

## CHAPTER 7

- 1 ► B      2 ► A      3 ► B      4 ► C
- 5 ► a 'Hormones' are chemical messenger substances, carried in the blood. 'Secreted' refers to the process where a cell makes a chemical that passes to the outside of the cell. 'Glands' are organs that secrete chemicals, and 'endocrine' glands secrete their products into the blood.
- b A = insulin, B = adrenaline, C = testosterone, D = progesterone.
- 6 ► a Glucose has been absorbed into the blood following a meal (lunch!)
- b The high concentration of glucose in the blood is detected by the pancreas, which secretes the hormone insulin into the blood. Insulin stimulates the uptake of blood glucose into the liver, where it is converted into an insoluble storage carbohydrate called glycogen.
- c i Untreated diabetes leads to weakness and loss of weight, and eventually coma and death.
- ii Coloured test strips to detect glucose in the urine, and direct measurement of blood glucose using a sensor.
- iii Reducing the amount of carbohydrate in the diet, and injections of insulin.

## CHAPTER 8

- 1 ► D      2 ► A      3 ► C      4 ► C
- 5 ► a Maintaining constant conditions in the internal environment of the body.
- b Removal of the waste products of metabolism from the body.
- c Filtration of different sized molecules under pressure (as in the Bowman's capsule).
- d Reabsorption of different amounts of different substances by the kidney tubule.
- e An animal (mammal or bird) that generates internal (metabolic) heat to keep its temperature constant.
- 6 ► a X = glomerulus, Y = Bowman's capsule (or renal capsule), Z = loop of Henlé
- b A = water, urea, protein, glucose, salt  
B = water, urea, glucose, salt  
C = water, urea, salt  
D = water, urea, salt.
- 7 ► Description should include:
- increase in blood concentration
  - receptors in hypothalamus of brain stimulated
  - pituitary gland releases more ADH
  - ADH travels in the blood to the kidney
  - ADH causes collecting ducts of tubules to become more permeable to water
  - more water reabsorbed into blood
  - blood becomes more dilute, its concentration returns to normal

- negative feedback involves a change in the body that is detected and starts a process to return conditions to normal
- this is negative feedback because an increase in blood concentration is detected, action of ADH returns blood concentration to normal.

- 8 ► a Before the water was drunk, the volume of urine collected was about 80 cm<sup>3</sup>. After drinking the water, the volume increased, reaching a peak of about 320 cm<sup>3</sup> after 60 min. After this, the volume decreased, until it reached the volume produced before drinking the water at about 180 min.
- b At 60 minutes, the concentration of ADH in the blood was low. This made the collecting ducts of the kidney tubules less permeable to water, so less water was reabsorbed into the blood and more was excreted in the urine, forming a large volume of urine. By 120 minutes, the secretion of ADH had increased, causing the collecting ducts to become more permeable, so that more water was reabsorbed into the blood and less entered the urine.
- c The volume would be less. More water would be lost in sweating, so less would be in the blood for production of urine.
- d 150 cm<sup>3</sup> is produced in 30 minutes, which is  $150 \div 30 = 5 \text{ cm}^3$  per minute.
- the filtration rate is 125 cm<sup>3</sup> per minute
  - therefore 120 cm<sup>3</sup> is reabsorbed per minute
  - so the percentage reabsorption is:  $(120/125) \times 100 = 96\%$ .

9 ►

Changes taking place	Hot environment	Cold environment
(sweating)	increased sweat production so that evaporation of more sweat removes more heat from the skin	decreased sweat production so that evaporation of less sweat removes less heat from the skin
(blood flow through capillary loops)	vasodilation increases blood flow through surface capillaries so that more heat is radiated from the skin	(vasoconstriction decreases blood flow through surface capillaries so that less heat is radiated from the skin)
(hairs in skin)	hairs lie flat due to relaxed muscles, trapping less air next to the skin	hairs are pulled erect by muscles, trapping a layer of insulating air next to the skin
(shivering)	no shivering occurs	shivering occurs; respiration in muscles generates heat
(metabolism)	metabolism slows down, e.g. in organs such as the liver, reducing heat production.	metabolism speeds up, e.g. in organs such as the liver, generating heat.