

Question			Answer	Marks	AO	Guidance	
11	(a)		$T_1 - 4.5 = 0.6(3.5)$	M1	3.3	N2L for P – correct number of terms and dimensionally consistent – allow sign confusion	
			$T_1 = 6.6 \text{ (N)}$	A1 [2]	1.1		
11	(b)		For Q : $T_2 + 0.4g - T_1 = 0.4(3.5)$ For R : $mg - T_2 = m(3.5)$	M1 M1 A1	3.3 3.3 1.1	M1 for N2L for Q and M1 for N2L for R – correct number of terms and dimensionally consistent – allow sign confusion A1 for both correct (allow with their tension from (a))	Must be using $a = 3.5$ Or (by considering Q and R together) $(0.4 + m)g - T_1 = (0.4 + m) \times 3.5$ scores M2 A1
			$m = 0.648$	A1 [4]	1.1		

Question			Answer	Marks	AO	Guidance	
11	(c)		Before string breaks P moves $0.5(3.5)(0.4)^2 (=0.28)$	B1	3.4	Correct (unsimplified) expression	For reference if solved correctly then a is -0.58 M0 if $a = 3.5$ used For reference $s = \frac{49}{29} = 1.689655...$
			When string breaks the speed of P is $3.5(0.4) (=1.4)$	B1	3.4	Correct (unsimplified) expression	
			For P : $T - 4.5 = 0.6a$ For Q : $0.4g - T = 0.4a$	M1* A1	3.3 1.1	M1 for attempt at N2L for both P and Q after string breaks – correct number of terms and dimensionally consistent- but allow sign confusion	
			When string breaks P travels a distance s where $0 = 1.4^2 + 2(-0.58)s$	M1dep*	3.1b	Use of $v^2 = u^2 + 2as$ with $v = 0$ and their values for u and a	
			Total distance is $0.28 + 1.689... = 1.9696... < 2$ or Total distance is $0.28 + 1.689... = 1.9696...$ so P does not reach the pulley	A1	2.2a	AG	
				[6]			
11	(d)		Both P and the pulley are modelled as having negligible size rather than as objects with dimensions and therefore this could account for why P does reach the pulley	B1	3.5a	An answer that refers to the dimensions of P and/or the pulley	If more than one factor given then B1 if all are acceptable, B0 if not.
			See Appendix for some allowable responses Identifying a relevant factor is sufficient	[1]			

APPENDIX

Exemplar responses for Q11(d)

Response	Mark
Frictional force may not be constant	B1
String not light	B1
String not inextensible	B1
String may be elastic	B1
Elasticity	B1
String may be extensible	B1
Friction is constant	B1
Friction (as a one word answer)	B1
Surface being smooth	B0
Air resistance	B0
Particle may be smooth	B0
Frictional force on pulley	B0