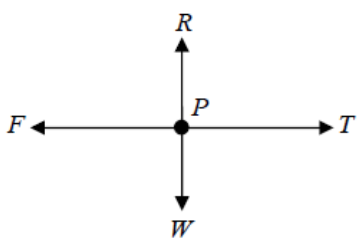
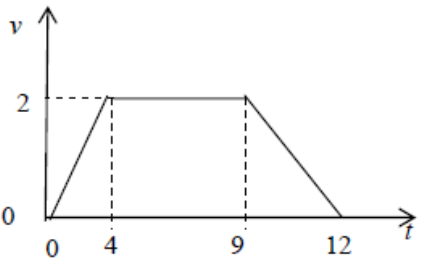


## Mechanics 1 Newtons Laws Answers

7(a)(i)	$T = 0.6 \times 9.8 = 5.88N$ Or $0.6g$	B1	1	
(ii)	Force = $2T = \downarrow 11.76N$ Or $11.8 N$ Or $1.2g$	B1 B1	2	Magnitude Direction
(b)(i)	$Q: 0.8g - T = 0.8a$ $T - 0.6g = 0.6a$ $0.2g = 1.4a$ $a = 1.4$ $T = 6.72N$	M1 A1 A1 m1 A1 A1	6	Either equation  Alternative for m1 A1 if solving for $T$ m1 method for solving, A1 accurate attempt cao   SC whole string to find $a : 0.2g = 1.4a$ M1 $a = 1.4$ A1 to find $T : M1$ A1
(ii)	Force = $2T = 13.44N$	B1	1	cao
<b>Total</b>			<b>10</b>	

5(a)(i)		B1	1	Accept $mg$ , $0.4g$ or $3.92$ for weight Arrows and labels needed
(ii)	$F = 0.5 \times (0.4 \times 9.8)$ $F = 1.96N$	M1 A1	2	Need to see $0.4 \times 9.8$ or $3.92$ used
(b)	$T - 1.96 = 0.4a$ $0.3g - T = 0.3a$ $a = 1.4ms^{-2}$	M1A1 M1A1 A1	5	Consistent reversal of signs in both equations 4 marks; reversal of signs in one equation, M1 A1 M1 A0 Sign change needs justification (whole string: equation, $0.3g - 1.96 = 0.7a$ M1A1 $a = 1.4$ A1) max 3/5
(c)	$v = 1.4 \times 3$ $v = 4.2ms^{-2}$	M1 A1	2	Full method CAO
(d)	$P$ : Friction will cause speed to decrease	M1 A1		Accept decelerate or comes to rest
	$Q$ : Gravity will cause speed to increase	M1 A1	4	Accept accelerate
<b>Total</b>			<b>14</b>	

2(a)		B1 B1 B1 B1	4	Starts and finishes at rest Correct shape Correct values on $t$ -axis Correct values on $v$ -axis Condone omission of the origin
(b)	$s = \frac{1}{2}(5+12) \times 2$ <p>or <math>s = \frac{1}{2} \times 2 \times 4 + 5 \times 2 + \frac{1}{2} \times 2 \times 3 = 17</math> = 17</p>	M1  A1	2	Use of the area under the graph (or equivalent) to find $s$  Correct distance SC When 21 used instead of 12 allow full marks for $s = 26$
(c)	$\max a = \frac{2}{4} = 0.5$ $300 \times 0.5 = T - 300 \times 9.8$ $T = 2940 + 150 = 3090$	B1  M1 A1 A1	4	Maximum acceleration  Three term equation of motion using their $a$ Correct equation using $a = 0.5$  Correct tension
			<b>10</b>	

4(a)	The string is light and inextensible or inelastic or taut	B1 B1	2	First assumption Second assumption
(b)	$6 = 0 + 4a$ $a = \frac{6}{4} = 1.5$	M1  A1	2	Finding $a$ using a CA equation  Correct $a$ from correct working
(c)	$7 \times 9.8 - T = 7 \times 1.5$ $T = 68.6 - 10.5 = 58.1$	M1A1  A1	3	Three term equation of motion with $F$ for the 7 kg particle. Correct equation Correct tension
(d)	$58.1 - F = 13 \times 1.5$ $F = 58.1 - 19.5 = 38.6$ $R = 13.98 = 127.4$ $38.6 = \mu \times 127.4$ $\mu = \frac{38.6}{127.4} = 0.303$	M1A1  A1 B1 dM1  A1	6	Three term equation of motion with $F$ for the 13 kg particle. Correct equation Correct $F$ Correct $R$ Use of $F = \mu R$  Correct coefficient of friction
			<b>13</b>	

4(a)	$T - 800 = 1200 \times 0.4$ $T = 800 + 480$ $= 1280 \text{ N}$	M1 A1  A1	3	Three term equation of motion for the car Correct equation  Correct tension Treat calculation of two tensions as two methods unless one selected Treat sum or difference of two tensions as an incorrect method
(b)	$3000 - 800 - F = 4000 \times 0.4$  $F = 3000 - 800 - 1600$ $F = 600 \text{ N}$  <b>OR</b> $3000 - 1280 - F = 2800 \times 0.4$ $F = 3000 - 1280 - 1120$ $F = 600 \text{ N}$	M1  A1 A1  A1	4	Four term equation of motion (truck or both) Correct terms Correct signs  AG Correct resistance force from correct working
(c)	Increase, because a greater tension would be needed so that the horizontal component would be the same as the tension above.	B1 B1	2	Greater Reason Second B1 dependent on the first B1 mark
<b>Total</b>			<b>9</b>	