Solutions

Marking: **M1** a correct method, **A1** the correct answer, **B1** an independent mark.

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

2.1

$70 \times 70 = 4900$ mL/min

$=$ **4.9** L/min

2.2

$80 + \frac{1}{3}(120 - 80)$

$\approx$ **93** mmHg

2.3

$SV = 120 - 50 = 70$ mL

$EF = 70/120 \approx$ **58**%

above 50%, so normal

2.4

S1: mitral and tricuspid

S2: aortic and pulmonary

a systolic murmur is heard between S1 and S2

3.1

(a) $MAP \propto 3 \times 1.67 = 5$, the same as before

(b) $(5 - 3)/5 =$ **40**%

(c) lower pressure means fewer signals from carotid and aortic stretch receptors; the brainstem raises sympathetic drive: faster heart and narrower arterioles

(d) kidney blood vessels narrow, so kidney flow falls even while pressure is held; low urine output shows the poor flow early

3.2

(a) $r \to r/2$, so $r^4 \to r^4/16$; resistance $\times$ **16**

(b) flow falls to $\frac{1}{16}$

(c) arterioles have a thick muscle wall that changes their radius; a small change in radius gives a large change in resistance, and so in pressure

3.3

(a) **aortic stenosis**: a systolic ejection murmur at the aortic area that spreads to the carotids

(b) the ventricle must make a higher pressure to push blood through the narrow valve; the extra work makes the muscle grow thicker

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(c) **mitral regurgitation** from a damaged or torn papillary muscle

(d) part of each beat goes back into the left atrium; the baroreflex speeds the heart to keep cardiac output up