Solutions

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

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

2.1

total body water $0.6 \times 70 = \mathbf{42}$ L

ICF **28** L, ECF **14** L

ECF: plasma about **3** L and interstitial fluid about **11** L

2.2

$2 \times 140 + 5 + 5$

$= \mathbf{290}$ mOsm/kg

2.3

sensor: temperature receptors in the skin and hypothalamus

control centre: the hypothalamus

effector: sweat glands, and widening skin blood vessels

2.4

$100 \div 33$

$\approx \mathbf{3.0}$ L

3.1

(a) saline stays in the ECF: $1 \times \dfrac{3}{14} \approx \mathbf{0.21}$ L

(b) dextrose spreads through all water: $1 \times \dfrac{3}{42} \approx \mathbf{0.07}$ L

(c) **saline**, because it stays in the ECF, so about three times as much reaches the plasma

(d) they carry no red cells, so they cannot carry oxygen

3.2

(a) $2 \times 130 + 40 + 5 = \mathbf{305}$ mOsm/kg

(b) the ECF now has more particles than the cells, so water moves out of the cells by osmosis and they shrink

(c) water drawn out of the cells dilutes the sodium in the ECF

3.3

(a) $2 \times 120 + 5 + 5 = \mathbf{250}$ mOsm/kg

(b) too much ADH makes the kidney keep water, so the sodium is diluted

(c) water moves into brain cells, which have more particles than the ECF; the brain swells inside the skull

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(d) brain cells have adapted by losing particles; a fast rise pulls water out quickly and can destroy myelin in the brainstem

(e) limit the water the patient drinks (fluid restriction)