Que.	Scheme	Marks	AOs
4(a)	$[H_1 :] p \neq 0.25$	B1	2.5
		(1)	
(b)	$X \sim B(50, 0.25)$	B1	3.3
	$[P(X \leqslant 6) =] 0.0194$ <u>or</u> $[P(X \geqslant 18) =] 0.9713$ <u>or</u> $[P(X \geqslant 19) =] 0.0287$ <u>or</u> $X \leqslant 6$ <u>or</u> $X \geqslant 19$	M1	3.4
	$[P(X \leqslant 6) =]$ awrt 0.0194 and $[P(X \geqslant 19) =]$ awrt 0.0287	A1	1.1b
	CR: $X \leqslant 6$ or $X \geqslant 19$	A1	1.1b
		(4)	
(c)	[0.0194 + 0.0287 =] awrt 0.048	B1ft	1.1b
		(1)	
(d)	(Do not reject H_0,) there is insufficient evidence to suggest that the **proportion** of those with the **allergy** differs from 25%/**Rylan's belief** not supported	B1	2.2b
		(1)	
			(7 marks)

Notes	
(a)	**B1:** correct alternative hypothesis may be stated in terms of p or π Ignore null hypothesis if stated
	Mark part (b) and part (c) together
(b)	**B1:** setting up a Binomial model with $n = 50$ and $p = 0.25$ (allow if seen previously) May be implied by M mark **M1:** use of Binomial (50, 0.25) to find a tail probability or a CR tail May be implied by a relevant probability e.g. $P(X \leqslant 7) = 0.0453$, $P(X \leqslant 19) = 0.986$, $P(X \geqslant 20) = 0.0139$ For this mark allow 2sf or better. Watch out for $P(X = 6) = 0.0123$, $P(X = 7) = 0.02586$, $P(X = 18) = 0.0262$ which on their own score M0 as these are not tail probabilities. **A1:** both correct probabilities **seen** (condone awrt 0.0193 and awrt 0.0288) **A1:** correct CR oe e.g. $X < 7$, $X > 18$ Condone $X \leqslant 6$ and $X \geqslant 19$
(c)	**B1ft:** awrt 0.048 or ft their two-tailed CR from B(50, p) to 2sf accuracy Each tail probability must be < 0.05
(d)	**B1:** correct inference in context. Do not allow contradictory non-contextual statement e.g. 'Reject H_0' or '10 is in CR' Allow 'proportion' or 'probability' or 'percent(age)/%' but not 'number'. 'Rylan's hypothesis is not supported' is B1, but 'Rylan's hypothesis test is not supported' is B0.