

Solutions

Each answer shows the steps, then the **result**.

2.1

- **atrioventricular valves**, between each atrium and the ventricle below it
- **semilunar valves**, where the arteries leave the ventricles

2.2

- the atria only push blood a **short distance**, down into the ventricles
- so much **less force** is needed, and a thinner layer of muscle is enough

2.3

- the septum normally keeps **oxygenated** blood on the left completely separate from **deoxygenated** blood on the right
- a hole lets the two mix, so the blood pumped to the body carries **less oxygen**
- the body cells cannot respire fast enough, so the baby breathes faster to try to take in more oxygen and becomes breathless

2.4

- measuring the **pulse rate**
- **listening** to the sounds of the valves closing, with a stethoscope
- recording an **ECG**

2.5

- measure the resting pulse rate, repeating it and taking a **mean**
- exercise for a set **time** at a set **intensity**, then measure the pulse rate immediately afterwards
- keep measuring once a minute until it returns to the resting value; keep the type, intensity and duration of the exercise the **same** for everyone compared

3.1 B

- while the ventricles contract, the atrioventricular valves are pushed **shut** and the semilunar valves are pushed **open**, so blood leaves in the arteries
- **A** describes the atria contracting; **C** would let blood run straight through; **D** would move no blood at all

3.2

(a)

- the atria **contract**, raising the pressure inside them
- the **atrioventricular valves open**
- blood is pushed **down into the ventricles**, while the semilunar valves stay shut

(b)

- the first sound is the **atrioventricular valves shutting**, as the ventricles begin to contract
- the second is the **semilunar valves shutting**, as the ventricles relax

(c)

- the **semilunar valves**

3.3

(a)

- the pulse rate is the number of **heart beats per minute**, felt where an artery passes close to the skin
- also acceptable: an **ECG**, or listening to the valve sounds with a stethoscope

(b)

- it **fell**, from 148 beats per minute immediately after the exercise to 74 after 4 minutes
- the fall was **fastest at the start** and slowed as the rate approached the resting value of 72

(c)

- her muscles **respired faster** during the exercise, to release more energy
- so they needed more **oxygen** and **glucose**, and produced more **carbon dioxide**
- the heart beat **faster and more strongly**, so blood flowed through the muscles more quickly
- delivering oxygen and glucose faster and carrying carbon dioxide away faster

(d)

- her pulse rate **recovered more quickly**, in 2 minutes rather than 4
- which suggests she is **fitter**

(e)

- any **two** of: a diet high in **saturated fat** or salt; **smoking**; **stress**; **age**; **sex**; a **genetic** predisposition

(f)

- exercise **strengthens the heart muscle** and helps keep blood pressure and body mass down
- so less fatty material builds up in the **coronary arteries**, and they are less likely to become blocked