Question	Answer	Marks
1	D	1
2 a	1024 bits	1
2 b	128 bytes	1
3 a	5 MHz	1
3 b	Frequency remains the same Wavelength decreases to 6.8×10^{-5} m	1 1
4 a	A transverse wave is (linearly) polarised when its oscillations are all in the same plane. Unpolarised transverse waves vibrate in randomly changing planes (see Topic 1.4, Figure 5).	1 1
4 b	The signal will fall to a minimum at B and rise back to a maximum at position C.	1 1
5 a	It is difficult to determine the distance at which the image is the sharpest ('in focus'). The student assumed that this uncertainty is much greater than the uncertainty in measuring the distance between the fixed point source and the lens.	1 1
5 b	Minimum value v, v_{min} = 0.145 m – 0.01 m = 0.135 m Maximum value v, v_{max} = 0.145 m + 0.01 m = 0.155 m $\frac{1}{f} = -\frac{1}{u} + \frac{1}{v} = \frac{1}{0.300} + \frac{1}{0.135}$ gives f_{min} = 0.093 m $\frac{1}{f} = -\frac{1}{u} + \frac{1}{v} = \frac{1}{0.300} + \frac{1}{0.155}$ gives f_{max} = 0.102 m Mean $f = \frac{1}{2}(0.093 + 0.102)$ m = 0.0975 m $\Delta f = \frac{1}{2}(0.102 - 0.093)$ m = 0.005 m (1 s.f.) So $f = (0.098 \pm 0.005)$ m *Alternate method for 5b* $\frac{1}{f} = -\frac{1}{u} + \frac{1}{v} = \frac{1}{0.300} + \frac{1}{0.145}$ f = 0.0978 m Percentage error in = 7% (1 s.f.) Value of f with 7% error = 0.098 ± 0.07 m	1 1 1 1 1 1 1 1
5 c	If $\frac{1}{v} = 3$ D, v = 0.303 m so that v_{min} = 0.303 – 0.01 m = 0.293 m and v_{max} = 0.303 + 0.01 m = 0.313 m. These give minimum and maximum values of $\frac{1}{v}$ of 3.19 D and 3.41 D, i.e. an uncertainty bar ranging from 3.2 D to 3.4 D *Alternate method for 5c* Uncertainty bar on data point of ± 0.3	1 1
5 d	When $\frac{1}{v} = 0, \frac{1}{f} = -\frac{1}{u} + 0 = -\frac{1}{u}$ When $\frac{1}{u} = 0, \frac{1}{f} = \frac{1}{v} + 0 = \frac{1}{v}$	1 1