Question Number	Scheme	Marks
1(a)	$\mathrm{P}(X=2)=\binom{100}{2}\times 0.05^2\times 0.95^{98}=0.081181\ldots$	M1
	awrt 0.0812	A1
		(2)
(b)	$\lambda = np = 5$	M1
	$\mathrm{P}(X=2)=\dfrac{\mathrm{e}^{-5}\times 5^2}{2!}=0.084224\cdots$	
	awrt 0.0842	A1
		(2)
(c)	$\dfrac{"0.084224"-"0.0812"}{"0.0812"}\times 100$ or $\left(\dfrac{"0.084224"}{"0.0812"}-1\right)\times 100$	M1
	awrt 3.7%	A1
		(2)
(d)	Eg Large values of n **and** small values of p	B1
		(1)
(e)	$\mathrm{P(Y=6)}=0.1601=\dfrac{\mathrm{e}^{-\lambda}\times\lambda^6}{6!}$ and $\mathrm{P(Y=7)}=0.1418=\dfrac{\mathrm{e}^{-\lambda}\times\lambda^7}{7!}$	M1
	$\dfrac{0.1418}{0.1601}="\dfrac{\frac{\mathrm{e}^{-\lambda}\times\lambda^7}{7!}}{\frac{\mathrm{e}^{-\lambda}\times\lambda^6}{6!}}"$	M1
	$\lambda = 7\times\dfrac{0.1418}{0.1601}$ oe e.g. $\dfrac{\text{awrt } 715}{\text{awrt } 115}$ or $7\times 0.88(5696...)\ 1\div 0.16(08...)$	M1
	$\lambda = 6.19987\cdots$ awrt $\lambda = 6.2$	A1
		(4)
	Notes	**Total 11**
(a)	**M1** attempt to find P(X=2) using a correct binomial distribution. Either the calculation shown or can be implied by awrt 0.081. Allow ${}^{100}C_2$ or ${}^{100}C_{98}$ or $\dfrac{100!}{2!98!}$ for $\binom{100}{2}$	
	A1 awrt 0.0812	
(b)	**M1** for mean = 5 stated or implied by working	
	A1 awrt 0.0842 or accept 0.0843 if tables used (0.1247 – 0.0404 = 0.0843) may be seen in (c)	
(c)	**M1** correct method using their answers to (a) and (b) (can be implied by correct answer)	
	A1 awrt 3.7% or accept 3.75%. Condone awrt 3.8% if using 0.0843. Do not accept e.g. 0.037	
(d)	**B1** any two suitable comments which refer to n/sample/trials being large/big and p/probability/ chance being small/little, specific values not expected but allow values e.g. "$n>50,\ p<0.2$" but not just "$np<10$". Allow e.g. "$np<10$ if $n>50$". Ignore non-contradictory comments	
(e)	**M1** Two correct simultaneous equations in terms of λ.	
	M1 for using ratio of probabilities for their two simultaneous equations (one must have been correct or implied). May be implied by awrt 6.2. Condone errors dealing with their Poisson expressions $\dfrac{\mathrm{e}^{-\lambda}\times\lambda^7}{7!}$ provided they attempt to divide the two given probabilities either way round.	

	M1	for solving their linear equation in λ from two simultaneous equations (one must have been correct or implied) via a correct rearrangement. i.e. $7\times$their $\frac{0.1418}{0.1601}$ $\left(=\frac{9926}{1601}\text{ or }=\frac{89334}{14409}\right)$ Condone premature rounding/truncation of these numbers in the expression. May be implied by awrt 6.2.
	A1	awrt 6.2 following two correct simultaneous equations or a correct equation in λ. **Do not allow following an invalid method seen** e.g. using the equation solver on the individual equations leading to values of 6.20004 and 6.1998 which scores M1M0M0A0