

Question Number	Answer	Mark
13	<p>Use of $\frac{\Delta\lambda}{\lambda} = \frac{v}{c}$ [Must see lab wavelength (393.4 nm) in denominator] (1)</p> <p>Use of $v = H_0 d$ [$d = 5.18 \times 10^{23}$ m] (1)</p> <p>Use of $s = ut$ with $u = c$ and $t = 3.15 \times 10^7$ s (1)</p> <p>Conversion of d to light-year Or conversion of 55 million light years to m [5.20×10^{23} m] (1)</p> <p>$d = 54.8 \times 10^6$ light-year which is the website value so statement is accurate. Or comparison of 5.18×10^{23} m with 5.20×10^{23} m so statement is accurate. (1)</p> <p><u>Example of calculation</u></p> $\frac{(394.5 - 393.4) \times 10^{-9} \text{ m}}{393.4 \times 10^{-9} \text{ m}} = \frac{v}{3.0 \times 10^8 \text{ m s}^{-1}}$ $v = 3.0 \times 10^8 \text{ m s}^{-1} \times \frac{1.1 \times 10^{-9} \text{ m}}{393.4 \times 10^{-9} \text{ m}} = 8.39 \times 10^5 \text{ m s}^{-1}$ $d = \frac{v}{H_0} = \frac{8.39 \times 10^5 \text{ m s}^{-1}}{1.62 \times 10^{-1} \text{ s}^{-1}} = 5.18 \times 10^{23} \text{ m}$ <p>1 light year = $3.0 \times 10^8 \text{ m s}^{-1} \times 3.15 \times 10^7 \text{ s} = 9.45 \times 10^{15} \text{ m}$</p> $d = \frac{5.18 \times 10^{23} \text{ m}}{9.45 \times 10^{15} \text{ m (light year)}^{-1}} = 5.48 \times 10^7 \text{ light-year}$ <p>$\therefore d \approx 55 \times 10^6$ light-year so website statement is correct</p>	5
Total for question 13		5