Solutions

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

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

2.1

$t_{1/2} = 0.693 \times 70 \div 7$

$\approx$ **6.9 h**

steady state after 4–5 half-lives: about **28–35 h**

2.2

$4 \times 30 \div 0.6$

$=$ **200 mg**

2.3

steady state: about 4–5 half-lives, **32–40 h**

after 16 h (2 half-lives): **25%**

after 24 h (3 half-lives): **12.5%**

2.4

first-order: the same **fraction** is removed each hour (curve A)

zero-order: the same **amount** is removed each hour because the enzymes are full (line B)

3.1

(a) $F = 10 \div 30 \approx$ **0.33**

(b) after absorption the drug goes to the liver in the portal vein, where much is broken down before it reaches the rest of the body (first-pass metabolism)

(c) sublingual, IV, rectal, skin patch or inhaled

(d) the liver breaks down less, so more reaches the blood (higher F), and it is cleared more slowly

3.2

(a) clearance halves, so half-life doubles

(b) the trough level shows if the drug has been cleared; if high, the next dose is delayed to prevent toxicity

(c) kidney damage or hearing (ear) damage

3.3

(a) $0.693 \times 35 \div 3.5 \approx$ **6.9 h**

(b) $10 \times 35 =$ **350 mg**

(c) $10 \times 3.5 =$ **35 mg/h**

(d) 4–5 half-lives: about **28–35 h**

(e) the enzymes are full, so the level rises far more than the dose

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