13	**(a)**		H_0: $\mu = 0.14$ H_1: $\mu < 0.14$ their μ is the **population mean mass** of this variety of apple	**B1** **B1**	**1.1** **2.5**	allow any other symbol except $\bar{x}$ or $\bar{X}$, as long as it is correctly defined; allow hypotheses stated in words allow weight; correct definition of μ may be embedded in hypotheses written out as a sentence; do not allow $\bar{x}$ or $\bar{X}$
				[2]		
13	**(b)**		$[\bar{X}\sim]\text{N}\left(0.14, \frac{0.0199^2}{80}\right)$	**B1** **B1**	**3.3** **2.2a**	Normal distribution with correct mean or variance allow variance = **awrt** 4.95×10^{-6} or **awrt** 0.00222^2 all correct, but allow full credit if no symbol used; allow symbol other than $\bar{X}$ if correctly defined as sample mean, but do not allow μ
				[2]		
13	**(c)**		**awrt** 0.136 seen **BC** $\bar{X} < 0.136$ only or $\bar{X} \leq 0.136$ only	**B1** **B1**	**1.1** **3.4**	 **FT** other correctly defined symbol
				[2]		

Question			Answer	Marks	AO	Guidance
13	(d)		0.1316 < 0.136 **or** 0.1316 is in the critical region (must be correct critical region) **oe** **or** p = awrt 0.00008 < 0.05 **oe** **NB** 0.0000799 **or** z = awrt –3.78 < –1.645 **oe**	**M1**	**3.4**	condone p = awrt 0.00007 < 0.05 **oe NB** 0.0000740 **or** z = awrt –3.79 < –1.645 **oe** from use of $\bar{X} \sim \text{N}\left(0.14, \frac{0.0198^2}{80}\right)$
			reject H_0	**A1**	**1.1**	allow accept H_1 **or** result is significant
			there is sufficient evidence at the 5% level to **suggest** that the **mean** mass of the apples is **less than** 0.14 kg	**A1**	**2.2b**	allow weight; do not allow eg conclude / prove / indicate or other assertive statement instead of suggest
				[3]		