

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 cm³. After drinking the water, the volume increased, reaching a peak of about 320 cm³ 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 cm³ is produced in 30 minutes, which is $150 \div 30 = 5 \text{ cm}^3$ per minute.
- the filtration rate is 125 cm³ per minute
 - therefore 120 cm³ 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.

- 10 ▶ a The average body temperature of birds is slightly higher than that of mammals. This is because they have a higher metabolic rate, needed for flight (note that the flightless birds have a lower body temperature).
- b No. For example, the temperature of the camel and of the polar bear is the same, despite their different habitats.
- c The fur traps air, providing insulation. The colour acts as camouflage (so they are not so easily seen by prey).

CHAPTER 9

- 1 ▶ C 2 ▶ D 3 ▶ D 4 ▶ C
- 5 ▶ a A = placenta, B = umbilical cord, C = amnion, D = amniotic fluid, E = uterus (womb).
- b The function of the placenta is the transfer of oxygen and nutrients from the mother's blood to the blood of the embryo / fetus, and removal of waste products such as carbon dioxide and urea from the fetus to the mother.
- c Just before birth, contractions of the muscle of the uterus (E) causes the amnion to rupture, allowing the amniotic fluid (D) to escape. This is the 'breaking of the waters'.
- d During birth, the cervix (F) becomes fully dilated, and strong contractions of the muscles of the uterus (E) pushes the baby out.
- 6 ▶ a Method B. the formation of a new individual (the bud) does not involve sex cells from sex organs (as shown in method A).
- b In asexual reproduction, all the cells of the new individual are produced by mitosis from one cell in the parent. When cells divide by mitosis, all the new cells are genetically identical to the parent cell, and to each other.
- c If *Hydra* is well adapted to its environment, and the environment is stable, asexual reproduction will produce offspring that are also well adapted. However, if the environment changes, they may not be well adapted and may die out. Sexual reproduction produces offspring that show variation, so some of the new *Hydra* may be better adapted to survive in the new conditions.
- 7 ▶ a i A ii B iii D iv A
- b i oestrogen
- ii Approximately 29–30 days. This can be seen by counting the days from the start of the first menstruation (day 0) to the start of the next menstruation.
- iii Fertilisation is most likely to have taken place about 15 days after the day when the last menstruation started. The last menstruation started on about day 57, so fertilisation probably took place on about day 72. (Note – this is very approximate!) After day 72 there is no menstruation, the uterus lining becomes thicker.
- iv To prepare for implantation of the fertilised egg.

- 8 ▶ There is evidence for and against the involvement of pollutants in lowering of the sperm count, and indeed whether or not the count has become lower at all. A good account of the student's findings should be a balanced one, giving both sides of the argument. It should be illustrated with some graphs or tables of data.
- 9 ▶ a A = oestrogen, B = progesterone
- b Corpus luteum
- c To prepare for the implantation of a fertilised embryo
- d 13
- e Progesterone maintains the thickened uterus lining and prevents menstruation, as well as preventing further ovulation by inhibiting release of FSH and LH.
- i Progesterone is secreted by the corpus luteum.
- ii Progesterone is secreted by the placenta.

Name of hormone	Place where the hormone is made	Function(s) of the hormone
follicle stimulating hormone / FSH	pituitary (gland)	Stimulates growth of follicles in the ovary. Stimulates secretion of oestrogen by the ovary.
luteinising hormone / LH	pituitary (gland)	Stimulates ovulation.
oestrogen	ovary	Causes repair (thickening) of the lining of the uterus following menstruation.
progesterone	ovary (corpus luteum)	Completes the development of the uterus lining and maintains it ready for implantation of the egg. Inhibits the release of FSH and LH by the pituitary (and stops ovulation).

END OF UNIT 2 QUESTIONS

- 1 ▶ a (1 mark for each correct row)

Gas	Inhaled air / %	Exhaled air / %
nitrogen	(78)	(79)
oxygen	21	16
carbon dioxide	0.04	4
other gases (mainly argon)	(1)	(1)

- b It increases in exhaled air (1) because carbon dioxide is produced in respiration (1).
- c Excretion is getting rid of a waste product of metabolism (1); carbon dioxide is a waste product of respiration (1).
- d i Short distance (1) allows rapid / efficient diffusion of oxygen and carbon dioxide (1).
- ii Blood brings carbon dioxide and takes away oxygen (1) maintaining a diffusion gradient (1).
- iii Increases the surface over which diffusion of oxygen and carbon dioxide can occur (2).