Waves on Strings - Mark Scheme

Q1.

Question Number	Answer	Mark
	A is the correct answer B is not the correct answer as it can be altered to change frequency (CP 5) C is not the correct answer as it can be altered to change frequency (CP 5) D is not the correct answer as it can be altered to change frequency (CP 5)	**(1)**

Q2.

Question Number	Answer	Mark
a	Recognises that node to node distance = $\lambda/2$ **Or** $\lambda = L/2$ stated (1) Wavelength = 0.85m (1) Example of calculation Node to node distance = $\lambda/2$. String has 4 loops so total length of string is 2λ λ = 1.70 m / 2 = 0.85 m.	**(2)**
b	Use of $v = \sqrt{(T/\mu)}$ (1) Use of $T = mg$ (1) v = 21 m s^{-1} (1) Example of calculation $T = mg$ = 0.20 kg × 9.81 N kg^{-1} = 1.96 N $v = \sqrt{(T/\mu)} = \sqrt{(1.96 \text{ N} / 4.5 \times 10^{-3} \text{ kg m}^{-1})}$ = 20.9 m s^{-1}	**(3)**
c	T and μ are the same **Or** (As f decreases,) λ *in*creases (1) Speed would be the same **Or** There is no effect (on the speed) (1)	**(2)**

Q3.

Question Number	Answer		Mark
a	(Two) waves travelling in opposite directions **Or** Wave reflected back on itself	(1)	
	Superposition / interference occurs	(1)	**(2)**
bi	Units of u are ms^{-1} and units of d are m	(1)	
	Units of f are s^{-1}	(1)	**(2)**
bii	Use of $v = \sqrt{(T/\mu)}$	(1)	
	Recognises that $\lambda = 2L/3$ **Or** states that $\lambda = 0.22$ m	(1)	
	Uses their <u>calculated</u> v and their λ in $v = f\lambda$ to establish f	(1)	
	Use of $f = Ku/d$ with their f to establish u	(1)	
	$u = 1.1$ ms^{-1}	(1)	**(5)**
	<u>Example of calculation</u> $v = \sqrt{(T/\mu)} = \sqrt{(63N / 0.58 \times 10^{-3}\ kgm^{-1})} = 330\ ms^{-1}$ $\lambda = 2L/3 = (2 \times 0.33 / 3) = 0.22$ m $f = v/\lambda = 330\ ms^{-1} / 0.22$ m $= 1500$ Hz $u = fd/K = [1500\ Hz \times (0.15 \times 10^{-3}\ m)] / 0.2 = 1.125\ ms^{-1}$		
	Total for question		**9**