Question Number	Scheme	Marks
5(a)	$X \sim \text{Po}(4)$	M1
	$\text{P}(X = 0) = 0.0183$ $\quad$ $\text{P}(X \geq 8) = 0.0511$	
	$\text{P}(X \leq 1) = 0.0916$ $\quad$ $\text{P}(X \geq 9) = 0.0214$	
	CR $X = 0$ oe $\quad$ $X \geq 9$ oe	A1A1
		(3)
(b)	3.97%	B1
		(1)
(c)	6 is not in the critical region – the data collected are consistent with Chris's claim	B1ft
		(1)
(d)	$\lambda = \dfrac{2n}{9}$	B1
	$1 - \text{P}(Y = 0) > 0.9$	M1
	$1 - \text{e}^{-\frac{2n}{9}} > 0.9$	
	$\text{e}^{-\frac{2n}{9}} < 0.1$	
	$n = 10$ and $\text{e}^{-\frac{2n}{9}} = 0.1083...$ $\quad$ or $\quad -\dfrac{2n}{9} < \ln 0.1$	dM1
	$n = 11$ $\quad$ $\text{e}^{-\frac{2n}{9}} = 0.08677...$	
	Therefore $n = 11$	A1 cao
		(4)
(e)	$\text{H}_0 : \lambda = 10$ $\text{H}_1 : \lambda < 10$	B1
	[$W \sim \text{Po}(10)$ $\text{P}(W \leq 5) =$] 0.0671 or CR $W \leq 4$	B1
	Do not reject H_0 or insignificant or 5 does not lie in the critical region	M1
	There is no significant evidence that the **mean** number/**rate** of **whales** has decreased.	A1cso
		(4)
		Total 13

Notes

(a)	**M1**	Writing or using Po(4) (may be implied by one correct CR)
	A1	**Either tail** $X = 0$ (allow $X \leq 0$) **or** [$18 \geq$] $X \geq 9$ (allow $X > 8$) Allow any letters in place of X
	A1	**Both tails** $X = 0$ oe , [$18 \geq$] $X \geq 9$ oe Allow any letters in place of X
		SC: $\text{P}(X = 0)$ and $\text{P}(X \geq 9)$ as final answer to score M1A1A0.
(b)	**B1**	awrt 3.97% or awrt 0.0397
(c)	**B1ft**	Supports this claim **and** correct reason. Allow a correct f.t. statement and reason based on their CR
(d)	**B1**	writing or using $\frac{2n}{9}$
	M1	May be implied by $\text{P}(Y = 0) < 0.1$ (Allow = in place of <)
	dM1	Dep on previous M mark for solving $\text{e}^{-\lambda} < 0.1$. This may be implied by n = awrt 10.4
		Allow for a trial of any n value or $"-\frac{2n}{9}" < \ln 0.1$ (condone $\frac{2n}{9} = 2.5$) (Allow = in place of <)
	A1	11 cao (Do not allow $n \geq 11$)
(e)	**B1**	Both hypotheses with λ or μ (Allow $\text{H}_0 : \lambda = 2$ $\text{H}_1 : \lambda < 2$)
	B1	awrt 0.0671 or $W \leq 4$
	M1	Correct statement – ft their probability or CR Do not allow contradicting non-contextual comments
	A1cso	Fully correct solution with conclusion in context must have mean/rate with whales.
		NB award M1A1 for a correct contextual statement on its own provided previous marks scored