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Critter's Café

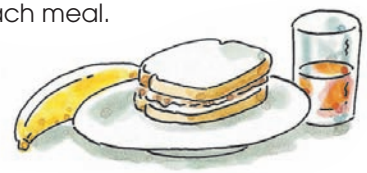
Read the clues. Mark the chart with ✓s.
The first one is done for you.

1. Everyone had fruit.
2. Dad and Ben had a taco.
3. Mum had a salad.
4. Anna had a turkey sandwich.
5. Mum, Ben and Anna had juice.
6. Dad had milk.

	milk	juice	fruit	salad	taco	sandwich
Dad			✓			
Ben			✓			
Mum			✓			
Anna			✓			

Write a person's name under each meal.

1. _____



2. _____

3. _____

4. _____

Try This! Make critter place mats. You need construction paper, crayons or pens, and clear contact paper. Draw animals on the construction paper. Cover with clear contact paper.

Froggy Grows Up

Look at the pictures.

A B C D E

Read the sentences.
Write **A**, **B**, **C**, **D** and **E** to show how Froggy grows up.

1. _____ Froggy is a tiny tadpole.
2. _____ Froggy is a big frog.
3. _____ Froggy is an egg.
4. _____ Froggy grows four legs.
5. _____ Froggy grows two legs.

Step 4. Click on any part of the image. All the adjacent pixels of the same colour will be selected **(Fig. 8.12)**.

Fig 8.12 Selection done with Magic Wand tool

Quick view

Magic Wand can make and merge selections if we press the Shift key.

Crop Tool

The **Crop** tool is used to remove unwanted parts of an image. The steps to crop an image are:

Step 1. Open the image **(Fig. 8.13)** and select the **Crop** tool from the toolbox or press **C**.

Step 2. The Shape of the mouse pointer changes to the Crop tool cursor

Step 3. Now place the mouse pointer on the image. Click on the image and drag over the part of the image you want to crop. The area outside the selection will get dimmed and the selected part will be highlighted. Release the mouse button **(Fig. 8.14)**.

Step 4. The **Crop marquee** appears with handles on the corners and sides. Use the handles to make the final adjustments.

Step 5. Double–click inside the crop marquee or press the **Enter** key to crop the area of the image selected **(Fig. 8.15)**.

Fig 8.13 Image

Fig 8.14 Select portion to crop

Fig 8.15 Cropped image

Move Tool

The **Move** tool is used for moving the selected part of an image to a new location. The steps for using the Move tool are:

Step 1. Open the image and select the part of the image that you want to move using Marquee/ Lasso tool.

Step 2. Click on the **Move** tool from the toolbox or press **V**.

We keep some animals like cows, buffaloes, hens, and sheep in farms. These animals are useful to us in many ways. We get milk from buffaloes and cows, eggs from hens and ducks, and meat from hens and goats. We get wool from sheep. Elephants, donkeys, bullocks, and horses carry our heavy loads. Bullocks and cows plough our fields. Such animals which can be tamed or domesticated are called domestic animals.

Shearing of sheep

We keep some animals like dogs, cats, rabbits and parrots at our homes as our companions. These animals are called pet animals.

Do you have a pet? Yes/ No

Which animals is it? What is its name?

.....

Let's talk...

What can we do to stop cruelty towards animals?

ANIMALS LIVE IN DIFFERENT PLACES

You must have noticed that animals live in different places. Some animals live on land. Some live in water, some live under ground while others live on trees. Some can live only in water while some live on both land and in water. Some of them also live in your kitchen or garden.

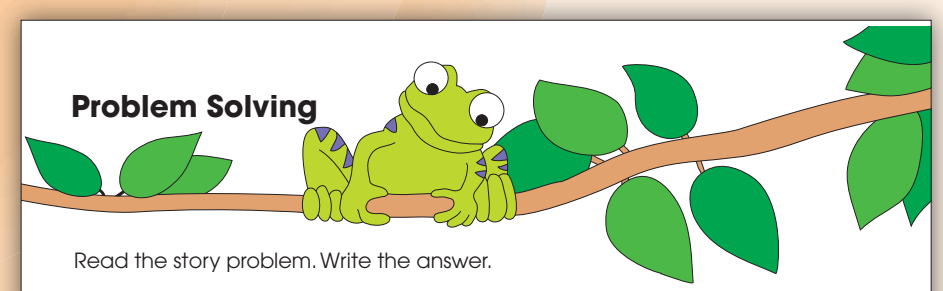
Animals like tigers, elephants, cows, horses, cats live on land.

Animals like monkeys and birds live on trees.

Animals like fishes, whale, and octopus live in water.

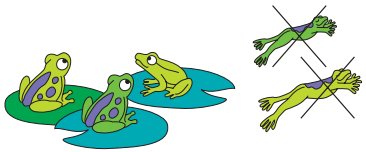
Animals like crocodile, frog, and turtle can live on both land and water.

Problem Solving



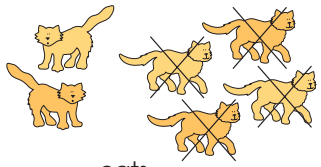
Read the story problem. Write the answer.

1. How many **are left**?



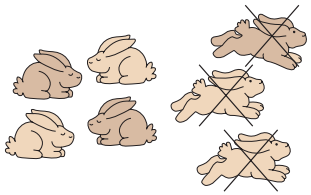
_____ frogs

2. How many **are left**?



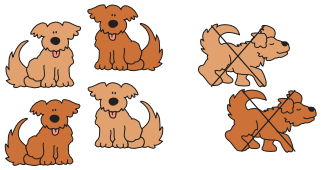
_____ cats

3. How many **are left**?



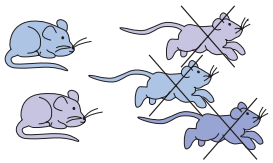
_____ rabbits

4. How many **are left**?



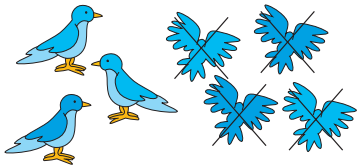
_____ dogs

5. How many **are left**?



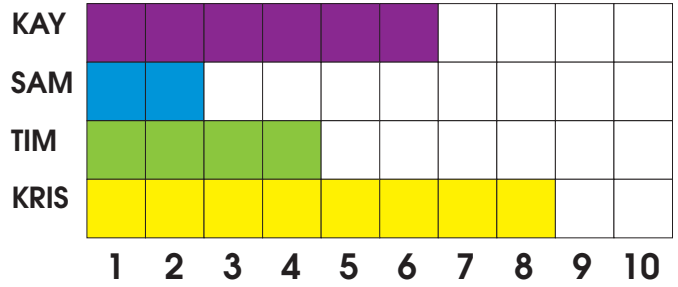
_____ mice

6. How many **are left**?



_____ birds

Bar Graphs and Story Problems



1. How many boxes of biscuits did Kay sell? _____

2. How many boxes of biscuits did Tim sell? _____

3. How many boxes of biscuits did Tim and Sam sell altogether?

_____ ☐ _____ = _____

4. How many did Kris and Sam sell altogether?

_____ ☐ _____ = _____

5. Kris sold more boxes than Tim. How many more did Kris sell?

_____ ☐ _____ = _____

6. How many boxes did Tim and Kay sell in all?

_____ ☐ _____ = _____

5.1 Polynomial Functions and Models

PREPARING FOR THIS SECTION *Before getting started, review the following:*

- Polynomials (Chapter R, Section R.4, pp. 39–47)
- Using a Graphing Utility to Approximate Local Maxima and Local Minima (Section 3.3, p. 228)
- Intercepts of a Function (Section 3.2, pp. 215–217)
- Graphing Techniques: Transformations (Section 3.5, pp. 244–251)
- Intercepts (Section 2.2, pp. 159–160)

Now Work the 'Are You Prepared?' problems on page 334.

OBJECTIVES

1 Identify Polynomial Functions and Their Degree

In Chapter 4, we studied the linear function $f(x) = mx + b$, which can be written as

$$f(x) = a_1x + a_0$$

and the quadratic function $f(x) = ax^2 + bx + c, a \neq 0$, which can be written as

$$f(x) = a_2x^2 + a_1x + a_0 \qquad a_2 \neq 0$$

Each of these functions is an example of a *polynomial function*.

DEFINITION

A **polynomial function** is a function of the form

$$f(x) = a_nx^n + a_{n-1}x^{n-1} + \cdots + a_1x + a_0 \qquad (1)$$

where $a_n, a_{n-1}, \ldots, a_1, a_0$ are real numbers and n is a nonnegative integer. The domain of a polynomial function is the set of all real numbers.

In Words
A polynomial function is the sum of monomials.

A polynomial function is a function whose rule is given by a polynomial in one variable. The **degree** of a polynomial function is the largest power of x that appears. The zero polynomial function $f(x) = 0 + 0x + 0x^2 + \cdots + 0x^n$ is not assigned a degree.

Polynomial functions are among the simplest expressions in algebra. They are easy to evaluate: only addition and repeated multiplication are required. Because of this, they are often used to approximate other, more complicated functions. In this section, we investigate properties of this important class of functions.

EXAMPLE 1 **Identifying Polynomial Functions**

Determine which of the following are polynomial functions. For those that are, state the degree; for those that are not, tell why not.

(a) $f(x) = 2 - 3x^4$ (b) $g(x) = \sqrt{x}$ (c) $h(x) = \dfrac{x^2 - 2}{x^3 - 1}$

(d) $F(x) = 0$ (e) $G(x) = 8$ (f) $H(x) = -2x^3(x - 1)^2$

Solution The y-intercept of f is $f(0) = -6$. We can eliminate the graph in Figure 19(a), whose y-intercept is positive.

We don't have any methods for finding the x-intercepts of f, so we move on to investigate the turning points of each graph. Since f is of degree 4, the graph of f has at most 3 turning points. We eliminate the graph in Figure 19(c) since that graph has 5 turning points.

Now we look at end behavior. For large values of x, the graph of f will behave like the graph of $y = x^4$. This eliminates the graph in Figure 19(d), whose end behavior is like the graph of $y = -x^4$.

Only the graph in Figure 19(b) could be (and, in fact, is) the graph of $f(x) = x^4 + 5x^3 + 5x^2 - 5x - 6$.

Now Work PROBLEM 65

SUMMARY Graph of a Polynomial Function $f(x) = a_nx^n + a_{n-1}x^{n-1} + \cdots + a_1x + a_0 \quad a_n \neq 0$

Degree of the polynomial function f: n
Graph is smooth and continuous.
Maximum number of turning points: $n - 1$
At a zero of even multiplicity: The graph of f touches the x-axis.
At a zero of odd multiplicity: The graph of f crosses the x-axis.
Between zeros, the graph of f is either above or below the x-axis.
End behavior: For large $|x|$, the graph of f behaves like the graph of $y = a_nx^n$.

4 Analyze the Graph of a Polynomial Function

EXAMPLE 9 **How to Analyze the Graph of a Polynomial Function**

Analyze the graph of the polynomial function $f(x) = (2x + 1)(x - 3)^2$.

Step-by-Step Solution

Step 1: *Determine the end behavior of the graph of the function.*

Expand the polynomial to write it in the form

$$f(x) = a_nx^n + a_{n-1}x^{n-1} + \cdots + a_1x + a_0$$
$$f(x) = (2x + 1)(x - 3)^2$$
$$= (2x + 1)(x^2 - 6x + 9)$$
$$= 2x^3 - 12x^2 + 18x + x^2 - 6x + 9 \quad \text{Multiply.}$$
$$= 2x^3 - 11x^2 + 12x + 9 \quad \text{Combine like terms.}$$

The polynomial function f is of degree 3. The graph of f behaves like $y = 2x^3$ for large values of $|x|$.

Step 2: *Find the x- and y-intercepts of the graph of the function.*

The y-intercept is $f(0) = 9$. To find the x-intercepts, we solve $f(x) = 0$.

$$f(x) = 0$$
$$(2x + 1)(x - 3)^2 = 0$$
$$2x + 1 = 0 \quad \text{or} \quad (x - 3)^2 = 0$$
$$x = -\frac{1}{2} \quad \text{or} \quad x - 3 = 0$$
$$x = 3$$

The x-intercepts are $-\dfrac{1}{2}$ and 3.

Skill Building

In Problems 15–26, determine which functions are polynomial functions. For those that are, state the degree. For those that are not, tell why not.

15. $f(x) = 4x + x^3$ Yes; degree 3

16. $f(x) = 5x^2 + 4x^4$ Yes; degree 4

17. $g(x) = \frac{1 - x^2}{2}$ Yes; degree 2

18. $h(x) = 3 - \frac{1}{2}x$ Yes; degree 1

***19.** $f(x) = 1 - \frac{1}{x}$ No

20. $f(x) = x(x - 1)$ Yes; degree 2

***21.** $g(x) = x^{3/2} - x^2 + 2$ No

***22.** $h(x) = \sqrt{x}(\sqrt{x} - 1)$ No

23. $F(x) = 5x^4 - \pi x^3 + \frac{1}{2}$ Yes; degree 4

***24.** $F(x) = \frac{x^2 - 5}{x^3}$ No

***25.** $G(x) = 2(x - 1)^2(x^2 + 1)$

***26.** $G(x) = -3x^2(x + 2)^3$

*In Problems 27–40, use transformations of the graph of $y = x^4$ or $y = x^5$ to graph each function.**

27. $f(x) = (x + 1)^4$

28. $f(x) = (x - 2)^5$

29. $f(x) = x^5 - 3$

30. $f(x) = x^4 + 2$

31. $f(x) = \frac{1}{2}x^4$

32. $f(x) = 3x^5$

33. $f(x) = -x^5$

34. $f(x) = -x^4$

35. $f(x) = (x - 1)^5 + 2$

36. $f(x) = (x + 2)^4 - 3$

37. $f(x) = 2(x + 1)^4 + 1$

38. $f(x) = \frac{1}{2}(x - 1)^5 - 2$

39. $f(x) = 4 - (x - 2)^5$

40. $f(x) = 3 - (x + 2)^4$

*In Problems 41–48, form a polynomial function whose real zeros and degree are given. Answers will vary depending on the choice of a leading coefficient.**

41. Zeros: $-1, 1, 3$; degree 3

42. Zeros: $-2, 2, 3$; degree 3

43. Zeros: $-3, 0, 4$; degree 3

44. Zeros: $-4, 0, 2$; degree 3

45. Zeros: $-4, -1, 2, 3$; degree 4

46. Zeros: $-3, -1, 2, 5$; degree 4

47. Zeros: -1, multiplicity 1; 3, multiplicity 2; degree 3

48. Zeros: -2, multiplicity 2; 4, multiplicity 1; degree 3

*In Problems 49–60, for each polynomial function:**

(a) List each real zero and its multiplicity.
(b) Determine whether the graph crosses or touches the x-axis at each x-intercept.
(c) Determine the behavior of the graph near each x-intercept (zero).
(d) Determine the maximum number of turning points on the graph.
(e) Determine the end behavior; that is, find the power function that the graph of f resembles for large values of $|x|$.

49. $f(x) = 3(x - 7)(x + 3)^2$

50. $f(x) = 4(x + 4)(x + 3)^3$

51. $f(x) = 4(x^2 + 1)(x - 2)^3$

52. $f(x) = 2(x - 3)(x^2 + 4)^3$

53. $f(x) = -2\left(x + \frac{1}{2}\right)^2(x + 4)^3$

54. $f(x) = \left(x - \frac{1}{3}\right)^2(x - 1)^3$

55. $f(x) = (x - 5)^3(x + 4)^2$

56. $f(x) = (x + \sqrt{3})^2(x - 2)^4$

57. $f(x) = 3(x^2 + 8)(x^2 + 9)^2$

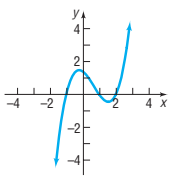
58. $f(x) = -2(x^2 + 3)^3$

59. $f(x) = -2x^2(x^2 - 2)$

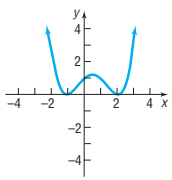
60. $f(x) = 4x(x^2 - 3)$

*In Problems 61–64, identify which of the graphs could be the graph of a polynomial function. For those that could, list the real zeros and state the least degree the polynomial can have. For those that could not, say why not.**

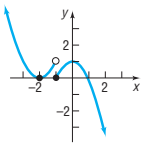
61.



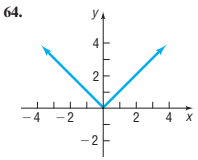
62.



63.



64.

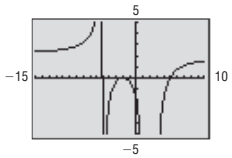


$q(x)$. A possibility for the denominator is $q(x) = (x + 5)(x - 2)^2$. So far we have $R(x) = \frac{(x + 2)^2(x - 5)}{(x + 5)(x - 2)^2}$.

The horizontal asymptote of the graph given in Figure 41 is $y = 2$, so we know that the degree of the numerator must equal the degree of the denominator and the quotient of leading coefficients must be $\frac{2}{1}$. This leads to

$$R(x) = \frac{2(x + 2)^2(x - 5)}{(x + 5)(x - 2)^2}$$

Figure 42



Check: Figure 42 shows the graph of R on a graphing utility. Since Figure 42 looks similar to Figure 41, we have found a rational function R for the graph in Figure 41.

Now Work PROBLEM 45

2 Solve Applied Problems Involving Rational Functions

EXAMPLE 7 **Finding the Least Cost of a Can**

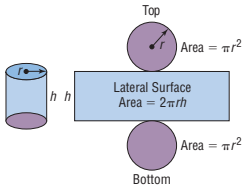
Reynolds Metal Company manufactures aluminum cans in the shape of a cylinder with a capacity of 500 cubic centimeters $\left(\frac{1}{2}\text{ liter}\right)$. The top and bottom of the can are made of a special aluminum alloy that costs 0.05¢ per square centimeter. The sides of the can are made of material that costs 0.02¢ per square centimeter.

(a) Express the cost of material for the can as a function of the radius r of the can.
(b) Use a graphing utility to graph the function $C = C(r)$.
(c) What value of r will result in the least cost?
(d) What is this least cost?

Solution

(a) Figure 43 illustrates the components of a can in the shape of a right circular cylinder. Notice that the material required to produce a cylindrical can of height h and radius r consists of a rectangle of area $2\pi rh$ and two circles, each of area πr^2. The total cost C (in cents) of manufacturing the can is therefore

Figure 43



$$\begin{aligned} C &= \text{Cost of the top and bottom} + \text{Cost of the side} \\ &= \underbrace{2(\pi r^2)}_{\substack{\text{Total area} \\ \text{of top and} \\ \text{bottom}}} \underbrace{(0.05)}_{\substack{\text{Cost/unit} \\ \text{area}}} + \underbrace{(2\pi rh)}_{\substack{\text{Total} \\ \text{area of} \\ \text{side}}} \underbrace{(0.02)}_{\substack{\text{Cost/unit} \\ \text{area}}} \\ &= 0.10\pi r^2 + 0.04\pi rh \end{aligned}$$

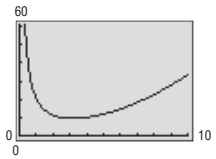
But we have the additional restriction that the height h and radius r must be chosen so that the volume V of the can is 500 cubic centimeters. Since $V = \pi r^2 h$, we have

$$500 = \pi r^2 h \quad \text{so} \quad h = \frac{500}{\pi r^2}$$

Substituting this expression for h, the cost C, in cents, as a function of the radius r is

$$C(r) = 0.10\pi r^2 + 0.04\pi r \cdot \frac{500}{\pi r^2} = 0.10\pi r^2 + \frac{20}{r} = \frac{0.10\pi r^3 + 20}{r}$$

Figure 44



(b) See Figure 44 for the graph of $C = C(r)$.
(c) Using the MINIMUM command, the cost is least for a radius of about 3.17 centimeters.
(d) The least cost is $C(3.17) \approx 9.47$¢.

Now Work PROBLEM 55

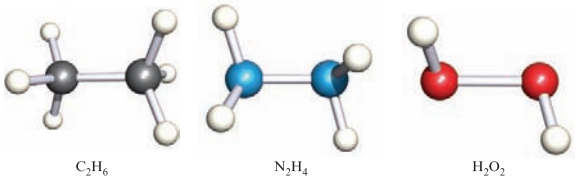


Fig. 4.1 Molecules that contain one *homonuclear bond*: ethane (C_2H_6), hydrazine (N_2H_4) and hydrogen peroxide (H_2O_2).

In the next section, we briefly introduce some of the methods that are used for the experimental determination of intramolecular and intermolecular distances. If you do not wish to interrupt the discussion of bonding, move to Section 4.3 and return to Section 4.2 later.

4.2 Measuring internuclear distances

Vibrational spectroscopy of diatomics: see Section 12.3

There are a number of methods available for determining important structural parameters. These techniques fall broadly into the groups of *spectroscopic* and *diffraction methods*. It is beyond the scope of this book to consider the details of the methods and we merely introduce them and look at some of the structural data that can be obtained.

An overview of diffraction methods

For solid state compounds, the two methods most commonly used to determine structure are *X-ray* and *neutron diffraction*. *Electron diffraction* is best used to study the structures of gaseous molecules, although the technique is not strictly confined to use in the gas phase. Whereas electrons are negatively charged, X-rays and neutrons are neutral. Accordingly, X-rays and neutrons get 'deeper' into a molecule than do electrons because they do not experience an electrostatic repulsion from the core and valence electrons of the molecules. X-rays and neutrons are said to be more *penetrating* than electrons. Selected comparative details of the three diffraction methods are listed in Table 4.1.

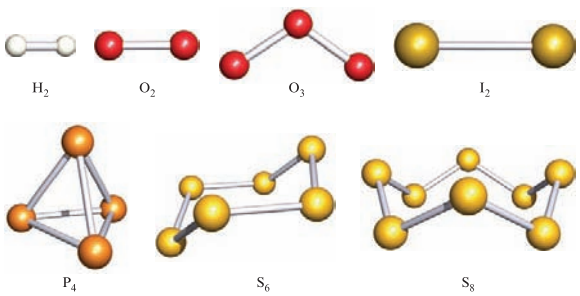


Fig. 4.2 Examples of covalent homonuclear molecules.

Throughout the following discussion we shall ignore the core (1*s*) electrons of each atom for reasons already discussed.

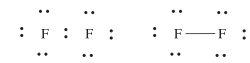
F_2

A species is ***diamagnetic*** if all of its electrons are paired.

A species is ***paramagnetic*** if it contains one or more unpaired electrons.

Experimental facts: The standard state of fluorine is the diamagnetic gas F_2.

The ground state electronic configuration of a fluorine atom is $[He]2s^2 2p^5$. Structures **4.10** and **4.11** show two Lewis representations of F_2; each fluorine atom has an octet of valence electrons. A single F–F covalent bond is predicted by this approach. The valence bond method also describes the F_2 molecule in terms of a single F–F bond.



(4.10) **(4.11)**

We can construct an MO diagram for the formation of F_2 by considering the linear combination of the atomic orbitals of the two fluorine atoms (Figure 4.22). There are 14 valence electrons and, by the *aufbau* principle,

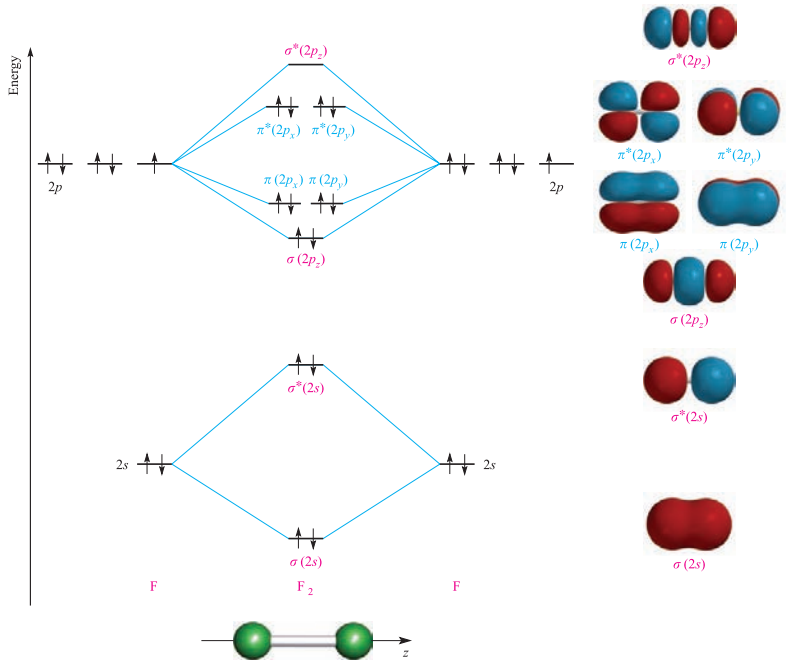


Fig. 4.22 A molecular orbital diagram to show the formation of F_2. The 1*s* atomic orbitals (with core electrons) have been omitted. The F nuclei lie on the *z*-axis. Representations of the MOs (generated using Spartan '04, © Wavefunction Inc. 2003) are shown on the right-hand side of the figure.

Figure 6.7 Taking a patient's oral temperature with an electronic thermometer

Figure 6.8 Taking a patient's axillary temperature

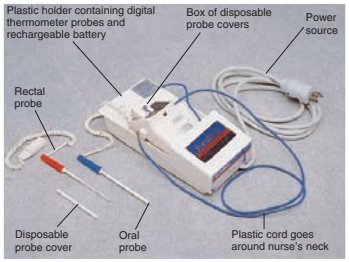


Figure 6.9 An oral, battery-operated thermometer

Measurement

Oral method

E

1. Place the thermometer (Figure 6.7) at the base of the tongue and to the right or left of the frenulum, and instruct the patient to close the lips and to avoid biting the thermometer. Ensure that it has been at least 15 minutes since the patient has consumed a hot or cold beverage or food.
2. Leave the thermometer in the mouth until the device has signalled that the maximum body temperature has been reached.
3. Remove the thermometer from the patient's mouth.

Rectal method

E

1. Position patient with the buttocks exposed. Adults may be more comfortable lying on the side (with the knees slightly flexed), facing away from you, or prone.
2. Put on nonsterile gloves.
3. Lubricate the tip of the thermometer with a water-soluble lubricant.
4. Ask the patient to take a deep breath; insert the thermometer into the anus 1.5 to 2.5 cms, depending on the patient's age.
5. Do not force the insertion of the thermometer or insert into faeces.
6. Leave the thermometer in the rectum until the device has signalled that the maximum body temperature has been reached.
7. Remove the thermometer from the patient's rectum.

Axillary method

E

1. Place the thermometer into the middle of the axilla (Figure 6.8) and fold the patient's arm across the chest to keep the thermometer in place.
2. Leave the thermometer in the axilla until the device has signalled that the maximum body temperature has been reached.
3. Remove the thermometer from the patient's axilla.

Electronic thermometer

E

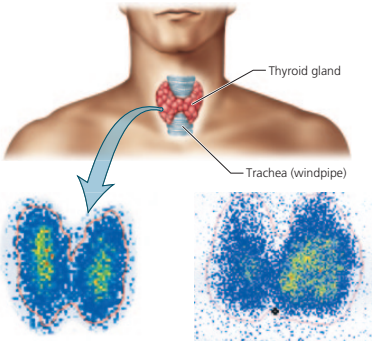
1. Remove the electronic thermometer from the charging unit (Figure 6.9).
2. Attach a disposable cover to the probe.
3. Using a method described (oral, rectal or axillary), measure the temperature.
4. Listen for the sound or look for the symbol that indicates maximum body temperature has been reached.
5. Observe and record the reading.
6. Remove and discard the probe cover.
7. Return the electronic thermometer to the charging unit.

Tympanic thermometer

E

1. Attach the probe cover to the nose of the thermometer (Figure 6.10).

E EXAMINATION — N NORMAL FINDINGS — A ABNORMAL FINDINGS — P PATHOPHYSIOLOGY



(a) An image of a normal thyroid gland.

(b) An image of an enlarged thyroid gland.

Figure 2.4 *Radioactive iodine can be used to generate images of the thyroid gland for diagnosing metabolic disorders.*

an accessory reproductive gland in males) involves placing radioactive seeds (pellets) directly in the prostate gland (Figure 2.5). Once in place, the seeds emit radiation that damages or kills nearby cancer cells. In most cases, the seeds are left in place, even though they stop emitting radiation within 1 year.

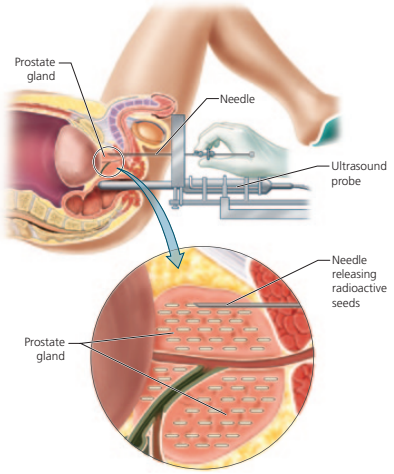


Figure 2.5 *Prostate cancer can be treated by implanting radioactive seeds in the prostate gland. A physician injects the seeds through needles, with guidance from an ultrasound probe placed in the rectum.*

what would you do?

Irradiation is the process in which an item is exposed to radiation. Many foods today are intentionally irradiated to delay spoilage, increase shelf life, and remove harmful microorganisms, insect pests, and parasites. The food does not become radioactive as a result. Supporters of the practice note that test animals fed on irradiated food show no adverse effects. Opponents, however, point to the environmental risks of building and operating food irradiation plants and the lack of carefully controlled, long-term experiments verifying that irradiated food is safe for people of all ages and nutritional states. Several foods, including white potatoes, wheat flour, fresh meat and poultry, and fresh spinach and iceberg lettuce, can be irradiated in the United States. If the entire product is irradiated, then a distinctive logo (Figure 2.6) must appear on its packaging. If an irradiated food is an ingredient in another product, then it must be listed as irradiated in the ingredients statement, but the logo is not required. Do you think irradiating food is a safe practice? Would you eat irradiated food?

Figure 2.6 *Logo for irradiated foods. This logo and words such as "Treated with radiation" must appear on food that has been irradiated in its entirety.*

2.2 Compounds and Chemical Bonds

Two or more elements may combine to form a new chemical substance called a **compound**. A compound's characteristics are usually different from those of its elements. Consider what happens when the element sodium (Na) combines with the element chlorine (Cl). Sodium is a silvery metal that explodes when it comes into contact with water. Chlorine is a deadly yellow gas. In combination, however, they form a crystalline solid called sodium chloride (NaCl)—plain table salt (Figure 2.7).

The atoms (or, as we will soon see, ions) in a compound are held together by chemical bonds. There are two types of chemical bonds: covalent and ionic. Recall that atoms have outer shells, which are the regions surrounding the nucleus where the electrons are most likely to be found. Figure 2.8 depicts the first two shells as concentric circles around the nucleus. A full innermost shell contains 2 electrons. A full second shell contains 8 electrons. Atoms with a total of more than 10 electrons have additional shells. When atoms form bonds, they lose, gain, or share the electrons in their outermost shell.

Covalent Bonds

A **covalent bond** forms when two or more atoms *share* electrons in their outer shells. Consider the compound methane (CH_4). Methane is formed by the sharing of electrons between one atom of carbon and four atoms of hydrogen. Notice in Figure 2.9a that the outer shell of an isolated carbon atom contains only four electrons, even though it can hold as many as eight. Also note that hydrogen atoms have only one electron, although the first shell can hold up to two electrons. A carbon atom can fill its outer shell by joining with four atoms of hydrogen. At the same time, by forming a covalent bond with

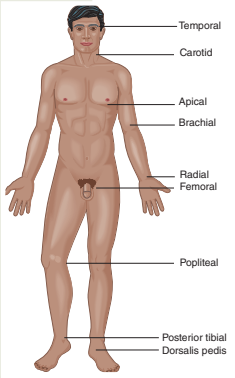


Figure 6.3 Peripheral pulse sites

Figure 6.4 Palpation of the radial pulse

2+/4+ indicates a normal pulse (2+) on a 4-point scale, whereas 2+/3+ indicates a normal pulse (2+) on a 3-point scale. Refer to the Clinical reasoning, Documenting pulses, for schematic representations. If a pulse is not palpable, then attempt to ascertain its presence with a Doppler ultrasonic stethoscope. The letter 'D' in a pulse chart or stick figure represents the pulse that was detected by using this mechanical device.

Site

Peripheral pulses can be palpated where the large arteries are close to the skin surface. There are nine common sites for assessment of pulse, as indicated in Figure 6.3. When routine vital signs are assessed, the pulse is generally measured at one of two sites: radial or apical.

Measuring the apical pulse is indicated for patients with irregular pulses or known cardiac or pulmonary disease. The assessment of apical pulse can be accomplished through palpation but is most commonly accomplished through auscultation.

Radial pulse

To palpate the radial pulse:

E
1. Place the pad of your first, second and/or third finger on the site of the radial pulse, along the radial bone on the thumb side of the inner wrist (see Figure 6.4).
2. Press your fingers gently against the artery with enough pressure so that you can feel the pulse. Pressing too hard will obliterate the pulse.
3. Count the pulse rate using the second hand of your watch. If the pulse is regular, count for 30 seconds and multiply by 2 to obtain the pulse rate per minute. If the pulse is irregular, count for 60 seconds.
4. Identify the pulse rhythm as you palpate (regular or irregular).
5. Identify the pulse volume as you palpate (using scales from Table 6.2).

N A P: Refer to section on Rate.

Apical pulse

To assess the apical pulse:

E
1. Place the diaphragm of the stethoscope on the apical pulse site.
2. Count the pulse rate for 30 seconds if regular, 60 seconds if irregular.
3. Identify the pulse rhythm.
4. Identify a **pulse deficit** (apical pulse rate greater than the radial pulse rate) by listening to the apical pulse and palpating the radial pulse simultaneously.

N A P: Refer to section on Rate.

Rate

N Normal pulse rates vary with age. Table 6.3 depicts ranges for normal pulse rates by age. The heart rate normally increases during periods of exertion. Athletes commonly have resting heart rates below 60 beats per minute because of the increased strength and efficiency of the cardiac muscle.

A **Tachycardia** refers to a pulse rate faster than 100 beats per minute in an adult.

E EXAMINATION — N NORMAL FINDINGS — A ABNORMAL FINDINGS — P PATHOPHYSIOLOGY

Q *Trace the path of oxygen from air entering the nose to the structures in the lungs where oxygen enters the blood supply.*

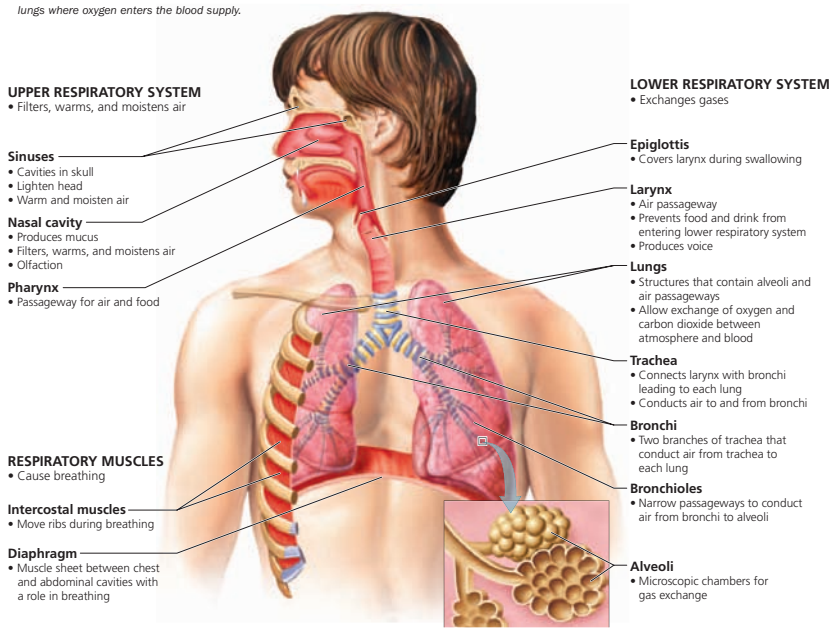


Figure 14.2 *The respiratory system*

A *Nasal cavity, pharynx, trachea, bronchi, bronchioles, alveoli*

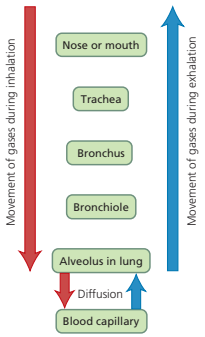


Figure 14.3 *The path of air during inhalation and exhalation*

for gas exchange, reducing their efficiency and setting the stage for infection (Figure 14.4).

- **Conditioning the air.** The nose also warms and moistens the inhaled air before it reaches the delicate lung tissues. The blood in the extensive capillary system of the mucous membrane lining the nasal cavity warms and moistens incoming air. The profuse bleeding that follows a punch to the nose is evidence of the rich supply of blood in these membranes. Warming the air before it reaches the lungs is extremely important in cold climates because frigid air can kill the delicate cells of the lung. Moistening the inhaled air is also essential because oxygen cannot cross dry membranes. Mucus helps moisten the incoming air so that lung surfaces do not dry out.
- **Olfaction.** Our sense of smell is due to the olfactory receptors located on the mucous membranes high in the nasal cavities behind the nose. The sense of smell is discussed in Chapter 9.

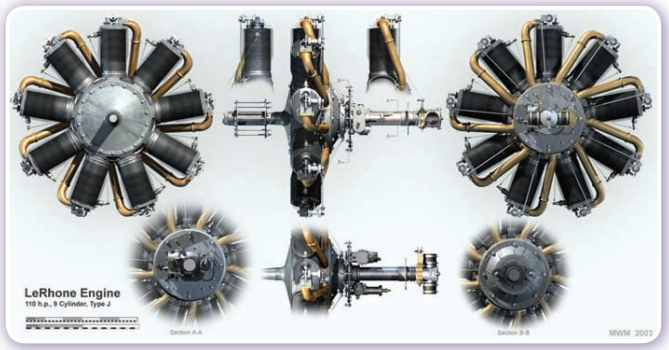
Military Aviation in the Golden Age

The growth of military aviation during the golden age can be directly credited to the work of General William Mitchell. His tireless demonstrations of aviation's impact in a time of war included naval attacks from "carriers," around-the-world flights, and aerial refueling. After numerous failed attempts to form a strong military aviation program, Mitchell openly criticized the weakness of American defenses, especially at Pearl Harbor where an aerial assault could cripple the fleet. Court-martialed and busted in rank, Mitchell wouldn't survive to witness his prophetic insight become a reality. However, soon after his death, the Army Air Corps was formed, and military aviation began to develop in earnest.

Building a Better Engine

Just as important as the transitions from biplane to monoplane, the change from thin to thick wings and improved aerodynamic design was the development of the aircraft engine. At the start of World War I, the Gnome rotary engine was capable of producing only 80 HP (see Figure 2-17). Although the engine was well balanced, produced uniform air cooling by rotation, and needed no flywheel to make it run smoothly, it had the distinct disadvantage of a large **gyroscopic effect** and a rapid use of both fuel and lubricating oil. The engine could only operate for 12-14 hours before it required a complete overhaul. The history of aviation has rested firmly on the development of capable powerplants since the Wrights were forced to design their own engine for the *Wright Flyer*.

Figure 2-17 The LeRhone 9C rotary engine delivered 80 HP—similar to the Gnome rotary engine.



Courtesy of Mark Miller

The initial gains in rotary engine performance were minor as reduction gears were added to allow the propeller to turn at a slower speed than that of the engine, which allowed a significant improvement in the efficiency of the propeller's ability to transform shaft horsepower into thrust. Far greater improvements in engine performance required a return to the prior design concept of a stationary engine block.

The radial engine looks deceptively similar to a rotary; however, unlike a rotary engine, the radial's cylinders and block stay stationary while only the crankshaft and propeller spin. Soon after WWI, the engineers had figured out how to redesign the cylinders to overcome the overheating problem that had prevented the engine's use during the Great War. The competing design of an inline engine also finally succumbed to a reengineering into the famous "V" engine configuration still seen today. Both types of engines quickly exceeded the rotary engine's limit of about 150 HP with power outputs ranging up to 1,000 HP by the end of the era.

If you set an aircraft from the end of World War I next to an airplane from the beginning of World War II, you can see the tremendous advances that took place in every facet of aerodynamic design, materials, and powerplant design (see Figures 2-18 and 2-19). The aircraft at the end of the golden age of aviation produced lift with little drag, had engines that were powerful and tucked into NACA engineered low drag cowlings, and had cargo capacities and flight performance that allowed them to fly higher, faster, and farther.

Figure 2-18 The Gotha Bomber of World War One.

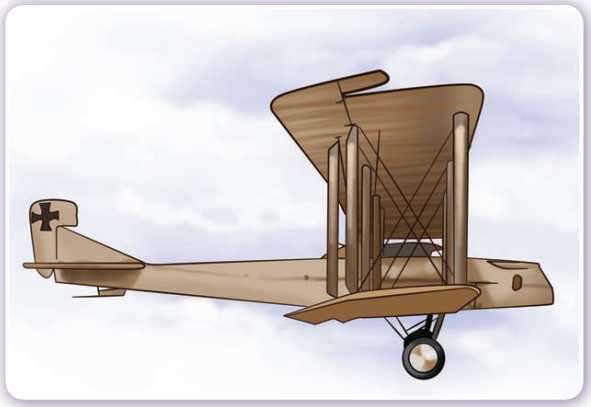


Figure 2-19 The B-17 Flying Fortress.

Courtesy of United States Air Force

Точка отсчёта

О чём идёт речь?

— Где вы сейча́с у́читесь?
— Я учу́сь. . .

в Калифорни́йском (госуда́рственном) университе́те
в Виско́нсинском университе́те
в Мичига́нском (госуда́рственном) университе́те
в Пенсильва́нском (госуда́рственном) университе́те
в Джорджта́унском университе́те
в Га́рвардском университе́те
в Дью́кском университе́те
в Колумби́йском университе́те
в Университе́те Джо́рджа Вашингто́на
в Университе́те Джо́нса Го́пкинса
в Государственном университе́те шта́та Orа́йо
в Государственном университе́те шта́та Нью-Йо́рк

Your teacher will tell you the name of your college or university.

— На како́м ку́рсе вы у́читесь?
— Я учу́сь. . .

	пе́рвом		
	второ́м		
на	на тре́тьем	ку́рсе	
	четвёртом		
пя́том			
в	аспиранту́ре		

— Кака́я у вас специа́льность?
— Моя́ специа́льность. . .


англи́йская литерату́ра


архитекту́ра


биоло́гия


исто́рия

Культура и быт

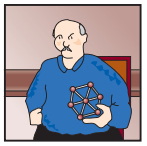
Вы́сшее образова́ние в Росси́и

Вуз (вы́сшее учёбное заведе́ние). Literally "higher learning institute," **вуз** is the bureaucratic expression that covers all postsecondary schools in Russia. A **вуз** can be a major **университе́т** such as **МГУ (Моско́вский госуда́рственный университе́т)** or a more specialized university, such as **(МГЛУ) Моско́вский госуда́рственный лингвисти́ческий университе́т.** Narrower still in focus are the thousands of **институ́ты,** each devoted to its own discipline: **медици́нский институ́т, энергети́ческий институ́т,** and so forth. Most full-time undergraduates attend college for five years. The school year (**учёбный год**) begins on 1 September and ends in June, with a break between semesters in late January. The early 1990s saw the rise of more streamlined **ко́лледжи** and **вы́сшие шко́лы** (schools of higher learning). Many of the newer **ко́лледжи** are akin to two-year colleges affiliated with more traditional universities. Others are independent entities. Most **ву́зы** are tuition-free for those students who pass fiercely competitive exams. Less talented students may be admitted after paying hefty fees. In the majority of institutions, students declare their major upon application and, if admitted, take a standard set of courses with few electives. Virtually all **ву́зы** are located in large cities. The concept of a college town is alien to Russia. **Факульте́т.** Russian universities are made up of units called **факульте́ты,** which are somewhere in size between what Americans call divisions and departments. A typical university would normally include **математи́ческий факульте́т, филологи́ческий факульте́т** (languages, literatures, linguistics), **истори́ческий факульте́т, юриди́ческий факульте́т,** etc. **Ка́федра.** This is roughly equivalent to a department. For instance, the **филологи́ческий факульте́т** may include **ка́федра ру́сского языка́, ка́федра англи́йского языка́,** and other individual language **ка́федры.**

4-6 Подгото́вка к разгово́ру. Review the dialogs. How would you do the following?

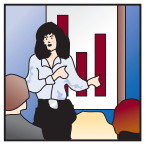
- Tell someone where you go (or went) to school.
- Say what year of college you are in.
- Tell someone what your major is.
- Tell someone what languages you know and how well.
- Tell someone where you live.
- Tell someone what courses you are taking.
- Say that you used to work.
- Ask and answer who takes a certain subject
- Express agreement with an opinion.
- Respond to a compliment.
- State that you missed something that was said.


рýсский язы́к


фи́зика


медици́на


му́зыка


фина́нсы


хи́мия


эконо́мика


юриспруде́нция

Други́е специа́льности:

американи́стика
антрополо́гия
ге́ндерные иссле́дования
журнали́стика
искусствове́дение
коммуника́ция
компью́терная те́хника
матема́тика
междунаро́дные отноше́ния
педаго́гика
политоло́гия
психоло́гия
страновéдение Росси́и
социоло́гия
филоло́гия
филосо́фия

— Что вы изуча́ете?
— Я изуча́ю. . .

англи́йскую литерату́ру
антрополо́гию
архитекту́ру
биоло́гию
ге́ндерные иссле́дования
журнали́стику
искусствове́дение
исто́рию
коммуника́цию
компью́терную те́хнику
матема́тику
медици́ну
междунаро́дные отноше́ния
му́зыку
педаго́гику
политоло́гию
психоло́гию
рýсский язы́к
страновéдение Росси́и
социоло́гию
фи́зику
филоло́гию
филосо́фию
фина́нсы
хи́мию
эконо́мику
юриспруде́нцию

3. Studying ≠ Studying: учи́ться, изуча́ть, занима́ться

— Где вы **у́читесь?**	Where do you *go to school?*
— Я **учу́сь** в Га́рвардском университе́те.	*I go* to Harvard.
— А что вы там **изуча́ете?**	What do you *take* there?
— Фи́зику.	Physics.
— Вы хорошо́ **у́читесь?**	Do you *do* well in school?
— Да, хорошо́.	Yes, I do.
— А где вы обы́чно **занима́етесь?**	And where do you usually *do your homework*?
— Я обы́чно **занима́юсь** в библиоте́ке.	I usually *do my homework* in the library.

You might translate each of the boldface verbs in the examples you just read as *study*. Don't.

The English verb study has many meanings, each of which corresponds to a different verb in Russian. So every time you think *study*, recast that thought into one of the following meanings:

Don't say *study*; instead say...

"study" synonym	Russian verb	What it takes
go to school (at the city college) do ***well*** or ***poorly*** in school	**учи́ться**	∅ где - **в университе́те** как – **хорошо́, пло́хо**
take (a course in... history, language)	**изуча́ть**	*requires* a school subject in accusative: **исто́рию, рýсский язы́к**
do homework	**занима́ться**	∅ (You cannot yet say in what subject)

занима́ться

Present:	
я	занима́юсь
ты	занима́ешься
он, она, кто	занима́ется
мы	занима́емся
вы	занима́етесь
они	занима́ются
Past:	
он (кто)	занима́лся
она	занима́лась
они	занима́лись

In this chapter you will learn how to:

- Talking about lifestyles and architecture
- Asking about and describing housing and furnishings
- Discussing daily chores and activities in the home

Cultural focus: **Estados Unidos**

A vista de pájaro. Look at the map and complete the following sentences with what you know:

1. ___ España está en…	a. América	b. Europa	c. Asia
2. ___ La capital de España es…	a. Barcelona	b. Madrid	c. Sevilla
3. ___ La paella es típica de…	a. Valencia	b. Salamanca	c. Madrid
4. ___ En la universidad hay…	a. estudiantes	b. catedrales	c. toros
5. ___ En la plaza de toros hay espectáculos (shows)	a. religiosos	b. cómicos	c. populares

Note. The 16th century fresco features the Chariot of Mercury and Virgo. It is located in the cupola of the Old Library at the University of Salamanca.
Suggestion. Point to the fresco and ask students if they understand the words fresco and universidad, which are cognates. Use sentences that they can easily understand and help them make connections: Este fresco está en la Universidad de Salamanca, en España. Using gestures preview some words that students will learn in the chapter to describe and locate the painting: el fresco es muy grande, está en la biblioteca de la universidad. Write down Universida de Salamanca. Los estudiantes estudian en la universidad; ustedes son estudiantes; ustedes estudian en una universidad. ¿Cómo se llama su universidad? Point to the map. ¿Dónde está España? ¿Dónde está Salamanca? Write on the board 1218, the date when the Univer-sidad de Salamanca was founded. ¿Es una universidad antigua o nueva? Explain antiguo/a and nuevo/a: la universidad es antigua; el fresco es antiguo; está en la Antigua Biblioteca de la universidad. Ask students about your college or university: ¿es antigua o nueva?

Ask students what they know about Spain, At this point you may ask this question in English and write down their answers on the board. Point out some of the photos on the map and introduce vocabulary as you ask questions. Use gestures to make yourself understood: ¿Qué es este edificio? Es una catedral. En España hay muchas catedrales. ¿Qué es este edificio? Es un museo de arte moderno. ¿Los estudiantes toman el sol o estudian en la universidad? Toman el sol en

SEGUNDA FASE. Tell your partner about your classes. Take turns completing the following ideas.

1. Llego a la universidad a la(s)...
2. Mi clase favorita es...
3. El/La profesor/a se llama...
4. La clase es muy...
5. Practico español en...
6. En mi clase de español hay...

En otras palabras

Words related to computers and computing are often borrowed from English (e.g., **software, email**) or vary from country to country. As you have already learned, one word for "computer" is **la computadora,** used mainly in Latin America, along with **el computador.** "Computer science" is **la informática** in Spain and **la computación** in Latin America.

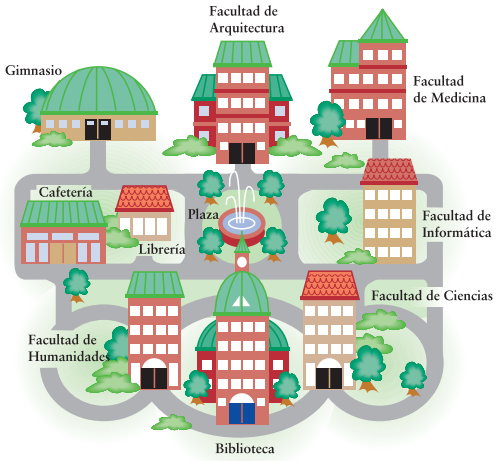
1-5 Las clases de mis compañeros/as. PRIMERA FASE. Use the following questions to interview your partner. Take notes. Then switch roles.

1. ¿Qué estudias este semestre?
2. ¿Cuántas clases tienes?
3. ¿Cuál es tu clase favorita?
4. ¿Qué día y a qué hora es tu clase favorita?
5. Tu clase de español, ¿cómo es? ¿Es fácil o difícil? ¿Es interesante o aburrida?
6. ¿Trabajas con computadoras? ¿Dónde?
7. ¿Sacas buenas notas?
8. ¿Tienes muchos exámenes?

SEGUNDA FASE. First, introduce your partner to another classmate and state one piece of information about him/her that you find interesting. Your classmate will ask your partner about his/her classes.

MODELO: USTED: Él es Pedro, estudia ciencias políticas y tiene cuatro clases este semestre.
YOUR CLASSMATE: Mucho gusto. ¿_____?

La universidad



En otras palabras

Some words for the parts of the house vary from one region to another in the Spanish speaking world. Here are some examples:

habitación, dormitorio, cuarto, alcoba
sala, salón, living
planta, piso
piscina, pileta, alberca

Las actividades de los estudiantes

Cultura

Since 2002 the euro has been the official monetary unit of the so-called Euro-zone, which includes Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Slovenia and Spain. In the United Kingdom and other European countries, the euro, although not official, is accepted in stores. The euro currency sign is E and the banking code is EUR.

En la biblioteca

Unos alumnos estudian en la biblioteca. Toman apuntes y trabajan en sus tareas. A veces buscan palabras en el diccionario. Frecuentemente conversan sobre sus clases.

Los fines de semana

1-9 Para escoger. Look at the illustrations on page 00. Then choose the word or phrase that fills in the blank logically.

1. 

2. 

3. 

4. 

5. 

1. Los estudiantes _____ en la biblioteca.
   a. toman café **b.** estudian **c.** hablan
2. Buscan palabras en _____ .
   a. el reloj **b.** el diccionario **c.** el laboratorio
3. Miran televisión en _____ .
   a. la biblioteca **b.** la playa **c.** casa
4. Montan en bicicleta _____ .
   a. los fines de semana **b.** en el café **c.** los jueves

1-6. ¿En qué Facultad estudian? PRIMERA FASE. Match the names of the university students above with the school where they study.

1. ___ Juan
2. ___ Carmen
3. ___ Lorena
4 ___ Alvaro

a. Facultad de Medicina
b. Facultad de Arquitectura
c. Facultad de Humanidades
d. Facultad de Ciencias


Carmen

SEGUNDA FASE. Exchange the information with a classmate and indicate two classes that each student probably has.

MODELO: E1: ¿Dónde estudia Carmen?
E2: Carmen estudia en la Facultad de… Probablemente tiene clase de … y de …


Juan

1-7 Mapa de la universidad. PRIMERA FASE. Look at the map on page 00 and indicate if the following statements are cierto (C) or falso (F). If the statement is falso, correct the information.

1. ___ La plaza está en el centro del campus.
2. ___ La Facultad de Humanidades está junto *(next to)* a la biblioteca.
3. ___ La cafetería está detrás del gimnasio.
4. ___ La Facultad de Ciencias está delante *(in front of)* de la Facultad de Informática.
5. ___ La librería está al lado de la cafetería.
6. ___ La Facultad de Medicina está al lado del gimnasio.


Alvaro

SEGUNDA FASE. Now use a map of your university and ask each other questions to locate places.

MODELO: E1: ¿Dónde está el gimnasio?
E2: Está al lado de la biblioteca.


Lorena

1-8 Busco una escuela. With a classmate, read the following ad and look for the name of the school, classes offered, address and telephone number of the school..

Centro Audiovisual

MÉTODOS AUDIOVISUALES

- Informática
- Inglés
- Contabilidad
- Prácticas de oficina
- Cálculo comercial
- Secretariado y administración

Miguel Moya, 16 - 2.°, Valencia
Telf. (96) 329 58 48
(Junto al Mercado)

TEIA DO SABER

1. Qual é a diferença entre planetas e estrelas?
Respostas e comentários às atividades são encontrados no Manual do Professor, ao final do livro.
2. Por que os meteoros também são chamados de estrelas cadentes?
3. O que é um satélite natural? Quantos planetas conhecidos no nosso Sistema Solar apresentam pelo menos um satélite natural?

FAÇA NO CADERNO
NÃO ESCREVA NO LIVRO

4. Qual é a diferença entre asteroides, cometas e meteoros?
5. Escreva as frases corretas. Depois, corrija as que estiverem erradas.
   a. A Terra tem apenas um satélite natural: a Lua.
   b. Galáxia é uma imensa massa de estrelas.
   c. Via Láctea é a principal estrela do Sistema Solar.
   d. Netuno é o planeta mais próximo do Sol no Sistema Solar.
   e. Dentre os planetas do Sistema Solar, o maior é Saturno.
   f. O Sol gira ao redor da Terra.
   g. Os planetas refletem parte da luz que recebem.
   h. Centenas de meteoroides entram na atmosfera da Terra todos os dias.

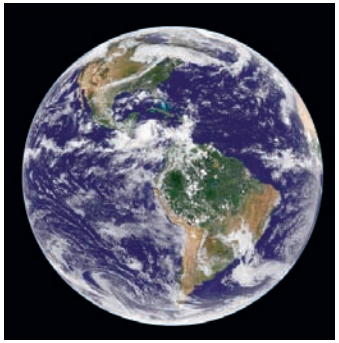
Encélado, lua de Saturno. Imagem obtida pela *Voyager 2* em 1981, a uma altura de 119 000 km.

6. Leia um trecho da letra da música de Guilherme Arantes.

Lindo balão azul

[...]
Pegar carona nessa cauda de cometa
ver a Via Láctea
estrada tão bonita
Brincar de esconde-esconde
numa nebulosa
voltar pra casa,
nosso lindo balão azul.

Guilherme Arantes. Lindo balão azul. Intérprete: Guilherme Arantes. In: *Meu mundo e tudo mais*. CBS, 1990. 1 CD. Faixa 10



Nebulosa: aglomerado de gases e poeira, semelhante a uma nuvem.

a. Em seu caderno, copie da música as palavras que você aprendeu relacionadas à Astronomia.
b. Para você, qual é o motivo de a Via Láctea, no texto, ser chamada de "estrada tão bonita"?
c. O que é um cometa?
d. Os cometas podem ser vistos da Terra?
e. O que representa, no texto, a expressão "voltar pra casa"?

Professor, vale a pena analisar com os alunos um globo terrestre ou uma imagem de satélite mostrando todo o planeta Terra. Uma das razões de o planeta ter a cor azulada está na composição atmosférica, além de fenômenos físicos devidos à incidência de luz solar.

Satélites artificiais e estações espaciais

Satélites artificiais são objetos construídos por seres humanos e que giram em torno de corpos celestes. Os satélites artificiais enviam para as bases na Terra uma série de informações. A função dos satélites artificiais depende do seu tipo:

- satélite de comunicação, que permite que nos comuniquemos via satélite;
- meteorológico, que prevê condições do tempo;
- de posicionamento, que mostra a posição de navios, aviões ou pessoas em qualquer parte do mundo;
- ambiental, que mostra desmatamentos ou queimadas;
- de observação astronômica.

Representação artística do satélite SMOS orbitando a Terra. Esse satélite gera mapas com dados de umidade do solo e salinidade dos oceanos.

Professor, consulte o Manual para obter mais informações a respeito da Estação Espacial Internacional.

As **estações espaciais** são estruturas colocadas fora da atmosfera, que podem permanecer em órbita em torno da Terra por semanas, meses e até anos, podendo hospedar uma tripulação composta de pesquisadores e astronautas. Em 1998, teve início a construção da Estação Espacial Internacional (ISS, sigla em inglês), projeto do qual fazem parte 16 países, incluindo o Brasil. A participação brasileira envolveu a produção de alguns equipamentos para a ISS e, em troca, o Brasil ganhou alguns direitos, dentre eles o de enviar um astronauta ao espaço, o que aconteceu em março de 2006.

As estações espaciais são usadas, entre outras finalidades, para realizar experimentos por longo período de tempo, tais como reações dos organismos quando expostos a um ambiente sem gravidade, entre outros.

Sondas espaciais

As sondas espaciais são espaçonaves não tripuladas que coletam informações de corpos celestes. Algumas são projetadas para pousar na superfície de outros planetas. Outras apenas entram na órbita de um planeta e tiram fotografias, que são enviadas para os centros de pesquisa localizados na Terra.

As informações enviadas por essas sondas ajudam a entender o clima, a planejar outras missões espaciais, a descobrir como são os planetas.

Modelo da sonda espacial *Viking 1*, a primeira sonda a percorrer a superfície de Marte.

SAIBA MAIS

Telescópio espacial Hubble

O telescópio espacial *Hubble* foi lançado ao espaço pela nave espacial *Discovery* no dia 25 de abril de 1990. Desde então, já foram realizadas cinco missões para aprimorar instrumentos científicos e seus sistemas operacionais. [...]

Telescópio *Hubble*, em 1997. As imagens produzidas por este telescópio auxiliaram no desenvolvimento de teorias astronômicas.

A galeria de imagens do *Hubble* tem encantado e deixado admiradas as pessoas do mundo inteiro e suas descobertas mudaram a forma de fazer livros de Astronomia. [...]

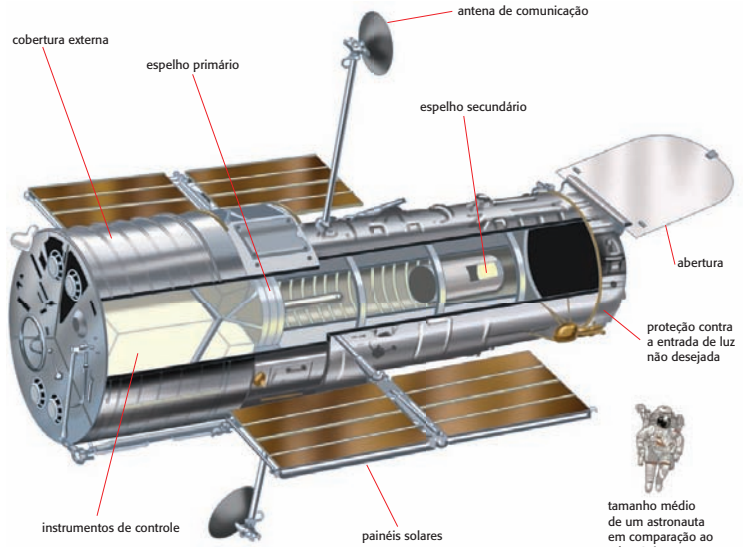
Nomeado em homenagem ao astrônomo Edwin P. Hubble (1889-1953), o telescópio espacial *Hubble* funciona como um grande observatório localizado no espaço. Revolucionou a Astronomia de forma nunca antes vista ao oferecer imagens nítidas do Universo, desde imagens do nosso Sistema Solar até das mais distantes galáxias, que se formaram logo após a origem do Universo há 13,7 bilhões de anos.

Lançado em 1990, aumentou sua capacidade de captação de imagens graças a novos instrumentos que foram instalados nele durante cinco missões de manutenção e reparo no espaço [...].

Fotografia de galáxias capturada pelo satélite *Hubble*, em 2011. As imagens feitas pelo *Hubble* trouxeram muitas informações novas a respeito do Universo e seus componentes. Cores artificiais.

[...] Seu espelho principal tem 2,4 metros de diâmetro. Portanto, não é tão grande quanto os maiores telescópios que estão na superfície da Terra, mas desempenha papel incomparável no espaço. O *Hubble* completa sua órbita em torno da Terra a cada 96 minutos, a 575 quilômetros acima da superfície terrestre.

ESTRUTURA DO TELESCÓPIO *HUBBLE*



Representação esquemática do telescópio *Hubble*. Cores-fantasia.

Steven Siceloff. *Hubble celebrates 20 years of astonishing discoveries*. <www.nasa.gov/mission_pages/hubble/main/index.html>. Acesso em: fev. 2012. Tradução livre dos autores.

PARA PENSAR Professor, consulte subsídios no Manual do Professor, ao final do livro.

1. O *Hubble*, além de telescópio, pode ser considerado um satélite artificial? Por quê?
2. A que altitude esse telescópio gira ao redor da Terra?
3. Quanto tempo ele leva para dar uma volta completa ao redor da Terra?
4. Como o *Hubble* consegue obter energia para continuar funcionando no espaço?
5. O monte Everest, o pico mais alto da Terra, tem quase 9 km de altura (8 848 metros). A altura na qual o telescópio *Hubble* orbita o nosso planeta é quantas vezes maior que o monte Everest?

坐	人	person	土	earth	_____
休	人*	person	木	tree	_____
男	田	field	力	strength	_____

*In combination 人 becomes 亻 on the left-hand side.

Now let's see if you have understood them correctly. A 'person' in an 'enclosure' is a 'prisoner'. 'Sun' and 'moon' together means 'bright'. And as we just saw, 'two people' 'down to earth' means 'to sit'. When a 'person' is against a 'tree', s/he is 'resting'. The 'strength' in the 'field' comes from a 'man' or a 'male'. Do these make sense to you?

The following characters are composed in the same way as those in Exercise 1. Let's see if you can work out their meanings. Remember these characters were made a long time ago. The concepts in those days might not always be the same as we perceive them today. For instance, why is it 'good' to have a child? Because in traditional Chinese society, as in many others around the world, a child, and more particularly a male child, was necessary to carry on the family line and to worship the ancestors. Children were (and are) also necessary to work in the fields, particularly in the labour-intensive paddy fields.

Insight

It helps you to memorize characters if you can perceive and remember their components. In this unit, we have illustrated 'meaning' components and 'sound' components of characters. There are, of course, components which do not fall into either category. It is still helpful if you treat each component as a building block rather than as a combination of individual strokes.

Exercise 2

Write out the meaning of the following characters in the space provided.

					Meaning
信	亻	person	言	speech/words	_____
鲜	鱼	fish	羊	sheep	_____
安	宀	roof	女	woman	_____

Sound	Meaning	(Meaning) radical	Sound
远 *yuǎn*	far	辶 (to walk quickly)	元 (*yuán*)
碗 *wǎn*	bowl	石 (stone, mineral)	宛 (*wǎn*)
们 *men**	persons	人 (person)	门 (*mén*)
伴 *bàn*	to accompany	人 (person)	半 (*bàn*)
拌 *bàn*	to blend	扌 (hand)	半 (*bàn*)
订 *dìng*	to book	言 (speech)	丁 (*dīng*)
钉 *dīng*	nail	钅 (metal)	丁 (*dīng*)
锈 *xiù*	rusty	钅 (metal)	秀 (*xiù*)
吐 *tǔ*	to spit	口 (mouth)	土 (*tǔ*)
园 *yuán*	garden	口 (enclosure)	元 (*yuán*)
房 *fáng*	house	户 (household)	方 (*fāng*)
骑 *qí**	to ride (a horse)	马 (horse)	奇 (*qí*)

*Check the pronunciation at the back of the book. It is *not* the same as in English.

By looking at the position of the radicals in the examples in this section and in characters or references earlier in the unit, you should be able to do the next two exercises.

Exercise 4

In each of the characters that follow, the radical is missing. (We have written it in the first column for you.) Where does it go? On the top, on the bottom, on the left-hand side or on the right-hand side?

Radicals

1	马 (horse)	累 (mule)	户 (donkey)	句 (pony)
2	⺾ (grass)	化 (flower)	早 (grass)	牙 (sprouts)
3	钅 (metal)	冈 (steel)	秀 (rusty)	令 (bell)
4	辶 (to walk)	兆 (escape)	寸 (to pass)	万 (to step over)

Exercise 5

Which character is right? Circle the correct one.

1	to hit	仃 打 订	2	stove	灶 杜 吐
3	to scorn	饥 机 讥	4	snow	雪 扫 灵

Let's summarize the radicals you have seen in these first two units. More radicals will be introduced in Units 3–5. A complete table

of radicals will be found in the reference section at the back of the book.

车	vehicle	鱼	fish	木	tree	水 氵	water
宀	roof	大	big	毛	hair, fur	人 亻	person
雨	rain	子	child	土	earth	心 忄	heart
田	field	力	strength	羊	sheep	言 讠	speech
石	stone	日	sun	女	woman	草	grass
辶	walk (quickly)	月	moon	小	small	火 灬	fire
豕	pig	舌	tongue	马	horse	竹 ⺮	bamboo
户	household	口	enclosure	工	work	手 扌	hand
山	mountain	口	mouth			金 钅	metal

Exercise 6

Can you recognize the character according to the following description? Please give what you think is the meaning of each character. We have done one for you.

1 an eye with water — 林 _____
2 two trees next to each other — 灾 _____
3 bamboo with fur/hair underneath — 囚 _____
4 a person in an enclosure — 从 to follow
5 fire under roof — 泪 _____
6 two people next to each other — 笔 _____

Exercise 7

Can you identify the meaning of the following characters with the help of their radicals? Again, we have done one for you. Refer back to the table of radicals to help you.

墙	to throw	吻	she
扔	wall	椅	warm
怕	sweat	暖	kiss
汗	fear	她	chair

小 small + 大 big = 尖 sharp, pointed
日 sun + 月 moon = 明 bright

*Note that 言 becomes 讠 when acting as the radical on the left-hand side of a simplified character, and 竹 becomes ⺮ when acting as the radical on top of a character.

As you may have observed, the position of a radical in a character varies. It can be on the left or right side of a character, or it can be on the top or bottom of a character. It can also be on the inside or outside of a character. It is important to know where a particular radical occurs in a character so that you can identify it and be able to look it up in the dictionary (more on this later). The radical's actual position normally has no bearing on the meaning or interpretation of the character.

竹 bamboo, for instance, always occurs on the top of a character when it looks like ⺮, as does 草 grass, when it looks like 艹. Fire 火 can occur on the left-hand side of a character as 火 or on the bottom of a character when it looks like 灬. The radical for speech 言 appears on the left-hand side of a character and is written as 讠 when it is simplified.

Exercise 3

You know 人 means 'person', 木 means 'wood/tree' and 火 means 'fire'. What do you think the following characters mean?

Radicals	Character(s)	Meaning
人 + 人	= 从*	_____
人 + 人 + 人	= 众*	_____
木 + 木	= 林	_____
木 + 木 + 木	= 森	_____
火 + 火	= 炎	_____
火 + 火 + 火	= 焱	_____

*These are simplified characters. The principle of making characters, however, remains the same.

In some combinations, as in Exercise 3, the meaning is very clear to the Westerner (at least after it has been given!), but in others it

Am ersten Tag des Unterrichts einigen sich die Schüler der Klasse, ihre Ausbildungsbetriebe vorzustellen. Diese Vorstellung soll in einem kleinen Projekt bearbeitet werden:

„Wir stellen unseren Ausbildungsbetrieb vor."

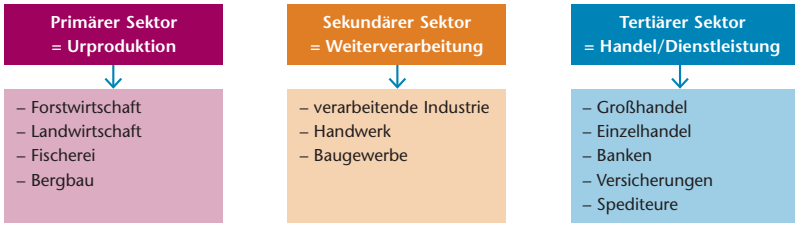
Arbeitsaufträge

- *Innerhalb der Klasse haben sich mehrere Gruppen gebildet. Einige Schüler, die in Unternehmen der gleichen Branche arbeiten, haben sich zusammengetan und ein Unternehmen ausgewählt, das sie vorstellen wollen. Daniela Schaub, Hera Dubowski, Rudolf Heller und Heinrich Peters stellen ihren Ausbildungsbetrieb, die Sommerfeld Bürosysteme GmbH, vor. Zu diesem Zweck haben sie sich Unterlagen von der Sommerfeld Bürosysteme GmbH besorgt (vgl. S. ??? ff.). Helfen Sie Daniela, Hera, Rudolf und Heinrich bei der Vorstellung der Sommerfeld Bürosysteme GmbH.*
- *Der zuständige Lehrer bittet außerdem um die Beantwortung nachstehender Fragen. Benutzen Sie zur Beantwortung dieser Fragen das Sachwortverzeichnis des vorliegenden Buches.*

1. *Erläutern Sie das Organigramm der Sommerfeld Bürosysteme GmbH.*
2. *Stellen Sie die wesentlichen Grundfunktionen (Aufgaben) der Sommerfeld Bürosysteme GmbH dar.*
3. *Beschreiben Sie die betrieblichen Ziele, die die Sommerfeld Bürosysteme GmbH verfolgt.*
4. *Erläutern Sie den Ablauf der Leistungserstellung bei einem Liefererbetrieb der Sommerfeld Bürosysteme GmbH.*
5. *Überprüfen Sie, auf welchen Absatzwegen die Sommerfeld Bürosysteme GmbH ihre Leistungen (Produkte/Dienstleistungen) vertreibt.*
6. *Geben Sie an, welche Unternehmensphilosophie die Sommerfeld Bürosysteme GmbH bei ihrer Tätigkeit verfolgt.*
7. *Finden Sie heraus, welche Bedeutung die Entsorgung von Materialien bei der Sommerfeld Bürosysteme GmbH hat.*
8. *Erläutern Sie, aus welchen Produkten sich das Produktionsprogramm der Sommerfeld Bürosysteme GmbH zusammensetzt.*
9. *Versuchen Sie herauszufinden, ob die Sommerfeld Bürosysteme GmbH ökologische Ziele berücksichtigt.*
10. *Finden Sie heraus, welche Fertigungsverfahren bei der Sommerfeld Bürosysteme GmbH Anwendung finden.*

Unternehmensgeschichte

In der Mitte des Ruhrgebietes zwischen Oberhausen und Bochum gründete der Tischlermeister Christian Sommer 1947 in Essen die **Sitzmöbelfabrik Christian Sommer**, die Stühle im gutbürgerlichen Geschmack und von hoher handwerklicher Qualität produzierte. Im Jahre 1952 trat der Tischlermeister Friedrich Feld in das bestehende Unternehmen als Mitgesellschafter ein, wobei das Unternehmen seitdem als **Sitzmöbelfabrik Sommer OHG** firmierte. 1957 trat Johannes Fartmann als Kommanditist (Teilhafter) in das als **Sitzmöbelfabrik Sommer KG** umfirmierte Unternehmen ein. 1973 wandelten die beiden Gründersöhne Dipl.-Kfm. Lambert Feld und Hartmut Sommer zusammen mit der Dipl.-Ing. Claudia Fartmann das Unternehmen in die **Sommerfeld Bürosysteme GmbH** um. Damit begann der eigentliche Aufstieg des Unternehmens zu einem der führenden Hersteller von Büro- und Einrichtungsmöbeln in Deutschland. Das Unternehmen hat mittlerweile den Ruf eines Pioniers der zeitgemäßen Möbelgestaltung erlangt.



Beispiel: Die Sommerfeld Bürosysteme GmbH ist ein Hersteller von Büromöbeln (sekundärer Sektor). Dazu bedient sie sich auf der Beschaffungsseite verschiedener Unternehmen, die die Materialien zur Verfügung stellen. Dies sind vor allem andere Industrieunternehmen (sekundärer Sektor), die Materialien aus Holz oder Metall herstellen. Dafür beziehen diese Unternehmen ihre Grundstoffe aus Sägewerken und Erzbergwerken (primärer Sektor). Auf der Absatzseite verkauft die Sommerfeld Bürosysteme GmbH ihre Produkte vor allem an Handelsbetriebe (tertiärer Sektor), die die Möbel weiterverkaufen.

In der Wirtschaftswissenschaft unterscheidet man zwischen der Unternehmung oder dem Unternehmen[1] sowie dem Betrieb.

Unternehmen:
Als Unternehmen wird die rechtlich und wirtschaftlich selbstständige Einheit mit all ihren verschiedenen Bereichen bezeichnet.

Beispiel: Sommerfeld Bürosysteme GmbH

Betrieb:
Mit dem Begriff Betrieb wird im Allgemeinen nur der Hauptzweckbereich eines Unternehmens bezeichnet, also bei einem Industriebetrieb der Ort der Leistungserstellung.

Beispiel: die Produktionsstätte der Sommerfeld Bürosysteme GmbH in Essen

Betriebe können anhand einer Vielzahl von Kriterien **strukturiert** werden. So anhand der erbrachten Leistung, des Verwendungszwecks der Leistung, des Wirtschaftszweiges und der Zielsetzung.

Art der erbrachten Leistung

Hiernach werden Betriebe unterschieden in Sachleistungsbetriebe und Dienstleistungsbetriebe.

- Typische Vertreter der **Sachleistungsbetriebe** sind Maschinen-, Automobil-, Schuhund Möbelfabriken.
- Zu den **Dienstleistungsbetrieben** gehören beispielsweise Banken, Versicherungen, Spediteure, Verkehrsbetriebe, der Groß- und Einzelhandel.

[1] *Die Begriffe „Unternehmung" und „Unternehmen" werden in der Wissenschaft weitestgehend synonym verwendet.*

Der Ausbildungsvertrag muss vor Beginn der Ausbildung schriftlich niedergelegt werden. Hierfür wird in der Praxis meist ein Vordruck der Industrie- und Handelskammer (IHK) oder der Handwerkskammer verwendet.

Mindestangaben eines Ausbildungsvertrages:

1. *Art, sachliche und zeitliche Gliederung sowie Ziel der Berufsausbildung*
2. *Beginn und Dauer der Berufsausbildung*
3. *Ausbildungsmaßnahmen außerhalb der Ausbildungsstätte*
4. *Dauer der täglichen Ausbildungszeit*
5. *Dauer der Probezeit*
6. *Zahlung und Höhe der Vergütung*
7. *Dauer des Urlaubs*
8. *Voraussetzungen, unter denen der Vertrag gekündigt werden kann*
9. *Hinweis auf anzuwendende Tarifverträge und Betriebsvereinbarungen*

Bedingungen für eine erfolgreiche Gruppenarbeit
Ob Ihre Gruppenarbeit erfolgreich verläuft, hängt von der gesamten Gruppe, dem zu bearbeitenden Thema und natürlich von Ihnen selbst ab. Was der oder die Einzelne alles falsch machen kann, wird in den folgenden „11 Minusregeln“ verdeutlicht:

11 Minusregeln, um eine Gruppe zu ruinieren

1. Rede nie von dir selber, bleibe immer nur sachlich und ernst
2. Rede in jede Pause hinein
3. Gerechtigkeit ist nicht zu erreichen, sei ungerecht
4. Ignoriere Konflikte in der Gruppe
5. Erzähle eine Anekdote nach der anderen
6. Greife nie in das Gruppengeschehen ein
7. Fühle dich immer persönlich angegriffen und antworte mit Kurzreferat
8. Gehe zum Lachen in den Keller
9. Gib überall deinen Senf dazu
10. Erteile ungefragt, aber heftig, Ratschläge
11. Scheue dich nie, Gesprächsteilnehmer zu korrigieren und zu unterbrechen

Vgl. Knoll, Jörg.: Kleingruppenmethoden. Weinheim und Basel, Beltz Verlag, 1993, S. 33.

PRAXISTIPP!

Machen Sie sich die Chancen, aber auch die Probleme der Gruppenarbeit immer wieder bewusst. Nur so können Sie Schwierigkeiten vermeiden bzw. ausräumen.

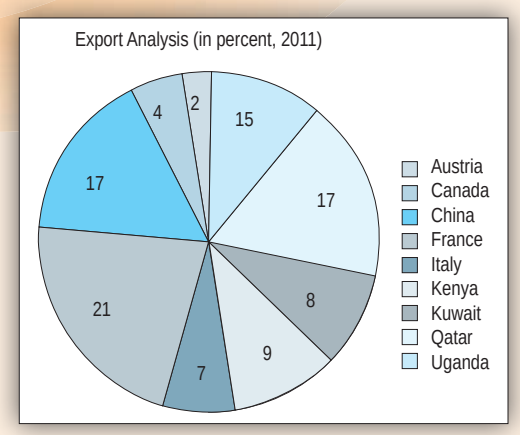
Gruppenprozessanalyse[1]

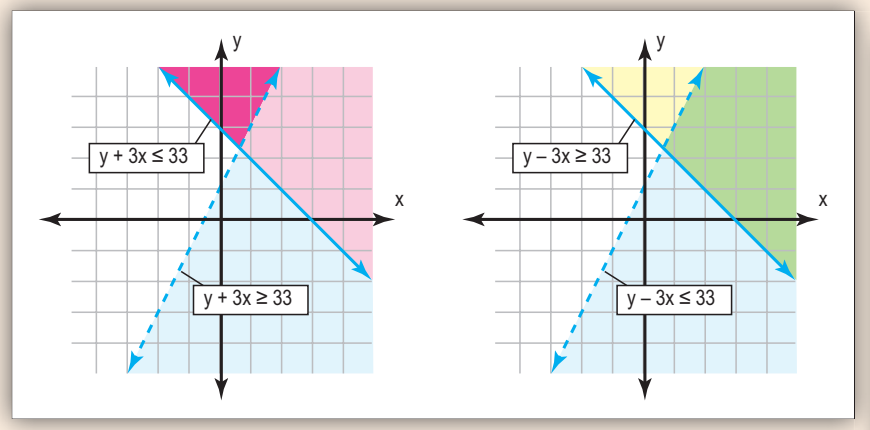
Gruppenprozessanalyse

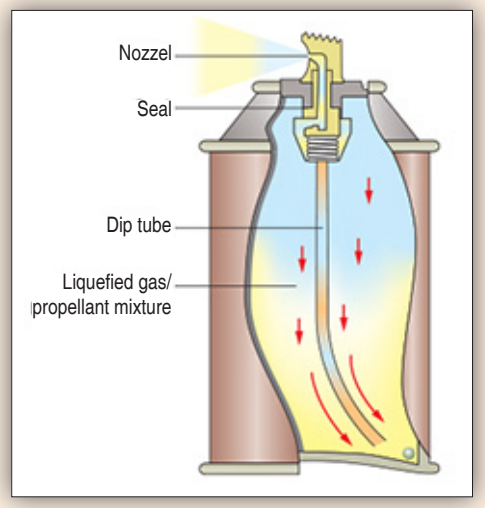
Bitte geben Sie an, inwieweit Sie mit den unten stehenden Aussagen übereinstimmen. Tun Sie dies zunächst individuell. Nachdem jedes Gruppenmitglied für sich die Punkte 1 bis 14 ausgefüllt hat, zeichnen Sie bitte das unten stehende Schema auf einen großen Bogen Papier. Dann gibt jedes Mitglied seine Meinung mit einem Strich im entsprechenden Feld an, damit Sie ein Bild des Gruppengefühls erhalten. Falls dieses Bild in Ihnen den Wunsch nach einer Diskussion über eventuelle Ursachen weckt, dann diskutieren Sie darüber. Es könnte sich bewähren, dieses Schema an der Wand hängen zu lassen, um im Verlauf der Gruppenarbeit auftretende Veränderungen zu diskutieren.

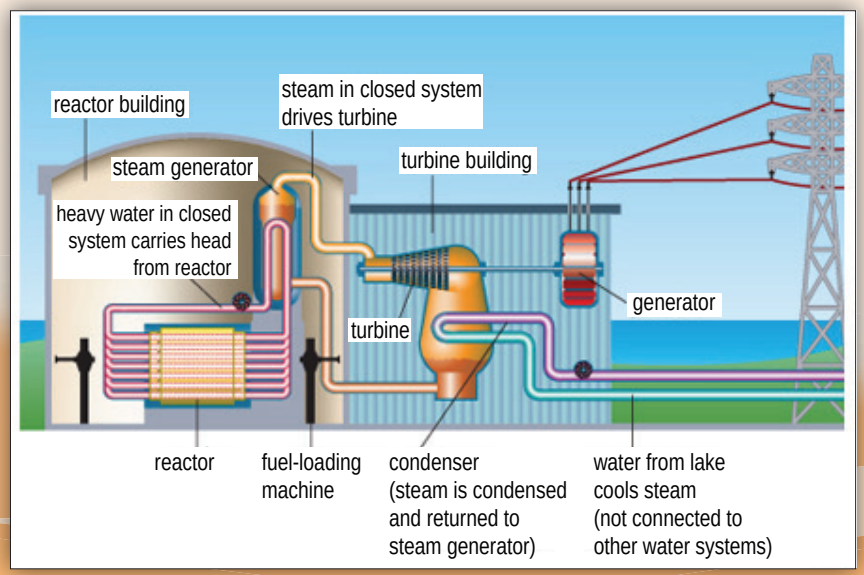
	A	B	C	D	E	F
1. Die Gruppe analysierte die Probleme richtig.						
2. Wir waren uns darüber im Klaren, was wir erreichen wollten.						
3. Ich war mit der Art zufrieden, wie wir dem Problem auf den Leib rückten.						
4. Wir überprüften während der Arbeit laufend die Zweckmäßigkeit unseres Vorgehens.						
5. Alle Ideen der Gruppenmitglieder wurden festgehalten.						
6. Wir unterstützten uns während der Gruppenarbeit gegenseitig.						
7. Ich hörte aufmerksam zu, wenn andere sprachen.						
8. Die anderen hörten aufmerksam zu, wenn ich etwas zu sagen hatte.						
9. Meine Fähigkeiten kamen voll zur Geltung und wurden von der Gruppe genutzt.						
10. Die Fähigkeiten der anderen kamen voll zur Geltung und wurden von der Gruppe genutzt.						
11. Ich fühlte mich in meiner Rolle ruhig und wohl.						
12. Die Gruppe wurde nicht durch ein oder mehrere Mitglieder dominiert.						
13. Es gab keine Konkurrenzkämpfe zwischen Gruppenmitgliedern, die die Effizienz der Arbeit reduzierten.						
14. Das Interesse am Problem war groß.						

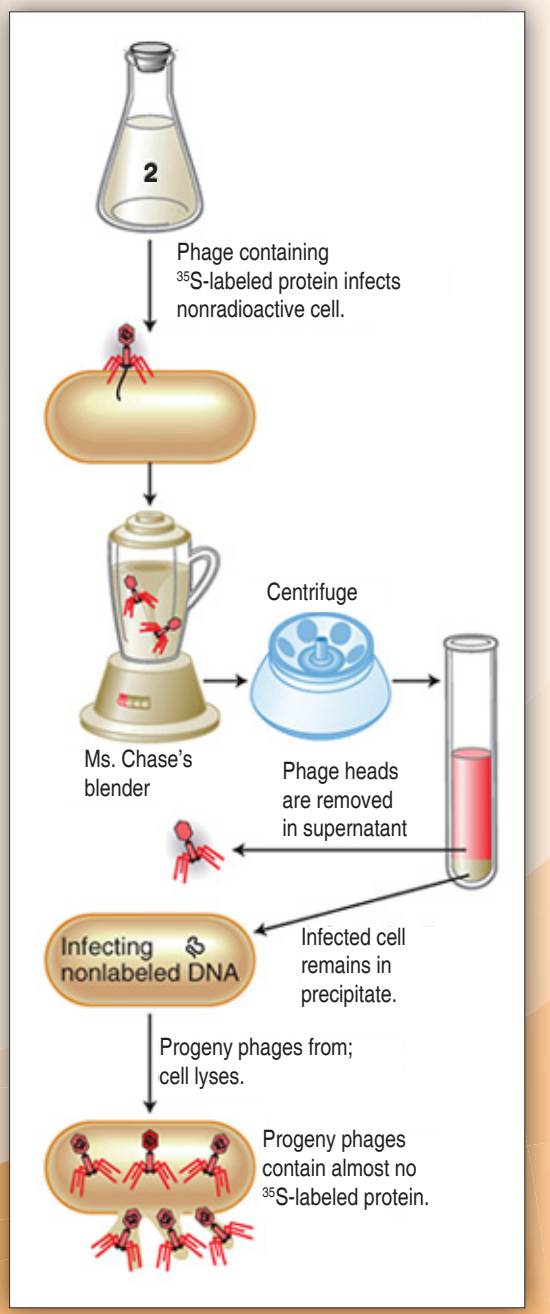
[1] *Vgl. Philipp, Elmar: Teamentwicklung in der Schule. Weinheim und Basel, Beltz Verlag, S. 107.*

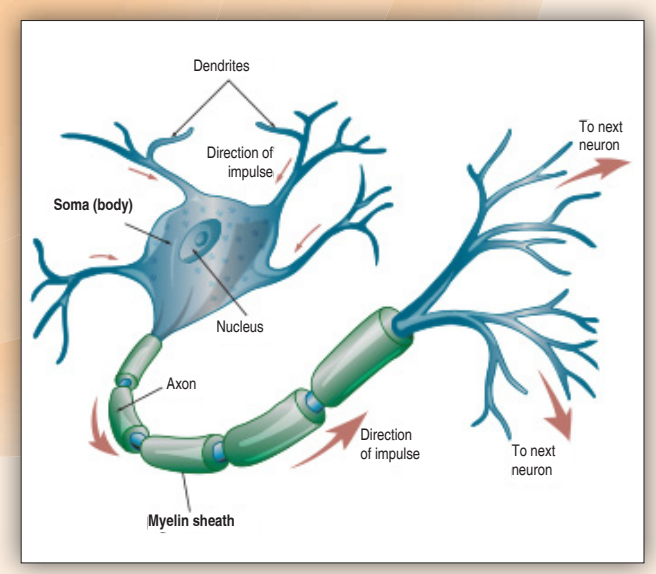

Export Analysis (in percent, 2011)
15
17
8
9
7
21
17
4
2
Austria
Canada
China
France
Italy
Kenya
Kuwait
Qatar
Uganda

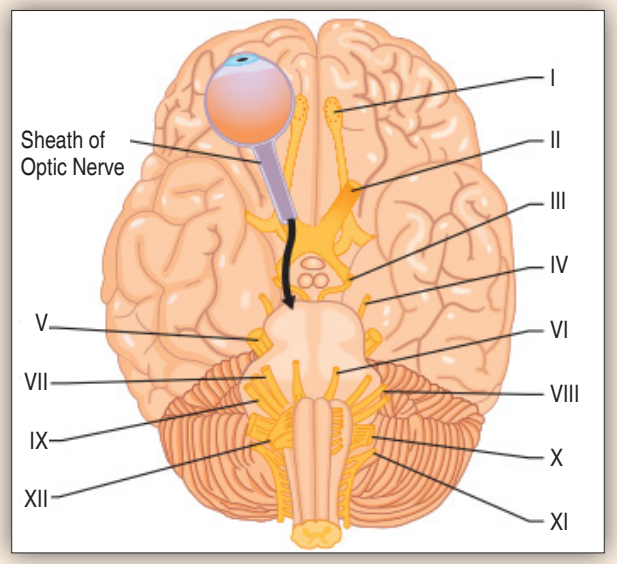

y
x
y + 3x ≤ 33
y + 3x ≥ 33
y
x
y – 3x ≥ 33
y – 3x ≤ 33

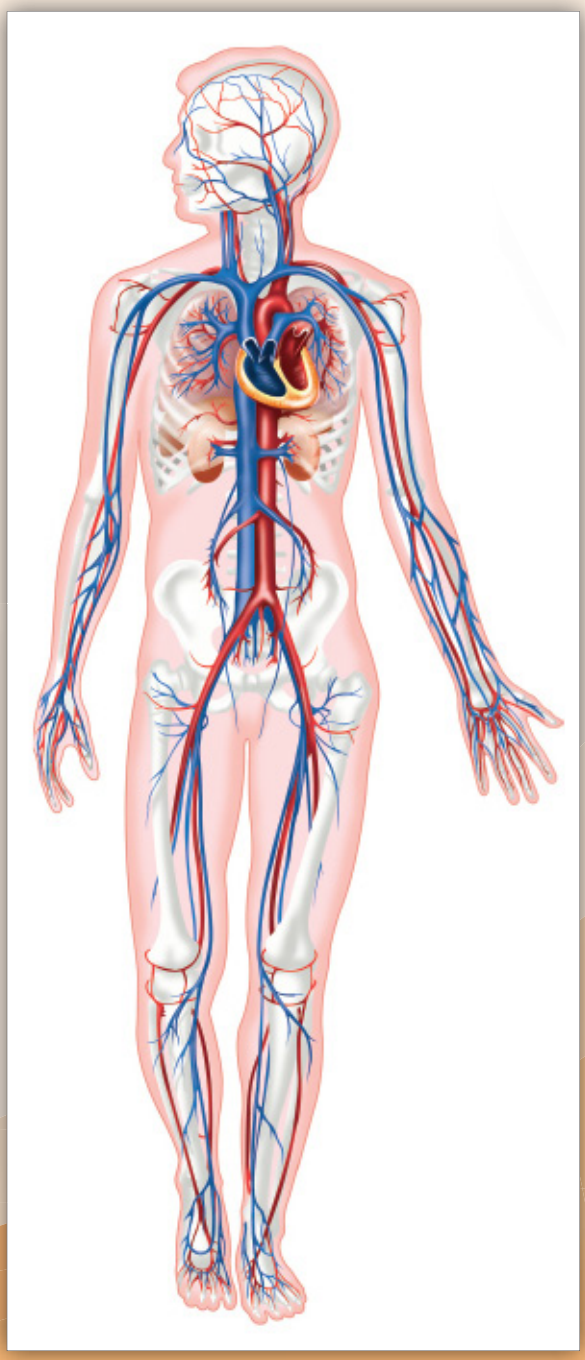

Nozzel
Seal
Dip tube
Liquefied gas/
propellant mixture

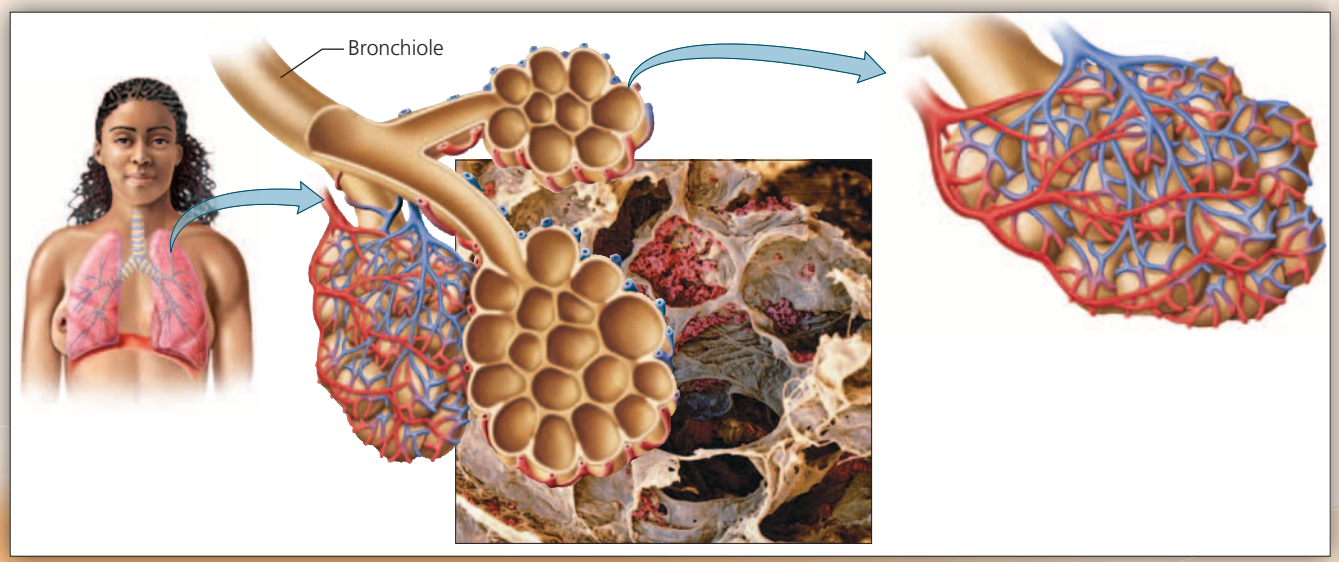

reactor building
steam in closed system
drives turbine
steam generator
turbine building
heavy water in closed
system carries head
from reactor
generator
turbine
reactor
fuel-loading
machine
condenser
(steam is condensed
and returned to
steam generator)
water from lake
cools steam
(not connected to
other water systems)

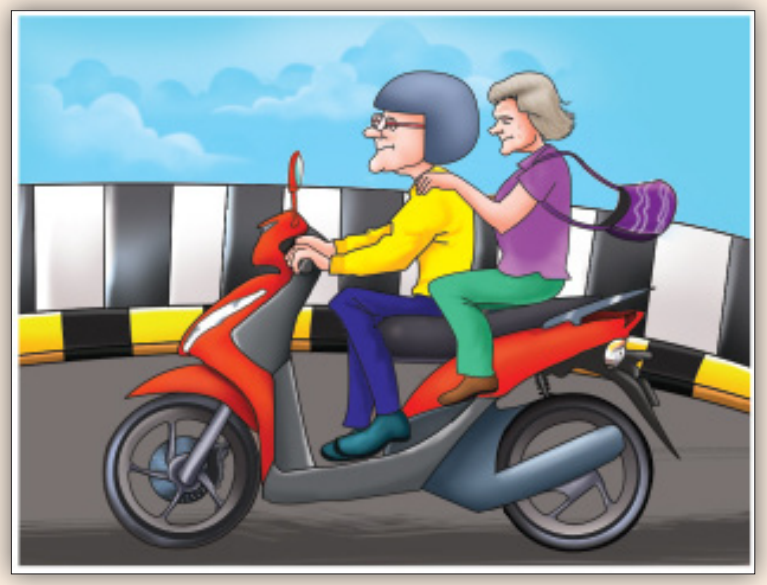

2
Phage containing
35S-labeled protein infects
nonradioactive cell.
Centrifuge
Ms. Chase's
blender
Phage heads
are removed
in supernatant
Infecting
nonlabeled DNA
Infected cell
remains in
precipitate.
Progeny phages from;
cell lyses.
Progeny phages
contain almost no
35S-labeled protein.


Dendrites
Direction of impulse
To next neuron
Soma (body)
Nucleus
Axon
Direction of impulse
To next neuron
Myelin sheath


Sheath of Optic Nerve
I
II
III
IV
V
VI
VII
VIII
IX
X
XII
XI




Bronchiole



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