Solutions

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

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

2.1

morphine: μ **opioid receptor**

diazepam: **GABA$_A$ receptor**

haloperidol: **dopamine D$_2$ receptor**

2.2

opioids act on μ receptors in the gut

gut movement slows, causing constipation

2.3

codeine: **step 2**

paracetamol: **step 1**

morphine: **step 3**

2.4

it blocks D$_2$ receptors in the nigrostriatal pathway

this is like the dopamine loss in Parkinson disease (extrapyramidal side effects)

3.1

(a) $40 \times 500 = 20\,000$ mg; $20\,000 \div 50 =$ **400 mg/kg**

(b) the normal routes are full, so more NAPQI is made; glutathione runs out and NAPQI kills liver cells

(c) it refills glutathione

(d) the drug is still being absorbed, so the level is not reliable

(e) **INR** (or ALT)

3.2

(a) an **opioid**

(b) opioids act on μ receptors in the brainstem, making the breathing centre less responsive to CO_2

(c) naloxone has a shorter half-life than many opioids, so it wears off while the opioid is still there; give more or an infusion

3.3

(a) valproate causes birth defects (neural tube defects) and harms brain development

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(b) SSRIs can cause the body to release too much ADH (SIADH), so water is kept and sodium is diluted

(c) **serotonin syndrome**: tramadol also raises serotonin, so the two drugs together give too much

(d) tolerance builds fast, and dependence leads to withdrawal on stopping

(e) **flumazenil**