Chapter 7: Surviving

Challenge 7.1: Brown paper body brainstorm

Experiment worksheet answers (pages 116–117 and 203)

There are no questions in this experiment.

Experiment 7.2A: Digesting protein

Experiment worksheet answers (pages 118–119 and 204)

Discussion

1 This experiment is a ‘controlled’ experiment. What do you understand this term to mean?

This experiment is considered to be controlled, as there is a test tube in which nothing is changed. This is used as a comparison or baseline. Every variable (other than the independent variable) is kept constant between the different test tubes.

2 How can combining the class’s data improve the accuracy of the interpretations?

Combining class data can improve accuracy of the interpretations, as there is more data from which to form a conclusion. The more tests that are done, the more data there is to compare.

3 Construct a sentence to explain how the comparison of tubes relates to the human stomach for A and B, A and C, and A and D.

Answers will vary, however students should note the following:

a Tube A most closely represents the human stomach, which contains acid and enzymes.

b Tube B is missing pepsin, which is an enzyme found in the stomach and aids in the digestion of protein.

c Tube C is missing HCl, which is an acid found in the stomach and aids in digestion.

d Tube D is missing HCl, but has NaOH, which is a basic solution. This test tube is the exact opposite of what happens with the human body because the pH is increased from acidic (where enzymes work best) to basic.

4 In which test tube(s) has the protein been almost completely digested? How do you know?

The protein will be completely digested in test tube A, as no protein is evident.

5 Has the pepsin digested the protein? If so, how can you be sure?

Pepsin digests the protein in combination with acid; less protein is present in those test tubes containing pepsin and acid.

6 What are enzymes?

Enzymes are chemicals that assist in a chemical reaction.

7 Does HCl digest the protein by itself? How do you know?

HCl does not digest the protein by itself because the protein wasn’t broken down in test tube B, which had HCl and no pepsin.

8 Copy and complete the following word equations to show what has happened in this experiment.

Tube A: protein + \_\_\_\_\_\_ + \_\_\_\_\_\_ → amino acids

Tube B: water + \_\_\_\_\_\_ + \_\_\_\_\_\_ → \_\_\_\_\_\_

Tube C: pepsin + \_\_\_\_\_\_ + \_\_\_\_\_\_ → \_\_\_\_\_\_

Tube D: pepsin + \_\_\_\_\_\_ + \_\_\_\_\_\_ → \_\_\_\_\_\_

Word equations:

Tube A: protein + HCl + pepsin → amino acids

Tube B: water + HCl + protein → coagulated protein

Tube C: pepsin + water + protein → protein

Tube D: pepsin + KOH + protein → protein

9 Why does the body digest protein? What would happen to the protein after it has been digested?

The body digests protein, as it is needed for growth and repair of cells. After the protein is digested, it is absorbed across the intestinal walls and into the blood to be transported around the body.

10 Predict what would happen if this experiment was repeated with carbohydrates instead of protein, leaving the rest of the experiment exactly the same.

If this experiment was repeated using carbohydrates instead of protein, it is likely that the same results would occur, as the pepsin and HCl emulate the human stomach and carbohydrates can be digested.

Conclusion

What do you know about the function of pepsin and the conditions under which pepsin functions best?

Pepsin controls digestion and works best when combined with HCl, another chemical found in the stomach.

Experiment 7.2B: What if an enzyme was boiled?

Experiment worksheet answers (pages 118–119 and 205)

Discussion

1 Describe the difference between the jelly with the fresh pineapple and the jelly with no pineapple.

Jelly with the fresh pineapple will not set. Jelly with no pineapple will set.

2 Use the term ‘chemical digestion’ to explain your observations.

The enzyme in the fresh pineapple chemically digests the gelatine protein found in jelly.

3 Was your hypothesis supported in your inquiry? Explain your answer.

Student answers will vary. They should provide an example from their results to support their answer.

4 Suggest an alternative reason for the results you obtained in your inquiry.

Student answers will vary.

Conclusion

Explain why you should not add fresh pineapple to jelly.

Fresh pineapple contains an enzyme that chemically digests the gelatine protein found in jelly.

Challenge 7.5A: Measure your lung capacity

Experiment worksheet answers (pages 124–125 and 206)

Discussion

1 Can you repeat the results by performing your experiment two more times?

Student results will vary.

2 Is there a chance your results could have been affected by something else? For example, do you have a lung infection?

Many factors can affect lung capacity. Fitness, asthma, lung infections, and the need to bend over will all restrict lung function.

3 Compare your results to others in the class. Can you notice any relationship between height of the person and their lung capacity?

In general, taller people will have a larger lung capacity. Michael Phelps (1.93 m tall) had a lung capacity of 12 L.

Challenge 7.5B: Fish dissection

Experiment worksheet answers (pages 124–125 and 206)

Discussion

PART A

1 What do you notice about the arrangement of the organs?

Fish organs are arranged in a fairly linear pattern in line with the body shape.

2 Are the systems clearly separated or are they intertwined?

They are intertwined, as they rely on one another.

3 Are certain organs a darker red colour than others?

Some organs will be a darker red, such as the heart, liver and gills.

4 What might this tell you about their blood supply?

Organs with a darker red colour have a higher concentration of oxygenated blood.

5 What might this tell you about their importance?

The darker colour indicates the organ is of high importance.

PART B

1 What feature do lungs have that is similar to fish gills?

Both lungs and gills have a large surface area.

2 How does this feature enable both gills and lungs to perform their functions?

The large surface area allows a greater amount of oxygen to move in and carbon dioxide to move out of the blood.

Experiment 7.7: Heart dissection

Experiment worksheet answers (pages 128–129 and 207)

Discussion

1 What is the artery from step 4 called?

Aorta

2 What is the artery from step 6 called?

Pulmonary artery.

3 How does the thickness of this artery wall compare with the thickness of a vein wall?

Arteries have thicker vessel walls than that of veins.

4 How does the thickness of ventricle walls compare with that of atrial walls?

Ventricle walls are thicker than that of atrial walls.

5 How can you explain the difference between the left and right ventricle walls?

The left ventricle has a thicker wall as more cardiac muscle is needed to generate the pressure to move blood all around the body. The right ventricle needs less cardiac muscle as blood from this area needs to move sideways into the lungs.

Conclusion

What do you know about the structure and function of the heart?

The structure of the heart reflects its function. The atria walls of the heart (receives blood and moves it into the ventricles) require less muscle than that of ventricles (moves blood around the body). The left ventricle moves blood around the body and has more cardiac muscle than that of the right ventricle which moves blood sideways to the lungs.

Challenge 7.8: Modelling blood flow

Experiment worksheet answers (pages 130–131 and 208)

Discussion

1 What effect did narrowing the straws have in the effectiveness of water flow?

Narrowing the straws decreases the water flow and causes it to become turbulent.

2 What complication of the circulatory system does this model reflect?

atherosclerosis

3 Treatment for this complication involves inserting a small balloon into the blood vessel and allowing it to stretch the vessel so that it becomes wider. How will this help the patient?

This increases the amount of blood flowing through the vessel and prevents the turbulence of the blood. This prevents the formation of blood clots.

Experiment 7.9: Kidney dissection

Experiment worksheet answers (pages 132–33 and 208)

Discussion

1 What did you notice about the colour of the kidney on the outside compared with the colour on the inside?

The kidneys are a much darker red inside due to the high blood supply.

2 The colour of the kidney gives an indication of the amount of waste products it contains. How does this support your observations?

Blood carrying waste products enters the kidneys and is filtered by the nephrons. The output is either clean blood or urine.

3 Could you actually see any nephrons? What does this tell you about their size and the size of the substances they filter?

Nephrons are too small to see, which indicates they are microscopic in size and also deal with microscopic substances.

4 The medulla, the middle section of the kidney, has a stripy appearance. This is due to the collecting ducts heading in the same direction. Where are they heading?

The collecting ducts connect the nephrons to the ureter to transport urine to the bladder.

Conclusion

What do you know about the form and function of a mammalian kidney?

The kidneys filter blood and remove wastes, which are diverted to the urinary bladder. The kidney is a bean-shaped structure, with both concave and convex surfaces. It contains nephrons, which are located in the medulla of the kidney.

Challenge 7.10A: Locating the stomata of a leaf

Experiment worksheet answers (pages 134–135 and 209)

Discussion

1 What function do stomata have in a plant?

Stomata allow gases (not water) to move in and out of a plant’s leaf.

2 Was the stoma you located open or closed?

Student answers will vary.

3 Refer to the time of day and the location of the plant to explain why the stoma on your plant was open or closed.

Hot windy days may cause the stomata to close. Stomata are more likely to be open at the start or end of the day.

Challenge 7.10B: Locating the xylem and phloem in a stem

Experiment worksheet answers (pages 134–135 and 209)

Discussion

1 What did you notice about the amount of water in the beaker after 2–3 days?

The amount of water in the beaker should decrease as water moves up the xylem.

2 Use the term 'transpiration' to explain your answer to the previous question.

As water is removed from the stomata of a leaf due to transpiration, water moves from the beaker and up the xylem to replace what was lost.

3 What is the name of the pathway that moved the coloured water through the celery?

xylem

4 How is this similar to the circulatory system in humans? How is it different?

The xylem is similar to a blood vessel in a human. Blood also contains blood cells and other nutrients that the xylem does not.

Challenge 7.10C: Modelling root cells

Experiment worksheet answers (pages 134–135 and 210)

Discussion

1 What was the difference in weight of the dialysis tube with starch before and after soaking in water?

Student results will vary. The dialysis tubing will weigh more after soaking in water than before.

2 What caused the change in the weight of the tubing?

As the starch cannot move out of the dialysis tubing, water will move into the tubing through osmosis.

3 What is osmosis?

Osmosis is the movement of water through a selectively permeable membrane from an area of low solute/starch concentration to and area of high solute/starch concentration. (Where salt goes, water flows.)

4 Use the term ‘osmosis’ to explain how the dialysis tubing is similar to the cells in a root.

Similar to dialysis tubing, root cells also have high concentrations of solutes (salts and sugar). Both dialysis tubing and root cells use the osmosis process. As the solutes cannot move out, the water will move into the root cells (as shown in the dialysis tubing).

Experiment 7.10: Factors that affect transpiration

Experiment worksheet answers (pages 134–135 and 210)

Discussion

1 What is transpiration?

It is the evaporation of water from leaves of plants.

2 What factors would you expect to affect transpiration?

Anything that increases evaporation will affect transpiration. This includes the presence of wind or heat, and the surface area of the leaf.

3 Did your results support your hypothesis? Use evidence from your results to support your answer.

Student results will vary.

4 How could you use your results to support the plants in your garden?

Plants that are vulnerable to water loss should be placed in the shade and out of the wind in hot weather.

Conclusion

What do you know about the factors that affect transpiration?

Transpiration will increase in hot windy weather. Plants with leaves with a large surface area will have high rates of transpiration.