Chapter 7: Surviving

7.1 The human body is divided into systems

Student book answers (pages 116–117)

Check your learning 7.1

Remember and understand

1 What is the difference between cells, tissues and organs?

Cells are the building blocks or basic units. Groups of cells working together are called tissues. Groups of tissues that work together are called organs.

2 Why did the Egyptian *shamans* study how the body worked?

Student answers will vary. Typically, the Egyptian shamans were spiritualists with a fear of illness, so they needed to study how the body worked.

3 Why is Leonardo da Vinci (Figure 7.4) so famous?

Leonardo da Vinci is famous for many things, including accurate drawings and written descriptions of the human body. He studied the human heart, creating a glass model of the aortic valve.

4 What is, or was, a body snatcher?

A ‘body snatcher’ was a member of a gang that stole bodies from graveyards to be used in dissections.

5 Why do surgeons need a thorough understanding of anatomy?

Student answers will vary. Typically, surgeons need a thorough understanding of anatomy so that they can perform various operations and repair the body.

Apply and analyse

6 Draw a timeline of when and how the early anatomists studied the body. Use an Internet search to help you complete this question.

Student answers will vary.

7.2 The digestive system is made up of organs

Student book answers (pages 118–119)

Check your learning 7.2

Remember and understand

1 List, in order, the organs of the digestive system that food moves through, from the mouth to the anus.

The organs of the digestive system that food moves through, in order from the mouth to the anus, are: mouth, oesophagus, stomach, small intestine, large intestine, rectum and anus.

2 How does saliva make it easier to eat dry biscuits?

Saliva contains enzymes that start the process of chemical digestion. This softens our food, making dry biscuits easier to eat.

3 What is the difference between mechanical and chemical digestion? Which occurs in the stomach?

Mechanical digestion is the action of the teeth breaking up our food, whereas chemical digestion is the action of enzymes in the saliva and stomach.

4 What is the difference between the digestive system and the digestive tract?

The digestive tract is a series of ‘hollow’ organs joined in a long, twisting tube from the mouth to the anus. The digestive system is made up of the digestive tract and other organs, such as the teeth, liver, gall bladder and pancreas.

5 Which organs are involved in digestion but do not have food pass through them?

The organs re involved in digestion that don’t have food pass through them are the teeth, liver, gall bladder and pancreas.

Apply and analyse

6 Teeth would look very nice if they were all the same size and shape. What is the advantage of having different types of teeth in your mouth?

The advantage of having different types of teeth is that both vegetables and meat can be consumed.

7 Can you think of any tools that may work the same way as incisors, canines or molars?

Different teeth perform different roles: incisors act like knives or scissors, molars act like a grinder and canines act like a fork.

8 What are villi? What is their function?

Villi are small finger-like projections that cover the inner walls of the small intestines. They increase the surface area of the intestines, which increases the rate at which nutrients can be absorbed.

7.3 The digestive system varies between animals

Student book answers (pages 120–121)

Check your learning 7.3

Remember and understand

1 How many stomachs does a cow have?

Four

2 Are digestive systems the same in all animals? Explain.

Digestive systems differ with the animals themselves. The type of digestive system relates to the food the animal consumes to ensure adequate uptake of nutrients from the food.

Apply and analyse

3 Examine the images in Figure 7.11 of the digestive systems of a carnivore, a herbivore and an omnivore. Correctly label each digestive system according to the animal’s diet. Provide evidence from the diagrams to support each of your answers.

a Carnivores have a shorter and simpler digestive tract due to the ease of digesting animal protein and fat. The caecum is often significantly reduced because of the lack of plant material in a carnivore’s diet.

b Herbivores have specialised structures because the cellulose in plant material is very difficult to digest. In particular, the caecum is relatively large and filled with bacteria specifically to digest this cellulose.

c Omnivores have medium-length intestines and only one stomach, giving them the ability to digest some plant material and animal proteins.

4 Identify the possible diet of the fossils in Figure 7.12. Provide evidence from the photographs to support each of your answers.

The top left skull is that of a herbivore and has flat teeth for chewing and grinding plant material. The top right skull is that of a carnivore and has sharp teeth designed to tear meat. The human skull is that of an omnivore and has both types of teeth (sharp and flat) so that they can effectively mechanically digest both plant and animal products.

Evaluate and create

5 Research the digestive system of an animal of your choice. In what way is it similar, and different, to the digestive system of humans? How does the structure of your animal’s digestive system relate to the food it eats?

Student answers will vary.

7.4 Science as a human endeavour: Things sometimes go wrong in the digestive system

Student book answers (pages 122–123)

Extend your understanding 7.4

1 What causes stomach ulcers?

The bacteria *Helicobacter pylori* causes stomach ulcers.

2 What role does bile play in the digestive system?

Bile helps to break up fats.

3 What is the difference between gluten intolerance and gluten allergy?

Some people do not have the enzyme that breaks down gluten, which means they cannot digest the gluten and they are gluten intolerant. If a person is allergic to gluten, their body’s immune system fights against the gluten.

4 Why does a person with constipation experience pain?

Constipation is caused by a blockage in the large intestine causing it to fill, and this causes pain.

5 Research the extreme measures that Barry Marshall took to show his colleagues that the spiral bacteria caused stomach ulcers.

Student answers will vary, but should state that Barry Marshall infected himself with the bacteria!

7.5 The respiratory system exchanges gases

Student book answers (pages 124–125)

Check your learning 7.5

Remember and understand

1 Draw a simple diagram showing how air travels down from the mouth and nose to the alveoli at the end of the branches of the bronchioles.

Student answers will vary; however, the diagrams should look similar to Figure 7.18.

2 Explain the term ‘gas exchange’.

The process of ‘gas exchange’ is the transfer of oxygen from inhaled air into the bloodstream and the transfer of carbon dioxide from the bloodstream back into the air that is then exhaled.

3 At the same time that oxygen is passing into the blood, what gas is passing out of the blood back into the lungs?

Carbon dioxide is passing out of the blood back into the lungs.

4 Write the sequence of steps in breathing in and breathing out

When breathing in (inhaling), the diaphragm and muscles between the ribs work together to expand the chest, creating suction that expands the lungs, pulling air in. When the muscles and diaphragm relax, the lungs deflate and the air moves out.

5 What role does the epiglottis play?

The epiglottis controls the path of food and air. It ensures that food travels down the oesophagus and that air travels down the trachea.

6 What advantage does the large surface area of the alveoli give in allowing oxygen to pass into the blood?

The large surface area of the alveoli allows large quantities of oxygen to pass into the blood, increasing the efficiency of the gas exchange process.

Apply and analyse

7 In your own words, explain why we need to breathe.

Student answers will vary. Typically, we need to breathe to capture oxygen, which helps convert food into energy in our cells, and expel carbon dioxide, the waste gas that is formed during respiration. This keeps us alive.

7.6 Science as a human endeavour: Things sometimes go wrong in the respiratory system

Student book answers (pages 126–127)

Extend your understanding 7.6

1 What causes each of the following?

a a cough

A cough is caused by large particles entering our throat and triggering the diaphragm to contract quickly.

b a sneeze.

A sneeze is caused by an irritation to the hairs in our nose. This triggers a message going to our brain, which coordinates the muscles in the eyes, chest, stomach and diaphragm, making us sneeze.

2 What is asthma?

Asthma is a narrowing of the airways caused by an irritant.

3 Why do people with pneumonia feel tired all the time?

Pneumonia is caused by a bacterial or viral infection in the lungs. The alveoli in the lungs fill up with bacteria, pus and fluid. This prevents air moving into the lungs. As a consequence, our bodies can’t get enough oxygen and we lack energy and feel tired.

4 It is physically impossible to keep your eyes open during a sneeze. Can you explain why?

Student answers will vary. Typically, part of the message that comes from our brain to make us sneeze is sent to the eyes, which makes it impossible to keep your eyes open while you are sneezing.

5 Describe some health risks people take with their lungs. What can be done to avoid these risks?

Student answers will vary. Typically, health risks people take with their lungs include smoking and inhaling other things, like during ‘chroming’. These risks can be avoided by not smoking or inhaling dangerous chemicals.

7.7 The circulatory system carries substances around the body

Student book answers (pages 128–129)

Check your learning 7.7

Remember and understand

1 Copy and complete: The circulatory system is the transport system for the body, delivering \_\_\_\_\_ and other \_\_\_\_\_ to the cells and carrying wastes away for removal. \_\_\_\_\_ blood cells are responsible for carrying oxygen, \_\_\_\_\_ blood cells fight germs, \_\_\_\_\_ block cuts and \_\_\_\_\_ is the liquid carrying them all.

The circulatory system is the transport system for the body, delivering oxygen and other nutrients to the cells and carrying wastes away for removal. Red blood cells are responsible for carrying oxygen, white blood cells fight germs, platelets block cuts and plasma is the liquid carrying them all.

2 Explain how the three blood vessel types differ in their structure, jobs and locations. Use diagrams in your answer.

Students will draw diagrams that should contain the following:

Arteries – largest blood vessel with thick muscular walls designed to cope with large pressure. They travel away from the heart.

Veins – similar in size to arteries but don’t have much muscle in the walls. They carry blood back to the heart and have one-way valves in them.

Capillaries – smallest blood vessel. They connect arterioles (artery branches) and venules (vein branches) and enable the exchange of water, oxygen and nutrients between the blood and surrounding tissues.

3 How many chambers are there in your heart? Name them.

There are four chambers in the heart: right atrium, left atrium, right ventricle and left ventricle.

4 Use Figure 7.26 showing the structure of the heart to complete the following for the path of blood through the chambers of the heart: body → \_\_\_\_\_ → \_\_\_\_\_ → lungs → \_\_\_\_\_ → \_\_\_\_\_ → body.

The path of the blood through the heart is: body → right atrium → right ventricle → lungs → left atrium → left ventricle → body.

5 Rewrite your answer to question 4, adding the names of the veins and the arteries involved.

The path of the blood through the heart (with arteries and veins) is: body → vena cava → right atrium → right ventricle → pulmonary artery → lungs → pulmonary vein → left atrium → left ventricle → aorta.

6 From which body system does the circulatory system absorb nutrients?

Digestive system

7 Why would muscles need the heart to pump faster during exercise? What chemical reaction does this include?

Muscles need the heart to pump faster during exercise to provide more oxygen and remove waste products, such as carbon dioxide. The chemical reaction is called respiration.

8 Instead of the blood travelling directly from the lungs to the rest of the body, the blood returns to the heart first. What is the advantage of doing this?

The blood returns to the heart first instead of travelling directly from the lungs to the body because the blood now contains oxygen and the heart muscle itself needs oxygen so that it can keep pumping.

7.8 Science as a human endeavour: Things sometimes go wrong in the circulatory system

Student book answers (pages 130–131)

Extend your understanding 7.8

1 What causes the lub-dub sound you hear when you listen to your heart?

The lub-dub sound of the heart is caused by the closing of the valves in the heart.

2 What is the cause of the following valve conditions?

a stenosis

Stenosis is the narrowing of a valve from scarring.

b regurgitation or insufficiency

Regurgitation or insufficiency is when a valve is leaky.

c prolapse.

Prolapse is when a valve doesn’t close properly.

3 What is the purpose of the heart having a pericardium?

The pericardium of the heart reduces friction.

4 What is the link between atherosclerosis and cardiovascular disease?

Atherosclerosis leads to cardiovascular disease.

5 What things could you do to ensure your circulatory system stays healthy?

To ensure your circulatory system stays healthy, eat less fatty food, exercise regularly and don’t smoke.

6 How does the heart muscle become damaged during a heart attack?

The heart muscle is damaged during a heart attack when fatty deposits in the coronary arteries block the blood flow and the heart muscle is starved of oxygen and dies.

7 How does the function of the pericardium become affected when it fills with fluid during an infection?

When the pericardium fills with fluid during an infection, it cannot do its job properly. It also restricts the heart from filling with blood properly, and hence the heart cannot beat properly.

7.9 The excretory system removes waste

Student book answers (pages 132–133)

Check your learning 7.9

Remember and understand

1 What does the word ‘excretion’ mean?

The word ‘excretion’ describes the process of removing wastes from the body.

2 Can you think of any similarities between your excretory system and your respiratory system?

Both the excretory system and the respiratory system remove waste products from the body.

3 What are four organs involved in excretion?

Kidneys, liver, lungs, skin

4 Why does urine tend to be more concentrated in hot weather?

In hot weather the body requires more water to function because it also uses water to cool itself through perspiration. This means there is less water going through the excretory system to dilute the urine.

5 How does your body get rid of the following wastes?

a salt

Salt is filtered out by the kidneys and removed in the urine.

b water

Waste water is expelled by urinating and by perspiring.

c urea

The liver converts ammonia into urea, which is filtered by the kidneys and removed in the urine.

Apply and analyse

6 What effect would running a marathon have on the quantity and concentration of the urine?

Running a marathon would result in less and more concentrated urine because the body is using water to cool down through perspiration, so there isn’t much waste water left over.

7 If someone passes blood in their urine, it is a likely sign of kidney damage. Can you think of why?

Blood in the urine may indicate problems with the excretory organs. The blood has passed through the filters in the kidney, which are usually too small to allow blood to pass through.

7.10 Plants have tissues and organs

Student book answers (pages 134–135)

Check your learning 7.10

Remember and understand

1 Name three organs found in most plants and describe their function (what they do).

• Roots – help anchor a plant in the soil and absorb water and nutrients from the soil

• Stem – transports water and nutrients from the roots to the leaves

• Leaves – are involved in gas exchange and photosynthesis

2 What is osmosis?

Osmosis is the movement of a solvent through a semi-permeable membrane from a region of higher concentration to a region of lower concentration.

3 What is the difference between xylem and phloem?

Xylem is a straw-like structure that moves water from the roots to the top of a plant. Phloem is another network of cells in the plant stem that transports glucose produced in the leaves to other parts of the plant.

4 Why do leaves become red and yellow in autumn?

During autumn, some leave lose their green chlorophyll. This allows the other colours present in the leaves (reds, oranges and yellows) to appear.

5 What system in humans provides the same function as a plant stem?

The circulatory system in humans provides the same function as a plant stem.

Apply and analyse

6 Some florists sell blue orchids that are artificially coloured. Use your knowledge of plant systems to explain how these orchids may have become blue.

Student answers will vary. Typically, blue dye was perhaps mixed with water and used to water the plant.

Review 7

Student book answers (pages 136–137)

Remember and understand

1 What was Leonardo da Vinci famous for?

Leonardo da Vinci was famous for many things, including accurate drawings and written descriptions of the human body. He studied the human heart, creating a glass model of the aortic valve.

2 What do you think motivated the earliest studies of the human body?

The motivations behind the earliest studies of the human body came from the desire to understand the structure and function of the body.

3 Name four things that the circulatory system transports around your body.

Oxygen, nutrients, wastes, blood

4 What is the gaseous waste product removed by the lungs?

Carbon dioxide

5 Describe how the respiratory system and circulatory system work together.

The respiratory and circulatory systems rely on each other. The respiratory system provides the oxygen and the circulatory system transports it around the body. The circulatory system carries waste products, such as carbon dioxide, back to the lungs to be removed from the body.

6 What is the difference between respiration and breathing?

Breathing is the process that moves air in and out of the lungs. Respiration is the transport of oxygen from the air to our cells and the transport of carbon dioxide from the blood into the air to be exhaled.

7 Where does chemical digestion occur in the body?

In the mouth and stomach

8 Where does peristalsis occur in the body? Explain how it causes food to move.

Peristalsis is a series of wave-like muscle contractions that push food along the digestive tract. It occurs in the oesophagus, stomach and small intestine.

9 Plants do not have a digestive system. What organ helps the plant supply all its energy needs?

The leaves of plants supply their energy needs via photosynthesis.

Apply and analyse

10 How does the human digestive system ‘feed’ all the other systems?

The digestive system breaks down food and absorbs the nutrients into the bloodstream. This ‘feeds’ or supplies all the other systems of the body.

11 Why would muscles need more blood during exercise?

Muscles need more blood during exercise to ensure they receive adequate oxygen and that waste products, such as carbon dioxide, are removed to prevent fatigue from occurring.

12 Would you expect to find chloroplasts in the roots of a plant? Why or why not?

Chloroplasts are not found in the roots of plants because photosynthesis does not occur in the roots. Photosynthesis occurs in the leaves, which are exposed to sunlight.

13 Sweating is often considered to be a bad thing. What is your perspective? Put forward an argument for your point of view. What do you think would happen if you didn’t sweat?

Student answers will vary.

14 Imagine it is your job to construct a ‘user’s manual’ for one of the systems covered in this chapter. Write a list of ten ‘Frequently Asked Questions’ (FAQ) to go at the front of the manual. Write an answer to as many of your questions as you can. If you don’t know the answer, write down where you could find the answer or who you could ask.

Student answers will vary.

15 Some people have had the valves in their heart replaced with prosthetic valves, either made from synthetic materials or transplanted directly from a pig or cow heart. Why is it so important that the valves in a heart are functioning properly?

It is important for the heart valves to function properly in order to ensure that blood doesn’t return from where it came.

16 Mangrove trees get rid of excess salt through their leaves. This salt is often seen as white crystals on the underside of the leaves. Which system does this represent for the plant? How is this similar to humans? Which organ(s) is responsible for this in humans?

Removal of salt via the leaves in plants is their excretory system. This is similar to humans, because the body will attempt to remove salt through the urinary system with water. The organs primarily responsible for this in humans are the kidneys.

17 Human dissections sound like grisly work, so why do you think it was so important that they happened?

It was important for human dissections to occur in order for scientists and doctors to understand the human body and how it functions. This has implications for the treatment of diseases.

Evaluate and create

18 Use your understanding of the different systems of the human body to create a concept map detailing the connections between the systems. An example has been provided to help you get started.

Student answers will vary.

19 Revisit Challenge 7.1, the brown paper body brainstorm that you did at the start of this unit. Look at the body you and your group created. Evaluate your own work by writing a short paragraph about how your knowledge of your major body systems has changed after completing this unit. Give yourself a score out of 5 for *then* and a score out of 5 for *now*.

Student answers will vary.

20 There are many diseases that affect the different organs in the body. Sometimes the only treatment available is an organ transplant. Replacement hearts and lungs can only be obtained from critically injured patients who have been certified brain dead. Discuss the advantages and disadvantages of organ donation with a partner. Would you want your organs donated if you were brain dead? Explain the reasoning behind your decision.

Student answers will vary.