More than 100,000 billion bacteria live inside our intestines, where they help digest the food we eat.

Chewing sugar-free gum increases the production of saliva; this helps neutralize the acids that attack teeth, reducing the risk of cavities.

A healthy newborn baby has a pulse rate between 120 and 160 beats per minute. A teenager’s pulse varies from 70 to 110 beats per minute.
FOOD AND NUTRIENTS

You will need the tables in Appendix 2 of the textbook to answer questions 5 and 9.

1. Identify the type of nutrient (or food constituent) that matches each of the following descriptions.

   a) Substances made up of a chain of amino acids
   b) Substances made up of a single sugar or a chain of sugars
   c) Type of nutrient consisting of a single substance
   d) Type of nutrient often associated with muscle building
   e) Type of nutrient also referred to as lipids
   f) Substances of mineral origin
   g) Small molecules of different shapes, required by the human body in small amounts

2. Check the type or types of nutrients involved in each of the functions described in the left-hand column of the table.

<table>
<thead>
<tr>
<th>Function in the body</th>
<th>Carbohydrates</th>
<th>Proteins</th>
<th>Fats</th>
<th>Water</th>
<th>Vitamins</th>
<th>Minerals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provide energy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Build and repair tissue</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Play an essential role in chemical reactions but do not provide energy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Act as a solvent in most chemical reactions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protect organs and insulate the body from the cold</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Help eliminate fecal matter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Vitamins perform many functions in the body. Check the functions they do not perform.

   A. Repairing tissue   □
   B. Fighting infection □
   C. Insulating the body from the cold □
4 Fill in the following table with the average energy content of all the types of nutrients.

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>Energy content</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>kJ/g</td>
</tr>
<tr>
<td>Carbohydrates</td>
<td></td>
</tr>
<tr>
<td>Fats</td>
<td></td>
</tr>
<tr>
<td>Proteins</td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td></td>
</tr>
<tr>
<td>Vitamins</td>
<td></td>
</tr>
<tr>
<td>Minerals</td>
<td></td>
</tr>
</tbody>
</table>

5 Mark has a bowl of rice cereal (250 ml) for breakfast. He adds a half-cup (125 ml) of 2% milk.

a) Refer to the table of nutritional values in Appendix 2 of the textbook and determine the amounts of carbohydrates, fat and protein in these foods.

<table>
<thead>
<tr>
<th>Food</th>
<th>Carbohydrates (g)</th>
<th>Fat (g)</th>
<th>Protein (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b) Calculate the energy value of the carbohydrates, fat and protein.

Carbohydrates ________________

Fat ________________

Protein ________________

Total ________________

c) According to the table, what minerals does rice cereal contain?

6 The Nutrition Facts label opposite is from a brand of cookies.

a) What percentage of the recommended daily intake of carbohydrates do you get if you eat four cookies?

__________________________

b) What nutrients from the mineral family do these cookies contain?

__________________________
7 Consider the following two Nutrition Facts labels, one from a carton of orange juice and the other from a carton of vegetable juice.

a) Which of the two labels is from the carton of orange juice? Explain your answer, referring to the vitamin content.

b) How many 250-ml glasses of juice A would you have to drink to get the same amount of calcium as in one 250-ml glass of juice B? Explain your answer.

c) Serving for serving, which of the two types of juice is the better source of minerals? Explain your answer.

d) A 250-ml serving of juice A contains 110 Cal, while the same amount of juice B contains only 50 Cal. Explain this difference, referring to the amounts of nutrients that are sources of energy.
8 To which food group does each of the following foods belong?
   a) Yogourt
   b) Rice
   c) Eggs
   d) Nuts
   e) Cheddar cheese
   f) A bagel

9 Three students at the school cafeteria have the trays of food below. Refer to the table of nutritional values in Appendix 2 to answer the questions that follow.

   Celery
   Ice cream
   Potato
   Chicken breast

   a) Name the three foods on the trays that contain the most nutrients to build and repair the body’s cells and tissues.

   b) Which four foods on the trays are the biggest sources of energy?

   c) Apart from carbohydrates, what nutrients are present in significant amounts on tray A?

   d) For a healthy diet, you should eat food from each of the four food groups at every meal. What could the student with tray A add to his or her lunch to make up the four food groups?
### THE DIGESTIVE SYSTEM

1. Name each of the digestive organs or glands labelled on the illustration.

   ![Digestive System Illustration]

   a) ____________________  
   b) ____________________  
   c) ____________________  
   d) ____________________  
   e) ____________________  
   f) ____________________  
   g) ____________________  
   h) ____________________  
   i) ____________________  
   j) ____________________  
   k) ____________________  
   l) ____________________  
   m) ____________________

2. Check the appropriate column to indicate whether the following organs or glands are located outside the digestive tract or in its lining.

<table>
<thead>
<tr>
<th>Organ/Glands</th>
<th>Outside</th>
<th>In the lining</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liver</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salivary glands</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gastric glands</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pancreas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intestinal glands</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3 Fill in the crossword below according to the following definitions.

Across

3. Glands located in the lining of the small intestine: ____ glands
4. First part of the digestive system to receive food
8. Part of the digestive tract between the rectum and the small intestine: ____ intestine
9. Passageway between the mouth and the esophagus
10. J-shaped organ where protein digestion begins
11. Type of gland in the shape of a bunch of grapes, located around the mouth: ____ glands

Down

1. Place where most nutrients are absorbed: ____ intestine
2. Part of the digestive tract between the pharynx and the stomach
5. Largest gland in the human body, which secretes bile
6. Glands located in the lining of the stomach: ____ glands
7. Gland outside the digestive tract, the secretions of which flow into the small intestine to break down proteins, carbohydrates and fats
4 Check the statements that describe a function of the digestive system.

A. Delivers nutrients to cells. [ ]
B. Moves food along the digestive tract. [ ]
C. DIGESTS food. [ ]
D. Absorbs nutrients. [ ]
E. Distinguishes sweet food from salty food. [ ]
F. Eliminates fecal matter. [ ]

5 Read the following statements about digestion. Write whether they describe mechanical transformation or chemical transformation.

a) The stomach churns food until it is completely mixed.
   ________________________________________________________________________

b) Saliva breaks down starch in the mouth.
   ________________________________________________________________________

c) Teeth grind food.
   ________________________________________________________________________

d) Proteins are digested by substances in the gastric juice.
   ________________________________________________________________________

6 True or false? If the statement is false, explain why.

a) The first chemical transformation of food takes place in the esophagus.
   ________________________________________________________________________

b) Proteins, carbohydrates and fat are complex molecules.
   ________________________________________________________________________

c) Amino acid, fatty acid, glucose and glycerol molecules are small enough to pass through the walls of the digestive tract.
   ________________________________________________________________________

d) Gastric glands are located in the small intestine.
   ________________________________________________________________________
e) The uvula prevents food from entering the trachea.

f) Intestinal juice mixes with bile to eliminate nutrients.

g) Bile is stored in the liver.

7 Use the following terms to complete the statements. You may use a term more than once.

<table>
<thead>
<tr>
<th>Amino acids</th>
<th>Blood</th>
<th>Digestive tract</th>
<th>Fatty acids</th>
<th>Food</th>
<th>Glycerol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minerals</td>
<td>Nutrients</td>
<td>Simple sugars</td>
<td>Small intestine</td>
<td>Vitamins</td>
<td>Water</td>
</tr>
</tbody>
</table>

a) Food contains substances called ___________.

b) When absorbed, nutrients pass through the walls of the ________________ and then into the ________________ and lymph.

c) Most nutrients are absorbed in the ________________.

d) ________________, ________________, and ________________ do not need chemical transformation to be absorbed by the body. They are all ________________.

e) During digestion, proteins are transformed into ________________, carbohydrates become ________________, and fats become ________________ and ________________.

8 The following table shows the steps that food goes through as it passes along the digestive tract. Number the steps in order and name the component of the digestive tract where each step takes place.

<table>
<thead>
<tr>
<th>Number</th>
<th>Step</th>
<th>Digestive tract component</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Chemical transformation of proteins in food begins.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chemical transformation of starch in food begins.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Food residue is expelled.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chemical transformation of fats takes place.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Most nutrients are absorbed.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Water in food residue is absorbed by the body.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Food is moved to the stomach through peristalsis.</td>
<td></td>
</tr>
</tbody>
</table>
Check the type of nutrients that are chemically transformed when mixed with the following three secretions: bile, pancreatic juice and intestinal juice.

A. Proteins
B. Carbohydrates
C. Fats
D. Vitamins
E. Minerals
F. Water

Check the organ in the digestive tract where fecal matter is stored until it is eliminated.

A. Stomach
B. Small intestine
C. Rectum
D. Anus

Pasta is very starchy. Fill in the table below on substances that help digest starch.

<table>
<thead>
<tr>
<th>Substance that helps digest starch</th>
<th>Gland that secretes the substance</th>
<th>Where secretions flow</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A chicken breast is rich in protein. Fill in the table below on substances that help digest protein.

<table>
<thead>
<tr>
<th>Substance that helps digest protein</th>
<th>Gland that secretes the substance</th>
<th>Where secretions flow</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Name the two main functions of the digestive system.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
1 Name each of the structures labelled on the following illustrations.

a) ____________________________

b) ____________________________

c) ____________________________

d) ____________________________

e) ____________________________

f) ____________________________

g) ____________________________

h) ____________________________

i) ____________________________

j) ____________________________

k) ____________________________

l) ____________________________

m) ____________________________

2 What are we?

a) We are branches of the bronchi. _________________

b) We make up the greater part of lung volume. _________________

c) We are the air passages created by the division of the trachea. _________________

d) We are surrounded by tiny blood vessels called capillaries. _________________
3 Identify the structure described in each of the following statements.

a) Airways with a diameter of less than 1 mm

b) Funnel-shaped cavity about 13 cm long, located in the throat

c) Hair-lined cavities that open to the outside through the nostrils and end inside the throat

d) Tube about 11 cm long, made up of rings of cartilage that keep it open

e) Spongy elastic organs enclosed in the rib cage, on each side of the heart

f) Flap of cartilage that controls the passage of air, directing it either to the airways or to the digestive tract

g) Tiny cavities with thin walls

h) Tubes that branch out into the lungs, with rings of cartilage that keep them open

i) Organ made of cartilage and holding the vocal cords

j) Large flat muscle in the lower part of the rib cage

k) Muscles that cause the rib cage to increase in size.

4 Place the structures of the respiratory tract in the order that oxygen travels to reach the blood.

<table>
<thead>
<tr>
<th>Alveoli</th>
<th>Bronchi</th>
<th>Bronchioles</th>
<th>Larynx</th>
<th>Nasal passages</th>
<th>Pharynx</th>
<th>Trachea</th>
</tr>
</thead>
</table>

5 The respiratory system contains structures that filter air.

a) Name two of these structures that are found on the lining of certain passages in the airways.

b) Apart from the bronchi, what are the two parts of the respiratory system that contain at least one of the structures named in a)?
6 Most structures of the respiratory system contain glands that secrete mucus. What is the main effect of mucus on air that is inhaled?

7 Complete the following sentences with one of the terms in parentheses.
   a) During exhalation, lung volume (increases OR decreases).
   b) As inhalation starts, air pressure in the lungs (increases OR decreases).
   c) Inhaled air is rich in (oxygen OR carbon dioxide).
   d) Air (exhaled OR inhaled) from outside flows into the lungs.
   e) During inhalation, the diaphragm (contracts OR relaxes).

8 The illustration below shows the gas exchange between blood and the outside air. Identify the gas indicated by each arrow.

9 From inhalation to absorption by a cell, oxygen passes through the structures listed below.

<table>
<thead>
<tr>
<th>Alveoli</th>
<th>Bronchi</th>
<th>Bronchioles</th>
<th>Cells</th>
<th>Larynx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nasal passages</td>
<td>Pharynx</td>
<td>Red blood cells</td>
<td>Trachea</td>
<td></td>
</tr>
</tbody>
</table>

   a) Place the structures in the order that oxygen travels, from inhalation to absorption.

   b) What substance travels the reverse path?

10 Why is exhaled air poorer in oxygen but richer in carbon dioxide?
CHAPTER 6

BLOOD AND BLOOD TYPES

1. When blood undergoes centrifugation, it separates into two types of constituents.
   a) What is the clear yellowish liquid that rises to the top of the test tube? __________
   b) What is the main component of this constituent? __________
   c) Name four substances that can be dissolved in this liquid.
      __________
   d) What percentage of the volume of the test tube contents does the yellowish liquid form? __________
   e) What makes up the rest of the test tube contents?
      __________

2. What does each of the following illustrations represent?
   a) __________
   b) __________
   c) __________

3. Complete the table below with the blood constituents that perform the functions described.

<table>
<thead>
<tr>
<th>Function</th>
<th>Blood constituent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport oxygen</td>
<td></td>
</tr>
<tr>
<td>Defend the body against disease</td>
<td></td>
</tr>
<tr>
<td>Make blood fluid and transport nutrients, hormones and waste products</td>
<td></td>
</tr>
<tr>
<td>Help in the blood-clotting process</td>
<td></td>
</tr>
</tbody>
</table>

4. Name the protein in cells that transports oxygen. __________
5 Complete the following table, identifying the substances present on the membrane of red blood cells according to the blood type.

<table>
<thead>
<tr>
<th>Blood type</th>
<th>Substance(s) present on the membrane of red blood cells</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Substance A</td>
</tr>
<tr>
<td>A+</td>
<td>✓</td>
</tr>
<tr>
<td>A−</td>
<td></td>
</tr>
<tr>
<td>B+</td>
<td></td>
</tr>
<tr>
<td>B−</td>
<td></td>
</tr>
<tr>
<td>AB+</td>
<td></td>
</tr>
<tr>
<td>AB−</td>
<td></td>
</tr>
<tr>
<td>O+</td>
<td></td>
</tr>
<tr>
<td>O−</td>
<td></td>
</tr>
</tbody>
</table>

6 Complete the following sentences.

a) A blood transfusion involves the ____________________________ ____________________________.

b) When an individual called the ____________________________ can receive blood from an individual called the ____________________________, we say there is ____________________________ .

c) For a blood transfusion to be possible, the membranes of the ____________________________ ____________________________ must not carry substances that differ from those on the ____________________________ .

7 Check the cases in which a blood transfusion is possible.

<table>
<thead>
<tr>
<th>Donor blood type</th>
<th>Recipient blood type</th>
<th>Possible transfusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>A−</td>
<td>A+</td>
<td></td>
</tr>
<tr>
<td>A+</td>
<td>A−</td>
<td></td>
</tr>
<tr>
<td>O+</td>
<td>B−</td>
<td></td>
</tr>
<tr>
<td>O+</td>
<td>B+</td>
<td></td>
</tr>
<tr>
<td>AB−</td>
<td>O−</td>
<td></td>
</tr>
<tr>
<td>O−</td>
<td>AB−</td>
<td></td>
</tr>
<tr>
<td>Universal recipient</td>
<td>Universal donor</td>
<td></td>
</tr>
<tr>
<td>Universal donor</td>
<td>Universal recipient</td>
<td></td>
</tr>
</tbody>
</table>
8. The illustrations below show red blood cells from three people.

Helen

Vladimir

Kristen

a) Write the blood type of each person.

Helen

Vladimir

Kristen

b) Fill in the following table to show how the three people can give and receive blood among them if necessary.

<table>
<thead>
<tr>
<th></th>
<th>Can give blood to ...</th>
<th>Can receive blood from ...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Helen</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vladimir</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kristen</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

c) Which person is a universal donor? 

d) Which person is a universal recipient? 

9. Naomi has type A− blood, and Vivian has type A+ blood.

a) Can Vivian receive blood from Naomi? Explain your answer.

b) Can Vivian give blood to Naomi? Explain your answer.

c) Name the blood types of the people to whom Vivian can give blood.
THE CARDIOVASCULAR SYSTEM

1. Name the blood vessels labelled on the illustration.
   a) 
   b) 
   c) 
   d) 
   e) 

2. Follow the directions below to complete the illustration of the heart.
   a) Write the name of each structure.

   1
   2
   3
   4
   5
   6
   7
   8
   9

   b) Colour red all the blood vessels and heart chambers containing blood rich in oxygen.
   c) Colour blue all the blood vessels and heart chambers containing blood rich in carbon dioxide.
   d) Draw arrows to indicate the direction of blood flow in the blood vessels and heart chambers.
3. Identify the type of blood vessels described in the following statements: arteries, veins or capillaries.
   
   a) Vessels with very thick walls
   
   b) Vessels that carry blood at high pressure
   
   c) Vessels that bring blood back to the heart
   
   d) Smallest vessels in the cardiovascular system

4. Together, all the blood vessels form a closed circuit. Explain this statement.

5. List the following terms in order, showing the route blood takes in pulmonary circulation and systemic circulation.

   **Circulation route**
   
   **Systemic circulation**
   - Left atrium
   - Pulmonary arteries
   - Pulmonary capillaries
   - Pulmonary veins
   - Right atrium
   
   **Pulmonary circulation**
   - Right atrium
   - Pulmonary arteries
   - Pulmonary capillaries
   - Pulmonary veins
   - Left atrium

96 THE LIVING WORLD
6. What do the valves in veins do?

7. Complete the following table.

<table>
<thead>
<tr>
<th>Circulation route</th>
<th>Pulmonary circulation</th>
<th>Systemic circulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td></td>
<td>Long</td>
</tr>
<tr>
<td>Blood is pumped</td>
<td></td>
<td></td>
</tr>
<tr>
<td>toward …</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Side of the heart involved</td>
<td></td>
<td></td>
</tr>
<tr>
<td>On leaving the heart, the blood is rich in …</td>
<td></td>
<td></td>
</tr>
<tr>
<td>On returning to the heart, the blood is rich in …</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8. Consider the following illustration of the cardiovascular system.

a) Colour green the blood vessels and heart chambers involved in pulmonary circulation.

b) Colour yellow the blood vessels and heart chambers involved in systemic circulation.

c) Write whether each of the numbered blood vessels contains blood rich in carbon dioxide or oxygen.

1. __________________
2. __________________
3. __________________
4. __________________
 CHAPTER 6

9 Check the appropriate column to indicate whether the following structures contain blood rich in oxygen or carbon dioxide.

<table>
<thead>
<tr>
<th>Structure</th>
<th>Blood rich in oxygen</th>
<th>Blood rich in carbon dioxide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aorta</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Superior vena cava</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inferior vena cava</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulmonary artery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulmonary vein</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right ventricle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left ventricle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left atrium</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right atrium</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carotid artery (artery that carries blood to the head)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jugular vein (vein that carries blood from the head)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

10 Identify the component of the circulatory system described in each statement.
   a) Muscular organ with four chambers
   b) Blood vessels attached to the atria
   c) Blood vessels attached to the ventricles
   d) Veins carrying oxygenated blood
   e) Chamber where blood rich in carbon dioxide enters the heart
   f) Chambers in the upper part of the heart
   g) Smallest blood vessels
   h) Side of the heart containing blood poor in oxygen

11 True or false? If the statement is false, explain why.
   a) An adult human heart is normally about the size of a fist.
   b) Blood can flow freely between the left and right sides of the heart.
   c) Arteries carry blood rich in oxygen, while veins carry blood rich in carbon dioxide.
1 What am I?
   a) Liquid component of blood that is the source of most of the substances in extracellular fluid
   b) Cellular component of blood found in the lymph
   c) Liquid surrounding cells
   d) Liquid from which lymph is derived
   e) Vessels that carry lymph
   f) Structures that filter lymph

2 Label the components of the lymphatic system in the following illustrations.

3 Unlike the cardiovascular system, the lymphatic system does not have a heart to pump lymph.
   a) What does lymph rely on to move through the body?
   b) What do some lymphatic vessels contain to prevent lymph from flowing in the wrong direction?
4 What fluid does lymph empty into at the end of its trip through the lymphatic system?

5 Consider the following illustration.
   a) Identify the labelled parts.

   1
   2
   3
   4

   b) By what process do white blood cells pass through capillary walls?

6 True or false? If the statement is false, explain why.
   a) Lymph, extracellular fluid and blood are three liquids that contain water.

   b) Waste from cells is discharged directly into the blood.

   c) Nutrients pass directly from blood to cells.

   d) All substances in plasma that are small enough to pass through capillary membranes are also found in extracellular fluid.
**CHAPTER 6**

**THE HUMAN ORGANISM AND THE IMPORTANCE OF NUTRITION**

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e) Extracellular fluid comes from lymph.

f) Some extracellular fluid returns to capillaries to form plasma again, while some extracellular fluid enters the lymphatic vessels to become lymph.

---

7 What structures are the best place for the body to fight off invaders? Explain your answer.

---

8 Consider the photo opposite.

a) Which of our body’s defence mechanisms is illustrated?

b) Describe the process in your own words.

c) What other way can white blood cells neutralize invaders?

---

9 What is the term used to describe the ability that the body develops to resist a disease?

---

10 Write whether each of the following statements refers to the specificity of antibodies (A) or to their immunizing effect (B).

a) An antibody can fight only the antigen for which it was produced.  

b) An antibody that neutralizes the diphtheria antigen is different from an antibody that neutralizes the measles antigen.

c) Because of antibodies, we have certain diseases only once in our lifetime.
True or false?

a) Antibodies are produced and secreted by white blood cells.  
   | True | False |

b) Antibodies have pseudopods that they use to ingest antigens.  
   | True | False |

c) To neutralize invaders, antibodies attach themselves to substances in the antigen membrane, preventing the antigens from attacking other cells.  
   | True | False |

d) An antibody can neutralize any antigen.  
   | True | False |

e) After producing antibodies to neutralize an antigen for the first time, white blood cells remember how to do it.  
   | True | False |

Check the statements that apply to lymphatic vessels.

A. Lymph flows through them toward the subclavian veins.  
   | True | False |

B. They are less permeable than blood vessels.  
   | True | False |

C. They collect extracellular fluid.  
   | True | False |

D. Bacteria can live in them.  
   | True | False |

E. Viruses are too big to enter them.  
   | True | False |

F. They carry lymph to the lymphatic nodes.  
   | True | False |

Explain how blood plasma, extracellular fluid and lymph are related to one another.

Matthew thinks the body’s defences are concentrated in the lymph nodes. However, the body can defend itself wherever it is invaded.

a) Why are the lymph nodes considered the body’s main line of defence against invaders?

b) Refer to a characteristic of white blood cells to explain to Matthew why the body can defend itself wherever it is invaded.
THE URINARY SYSTEM

1. Check the statement that best defines excretion.
   A. The elimination of digestive waste products
   B. The elimination of respiratory waste products
   C. The elimination of waste products from cellular activity

2. What three structures eliminate waste produced by our body's cellular activity?

3. Identify the structures labelled on the illustration.
   a) __________________________
   b) __________________________
   c) __________________________
   d) __________________________

4. What component of the urinary system performs each of the following functions?
   a) Stores urine.
   b) Carries urine to the organ that stores it.
   c) Filters blood and produces urine.
   d) Carries urine out of the body from the organ that stores it.

5. Check the substances that are not usually eliminated in urine.
   A. Red blood cells   B. Water   C. Urea
   D. Proteins        E. Drugs      F. White blood cells
   G. Minerals        H. Vitamins   I. Fats

6. Check the correct phrase to complete the following sentence:
   Urine is usually made up of …
   A. 40% water.   B. 60% water.
   C. 85% water.   D. 95% water.
   E. urea, for the most part.
7 Name the four structures urine passes through, placing them in order from its production to its release from the body.

8 Write whether the amount of urine produced increases or decreases after each action described below, and explain why.

   a) Exercising to the point of sweating a lot

   b) Eating a lot of fruit with a high water content

   c) Eating salty french fries

   d) Drinking large amounts of a soft drink

9 Place the following steps in the correct order.

   A. Urine is stored in the bladder until urination.
   B. Waste products from cellular activity are released into the bloodstream.
   C. Useful substances in the blood leave the kidneys through the renal veins.
   D. Urine is expelled from the body.
   E. The kidneys filter waste products and excess substances out of the blood and produce urine.
   F. Blood arrives in the kidneys through the renal arteries.

10 Check the statement that best describes blood balance in the body.

   A. The amount of blood in the body remains constant.
   B. The amounts of blood on the left and right sides of the body remain equal.
   C. The concentrations of substances in the blood remain constant.
   D. The rhythm of blood flow remains as constant as possible.

11 What substance does each of the following organs excrete?

   a) 
   b) 
   c)
12 True or false? If the statement is false, explain why.

a) Kidneys filter out carbon dioxide from blood.

b) Sweat is a secretion discharged from the sweat glands.

c) A ureter is a tube leading from the bladder to outside of the body.

d) Excretion helps to maintain blood balance.

e) The kidneys filter blood to remove waste and other substances.

13 Apart from maintaining blood pH, give two examples of factors the urinary system must control to maintain blood balance.

14 Elite athletes must regularly undergo urine analysis. Explain why these tests are a good way to find out if an athlete has taken drugs or other substances that have been banned from use in competition.

15 People suffering from kidney failure must go to the hospital frequently for dialysis. In a dialysis treatment, the patient's blood is filtered by a machine. What risk do patients expose themselves to by skipping dialysis treatments? Explain your answer.
CHAPTER 6 CONSOLIDATION

1. The following illustrations show different systems. Name each system.
   a) 
   b) 
   c) 
   d) 
   e) 

2. Fill in the following table by writing the path each substance takes in the body: from blood to cells or from cells to blood.

<table>
<thead>
<tr>
<th>Substance</th>
<th>Path in the body</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxygen</td>
<td></td>
</tr>
<tr>
<td>Cellular waste</td>
<td></td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td></td>
</tr>
<tr>
<td>Nutrients</td>
<td></td>
</tr>
</tbody>
</table>
3 Name the system(s) described in the following statements.

a) We are two systems that excrete waste.

b) I am the system that transforms food into nutrients.

c) I am the system that carries blood throughout the body.

d) I am an open system of structures that fights off invaders.

4 Check the appropriate column(s) to indicate whether the following components are found in the blood, the lymph or both.

<table>
<thead>
<tr>
<th>Component</th>
<th>In blood</th>
<th>In lymph</th>
</tr>
</thead>
<tbody>
<tr>
<td>White blood cells</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red blood cells</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cell waste</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nutrients</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Platelets</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5 Name the system of which each of the following structures is a part.

<table>
<thead>
<tr>
<th>Structure</th>
<th>System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lungs</td>
<td></td>
</tr>
<tr>
<td>Stomach</td>
<td></td>
</tr>
<tr>
<td>Bladder</td>
<td></td>
</tr>
<tr>
<td>Heart</td>
<td></td>
</tr>
<tr>
<td>Veins</td>
<td></td>
</tr>
<tr>
<td>Pancreas</td>
<td></td>
</tr>
<tr>
<td>Kidneys</td>
<td></td>
</tr>
<tr>
<td>Lymph nodes</td>
<td></td>
</tr>
<tr>
<td>Pharynx</td>
<td></td>
</tr>
</tbody>
</table>
6 Check the appropriate column to indicate whether the following substances represent input or output. Write the system responsible for input or output.

<table>
<thead>
<tr>
<th>Substance</th>
<th>Input</th>
<th>System responsible for introduction</th>
<th>Output</th>
<th>System responsible for elimination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amino acids</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxygen</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urine</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glucose</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7 The following structures are associated with vitamins, from ingestion to absorption by cells. Place the structures in order from ingestion to absorption.

<table>
<thead>
<tr>
<th>Blood</th>
<th>Cell</th>
<th>Esophagus</th>
<th>Extracellular fluid</th>
<th>Mouth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pharynx</td>
<td>Small intestine</td>
<td>Stomach</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8 Check the statements that reflect recommendations from Canada’s Food Guide.

A. It is better to drink whole milk (3.25%). ☐
B. We should eat at least two servings of fish every month. ☐
C. It is better to eat whole fruit and vegetables rather than juices. ☐
D. We should always salt our food. ☐
E. We should avoid fried food. ☐
F. We should eat at least one green vegetable and one orange vegetable every day. ☐

9 What is the function of the oxygen we absorb through respiration?

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

10 Fill in the blanks in the following text to explain why we breathe faster during strenuous exercise.

The body needs energy during physical exercise. When cells produce energy, they also release _________________. The concentration of this gas ________________ in the body. We must therefore ________________ our respiratory rhythm to expel it.
11 Consider the following illustration.
   a) Name the numbered structures.

   1  
   2  
   3  
   4  
   5  

   b) Which colour of arrow represents the path that air takes? _______
   c) What does the other arrow represent?

   d) What is the number of the structure that is considered the
      meeting point of the respiratory system and the digestive system? ______
   e) What is the function of structure 4?

12 The trachea and the esophagus are close to each other.
   a) Which one is located behind the other? ______________________
   b) Which one has rings of cartilage to hold it open? ______________________
   c) Explain why this structure must be kept open.

13 Check the appropriate column to indicate whether the following structures carry food, air
   or both.

<table>
<thead>
<tr>
<th>Structure</th>
<th>Carries food</th>
<th>Carries air</th>
<th>Carries both food and air</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pharynx</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trachea</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Esophagus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mouth</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nasal passages</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Larynx</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Consider the Nutrition Facts label opposite. It is from a box of pasta.

a) Would you recommend this pasta to someone suffering from constipation? Explain your answer.

b) Would you recommend this pasta to someone who must limit the carbohydrates in his or her diet?

c) What minerals does the pasta contain?

<table>
<thead>
<tr>
<th>Nutrition Facts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per about 1/4 box (85 g)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Amount</th>
<th>% Daily Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calories</td>
<td>300</td>
</tr>
<tr>
<td>Fat 1.5 g</td>
<td>2%</td>
</tr>
<tr>
<td>Saturated 0.3 g</td>
<td>2%</td>
</tr>
<tr>
<td>Trans 0 g</td>
<td></td>
</tr>
<tr>
<td>Cholesterol</td>
<td>0 mg</td>
</tr>
<tr>
<td>Sodium 10 mg</td>
<td>1%</td>
</tr>
<tr>
<td>Carbohydrates 62 g</td>
<td>21%</td>
</tr>
<tr>
<td>Fibre 8 g</td>
<td>32%</td>
</tr>
<tr>
<td>Sugars 2 g</td>
<td></td>
</tr>
<tr>
<td>Protein 11 g</td>
<td></td>
</tr>
<tr>
<td>Vitamin A</td>
<td>0%</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>0%</td>
</tr>
<tr>
<td>Calcium</td>
<td>2%</td>
</tr>
<tr>
<td>Iron</td>
<td>20%</td>
</tr>
<tr>
<td>Thiamine</td>
<td>40%</td>
</tr>
<tr>
<td>Riboflavin</td>
<td>25%</td>
</tr>
<tr>
<td>Niacin</td>
<td>20%</td>
</tr>
<tr>
<td>Folate</td>
<td>80%</td>
</tr>
</tbody>
</table>

Read the following information about the blood types and blood compatibility of four friends. Use the information to determine the blood type of each person.

- The membrane of Eric’s red blood cells carries only the Rh protein.
- The membrane of Maya’s red blood cells carries two substances.
- Eric cannot give blood to Maya.
- Mounir cannot give blood to Maya.
- Juliet has a different blood type than Eric.
- Juliet cannot receive blood from Eric.
- Juliet cannot receive blood type A−.

a) Eric’s blood type is ________.

b) Maya’s blood type is ________.

c) Mounir’s blood type is ________.

d) Juliet’s blood type is ________.