Solutions

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

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

2.1

heart rate rises: β_1

airways widen: β_2

saliva flows: $\mathbf{M_3}$

2.2

systolic fall $= 130 - 105 = 25$ mmHg

this is 20 or more, so **yes**

2.3

ptosis: a slightly drooping eyelid

miosis: a small pupil

anhidrosis: no sweating on that side of the face

2.4

it blocks β_2 receptors on airway smooth muscle

the airways cannot relax, so bronchospasm can occur

3.1

(a) **Horner syndrome**

(b) sympathetic fibres to the head pass over the top of the lung (near T1); the tumour damages them, cutting the sympathetic supply to the eye and face

(c) the pupil dilator muscle (sympathetic, α_1) stops working, so the parasympathetic constrictor acts unopposed

(d) only the small sympathetic eyelid muscle (superior tarsal) is weak; the main lifting muscle (oculomotor nerve) still works

(e) the **right** (same) side

3.2

(a) α_1; smooth muscle of the prostate and bladder neck relaxes, so urine flows better

(b) dizziness on standing (postural hypotension)

(c) it blocks muscarinic (M_3) receptors on the detrusor, so the bladder contracts less; dry mouth, constipation or confusion

3.3

(a) blood pools in the legs and pressure falls; the baroreceptors fire less; the brainstem raises sympathetic and lowers vagal activity, so heart rate rises and vessels constrict

(b) carotid sinus: **glossopharyngeal (IX)**; aortic arch: **vagus (X)**

(c) α_1: vessels constrict, raising blood pressure; β_2: airways widen (β_1: heart beats harder)

(d) the reflex cannot constrict vessels or speed the heart

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