Solutions

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

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

2.1

foramen ovale: right atrium to left atrium

ductus arteriosus: pulmonary artery to aorta

ductus venosus: umbilical vein to the inferior vena cava, past the liver

2.2

weeks 1–2: all or nothing; the embryo is lost or recovers fully

weeks 3–8: organs are forming, so major structural defects are most likely

2.3

closes it: **indomethacin** or ibuprofen

keeps it open: **prostaglandin E** (alprostadil)

when a baby's blood flow to the lungs or body depends on the duct, until surgery

2.4

no thymus: few T cells, so many infections

no parathyroids: low calcium, causing fits or muscle spasms

3.1

(a) right atrial pressure is higher ($5 > 3$), so blood flows from right to left, past the lungs

(b) the lungs open and their resistance falls, so more blood returns to the left atrium; left pressure becomes higher and pushes the flap shut

(c) oxygen in the blood rises; prostaglandin falls as the placenta is removed

(d) a clot from a vein can cross to the left side and cause a stroke

3.2

(a) the limbs form in that window; before it there are no limb buds to harm, and after it the limbs are already formed

(b) at that stage cells are not yet specialised: the embryo is either lost or recovers fully

(c) avoid valproate if another drug works, with effective contraception if it is used; take high-dose (5 mg) folic acid before conception

3.3

(a) left ventricle pressure is much higher than right, so blood flows left to right

(b) $9 \div 5 = \mathbf{1.8}$

(c) high flow damages the lung arterioles and lung resistance rises; the shunt reverses to right-to-left and the child becomes blue (Eisenmenger syndrome)

(d) $50\,000 \times 8/1000 = \mathbf{400}$

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