

- 7 ▶ a** Arteries have thick walls containing much muscle tissue and elastic fibres. These adaptations allow their walls to stretch and recoil under pressure.
- b** Veins have valves, thin walls with little muscle, and a large lumen; arteries have no valves (except at the start of the aorta and pulmonary artery), thick muscular walls with many elastic fibres, and a narrow lumen.
- c** Capillaries have thin walls / walls one cell thick, to allow exchange of materials. They have a very small diameter to fit between other cells of the body.
- 8 ▶ a** A = left atrium, B = (atrioventricular) valves, C = left ventricle, D = aorta, E = right atrium.
- b** To ensure blood keeps flowing in one direction / prevent backflow of blood.
- c** **i** A; **ii** E
- 9 ▶ a** **i** A (red blood cell), identified by its colour (red) and biconcave disc shape.
- ii** B (lymphocyte), identified by its colour (white) and large nucleus (to produce antibodies quickly).
- iii** C (phagocyte), identified by its colour (white), variable shape (shows it is flowing) and lobed nucleus.
- b** Platelets – blood clotting.
- 10 ▶ a** C, heart rate is increasing so more blood can be pumped to muscles.
- b** E, brief jump in heart rate.
- c** A, lowest rate. B, increases from minimum to steady rate.
- 11 ▶ a** **i** Low rate (75 beats/minute) because body is at rest, need for oxygen is low.
- ii** Rate increases because more blood carrying oxygen for respiration needs to be pumped to muscles.
- iii** Rate decreases as need for oxygen is reduced / lactate produced during exercise is removed (repaying oxygen debt).
- b** The shorter the recovery period, the fitter the person.

CHAPTER 6

1 ▶ D **2 ▶** B **3 ▶** C **4 ▶** D

- 5 ▶ a** Changes that take place in the shape of the lens to allow the eye to focus upon objects at different distances away.
- b** The replacement artificial lens cannot change shape.
- c** The ciliary muscles contract and the suspensory ligaments slacken. The shape of the lens becomes more convex, refracting the light more.

6 ▶ a

Function	Letter
refracts light rays	G
converts light into nerve impulses	A
contains pigment to stop internal reflection	B
contracts to change the shape of the lens	E
takes nerve impulses to the brain	D

- b** **i** H
- ii** Contraction of circular muscles in the iris reduces the size of the pupil, letting less light into the eye. Contraction of radial muscles increases the size of the pupil, letting more light into the eye.
- iii** To protect the eye from damage by bright light, and to allow vision in different light intensities.

- 7 ▶ a** **i** Sensory neurone
- ii** Relay neurone
- iii** Motor neurone
- b** The sensory neurone carries impulses from sensory receptors towards the central nervous system. The motor neurone carries impulses out from the CNS to effector organs (muscles and glands). The relay neurone links the other two types of neurone in the CNS.
- c** X: white matter, Y: grey matter, Z: dorsal root ganglion.
- d** Electrical impulses.
- e** The gap between one neurone and another is called a synapse. An impulse arrives at the end of an axon and causes the release of a chemical called a neurotransmitter into the synapse. The neurotransmitter diffuses across the synapse and attaches to the membrane of the next neurone. This starts an impulse in the second nerve cell.
- 8 ▶ a** P: cell body, Q: dendrite, R: axon.
- b** Speed = distance/time
 $= 1.2 \text{ m} / 0.016 \text{ s}$
 $= 75 \text{ m per s}$
- c** Mitochondrion
- d** **i** Insulation / prevents short circuits with other actions (Also speeds up conduction).
- ii** Person would not be able to control their muscle contractions / not be able to coordinate body movements / 'wrong' muscles would contract.

- 9 ▶ a** A wide variety of answers are possible, such as:
- dust in the eye – secretion of tears
 - smell of food – secretion of saliva
 - touching a pin – withdrawal of hand
 - attack by a predator – increased heart rate
 - object thrown at head – ducking.
- b** Nature and role of receptor and effector correctly explained, e.g. for 'dust in the eye' above:
- i** The receptors consist of touch receptors in the eye. They respond by generating nerve impulses (which eventually stimulate the tear glands).
- ii** Tear glands are the effectors. They secrete tears, washing the irritant dust out of the eyes.
- c** Dust enters the eye and stimulates a touch receptor in the surface of the eye. The receptor sends nerve impulses along sensory neurones to the CNS (brain). In the CNS, impulses pass from sensory neurones to motor neurones via relay neurones. Impulses pass out from the CNS to the tear glands via motor neurones. These impulses stimulate the tear glands to secrete tears.