

## CHAPTER 4

1 ► D    2 ► A    3 ► D    4 ► B

5 ► a Starch: take a sample of the water in a spotting tile and add a drop of iodine solution. The colour changes from orange to blue-black.

Glucose: take a sample of the water in a test tube and add blue Benedict's solution. Place the tube in a water bath and heat until it boils. A brick-red precipitate results.

- b The starch molecules are too large to pass through the holes in the Visking tubing. Glucose molecules are smaller, so they can pass through.
- c The blood.
- d Large, insoluble food molecules are broken down into small, soluble ones.
- 6 ► a It is body temperature
- b It had been broken down into smaller molecules called peptides (short chains of amino acids) forming the clear solution.
- c The enzyme pepsin does not work in alkaline conditions, it is denatured.
- d The experiment is looking at the effects of pepsin on the egg white. The Control is carried out without the enzyme; all other factors are the same. This shows that it is the enzyme that breaks down the protein. In other words, the egg white does not break down by itself.
- e The enzyme works more slowly at a lower temperature. There are fewer collisions between enzyme and substrate molecules, because they have less kinetic energy.
- f Hydrochloric acid kills bacteria in the food entering the stomach.
- g By alkaline secretions in the bile and pancreatic juice.

Enzyme	Food on which it acts	Products
(amylase)	starch	maltose
(trypsin)	protein	peptides
lipase	fats	(fatty acids and glycerol)

- 8 ► Descriptions of any four of the following:
- length, which increases time and surface area for absorption
  - folds in lining, which increase surface area
  - villi covering lining, which increase surface area
  - microvilli on lining cells, which increase surface area
  - capillary networks in villi, where products are absorbed
  - lacteals in villi, which absorb fats.
- 9 ► The account should include full descriptions of most of the following points:
- digestion of starch to maltose in the mouth, action of saliva in moistening food
  - mechanical digestion by the teeth
  - movement through the gut by peristalsis (diagram useful)
  - digestion of protein by pepsin in the stomach and the role of hydrochloric acid
  - emulsifying action of bile from the liver on fats

- pancreatic enzymes (amylase, trypsin, lipase) and their role in digestion of starch, protein and fats
- adaptations of the ileum for the absorption of digested food (see question 4)
- role of the colon in absorption of water.

- 10 ► a Energy =  $(20 \times 18 \times 4.2) = 1512$  joules = 1.512 kilojoules.
- b Energy per gram =  $1.512 \div 0.22 = 6.872$  kJ per g.
- c There are several errors involved. Some major ones include:
- some of the energy from the burning pasta is used to heat the test tube, thermometer, etc
  - much energy will be lost when heating up the air near the tube, or when transferring the pasta
  - not all the energy in the pasta will be released when it burns
  - some energy will be lost when evaporating the water from the tube
  - measurement errors such as measurement of the volume of water and temperatures (although these are probably small compared with the other reasons).
- d One way is to shield the tube inside (for example) a metal can, to reduce heat losses to the air (or use a calorimeter).
- e Peanuts contain a large proportion of fat, which has a high energy content. Pasta is largely carbohydrate, which contains less energy per gram.

## CHAPTER 5

1 ► B    2 ► C    3 ► A    4 ► B

- 5 ► a Single: fish; double: human or other named mammal.
- b i (Either) The blood passes once through the heart in a single system, and twice through the heart in a double system for every complete circulation of the body.
- (Or) In a double system the blood flows from the heart through one circuit to the lungs, then back to the heart and out through another circuit to the rest of the body.
- ii Double circulatory system pumps the blood twice per circulation so higher pressures can be maintained.
- c Diffusion can take place because it has a large surface area compared with its volume and the distances for substances to move inside the cell are short.
- 6 ► a A red blood cell has a large surface area compared with its volume; contains haemoglobin; and has no nucleus, so more space is available for haemoglobin.
- b i Oxygen dissolves in the liquid lining the alveoli and then diffuses down a concentration gradient through the walls of the alveoli and capillaries into the plasma and into the red blood cells.
- ii Oxygen dissolves in the plasma and then diffuses down a concentration gradient through the walls of the capillaries into the muscle cells.
- c Dissolved in plasma.