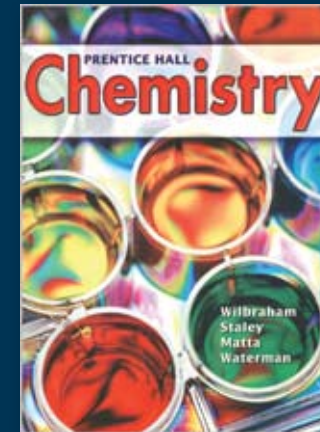


Program: Chemistry SE, Grade 10

Scope: Full-service content development for new SE; page layout, photo research, tech art creation, commissioning of illustrations, creation of prototype for a 45-page Elements Handbook EM section, design feature pages, and composition.



Technology & Society

Organic Dyes

Organic dyes are made from plants or insects and generally produce colors that are soft and natural. Using organic dyes requires two steps: extracting the dyestuff from the plant, and fixing the dye to a surface or material. The earliest recorded use of organic dyes to color fabrics dates from 2000 BC in China. **Interpreting Photographs** What plant yields a dye that produces salmon pinks to deep reds?

Dyeing fabric: Long lengths of fabric are bathed in large vats of dye before being removed into baths and sold.

The shrubby wood and root bark of the Chinese orange tree (*Melicope pumila*) yields a dye that can produce colors ranging from yellow to tan to green. During World War I, dye from Chinese orange was used to color U.S. uniforms khaki.

The wood of the snake tree (*Cotinus coggygria*) yields dyes which produce colors from yellow to gold to orange.

Made from the Indian plant *Indigofera tinctoria*, indigo dye produces a wide variety of blues from pale sky blue to dark navy.

The ground root of the madder plant (*Rubia tinctoria*) yields a dye that produces colors from salmon pink to deep red. The red coats worn by British soldiers during the Revolutionary War were colored by a dye made from madder root.

Long-tailed insects (*Cryptinae*) secrete a sticky, white substance, which, when dried, and ground yields a dye that produces colors from pink to purple.

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Technology & Society

Cold Water Makes a Hot Meal

Researchers have solved a long-standing problem: how to provide astronauts and military personnel with hot meals when there are no cooking facilities or time to cook. They developed the Flameless Ration Heater (FRH). An FRH is very small and weighs only one and a half ounces. It heats precooked, packaged meal rations with no flame or electricity. Simply place a meal pouch in an FRH and add water. After about 15 minutes, the food is a warm 60° C.

Applying Concepts What is the chemical equation for the reaction of magnesium metal and water?

How it works: An FRH uses a reaction to generate heat. Water reacts with magnesium metal to yield magnesium hydroxide, hydrogen, and heat. Just 25 grams of magnesium releases 153,000 joules of heat, enough to heat about 1 L of water.

Eating in space: Astronauts on the space shuttle *Columbia* eat Japanese rice. Astronauts use the FRH to heat prepackaged meals.

Program: Chemistry SE, Grade 10

Scope: Full-service content development for new SE; page layout, photo research, tech art creation, commissioning of illustrations, creation of prototype for a 45-page Elements Handbook EM section, design feature pages, and composition.

CHAPTER 11 Chemical Reactions

INQUIRY Activity

Modeling Chemical Reactions

Materials
18 colored paper clips (2 each of 8 different colors)

Procedure

- Each paper clip represents a single atom. Design one of 8 different colors of paper clip to represent one of 8 elements: carbon (C), hydrogen (H), and oxygen (O). Make two molecules each of hydrogen (H₂) and water (H₂O) and one molecule of oxygen (O₂).
- "Heat" your H₂ and H₂O by lighting the matches and joining one oxygen atom to two hydrogen atoms. Because there is an unreacted oxygen atom, you must react it with another hydrogen molecule to form a second water molecule.
- Summarize what happened in this reaction by placing the number of each molecule reacted or

Summarize what happened in this reaction:
 $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$

Think About It

- Summarize Dalton's atomic theory.
- How might the colors and kinds of atoms in the left and right of the arrow (\rightarrow) in the model reaction you performed support this theory?

Quick LAB

Testing for an Aldehyde

Purpose
To distinguish an aldehyde from an alcohol or a ketone.

Procedure

- Add 1 drop of 1M sodium hydroxide to 2 mL of 5% clear solution in a test tube. Add 1 drop of the substance being tested (see Table 23.1).
- Write the equation for any chemical reaction you observe.
- If you observed a chemical reaction in one or more of the test tubes, what practical uses might the reaction have?

Assessment 23.3 Check your understanding of the experiment. Write and compare answers in Section 23.3.

23.4 Polymerization

Connecting to Your World

The base of the tower of the Americas in San Antonio, Texas, is actually hundreds of feet above the ground! The rest of the tower was built and then elevated as the section below it was constructed. This section was put into place in this fashion, the next section was built by placing the entire tower on top until the original base ended up at the top.

Chemical compounds called polymers are very much like this tower. You will now learn about some characteristics of polymers and monomers.

Addition Polymers

Most of the reactions that you have learned about so far involve reactions of two or more atoms. Some of the most important organic compounds that exist, however, are giant molecules called polymers. Each day, you see many different polymers. For example, the materials you know as plastics are polymers, the kinds and uses of plastics are numerous and useful. A polymer is a large molecule formed by the covalent bonding of repeating smaller molecules. The smaller molecules that combine to form a polymer are called **monomers**. Some polymers contain only one type of monomer, others contain two or more types of monomers. The reaction that joins monomers to form a polymer is called **polymerization**. Most polymerization reactions require a catalyst.

Key Concepts

- Monomers are addition polymer building blocks.
- There are two main types of polymerization: addition and condensation.
- Monomers are small molecules that combine to form a polymer.
- Polymers are large molecules formed by the covalent bonding of repeating smaller molecules.

Reading Strategy
SK 1.1



23.4 Section Assessment

10. Key Concept Describe addition polymerization. Give an example of an addition polymer.

11. Key Concept Describe condensation polymerization. Give an example of a condensation polymer.

12. Like monomers and monomers, a polymer is a long chain of repeating units. Like monomers and monomers, a polymer is a long chain of repeating units. Like monomers and monomers, a polymer is a long chain of repeating units.

Assessment 23.4 Check your understanding of the experiment. Write and compare answers in Section 23.4.

Small-Scale LAB

Making a Solution

Purpose
To create link some polymers and examine their properties.

Materials

- 1% (w/v) gelatin
- table salt
- groundnut oil
- plastic spoon
- 250-mL beaker
- glass

Procedure

- Use a 250-mL beaker as a measuring cup to obtain approximately 200 mL of groundnut oil.
- Use a plastic spoon to stir the mixture.
- Use a plastic spoon to stir the mixture.

Assessment 23.4 Check your understanding of the experiment. Write and compare answers in Section 23.4.

Condensation Polymers

Condensation polymers are formed by the head-to-tail joining of monomer units. This is usually accompanied by the loss of water from the reacting monomers and the formation of a reaction product, thus the name **condensation polymers**. Water is an example of a condensation reaction product. The formation of a polymer from two monomers is usually accompanied by the loss of water. This is usually accompanied by the loss of water from the reacting monomers and the formation of a reaction product, thus the name **condensation polymers**. Water is an example of a condensation reaction product. The formation of a polymer from two monomers is usually accompanied by the loss of water.

Key Concepts

- Condensation polymers are formed by the head-to-tail joining of monomer units.
- This is usually accompanied by the loss of water from the reacting monomers and the formation of a reaction product, thus the name condensation polymers.
- Water is an example of a condensation reaction product.
- The formation of a polymer from two monomers is usually accompanied by the loss of water.

Nylon

Nylon is a synthetic polymer. It is a long chain of repeating units. It is a synthetic polymer. It is a long chain of repeating units. It is a synthetic polymer. It is a long chain of repeating units.

Figure 23.28 Nylon fishing lines are lightweight, yet very strong. Nylon fishing lines are lightweight, yet very strong. Nylon fishing lines are lightweight, yet very strong.

Section 23.4 Polymerization 248



Program: Interactive Science, Grades K-6

Scope: Commissioning of illustrations, and composition.

 Lesson 10

Confusion in the Sky Wilderness

Remember the camping trip from lesson 1? Find the drawing you made about what objects Chloe saw in the sky. Would you draw the sky the same way now?



The crescent-shaped Sun appeared to move lower and lower in the sky as I got closer and closer to noon. The full moon shone brightly overhead.



Directions

1. Decide which teammate will be the Sun, the Moon, and Earth. Pin on the name tags.
2. Read information clue #1 as a team. Do what the clue tells you to do.

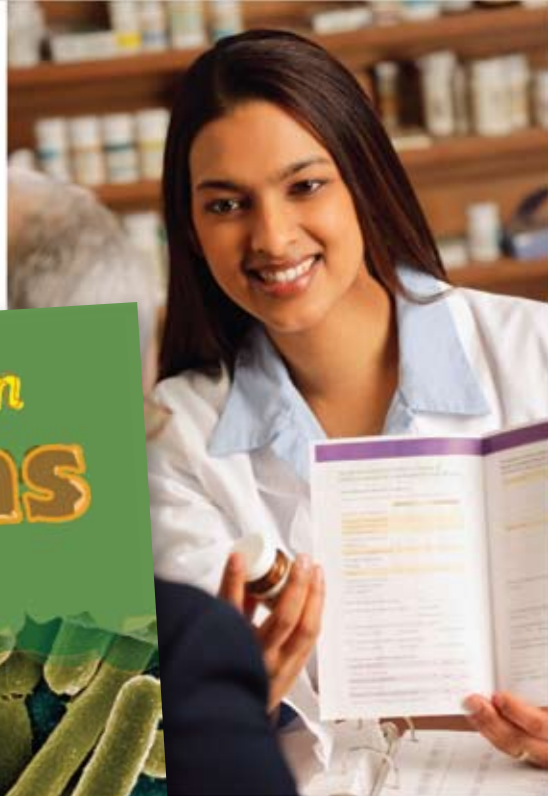
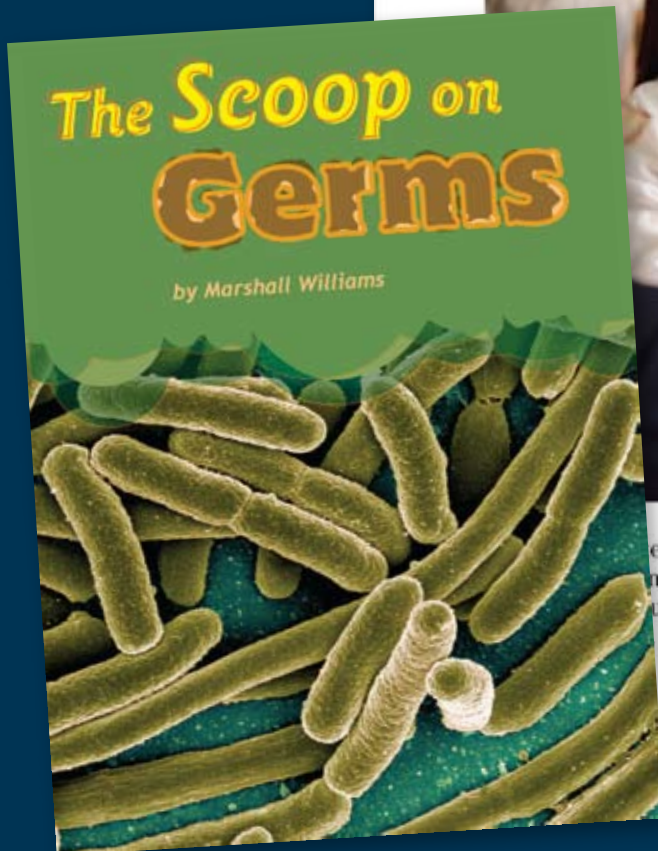


3. Read information clue #2. Do what the clue tells you to do.



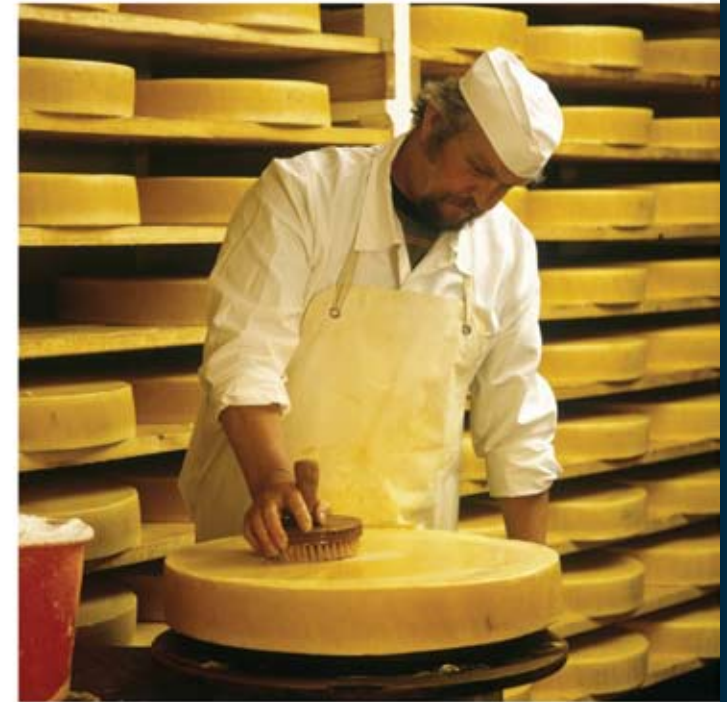
Program: Leveled Readers, Grade 4

Scope: Full-service content development including page layout, cover design, photo research, maps, art buying, and production.



Are most of these germs bad?
There are many more good bacteria than bad
germs in your body all the time. Doctors even use them

Some good bacteria live inside you. They help you digest your food. People also use bacteria to make foods like bread and cheese. They give the food a tangy taste.



Program: Leveled Readers, Grade 4

Scope: Full-service content development including page layout, cover design, photo research, maps, art buying, and production.



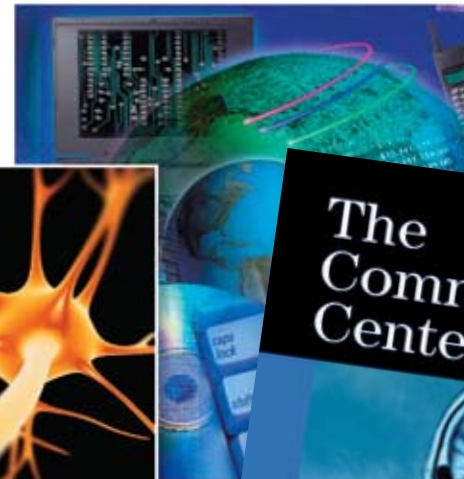
The hypothalamus lets us know when we are hungry.

The thalamus receives and sends signals from your senses. It lets the brain know what is going on outside your body.

The hypothalamus sends signals about what is going on inside your body. It regulates your body temperature, hunger, and thirst. It also controls the flow of hormones from glands in the body.

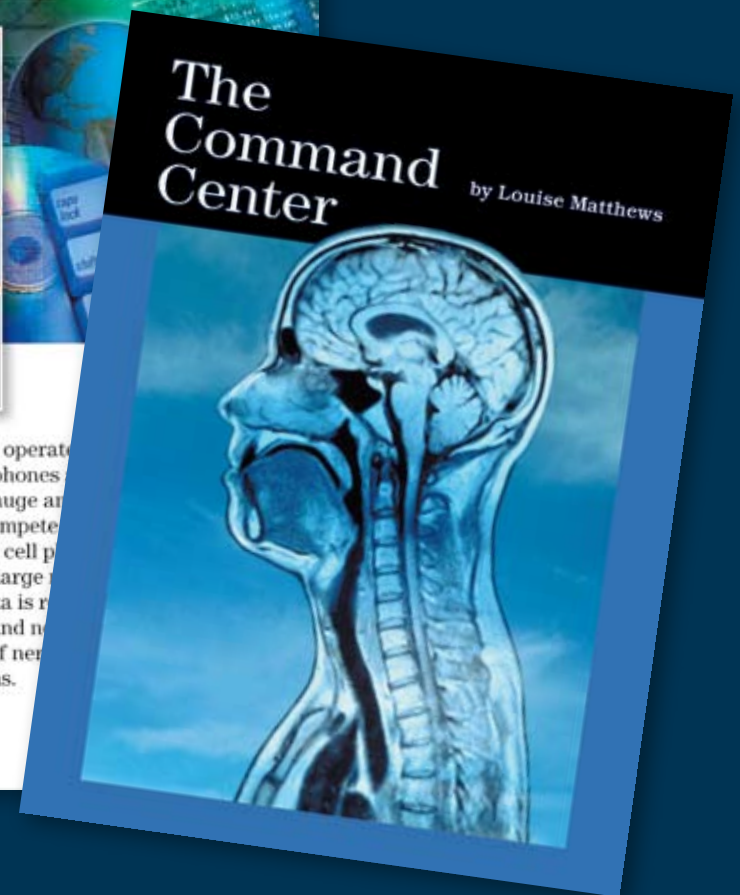
The spinal cord is a thick bundle of nerves found inside the vertebrae of your backbone. Spinal nerves connect the cord to the rest of your body. The spinal cord sends signals to and from your brain about what is happening inside and outside your body.

Cell phones and Internet connections operate much like neurons.



Many modern technological devices operate the way the nervous system does. Cell phones and Internet connections, for example, can process huge amounts of data in just seconds. Even so, they cannot compete with the speed or efficiency of your nervous system. A cell phone is constantly receiving signals and messages from a large number of other devices.

Similarly, in the nervous system, data is received and sent to the brain through a network of nerves and neurons. This is their only function. There are millions of neurons in your nervous system. They are called neurons.





Jared is about to be exposed to a cold virus. A first-period student, who uses the same desk that Jared uses, sneezed. The force of the sneeze spread tiny, invisible particles of a cold virus on the desk.

Moments later Jared arrived for second-period class. He placed his hand on the desk as he sat down. Some germs got on his hand. Then he rubbed his nose because it itched.

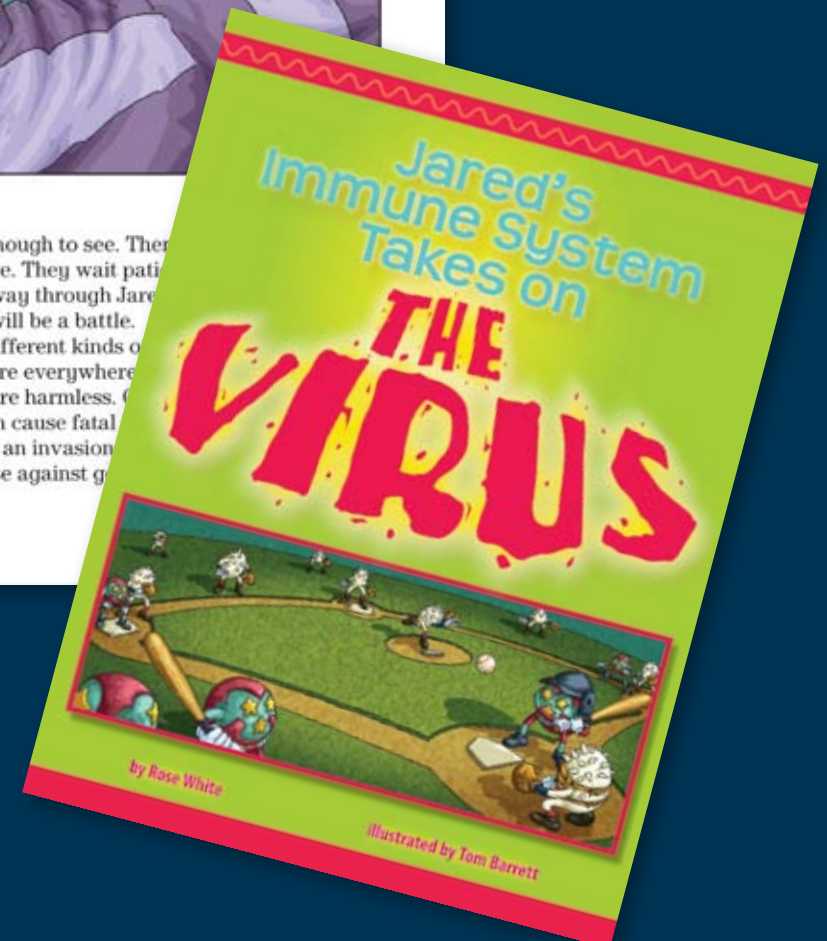
Jared transferred some of the cold germs to the mucous membrane in his nose. The germs entered cells in the lining of his nose. Then they started to reproduce—rapidly.

4

If only they were big enough to see. There are billions of numbers of germs out there. They wait patiently for their moment. They will find a way through Jared's defenses. If they attack. Be assured, there will be a battle.

There are millions of different kinds of germs, including parasites on Earth. They are everywhere. You are exposed to them every day. Some are harmless. Others can make you ill. There are some that can cause fatal diseases.

How can Jared survive an invasion of germs? His immune system is his body's defense against germs.



Program: Leveled Readers, Grade 4

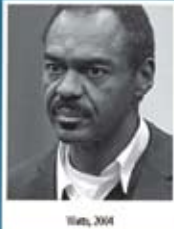
Scope: Full-service content development including page layout, cover design, photo research, maps, art buying, and production.



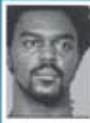
Program: Forensic Science SE, High School
Scope: Design of interior prototype, photo research, and composition.

CASE STUDY

Case Study: Coral Eugene Watts



Watts, 2004



Watts, 1979



Police Sketch

In 1982 Coral Watts was convicted in Texas of burglary with intent to murder; he was sentenced to a 60-year prison term. Because of mandatory release laws, an appeals court shortened his sentence to 25 years. Watts had confessed to killing 13 women, one in Michigan and 11 in Texas, and had been implicated in more than 20 more murders. He received immunity from prosecution in these cases because of his confession.



Preparing to process a crime scene



Processing a crime scene

A short exercise on observation and sketching can prepare students for processing the more detailed crime scenes to follow in the course. Find an area of a scene that will remain undisturbed for a day or so. Place a number of objects on a table or desk and measure a few inches. These may include a pen, pencil, ruler, and a small paper cup, mousetrap, or whatever. Rip or tear the area off so nothing can be touched. Have each student investigate, make notes and a sketch of what they observe. After the students finish, change a few items such as a different brand of pencil or type of pen, or a sword on the table, or a different mousetrap, and bring the students to explain to note changes.



Interviewing witnesses

38 Chapter 3

accurately, taking great care to observe and collect all evidence that will be used for scientific analysis and its legal application.

The main reason to carefully analyze the crime scene is to learn what happened and to gather evidence that can be used to identify and, ultimately, convict the people responsible.

The crime scene is the area where the crime took place, and it is the responsibility of the investigator to identify and document it.

The capital scene with the evidence for the crime scene. So for evidence in an area. The crime scene is the area where the crime took place, and it is the responsibility of the investigator to identify and document it.

PRES

The crime scene is the area where the crime took place, and it is the responsibility of the investigator to identify and document it. The crime scene is the area where the crime took place, and it is the responsibility of the investigator to identify and document it.

The crime scene is the area where the crime took place, and it is the responsibility of the investigator to identify and document it.

CHAPTER

3

THE CRIME SCENE

"Oh, how simple it would all have been had I been here before they came like a herd of buffalo and wallowed all over it."

—A. Conan Doyle, *The Boscombe Valley Mystery*, 1892

OBJECTIVES

After reading this chapter, you will understand:

- The steps to take when processing a crime scene.
- That type of evidence determines what packaging should be used.
- Why the chain of custody must be preserved.

You will be able to:

- Isolate, record, and search for evidence at a mock crime scene.
- Collect and package evidence at a mock crime scene using to proper forensic procedures.

AT THE CRIME SCENE

Forensic science begins at the crime scene, which can provide useful information that must be carefully, systematically, scientifically, and legally collected. If the crime scene is not treated carefully, it can make vital information not only useless, but even deceptive, pointing an investigation in the wrong direction.

Crime scene investigators gather important information at the crime scene that must be used later in reconstructing the sequence of events, the *modus operandi*, and the motive for the crime. Investigators must treat the crime scene meticulously and



Often investigate a crime scene

crime scene: any place where evidence may be located to help explain events

modus operandi: the characteristic method of operation of a criminal; sometimes referred to as MO

LABORATORY ACTIVITY

Blood Pattern Analysis

Develop a procedure to analyze and interpret bloodstains. Be sure to make accurate observations, measurements, and sketches and to record all data. The questions you want to answer include:

- What effect does release height have on the pattern left by drops of blood?
- What effect does velocity have on impact patterns?
- How does the angle of impact affect the appearance of drops of blood?
- How can you determine the direction of travel from a blood pattern?
- How can you determine whether an assailant is right- or left-handed?
- How can you determine the origin of a blood spatter?

Remember you may be called upon to justify your methods and interpretation in court, subject to cross examination!

Materials

- | | |
|-----------------------------------|--|
| wide roll of paper | ring stand |
| simulated blood | syringe |
| pipets | spray aspirator |
| paper | Beral pipet or eye dropper |
| plastic knife or tongue depressor | size table (see Appendix A at the end of this chapter) or trig function calculator |
| protractor, ruler, meter stick | digital camera |
| string and masking tape | |

Procedure

1. **Height:** Work out a method to study the relationship of drop shape and size to the height of origin.
2. **Velocity:** The density of blood is 1.06 g/cc, and its viscosity is 6 times that of water. Its average drop size, because of surface tension and viscosity, is 0.05 ml for a free fall. As with all objects falling freely, a drop of blood accelerates because of gravity, 32 ft/sec² (9.8 m/sec²). Any object will fall at this rate until it reaches its terminal velocity, which is a direct function of drop size. An average-sized drop reaches the terminal velocity of 25 ft/sec after a fall of 4 feet, so drop size should not change above that. The majority of high-velocity droplets, which tend to be less than 1 mm, will usually travel no more than 46 inches in a horizontal direction. Check it out.

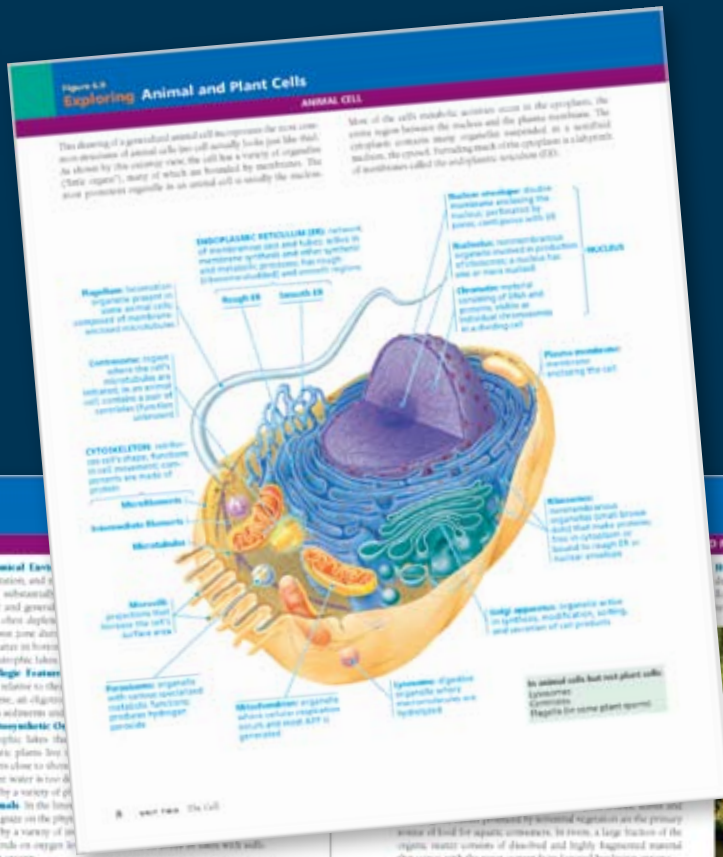
CASE STUDY



24



Police Sketch



Program: College, High School AP

Scope: Design of Exploring Module spreads, page review, management and tracking of all illustration and photo, full-service project management, and composition.

Figure 50.14 Exploring Aquatic Biomes

LAKES

Physical Environment Light decreases with depth, creating stratification (Figure 50.13a). During the temperate summer, the sun-heated water is separated from the deeper water by a zone of steep temperature decline (see Figure 50.12); in tropical lowland lakes, this thermocline is generally present year-round.

Chemical Environment Light penetration, and a very substantial pool of general and often dissolved organic matter, is present in most lakes. In temperate lakes, the thermocline is generally present year-round.

Geologic Features Lakes are formed in a variety of ways, including glacial erosion and deposition, tectonic activity, and volcanic activity.

Phytoplankton Chlorophyll *a* is the primary photosynthetic pigment in most aquatic plants. In lakes, phytoplankton are found in the upper layers of the water column, where light is available.

Animals In the lower layers of the water column, where light is scarce, a variety of animals are found, including zooplankton and benthic organisms.

Human Impact Pollution by runoff from land and dumping of toxic wastes lead to nutrient enrichment, which can produce algal blooms, oxygen depletion, and fish kills.

A eutrophic lake in Okanogan Falls, Bismarck

An oligotrophic lake in Grand Teton, Wyoming

RIVERS

Human Impact Municipal, agricultural, and industrial pollution degrade water quality and kill aquatic organisms. Damming and flood control impair natural functioning of streams and river ecosystems and threaten migratory species such as salmon.

A headwater stream in the Great Smoky Mountains

The Mississippi River far from its headwaters

WETLANDS

Physical Environment A wetland is an area covered with water for a long enough period to support aquatic plants. Wetlands range from those that are permanently inundated to those that flood infrequently.

Chemical Environment Because of the high organic production and decomposition in wetlands, both the water and the soils are periodically low in dissolved oxygen. Wetlands have a high capacity to filter dissolved nutrients and chemical pollutants.

Geologic Features Some wetlands develop in shallow basins, ranging from upland depressions to filled-in lakes and ponds. Others develop along shallow and periodically flooded banks of rivers and streams. Fringe wetlands occur along the coasts of large lakes and seas, where water flows back and forth because of rising lake levels or tidal action. Thus, fringe wetlands include both freshwater and marine biomes.

Photosynthetic Organisms Wetlands are among the most productive biomes on Earth. Their water-saturated soils favor the growth of specially adapted plants, such as floating pond lilies and emergent cattails, marsh sedges, tamarack, and black spruce, which can grow in water or in soil that is periodically anoxic (owing to the presence of water). Shady plants dominate the vegetation of swamps, while bogs are dominated by sphagnum mosses.

Animals Wetlands are home to a diverse community of invertebrates, which in turn support a wide variety of birds, fish, and mammals.

Cherokee National Wetland Reserve, in Georgia

ESTUARIES

Physical Environment An estuary is a transition between river and sea. Estuaries are flowing water environments with very complex flow patterns. During a rising tide, seawater flows up the estuary channel, flowing back down again during the falling tide. Often highly-dissolved nutrients accumulate in the bottom of an estuary channel, while lower-dissolved river water forms a surface layer that mixes little with the salty bottom layer.

Chemical Environment Salt concentrations vary spatially within estuaries, from nearly that of fresh water to the salinity of the ocean. Salinity also varies over the course of a day with the rise and fall of the tides. Nutrients from the river enrich estuarine waters, making estuaries the wetlands among the most biologically productive biomes on Earth.

Geologic Features Estuarine flow patterns combined with the sediments carried by river and tidal waves create a complex network of tidal channels, islands, natural levees, and mudflats.

Photosynthetic Organisms Saltmarsh grasses, algae, and phytoplankton are the major producers in estuaries.

Animals Estuaries support an abundance of worms, spiders, crabs, and many of the fish species that humans consume. Because of the abundant food in estuaries, many marine invertebrates and fishes use them as a breeding ground; others migrate through estuaries to freshwater habitats upstream. Estuaries are also critical feeding areas for many semi-aquatic wetlands, particularly waterfowl.

Human Impact Pollution from agriculture, and also filling and dredging, have disrupted estuarine ecosystems.

An estuary in a low coastal plain of Georgia.

Figure 3.10 Exploring Levels of Protein Structure

PRIMARY STRUCTURE
The primary structure of a protein is its unique sequence of amino acids. In an example, let's consider transferrin, a globular protein found in the blood that transports iron. It has a particular three-dimensional shape that is due to its primary structure. A specific one of the 20 amino acids, indicated here by its three-letter abbreviation, occupies each of the 127 amino acids. When two or more of these amino acids are clustered together, they can form a secondary structure. For example, a cluster of three amino acids, known as a motif, can form a secondary structure. The primary structure is like the order of letters in a very long word. If left to change, there would be 20¹²⁷ different ways of writing a 127-letter word. If 127 amino acids long, however, the overall primary structure of a protein is constrained not by the random linking of amino acids, but by selected genes within a genome.

SECONDARY STRUCTURE
Many proteins have regions of their polypeptide chains especially suited or folded in patterns that conform to the protein's overall conformation. These coils and folds, collectively referred to as secondary structure, are the result of hydrogen bonds between the repeating constituents of the polypeptide backbone over the amino and side chains. Both the oxygen and the nitrogen atoms of the backbone are electronegative, with partial negative charges (see Figure 2.11). The nearby positive hydrogen atoms, attached to the oxygen atom, has an affinity for the oxygen atom of a nearby polypeptide bond. Individually, these hydrogen bonds are weak, but because they are repeated many times over a relatively long region of the polypeptide chain, they can support a particular shape for that part of the protein.

The most common secondary structure is the α helix. In a helix, side chains fold together by hydrogen bonding between every fourth amino acid. Although transferrin has only one α helix region, two tertiary structures, other globular proteins have multiple stretches of α helix separated by unstructured regions, known as loops, such as in lactase. The secondary structure of lactase has the α helix because one side of its long loop.

The other main type of secondary structure is the β pleated sheet. In this structure, one or more regions of the polypeptide chain fold side by side, not connected by hydrogen bonds between parts of the two parallel polypeptide backbones. Instead, these side chains are connected by hydrogen bonds between the carbonyl groups of the side chains. The side chains of the β pleated sheet are parallel to each other, and the hydrogen bonds are perpendicular to the plane of the sheet.

TERTIARY STRUCTURE
Superimposed on the patterns of secondary structure is a protein's tertiary structure, shown above for the transferrin polypeptide. Tertiary structure involves interactions between hydrophobic interactions, ionic interactions, the small size of a polypeptide backbone, and the overall shape of the protein. The type of interaction that predominates in tertiary structure is hydrophobic interactions, called a hydrophobic interaction. In a polypeptide chain, the hydrophobic interactions, amino acids with hydrophobic side chains usually fold up to cluster at the center of the protein, out of contact with water. This is why we call it hydrophobic. The interaction is actually caused by the action of water molecules, which are held together with hydrogen bonds. As they form hydrogen bonds with each other and with hydrophilic parts of the protein, they exclude hydrophobic parts of the protein. This exclusion forces the hydrophobic parts of the protein to cluster together, and this clustering is called the hydrophobic effect. Hydrophobic interactions between positively and negatively charged side chains also help stabilize tertiary structure. These are all weak interactions. The formation of hydrogen bonds gives the protein a unique shape.

The conformation of a protein may be stabilized further by one or two bonds called disulfide bridges. Disulfide bridges form when two cysteine amino acids with sulfhydryl groups (-SH) on

QUATERNARY STRUCTURE
Some proteins consist of two or more polypeptide chains aggregated into one functional macromolecule. Quaternary structure is the overall protein structure that results from the aggregation of these polypeptide subunits. For example, shown above is the antibody globulin immunoglobulin protein, made up of six polypeptide chains. Another example is collagen, shown on the right, which is a fibrous protein that has hydroxyl side chains that are converted into a larger triple helix, giving the long fibers great strength. The two α chains have three amino acids in the glycerol backbone that are not in the β chain. In collagen, the oxygen-binding protein of red blood cells shown below, is another example of a globular protein with quaternary structure. It consists of two polypeptide subunits that are held together by one or two disulfide bonds. β chains consist primarily of a folded secondary structure. Each subunit has a nonpolypeptide component, called heme, with an iron atom that binds oxygen.

Hydrophobic interactions and van der Waals interactions
Hydrophobic interactions are caused by the action of water molecules, which are held together with hydrogen bonds. As they form hydrogen bonds with each other and with hydrophilic parts of the protein, they exclude hydrophobic parts of the protein. This exclusion forces the hydrophobic parts of the protein to cluster together, and this clustering is called the hydrophobic effect. Hydrophobic interactions between positively and negatively charged side chains also help stabilize tertiary structure. These are all weak interactions. The formation of hydrogen bonds gives the protein a unique shape.

Disulfide bridge
The conformation of a protein may be stabilized further by one or two bonds called disulfide bridges. Disulfide bridges form when two cysteine amino acids with sulfhydryl groups (-SH) on

Program: College, High School AP
Scope: Design of Exploring Module spreads, page review, management and tracking of all illustration and photo, full-service project management, and composition.

Figure 3.8 Exploring The Stages of Mitotic Cell Division in an Animal Cell

G₂ of INTERPHASE
Chromosomes with centromeres, Aster, Chromatin, Nuclear envelope, Nuclear pore, Nucleolus, Spindle fibers, Spindle poles, Spindle fibers, Spindle poles, Spindle fibers, Spindle poles.

PROPHASE
Early mitotic spindle, Centrioles, Chromosomes, consisting of two sister chromatids.

PROMETAPHASE
Suggers of nuclear envelope, Kinetochores, Nuclear envelope, Spindle poles, Spindle fibers, Spindle poles, Spindle fibers, Spindle poles.

METAPHASE
Metaphase plate, Spindle, Spindle fibers, Spindle poles, Spindle fibers, Spindle poles.

ANAPHASE
Sister chromatids separate, Spindle fibers, Spindle poles, Spindle fibers, Spindle poles.

TELOPHASE AND CYTOKINESIS
Cleavage furrow, Nuclear envelope forming, Spindle fibers, Spindle poles, Spindle fibers, Spindle poles.

G₂ of Interphase

- The cell is well defined and bounded by the nuclear envelope.
- Nucleolus is present.
- Chromosomes are well defined and bounded by the nuclear envelope.
- Two centrosomes, formed earlier in the cell cycle, are positioned on opposite sides of the nucleus.
- Chromosomes have already duplicated their DNA.

Prophase

- The chromatin fibers become more tightly coiled, condensing into discrete chromosomes consisting of two sister chromatids.
- The nuclear envelope begins to disintegrate.
- The two centrosomes begin to move toward opposite sides of the nucleus.
- The spindle fibers begin to form at the centrosomes and attach to the kinetochores.
- The centrosomes move toward the poles of the cell, and the spindle fibers begin to form.

Prometaphase

- The nuclear envelope fragments.
- The spindle fibers attach to the kinetochores.
- The spindle fibers pull the chromosomes toward the center of the cell.
- The two centrosomes move toward opposite sides of the cell.
- The spindle fibers pull the chromosomes toward the poles of the cell.

Metaphase

- The chromosomes align at the metaphase plate.
- The spindle fibers pull the chromosomes toward the poles of the cell.
- The spindle fibers pull the chromosomes toward the poles of the cell.

Anaphase

- The sister chromatids separate.
- The spindle fibers pull the chromosomes toward the poles of the cell.
- The spindle fibers pull the chromosomes toward the poles of the cell.

Telophase

- The nuclear envelope reforms.
- The spindle fibers pull the chromosomes toward the poles of the cell.
- The spindle fibers pull the chromosomes toward the poles of the cell.

Program: Microsoft Office SE, High School

Scope: Content development, creation of prototype, templates, and composition.

UNIT 1 Word 2003: Business and Personal Communication

Unit Contents:

- LESSON 1: Creating a Document
- LESSON 2: Formatting Content
- LESSON 3: Using Word Tools
- LESSON 4: Columns, Tables, and Graphics
- LESSON 5: Margins, and Printing Options
- LESSON 6: Formatting and Managing Documents
- LESSON 7: Collaborating with Others

Why It Matters

How does technology help you communicate with others? Chances are you use cell phones, e-mail, instant messaging, and other forms of technology to stay in touch with your friends and family. Word processing allows business employees to communicate quickly and easily through memos, letters, and business reports. **Why is communication important to individuals and organizations?**

PowerUp Activity Visit the **Online Student Resource Center** at icheck.com. Click on **Unit 1** to learn how organizations use word processing applications.

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UNIT 1 Career Facts

Data Bytes

Computer-related jobs make up eight of the 14 fastest-growing occupations in the United States. They will account for nearly two million of the eight million new jobs created through 2010.

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What Are the Jobs of Tomorrow?

Job	Percent Increase From 2006 - 2014
Application software engineers	~85%
Computer support specialists	~80%
Systems software engineers	~75%
Computer systems administrators	~70%
Database administrators	~65%
Computer systems analysts	~60%
Medical assistants	~55%
Information systems managers	~50%
Health health aides	~45%
Physical therapist aides	~40%
Occupational therapist aides	~35%
Physical therapist assistants	~30%
Phone trainers and instructors	~25%

FACT CHECK

- Explain:** What do the numbers along the x-axis indicate?
- Interpret:** If there were 100,000 computer systems analyst jobs in the year 2006, about how many more of these jobs does the graph predict there will be in 2014?
- Describe:** Which job has the highest percent increase?

EXERCISE 1-2: Locate Menus and Menu Commands

Step-By-Step

- Launch Word.
- Move your pointer over the menu headings called out in Figure 1.2.
- Click **Edit** on the menu bar. A list of menu commands appears. Do not click the pointer again.
- Move the pointer over each heading in the menu bar. Each heading's commands automatically appear.
- To show the list of commands, click any menu heading OR click the **Shift** key while you click the menu heading.
- Click **Tools**.
- Move the pointer to the **Language** command. The **Language** submenu automatically opens (see Figure 1.3).
- HOW TO:** Close the **Tools** menu. Your screen should appear like Figure 1.2.

FIGURE 1.2 Menu bar and menu headings

FIGURE 1.3 Language submenu

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UNIT 1 Portfolio Project

LEVEL: This is a beginning-level project.

Summer Day Camp Fun

The summer day camp you work for is putting together its schedule for the coming summer. Your supervisor has asked you to arrange for six fun and exciting classes for seven- and eight-year-olds. The classes will be held at the local community center. You do not have a large budget to work with, so you must be creative.

Part 1: Write a Letter

Goal: Your task is to find people who can teach activities at your camp. You decide to ask people in your community if they have talents they want to share. For example:

- the owner of the local gardening center might like to teach gardening skills
- the owner of the local music store might like to teach guitar lessons
- someone might have a craft or hobby they would like to share

Create: Write a general letter that you can send to people like the musician. Your letter should include the following:

- ask whether the person has any skills or talents that they would like to share with children
- in the second paragraph:
 - ask the person to describe the skill or talent they would like to teach
 - ask the person what days and times they might be available to teach

Self-Assess: Use the **Have You...?** checklist to review your letter. Make sure your letter contains all of the items noted in the checklist. Then, print your letter and proofread it carefully. Make necessary corrections. Follow your teacher's instructions for saving the document and saving it to your Portfolio folder.

When finished, proceed to Part 2.

Have You...?

<input type="checkbox"/>	Used standard margins for a business letter
<input type="checkbox"/>	Included your return address in the header
<input type="checkbox"/>	Included today's date
<input type="checkbox"/>	Included a greeting
<input type="checkbox"/>	Provided two or more paragraphs in the body of the letter
<input type="checkbox"/>	Included a closing

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