic food is cheaper and easier for the farmer.
   D. organic farming tends to improve environmental quality for the future.

7. According to the passage, to be considered organic, a farmer must do which of the following?
   A. Use special fertilizers.
   B. Use special bioengineering techniques.
   C. Show that the foods produced on the farm are healthier than those produced using conventional methods.
   D. Follow certain rules and standards set by the federal government.

Technical Writing

8. According to the passage, how can a person identify an organically produced food?
   A. There will be a label or a sign with the word "organic."
   B. There is no way to tell.
   C. Organic labels are prohibited.
   D. A label will indicate "Safe to Eat."

9. In this passage the word renewable most nearly means which of the following?
   A. Fresh
   B. New
   C. Replaceable
   D. Ignored

10. According to the passage, which of the following ensures that foods are organic?
    A. The foods are naturally grown and produced.
    B. The foods are hormone-free.
    C. The foods are grown without chemicals.
    D. The foods are grown according to government standards.

Technical Writing

More than 50 volcanoes in the United States have erupted one or more times in the past 200 years. The most volcanically active regions of the nation are in Alaska, Hawaii, California, Oregon, and Washington. Volcanoes produce a wide variety of hazards that can kill people and destroy property. Large explosive eruptions can endanger people and property hundreds of miles away and even affect global climate. Some volcanic hazards can occur even when a volcano is not erupting.

An explosive eruption blasts solid and molten rock fragments and volcanic gases into the air with tremendous force. The largest rock fragments, called *bombs*, usually fall back to the ground within 2 miles of the vent. Small fragments (less than about 0.1 inch across) of volcanic glass, minerals, and ash rise high into the air, forming a huge, billowing eruption column.

Eruption columns can grow rapidly and reach more than 12 miles above a volcano in less than 30 minutes, forming an eruption cloud. The volcanic ash in the cloud can pose a serious hazard to aviation. During the past 15 years, about 80 commercial jets have been damaged by inadvertently flying into ash clouds, and several have nearly crashed because of engine failure. Large eruption clouds can extend hundreds of miles downwind, resulting in ash fall over enormous areas; the wind carries the smallest ash particles the farthest. Ash from the May 18, 1980, eruption of Mount St. Helens, Washington, fell over an area of 22,000 square miles in the western United States. Heavy ash fall can collapse buildings, and even minor ash fall can damage crops, electronics, and machinery.

Volcanoes emit gases during eruptions. Even when a volcano is not erupting, cracks in the ground allow gases to reach the surface through small openings. Common volcanic gases are carbon dioxide, sulfur dioxide, hydrogen sulfide, hydrogen, and fluorine. Sulfur dioxide gas can react with water droplets in the atmosphere to create acid rain, which causes corrosion and harms vegetation. Carbon dioxide is heavier than air and can be trapped in low areas in concentrations that are deadly to people and animals.

1. According to this passage, fragments that fall close to the volcano itself during an eruption are referred to as
   A. bombs.
   B. vents.
   C. volcanic ash.
   D. rocks.

2. From the passage you can infer that
   A. areas a long distance from the volcano can be damaged by an eruption.
   B. volcanoes hurt the farming industry in many ways.
   C. it's best for airplanes to fly around volcanoes even when they are not erupting.
   D. volcanic ash has caused a few airlines to go bankrupt.

Technical Writing

3. According to the passage, most volcanoes in the United States are located in which part of the country?
   A. The central states
   B. The western states
   C. Along the East Coast
   D. The southern states

4. According to the passage, which of the following creates acid rain?
   A. Volcanic glass
   B. Ash combined with water
   C. Fluorine
   D. Sulfur dioxide

5. In this passage, the word *billowing* most nearly means which of the following?
   A. Tall
   B. Dense
   C. Imploding
   D. Swelling

Technical Writing

Langston Hughes was born in Joplin, Missouri, to two bookkeepers. His parents separated when he was very young. His father moved to Mexico, and his mother left him for long periods of time while she searched for steady employment. Hughes's grandmother raised him in Lawrence, Kansas, until he was 12, when he moved to Illinois to live with his mother and stepfather. The family later moved to Ohio. From these humble origins, Langston developed a deep admiration for those he called "low-down folks," poor people who had a strong sense of emotion and pride.

To express his feeling and emotions, Hughes began writing poetry in high school. He gained some early recognition and support among important black intellectuals such as James Weldon Johnson and W. E. B DuBois. While working as a busboy at the Wardman Park Hotel in Washington, D.C., Hughes gave three of his poems to Vachel Lindsay, a famous critic. Lindsay's enthusiastic praise won Hughes an even wider audience.

Hughes spent the summers of 1919 and 1920 with his father in Mexico. While on a train on his second trip, he wrote his first great poem, "The Negro Speaks of Rivers." The poem was published in *The Crisis*, a magazine of the National Association for the Advancement of Colored People.

Langston Hughes became one of the most important writers and thinkers of the Harlem Renaissance, which was the African American artistic movement in the 1920s that celebrated black life and culture. Hughes's creative genius was influenced by his life in New York City's Harlem, a primarily African American neighborhood. His literary works helped shape American literature and politics. Hughes, like others active in the Harlem Renaissance, had a strong sense of racial pride. Through his poetry, novels, plays, essays, and children's books, he promoted equality, condemned racism and injustice, and celebrated African American culture, humor, and spirituality.

6. Of the following, which is the best title for the passage?
   A. A Kid from Missouri
   B. An Extraordinary Poet
   C. From Busboy to Poet
   D. A Poet Is Praised

7. Who was Vachel Lindsay?
   A. A restaurant worker
   B. A family friend
   C. One of the "low-down folks"
   D. A literary critic

Technical Writing

8. According to the passage, what was the Harlem Renaissance?
   A. The neighborhood were Langston Hughes was born
   B. His grandmother's home in Illinois
   C. An African American artistic movement
   D. The topic of Hughes' first great poem

9. Why was Langston Hughes considered a great poet?
   A. His literary works helped shape American politics and literature.
   B. He came from a humble background to reach fame and fortune.
   C. His poems were published in many countries around the world.
   D. His poems were praised by Vachel Lindsay.

10. According to the passage, why did Langston Hughes live with his grandmother?
    A. He didn't want to stay in Missouri.
    B. He didn't want to move to Ohio.
    C. He wanted to continue to write his poems.
    D. His parents were not able to care for him.

Technical Writing

Laura Ingalls Wilder was born on February 7, 1867, in the Big Woods of Wisconsin. Reflecting the pioneer spirit of the era, Laura's family moved several times throughout her childhood. She lived for periods in Kansas, Minnesota, Iowa, and South Dakota. Life on the frontier was difficult, and members of Laura's family experienced many hardships that threatened their survival. For example, grasshoppers destroyed their crops two seasons in a row, and a winter of continuous blizzards threatened their supplies. Laura's brother died nine months after his birth, and Laura's sister Mary lost her eyesight at the young age of 15 because of a stroke. The lessons of life on the prairie in America's heartland made a lasting impression on Laura.

Laura and her sisters attended nearby schools during their childhood, and Laura's love for learning sparked her interest in teaching. At age 15 while living in De Smet, South Dakota, Laura earned her teaching certificate. In a rural area just 12 miles from De Smet, she began her first teaching job. During this time, she met and married Almanzo Wilder.

Following in the pioneer footsteps of their families, Laura and Almanzo struggled to establish homes first in South Dakota and later in Minnesota. They along with their daughter, Rose, suffered through droughts, hail storms, fires, and diseases. Laura and Almanzo eventually settled on a farm in Missouri called "Rocky Ridge."

While living at Rocky Ridge, Laura developed her writing abilities, and for 12 years she edited the *Missouri Ruralist.* As she grew older, Laura became interested in sharing her pioneer experiences with the next generation. Unable to find a publisher for her autobiography called *Pioneer Girl*, Laura rewrote a section of the book and called it *Little House in the Big Woods*, which was published in 1932 when she was 65 years old. Soon after the book was released, *Little House* became a success. Children everywhere wanted to read more stories about the Ingalls family. Laura continued to write books about her family and finished her 18-volume series in 1943. Her desire to share her family's history painted a picture of life on the frontier for generations of children.

11. According to this passage what profession did Laura choose?
    A. Farmer
    B. Daughter
    C. Teacher
    D. Student

12. According to this passage, why did Laura choose to write about her childhood?
    A. She was otherwise unoccupied.
    B. She was too old to be considered a credible author.
    C. She wanted to share her experiences with others.
    D. She wanted to become a success.

Technical Writing

13. According to the passage, where did Laura and Almanzo finally settle down?
    A. South Dakota
    B. Missouri
    C. Minnesota
    D. Iowa

14. Which of the following was *not* one of the hardships that Laura faced while growing up?
    A. Death of her brother
    B. Invasion of grasshoppers
    C. Blizzards
    D. Volcanic eruptions

15. Which of the following is the best title for this passage?
    A. Laura Ingalls Wilder—a Great Author
    B. Pioneer Woman and Writer
    C. Hardships of Farmers
    D. Little House in the Big Woods

Technical Writing

Where Does Electricity Come From?

Some of you may smartly reply, "Electricity comes from the outlet in the wall." If only it was that simple! Let us dig deeper into the making of the electrical power that we take for granted every day.

Electricity is a property of atoms, so to understand where electricity comes from, you will need a general knowledge of atoms.

Atoms are the building block of all matter. Everything from the book you are reading to the air you are breathing is made up of millions of tiny atoms. Atoms contain electrically charged particles. The structure of an atom is comparable to our solar system with a large central core, tiny orbiting particles and a lot of space in between. The center of an atom is called the nucleus. The nucleus contains two types of particles: neutrons which have no electrical charge, and protons which have one unit of positive or plus (+) charge each. Orbiting the nucleus are the electrons which are much smaller in size than the neutrons and protons. Electrons have one unit of negative or minus (-) charge in strength. When placed in an atom in equal numbers, protons and electrons cancel each other's effect to give the atom an overall zero charge. All matter that you can touch without getting an electrical shock is made up of atoms with equivalent numbers of proton and electrons. Atoms, however, can lose or gain electrons which offsets the electrical balance of charges. Material made up of charged atoms is said to have electrical potential. An atom which picks up electrons has a negative electrical charge due to the fact that it contains more electrons than protons.

There are three ways to make an atom lose electrons and, thus, gain an electrical charge: friction, chemical action, and the use of magnets and wire, and these are the methods used to generate power.

Static Electricity is produced by friction. As two materials rub together, electrons are rubbed off of the surface of one material and are picked up by the surface atoms of the other material. For example, electrons are rubbed off from nylon or wool carpet as you walk across it. The carpet loses electrons, so it takes on a positive charge, and you can pick up the electrons so your skin takes on a negative charge.

You hold that charge (static) until it can be released by touching an object. The sudden release of charge is the static shock. Lightning is a form of static electricity. The friction is generated between rain clouds moving rapidly in the atmosphere. The lighting bolt is the immense release of static electricity.

Dry cells and lead storage batteries use chemical action to produce large numbers of free electrons at the negative (-) pole.

When the negative pole is connected to the positive terminal via a conductor, electric current flows, due to the attraction of unlike charges and the electromotive force from the source.

Motors, meters, generators, transformers and electromagnets all depend on the relation of magnetism and electrical current to generate massive electrical power. The electricity in your home is probably generated by the use of a magnetic core surrounded by a coil of wire.

Technical Writing

[1] What are the 3 types of particles found in atoms?

A | Orbits, core and charges

B | Protons, nucleus and electrons

C | Matter, space and nucleus

D | Protons, neutrons and electrons

E | None of the above

[2] A proton has a single unit of _____ charge and an electron has a single unit of _____ charge.

A | Neutral, positive

B | Negative, positive

C | Positive, negative

D | Negative, neutral

E | None of the above

[3] Lightning is a form of _____ electricity.

A | Chemical

B | Solar

C | Atomic

D | Magnetic

E | None of the above

[4] Batteries generate electricity from

A | Chemical action

B | Friction

C | Magnets and wires

D | Transformers

E | All of the above

[5] By which 3 methods are electrons separated from their atoms in the making of electricity?

A | Chemical, nuclear and atomic.

B | Solar, magnetic and lightning.

C | Water, power, lighting and nuclear.

D | Friction, chemical, and magnets and wires.

E | All of the above

Technical Concepts

Salt Production and Processing

There are three methods used to produce salt: solar, evaporation and rock mining.

Solar Evaporation Method

This is the oldest method of salt production. It has been used since salt crystals were first noticed in trapped pools of sea water. Its use is practical only in warm climates where the evaporation rate exceeds the precipitation rate, either annually or for extended periods, and ideally, where there are steady prevailing winds. Solar salt production is, typically, the capturing of salt water in shallow ponds where the sun evaporates most of the water. The concentrated brine precipitates the salt which is then gathered by mechanical harvesting machines. Any impurities that may be present in the brine are drained off and discarded prior to harvesting.

Usually two types of ponds are used. First is the concentrating pond, where the salty water from the ocean or salt lake is concentrated. The second is called the crystallizing pond, where the salt is actually produced.

Crystallizing ponds range from to 40 to 200 acres with a foot-thick floor of salt resulting from years of depositions. During the salt-making season of four to five months, brine flows continuously through these ponds. This is a saturated brine solution, containing as much salt as it can hold, so pure salt crystallizes out of the solution as the water evaporates. Natural chemical impurities are returned to the salt water source.

Rock Salt Mining Method

Morton also uses the second oldest method of producing salt – underground mining. This is probably the most dramatic method of gathering salt. Large machines travel through vast cave-like passageways performing various operations.

Salt mines are among the safest of mines. They are also the most comfortable to work in. While mine temperature varies with depth, the average temperature remains about 70 °F year round.

Salt may appear in veins, as does coal. Veins are the original bedded salt deposits. Salt also may be found in domes, which were formed when Earth pressures forced salt up through cracks in the bedrock from depths as great as 30,000 or 40,000 feet; they resemble plugs of almost-circular shape a few hundred yards to a mile across. Some domes occur close to the surface. Both domes and veins are mined in a similar way. Most domes in North America are located in the south from Alabama to Texas with many out under water in the Gulf of Mexico.

To enter a salt mine, miners go down a shaft from the Earth's surface to the salt bed. There are two shafts in each Morton mine : one for personnel and one to lower materials and equipment into the mine, as well as to hoist the mined rock salt to the surface. The shafts

Technical Concepts

Salt Production and Processing

also are used to deliver a constant supply of fresh air to the miners while they work hundreds to thousands of feet below the surface. Most mine shafts are lined with a concrete wall called a shaft liner.

Salt is mined by the room and pillar method. It is removed in a checkerboard pattern to leave permanent, solid salt pillars for mine roof support. Usually 45 to 65 percent of the salt is removed. The room height may average 18 feet in a bedded deposit to 100 feet in a dome mine.

Normally, the first operation is undercutting. Large machines cut a slot 10 or more feet in depth across the bottom of a solid salt wall. This leaves a smooth floor for picking up the salt after blasting.

Next, small holes are drilled into the salt wall to a depth of 10 or more feet and explosives are loaded into the drilled holes. After the work shift, the explosives are set off electrically. Several hundred to several thousand tons of rock salt are blasted and fall onto the mine floor.

Equipment is used to load and haul the salt to machines that crush and feed the salt onto a conveyor belt. The lumps are conveyed to a series of stations for crushing and additional sizing of the lumps. The salt is then placed in a storage bin to await hoisting to the surface.

The above ground processing of the rock salt consists of screening the mined salt into various marketable sizes by sorting through mechanically operated screens. When separated, each size is conveyed to its individual storage bin to await packaging for shipment or to be loaded as bulk salt into railroad cars, trucks, river barges or lake boats for shipment to customers.

Vacuum Evaporation Method

Another method of salt production used by Morton Salt is the evaporation of salt brine by steam heat in large commercial evaporators, called vacuum pans. This method yields a very high purity salt, fine in texture, and principally used in those applications requiring the highest quality salt.

The first part of the operation is known as solution mining. Wells are drilled from several hundred to 1,000 feet apart into the salt deposit. These wells are connected via lateral drilling, a recently developed technology. Once the wells are connected, the solution mining operation begins: water is pumped down one well, the salt below is dissolved, and the resulting brine is forced to the surface through the other well. It is then piped into large tanks for storage.

Next, the brine is pumped into vacuum pans. These are huge closed vessels under vacuum about three stories high. They are normally arranged in a series of three, four or five, with each one in the line under greater vacuum than the preceding one. This series of vacuum pans operates on a very simple principle: Whenever pressure is lowered, the temperature

Technical Concepts

Salt Production and Processing

at which water will boil is also lowered. For instance, under normal air pressure at sea level, water boils at 212•F. But at ten thousand feet above sea level, where air pressure is much less, water boils at 194•F. Vacuum pans may operate at as low as 100•F.

In the vacuum pan process, steam is fed to the first pan. This causes the brine in the pan to boil. The steam from the boiling brine is then used to heat the brine in the second pan. The pressure in the second pan is lower, allowing the steam made by the boiling in the first pan to boil the brine in the second pan. The pressure is reduced still further in each succeeding pan. This allows the steam made by the boiling brine in the previous pan to boil the brine in the next pan. While the boiling operation could be done with just one pan, several pans in a row produce more salt per pound of steam, thus allowing greater energy efficiency.

http://www.mortonsalt.com/salt-production-and-processing/

1. What is brine?

_____

2. What happens when brine is crystallized?

_____

3. What does precipitation mean?

_____

4. What is the difference between a concentration and crystallizing pond?

_____

_____

Technical Concepts

Salt Production and Processing

5. What two shapes does salt exist in underground?

6. What is the room and pillar method, and why is this method used when mining salt?

7. What is undercutting?

8. Which of the three methods is used for to make reagent (industrial) salt?

9. Why is there an advantage to applying the vacuum evaporation method in a mountainous region?

10. Why is it easier to evaporate salt in a vacuum?

11. Why are several pans of brine placed in a row when producing salt using the vacuum process?

Technical Concepts

Road Construction

The earliest records of paved roads for wheeled traffic date from about 2200 BC in Babylonia (modern Iraq), in Crete from about 1500 BC and in Egypt from about 540 BC. In Europe the first substantial roads were built by the Romans – a network of more than 100 000 kms of road was built between 400 BC and 400 AD. The Roman roads were cambered to shed rainwater and were constructed on a foundation of large stones with a wearing course of smaller stones and gravel, constrained between raised stone kerbs.

The Romans were the best road builders of the remote ages. Conquests achieved through war games were one of the reasons for this. The Romans needed a good network of roads to control their conquered subject-nations. The army needed to be able to move fast in order to quell any revolting groups. The Roman roads were cobbled with a base system that was dependent on the subgrade. They developed a three/four layer system of:

- top layer
- base/subbase sometimes with a stabilized material in the base
- subgrade.

As soon as the Roman Empire collapsed, the roads structures began to degenerate.

Napoleon was responsible for the construction of a considerable network of roads in Europe in the late 18th and early 19th centuries. In 1747 the "Ecole des Ponts et Chaussess" was founded in Paris, France. In 1765 Tresaguet developed the Roman road structure further. His basic principle was to construct the first layer with big blocks and then to place little rocks in between. By doing this, he attempted to ensure that the first layer was consistently exposed to compressive stresses, in order to achieve better load spreading on the subgrade.

At the same time, in about 1810 in England, people such as Telford and Metcalf made valuable developments, including:

- design of drainage,
- design of the road camber, and
- active and regular maintenance.

Telford and Metcalf found that through drainage design and the inclusion of a crossfall, that maintenance could be substantially reduced and the required layer thickness dramatically reduced.

In Great Britain, the Industrial Revolution required a road building programme to satisfy the need for the movement of materials and goods and many kilometers of road were built by various means. During this time John Macadam (1756 – 1836) invented a method of road building as follows: after careful preparation and draining of the roadbed (or subgrade), he laid a 25cm layer of stone (a size that could fit in a

Technical Concepts

Road Construction

man's mouth), followed by a surfacing of smaller stones. This type of roadway was ideal for animal drawn wagons and coaches, and was cheap to build. John Macadam's roads lasted well under traffic and many British roads were "macadamised". They were a good solution in the nineteenth century for iron rims i.e. treads.

However, the invention of motorized transport (Siegfried Marcus invented the first car with traction in Vienna) and rubber tires (Dunlop in 1888) changed the requirements once again. Speeds increased making safety an important consideration. Rubber-tired wheels "sucked" the dust from the road surface, loosening the stones and causing blinding clouds of dust. Hence in the early part of the 20th century, tar was spread over the road surface to hold the stones in place and to prevent dust. Sand and stone and tar formed a "surface dressing". Later the "tar- macadam" surface of stone coated with and rolled to a smooth surface was used, hence the term tarmac. Today we still make waterbound macadam and penetration macadam (using bitumen-emulsion slurry) and a variation of it heat up i.e. asphalt .

http://www.citg.tudelft.nl/fileadmin/Faculteit/CiTG/Over_de_faculteit/Afdelingen/Afdeling_Bouw/-_Secties/Sectie_Weg_en_Railbouwkunde/-_Leerstoelen/Leerstoel_Wegbouwkunde/-_Onderwijs/-_College_Dictaten/doc/Introduction_to_Roads_KJJ.pdf

Technical Concepts

Road Construction

1. Paved roads serve what purpose?

_____

2. What does cambering mean?

_____

3. Where is the wearing course located in a layered roadway?

_____

4. Why are layered roadways more effective than a single layer?

_____

5. What two functions does the subgrade serve?

_____

6. How did Macadam improve roadway technology?

_____

7. Why are “macadamised” roads no longer constructed?

_____

8. What was added to macadam to serve the needs of 20th century traffic?

_____

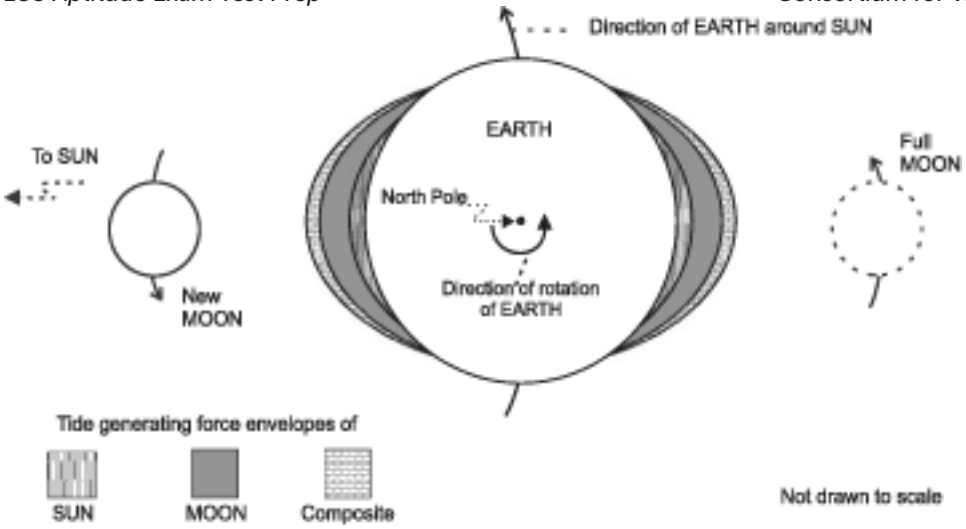


Figure 2. Spring tides

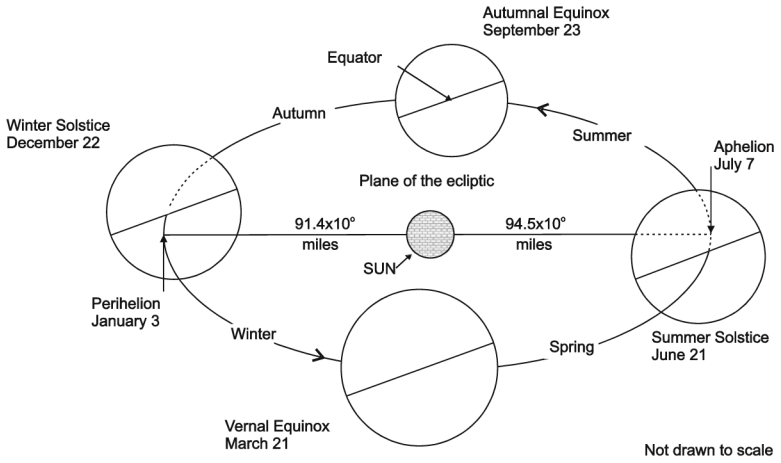


Figure 6. the sun-earth system

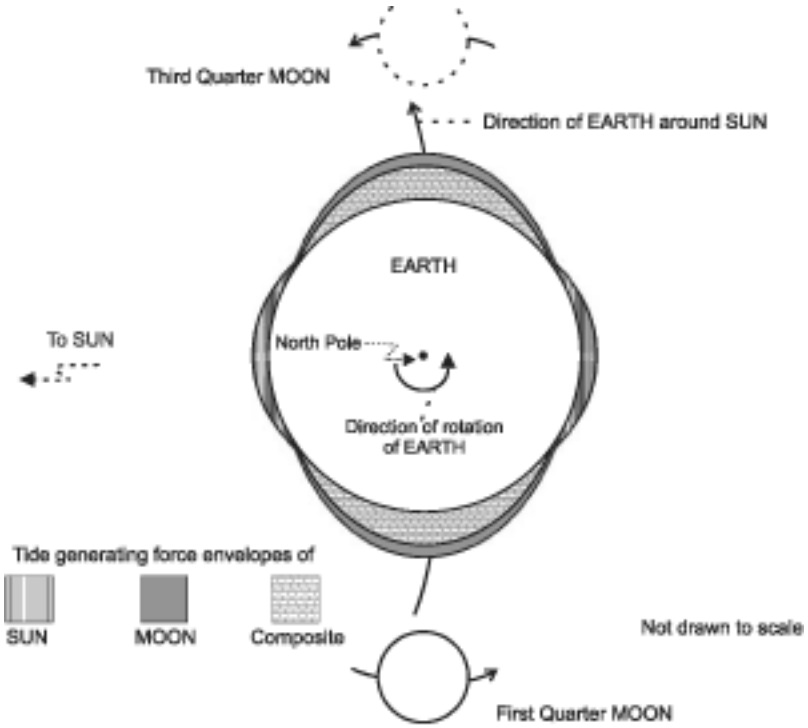


Figure 3. Neap tides

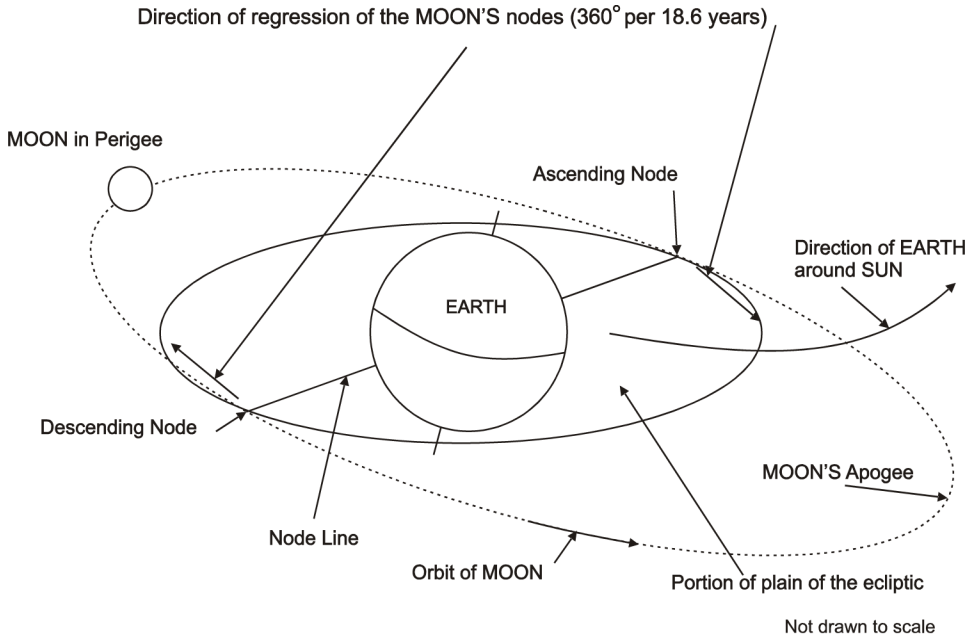


Figure 7. the moon-earth system

Technical Concepts

Solar/Lunar Tides

The tide is fundamentally caused by gravitational interactions between the sun, moon, and earth. These interactions of the gravitational forces are the same as those causing the moon and earth to remain in their respective orbits.

Spring and Neap Tides

The range of tide, defined as the vertical difference in height between consecutive high and low tides, varies from place to place and also varies over time. The combination of the solar and lunar envelopes during the synodic month causes spring tides and neap tides. The synodic month is referenced to the sun (or phase of moon) and is 29.530588 days in length.

By combining the sun-earth system and the moon-earth system, spring and neap tides are developed. Spring tides have nothing to do with springtime. They are tides with ranges greater than the average monthly range. Spring tides occur twice each synodic month due to the approximate alignment of the sun, moon, and earth. Neap tides are tides with ranges less than the average monthly range. They occur twice each synodic month due to the sun, earth, and moon forming right angles (approximately) to each other.

Colloquially, the tide is said to "follow the moon" since it is 2.16 times more influential than the sun in causing the tide. It is probably more descriptive to say that the tide, in most locations, is controlled by the lunar tide-generating forces as modified by the solar.

When the moon is new (on the side of the earth toward the sun) or full (on the side of the earth away from the sun), the tide-generating forces of the sun and moon are aligned. In Figure 2, the envelope of the tide-generating forces of the sun augments the envelope of the moon. The high tides of the solar envelope occur at the same time as the high tides of the lunar. This increases the height of the composite high tides. Likewise, the low tides of the solar envelope occur at the low tides of the lunar. This decreases the height of the composite low tides. Therefore, larger than average tidal ranges occur, called spring tides.

When the moon is in its first or third quarter, however, the tide-generating forces of the sun are at right angles to those of the moon. In Figure 3, the envelope of the tide-generating forces of the sun is shown to conflict with the force envelope of the moon. The low tides of the solar envelope occur at the times of the high tides of the lunar. This reduces the height of the composite high tides. Likewise, the high tides of the solar envelope occur at the low tides of the lunar. This increases the height of the composite low tides. Therefore, smaller than average tidal ranges occur, called neap tides. The change in range between spring and neap tides amounts to about 20%.

Technical Concepts

Solar/Lunar Tides

Distance

The sun and earth revolve around their common center of mass in elliptical, rather than circular, orbits. When the earth is closest to the sun, the earth is said to be in perihelion. When the earth is farthest from the sun, it is said to be in aphelion. Perihelion to perihelion occurs in one anomalistic year of 365.2596 days. Perihelion occurs on January 3rd, with the distance being about 91,400,005 miles. Aphelion occurs on July 7th, the distance being approximately 94,512,258 miles (Figure 6). When the earth is in perihelion, the tide-generating forces are larger than average and greater than average ranges in the tide are experienced. In aphelion, smaller than average ranges occur.

The moon and earth also revolve around their common center of mass in elliptical orbits. When the moon is closest to the earth, the moon is said to be in perigee. When the moon is farthest away, it is in apogee. Perigee to perigee occurs in one anomalistic month of 27.554,550 days. At perigee the two bodies are about 221,000 miles apart while at apogee they are about 253,000 miles away from each other (Figure 7). When the moon is in perigee, the tide-generating forces are larger than average and greater than average ranges in the tide occur. The opposite is true when the moon is in apogee.

https://tidesandcurrents.noaa.gov/publications/Understanding_Tides_by_Steacy_finalFINAL11_30.pdf

Technical Concepts

Solar/Lunar Tides

1. What is an anomalistic year?

_____

2. Which seasons does the earth pass through aphelion?

_____

3. How much closer does the earth get to the sun when it moves from aphelion to perihelion?

_____

4. How much closer does the moon get to the earth when it moves from apogee to perigee?

_____

5. What word is used to indicate that the moon's tide-generating forces are at a maximum?

_____

6. What phases can the moon be in when spring tides occur?

_____

7. What is a neap tide?

_____

Technical Concepts

Plate Tectonics

The following is from a passage about continental drift and plate tectonics from Science World.

By 1965, investigations led to the proposal that Earth's surface was broken into seven large plates and several smaller plates. It was further suggested that these plates are rigid, and that their boundaries are marked by earthquakes and volcanic activity. In recent years, satellite pictures have documented the existence of plate boundaries. An especially visable example is the San Andreas Fault in California.

Plates interact with one another at their boundaries by moving toward, away, or alongside each other. Faults are examples of boundaries where two plates slide horizontally pat each other. Mid-ocean ridges mark boundaries where plates are forced apart as new ocean floor is being created between them. Mountains, volcanic-island arcs, and ocean trenches occur at the boundaries where plates are colliding, causing one plate to slide beneath the other. The network of crustal plates and the geologic activity caused by their movement is referred to as *plate tectonics*.

The original continental-drift theory suggested that continents plowed through the ocean floor like ships. Plate tectonics, on the other hand, holds that continents are carried along together with the surrounding seabed in huge plates -- much like rafts frozen into the ice on flowing stream.

There are several major plates. The North American plate comprises North America and the western half of the North Atlantic seafloor. The South American plate includes South America east to the Mid-Atlantic Ridge. The African plate contains Africa and its surrounding seafloor. The Antarctic plate has Antarctica and surrounding seafloor. The Eurasian plate includes Europe, Asia, and nearby seafloor. The Pacific plate underlies the Pacific Ocean. Recently, an international team of geologists and other researchers analyzing seafloor measurements discovered that what was classified as the Indo-Australian plate may actually be two separate plates--one withe Indian subcontinent and the adjacent seabed, and the other with Australia and surrounding waters.

Scientists believe that in addition to the great, slow convection currents that carry plates about Earth, there are also smaller, rapidly rising *mantle plumes*, columns of hot material rising from deep within Earth. (Earth is believed to be composed of an inner solid core, a middle mantle, and and outer crust.) These plumes of molten rock, often called *hot spots*, rise and erupt through the crust of a moving plate.

Most of the isolated mid-plate volcanoes, such as those of Hawaii and Yellowstone, lie at one end of a line of extinct volcanoes that grow steadily older with distance from the active center. Hawaii's Mauna Loa is at the extreme southeastern end of the rest of the Hawaiian island chain. The volcanoes in the chain become steadily older and less active to the northeast. Likewise, Yellowstone's hot springs and geysers are at the eastern end of a line of extinct volcanoes that extend into Idaho. Such a line of volcanoes suggests that the crust of Earth is passing over a hot spot, or hot spots, in the deeper mantle. As the crustal plate moves, the hot spot "punches" up a line of volcanic and hotspring activity.

Indeed, the motions of the Pacific plate are compatible with the direction of the Hawaiian chain and the ages of its volcanic islands. Plate motion has slowly moved the volcanic islands away from the hot spot that created them. In other words, the Hawaiian island chain traces motion of the Pacific plate.

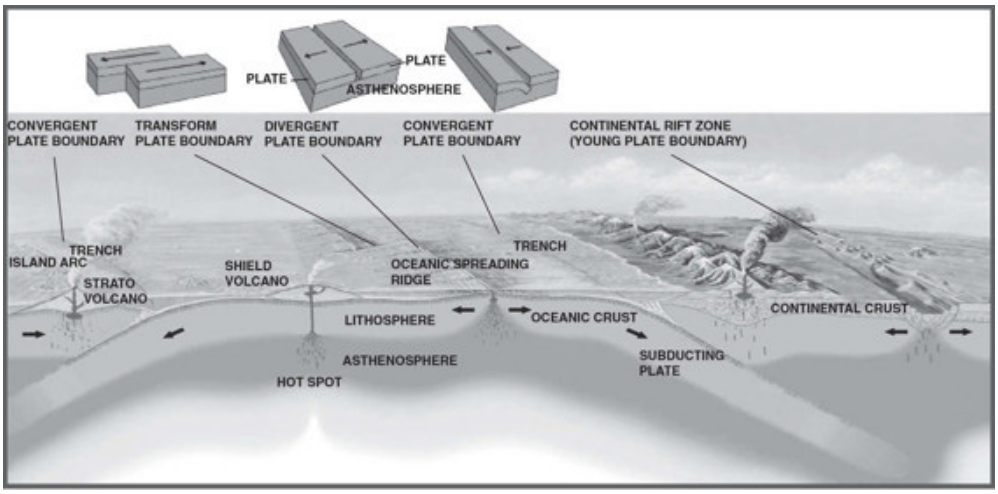
As molten rock flows up along the mid-ocean ridges to create new seafloor, the lava flows more abundantly in certain spots, producing volcanic islands. Scientists believe that these places of abundant lava flow may be hot spots that occur between two separating plates. Two such plates underlie the large, highly volcanic island of Iceland,which straddles the Mid-Atlantic Ridge. On one side is the North American plate, on the other, the Eurasian plate. Similarly, ridges extend from the active volcanic island of Tristan da Cunda westward to South America and eastward to Africa. Some geologists propose that, although such hot spots do not actually move plates, they may mark weak points in the mantle, which in turn help determine the lines along which plates fracture and separate.

Hot spots of volcanic activity often occur at the junction where plates collide. Examples are the volcanic Azores, which arise where the North American, Eurasian, and African plates meet. Another--Macquarie Island, south of New Zealand--marks the meeting point for the Pacific, Antarctic, and Indo-Australian plates. These hot spots may be fueled in part by plate collision.

https://mnliteracy.org/sites/default/files/curriculum/unit_1.6_plate_tectonics.pdf

Technical Concepts

Plate Tectonics



This image shows the three main types of plate boundaries: divergent, convergent, and transform. Image adapted from the U.S. Geological Survey.

1. Based on the information in the passage it can be reasonably inferred that

   A. geological theories are only proven with the help of technological advances.

   B. improvements in satellite technology advanced plate tectonics theory.

   C. the plate tectonics theory was created in 1965.

   D. the San Andreas Fault proved the veracity of plate tectonics theory.

2. In the third paragraph (lines 20-25), what is the distinction the author draws between continental-drift theory and plate tectonics?

   A. Fluidity versus immobility

   B. Drifting along versus pushing with purpose

   C. Moving through versus moving with

   D. Sailing on oceans versus rafting through streams

3. As used in line 42, "convection" most nearly means

   A. liquefying.

   B. melting.

   C. mobilizing.

   D. transferring.

4. In line 56, what is the most likely reason the author introduces Yellowstone's hot springs?

   A. As an example of a mid-plate volcano

   B. As proof that plates slide past each other

   C. As support for an opposing theory

   D. As support for an opposing theory

5. Which choice provides the best evidence for the answer to the previous question?

   A. Lines 3-5 ("It was ... activity")

   B. Lines 54-55 ("The volcanoes ... northeast"

   C. Lines 60-62 ("As the ... activity")

   D. Lines 65-67 ("Plate ... them")

Technical Concepts

Plate Tectonics

6. As used in line 64, "compatible" most nearly means

   A. consistent.

   B. adaptable.

   C. opposed.

   D. skewed.

7. What is the most likely reason the author mentions Iceland?

   A. To offer an example of an island created at a mid-ocean ridge

   B. To show a contrast between an island and a continent

   C. To prove that an island can also be a volcano

   D. To assert that the Mid-Atlantic Ridge connects two plates

8. Which choice provides the best evidence for the answer to the previous question?

   A. Lines 9-12 ("Plates ... other")

   B. Lines 41-44 ("Scientists ... Earth")

   C. Lines 49-52 ("Most ... center")

   D. Lines 69-72 ("As ... islands")

9. The principal rhetorical purpose of the phrase "Some geologists ... separate" (lines 80-84) is to

   A. suggest that scientists are still investigating plate tectonic theory.

   B. emphasize the lack of data supporting how fractures separate.

   C. reveal that some scientists disagree with the major tenets of plate tectonics.

   D. expose a weakness in the continental-drift theory.

10. It can be reasonably inferred from information in the passage and the diagram that

    A. continental rift zones always occur beside the ocean.

    B. hot spots are molten plumes that travel through the lithosphere to the surface.

    C. mid-ocean ridges are caused by the presence of subducting plates.

    D. oceanic crust is more rigid than continental crust.

Technical Concepts

Bats

Let's Go Bats

A Bats have a problem: how to find their way around in the dark they hunt at flight, and cannot use light to help them find prey and avoid obstacles. You might say that this is a problem of their own making one that they could avoid simply by changing their habits and hunting by day. But the daytime economy is already heavily exploited by other creatures such as birds. Given that there is a living to be made at night, and given that alternative daytime trades are thoroughly occupied, natural selection has favored bats that make a go of the night-hunting trade. It is probable that the nocturnal trades go way back in the ancestry of all mammals. In the time when the dinosaurs. dominated the daytime economy, our mammalian ancestors probably only managed to survive at all because they found ways of scraping a living at night. Only after the my stenos mass extinction of the dinosaurs about 65 million years ago were our ancestors able to emerge into the daylight in any substantial numbers.

B Bats have an engineering problem: how to find their way and find their prey in the absence of light Bats are not the only creatures to face this difficulty today. Obviously, the night-flying insects that they prey on must find their way about somehow. Deep-sea fish and whales have little or no light by day or by night. Fish and dolphins that live in extremely muddy water cannot see because, although there is light, it is obstructed and scattered by the dirt in the water. Plenty of other modern animals make their living in conditions where seeing is difficult or impossible.

C Given the questions of how to manoeuvre in the dark, what solutions might an engineer consider? The first one that might occur to him is to manufacture light, to use a lantern or a searchlight Fireflies and some fish (usually with the help of bacteria) have the power to - manufacture their own light but the process seems to consume a large amount of energy. Fireflies use their light for attracting mates. This doesn't require a prohibitive amount of energy: a male's tiny pinprick of light can be seen by a female from some distance on a dark night since her eyes are exposed directly to the light source itself. However, using light to find one's own way around requires vastly more energy, since the eyes have to detect the tiny fraction of the light that bounces off each part of the scene. The light source must, therefore, be immensely brighter if it is to be used as a headlight to illuminate the path, than if it is to be used as a signal to others. In any event, whether or not the reason is the energy expense, it seems to be the case that with the possible exception of some weird deep-sea fish, no animal apart from man uses manufactured light to find its way about

Technical Concepts

Bats

D What else might the engineer think off Well, blind humans sometimes seem to have an uncanny sense of obstacles in their path, ft has been given the nameí facial vision', because blind people have reported that it feels a bit like the sense of touch, on the face. One report tells of a totally blind boy who could and his tricycle at good speed round the block near his home, using facial vision. Experiments showed that, in fact, facial vision is nothing to do with touch or the front of the face, although the sensation may be referred to the front of the face, like the referred pain in a phantom limb The sensation of facial vision, it turns out really goes in through the ears. Blind people, without even being aware of the fact are actually using echoes of their own footsteps and of other sounds, to sense the presence of obstacles. Before this was discovered, engineers had already built instruments to exploit the principle, for example, to measure the depth of the sea under a ship. After this technique had been invented, it was only a matter of time before weapons designers adapted ft for the detection of submarines. Both sides in the Second World War relied heavily on these devices, under such code names as Asdic (British) and Sonar (American), as wall as Radar (American) or RDF (British), which uses radio echoes rather than sound echoes.

E The Sonar and Radar pioneers Didnít know it then, but all the world now knows that bats, or rather natural selection working on bats, had perfected the system tens of millions of years earlier, and their radar'" achieves feats of detection and navigation that would strike an engineer dumb with admiration It is technically incorrect to talk about bat'radar1, since they do not use radio waves. It is sonar. But the underlying mathematical the ones of radar and sonar are very similar, and much of our scientific understanding of the details of what bats are doing hasí come from applying radar theory to them. The American zoologist Donald Griffin, who was largely responsible for the discovery of sonar in bats, coined the term 'echolocation' to cover both sonar and radar, whether usedí by animals or by human instruments.

Technical Concepts

Bats

Questions 1-5

Reading Passage 1 has five paragraphs, A-E.

Which paragraph contains the following information?

Write the correct letter. A-E, in boxes 1-5 on your answer sheet.

* You may use any letter more than once.

1. examples of wildlife other than bats which do not rely on vision to navigate by
2. how early mammals avoided dying out
3. why bats hunt in the dark
4. how a particular discovery has helped our understanding of bats
5. early military uses of echolocation

Questions 6-9

Complete the summary below.

Choose ONE WORD ONLY from the passage for each answer.

Write your answers in boxes 6-9 on your answer sheet.

Facial Vision

Blind people report that so-called 'facial vision' is comparable to the sensation of touch on the face. In fact, the sensation is more similar to the way in which pain from a 6_____ arm or leg might be felt. The ability actually comes from perceiving 7_____. through the ears. However, even before this was understood, the principle had been applied in the design of instruments which calculated the 8 _____ of the seabed. This was followed by a wartime application in devices for finding 9 _____.

Technical Concepts

Bats

Questions 10-13

Complete the sentences below.

Choose NO MORE THAN TWO WORDS from the passage for each answer.

Write your answers in boxes 10-13 on your answer sheet.

10 Long before the invention of radar, _____ had resulted in a sophisticated radar-like system in bats.

11 Radar is an inaccurate term when referring to bats because _____ are not used in their navigation system.

12 Radar and sonar are based on similar _____

13 The word 'echolocation' was first used by someone working as a _____

https://www.ielts-mentor.com/reading-sample/academic-reading/659-ielts-academic-reading-sample-60-let-s-go-bats

Technical Concepts

Photosynthesis

Chloroplasts

Photosynthesis is a process in which sunlight energy is used to make glucose. The site of photosynthesis is in the chloroplast – a organelle found in the leaves of green plants. The main functions of chloroplasts are to produce food (glucose) during photosynthesis, and to store food energy. Chloroplasts contain the pigment, chlorophyll. Chlorophyll absorbs most of the colors in the color spectrum, and reflects only green and yellow wavelengths of light. This is why we see leaves as green or yellow – because these colors are reflected into our eyes.

1. What is photosynthesis?

2. Where does photosynthesis occur?

3. What are chloroplasts and where are they found?

4. What are the two main functions of chloroplasts?

5. Why doe most leaves appear green?

6. What is the primary pigment found in the chloroplast?

Photosynthesis

Glucose is another name for sugar. The molecular formula for glucose in C6H12O6. Plants make sugar by using the energy from sunlight to transform CO2 from the air with water from the ground into glucose. This process, called photosynthesis, occurs in the chloroplast of the plant cell. During this process, oxygen (O2) is created as a waste product and is released into the air for us to breath. The formula for photosynthesis is:

$$CO_2 + H_2O + \text{sunlight} \text{ ---- } C_2H_{12}O_6 + O_2$$

This formula says that carbon dioxide and water molecules are combined with the energy from sunlight to produce sugar and oxygen. The reactants in photosynthesis (what is used) are CO2, water and sun. The plant gets water from the ground through its roots. The plant collects carbon dioxide from the air. Much of the carbon dioxide comes from living organisms that exhale it, but some also comes from factory smokestacks and car fumes.

Technical Concepts

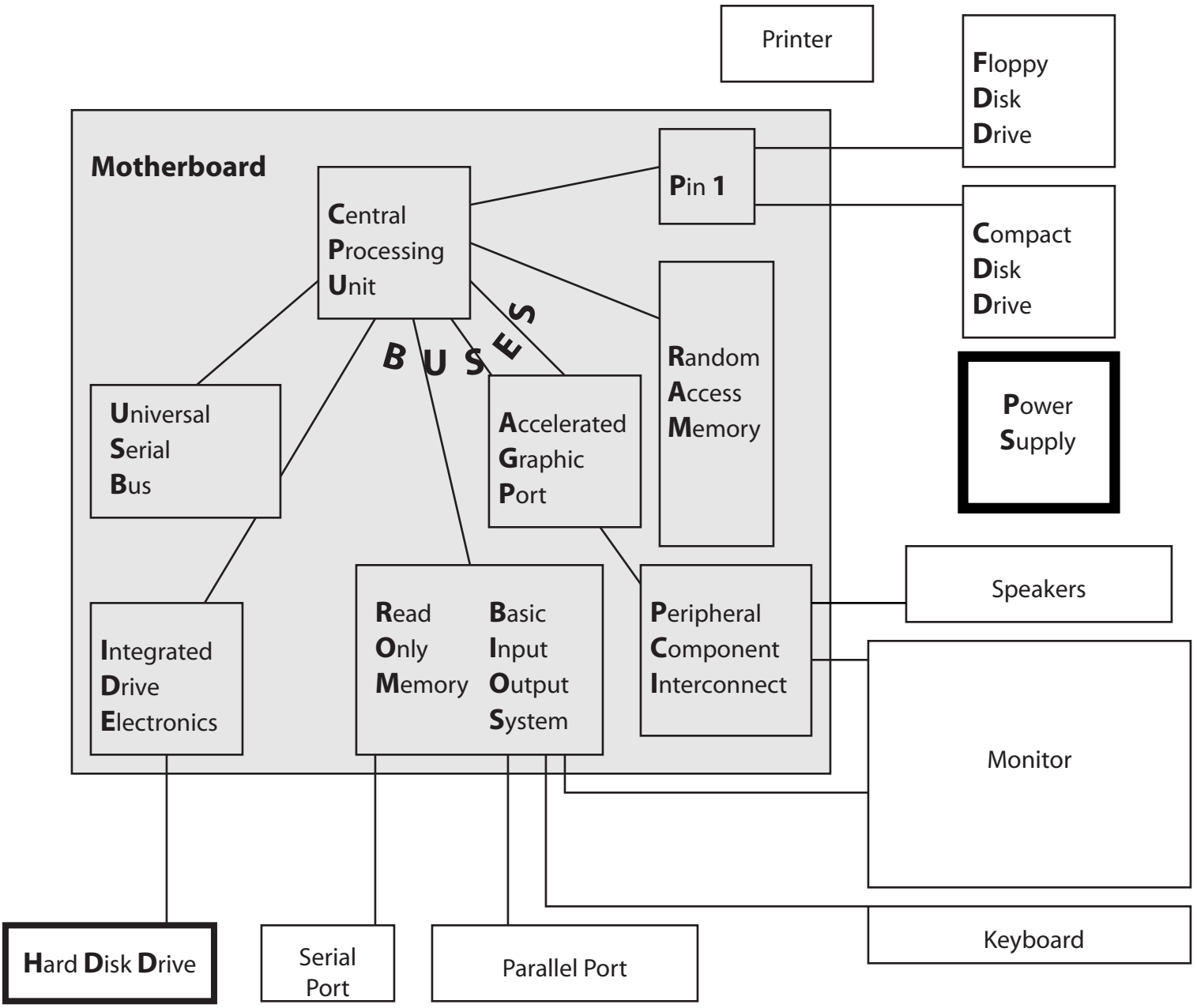
Photosynthesis

7. What is the formula for photosynthesis?
8. What three things are used to make glucose in photosynthesis?
9. Where does the water come from?
10. Where does the water enter the plant?
11. What are some sources of CO2?
12. What type of energy does the plant use to convert CO2 and H2O into sugar?

The products (what is made) are glucose and oxygen. The glucose produced is used by the plant for energy and growth. We also use this glucose by eating plants. The oxygen produced is released into the air for us to breath. Photosynthesis is essential for all life on earth, because it provides food and oxygen.

13. What is produced in photosynthesis?
14. What is the glucose used for?
15. What is the oxygen used for?

Network **S**oftware	**Browsers (Explorer,Netscape/Firefox,Mosaic,Lynx)** **TCP/IP – Universal Resource Locators**
Software **A**pplications	**Word Precessing (Word, WordPerfect, WordStar, StarOffice)** **Spreadsheets (Excel, FoxPro, VisiCalc, Lotus 1-2-3)** **Presentations (Powerpoint, Harvard Graphics)** **Databases (Access, dBase)**
Disk **O**perating **S**ystem	**MS-DOS Windows LINUX**



Technical Concepts

Human Body/Computer Analogy

NERVOUS SYSTEM – Motherboard

All computer parts are connected to each other on the motherboard. All electrical signals are conducted through it. Without a motherboard, all other components are lifeless.

HARD DRIVE = BRAIN – Subconscious

All knowledge of programs, files and data is stored on the Hard Drive. Just like the brain, it is sectioned off for various purposes. The hard drive stores and retrieves all of our precious information and programs for use by use whenever we wish. Just like our long term memories.

CPU CHIP = SPINAL CORD – (Central Processing Unit)

A chip that is on the Motherboard that is responsible for processing instructions (commands) received from hard drive (brain). It controls every activities of the computer. Just like the spinal cord, it receives instructions from the brain (hard drive).

RAM - Random Access Memory = BRAIN – conscious thought

RAM is a holding area of files and instructions that are to be used and then forgotten about. It allows the computer to multi-task just as your brain's conscious thought allows you to multi- task. The more RAM, the better your computer can multi-task, and the faster it will perform.

SPEAKER / PRINTER = MOUTH

Both are output devices. They produce what the computer needs to give out.

MOUSE / KEYBOARD = HANDS

Both are input devices. They are used to send in instructions and information into and out of the computer.

WEB CAM = EYES

Web cam detect light and send signals through the optic lens to the visual and the computer to the CPU. Just exactly like how the eyes works sending visual signals to the brain through optic nerves.

MICROPHONE = EARS

Microphone receives sound waves and sends it into the computer for processing

MONITOR = FACE

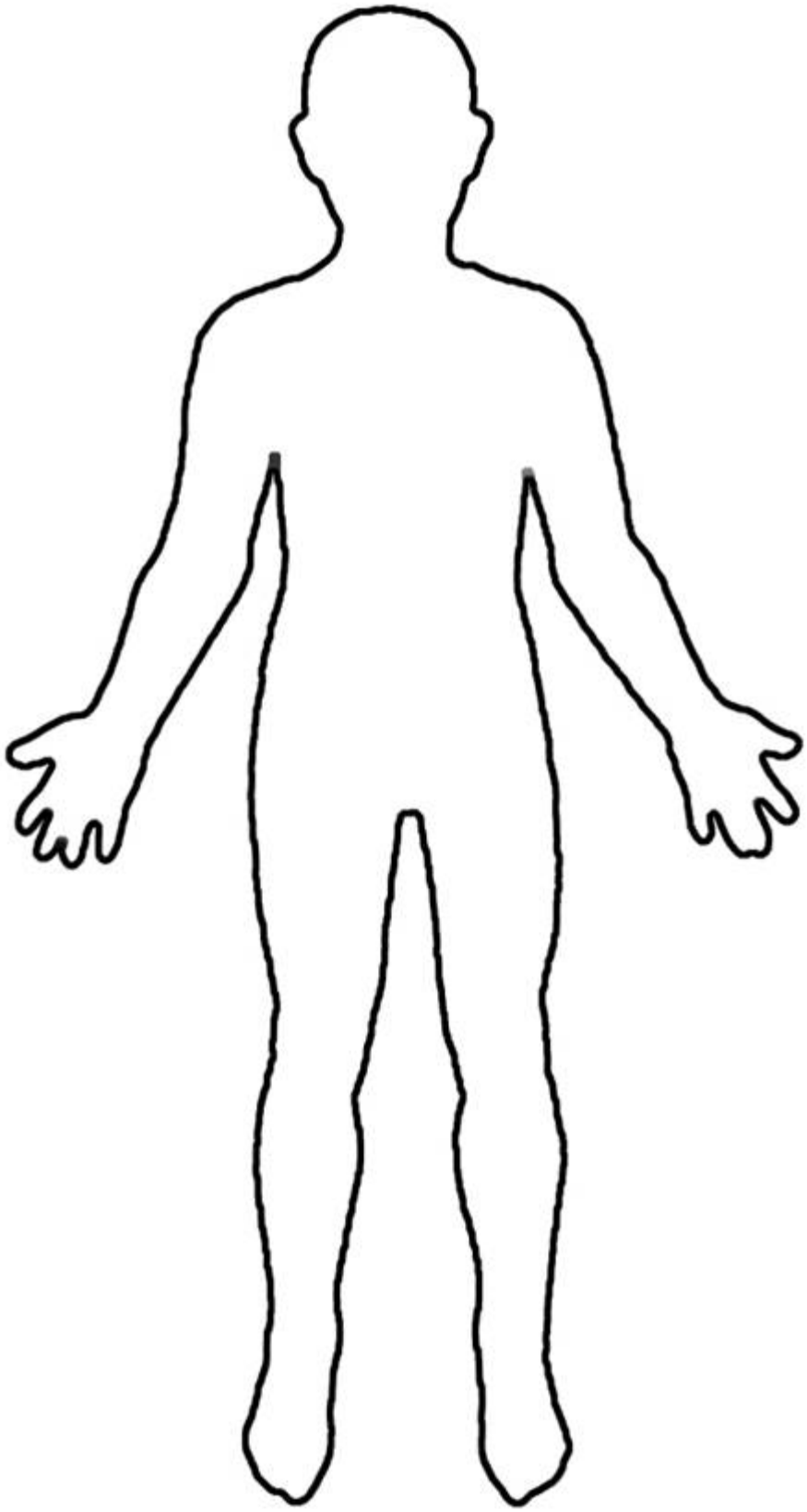
This is an output device. It has a screen which it uses to display what the computer is doing or how it feels. Just like the human face shows different expressions.

SYSTEM CASE = SKIN

This gives the computer a definite shape. It defines a computer telling us more about it, how it responds to the conditions around. Same implies the human skin, it defines the human body.

Technical Concepts

Human Body/Computer Analogy



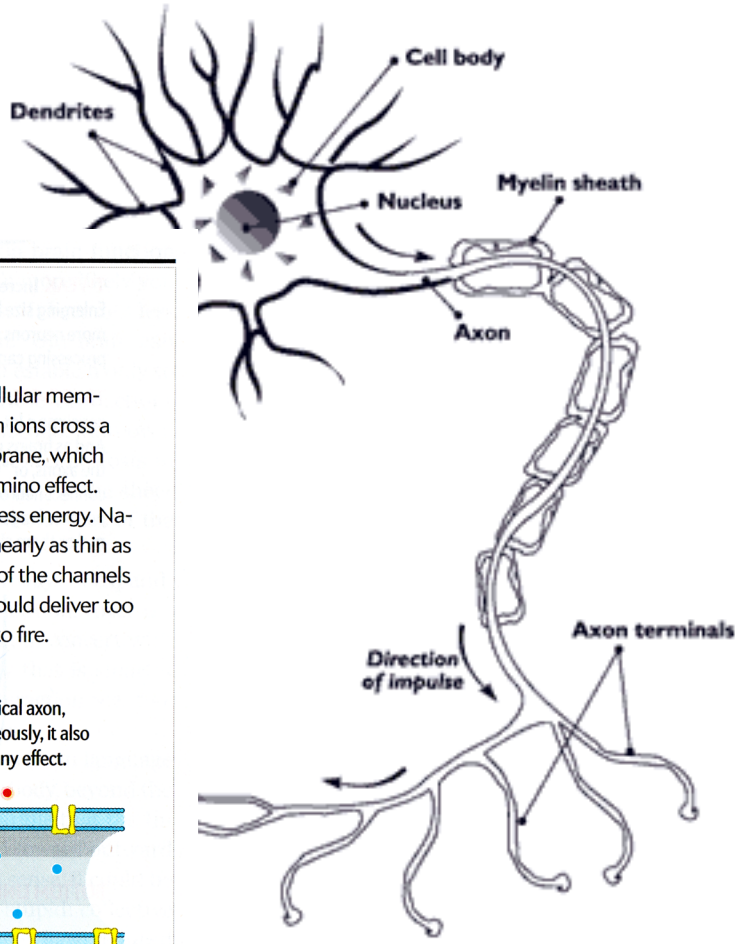
Technical Concepts

Human Body/Computer Analogy

Electric Circuit	Neural Network
Motherboard	neural network
open switch	synapse
closed switch	seratonin, dopamine
wire	Na & K in the axon
RAM	dreaming cerebral cortex ddd
wire insulator	myelin sheath
100 GB	100,000,000,000 neurons
USB port	Receptors in dendrite
Keyboard mouse microphone, touchpad, camera , scanner	Sensory neurons
printer, projector, fax, email,	Motor neurons

Technical Concepts

Human Body/Computer Analogy



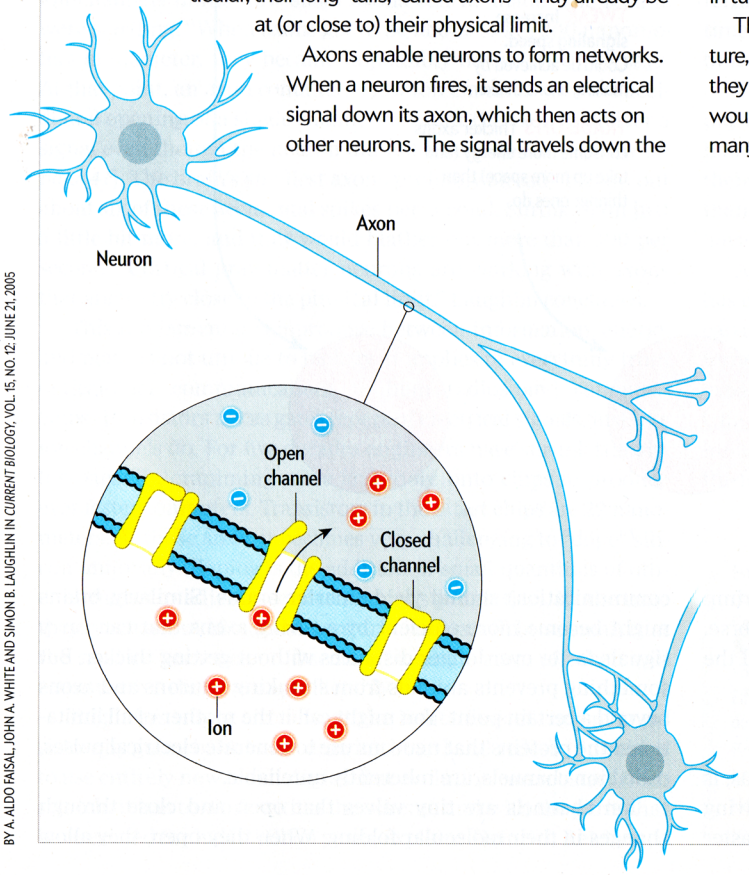
MINIATURIZATION HITS A LIMIT

The Physics of Thought

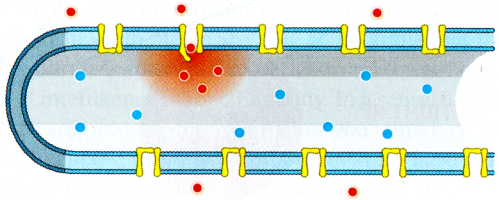
Just as shrinking transistors makes computers more powerful, brains with smaller components could, in principle, pack in more power and become faster. Human neurons, however—and in particular, their long "tails," called axons—may already be at (or close to) their physical limit.

Axons enable neurons to form networks. When a neuron fires, it sends an electrical signal down its axon, which then acts on other neurons. The signal travels down the axon by opening ion channels embedded in the cellular membrane (*inset*), which let ions through. When enough ions cross a channel, they change the voltage across the membrane, which in turn causes the channels nearby to open in a domino effect.

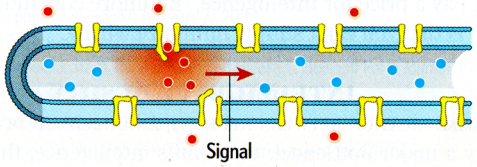
Thinner axons would save space and consume less energy. Nature, however, seems to have made them already nearly as thin as they can be: any thinner, and the random opening of the channels would make axons too noisy, meaning that they would deliver too many signals when the neuron was not supposed to fire.



INCONSEQUENTIAL BLIPS In a typical axon, when an ion channel opens spontaneously, it also closes back again before it can have any effect.



UNINTENDED CASCADE In a thinner axon, the opening of a single ion channel has a better chance of triggering the opening of neighboring channels and initiating a chain reaction.



SOURCE: "ION-CHANNEL NOISE PLACES LIMITS ON THE MINIATURIZATION OF THE BRAIN'S WIRING," BY A. ALDO FAISAL, JOHN A. WHITE AND SIMON B. LAUGHLIN IN *CURRENT BIOLOGY*, VOL. 15, NO. 12, JUNE 21, 2005

Illustration by Brown Bird Design

July 2011, ScientificAmerican.com **41**

Technical Concepts

Human Body/Computer Analogy

Woman recovering from rare illness

By JESSICA McCARTHY / The News Herald

Published: Friday, December 14, 2012

PANAMA CITY — A healthy, active, 39-year-old woman woke up Aug. 28 paralyzed.

"I got up and I just fell to the ground," Sharon Conway said. "Neither one of my legs would work; I was heavy from my waist down, dead weight. No matter what I did, I couldn't pick myself up."

Before that morning, Conway waitressed for 14 years in the same restaurant, spent time with her children and grandchildren and led a normal life. Now she is relearning how to walk, write and take care of herself.

"It's like being a baby," Conway said. "I have to retrain all of my muscles to do everything, even bathing."

Conway was diagnosed with Guillain-Barre Syndrome, which the Mayo Clinic describes as a condition in which the body's immune system attacks the nerves and eventually can paralyze the entire body by "destroying the protective covering of the peripheral nerves (myelin sheath), preventing the nerves from transmitting signals to the brain." The cause is unknown, but it often is preceded by an infectious illness such as a respiratory infection or the stomach flu.

Conway said she's allergic to bees and wasps and was bitten by a wasp the day before she woke up unable to use her legs and one of her hands. During her time in the hospital, the paralysis reached her chest and both hands.

Conway said she was treated with immunoglobulin and spent nine days in the ICU, followed by several days in critical care.

"While I was in the ICU, the Guillain-Barre affected my heart and my heart rate went down to 32," Conway said. "I couldn't really talk for the first few days; I could talk some, but in a whisper. Then if someone asked me to repeat what I said because they couldn't hear me, I was out of breath by that time. I was frustrated because I couldn't get it out."

Her doctors caught the disease early enough to avoid respirator use and Conway was told she had a 70 percent chance at full recovery but that it would take her about six months to walk again. Recovery was up to her, they said.

She was walking in five weeks.

"Everyone's been amazed how fast I've been getting over it," Conway said. "They say it's a willpower thing."

She said her walking hasn't recovered completely yet, but she is able to walk without assistance, although it's difficult to get started in the mornings. She has to be careful throughout the day, especially when it comes to temperature.

"I can feel coldness in arms, but it's like a numb coldness," Conway said. "It's not the same as before. From my waist down, I can't feel if it's cold or hot and when I take showers I can't feel the water on it. I only feel the pressure on my skin. I burned myself a couple of weeks ago on the stove and didn't know it."

Practice Test

According to the World Health Organization, "Sanitation generally refers to the provision of facilities and services for the safe disposal of human urine and feces. Inadequate sanitation is a major cause of disease world-wide and improving sanitation is known to have a significant beneficial impact on health both in households and across communities. The word 'sanitation' also refers to the maintenance of hygienic conditions, through services such as garbage collection and wastewater disposal."

1. Which of the following statements is best supported by the preceding paragraph?

   A. The word "sanitation" refers only to the maintenance of hygienic conditions, through services such as garbage collection and wastewater disposal.

   B. All Sanitation workers work in garbage collection.

   C. The word "sanitation" has more than one meaning.

   D. None of the above

The earliest evidence of urban sanitation was seen in Harappa, Mohenjo-daro and the recently discovered Rakhigarhi of Indus Valley civilization. This urban plan included the world's first urban sanitation systems. Within the city, individual homes or groups of homes obtained water from wells. From a room that appears to have been set aside for bathing, waste water was directed to covered drains, which lined the major streets. Roman cities and Roman villas had elements of sanitation systems, delivering water in the streets of towns such as Pompeii, and building stone and wooden drains to collect and remove wastewater from populated areas. But there is little record of other sanitation in most of Europe until the High Middle Ages. Unsanitary conditions and overcrowding were widespread throughout Europe and Asia during the Middle Ages, resulting periodically in cataclysmic pandemics such as the Plague of Justinian (541-42) and the Black Death (1347–1351), which killed tens of millions of people and radically altered societies.

2. According to the preceding passage, which of the following statements is correct?

   A. Most of Europe had elements of sanitation systems before the Romans.

   B. The urban plan of the recently discovered Rakhigarhi of Indus Valley civilization included the world's first urban sanitation systems.

   C. The Roman sanitation system killed tens of millions of people and radically altered societies.

   D. The Black Death occurred during pre-Roman times.

Practice Test

Poor sanitation accounts for almost 50 percent of underweight children since it has a direct link to diarrhea.. Children suffering for diarrhea are more vulnerable to become underweight. According to Mara, Lane, and Scott and Trouba, about 26 percent acute respiratory infections occur in children who are malnourished, which has a direct link to diarrhea. Sanitation is a serious issue that is affecting most parts of the world, especially the developing countries. On a global scale, the most affected are children who in most cases lose their lives due to diseases caused by poor sanitation. Major initiatives need to be set up if the MDG goal on sanitation is to be achieved by 2015.

3. According to the above selection, which of the following statements is correct?

   A. According to Mara, Lane, and Scott and Trouba, about 26 percent of acute respiratory infections occur in adults who are malnourished.

   B. Sanitation is a serious issue that is affecting most parts of the world, especially in developed countries.

   C. On a global scale, most people who lose their lives due to diseases caused by poor sanitation are children.

   D. Poor sanitation accounts for almost 50 percent of overweight children.

Disposal of solid waste is most commonly conducted in landfills, but incineration, recycling, composting and conversion to biofuels are also avenues. In the case of landfills, advanced countries typically have rigid protocols for daily cover with topsoil, where underdeveloped countries customarily rely upon less stringent protocols. The importance of daily cover lies in the reduction of vector contact and spreading of pathogens. Daily cover also minimizes odor emissions and reduces windblown litter. Likewise, developed countries typically have requirements for perimeter sealing of the landfill with clay-type soils to minimize migration of leachate that could contaminate groundwater (and hence jeopardize some drinking water supplies).

4. Which of the following statements is supported by the preceding paragraph?

   A. Daily cover increases windblown litter.

   B. Underdeveloped countries typically have requirements for perimeter sealing of the landfill with clay-type soils.

   C. Handling of waste disposal in landfills differs among developed and underdeveloped countries.

   D. Solid waste is mostly disposed of by incineration.

Practice Test

Recycling is a resource recovery practice that refers to the collection and reuse of waste materials such as empty beverage containers. The materials from which the items are made can be reprocessed into new products. Material for recycling may be collected separately from general waste using dedicated bins and collection vehicles, a procedure called curbside collection. In some communities, the owner of the waste is required to separate the materials into various different bins (e.g. for paper, plastics, metals) prior to its collection. In other communities, all recyclable materials are placed in a single bin for collection, and the sorting is handled later at a central facility. The latter method is known as "single-stream recycling." The most common consumer products recycled include aluminum such as beverage cans, copper such as wire, steel from food and aerosol cans, old steel furnishings or equipment, polyethylene and PET bottles, glass bottles and jars, paperboard cartons, newspapers, magazines and light paper, and corrugated fiberboard boxes.

5. Which of the following statements is supported by the above paragraph?

   A. One of the most common consumer products recycled is tree leaves.

   B. All communities require that the consumer separate recycle materials from general waste.

   C. "Single stream cycling" refers to the recycle system where the owner of the waste is required to separate the materials into various different bins (e.g. for paper, plastics, metals) prior to its collection.

   D. The most common consumer products recycled include aluminum such as beverage cans, and copper such as wire.

A number of different systems have been implemented to collect recyclates from the general waste stream. These systems lie along the spectrum of trade-off between public convenience and government ease and expense. The three main categories of collection are "drop-off centers," "buy-back centers," and "curbside collection." Drop-off centers require the waste producer to carry the recyclates to a central location, either an installed or mobile collection station or the reprocessing plant itself. They are the easiest type of collection to establish, but suffer from low and unpredictable supply throughput. Buy-back centers differ in that the cleaned recyclates are purchased, thus providing a clear incentive for use and creating a stable supply. The post-processed material can then be sold on, hopefully creating a profit. Unfortunately, government subsidies are necessary to make buy-back centers a viable enterprise, as according to the United States' National Waste & Recycling Association, it costs on average $50 to process a ton of material, which can only be resold for $30.

Practice Test

6. Which of the following statements is supported by the above paragraph?

   A. The cost to process a ton of recycle material is $30.

   B. The three main categories of collection are "drop-off centers," "sell-back centers," and "curbside collection."

   C. Drop-off Centers are the easiest type of collection to establish, but suffer from low and unpredictable supply throughput.

   D. Recycle items are universally collected under one unified system.

Answer questions 7 and 8 based on the following "Human Decontamination Procedure."

Human Decontamination Procedure Persons suspected of being contaminated are usually separated by sex, and led into a decontamination tent, trailer, or pod, where they shed their potentially contaminated clothes in a strip-down room. Then they enter a wash-down room where they are showered. Finally they enter a drying and re-robing room to be issued clean clothing, or a jumpsuit or the like. Some more structured facilities include six rooms (strip-down, wash-down and examination rooms...Facilities, such as Modecs, and many others, are remotely operable, and function like "human car washes". Mass decontamination is the decontamination of large numbers of people. The ACI World Aviation Security Standing Committee describes a decontamination process thus, specifically referring to plans for Los Angeles authorities: The disinfection/decontamination process is akin to putting humans through a car wash after first destroying their garments. Los Angeles World Airports have put in place a contingency plan to disinfect up to 10,000 persons who might have been exposed to biological or chemical substances.

7. The above "Human Decontamination Procedure" refers to which type of decontamination?

   A. only decontamination of humans exposed to biological substances.

   B. only decontamination of humans exposed to chemical substances.

   C. decontamination of humans exposed to chemical or biological substances.

   D. none of the above

8. Which of the following statements is correct?

   A. The Los Angeles World Airports have put in place a contingency plan to disinfect up to 1,000 persons who might have been exposed to biological or chemical substances.

   B. Modecs, and many others, cannot be operated remotely.

   C. Prior to persons being led to a wash-down room, they are usually separated by sex.

   D. Some more structured facilities include sixty rooms.

